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(54) DEVICE FOR OBTAINING SOAP

(57) A device for obtaining soap, comprising a body (100) and a jug (200) that is removable from the body (100); the jug (200) is configured to hold oil collected by a user, and comprises: helical stirrers (201); a heater element (202); and a number of electrodes (203), as well as a level viewer. The body (100) of the device comprises: a first motor (101) configured to transmit a rotational movement to the helical stirrers (201); a reagent supply module (104) configured to supply the oil with the reagent in order to bring about the saponification reaction to obtain the soap; a water supply system (105) configured to supply water from a water reservoir (105a) to the jug (200); and a control system (107) configured to control, by means of sensors, the process of obtaining the soap.

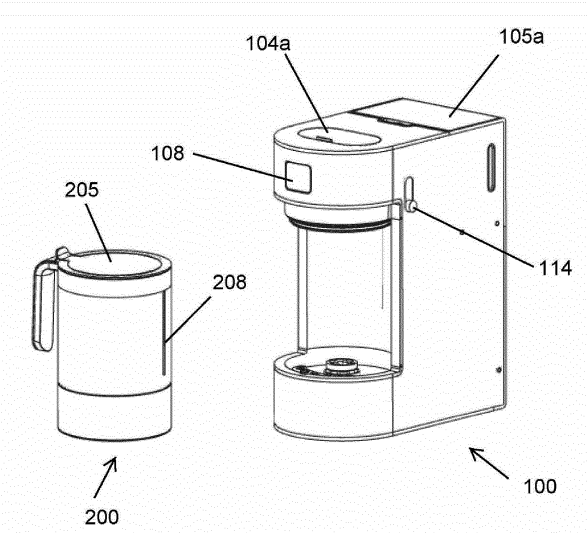

Fig.1

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Description

Technical field

[0001] The object of the present invention relates to a device for obtaining soap which allows the domestic manufacture of soap in a simple and systematic manner, through a sequence of steps to be performed by the user at home, without the need for prior knowledge in the field of saponification.

[0002] The device for obtaining soap that is the object of the present invention also provides great safety for the user, who does not need to come into contact with caustic substances at any time.

[0003] The device for obtaining soap object of the present invention is applicable in the field of the industry for the design, manufacture, marketing and operation of household appliances for domestic or hospitality use, as well as in the field of the industry for the manufacture of soaps.

State of the art

[0004] In the state of the art, most of the soap used comes from industrial manufacturing processes, in which a lot of machinery and complex processes are involved from the management and coordination point of view.

[0005] The usual main processes in manufacture of soap include: stockpiling essential materials for the manufacture (an oil of vegetable or animal origin, or tallow, and a strong alkali or base, typically sodium hydroxide (caustic soda) or hydroxide potassium (potash)); supplying oil or fat to a heated container; adding the alkali, while adding water to the mixture and stirring; and there may also be a refining and customizing phase, where dyes and fragrances are added. Finally, it is left to cool and the reaction ends, obtaining the final product.

[0006] In the domestic sphere, all these processes are supervised directly by the user, who, through experience, determines temperatures, amounts, times, etc. In addition, since it is a high-risk chemical reaction due to the alkali (traditionally caustic soda), the person is exposed to dangers such as inhalation or skin burns (reagent). Users in the domestic sphere do not usually have the utensils or safety measures created specifically for making soaps, which complicates the work and increases the risks to which they are exposed. This process is likely to cause environmental problems as a result of the uncontrolled dumping of the substances used and requires expertise, which discourages many people from undertaking homemade soap production.

[0007] In view of these problems, devices have been developed, such as in patent ES2457716B1, where a method for manufacturing ecological soap and a device for the execution thereof are disclosed. In this case, it is the user who has to manually supply water to the mixture and directly fill the cups with the alkali.

[0008] Another solution is utility model ES1077013U, which protects a device for the manufacture of solid soap by means of a system of cascading reservoirs. The oil is collected in a reservoir that can be opened to pour it into a mixing jug. Once the mixture is made, it is poured through another valve onto a tray in which the soap solidifies. All this translates into a large machine where the oil is poured into an upper reservoir and the saponifying agent is understood to be placed directly in the mixing jug. It should be noted that the object of protection of this utility model is the control of system valves.

[0009] Finally, application KR1020130125607A describes an apparatus for manufacturing soap which uses used cooking oil to prepare soap. A first storage container includes externally supplied used cooking oil; a second container includes caustic soda; all this is brought together in a stirring part that receives the used cooking oil and caustic soda, stirring and mixing them for a set time. Finally, the mixture is poured into a tray in the interior and left to settle.

Object of the invention

[0010] In order to solve the aforementioned drawbacks, the present invention relates to a device for obtaining soap, which allows the processes necessary for obtaining soap to be simplified and automated, in such a way that it facilitates obtaining the soap by any person in a home setting safely.

[0011] The device for obtaining soap object of the present invention comprises a body and a jug that is removable from the body of the device.

[0012] The jug is configured to hold oil (or any oil, fat or tallow from which soap can be obtained) collected by a user of the device.

[0013] The jug comprises:

- helical stirrers connected to a shaft comprising a first gear configured to be connected to a gear wheel located in the body of the device, wherein the helical stirrers are configured to stir a mixture of the oil (and water supplied with the oil) and a reagent with the oil to bring about a saponification reaction to obtain the soap in a tight and safe manner;
- a heating element configured to heat, in the jug, the mixture of the oil (and water supplied with the oil) and a reagent with the oil to bring about a saponification reaction to obtain the soap; and
- a number of electrodes configured to be connected to connectors located in the body of the device.

[0014] The body of the device comprises:

- a first motor configured to transmit a rotational movement to the helical stirrers;
- a reagent supply module configured to supply the oil with the reagent in order to bring about the saponification reaction to obtain the soap;
- a water supply system configured to supply water

from a water reservoir to the jug; and

- a control system configured to control the process of obtaining the soap.

[0015] By means of the device described above, a household appliance-type tool is provided which facilitates obtaining both liquid and solid soap by any person (user) with absolute safety in their own home, in an automated manner, without the need to know a lot about the chemistry of the saponification process. Likewise, it is possible to obtain a high percentage of transformation of the oil into soap, reducing or avoiding traces of alkali, favoring a greater yield of the chemical reaction when the mixture is homogeneously carried out in a controlled manner.

[0016] According to a possible embodiment, the reagent supply module comprises a compartment (or carousel) with at least one chamber configured to hold the reagent (preferably in capsule, sachet or tablet format, and preferably covered with a water-soluble material that isolates the reagent from contact with the user's hand, while allowing the reagent to be properly preserved until it is used in the process of obtaining the soap). The reagent supply module is controlled by the control system to supply the reagent to the jug through a supply conduit at a certain time throughout the process of obtaining the soap. By means of this feature, it is possible to supply the reagent at a specific time during the process of obtaining the soap (for example, after a time interval has elapsed from the start, thus ensuring that the oil has been heated as a result of the heating element or when a thermal switch receives a signal that the oil (mixed with water) has reached a certain temperature).

[0017] According to a possible embodiment, the control system is configured to act on a second motor configured to rotate the compartment (or carousel), causing an outlet opening of the at least one chamber to coincide with a slot that gives way to the supply conduit. In this way, it is possible to supply the reagent by means of a simple rotation of the compartment, letting the reagent fall into the jug when the outlet opening of the chamber coincides with the slot of the supply conduit.

[0018] Preferably, the compartment (or carousel) comprises two chambers, one chamber being configured to hold the reagent with the oil to bring about the saponification reaction to obtain the soap, and another chamber being configured to hold a mixture of soap refining and customizing substances. In this way, the device can be equipped with the possibility of supplying substances that allow the soap obtained to be customized (for example, through dyes or perfumes, which give the soap the desired appearance and smell, as well as physical qualities such as density, texture or viscosity).

[0019] According to a possible embodiment, the reagent supply module comprises at least one position sensor configured to read a rotational position of the compartment (or carousel). In this way, the rotational position of the compartment is controlled, causing the outlet opening of the chamber containing the reagent and/or the chamber containing the refining and customizing substance to coincide at the precise time with the slot that gives way to the supply conduit for supplying the substance in question to the jug.

[0020] Likewise, according to a possible embodiment, the reagent supply module comprises a presence sensor for detecting the presence of the reagent in the corresponding chamber of the compartment. The presence sensor is connected to the control system. The control system is configured to allow the process of obtaining the soap to start only if it detects that there is a reagent in the corresponding chamber of the compartment (or carousel). This feature makes it possible to guarantee that the process of obtaining the soap cannot be started (unsuccessfully, due to a possible oversight of the user) if the reagent has not been introduced into the corresponding chamber of the compartment.

[0021] Furthermore, to avoid mistakenly introducing a capsule into the compartment of another, the two chambers have different shape conditions associated with each reagent capsule.

[0022] The previous feature of the presence sensor is also preferably applied to the chamber containing the refining and customizing substance.

[0023] Preferably, the reagent supply module comprises a lid and an opening sensor for the lid, as well as sealing gaskets that guarantee correct sealing. The opening sensor is connected to the control system. The control system is configured to allow the process of obtaining the soap to start only if it detects that the lid is closed. In this way, it is possible to avoid interference or the possible accidental introduction of objects into the reagent supply module during the process of obtaining the soap. In the embodiment in which the reagent supply module comprises the rotating compartment (or carousel), this feature of preventing the start of the process if the lid is open avoids interferences such as the possible introduction of the user's finger into one of the chambers of the compartment, and the possibility of the device catching the user's finger when rotating the compartment (or carousel) or of being able to cause splashing or gas leaks. Preferably, the device comprises an oil volume meter configured to measure the volume of oil present in the jug. The oil volume meter is connected to the control system. The control system is configured to allow the process of obtaining the soap to start only if it detects that the volume of oil present in the jug is between a minimum threshold and a maximum threshold.

[0024] By means of this feature, it is possible to avoid, due to an oversight of the user, the process of obtaining the soap starting when the user has not introduced a sufficient amount of oil into the jug, or when the user has introduced due to an oversight an excessive amount of oil that can give rise, for example, to the fact that during the rotating action of the helical stirrers, the level of oil mixed with the water (and subsequently with the reagent) can rise too much, reaching the upper edge of the jug.

Likewise, the reaction is prevented from taking place in undesired proportions of water and oil, which would be a problem for the correct dissolution of the reagent. It cannot be guaranteed that all the oil has been transformed, leaving traces in the final solution. The same is true with the reagent, possibly resulting in a dangerous mixture due to excess reagent.

[0025] According to a possible embodiment, the water supply system comprises a water volume sensor for detecting the water volume in the water reservoir. The water volume sensor is connected to the control system. The control system is configured to allow the process of obtaining the soap to start only if it detects that the water volume inside the water reservoir is above a predetermined minimum threshold. In this way, the process of obtaining the soap being able to start when the user has not introduced a sufficient amount of water into the reservoir is prevented.

[0026] According to a possible embodiment, the water supply system comprises a pump, a water conduit, a water outlet nozzle and, optionally, a flow meter. The flow meter and the pump are connected to the control system. The control system is configured to control the amount of water supplied to the jug at all times throughout the process of obtaining the soap. In this way, it is possible to dose the amount of water that has been introduced into the jug at all times of the process of obtaining the soap, and it is even possible to gradually introduce a certain amount of water throughout the entire process of obtaining the soap, and interrupt the supply of water during certain periods of the process of obtaining the soap, for example, while the reagent is being supplied.

[0027] According to a possible embodiment of the device for obtaining soap, the water reservoir is removable from the body of the device. The water supply system then comprises a globe valve configured to open when the water reservoir is inserted into the body of the device, allowing the passage of water from the water reservoir to the water conduit. In this way, in the event that the pump is turned on, said pump is prevented from working and sucking in air from the environment because the water reservoir has not been connected to the body of the device.

[0028] Preferably, the device comprises a protective screen configured to seal the space between the jug and the body of the device to prevent the gas leaks or splashes of the mixture from the jug out of the device during the process of obtaining the soap. This protective screen is configured as a continuation of the side wall or walls of the jug, tightly sealing the space located between the upper opening or mouth of the jug and the body of the device.

[0029] According to a possible embodiment, the protective screen is configured to be assembled and disassembled by means of a pin that can be actuated by the user once the jug is positioned in the device. This allows the user to be able to manually actuate or assemble the protective screen. Optionally, there is the possibility of automating the process by placing the protective screen independently before starting the process.

[0030] Preferably, the device comprises an assembly sensor configured to detect whether the protective screen is assembled or disassembled. The assembly sensor is connected to the control system. The control system is configured to allow the process of obtaining the soap to start only if it detects that the protective screen is assembled. In this way, it is possible to prevent the process of obtaining the soap from starting with the protective screen disassembled, thus avoiding the risk that the user may inhale the gases released during the saponification process or that the liquid reagent spills or overflows. from the jug.

[0031] Preferably, the device comprises an anchoring detector configured to detect whether the jug is anchored or inserted in the body of the device. The anchoring detector is connected to the control system. The control system is configured to allow the process of obtaining the soap to start only if it detects that the jug is anchored to the body of the device. In this way, it is possible to prevent the first motor from starting to rotate the gear wheel without the jug having been introduced, and it also prevents the water supply system from starting to supply water and the reagent supply module from supplying said reagent without the jug having been introduced or anchored or inserted in the body of the device.

[0032] Preferably, the device includes thermal detection means, such as a thermal probe or a thermal switch. Preferably, it comprises a thermal switch, configured to control the temperature of the mixture of the oil and the reagent in the jug. The thermal switch is connected to the control system. The control system is configured to send an open command to a first switch, disconnecting a power supply to the heating element, if it detects that the temperature of the mixture of the oil and the reagent exceeds a predetermined upper threshold. In this way, it is possible to control the temperature of the mixture of oil, water and the reagent, avoiding overheating of said mixture, and keeping it at an optimal temperature to maximize the efficiency of the process of obtaining the soap.

[0033] Preferably, the device for obtaining soap comprises a user interface (for example, a touch screen, and/or a screen together with one or more buttons and a possible loudspeaker). This user interface is configured to allow the user to select between different types of processes of obtaining the soap (for example, it allows the user to choose a process to obtain liquid soap or a process to end up obtaining a solid soap, which will involve different reagents, different proportions of water, different times and/or temperatures). These types of processes can be automatically regulated by the device without the need for any adjustment by the user.

[0034] The user interface is also configured to display information about the progress of the process of obtaining the soap, including warnings, in different ways such as color codes or sounds, of possible errors in the process, insufficient water in the water reservoir, insufficient

or excess oil in the vat or absence of reagent (and/or refining and customizing substance) in the reagent supply module.

[0035] By means of the user interface, the user is guaranteed to have control of the process of obtaining the soap and to be informed at all times of any event related to it.

[0036] According to one design option, the soap device comprises a WiFi connectivity module that transmits information about the device to other devices, such as a mobile phone. This allows this device to be controlled and monitored by the user via WiFi and without the need to be in the presence of the device, such as through an app designed for this purpose. It is also contemplated that the device can be provided with firmware updates, especially remotely.

Description of the figures

[0037] The following figures have been included as part of the explanation of at least one embodiment of the invention.

Figure 1 shows a schematic view of a possible embodiment of the device for obtaining soap, in which the jug is removed from the body of the device.

Figure 2a shows a perspective view of the device for obtaining soap of Figure 1, in which the jug can be seen inserted into the body of the device.

Figure 2b shows a sectional schematic view of the device for obtaining soap of Figure 2a.

Figure 3a shows a perspective view of the device of Figure 2a, in which the reagent supply module can be seen.

Figure 3b shows a detailed perspective view of the bottom of the compartment or carousel of the reagent supply module of the device of Figure 3a, in which some parts of the device have been removed for better visualization.

Figure 3c shows a perspective view of an upper detail of the device for obtaining soap, in which it is possible to observe in detail the upper part of the reagent supply module, with the lid open, and its position under the casing in dashed lines.

Figure 4 shows a view of the device of Figure 2a without some parts and with a sectional view of the casing, in which the first motor, the cog belt and the gears, including the gear wheel where the jug fits, can be seen.

Figure 5 shows a view of the device of Figure 2a, in which the connection pins of the body and the electrodes of the jug, which form the heating system, can be seen.

Figure 6 shows a perspective view of the device of Figure 2a without some parts, in which the water reservoir and the water supply system for supplying water to the jug can be seen.

Figure 7 shows a sectional view of the jug, in which the lateral strip of transparent thermosetting polymer that marks the oil level and its elements can be seen.

Figure 8 shows a bottom perspective view of the body, in which the reagent supply conduit and the slot through which the reagent precipitates, which is concealed by the protective screen in the other figures, can be seen.

Figure 9a shows a side view of the device without some parts, in which a first group of sensors as well as the control system with the main module and the secondary module can be seen.

Figure 9b shows another top view of the device, in which the place where the jug is positioned as well as the upper part of the device with the lid closed can be seen.

Detailed description of the invention

[0038] As mentioned above, the present invention relates to a device for obtaining soap.

[0039] As shown in Figure 1, the device comprises a body (100) and a jug (200) or jar. The jug (200) is configured to hold the oil, so that the user deposits therein used oil coming from, among others, excess oil used in cooking or oil from canned food and, during the process of obtaining the soap, also to hold the other reagents supplied by the device to produce soap.

[0040] The jug (200) also comprises (see Figure 7), at the bottom, the set of helical stirrers (201) configured to stir the oil mixed with the reagents and with the water during the process of obtaining the soap. The helical stirrers (201) are attached to a shaft (206) with a first gear (207) at its end, in such a way that when inserting the jug (200) into the body (100) of the device, the end of the shaft (206) is introduced in a gear wheel (106) of the body (100) of the device.

[0041] The device comprises (see Figure 4) a first motor (101) configured to transmit the rotational movement to the gear wheel (106) by means of a cog belt mechanism (110) connected to a second gear (111) of the first motor. (101) and a third gear (112) connected to the ring gear (106). The gear wheel (106) in turn transmits the rotational movement to the shaft (206) of the helical stirrers (201). The device comprises a speed sensor (e.g., a Hall sensor) configured to measure the rotational speed of the first motor (101) in order to maintain adequate con-

trol of the stirring by the helical stirrers (201).

[0042] The first motor (101) preferably comprises a power of 500 W or more, together with a reduction gear that allows it to operate in a range between 100 and 3000 rpm.

[0043] The jug (200) also comprises (see Figure 7), at its bottom, a heating element (202) (for example, a resistor welded to the base of the jug (200)) configured to heat the mixture of oil and reagents to a temperature adequate for producing the soap (about 80 C), so that heating is brought about without direct contact with the liquid, achieving homogeneous heating by contact through the walls of the jug.

[0044] By means of a number of electrodes (203) located in the lower part of the jug (200), the jug (200) is connected to connectors (103) located in the body (100) of the device, typically inserting the electrodes (203) of the jug (200) into the connectors (103). A power supply is thus provided to the heating element (202), and to a first switch located in the jug (200). This first switch is configured to allow and interrupt the passage of electrical current to the heating element (202).

[0045] The thermal switch preferably has a precision of ± 1°C in the range of 20°C to 80°C. Optionally, the temperature can be controlled by means of a temperature sensor for a more precise control of the temperature of the reaction.

[0046] The heating element (202) can be an electrical resistor, and can have a power equal to or greater than 300 W.

[0047] Optionally, the device comprises an anchoring detector for detecting the anchoring of the jug (200) to the body (100) of the device. This anchoring detector can be located in correspondence with the connectors (103), so that when the electrodes (203) of the jug (200) are inserted into the connectors (103), the anchoring detector detects that the jug (200) has been anchored to the body (100) of the device. In the absence of said anchoring detector, the jug can be detected by the control system (107), detecting whether or not the thermal switch is connected.

[0048] The thermal switch is configured to measure the temperature in the jug (200) (preferably at the base or bottom of the jug (200)) and send a disconnect/open signal when it is detected that the temperature in the jug (200) exceeds a predetermined threshold. For example, the switch can be configured to disconnect the heating element (202) when it is detected that the temperature rises above a threshold of 85°C, and may be configured to reapply power to heating element (202) when the temperature of the vat (200) drops below 79°C.

[0049] Optionally, the device also includes an oil volume meter (109), to measure the amount of oil present in the jug (200). This oil volume meter (109) can be a capacitive volume sensor. It is also contemplated that the correct positioning of the jug (200) can be detected through said capacitive volume sensor.

[0050] The device comprises (see Figure 3a, Figure 3b and Figure 3c) a reagent supply module (104) for supplying reagent to the jug (200).

[0051] The reagent supply module (104) comprises a lid (104a), a compartment (104b) (or carousel) configured to contain one or more reagents, a supply conduit (104c) for supplying the reagent to the jug (200), a second motor (104d) (typically a DC motor or, for example, a stepper motor) configured to rotate the compartment (104b) (or carousel), at least one position sensor (104e) configured to read the rotational position of the compartment (1 04b), and an opening sensor (104f) configured to read an open and closed position of the lid (104a). The compartment (104b) can have one or more chambers (104g). Each chamber (104g) is configured to hold a reagent, for example, supplied in capsule or sachet format with a wrapper, which is preferably water-soluble or fat-soluble.

[0052] Each chamber (104g) includes an inlet opening (104h) for introducing the reagent capsule or sachet into the corresponding chamber (104g). Each chamber (104g) also includes an outlet opening (104i) which, when the compartment (104b) is rotated by means of the second motor (1 04d), is made to coincide at a certain position or angle of rotation of the compartment (104b) with a slot (104j) that gives way to the supply conduit (104c) and surrounded by a sealing gasket (1 04n), allowing the reagent capsule or sachet to fall into the jug (200) in that position, through the supply conduit (104c). One chamber (104g) of the compartment (104b) can comprise a first reagent, for example a strong base or alkali (e.g., caustic soda or potash), and another chamber (104g) of the compartment (104b) can comprise a reagent to supply a perfume or color to the soap or other properties.

[0053] The two chambers (104g) have different shape conditions associated with each reagent capsule so that one cannot be mistakenly introduced into the compartment of the other. According to a design form, they will be referenced by a symbol engraved in the opening of each cavity. Thus, rotation in both directions will be brought about. In a first rotation, the compartment (104b) rotates 120°, bringing about the precipitation of the reagent capsule, then undoing the rotation to preserve total tightness. Subsequently, it performs another 120° rotation in the direction opposite the first one, thus bringing about the precipitation of the resulting soap color and perfume customizing capsule, then undoing the rotation and ending up in the initial position.

[0054] The second motor (104d) rotates the compartment (104b) (or carousel) by means of an intermediate cog wheel (104k) that meshes with a toothed edge (104l) of the compartment (104b).

[0055] When the opening sensor (104f) detects that the lid (104a) is open, the actuation of the second motor (104d) is prevented and, therefore, the rotation of the compartment (104b) is blocked.

[0056] The reagent supply module (104) optionally comprises a presence sensor (104m) for detecting the presence of the tablet or sachet of reagent in each chamber (104g) of the compartment (104b).

[0057] To obtain the soap, it is essential to supply a certain amount of water to the jug (200) with the mixture of the oil and reagents. The amount of water to be supplied must be related to the amount of oil stored in the jug (200).

[0058] The device comprises (see Figure 6) a water supply system (105) for supplying water to the jug (200). The water supply system (105) comprises a water reservoir (105a), a pump (105b) (for example, a solenoid pump), a water conduit (1 05c), a water outlet nozzle (105d), optionally a flow meter (105e), a globe valve (105f) and a water volume sensor (105g) for detecting the water volume in the water reservoir (105a). When the water reservoir (105a) is placed in its corresponding position in the body (100) of the device, the water reservoir (105a) exerts pressure on the globe valve (105f), which opens and allows the passage of water. The pump (105b) is configured to exert a vacuum in the water conduit (105c), thus propelling the water from the water reservoir (105a), through the water conduit (105c) and through the nozzle (105d) to the jug (200).

[0059] According to a possible embodiment, the volume sensor (105g) is located in the body (100) of the device, and is configured to capture the magnetic field of a buoy provided with a magnet, the buoy being located in the water reservoir (105a). However, according to alternative embodiments, the volume sensor (105g) can be an optical, humidity or other type of sensor capable of detecting the water volume inside the water reservoir (105a).

[0060] The device comprises a protective screen (113) configured to cover in the upper area the space between the jug (200) and the body (100) of the device.

[0061] The protective screen (113) is configured to be assembled and disassembled by means of a pin (114). Figure 2a shows the protective screen (113) in its assembled position, while Figure 1 shows the device with the protective screen (113) disassembled and the jug (200) removed from the body (100) of the device.

[0062] When the protective screen (113) is in its assembled position, the protective screen (113) is arranged as an extension of the side wall or walls of the reservoir (200), guaranteeing a tight closure and thus preventing gases released from the saponification reaction inside the jug (200) from coming out and being inhaled by the user. For this purpose, it has a custom-designed molded gasket with a specific lip-type geometry.

[0063] Preferably, the device also includes an assembly sensor of the protective screen (113). This assembly sensor is configured to detect whether the protective screen (113) is assembled or disassembled. When the protective screen (113) is disassembled, the jug (200) can be easily inserted into and removed from the body (100) of the device.

[0064] The device comprises a control system (107). This is essentially incorporated into a printed circuit controlled by a microprocessor.

[0065] Also, to facilitate the connection of the different detectors/sensors/meters/probes, there can also be printed circuits that allow simplification of the wiring.

[0066] The following elements of the device are connected to the control system (107):

- the level sensor (105g) of the water reservoir;
- the first motor (101) with its associated speed sensor;
- the heating element (202);
- the thermal switch;
- the water pump (105b);
- the assembly sensor of the protective screen (113);
- the second motor (104d) to rotate the compartment (104b) of the reagent supply module (104);
- the position sensors (104e) for detecting the rotational position or angle of rotation of the compartment (104b) or slide;
- the presence sensor (104m) for detecting the tablet or sachet of reagent in each chamber (104g) of the compartment (104b);
- the opening sensor (104f) for the lid (104a) of the reagent supply module (104);
- a user interface (108); and
- the oil volume meter (109) for measuring the oil volume in the jug (200).

[0067] The user interface (108) allows the user to select the type of work cycle of the device, as well as, optionally, to start and stop the work cycle when desired. The user interface (108) also makes it possible to view the operation and the possible error codes. The user interface (108) is configured to display warnings and visual information by means of a screen built into the device, as well as, optionally, audible warnings and information by means of a loudspeaker built into the device, or light signals. The user interface (108) comprises one or more buttons or push buttons that allow the user to select the type of work cycle and other operating parameters of the device. These capacitive buttons or pushbuttons can be integrated into the user interface screen (108), in which case it is a touch screen or tactile interactive graphic display.

[0068] The control system (107) of the device is configured to allow the actuation of the water pump (105b), only in the case of receiving a signal from the volume sensor (105g) indicating that the water level inside the water reservoir (105a) exceeds a certain threshold value, making it possible to check that there is enough water at the start of the process.

[0069] The control system (107) of the device is configured to allow the actuation of the first motor (101), only in the case of receiving:

- a signal from the thermal switch indicating that the jug (200) has been introduced into the body (100) of the device;
- a signal from the oil volume meter (109) indicating that the oil volume inside the jug (200) is between a

minimum threshold and a maximum threshold; and
- a signal from the assembly sensor indicating that the protective screen (113) is assembled.

[0070] Also, at the time of starting a work cycle selected by the user by means of the user interface (108), the control system (107) checks the water volume existing in the water reservoir (105a). If the water threshold is exceeded, the user receives a positive indicator; if the threshold is not exceeded, the user receives an alert and is asked to fill the water reservoir (105a). Therefore, at the start of a work cycle, the control system (107) of the device is configured to allow the actuation of the first motor (101), only in the case of receiving water from the water volume sensor (105g) for detecting the water volume in the water reservoir (105a) a signal indicating that the water level inside the water reservoir (105a) exceeds a certain threshold value.

[0071] The control module (107) is in charge of controlling the power of the different elements of the device. This module (107) can be associated with two TRIACs, with a TRIAC and a relay, or simply with a relay for power control of the first motor (101) and the heating element (202) which, together with the speed sensor and the thermal switch, allow the device to be provided with a double PID control of process variables.

[0072] Additionally, associated with the module (107), the device includes a controller to act on:

- the second motor (104d) to rotate the compartment (104b) of the reagent supply module (104);
- a possible electrical lock of the anchoring of the jug (200); and
- a relay that activates the water pump (105b).

[0073] In addition to controlling the readings of the speed sensor and the thermal switch, the module (107) can also control the readings of the position sensors (104e), there being several sensors for measuring the start and end positions, and thus detecting the rotational position or angle of rotation of the compartment (104b) or slide, of the presence sensor (104m) for detecting the presence of the tablet or sachet of reagent in each chamber (104g) of the compartment (104b), of the water volume sensor (105g) for detecting the water volume in the reservoir (105a), of the assembly sensor of the protective screen (113), of the opening sensor (104f) for the lid (104a) of the reagent supply module (104), and of the oil volume meter (109).

[0074] Additionally, the microcontroller of the electronic module (107) includes a hardware code execution monitor (watchdog) to restart the firmware of the different elements connected to it in case of code execution failure.

[0075] In addition, preferably, the control module (107) will include a serial communication port to be able to connect with a USB or WiFi communication module and/or with a graphic user interface module depending on the user interface (108) used, on the capacitive pushbuttons and RGB LEDs or graphic touch screen, which may be different for different models of the device. The choice also depends on the desired wireless connectivity with other devices. In this way, through the WiFi module, it would be possible to control the device through the use of an app.

[0076] The microprocessor of the module (107) is an 8-bit microprocessor/microcontroller. Firmware is stored in a flash memory and can be updated through the serial communication. This firmware stored in memory in the module (107) includes, at a first level, the routines to periodically calculate the temperature of the mixture in the jug (200) and the rotational speed of the first motor (101), as well as to update the position of the compartment (104b) or carousel, verify the presence of the reagent capsules, tablets or sachets in each chamber (104g) of the compartment (104b), the water level in the water reservoir, the amount of water added to the mixture, the position of the lid (104a) of the compartment (104b) of the capsules/sachets/tablets and the anchoring/locking of the jug (200), the oil level in the jug (200), to detect the times the user presses the user interface (108) and to turn on the audible and/or light indicators of the user interface (108).

[0077] Additionally, at a second level, the module has the following functions:

- dosing the water volume into the jug (200) from the reservoir (105a);
- dropping one of the selected reagent capsules/tablets/sachets into the jug (200);
- controlling the temperature of the mixture inside the jug (200); and
- control the mixing speed.
- Communicating with other modules.

[0078] The third level of the firmware includes the routines to calculate the times of the work cycle or program and the amount of water to be added based on the program selected by the user, as well as to control the time elapsed in each phase of the work cycle and the state of the detectors/sensors/probes/meters to guarantee safety throughout each stage of the work cycle. In addition, this part of the firmware incorporates the management and storage of device state variables and possible alarms and faults detected. It also optionally includes the communications routines necessary for wireless communication with other possible user interface devices (smartphones, tablets, etc.).

[0079] As for the sensors/probes/meters/detectors of the device, it should be noted that their existence is essential to ensure the proper operation of the device, and for the convenient removal and safe handling of the soapy product once obtained.

[0080] Preferably, the oil volume in the jug (200) should be measured in two phases. In the first, the user must visually monitor the oil volume. While the user pours the oil into the jug (200), by means of a lateral strip (208) of

transparent thermosetting polymer, the user will be able to observe the height of the liquid (the oil level reached inside the jug (200)). When the oil reaches the level indicated for the type of cycle to be performed (liquid soap or bar soap), the user must stop pouring oil. The jug (200) has at least one liquid height mark that marks the ideal volume for manufacturing, for example, each type of soap.

[0081] The second reading phase occurs after placing the jug (200) in the device and turning it on. The oil volume meter (109) (typically a capacitive sensor) is aligned with the strip of polymer placed on the wall on which the jug (200) rests. The oil volume meter (109) senses the oil volume and, preferably, the change in volume after the water is poured. To prevent the stainless steel of the jug (200) from affecting the reading of the oil volume meter (109), the strip of polymer preferably has an optimal width for viewing the contents.

[0082] The reading of the oil volume meter (109) allows knowing if the oil volume is correct for the process of manufacturing the soap. This makes it possible to check that the oil level is adequate for the type of soap to be obtained, which will have been previously selected by the user in the user interface (108). If it is not in this range, the device sends an error message through the user interface (108) for the user to reset the amount of oil. If it is by default, completing with more oil when it is available. And if it is due to excess, removing the jug (200) and pouring the excess into another container.

[0083] Some of the sensors/detectors/meters/probes have the ability to block the operation of the device when it is detected that they do not provide a required reading: the oil volume meter (109) of the jug (200) measures the oil level to confirm that the amount of oil is sufficient while the water volume sensor (105g) of the reservoir (105a) (preferably also a capacitive-type sensor) does the same with the water level. The oil volume meter (109) can check that the liquid volume is correct at the start of the process and/or once mixing is taking place.

[0084] The presence sensor(s) (104m) for detecting the presence of the tablet or sachet of reagent in each chamber (104g) of the compartment (104b), as well as the opening sensor (104f) (preferably a Hall sensor-type magnetic sensor) for the lid (104a) of the compartment (104b) of the reagent supply module (104) are typically photocell-type sensors (although they could be capacitive or pressure-actuated limit-switch sensors). These sensors (104m, 104f) ensure the existence of a tablet in the chambers (104g) of the compartment (104b) or carousel, and record if light enters them in order to identify if the lid (104a) is closed. The opening sensor (104f) for the lid (104a), as well as the assembly sensor of the protective screen (113) are arranged to ensure that the protective screen (113) and the cover (104a) of the reagent supply module (104) are closed before starting the operation of the device. The remaining sensors ensure correct operation of the device and send information to the control system (107) for monitoring.

[0085] As for the capsules, tablets or sachets (hereinafter, capsules) to be introduced into the different chambers (104g) of the compartment (104b) or carousel of the reagent supply module (104), these capsules can be: a reagent capsule to bring about the saponification reaction; and a soapy product refining and customizing capsule.

[0086] As for the reagent capsule to bring about the saponification reaction, this is the tablet used in the saponification phase of the corresponding operating cycle of the device. This capsule contains the reagents for the saponification reaction that turns oil into soap to be brought about. Its main component is a strong base, such as potassium or sodium hydroxide, which are used to obtain liquid or bar soap, respectively.

[0087] The reagent may be made up of potassium hydroxide or sodium hydroxide, which are caustic compounds that can cause burns when in contact with the skin. For this reason, it is necessary for this compound to be covered with a protective medium which, while preventing contact with the user, protects the basic compound from being deactivated by the effect of atmospheric components such as CO_2. This coating must be soluble in the reaction mixture, and must be compatible with the chemical reagents it contains. In this way, the user will be able to touch the capsule with his or her hand, without the need for any additional protection, and keep it safely under normal environmental conditions.

[0088] As for the soapy product refining and customizing capsule, it can comprise three main components: an acid reagent that is used to neutralize the essential product; fragrance; and dyes. These last two components are used to modify the color and smell of the soap. There are also optionally other substances that modify the physical properties such as the texture, density or viscosity of the final product.

[0089] These three components are wrapped with a material that is compatible with the three types of reagents used and that must be soluble in the mixture obtained. Preferably, the refining or customizing capsule can be compartmentalized to prevent the different elements from mixing, which at least in part may be in a liquid state since the mixing is carried out at lower revolutions to avoid the formation of foam.

[0090] The reagent capsule and/or the refining capsule can incorporate coadjuvant compounds that increase the stability of the final product, such as surfactants and/or binders and/or water hardness correctors.

[0091] According to a possible embodiment of the device, the jug (200) includes a filtration accessory (210) for filtering out the impurities in the oil introduced by the user. This accessory could be a kind of filter or strainer, which can be removed and washed independently of the jug (200). Optionally, in said filtration accessory (210) a paper-type filter that filters not only by particle size but also by chemical composition, thus avoiding undesirable substances that may be present in the waste oil. This special paper filter is known in and of itself.

[0092] The jug (200) has an ergonomic grip or handle for comfortable handling by the user and, optionally, an upper lid (205) on the filtering part that is mechanically actuated with the thumb of the hand holding the handle.

[0093] Optionally, the device can incorporate a pH sensor to measure the pH level of the soapy product obtained once the cycle is finished, ensuring that the soapy product obtained has a pH level suitable for handling by the user. In the event that the pH result was not optimal, the device would try to solve it and, if not possible, it would give off an alert to discard the result.

[0094] As an alternative to the previous system, a color pH indicator could optionally be used, so that the resulting product has the color of the indicator so that the user can ensure that the final pH is correct.

[0095] The control system (107) is prepared for its connectivity with external devices, thus integrating itself into an IoT system, and into a BigData and artificial intelligence environment.

[0096] The user interface (108) is intuitive and friendly, giving the user information about the work cycle and all the variables related to it at all times.

[0097] In an exemplary embodiment, different icons associated with different variables could be identified on the user interface, in which a series of LEDs light up green if the process is carried out correctly and red if there is some type of incident.

[0098] As for the work cycle, as already mentioned, there is a first saponification phase and a second soapy product refining and customizing phase.

[0099] In the saponification phase, the saponification reaction itself is brought about, in which the transformation of the oil stored in the reservoir (200) into soap is carried out. This phase can be subdivided into the following stages:

- Oil storage: it is introduced into the reservoir (200) directly at one time or in different additions during the oil storage phase outside the body (100).
- Water supply: Once the jug (200) is anchored to the body (100) of the device, and the protective screen (113) that seals the inside of the jug (200) is assembled, the water is automatically introduced inside the jug (200), regulated by the device itself. Initially, only a partial amount of the total water to be added is poured into the jug (200).
- Supply of the saponification capsule: The saponification product capsule is poured in by means of the reagent supply module (104). Next, the stirring system (the helical stirrers (201)) is started at a speed typically of (about) 1500 rpm while heating is started (which may be at about 80-85°C) for about one hour. The mixture can reach the temperature of 80-85°C in about 5 minutes.

[0100] The objective of this saponification phase is to mix water and oil in order to obtain a stable emulsion within which the saponification reaction is carried out, properly and completely dissolving the normally solid reagent. This requires stirring at high speed and at high temperature (around about 80-85°C) for about one hour. In this phase, less water is used to achieve a high concentration of basic reagent (leading to a very high pH), thus trying to maximize the conversion of residual oil and avoiding its existence in the final product. During this stage, a highly viscous product is obtained which, due to the centrifugal force, tends to accumulate on the walls of the jug (200). This effect is influenced by the shape and the diameter ratio of the helical stirrers (201) and the inside of the jug (200). For this reason, the helical stirrers (201) inside the jug (200) have a diameter ratio with respect to the jug to favor the shear stress in the mixing and the hydrodynamics of the reaction, engulfing the liquid towards the helical stirrers in order to avoid the accumulation on the walls and a not completely homogeneous mixture.

[0101] Also important are the properties of the material of the jug (200), which must not interact with the reaction mixture. For this reason, the jug (200) is preferably made of a chemically compatible material, or lined with it, with the demanding conditions set by the reaction mixture in the saponification phase.

[0102] In the soapy product refining and customizing phase, the process of refining the properties of the soap resulting from the saponification phase occurs by neutralizing the excess caustic reagent. Also, in this phase it is possible to customize the fragrance, color, texture, density, etc., of the product to suit the user, who can choose from among different capsules that will be distinguished by their final characteristics. This phase can be subdivided into the following stages:

- Water supply: water continues to be introduced inside the jug (200) automatically, regulated by the device itself; and
- Capsule addition: The refining and customizing capsule, which has a water-soluble wrapper, is automatically poured by the device at a certain time of the reaction.

[0103] The main objective of this phase is to ensure that the final product is stable, pleasing to the user and safe for use. During this phase, the mixture obtained in the previous stage is stirred at low speed (lower than the stirring of the saponification phase, for example, around 500 rpm) for the necessary time, with the reagents from the refining and customizing capsule and the amount of water necessary to achieve a chemically stable material and with a pH value compatible with its safe handling by the user. Likewise, the process allows the appropriate viscosity and final appearance to be achieved. At this point it is important not to generate a high volume of foam.

[0104] The final result is a viscous liquid product that is poured into a specific container for storage (bottle or mold).

[0105] In the case of liquid soap, the product will be

ready to be used after completion of the refining and customizing stage.

[0106] In the case of bar soap, the product will be ready to be used after the curing process, which may take days for the soap to reach a pH suitable for use (up to about 40 days).

Claims

1. A device for obtaining soap, **characterized in that** it comprises a body (100) and a jug (200) that is removable from the body (100) of the device, wherein the jug (200) is configured to hold oil collected by a user of the device, wherein the jug (200) comprises:

    - helical stirrers (201) connected to a shaft (206) comprising a first gear (207) configured to be connected to a gear wheel (106) located in the body (100) of the device;
    - a heating element (202) configured to heat, in the jug (200), a mixture of the oil and a reagent with the oil to bring about a saponification reaction to obtain the soap; and
    - a number of electrodes (203) configured to be connected to connectors (103) located in the body (100) of the device;

    and wherein the body (100) of the device comprises:

    - a first motor (101) configured to transmit a rotational movement to the helical stirrers (201);
    - a reagent supply module (104) configured to supply the oil with the reagent in order to bring about the saponification reaction to obtain the soap;
    - a water supply system (105) configured to supply water from a water reservoir (105a) to the jug (200); and
    - a control system (107) configured to control the process of obtaining the soap.

2. The device for obtaining soap according to claim 1, **characterized in that** the reagent supply module (104) comprises a compartment (104b) with at least one chamber (104g) configured to hold the reagent, wherein the reagent supply module (104) is controlled by the control system (107) to supply the reagent to the jug (200) through a supply conduit (104c) at a certain time throughout the process of obtaining the soap.

3. The device for obtaining soap according to claim 2, **characterized in that** the control system (107) is configured to act on a second motor (104d) configured to rotate the compartment (104b), causing an outlet opening (104i) of the at least one chamber (104g) to coincide with a slot (104j) that gives way to the supply conduit (104c).

4. The device for obtaining soap according to claim 2 or 3, **characterized in that** the compartment (104b) comprises two chambers (104g), one chamber (104g) being configured to hold the reagent with the oil to bring about the saponification reaction to obtain the soap, and another chamber (104g) being configured to hold a soap refining and customizing substance.

5. The device for obtaining soap according to claim 3 or 4, **characterized in that** the reagent supply module (104) comprises a position sensor (104e) configured to read a rotational position of the compartment (104b).

6. The device for obtaining soap according to claims 3 to 5, **characterized in that** the reagent supply module (104) comprises a presence sensor (104m) for detecting the presence of the reagent in the corresponding chamber (104g) of the compartment (104b), wherein the presence sensor (104m) is connected to the control system (107), wherein the control system (107) is configured to allow the process of obtaining the soap to start only if it detects that there is a reagent in the corresponding chamber (104g) of the compartment (104b).

7. The device for obtaining soap according to any of the preceding claims, **characterized in that** the reagent supply module (104) comprises a lid (104a) and an opening sensor (104f) for the lid (104a), wherein the opening sensor (104f) is connected to the control system (107), wherein the control system (107) is configured to allow the process of obtaining the soap to start only if it detects that the lid (104a) is closed.

8. The device for obtaining soap according to any of the preceding claims, **characterized in that** comprises an oil volume meter (109) configured to measure the amount of oil present in the jug (200), wherein the oil volume meter (109) is connected to a control system (107), wherein the control system (107) is configured to allow the process of obtaining the soap to start only if it detects that the oil volume present in the jug (200) is between a predetermined a minimum and a maximum threshold.

9. The device for obtaining soap according to any of the preceding claims, **characterized in that** the water supply system (105) comprises a water volume sensor (105g) for detecting the water volume in the water reservoir (105a), wherein the volume sensor (105g) is connected to the control system (107), wherein the control system (107) is configured to allow the process of obtaining the soap to start only if

it detects that the water volume inside the water reservoir (105a) is above a predetermined minimum threshold.

10. The device for obtaining soap according to any of the preceding claims, **characterized in that** the water supply system (105) comprises a pump (105b), a water conduit (105c), a water outlet nozzle (105d) and a flow meter (105e), wherein the flow meter (105e) and the pump (105b) are connected to the control system (107), wherein the control system (107) is configured to control the amount of water supplied to the jug (200) at all times throughout the process of obtaining the soap.

11. The device for obtaining soap according to claim 10, **characterized in that** the water reservoir (105a) is removable from the body (100) of the device, and wherein the water supply system (105) comprises a globe valve (105f) configured to open when the water reservoir (105a) is inserted into the body (100) of the device, allowing the passage of water from the water reservoir (105a) to the water conduit (105c).

12. The device for obtaining soap according to any of the preceding claims, **characterized in that** comprises a protective screen (113) configured to cover the space existing between the jug (200) and the body (100) of the device preventing gases releasing, overflows or spills from the jug (200) to the outside of the device during the process of obtaining the soap.

13. The device for obtaining soap according to claim 12, **characterized in that** the protective screen (113) is configured to be assembled and disassembled by means of a pin (114) actuated by a user.

14. The device for obtaining soap according to claim 12 or 13, **characterized in that** comprises an assembly sensor configured to detect if the protective screen (113) is assembled or disassembled, wherein the assembly sensor is conected to the control system (107), wherein the control system (107) is configured to allow the process of obtaining the soap to start only if it detects that the protective screen (113) is assembled.

15. The device for obtaining soap according to any of the preceding claims, **characterized in that** comprises an anchoring detector configured to detect whether the jug (200) is anchored in the body (100) of the device, wherein the anchoring detector is connected to the control system (107), wherein the control system (107) is configured to allow the process of obtaining the soap to start only if it detects that the jug (200) is anchored to the body (100) of the device.

16. The device for obtaining soap according to any of the preceding claims, **characterized in that** it comprises thermal detection means configured to measure the temperature of the mixture of the oil and the reagent in the jug (200), wherein the thermal detection means are connected to the control system (107), and wherein the control system (107) is configured to send an open command to a first switch, disconnecting a power supply to the heating element (202) if it detects that the temperature of the mixture of the oil and the reagent exceeds a predetermined upper threshold.

17. The device for obtaining soap according to any of the preceding claims, **characterized in that** it comprises a user interface (108) configured to allow the user to select between different types of processes of obtaining the soap, as well as to display information about the progress of the process of obtaining the soap, including warnings of possible errors in the process, insufficient water in the water reservoir (105a), insufficient or excess oil in the jug (200) or absence of reagent in the reagent supply module (104).

18. The device for obtaining soap according to any of the preceding claims, **characterized in that** it includes a WiFi module for connection with external devices.

19. Use of the device according to any of claims 1 to 18, **characterized in that** the reagent and/or the refining and customizing substance is supplied in capsule format, said capsule being provided with a water-soluble or fat-soluble wrapper.

20. A capsule for a device according to any of claims 1 to 18, **characterized in that** it is provided with a water-soluble or fat-soluble wrapper containing the reagent and/or the refining and customizing substance.

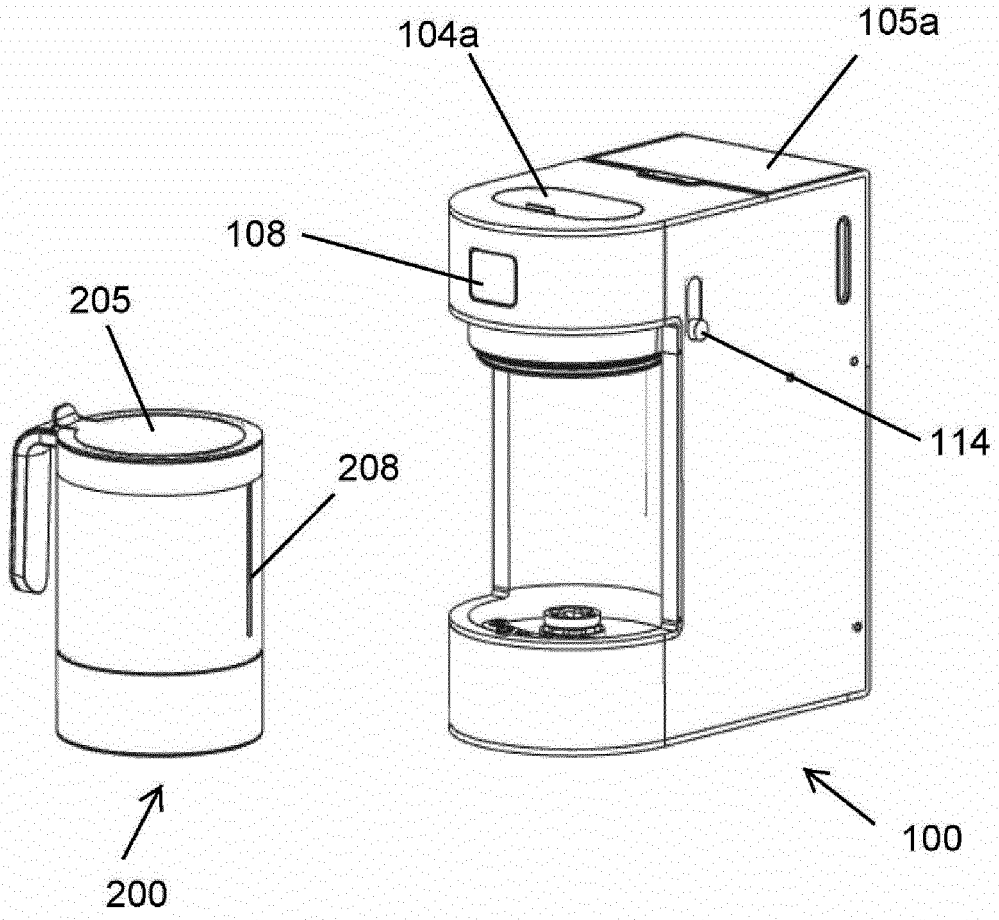

Fig.1

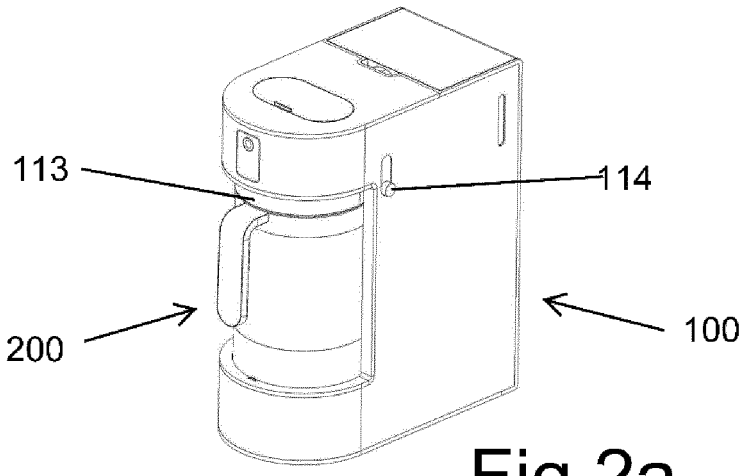
113
114
200
100

Fig.2a

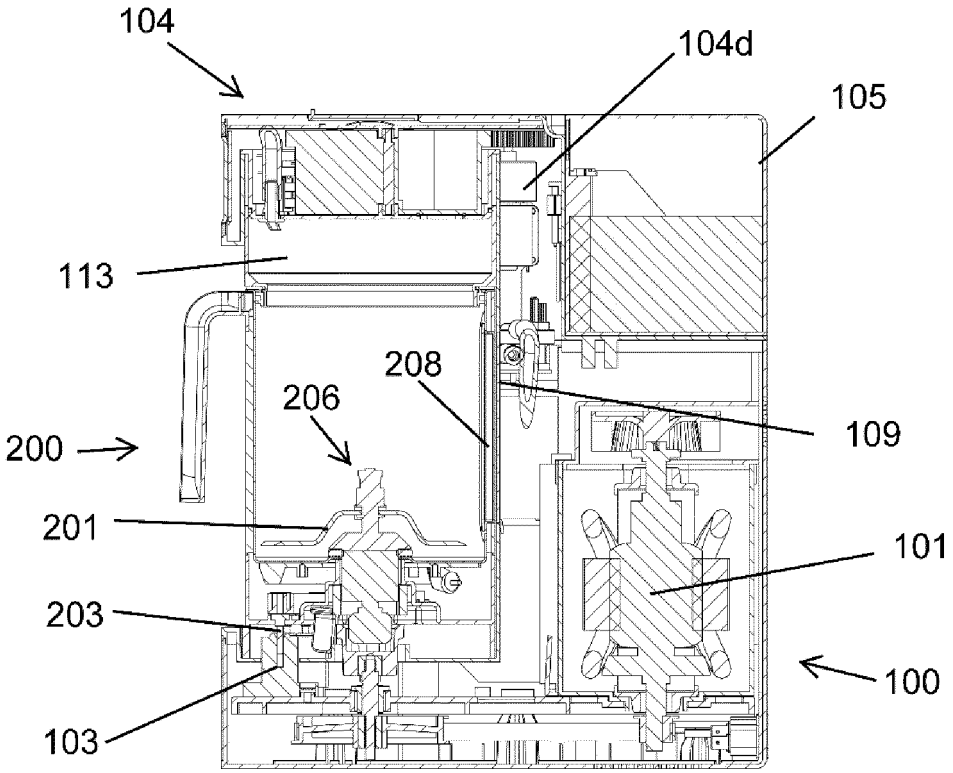
104
104d
105
113
208
206
109
200
201
101
203
100
103

Fig.2b

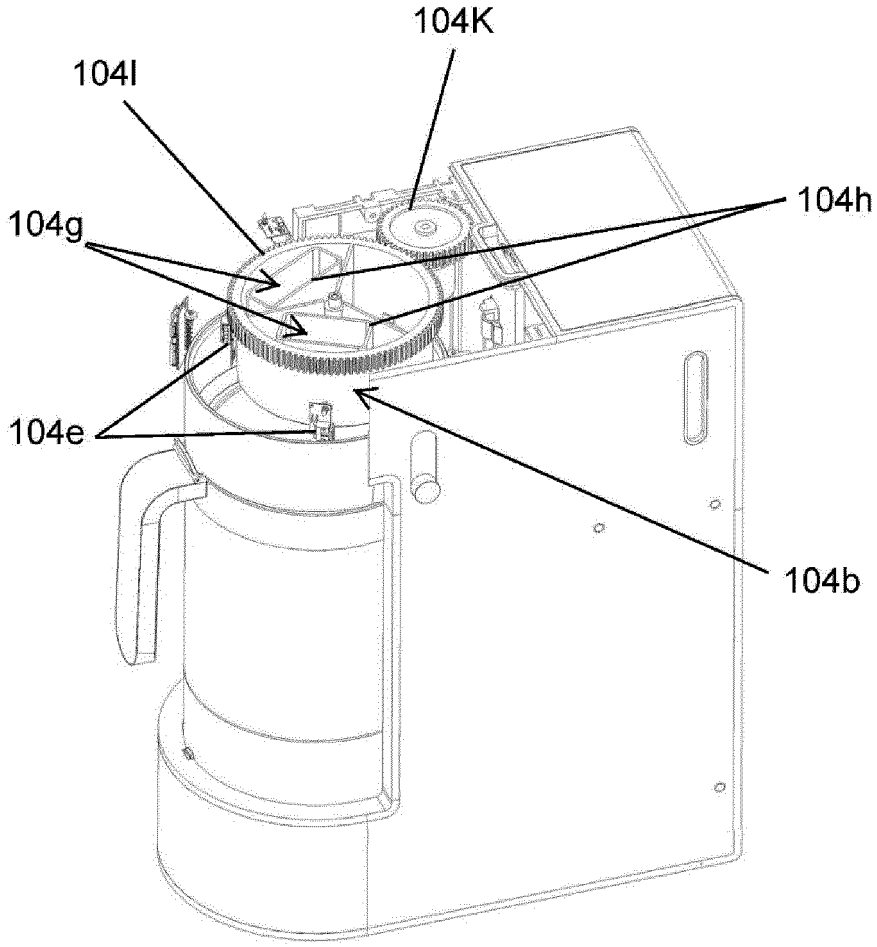

Fig.3a

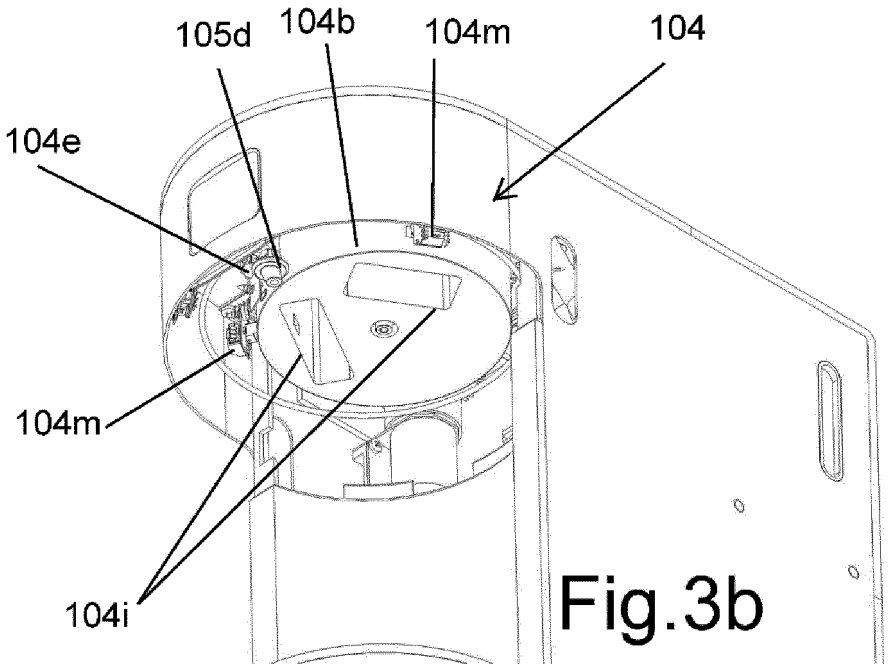

Fig.3b

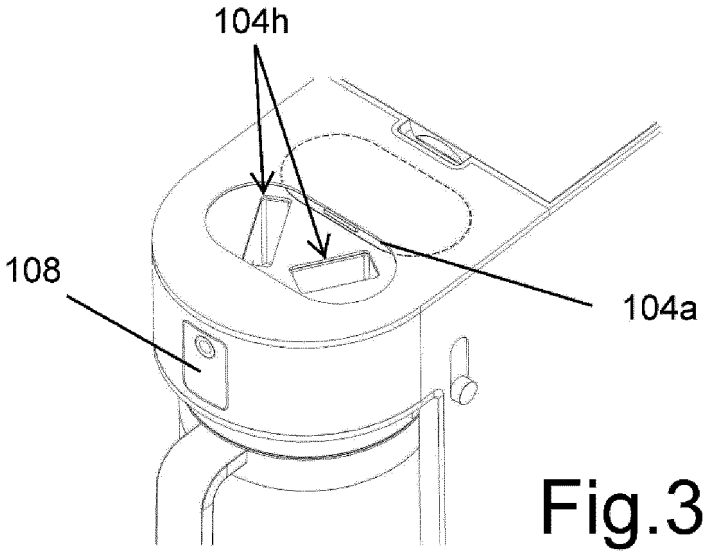

Fig.3c

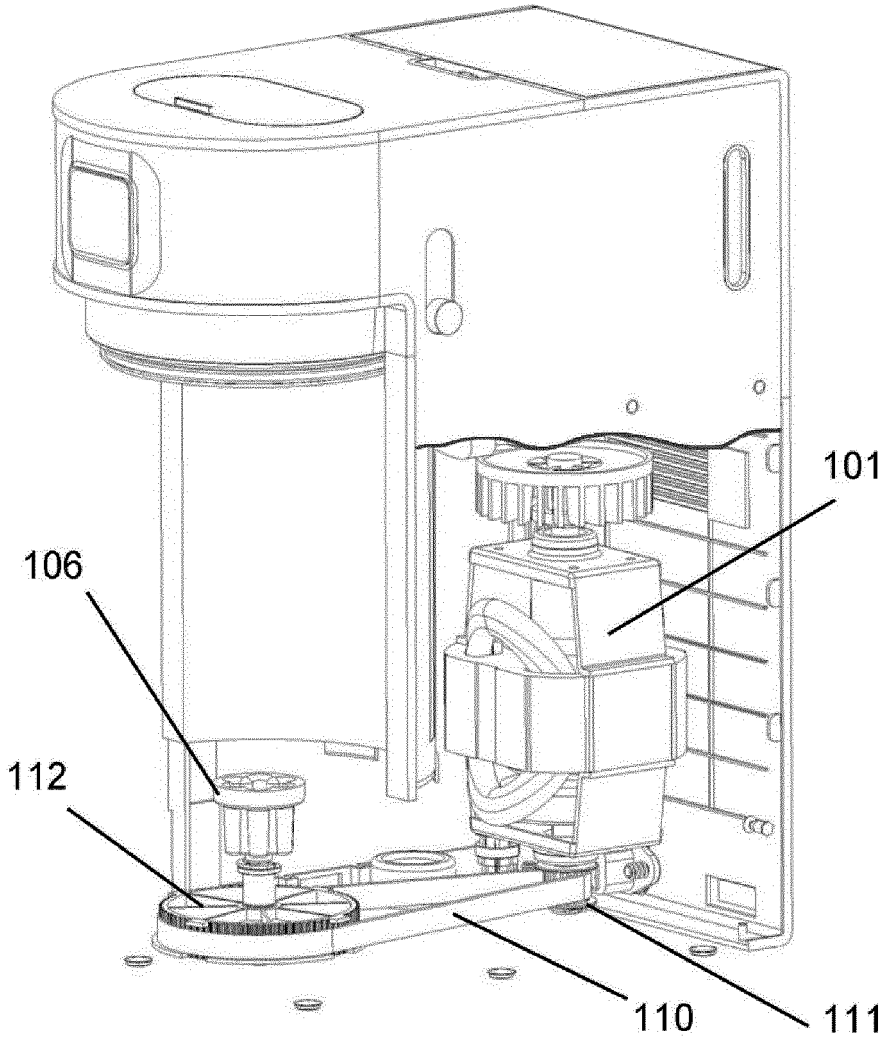

Fig.4

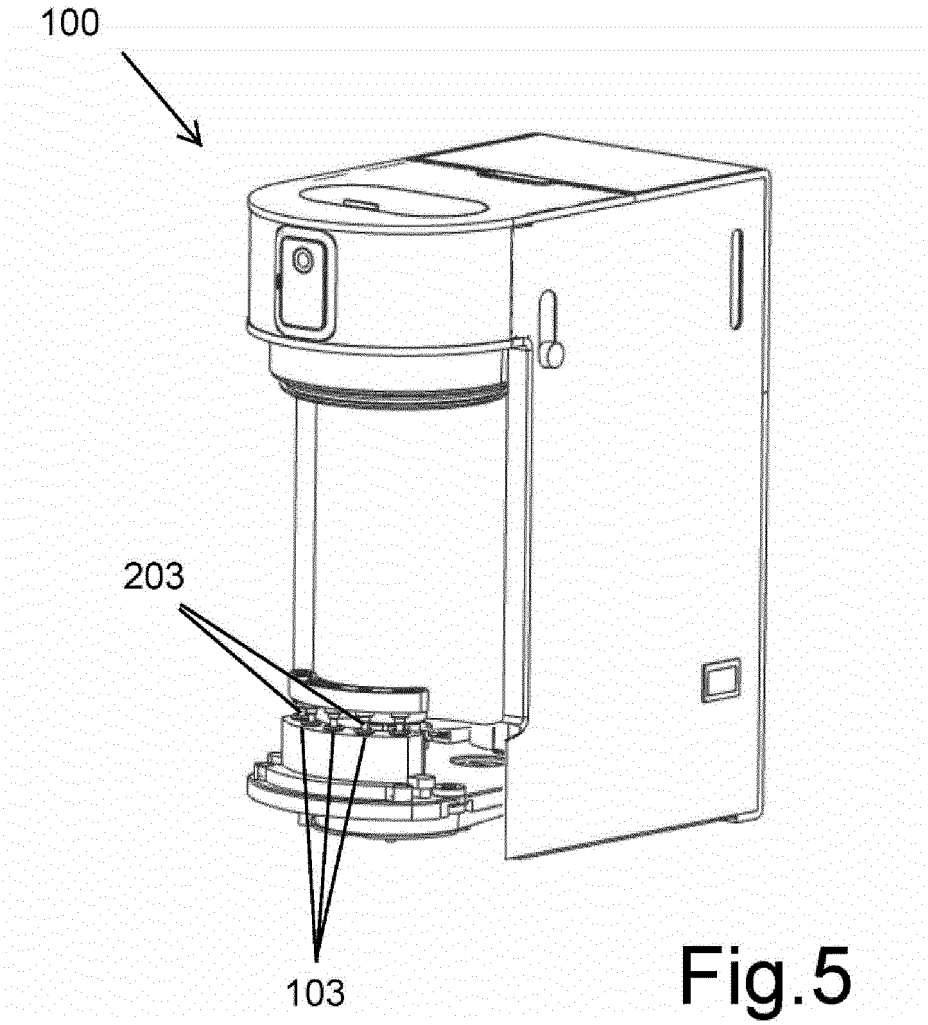

Fig.5

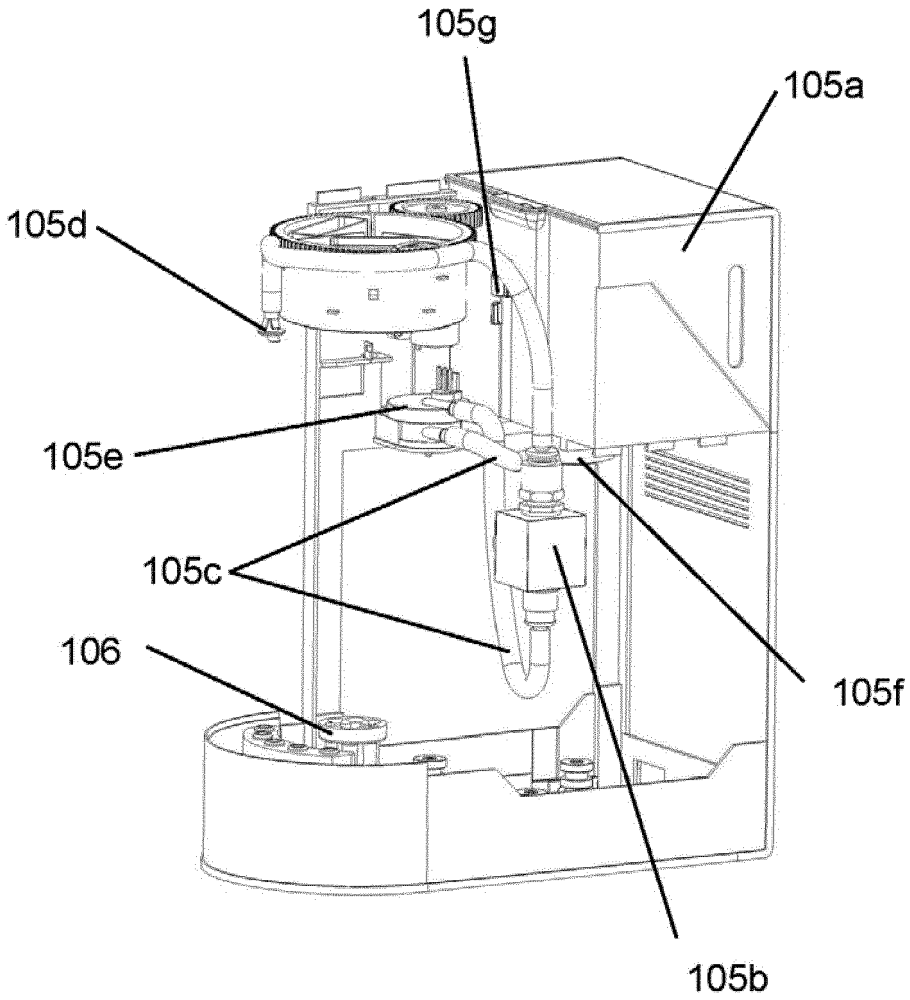

Fig.6

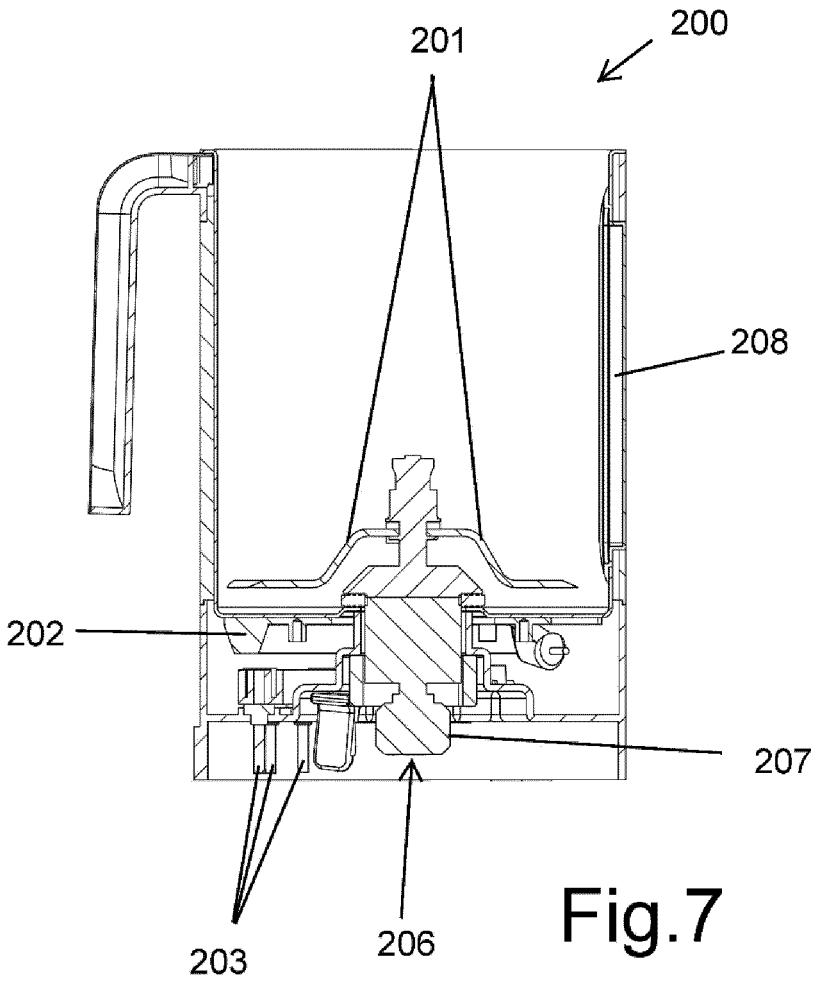

Fig.7

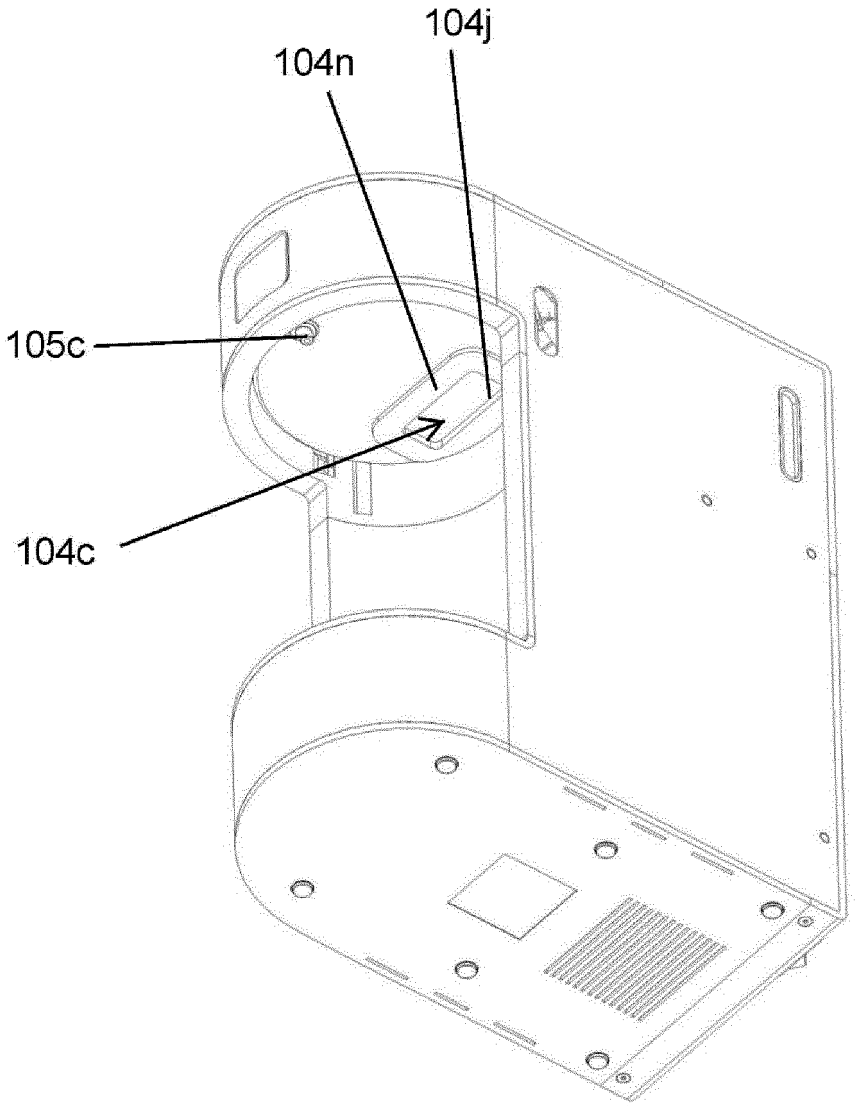

Fig.8

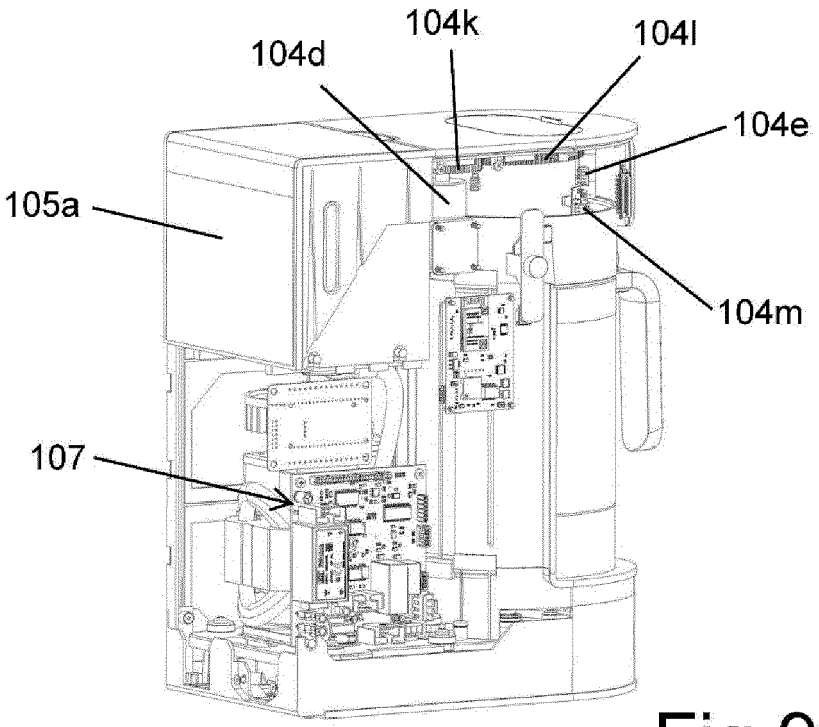

Fig.9a

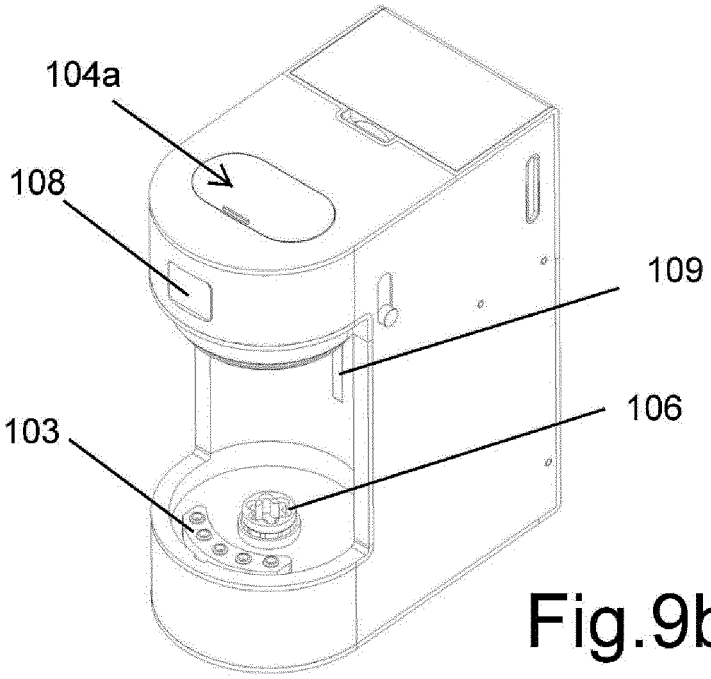

Fig.9b

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2020/070557

A. CLASSIFICATION OF SUBJECT MATTER

C11D13/10 (2006.01)

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)
C11D

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)

EPODOC, INVENES, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 104862156 A (SU ZIMING) 26/08/2015, Claim 1, figures 3 - 4.	1-20
A	JP H06279793 A (TAU GIKEN KK) 04/10/1994, Paragraph [7]; paragraphs [9 - 11]; figures 1 - 2.	1-20
A	ES 1063572U U (RUIZ MOLINA ADELAIDA ET AL.) 01/11/2006, columnas 3 - 4; figure 1.	1-20
A	ES 2596225 A1 (DEMARIA CASTANEDA IGNACIO ET AL.) 05/01/2017, claim 1, figure 2.	1-20
A	WO 2017140998 A1 (RAMPAL PATOU) 24/08/2017, (abstract) figure 1.	1-20

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

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