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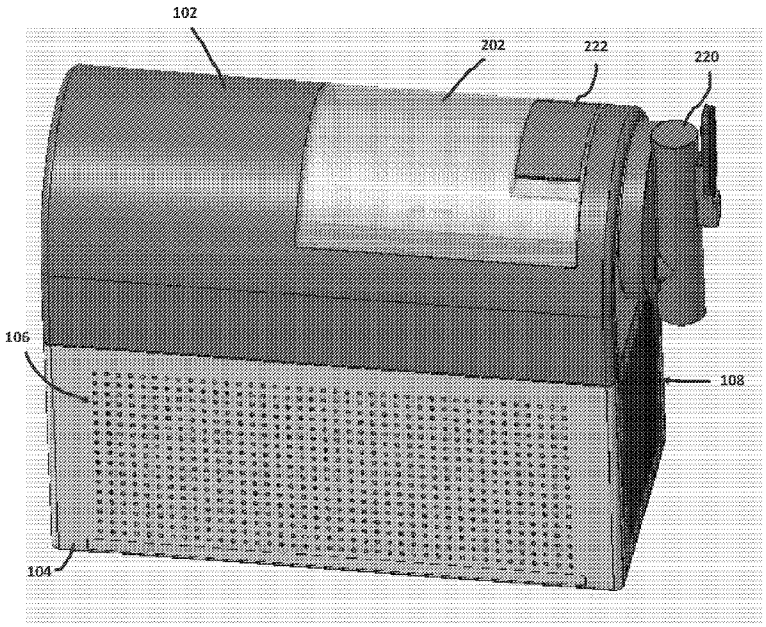

FIG. 1

(57) Abstract: Systems and methods are provided for producing frozen products and cleaning a cooling system. An exemplary system includes: a chamber for storing a frozen product, the chamber including a wall; and a replaceable helix-shaped agitator positioned in the chamber, the helix-shaped agitator being arranged to scrape ice collected on a surface of the wall and mix the scraped ice with the liquid in the chamber to generate the frozen product. An exemplary method includes: de-coupling an agitator positioned within a chamber used in producing a frozen food product; inserting a cleaning scraper in the chamber; and spinning the cleaning scraper to engage at least one edge element with the cleaning fluid to remove waste materials.

[Continued on next page]

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MACHINE FOR MAKING FROZEN FOOD PRODUCTS

FIELD

The present disclosure relates to the field of cooling systems, and in particular, a system used in the production of frozen food products.

BACKGROUND

Slush machines commonly found in self-serve areas are often kept in metal cabinets to ensure durability. The machines are designed to maintain the drink's temperature, preventing further freezing or melting. These machines have a compressor and a sealed cooling cylinder to maintain the perfect texture of the icy drink. However, some machines have a glass or plastic container attached to the freezing unit instead. To keep the slush consistent, a circular auger or plastic mixing paddles circulate the drink mixture continuously. Many models also have a thermostat on the front or side for temperature adjustments to achieve the perfect slushie.

SUMMARY

According to one aspect of the subject matter described in this disclosure, an example system for producing frozen products is provided. The system includes a chamber for storing a frozen product. The chamber includes a wall. A replaceable helix-shaped agitator is positioned in the chamber. The helix-shaped agitator is arranged to scrape ice collected on a surface of the wall and mix the scraped ice with the liquid in the chamber to generate the frozen product. The replaceable helix-shaped agitator comprises the follows: a shaft and distal ends of the shaft being connectable to

distal ends of the chamber to enable rotation of the replaceable helix-shaped agitator in the chamber; and at least one helical blade coupled to the shaft and extending radially away from and around the shaft. The at least one helical blade are arranged to engage with one or more portions of the surface of the wall to scrape the ice collected on the surface of the wall. The distal ends of the shaft are configured to be de-coupled from the distal ends of the chamber to enable removal of the replaceable helix-shaped agitator from within the chamber.

In some implementations of the example system, the at least one helical blade may be positioned on at least one rib. Diameters of the helix-shaped agitator at its distal ends may be uniform. A cleaning agitator may be arranged to be insertable into the chamber when the replaceable helix-shaped agitator is removed from the chamber. The cleaning agitator may include one or more edge elements to engage with one or more portions of the surface of the wall. The one or more edge elements may include at least one of an agitator, brush, and squeegee. The one or more edge elements may include at least one over-molded edge extending radially from the shaft. The at least one over-molded edge includes at least one of a rubber and plastic. The chamber may be configured to receive a cleaning fluid for cleaning the one or more surfaces of the wall of the chamber. At least one rib may extend radially from the shaft and arranged to couple the shaft to the at least one helical blade.

According to another aspect of the subject matter described in this disclosure, an example method for cleaning a cooling system is provided. The method includes: de-coupling an agitator positioned within a chamber used in producing a frozen food product, the chamber including a wall; inserting a cleaning scraper in the

chamber, where the cleaning scraper comprises at least one edge element to engage with one or more surfaces of the wall and the chamber; placing a cleaning fluid into the chamber; spinning the cleaning scraper to engage the at least one edge element with the cleaning fluid so the at least one edge element removes waste materials from the one or more surfaces of the wall and the chamber using the cleaning fluid; determining whether the chamber is sufficiently clean; upon determining the chamber is sufficiently clean, removing the waste materials and the cleaning fluid from the chamber; and de-coupling the cleaning scraper positioned within the chamber.

In some implementations of the example method, the at least one edge element may include at least one of an agitator, brush, and squeegee. The at least one edge element may include at least one over-molded edge extending radially from the shaft. The at least one over-molded edge may include at least one of a rubber and plastic. The method may include coupling one distal end of the cleaning scraper to a gear-box. The agitator may be de-coupled by de-coupling the distal ends of a shaft of the agitator from the distal ends of the chamber to enable removal of the agitator from within the chamber. The cleaning scraper may be de-coupled by de-coupling the distal ends of a shaft of the cleaning scraper from the distal ends of the chamber to enable removal of the cleaning scraper from within the chamber. The chamber may be sufficiently clean by determining a level of residue of the frozen food product remaining the on the one or more surfaces of the wall and the chamber. The cleaning fluid may include warm water and soap. The method may include extending at least one rib radially from a shaft of the cleaning scraper and arranged to couple the shaft to at least over-molded edge element.

According to another aspect of the subject matter described in this disclosure, an example cleaning accessory arranged to replace an agitator during a cleaning process is provided. The clean accessory includes a shaft and distal ends of the shaft being connectable to distal ends of a chamber to enable rotation of the cleaning accessory in the chamber. The chamber includes a wall. At least one over-molded edge coupled to the shaft and extending radially away from the shaft. The at least one over-molded edge is arranged to engage with one or more surfaces of the wall and the chamber to remove waste collected on the one or more surfaces of the wall and chamber. The distal ends of the shaft are configured to be de-coupled from the distal ends of the chamber to enable removal of the cleaning accessory from within the chamber after the cleaning process.

According to one aspect of the subject matter described in this disclosure, an example system for cooling is provided. The system includes a chamber for receiving liquid to form a frozen product, the chamber including a wall. At least one evaporation tube receives refrigerant liquid, the at least one evaporation tube being positioned adjacent to the wall of the chamber. The refrigerant liquid evaporates to gas and absorbs heat of the at least one evaporation conductor. A chilling conductor forms a portion of the wall. The chilling conductor is arranged to transfer heat from the liquid in the chamber to the at least one evaporation tube to generate the frozen product.

In some implementations of the example system, the chilling conductor may include a conduction plate. The wall may include an upper section and a lower section. The conduction plate may form a portion of the lower section. The at least one evaporation tube may be positioned on at least one channel on the conduction plate.

The chilling conductor may include at least one of a semi-cylindrical shape, semispherical shape, and an arc shape. The at least one evaporation tube may include a U-shape.

According to another aspect of the subject matter described in this disclosure, an example method for cooling is provided. The method includes: receiving, in a chamber, liquid to form a frozen product, the chamber including a wall; receiving, in at least one evaporation tube, refrigerant liquid, the at least one evaporation tube being positioned adjacent to the wall of the chamber, where the refrigerant liquid evaporates to gas and absorbs heat of the at least one evaporation conductor; and providing a chilling conductor forming a portion of the wall, the chilling conductor being arranged to transfer heat from the liquid in the chamber to the at least one evaporation tube to generate the frozen product.

In some implementations of the example method, the chilling conductor may include a conduction plate. The wall may include an upper section and a lower section. The method may further include forming, using the conduction plate, a portion of the lower section. The method may further include positioning the at least one evaporation tube on at least one channel on the conduction plate. The chilling conductor may include at least one of a semi-cylindrical shape, semispherical shape, and an arc shape. The at least one evaporation tube may include a U-shape.

According to one aspect of the subject matter described in this disclosure, an example system for cooling is provided. The system includes a chamber for receiving liquid to form a frozen product, the chamber including a wall. At least one evaporation tube receives refrigerant liquid, the at least one evaporation tube being

positioned adjacent to the wall of the chamber. The refrigerant liquid evaporates to gas and absorbs heat of the at least one evaporation conductor. A chilling conductor forms a portion of the wall. The chilling conductor is arranged to transfer heat from the liquid in the chamber to the at least one evaporation tube to generate the frozen product. A helix-shaped agitator is positioned in the chamber. The helix shaped agitator is arranged to scrape ice collected on a surface of the wall and mix the scraped ice with the liquid in the chamber to generate the frozen product.

In some implementations of the example system, the chilling conductor may include a conduction plate. The wall may include an upper section and a lower section. The conduction plate may form a portion of the lower section. The chilling conductor may include at least one of a semi-cylindrical shape, semispherical shape, and an arc shape. The at least one evaporation tube may include a U-shape.

According to one aspect of the subject matter described in this disclosure, an example system for temperature-regulation of frozen products is provided. The system includes a chamber for receiving liquid to form a frozen product. A temperature sensor is arranged to detect a temperature of at least one of the liquid and a refrigerant liquid. A compressor circulates the refrigerant liquid to cool the liquid and high-pressure gas to warm the liquid in the chamber. The compressor sends the refrigerant liquid or the high-pressure gas to at least one evaporation conductor positioned adjacent to the chamber. The refrigerant liquid evaporates to gas and absorbs heat for cooling the chamber. At least one chilling conductor produces ice on a surface of the at least one chilling conductor. The least one chilling conductor is cooled by the at least one evaporation conductor. A controller is arranged to receive temperature data from the

temperature sensor and, in response, control an amount of the refrigerant liquid or the high-pressure gas circulated by the compressor to regulate the temperature of the liquid.

In some implementations of the example system, the controller may include a processor. A user interface may be arranged to receive a user input. The controller may be arranged to receive a target temperature setting based on the user input. The controller may regulate the temperature of the liquid based on the received temperature data from the temperature sensor and the target temperature setting. A memory may be arranged to store one or more recipes. The one or more recipes may be selectable by the user via the user interface, each of the one or more recipes including at least one target temperature setting. The controller may cool the chamber by controlling the rates the refrigerant liquid being circulated to the at least one chilling conductor. The controller may provide the high-pressure gas to the at least one evaporation conductor to melt ice in the chamber.

According to another aspect of the subject matter described in this disclosure, an example method for temperature-regulation of frozen products is provided. The method includes: receiving, in a chamber, liquid to form a frozen product; detecting, using a temperature sensor, a temperature of at least one of the liquid and a refrigerant liquid; circulating, using a compressor, the refrigerant liquid to cool the liquid and high-pressure gas to warm the liquid in the chamber, the compressor sending the refrigerant liquid or the high-pressure gas to at least one evaporation conductor positioned adjacent to the chamber, where the refrigerant liquid evaporates to gas and absorbs heat for cooling the chamber; producing, using at least one chilling conductor, ice on a surface of the at least one chilling conductor, the least one chilling conductor

being cooled by the at least one evaporation conductor; and receiving, using a controller, temperature data from the temperature sensor and, in response, the controller controlling the amount of the refrigerant liquid or the high-pressure gas circulated by the compressor to regulate the temperature of the liquid.

In some implementations of the example method, the controller may include a processor. The method may further include providing a user interface arranged to receive a user input. The method may further include receiving, based on the user input, a target temperature setting, the controller regulating the temperature of the liquid based on the received temperature data from the temperature sensor and the target temperature setting. The method may further include storing, using a memory, one or more recipes, the one or more recipes being selectable by the user via the user interface, each of the one or more recipes including at least one target temperature setting. The method may further include providing, using the controller, cooling to the chamber by controlling the rates the refrigerant liquid is circulated to the at least one chilling conductor. The method may further include providing, using the controller, the high-pressure gas to the at least one evaporation conductor to melt ice in the chamber.

According to one aspect of the subject matter described in this disclosure, an example system for temperature-regulation of frozen products is provided. The system includes a chamber for receiving liquid to form a frozen product. A temperature sensor is arranged to detect a temperature of at least one of the liquid and a refrigerant liquid. A compressor circulates the refrigerant liquid to cool the liquid and high-pressure gas to warm the liquid in the chamber. The compressor sends the refrigerant liquid or the high-pressure gas to at least one evaporation conductor positioned adjacent to the

chamber. The refrigerant liquid evaporates to gas and absorbs heat for cooling the chamber. At least one chilling conductor produces ice on a surface of the at least one chilling conductor. The least one chilling conductor is cooled by the at least one evaporation conductor. A valve regulates temperature of the liquid in the chamber via the at least one chilling conductor. The valve controls, in response to one or more control signals from a controller, an amount of the refrigerant liquid or the high-pressure gas circulated by the compressor to regulate the temperature of the liquid in the chamber. The controller is arranged to receive temperature data from the temperature sensor and, in response, control the amount of the refrigerant liquid or the high-pressure gas circulated by the compressor to regulate the temperature of the liquid.

In some implementations of the example system, the chilling conductor may include a conduction plate. A user interface may be arranged to receive a user input. The controller may be arranged to receive a target temperature setting based on the user input. The controller may regulate the temperature of the liquid based on the received temperature data from the temperature sensor and the target temperature setting. A memory may be arranged to store one or more recipes. The one or more recipes may be selectable by the user via the user interface, each of the one or more recipes including at least one target temperature setting. The controller may cool the chamber by controlling the rates the refrigerant liquid being circulated to the at least one chilling conductor. The valve may be a solenoid valve.

Additional features and advantages of the present disclosure is described in, and will be apparent from, the detailed description of this disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

The disclosure is illustrated by way of example, and not by way of limitation, in the figures of the accompanying drawings in which like reference numerals are used to refer to similar elements. It is emphasized that various features may not be drawn to scale and the dimensions of various features may be arbitrarily increased or reduced for clarity of discussion.

FIG. 1 is a schematic diagram of an example cooling system with enclosures.

FIGs. 2A-2E are detailed schematic diagrams of the example cooling system of FIG. 1.

FIG. 3 is a schematic diagram of a bottom view of the cooling conductor used by the example cooling system shown in FIG. 2.

FIGs. 4A-4B are schematic diagrams of an example cleaning agitator.

FIG. 5 is a process flowgraph of operations included in an example process 600 for cleaning a cooling system.

DETAILED DESCRIPTION

The figures and descriptions provided herein may have been simplified to illustrate aspects that are relevant for a clear understanding of the herein described devices, systems, and methods, while eliminating, for the purpose of clarity, other aspects that may be found in typical similar devices, systems, and methods. Those of ordinary skill may recognize that other elements and/or operations may be desirable and/or necessary to implement the devices, systems, and methods described herein.

But because such elements and operations are well known in the art, and because they do not facilitate a better understanding of the present disclosure, a discussion of such elements and operations may not be provided herein. However, the present disclosure is deemed to inherently include all such elements, variations, and modifications to the described aspects that would be known to those of ordinary skill in the art.

The terminology used herein is for the purpose of describing particular example embodiments only and is not intended to be limiting. For example, as used herein, the singular forms “a”, “an” and “the” may be intended to include the plural forms as well, unless the context clearly indicates otherwise. The terms “comprises,” “comprising,” “including,” and “having,” are inclusive and therefore specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. The method steps, processes, and operations described herein are not to be construed as necessarily requiring their performance in the particular order discussed or illustrated, unless specifically identified as an order of performance. It is also to be understood that additional or alternative steps may be employed.

Although the terms first, second, third, etc., may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms may be only used to distinguish one element, component, region, layer or section from another element, component, region, layer or section. That is,

terms such as “first,” “second,” and other numerical terms, when used herein, do not imply a sequence or order unless clearly indicated by the context.

The disclosure describes a cooling system used to produce frozen food products like slushies, soft ice cream, or the like. The cooling system includes a chamber having a cooling conductor and evaporation tube arrangement where liquid refrigerant evaporates to gas and absorbs heat in an evaporation tube. The cooling conductor chills/freezes liquid in the chamber that encounters the surface of the cooling conductor to form ice. A spinning agitator scrapes the ice from the surface of the cooling conductor into the liquid to generate slushies or other frozen food products. Moreover, the cooling system utilizes a controller to regulate the temperature in the chamber by controlling the flow of either refrigerant liquid or high-pressure & high-temperature gas into the evaporator tube. Furthermore, the cooling contain includes an approach for cleaning a cooling system using a cleaning scraper.

FIG. 1 is a schematic diagram of an example cooling system 100 with enclosures. Cooling system 100 includes a first enclosure 102 and a second enclosure 104. First enclosure 102 is a semi-cylindrical enclosure arranged to protect a chamber 202, used to prepare frozen food products, such as slushies or soft ice cream. Chamber 202 may be a glass or transparent plastic cylindrical container positioned within first enclosure 102. A portion of first enclosure 102 exposes chamber 202, including latch 222. Latch 222 is arranged to allow one to access interiorly chamber 202 and provide the liquid ingredients to produce the frozen food product. In some implementations, first enclosure 102 may be made from durable plastic or metal

materials capable of protecting chamber 202 from damage caused by objects hitting the first enclosure. Further details of chamber 202 are described below.

Second enclosure 104 is a rectangular-shaped enclosure arranged to protect main body 400, as shown in FIG. 2, containing the components used in regulating the temperature in chamber 202. Select sides of second enclosure 104 may include perforations 106 to allow air to enter for ventilation. Other sides of second enclosure 104 may include a square-sized mesh opening 108 for receiving air. In other implementations, square-sized mesh opening 108 may have another shaped opening besides square. Further details of main body 400 are described below.

FIGs. 2A-2D are detailed schematic diagrams of example cooling system 100. FIG. 2A shows first enclosure 102 and second enclosure 104 being removed, illustrating details of cooling system 100. Cooling system 100 includes chamber 202, latch 222, main body 400, a DC motor 206, gear train 208, micro switch 240, and dispenser 220. DC motor 206 is connected to gear-train 208 and provides DC power to gear-train 208. Chamber 202 is a transparent cylindrical body connected to gear-train 208. Gear-train 208 is arranged to transmit torque or power to chamber 202 to rotate an agitator 214. Latch 222 is arranged to allow one to access the interior of chamber 202 and provide the liquid ingredients to produce the frozen food product.

Dispenser 220 is configured to pour the frozen food product thru spout 244 when a user engages with a handle 242. Moreover, dispenser 220 is removable, allowing access to chamber 202. Micro switch 240 alerts the user when there is movement at dispenser 220 and beverage in chamber 202, preventing liquid spillover from chamber 202. In some implementations, a sound alarm may be triggered by micro

switch 240 once there is movement at dispenser 220 and beverage in chamber 202. In one implementation, flashing lights may be triggered by micro switch 240 when movement at dispenser 220 and beverage in chamber 202 is detected.

Main body 400 is positioned below chamber 202 and provides the cooling and heating needed to regulate the temperature set points needed to produce frozen food products in chamber 202. Note chamber 202 is securely placed above a thermal plate 246 by structures 250 made from metal or plastics. Details of main body 400 are discussed further below.

FIG. 2B is a detailed schematic diagram of the interior of chamber 202. Chamber 202 includes agitator 214, liquid 212 provided thru latch 222, and a cooling conductor 218. Liquid 212 may include liquid ingredients to form the frozen food product or slushie. Temperature sensor 248 collects temperature data regarding the temperature of liquid 212 and chamber 202. The temperature data is sent to controller 424 for processing. Cooling conductor 218 is configured to transfer heat from liquid 212 to evaporation tube 232 on the lower side of cooling conductor 218 to generate the frozen food product. Moreover, cooling conductor 218 chills/freezes liquid 212 that encounters a surface 224 of the cooling conductor 218 to form ice. Cooling conductor 218 may form a wall in chamber 202. Also, cooling conductor 218 includes an upper section defined by surface 224 and a lower section defined by conduction plate 226. Cooling conductor 218 includes a semispherical, arc, or semicylindrical shape. In other implementations, cooling conductor 218 may include other shapes besides semispherical, arc, or semicylindrical. Further details regarding cooling conductor 218 are described below in FIG. 3.

Agitator 214 includes a shaft 228 and the distal ends of shaft 228 being connectable to the distal ends of chamber 202 to enable rotation of agitator 214 in chamber 202. At one distal end of chamber 202, shaft 228 is securely positioned with gear-train 208 via a metal rod 230 placed internally in shaft 228. Shaft 228 is securely positioned to dispenser 220 at the other distal end. Shaft 228 may include one or more plastic materials. In other implementations, shaft 228 may include one or more metals. One may use other fastening elements instead of metal rod 230 to connect shaft 228 to gear-train 208.

FIG. 2C is a perspective view of agitator 214. Agitator 214 includes a helical blade 216 arranged to scrape ice collected on surface 224 of cooling conductor 218 and mix the scraped ice with liquid 212 in chamber 202 to generate the frozen food product or slushie. Helical blade 216 is connected to shaft 228 via ribs 238, extending radially away from and around shaft 228. Moreover, agitator 214 is configured to maintain the appropriate texture of liquid 212 and move liquid 212 to dispenser 220 for dispensing. Helical blade 216 may include a metal blade. In some implementations, helical blade 216 may include a plastic blade capable of removing ice from surface 224. In one implementation, helical blade 216 may be integrally molded with shaft 228 using plastic or metal materials.

Moreover, the distal ends of shaft 228 are configured to be de-coupled from the distal ends of chamber 202 to enable the removal of the replaceable helix-shaped agitator 214 from within chamber 202. Once the distal ends of shaft 228 are de-coupled, dispenser 220 may be removed, providing an opening to remove agitator 214 from chamber 202. The same or different agitator may be reintroduced into chamber

202 by connecting the distal ends of agitator 214 to the distal ends of chamber 202. In another implementation, chamber 202 may include an opening to add or remove agitator 214 from the distal end of dispenser 220.

FIG. 2D is a schematic diagram of the right-side perspective view of main body 400. Main body 400 is configured to regulate the temperature of chamber 202 used in producing a frozen food product, such as slushie, soft ice cream, or the like. Also, main body 400 includes a compressor 402, a condenser 404, a fan 406, a dry filter 408, capillary tube 410, a by-pass valve 412, and a controller 424. Compressor 402 includes an input port 416 receiving evaporated gas from an outlet 236 of chamber 202. Compressor 402 compresses the received gas increasing both temperature and pressure resulting in a high-pressure and high-temperature gas. This high-pressure and high-temperature gas is sent to condenser 404 via port 418. Also, compressor 402 includes a starter 452 to start up compressor 402 due to the high torque required,

Condenser 404 is configured to remove heat from the high-pressure and high-temperature gas resulting in a mid-temperature and high-pressure liquid. Condenser 404 uses fan 406 for cooling the high-pressure and high-temperature gas. Fan 406 may also be used for cooling compressor 402 or regulating its temperature. Condenser 404 sends the mid-temperature high-pressure liquid to dry filter 408. In other implementations, condenser 404 may be an air-cooled condenser, a cooling tower, a finned-tube condenser, a water-cooled condenser, an evaporative condenser, or the like. Note all components of main body 400 are positioned securely on bottom surface 420 of second enclosure 104.

Dry filter 408 absorbs residual moisture and unwanted particles from the mid-temperature high-pressure liquid. Moreover, capillary tube 410 is arranged to decrease both the pressure and temperature of the mid-temperature and high-pressure liquid, resulting in a refrigerant liquid being a low-temperature and low-pressure liquid. This refrigerant liquid is later used sent to evaporation tube 232 for cooling chamber 202. Capillary tube 410 is a copper tube of very small internal diameter that varies from 0.5 to 2.28 mm. Capillary tube 410 may use other materials beside copper. Moreover, capillary tube 410 is arranged to have relatively long length compared to the length of main body 400 and it is coiled to several turns so that it would occupy less space.

Controller 424 includes one or more processors, including other programmable logic to control the operations of agitator 214, compressor 402, condenser 404, fan 406, by-pass valve, and dry filter 408, as shown in FIG. 2E. Moreover, controller 424 may send control signals to agitator 214 to manage the temperature of chamber 202, the amount of ice used, and the texture of the frozen food product based on the temperature data of temperature sensor 248. By-pass valve 412 is connected to capillary tube 410 and compressor 402. Controller 424 sends specific control signals to by-pass valve 412 to direct the flow to inlet 234 of either the refrigerant liquid or the high-pressure and high-temperature gas to the chamber to achieve target temperature set points based on the temperature data. Controller 424 sends control signals to agitator 214 to manage the rotational speeds of agitator 214. This allows controller 424 to regulate the amount of ice being used to make the frozen food product and the texture of the frozen food product.

Controller 424 may be positioned near chamber 202 or other locations. Chamber 424 may be a print circuit board assembly having any number of components, such as memory, embedded processors, or the like. Controller 424 includes the necessary components, physical or software, to control the operations of agitator 214, compressor 402, condenser 404, fan 406, by-pass valve, and dry filter 408.

Controller 424 is configured to regulate the chamber's temperature by controlling the refrigerant sent to the chamber by turning ON and OFF compressor 402 at different rates to achieve target temperature set points. Moreover, controller 424 may direct by-pass valve 412 to send the high-pressure and high-temperature gas to the chamber via an evaporator tube, such as evaporator tube 232, to regulate the amount of ice in the chamber or raise the temperature of the liquid in the chamber.

A user interface, executed on controller 424, is provided, allowing a user to enter data like desired temperature of chamber 202, speed for rotating agitator 214, desired texture of the frozen food product, or the like. In one implementation, the user interface may provide a selection of frozen food products, including displaying the ingredients needed for each. Once the ingredients are prepared and placed in the chamber, controller 424 may retrieve stored temperature set points for regulating the temperature in the chamber and the speed of agitator 214 to produce the frozen food product. The user interface may be displayed on a screen positioned on first enclosure 104.

FIG. 3 is a schematic diagram of a bottom view of cooling conductor 218 of example cooling system 100 shown in FIG. 2. The bottom region of cooling conductor 218 is detailed in FIG. 3. The evaporation tube 232 is placed on the

conduction plate 226, which has channel 304 to securely hold and protect the tube from damage. In certain implementations, channel 304 may not be necessary, while in other implementations, channel 304 may be created as a part of the evaporation tube 232.

Conduction plate 226 may be a plate evaporator configured to drive the evaporation process of evaporation tube 232 during the cooling process or conduct heat when high-pressure and high-temperature gas is used, leading to heating and cooling of surface 224. Moreover, metal straps 306 are to securely keep in place evaporation tube 232 in case of sudden movements experienced by chamber 202 or main body 400. Non-metal straps may be used instead of metal straps 306 in certain implementations.

Evaporation tube 232 is connected to inlet 234 and outlet 236 and has a U-shape. However, evaporation tube 232 may have other shapes or configurations beside that shown in FIG. 3. Inlet 234 receives either refrigerant liquid or high-pressure and high-temperature gas from main body 400. Outlet 236 receives evaporated gas or high-pressure and high-temperature gas from chamber 202 to be sent to main body 400.

Conduction plate 226 is located above the main body 400 and below the lower section of chamber 202. It is equipped with cylinder structures 308 for securely connecting cooling conductor 108 with chamber 202. Cylinder structures 308 may include the same materials as cooling conductor 218. This helps protect main body 400 from temperature changes that may affect conduction plate 226.

FIGs. 4A-4B are schematic diagrams of an example cleaning agitator 500. Cleaning agitator 500 may be positioned in chamber 202 to clean chamber 202 once agitator 214 and liquid 112 are removed, as shown in FIG. 4A. A cleaning fluid 508 may replace liquid 112 in chamber 202. In some implementations, cleaning fluid 508 may be

warm soap and water, but other cleaning fluids may be used that do not damage the interior surface of chamber 202 and/or surface 224 of cooling conductor 218.

Cleaning agitator 500 includes shaft 502 and distal ends of shaft 502 being connectable to distal ends of chamber 202 to enable rotation of cleaning agitator 500 in chamber 202. At one distal end of chamber 202, shaft 502 is securely positioned with gear-train 208 via a metal rod 230 placed internally in shaft 502. Shaft 502 is securely positioned to dispenser 120 at the other distal end. Shaft 502 may be made from one or more plastic materials. In other implementations, shaft 502 may made from one or more metal materials. One may use other fastening elements instead of metal rod 230 to connect shaft 502 to gear-train 208.

FIG. 4B shows a detailed depiction of cleaning agitator 500, including several over-molded edges 504 arranged to remove ice and residue from several portions of the surface of chamber 202 and surface 224 of cooling surface 218. Cleaning agitator 500 includes a curved profile, but other profiles may be used. Over-molded edges 504 are coupled to shaft 502 via ribs 506 extending radially away from shaft 502. Moreover, cleaning agitator 500 is configured to rotate in chamber 202 while engaging with the cleaning liquid 508, the surface 224, and the surface of chamber 202 to clean chamber 202 and cooling conductor 218. In some implementations, over-molded edges 504 may be integrally molded with shaft 502 and ribs 506 using plastic or metal materials. In some implementations, over-molded edges 504 may be replaced with at least one agitator, brush, squeegee, and the like. In some implementations, a controller, such as controller 424 of main body 400, may control the rotational speed of cleaning agitator 500 for performing cleaning operations.

FIG. 5 is a process flowgraph of operations included in an example process 600 for cleaning a cooling system. Process 600 includes de-coupling an agitator (such as agitator 214) positioned within a chamber (such as chamber 202) used in producing a frozen food product (Step 602). The chamber includes a wall (such as cooling conductor 218). Process 600 includes inserting a cleaning scraper (such as cleaning scraper 500) in the chamber (Step 604). The cleaning scraper may include at least one edge element (such as over-molded edge 504) to engage with one or more surfaces of the wall (such as surface 214) and the chamber (such as interior surface of chamber 202). Process 600 includes placing a cleaning fluid (such as cleaning fluid 508) into the chamber (Step 606). The cleaning scraper is spun to engage the at least one edge element with the cleaning fluid so the at least one edge element removes waste materials from the one or more surfaces of the wall and the chamber using the cleaning fluid (Step 608). Process 608 includes determining whether the chamber is sufficiently clean (Step 610). Upon determining the chamber is sufficiently clean, the waste materials (such as residue and ice) and the cleaning fluid is removed from the chamber (Step 612). Furthermore, process 600 includes de-coupling the cleaning scraper positioned within the chamber (Step 617).

In some implementations, the at least one edge element may include at least one of an agitator, brush, and squeegee. The at least one edge element may include at least one over-molded edge extending radially from the shaft. The at least one over-molded edge may include at least one of a rubber and plastic. Process 600 may include coupling one distal end of the cleaning scraper to a gear-box. The agitator may be de-coupled by de-coupling the distal ends of a shaft of the agitator from the

distal ends of the chamber to enable removal of the agitator from within the chamber. The cleaning scraper may be de-coupled by de-coupling the distal ends of a shaft of the cleaning scraper from the distal ends of the chamber to enable removal of the cleaning scraper from within the chamber. The chamber may be sufficiently clean by determining a level of residue of the frozen food product remaining the on the one or more surfaces of the wall and the chamber. The cleaning fluid may include warm water and soap. Process 600 may include extending at least one rib radially from a shaft of the cleaning scraper and arranged to couple the shaft to at least over-molded edge element.

In other implementations, a controller, such as controller 424, may implement the operations of process 600 using computer-executable instructions stored on one or more non-transitory machine-readable storage media. The instructions may be executed by one or more processing devices of controller 424, as described in FIG. 2, to implement the operations.

Reference in the specification to "one implementation" or "an implementation" means that a particular feature, structure, or characteristic described in connection with the implementation is included in at least one implementation of the disclosure. The appearances of the phrase "in one implementation," "in some implementations," "in one instance," "in some instances," "in one case," "in some cases," "in one embodiment," or "in some embodiments" in various places in the specification are not necessarily all referring to the same implementation or embodiment.

Finally, the above descriptions of the implementations of the present disclosure have been presented for the purposes of illustration and description. It is not

intended to be exhaustive or to limit the present disclosure to the precise form disclosed. Many modifications and variations are possible in light of the above teaching. It is intended that the scope of the present disclosure be limited not by this detailed description, but rather by the claims of this application. As will be understood by those familiar with the art, the present disclosure may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. Accordingly, the present disclosure is intended to be illustrative, but not limiting, of the scope of the present disclosure, which is set forth in the following claims.

CLAIMS

WHAT IS CLAIMED IS:

1. A system for producing frozen products comprising:

a chamber for storing a frozen product, the chamber including a wall; and

a replaceable helix-shaped agitator positioned in the chamber, the helix-shaped agitator being arranged to scrape ice collected on a surface of the wall and mix the scraped ice with the liquid in the chamber to generate the frozen product, the replaceable helix-shaped agitator comprising

a shaft and distal ends of the shaft being connectable to distal ends of the chamber to enable rotation of the replaceable helix-shaped agitator in the chamber; and

at least one helical blade coupled to the shaft and extending radially away from and around the shaft; wherein

the at least one helical blade are arranged to engage with one or more portions of the surface of the wall to scrape the ice collected on the surface of the wall; and wherein

the distal ends of the shaft are configured to be de-coupled from the distal ends of the chamber to enable removal of the replaceable helix-shaped agitator from within the chamber.

2. The system of claim 1, wherein the at least one helical blade is positioned on at least one rib.

3. The system of claim 2, wherein diameters of the helix-shaped agitator at its distal ends are uniform.

4. The system of claim 1 comprising a cleaning agitator arranged to be insertable into the chamber when the replaceable helix-shaped agitator is removed from the chamber.

5. The system of claim 4, wherein the cleaning agitator includes one or more edge elements to engage with one or more portions of the surface of the wall.

6. The system of claim 5, wherein the one or more edge elements include at least one of an agitator, brush, and squeegee.

7. The system of claim 5, wherein the one or more edge elements include at least one over-molded edge extending radially from the shaft.

8. The system of claim 7, wherein at least one over-molded edge includes at least one of a rubber and plastic.

9. The system of claim 5, wherein the chamber is configured to receive a cleaning fluid for cleaning the one or more surfaces of the wall of the chamber.

10. The system of claim 1 comprising at least one rib extending radially from the shaft and arranged to couple the shaft to the at least one helical blade.

11. A method for cleaning a cooling system, the method comprising:

de-coupling an agitator positioned within a chamber used in producing a frozen food product, the chamber including a wall;

inserting a cleaning scraper in the chamber, where the cleaning scraper comprises at least one edge element to engage with one or more surfaces of the wall and the chamber;

placing a cleaning fluid into the chamber;

spinning the cleaning scraper to engage the at least one edge element with the cleaning fluid so the at least one edge element removes waste materials from the one or more surfaces of the wall and the chamber using the cleaning fluid;

determining whether the chamber is sufficiently clean;

upon determining the chamber is sufficiently clean, removing the waste materials and the cleaning fluid from the chamber; and

de-coupling the cleaning scraper positioned within the chamber.

12. The method of claim 11, wherein the at least one edge element includes at least one of an agitator, brush, and squeegee.

13. The method of claim 12, wherein the at least one edge element includes at least one over-molded edge extending radially from the shaft.

14. The method of claim 13, wherein the at least one over-molded edge includes at least one of a rubber and plastic.

15. The method of claim 11, further comprising coupling one distal end of the cleaning scraper to a gear-box.

16. The method of claim 11, wherein de-coupling the agitator includes de-coupling the distal ends of a shaft of the agitator from the distal ends of the chamber to enable removal of the agitator from within the chamber.

17. The method of claim 11, wherein de-coupling the cleaning scraper includes de-coupling the distal ends of a shaft of the cleaning scraper from the distal ends of the chamber to enable removal of the cleaning scraper from within the chamber.

18. The method of claim 11, wherein determining whether the chamber is sufficiently clean comprises determining a level of residue of the frozen food product remaining the on the one or more surfaces of the wall and the chamber.

19. The method of claim 11, wherein the cleaning fluid includes warm water and soap.

20. A cleaning accessory arranged to replace an agitator during a cleaning process comprising:

a shaft and distal ends of the shaft being connectable to distal ends of a chamber to enable rotation of the cleaning accessory in the chamber, the chamber including a wall; and

at least one over-molded edge coupled to the shaft and extending radially away from the shaft; wherein

the at least one over-molded edge is arranged to engage with one or more surfaces of the wall and the chamber to remove waste collected on the one or more surfaces of the wall and chamber; and wherein

the distal ends of the shaft are configured to be de-coupled from the distal ends of the chamber to enable removal of the cleaning accessory from within the chamber after the cleaning process.

21. A system for cooling comprising:

a chamber for receiving liquid to form a frozen product, the chamber including a wall;

at least one evaporation tube for receiving refrigerant liquid, the at least one evaporation tube being positioned adjacent to the wall of the chamber, where the refrigerant liquid evaporates to gas and absorbs heat of the at least one evaporation conductor; and

a chilling conductor forming a portion of the wall, the chilling conductor being arranged to transfer heat from the liquid in the chamber to the at least one evaporation tube to generate the frozen product.

22. The system of claim 21, wherein the chilling conductor includes a conduction plate.

23. The system of claim 21, wherein the wall includes an upper section and a lower section.

24. The system of claim 23, wherein the conduction plate forms a portion of the lower section.

25. The system of claim 21, wherein the at least one evaporation tube is positioned on at least one channel on the conduction plate.

26. The system of claim 21, wherein the chilling conductor includes at least one of a semi-cylindrical shape, semispherical shape, and an arc shape.

27. The system of claim 21, wherein the at least one evaporation tube includes a U-shape.

28. A method for cooling, the method comprising:

receiving, in a chamber, liquid to form a frozen product, the chamber including a wall;

receiving, in at least one evaporation tube, refrigerant liquid, the at least one evaporation tube being positioned adjacent to the wall of the chamber, where the refrigerant liquid evaporates to gas and absorbs heat of the at least one evaporation conductor; and

providing a chilling conductor forming a portion of the wall, the chilling conductor being arranged to transfer heat from the liquid in the chamber to the at least one evaporation tube to generate the frozen product.

29. The method of claim 28, wherein the chilling conductor includes a conduction plate.

30. The method of claim 28, wherein the wall includes an upper section and a lower section.

31. The method of claim 30, further comprising forming, using the conduction plate, a portion of the lower section.

32. The method of claim 28, further comprising positioning the at least one evaporation tube on at least one channel on the conduction plate.

33. The method of claim 28, wherein the chilling conductor includes at least one of a semi-cylindrical shape, semispherical shape, and an arc shape.

34. The method of claim 28, wherein the at least one evaporation tube includes a U-shape.

35. A system for cooling comprising:

a chamber for receiving liquid to form a frozen product, the chamber including a wall;

at least one evaporation tube for receiving refrigerant liquid, the at least one evaporation tube being positioned adjacent to the wall of the chamber, where the refrigerant liquid evaporates to gas and absorbs heat of the at least one evaporation conductor;

a chilling conductor forming a portion of the wall, the chilling conductor being arranged to transfer heat from the liquid in the chamber to the at least one evaporation tube to generate the frozen product; and

a helix-shaped agitator positioned in the chamber, the helix shaped agitator arranged to scrape ice collected on a surface of the wall and mix the scraped ice with the liquid in the chamber to generate the frozen product.

36. The system of claim 35, wherein the chilling conductor includes a conduction plate.

37. The system of claim 35, wherein the wall includes an upper section and a lower section.

38. The system of claim 37, wherein the conduction plate forms a portion of the lower section.

39. The system of claim 35, wherein the chilling conductor includes at least one of a semi-cylindrical shape, semispherical shape, and an arc shape.

40. The system of claim 35, wherein the at least one evaporation tube includes a U-shape.

41. A system for temperature-regulation of frozen products comprising:

a chamber for receiving liquid to form a frozen product;

a temperature sensor arranged to detect a temperature of at least one of the liquid and a refrigerant liquid;

a compressor for circulating the refrigerant liquid to cool the liquid and high-pressure gas to warm the liquid in the chamber, the compressor sending the refrigerant liquid or the high-pressure gas to at least one evaporation conductor positioned adjacent to the chamber, where the refrigerant liquid evaporates to gas and absorbs heat for cooling the chamber;

at least one chilling conductor for producing ice on a surface of the at least one chilling conductor, the least one chilling conductor being cooled by the at least one evaporation conductor; and

a controller being arranged to receive temperature data from the temperature sensor and, in response, control an amount of the refrigerant liquid or the high-pressure gas circulated by the compressor to regulate the temperature of the liquid.

42. The system of claim 41, wherein the controller includes a processor.

43. The system of claim 41 comprising a user interface arranged to receive a user input.

44. The system of claim 43, wherein the controller is arranged to receive a target temperature setting based on the user input, the controller regulating the temperature of the liquid based on the received temperature data from the temperature sensor and the target temperature setting.

45. The system of claim 44, further comprising a memory arranged to store one or more recipes, the one or more recipes being selectable by the user via the user interface, each of the one or more recipes including at least one target temperature setting.

46. The system of claim 41, wherein the controller cools the chamber by controlling the rates the refrigerant liquid is circulated to the at least one chilling conductor.

47. The system of claim 41, wherein the controller provides the high-pressure gas to the at least one evaporation conductor to melt ice in the chamber.

48. A method for temperature-regulation of frozen products comprising:

receiving, in a chamber, liquid to form a frozen product;

detecting, using a temperature sensor, a temperature of at least one of the liquid and a refrigerant liquid;

circulating, using a compressor, the refrigerant liquid to cool the liquid and high-pressure gas to warm the liquid in the chamber, the compressor sending the refrigerant liquid or the high-pressure gas to at least one evaporation conductor positioned adjacent to the chamber, where the refrigerant liquid evaporates to gas and absorbs heat for cooling the chamber;

producing, using at least one chilling conductor, ice on a surface of the at least one chilling conductor, the least one chilling conductor being cooled by the at least one evaporation conductor; and

receiving, using a controller, temperature data from the temperature sensor and, in response, the controller controlling the amount of the refrigerant liquid or the high-pressure gas circulated by the compressor to regulate the temperature of the liquid.

49. The method of claim 48, wherein the controller includes a processor.

50. The method of claim 48, further comprising providing a user interface arranged to receive a user input.

51. The method of claim 50, further comprising receiving, based on the user input, a target temperature setting, the controller regulating the temperature of the liquid based on the received temperature data from the temperature sensor and the target temperature setting.

52. The method of claim 51, further comprising storing, using a memory, one or more recipes, the one or more recipes being selectable by the user via the user interface, each of the one or more recipes including at least one target temperature setting.

53. The method of claim 48, further comprising providing, using the controller, cooling to the chamber by controlling the rates the refrigerant liquid is circulated to the at least one chilling conductor.

54. The method of claim 48, further comprising providing, using the controller, the high-pressure gas to the at least one evaporation conductor to melt ice in the chamber.

55. A system for temperature-regulation of frozen products comprising:

a chamber for receiving liquid to form a frozen product;

a temperature sensor arranged to detect a temperature of at least one of the liquid and a refrigerant liquid;

a compressor for circulating the refrigerant liquid to cool the liquid and high-pressure gas to warm the liquid in the chamber, the compressor sending the refrigerant liquid or the high-pressure gas to at least one evaporation conductor positioned adjacent to the chamber, where the refrigerant liquid evaporates to gas and absorbs heat for cooling the chamber;

at least one chilling conductor for producing ice on a surface of the at least one chilling conductor, the least one chilling conductor being cooled by the at least one evaporation conductor; and

a valve for regulating temperature of the liquid in the chamber via the at least one chilling conductor, wherein the valve controls, in response to one or more control signals from a controller, an amount of the refrigerant liquid or the high-pressure gas circulated by the compressor to regulate the temperature of the liquid in the chamber; wherein

the controller being arranged to receive temperature data from the temperature sensor and, in response, control the amount of the refrigerant liquid or the high-pressure gas circulated by the compressor to regulate the temperature of the liquid.

56. The system of claim 55, wherein the controller includes a processor.

57. The system of claim 55 comprising a user interface arranged to receive a user input.

58. The system of claim 57, wherein the controller is arranged to receive a target temperature setting based on the user input, the controller regulating the temperature of the liquid based on the received temperature data from the temperature sensor and the target temperature setting.

59. The system of claim 58, further comprising a memory arranged to store one or more recipes, the one or more recipes being selectable by the user via the user interface, each of the one or more recipes including at least one target temperature setting.

60. The system of claim 51, wherein the valve is a solenoid valve.

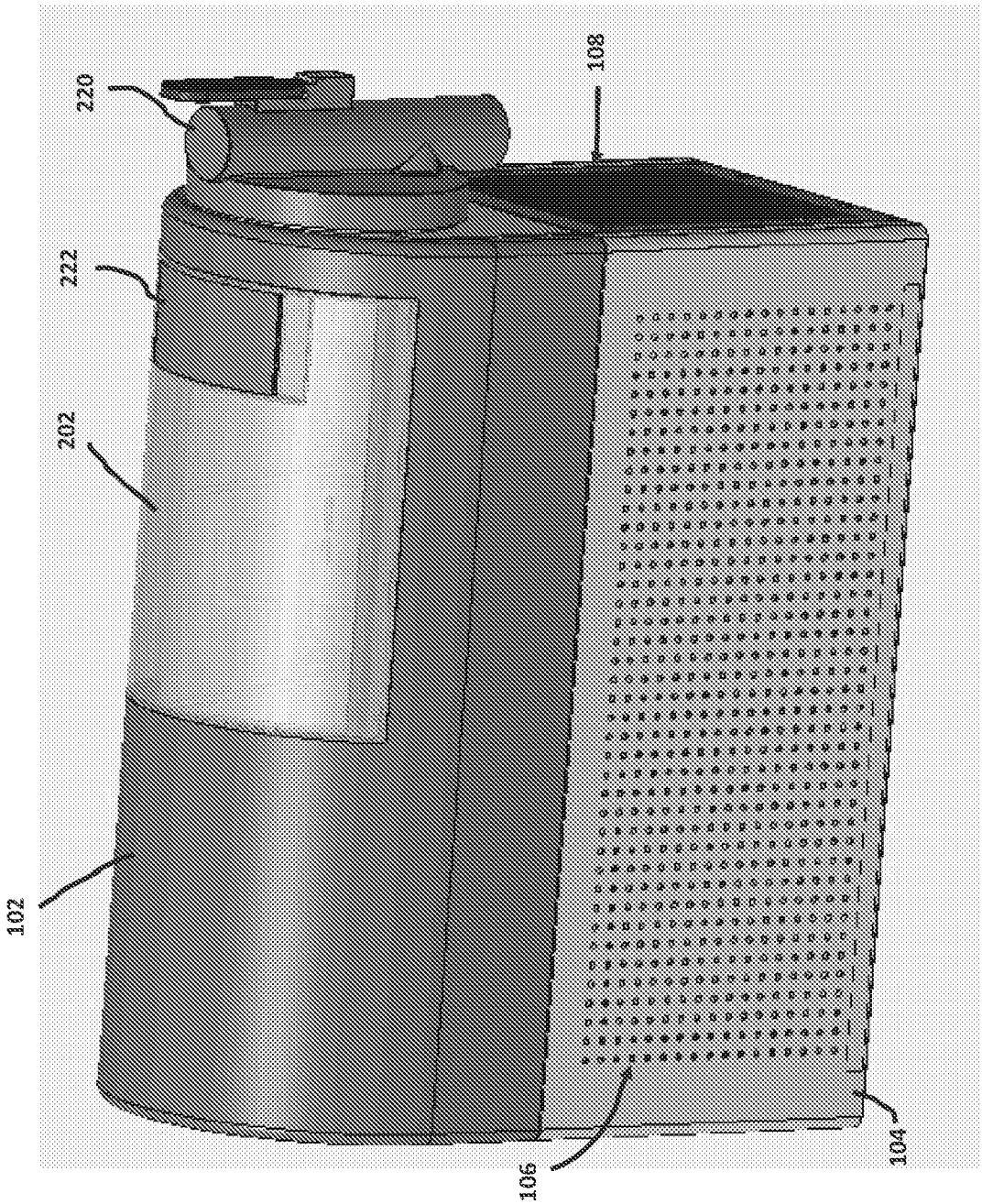
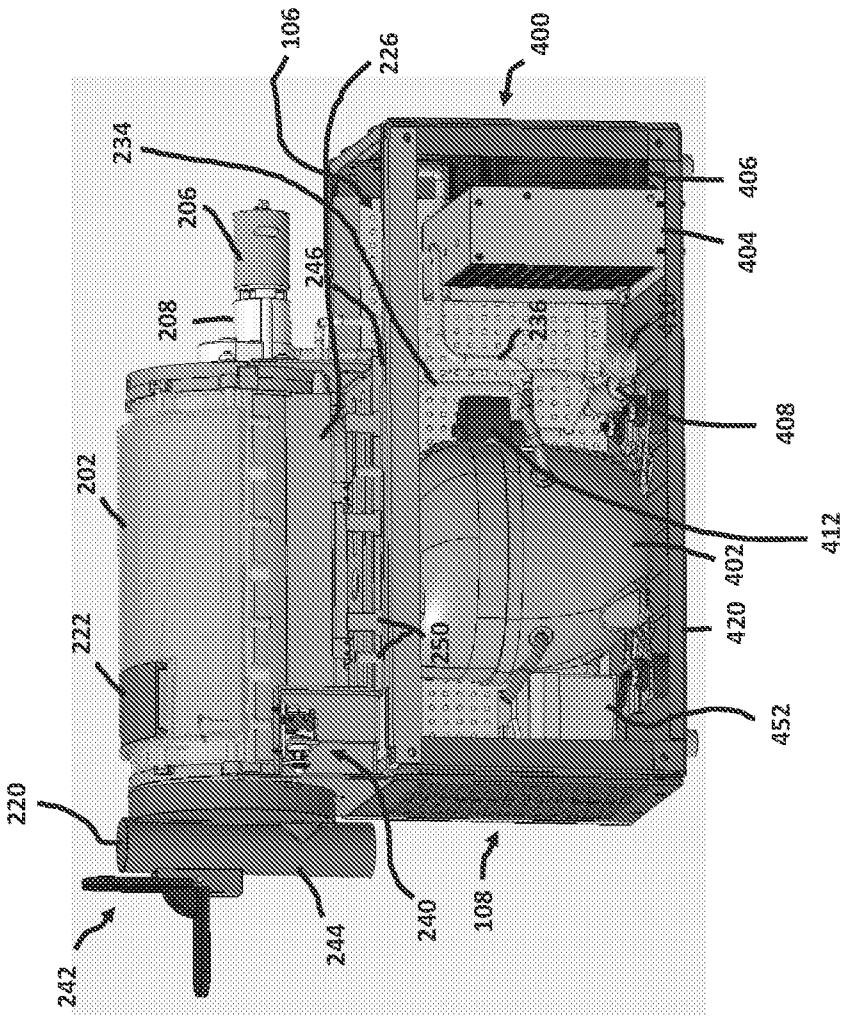


FIG. 1


106
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108

FIG. 2A

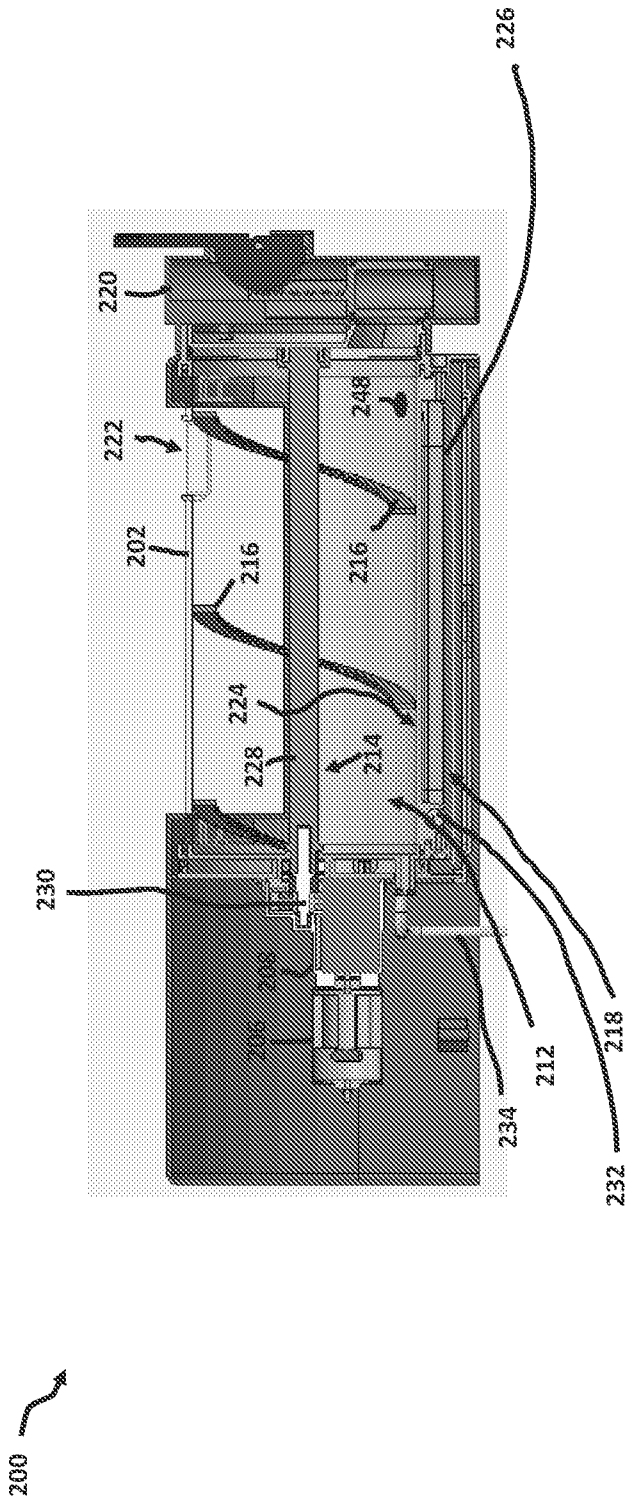

FIG. 2B

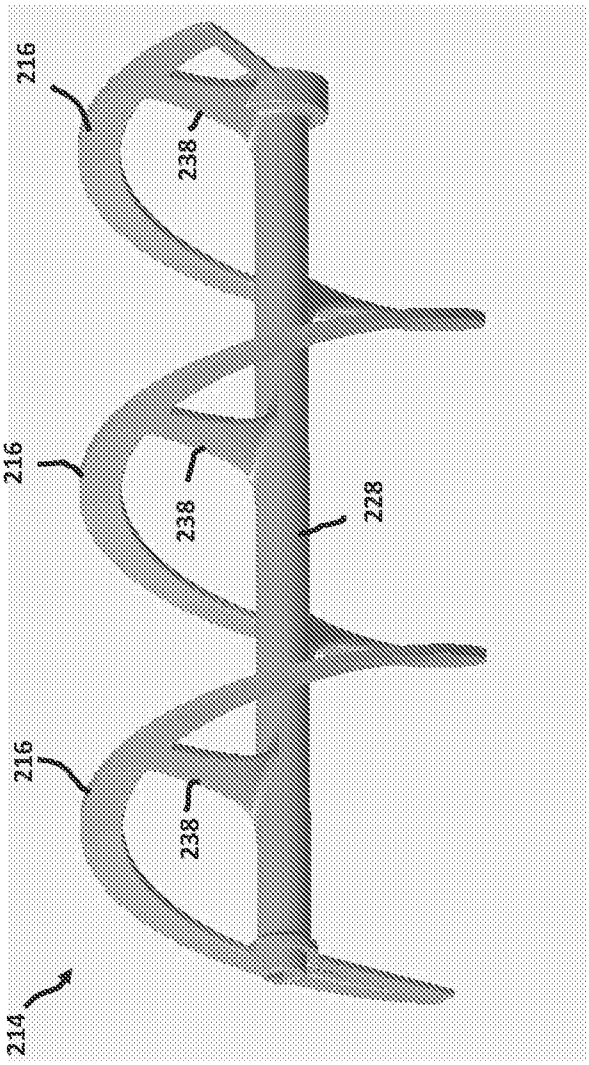

FIG. 2C

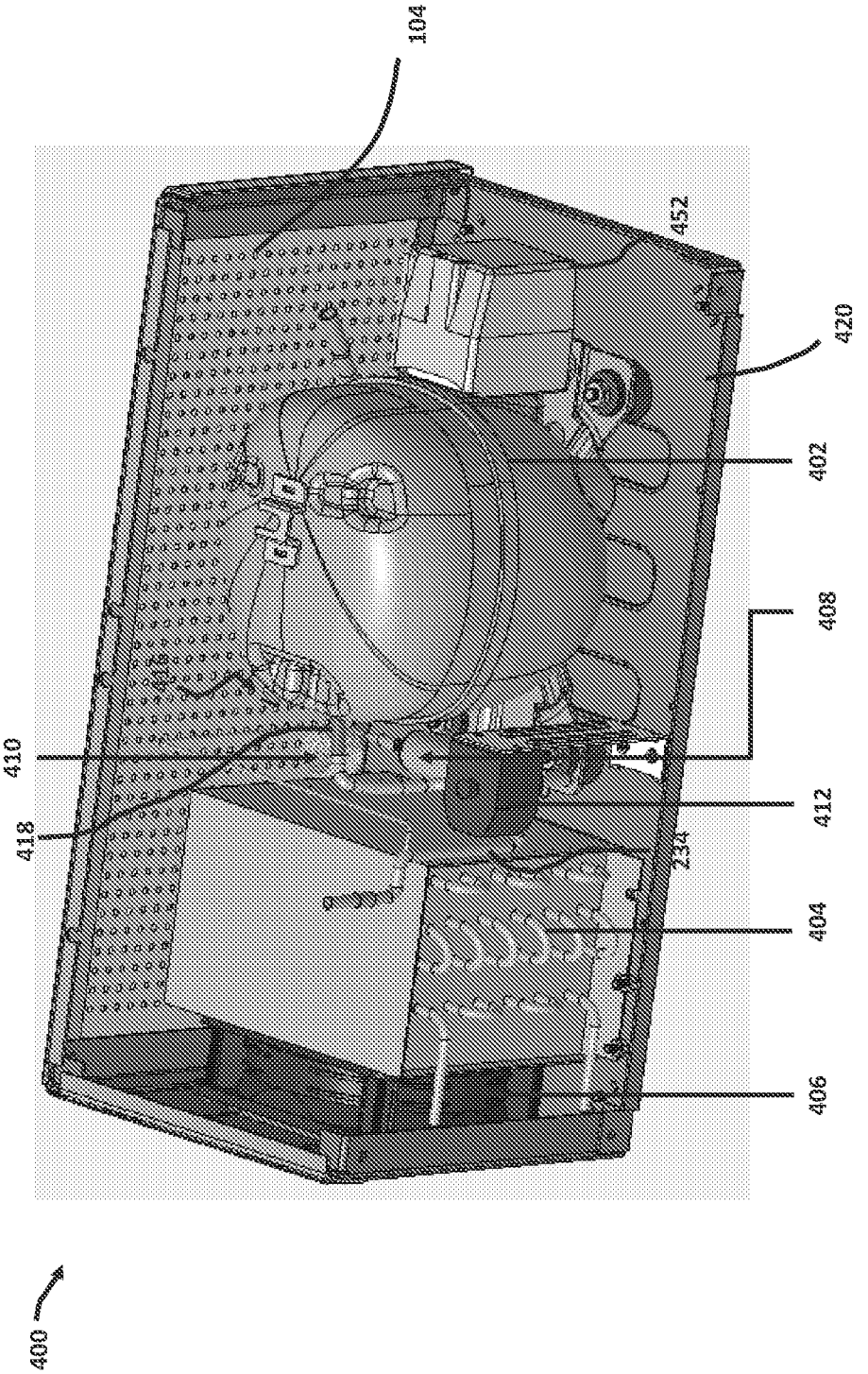

FIG. 2D

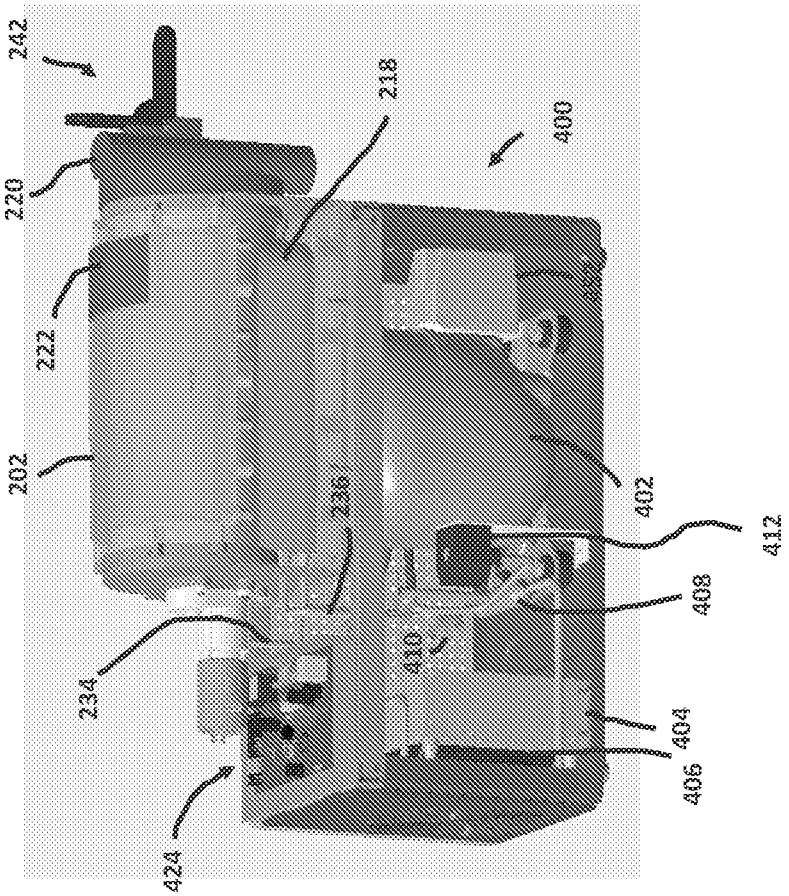

FIG. 2E

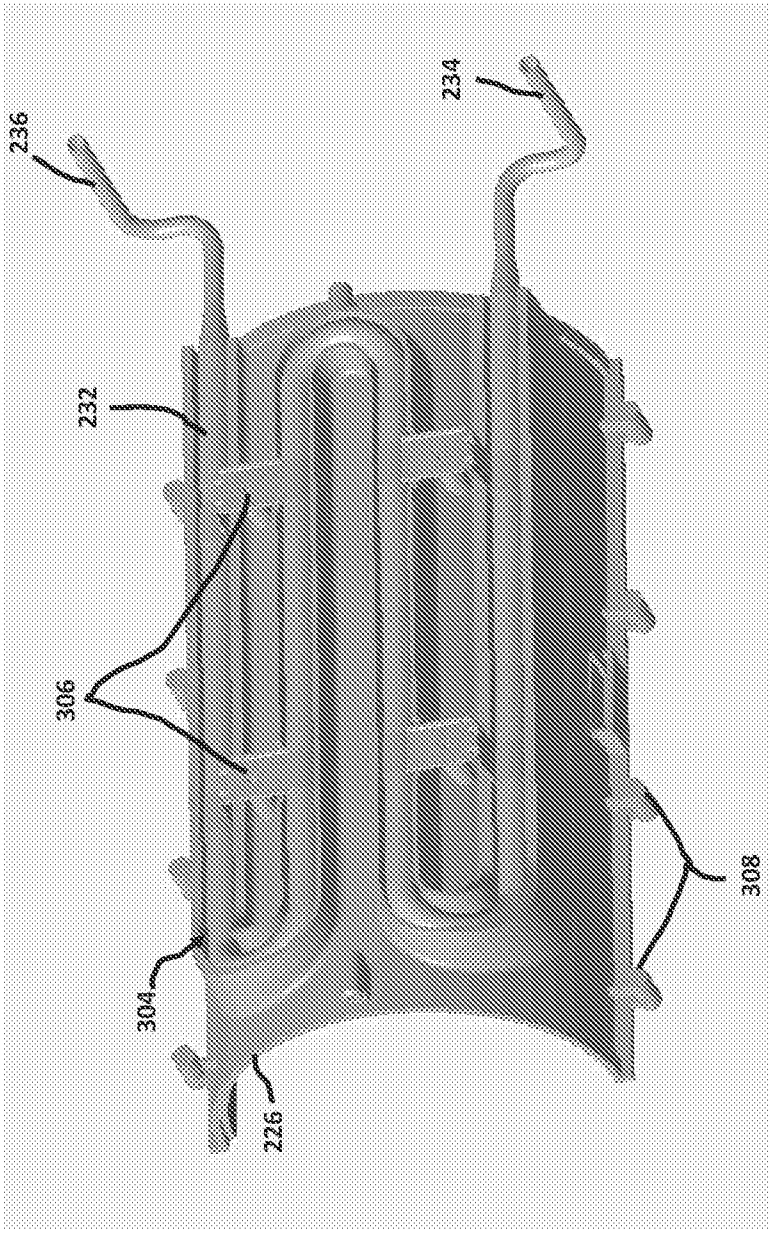

FIG. 3

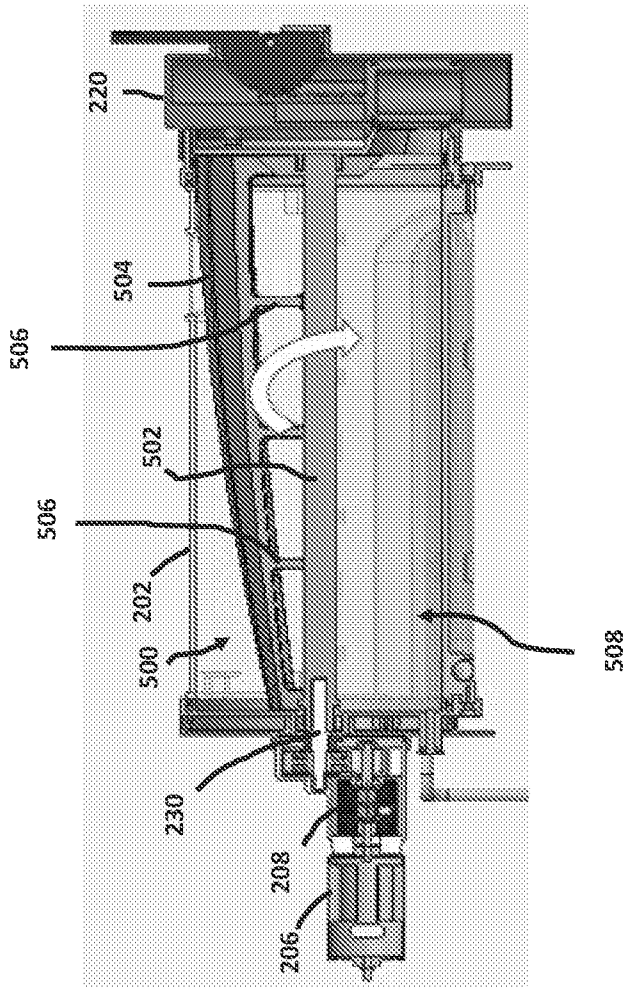

FIG. 4A

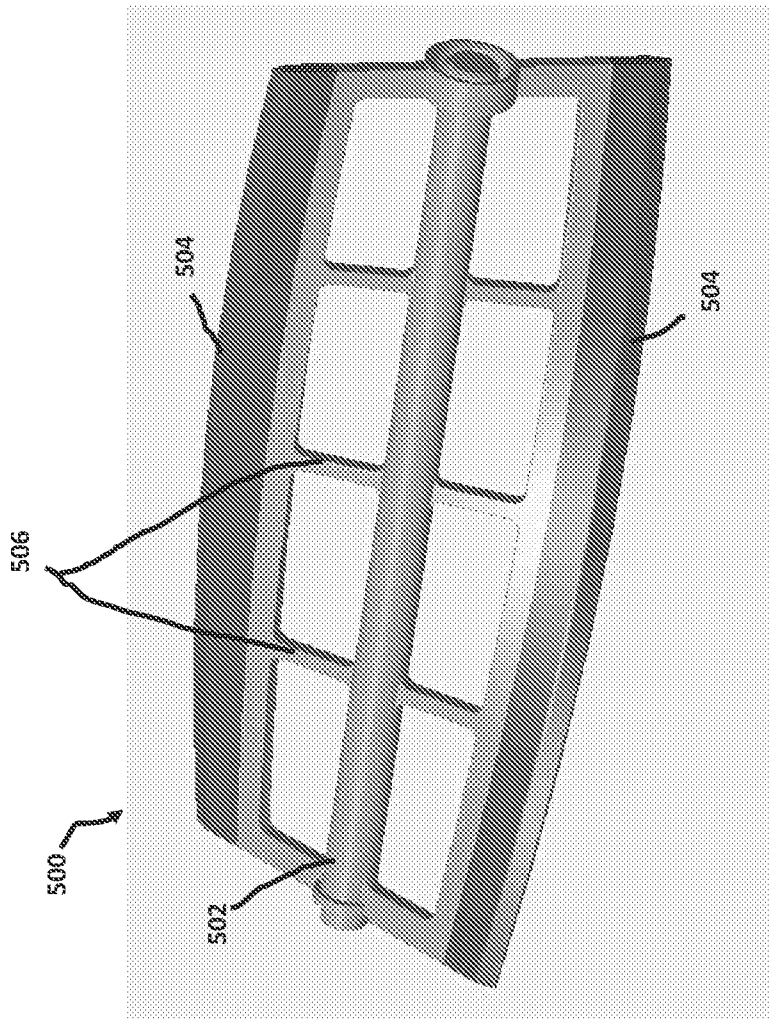

FIG. 4B

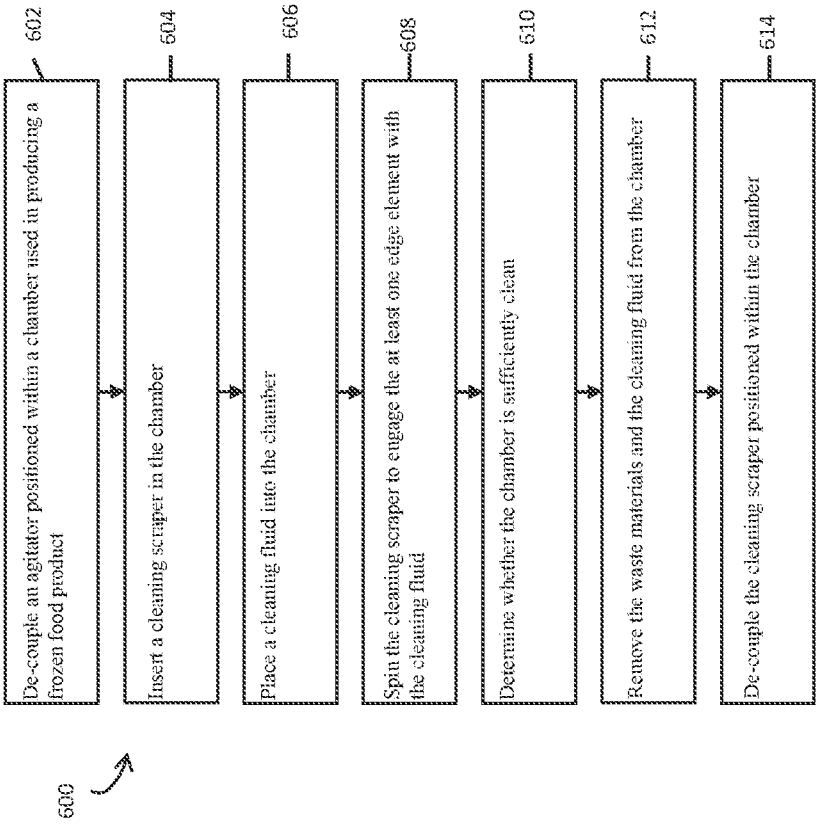
600
602
De-couple an agitator positioned within a chamber used in producing a frozen food product
604
Insert a cleaning scraper in the chamber
606
Place a cleaning fluid into the chamber
608
Spin the cleaning scraper to engage the at least one edge element with the cleaning fluid
610
Determine whether the chamber is sufficiently clean
612
Remove the waste materials and the cleaning fluid from the chamber
614
De-couple the cleaning scraper positioned within the chamber

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/CN2023/098350

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23G9/04
ADD.

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 A23L

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, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2 524 616 A (DANIEL WESTMORELAND) 3 October 1950 (1950-10-03) claims 1,4; figures 1-3	1-3,10
X	US 4 732 013 A (BECK NORMAN L [US]) 22 March 1988 (1988-03-22) column 4, lines 26-35; claim 1; figures 1-2	1-3,10
X	US 2 017 116 A (BONNELL HAROLD D) 15 October 1935 (1935-10-15) page 3, lines 31-34; figure 1	1-3,10
A	CN 103 506 047 B (CARPIGIANI GROUP ALI SPA) 14 November 2017 (2017-11-14) figures 1-3	2,3,10

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"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

"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 October 2023	08/01/2024

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	Groh, Björn

1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/098350

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims;; it is covered by claims Nos.:
1-3, 10

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/CN2023/098350

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2524616 A	03-10-1950	NONE	
US 4732013 A	22-03-1988	FR 2551191 A1	01-03-1985
		GB 2145505 A	27-03-1985
		NL 8401206 A	18-03-1985
		US 4732013 A	22-03-1988
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CN 103506047 B	14-11-2017	CN 103506047 A	15-01-2014
		EP 2679100 A1	01-01-2014
		JP 6294014 B2	14-03-2018
		JP 2014008063 A	20-01-2014
		US 2014000302 A1	02-01-2014

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-3, 10

system for producing frozen (food) products comprising a chamber and an helix-shaped agitator according to claim 1 wherein the agitator is replaceable and the agitator has a specific design, such as blade on a rib (claim 2) or distal ends are uniform (claim 3) or rib extending radically between shaft and blade (claim 3).

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2. claims: 4-9, 11-20

system for producing frozen (food) products comprising a chamber and a replaceable helix-shaped agitator according to claim 1 wherein the system comprises a clearing agitator arranged to be insertable into the chamber when the replaceable agitator is removed from the chamber (see claim 4); and method of cleaning a cooling system using a clearing scraper according to method-type claim 11; and a cleaning agitator per se (see claim 20).

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3. claims: 21-40

system for cooling according to claim 21 or 35 comprising an evaporation tube and a chilling conductor; and a corresponding method for cooling (claim 28).

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4. claims: 41-60

a system for temperature-regulation of frozen products comprising a sensor, a compressor and a controller according to claims 41 or 55, and a corresponding method according to claim 48.
