(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 818 605 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.10.2026 Bulletin 2026/41

(21) Application number: **26169218.0**

(22) Date of filing: **30.03.2026**

(51) International Patent Classification (IPC):
F25C 1/24 *(2018.01)* ***F25C 5/08*** *(2006.01)*
F25C 5/20 *(2018.01)* ***F25C 1/25*** *(2018.01)*
F25C 5/04 *(2006.01)* ***F25D 23/02*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F25C 5/22; F25C 1/24; F25C 1/25; F25C 5/04; F25C 5/046; F25C 5/08; F25D 23/028; F25C 5/06; F25C 5/14; F25C 2400/10; F25C 2400/14; F25C 2500/02; F25C 2700/12; F25C 2700/14; F25D 2400/02

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH LA MA MD TN

(30) Priority: **04.04.2025 KR 20250044153**
04.04.2025 KR 20250044114
04.04.2025 KR 20250044117

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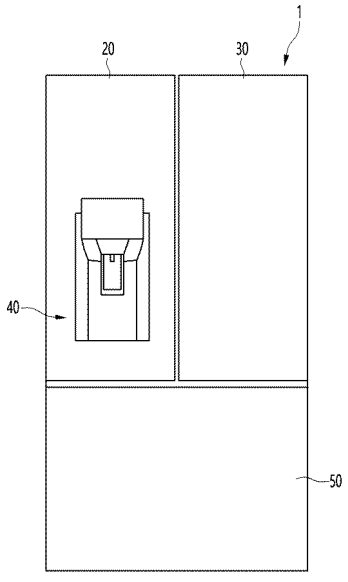
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(54) **REFRIGERATOR**

(57) A refrigerator includes a reservoir configured to store fluid and an ice-making body having a portion to which the fluid stored in the reservoir is supplied. The refrigerator further includes a heater installed adjacent to the reservoir and configured to provide heat to the reservoir. The heater is installed on a wall of the reservoir.

FIG. 1A



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a refrigerator.

BACKGROUND

[0002] A refrigerator is an appliance that may store food at a low temperature in an internal storage space shielded by a door. The refrigerator cools the inside of the storage space by using cold air, thereby keeping the stored food in a refrigerated state or a frozen state.

[0003] In some cases, an ice maker for making ice may be provided in a freezing space of the refrigerator. For example, the ice maker receives water supplied from a water supply source or a water tank in a tray, and then cools the water to generate ice. The ice generated by the ice maker may be stored in an ice bin. The user may open a freezing space door, approach the ice bin, and take out the ice of the ice bin.

[0004] In some cases, where ice is formed hard, a child, an elderly person, or a consumer having weak teeth may feel discomfort when chewing the ice.

SUMMARY

[0005] The present application describes apparatus and method configured to generate chewable ice having reduced hardness.

[0006] The present application describes a refrigerator capable of manufacturing ice having strength to an extent that a consumer may chew and eat.

[0007] The present application describes a refrigerator capable of providing a tray including a peripheral surface in which ice is generated, and cooling water supplied to the peripheral surface to manufacture thin ice (ice in a first state).

[0008] The present application describes a refrigerator capable of providing a blade on one side of the tray to separate the thin ice from the peripheral surface and manufacture powdered ice (ice in a second state or second state ice).

[0009] The present application describes a refrigerator capable of compressing the powdered ice to manufacture molded ice (ice in a third state or third state ice) having a predetermined strength.

[0010] The present application describes a refrigerator in which, so that cooling of the tray is rapidly performed by supplied cold air, the tray is made of a material having high thermal conductivity, for example, a metal material.

[0011] The present application describes a refrigerator including a reservoir storing water, wherein at least a portion of the tray is disposed to be immersed in the reservoir so that water may be smoothly supplied to a circumferential surface of the tray.

[0012] The present application describes a refrigerator including a bracket supporting the reservoir, wherein the bracket includes a wall extending toward a space between the circumferential surface of the tray and the reservoir so that supply of cold air to the reservoir is prevented.

[0013] The present application describes a refrigerator including a heater installed in the reservoir to prevent water stored in the reservoir from freezing. In particular, The present application describes a refrigerator capable of preventing water stored in the reservoir from freezing in a sub-zero temperature environment.

[0014] The present application describes a refrigerator in which a heater is disposed such that a heating output at a position close to a cold air inlet portion is great, with respect to a position of the cold air inlet portion through which cold air flows into an ice-making chamber.

[0015] The present application describes a refrigerator configured such that a wall of the reservoir and a wall of a bracket form the same plane, or the wall of the reservoir is disposed further outward than the wall of the bracket, so that ice separated from the wall of the bracket may be introduced into the reservoir and freezing near the wall of the reservoir may be prevented.

[0016] The present application describes a refrigerator in which a wall of the reservoir, particularly a lower wall, has a recessed structure so as to prevent interference with the reservoir when at least a portion of the tray moves into an inner space of the reservoir.

[0017] The present application describes a refrigerator including a temperature sensor capable of sensing a temperature of water stored in the reservoir, wherein an output of a heater may be adjusted based on a value sensed by the temperature sensor.

[0018] The present application describes a refrigerator and a control method thereof capable of supplying an optimal heating amount to the reservoir by performing feedback control of an output of a reservoir heater according to predetermined conditions.

[0019] The present application describes a refrigerator and a control method thereof capable of determining whether water supply to the reservoir is started by using a temperature of the reservoir and immediately responding thereto.

[0020] The present application describes a refrigerator and a control method thereof capable of supplying an optimal heating amount to the reservoir by performing feedback control according to an operating condition of the refrigerator even without a temperature sensor.

[0021] The present application describes a refrigerator in which, as the tray rotates, frozen ice is de-iced by a blade, and the de-iced powdered ice is transferred to a compression part, so that spray-type water supply, freezing, and de-icing may continuously proceed without a separate waiting time.

[0022] The present application describes a refrigerator in which freezing may be performed over an entire circumferential surface of the tray.

[0023] The present application describes a refrigerator in which continuous ice-making is performed over an

entire surface of the tray without a waiting time, whereby a greater amount of powdered ice per unit time is generated and a supply amount of powdered ice increases, resulting in a faster production speed of compressed molded ice, so that a user may be provided with a greater amount of molded ice per unit time.

[0024] The present application describes a refrigerator configured to maintain water of a spray device at a temperature above freezing so that the spray device may not be clogged when water sprayed toward the tray freezes.

[0025] The present application describes a refrigerator including a temperature sensor capable of sensing a temperature of a spray device, wherein a heater may be controlled on/off or an output of the heater may be adjusted based on a value sensed by the temperature sensor.

[0026] In some implementations, a refrigerator may include a reservoir in which water is stored, and a tray having a circumferential surface to which water of the reservoir is supplied. In some examples, a liquid other than water may be stored in the reservoir.

[0027] The refrigerator may include a cold air duct supplying cold air toward the tray, and the reservoir may be disposed at a side opposite to a cold air flow path through which cold air is supplied to the tray.

[0028] With respect to a center of the tray, a cold air flow path from the cold air duct toward the tray and the reservoir may be disposed opposite to each other. Accordingly, cold air introduced through the cold air duct may be prevented from directly flowing into the reservoir to freeze water stored in the reservoir.

[0029] The reservoir may be located below the tray with respect to a gravity direction, and the cold air flow path may be located above the tray.

[0030] The refrigerator may include a bracket having a wall supporting the reservoir, and the bracket may include a portion positioned in a space between the circumferential surface (circumferential wall) of the tray and the reservoir. Cold air may be prevented from being supplied to the reservoir by the portion of the bracket.

[0031] The refrigerator may further include a heater installed adjacent to the reservoir and providing heat so as to prevent water stored in the reservoir from freezing.

[0032] The heater may be installed on a wall of the reservoir.

[0033] The reservoir may include a plurality of walls forming a storage space, and portions at which the plurality of walls meet may form corners of the reservoir.

[0034] The heater may be installed on at least one of the plurality of walls.

[0035] The at least one wall may include a lower wall forming a bottom surface of the reservoir.

[0036] The at least one wall may include a side wall forming a lateral surface of the reservoir.

[0037] The tray may be movably provided, and the reservoir may include a recessed wall so as to prevent interference between the tray and the reservoir when at least a portion of the tray is positioned in an inner space of the reservoir.

[0038] The recessed wall may form a bottom surface of the reservoir.

[0039] The recessed shape may be formed in a U-shape or a V-shape.

[0040] The refrigerator may include a bracket supporting the tray, and the bracket may form a cold air inlet portion supplying cold air toward the tray.

[0041] With reference to a volume or an installation area of the heater, a volume or installation area of a portion of the heater located closer to the cold air inlet portion may be greater than that of another portion located farther from the cold air inlet portion.

[0042] With respect to a center of the tray, a volume of a first portion of the heater located closer to the cold air inlet portion may be greater than a volume of a second portion located farther from the cold air inlet portion.

[0043] The heater may be arranged to form multiple rows on the wall of the reservoir.

[0044] The reservoir may be disposed below the tray such that a lower portion of the tray is immersed in or contacted with water of the reservoir, and a direction in which the heater is arranged in multiple rows may correspond to a direction in which the tray and the reservoir are disposed.

[0045] The reservoir may include a surface facing a side wall or side surface of the tray. The surface of the reservoir may constitute a wall forming an exterior appearance.

[0046] The heater may be disposed between the side wall of the tray and the surface of the reservoir. Accordingly, freezing of ice in a region between the side wall of the tray and the surface of the reservoir may be prevented.

[0047] The refrigerator may include a blade separating ice frozen on the side wall of the tray, and the side wall of the tray may overlap an inner space of the reservoir so that ice separated from the side wall may be introduced into the reservoir.

[0048] The bracket may include a wall supporting the tray, and the wall of the bracket may include a portion forming the same plane as a surface of the reservoir so that ice separated from the wall of the bracket may be introduced into the reservoir and freezing near the wall of the reservoir may be prevented.

[0049] The refrigerator may include a temperature sensor capable of sensing a temperature of water stored in the reservoir.

[0050] The temperature sensor may be installed on a wall of the reservoir.

[0051] The temperature sensor may be installed outside the wall of the reservoir.

[0052] The temperature sensor may be installed inside the wall of the reservoir.

[0053] The temperature sensor may be eccentrically disposed in one direction with respect to a center of the reservoir.

[0054] The temperature sensor may be disposed on a recessed bottom surface of the reservoir. Accordingly, erroneous detection caused by cold air supplied to the tray from an upper side of the reservoir may be prevented.

[0055] A density per unit area of the heater in a region where the temperature sensor is disposed may be smaller than a density in a region where the temperature sensor is not disposed. Accordingly, erroneous detection caused by heat generated by the heater may be prevented.

[0056] The refrigerator may include a controller adjusting an output of the heater based on a value sensed by the temperature sensor.

[0057] The controller may increase the output of the heater to prevent freezing of water in the reservoir when the value sensed by the temperature sensor is less than or equal to a set value.

[0058] When the value sensed by the temperature sensor is less than or equal to a predetermined value, it may be recognized that water in the reservoir is insufficient, and a water supply device may be controlled to supply water to the reservoir.

[0059] The refrigerator may include a water supply device supplying water to the reservoir.

[0060] The water supply device may include a water supply pipe.

[0061] The water supply device may include a nozzle.

[0062] The bracket may include a communication portion through which the water supply device is introduced into an inner space of the bracket.

[0063] The bracket may include a guide wall guiding water supplied from the water supply device to the reservoir.

[0064] The guide wall may include an inclined surface extending obliquely with respect to a direction from the water supply device toward the reservoir, and an end portion of the inclined surface may be disposed adjacent to the reservoir.

[0065] The circumferential surface of the tray may include a portion extending in a rounded manner.

[0066] The circumferential surface of the tray may include a portion having an arc shape.

[0067] The circumferential surface of the tray may include a portion having a circular shape.

[0068] The tray may include a drum.

[0069] In one aspect of the present disclosure, a refrigerator may include a cabinet forming a storage space, a door opening and closing the storage space, a tray provided in the cabinet or the door and having a circumferential surface to receive water and generate ice, and a reservoir provided at one side of the tray and supplying water to the circumferential surface of the tray.

[0070] The refrigerator may include a heater installed in the reservoir and providing heat to the reservoir so that freezing of water stored in the reservoir is prevented.

[0071] The reservoir may include a plurality of surfaces forming a water storage space, and the heater may be installed on at least one of the plurality of surfaces. The plurality of surfaces may form a plurality of walls constituting an exterior appearance of the reservoir.

[0072] The reservoir may include a surface forming a water storage space, and the heater may be installed on an outer side of the surface so as not to contact water.

[0073] The reservoir may include a bottom surface defining a bottom on which water is stored, and the heater may be installed on the bottom surface.

[0074] The reservoir may include a surface having a predetermined height to form a water level of stored water, and the heater may be installed on the surface of the reservoir.

[0075] The reservoir may include a first surface defining a bottom and a plurality of second surfaces protruding from the first surface, and the heater may be installed on at least two of the first surface and the plurality of second surfaces.

[0076] The reservoir may include a surface facing one surface of the tray, and the heater may be installed on the surface of the reservoir so as to prevent freezing at the one surface of the tray.

[0077] The reservoir may include a surface on which the heater is installed, and the heater may include a plurality of heater lines arranged in multiple rows on the surface of the reservoir.

[0078] The refrigerator may include an ice-making bracket receiving the tray and forming an opening through which cold air for cooling the tray is introduced, and the heater may include a first portion disposed adjacent to the opening and a second portion disposed farther from the opening.

[0079] An installation area of the first portion of the heater may be greater than an installation area of the second portion.

[0080] The refrigerator may include a blade disposed adjacent to the circumferential surface of the tray to separate ice generated on the circumferential surface, and the heater may include a first portion disposed adjacent to the blade and a second portion disposed farther from the blade.

[0081] An installation area of the second portion of the heater may be greater than an installation area of the first portion.

[0082] The refrigerator may include a temperature sensor installed on a surface of the reservoir and sensing a temperature of water stored in the reservoir.

[0083] The temperature sensor may be installed on an outer side of the surface of the reservoir so as not to contact water stored in the reservoir.

[0084] The temperature sensor may be installed on an inner side of the surface of the reservoir at a position lower than a maximum water level of the reservoir so as to contact water stored in the reservoir.

[0085] A density per unit area of the heater in a region where the temperature sensor is disposed may be smaller than a density in a region where the temperature sensor is not disposed.

[0086] The temperature sensor may be eccentrically disposed toward one end of the reservoir with respect to a center of the reservoir.

[0087] The tray may be movably provided from a first position to a second position, and a bottom surface of the reservoir may have a recessed shape so as not to interfere with the reservoir when the tray moves from the first position to the second position.

[0088] The refrigerator may include an ice-making bracket having a wall supporting the tray, and the wall of the ice-making bracket may include a part forming the same plane as a surface of the reservoir so that ice separated from the tray may be readily introduced into the reservoir.

[0089] In another aspect of the present disclosure, a refrigerator may include a cabinet forming a storage space, a door opening and closing the storage space, a tray rotatably provided in the door and having a circumferential surface to receive water and generate ice, and a spray device spraying water onto the circumferential surface of the tray.

[0090] The spray device may include a spray nozzle spraying water onto the circumferential surface of the tray.

[0091] A plurality of spray devices may be provided to be spaced apart along a circumference of the tray.

[0092] The spray device may be fixed, and when the tray rotates, water may be sprayed onto the circumferential surface of the tray.

[0093] After the tray rotates and water is sprayed from the spray device onto the circumferential surface, rotation of the tray may be stopped so that water sprayed onto the circumferential surface may be frozen.

[0094] When the tray rotates, water may be sprayed from the spray device onto the circumferential surface while the sprayed water may be simultaneously frozen.

[0095] The circumferential surface may include irregularities.

[0096] The irregularities may include at least one recess recessed in the circumferential surface and a protrusion connected to the recess.

[0097] The protrusion and the recess may extend in a circumferential direction of the tray.

[0098] The refrigerator may include a blade scraping ice frozen on the circumferential surface of the tray, and with respect to an axial direction of the tray, the spray device may be disposed at one side of the tray, and the blade may be disposed at the other side of the tray.

[0099] The spray device may include an adjustment device for adjusting an amount of water sprayed from the spray device onto the circumferential surface of the tray.

[0100] The refrigerator further comprises a drive motor that provides rotational force to the tray, and wherein the drive motor drives the tray to rotate during the process of spraying water from the spray device, or separating frozen ice from the tray.

[0101] The drive motor is controlled to reduce the rotational speed of the tray or stop the rotation of the tray during the process of freezing the water.

[0102] A heater may be installed in the spray device.

[0103] The heater may be formed in a linear shape and may be wound in a spiral shape around an outer surface of the spray device.

[0104] The spray device may include a temperature sensor sensing a temperature of the spray device or a temperature of water inside the spray device.

[0105] When the heater is turned off and a temperature sensed by the temperature sensor falls below a predetermined target temperature, the heater may be controlled to be turned on, and when the heater is turned on and the temperature sensed by the temperature sensor reaches the predetermined target temperature, the heater may be controlled to be turned off.

[0106] In still another aspect of the present disclosure, a refrigerator may comprise a cabinet that defines a storage space; a door configured to open and close at least a portion of the storage space; an ice-making body provided at the cabinet or the door, the ice-making body having a peripheral portion configured to receive water and to generate ice; and a reservoir provided at one side of the ice-making body and configured to supply the water to the ice-making body.

[0107] The refrigerator further comprises a heater disposed at a bottom surface of the reservoir and configured to provide heat to the reservoir.

[0108] The refrigerator further comprises a temperature sensor disposed at the bottom surface of the reservoir and configured to sense a temperature of the water stored in the reservoir.

[0109] The refrigerator further comprises a controller configured to, based on the temperature sensed by the temperature sensor being lower than a first reference temperature, increase an output of the heater.

[0110] The refrigerator further comprises a controller configured to, based on the temperature sensed by the temperature sensor being lower than a first reference temperature, supply water to the reservoir.

[0111] The controller is configured to, based on the temperature sensed by the temperature sensor being higher than a second reference temperature, decrease an output of the heater.

[0112] The controller is configured to, based on the temperature sensed by the temperature sensor being higher than a second reference temperature, supply water to the reservoir.

[0113] In still another aspect of the present disclosure, a refrigerator may comprise a cabinet that defines a storage space; a door configured to open and close at least a portion of the storage space; an ice-making body provided at the cabinet or the door, the ice-making body having a peripheral portion configured to receive water and to generate ice; and at least one spray nozzle configured to spray the water to the peripheral portion of the ice-making body.

[0114] Wherein the at least one spray nozzle comprises a plurality of spray nozzles spaced apart from

one another along the peripheral portion of the ice-making body.

[0115] The refrigerator further comprises a blade configured to separate the ice from the peripheral portion of the ice-making body,

[0116] The at least one spray nozzle is disposed at a first side with respect to an axis of the ice-making body, and the blade is disposed at a second side of the axis of the ice-making body opposite to the first side.

[0117] The refrigerator further comprises a drive motor configured to provide a rotational force to the ice-making body, wherein the drive motor is configured to: rotate the ice-making body based on (i) the at least one spray nozzle spraying the water to the ice-making body or (ii) the ice being separated from the ice-making body; and reduce a rotation speed of the ice-making body or stop rotating the ice-making body while the water is being frozen on the ice-making body.

[0118] The refrigerator further comprises a heater disposed at the at least one spray nozzle.

[0119] The refrigerator further comprises a temperature sensor configured to sense a temperature of the at least one spray nozzle or a temperature of water inside the at least one spray nozzle.

[0120] In some implementations, since ice having strength to an extent that a consumer may chew and eat may be manufactured, consumer satisfaction may increase.

[0121] In some implementations, by providing a tray including a peripheral surface in which ice is generated, and cooling water supplied to the peripheral surface, thin ice (ice in a first state or first state ice) may be manufactured.

[0122] In some implementations, by providing a blade on one side of the tray to separate the thin ice from the peripheral surface, powdered ice (ice in a second state) may be manufactured.

[0123] In some implementations, by compressing the powdered ice, molded ice (ice in a third state) having a predetermined strength may be manufactured.

[0124] In some implementations, a reservoir storing water is provided, and at least a portion of the tray is disposed to be immersed in the reservoir so that water may be smoothly supplied to a circumferential surface of the tray.

[0125] In some implementations, a bracket supporting the reservoir is provided, and the bracket includes a wall extending toward a space between the circumferential surface of the tray and the reservoir, thereby preventing cold air from being supplied to the reservoir.

[0126] In some implementations, a heater is installed in the reservoir to prevent water stored in the reservoir from freezing. In particular, freezing of water stored in the reservoir may be prevented in a sub-zero temperature environment.

[0127] In some implementations, with respect to a position of a cold air inlet portion through which cold air flows into an ice-making chamber, the heater is disposed such that a heating output at a position close to the cold air inlet portion is great, thereby preventing freezing of the reservoir located near the cold air inlet portion.

[0128] In some implementations, a surface of the reservoir and a wall of the bracket form the same plane, or the surface of the reservoir is disposed further outward than the wall of the bracket, so that ice separated from the wall of the bracket may be introduced into the reservoir and freezing near the surface of the reservoir may be prevented.

[0129] In some implementations, a surface of the reservoir, particularly a lower surface, has a recessed structure, thereby preventing interference with the reservoir when at least a portion of the tray moves into an inner space of the reservoir.

[0130] In some implementations, a temperature sensor capable of sensing a temperature of water stored in the reservoir is provided, and an output of the heater may be adjusted based on a value sensed by the temperature sensor.

[0131] In some implementations, an optimal heating amount may be supplied to the reservoir by performing feedback control of an output of a reservoir heater according to predetermined conditions.

[0132] In some implementations, it may be determined whether water supply to the reservoir is started by using a temperature of the reservoir, and immediate responding may be taken accordingly.

[0133] In some implementations, even without a temperature sensor, an optimal heating amount may be supplied to the reservoir by performing feedback control according to an operating condition of the refrigerator.

[0134] In some implementations, water may be sprayed onto a circumferential surface of a rotating tray, and the sprayed water may be frozen on the circumferential surface of the tray.

[0135] In some implementations, as the tray rotates, frozen ice is separated by a blade, and the separated powdered ice is transferred to a compression part, so that spray-type water supply, freezing, and de-icing may continuously proceed without a separate waiting time.

[0136] In some implementations, freezing may be performed over an entire circumferential surface of the tray.

[0137] In some implementations, continuous ice-making may be performed over an entire surface of the tray without a waiting time, whereby a greater amount of powdered ice per unit time is generated and a supply amount of powdered ice increases, resulting in a faster production speed of compressed molded ice, so that a user may be provided with a greater amount of molded ice per unit time.

[0138] In some implementations, water in a spray device spraying water onto the tray may be maintained above freezing so that the spray device is not clogged when the water freezes.

[0139] In some implementations, a temperature sensor capable of sensing a temperature of the spray device is provided, and a heater may be controlled on/off or an

output of the heater may be adjusted based on a value sensed by the temperature sensor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0140]

FIG. 1A is a front view showing an example of a refrigerator, and FIG. 1B is a view showing a state in which one door of the refrigerator is separated.

FIG. 2A is a perspective view viewed from a front of an example of a first refrigerating space door, and FIG. 2B is a perspective view viewed from a rear of the first refrigerating space door.

FIG. 3A is a view showing an example state in which a basket and a filter are separated from the first refrigerating space door, and FIG. 3B is a view showing an example state in which an ice-making space door and a cover member are separated from the first refrigerating space door.

FIG. 4 is a perspective view showing an example of an ice maker disposed inside an ice-making space in a state in which the ice-making space door is separated from the first refrigerating space door.

FIG. 5 is a view showing an example configuration of an ice maker and a door duct.

FIG. 6 is a front perspective view showing an example configuration of an ice maker and an ice-making space bracket.

FIG. 7 is a rear perspective view showing an example configuration of an ice maker and an ice-making space bracket.

FIG. 8 is an exploded perspective view showing an example configuration of an ice maker and an ice-making space bracket.

FIG. 9 is an exploded perspective view showing an example configuration of an ice-making part of an ice maker.

FIG. 10 is an exploded perspective view showing an example configuration of a tray assembly and a reservoir.

FIG. 11A is a view showing an example state when the tray assembly is at a first position.

FIG. 11B is a view showing an example state when the tray assembly is at a second position.

FIG. 12 is an exploded perspective view showing an example configuration of a compression part of an ice maker.

FIG. 13 is a perspective view showing an example configuration of a transfer pipe and a gear device.

FIG. 14 is a plan view showing an example configuration of a transfer pipe and a gear device.

FIG. 15A is a view showing an example state in which a piston is at a first position and ice de-iced from a tray assembly falls into a transfer pipe.

FIG. 15B is a view showing an example state in which a piston moves to a second position and ice of a transfer pipe is compressed by the piston.

FIG. 15C is a view showing an example state in which a piston moves to a third position and a transfer guide device supplies ice to the transfer pipe.

FIG. 15D is a view showing an example state in which a piston returns to a first position and the transfer guide device moves to an original position.

FIG. 16 is a perspective view showing an example configuration of an ice-making part of an ice maker.

FIG. 17 is a left perspective view showing an example configuration of a reservoir and a heater.

FIG. 18 is a right perspective view showing an example configuration of a reservoir and a heater.

FIG. 19 is a bottom perspective view showing an example configuration of a reservoir and a heater.

FIG. 20 is a left side view showing an example configuration of a reservoir and a heater.

FIG. 21 is a cross-sectional view taken along line 21-21 of FIG. 20.

FIG. 22 is a bottom view showing an example configuration of a reservoir and a heater.

FIG. 23 is a front view showing an example configuration of a reservoir and a heater.

FIG. 24 is a front view showing an example state in which a reservoir and a heater are installed in a bracket of an ice maker.

FIG. 25 is a left side view showing an example configuration of an ice-making part of an ice maker.

FIG. 26 is a cross-sectional view taken along line 26-26 of FIG. 25.

FIG. 27 is a front view showing an example configuration of a tray, a reservoir, and a heater when the tray is in a first position.

FIG. 28 is a front view showing an example configuration of a tray, a reservoir, and a heater when the tray is in a second position.

FIG. 29 is a cross-sectional view showing an example of an internal configuration of the ice-making part when the tray is in the second position.

FIG. 30 is a view showing an example configuration of a reservoir.

FIG. 31 is a cross-sectional view showing an example configuration of an ice-making part.

FIG. 32 is a control flowchart illustrating an example method of controlling a reservoir heater.

FIG. 33 is a control flowchart illustrating an example method of controlling a reservoir heater.

FIG. 34 is a control flowchart illustrating an example method of controlling a reservoir heater.

FIG. 35 is a perspective view schematically showing an example structure of an ice-making part.

FIG. 36 is a front view schematically showing an example structure of an ice-making part.

FIG. 37 is a front view schematically showing an example structure of an ice-making part.

DETAILED DESCRIPTION

[0141] Hereinafter, some implementations of the present disclosure will be described in detail through example drawings. In adding reference numerals to components in each drawing, it should be noted that the same components are given the same numerals as much as possible even if displayed on different drawings. In addition, in describing implementations of the present disclosure, if it is determined that a detailed description of a related known configuration or function interferes with understanding of the implementations of the present disclosure, the detailed description thereof will be omitted.

[0142] FIG. 1A is a front view showing an example of a refrigerator, FIG. 1B is a view showing a state in which one door of the refrigerator is separated, FIG. 2A is a perspective view viewed from a front of an example of a first refrigerating space door, and FIG. 2B is a perspective view viewed from a rear of the first refrigerating space door.

[0143] FIG. 3A is a view showing an example state in which a basket and a filter are separated from the first refrigerating space door, and FIG. 3B is a view showing an example state in which an ice-making space door and a cover member are separated from the first refrigerating space door.

[0144] Referring to FIGS. 1A to 3B, a refrigerator 1 may include a cabinet 10. The cabinet 10 may include a storage space. The refrigerator 1 may further include a door opening and closing the storage space. The door may be rotatably or movably connected to the cabinet 10.

[0145] The storage space may include a refrigerating space 18. The storage space may selectively or additionally include a freezing space 19. For example, FIG. 1B illustrates that the storage space includes the refrigerating space 18 and the freezing space 19. The refrigerating space 18 and the freezing space 19 may be partitioned by a partition wall.

[0146] The door may include refrigerating space doors 20 and 30 opening and closing the refrigerating space 18. The refrigerating space 18 may be opened and closed by one or more refrigerating space doors 20 and 30. The door may include a freezing space door 50 opening and closing the freezing space 19. The freezing space 19 may be opened and closed by one or more freezing space doors 50.

[0147] Hereinafter, an example in which the refrigerating space 18 is opened and closed by a first refrigerating space door 20 and a second refrigerating space door 30 will be described.

[0148] At least one of the first refrigerating space door 20 and the second refrigerating space door 30 may include a dispenser 40 for discharging water and/or ice. In some examples, depending on a type of refrigerator, it is also possible that the freezing space door 50 includes the dispenser 40.

[0149] At least one of the first refrigerating space door 20 and the second refrigerating space door 30 may include one or more ice makers 100.

[0150] Hereinafter, an example in which the ice maker 100 is provided in the first refrigerating space door 20 will be described. In some examples, it is also possible that an ice maker is provided in the second refrigerating space door 30 or the freezing space door 50. In this case, the dispenser 40 and the ice maker may be provided in the same door. Alternatively, an additional ice maker may also be provided in the refrigerating space 18 or the freezing space 19.

[0151] FIG. 1B illustratively shows that the refrigerator 1 is a bottom freezer type refrigerator, but unlike this, it is noted that the idea of the present disclosure may be equally applied to a side-by-side type refrigerator or a top-mount type refrigerator. In the case of the side-by-side type or the top-mount type refrigerator, a freezing space door may include an ice maker and a dispenser, or a refrigerating space door may include an ice maker and a dispenser.

[0152] The dispenser 40 may be located on a front surface of the first refrigerating space door 20. A part of

the dispenser 40 is recessed rearward to provide a space in which a container may be located.

[0153] The dispenser 40 may discharge ice generated by the ice maker 100. At least a part of the ice maker 100 may be positioned higher than the dispenser 40.

[0154] The first refrigerating space door 20 may include an outer case 21. The outer case 21 may form a front appearance. The first refrigerating space door 20 may include a door liner 70. The door liner 70 may be directly or indirectly connected to the outer case 21. The door liner 70 may open and close the refrigerating space 18.

[0155] In a state in which the outer case 21 and the door liner 70 are connected, an insulating space may be formed between the outer case 21 and the door liner 70. An insulating material may be provided in the insulating space. The insulating material may be formed by curing a foaming liquid injected from the outside. Alternatively, a vacuum insulating body may be provided in the insulating space. It is also possible that the insulating material and the vacuum insulating body are provided together in the insulating space.

[0156] The refrigerator 1 may include an ice-making space 25 providing a space in which ice is generated. The ice-making space 25 may, for example, be provided in the first refrigerating space door 20. The ice maker 100 may be located in the ice-making space 25. For example, the door liner 70 may form the ice-making space 25. The ice-making space 25 may be formed as one surface of the door liner 70 is recessed toward the outer case 21.

[0157] The first refrigerating space door 20 may further include an ice bin 500 in which ice generated by the ice maker 100 is stored. The ice stored in the ice bin 500 may be discharged to the dispenser 40. The ice bin 500 may be accommodated in the ice-making space 25 together with the ice maker 100. The ice bin 500 may be located below the ice maker 100.

[0158] For example, cold air generated by a cooler may be supplied to the ice-making space 25. That is, the cooler may be configured to supply cold air to the ice-making space 25. Alternatively, the cooler may be configured to operate to supply cold air to the ice-making space 25. In this manner, the ice-making space 25 may be cooled by an indirect cooling method using cold air. In some implementations, the ice-making space 25 may be cooled by a direct cooling method, e.g., using a refrigerant pipe. In some examples, an ice-making body may be disposed in the ice-making space 25 and configured to receive water, where the ice-making body can be cooled directly or indirectly by a cooling medium such as refrigerant or cooled air. For instance, the cooling medium may be configured to contact the ice-making body and to transfer heat from the ice-making body to thereby freeze water received in the ice-making body into ice.

[0159] The cooler may be configured to cool the ice-making space 25 by including at least one of a refrigerant cycle and a thermoelectric element. For example, cold air for cooling of the freezing space 19 may be supplied to the ice-making space 25.

[0160] The refrigerator 1 may further include a supply flow path 16 guiding cold air of the freezing space 19 or cold air of a space in which an evaporator generating cold air for cooling of the freezing space 19 is located, to the first refrigerating space door 20. The refrigerator 1 may include a discharge flow path 17 guiding cold air discharged from the first refrigerating space door 20 to the freezing space 19 or the space in which the evaporator is located. The supply flow path 16 and the discharge flow path 17 may be provided in the cabinet 10. Cold air circulating through the supply flow path 16 and the discharge flow path 17 may flow by a fan, for example, disposed in the freezing space 19 or the space in which the evaporator is located.

[0161] A first opening 16a forming an end portion of the supply flow path 16 may be formed in an inner wall of the refrigerating space 18. Cold air of the supply flow path 16 may be discharged from the supply flow path 16 through the first opening 16a. A second opening 17a forming an end portion of the discharge flow path 17 may be formed in the inner wall of the refrigerating space 18. Cold air of the supply flow path 16 may flow into the discharge flow path 17 through the second opening 17a. The first opening 16a and the second opening 17a may be formed in one inner wall among a plurality of inner walls of the refrigerating space 18.

[0162] The first refrigerating space door 20 may include a cold-air inlet 75. When the first refrigerating space door 20 is closed, the cold-air inlet 75 may communicate with the supply flow path 16 through the first opening 16a. The first refrigerating space door 20 may include a cold-air outlet 76. When the first refrigerating space door 20 is closed, the cold-air outlet 76 may communicate with the discharge flow path 17 through the second opening 17a.

[0163] The cold-air inlet 75 may be formed on one side surface of the door liner 70. Although not limited, the one side surface of the door liner 70 is a surface facing an inner wall of the refrigerating space 18 in which the supply flow path 16 is located when the first refrigerating space door 20 is closed. The cold-air outlet 76 may be formed on the one side surface of the door liner 70. Although not limited, the one side surface of the door liner 70 is a surface facing an inner wall of the refrigerating space 18 in which the discharge flow path 17 is located when the first refrigerating space door 20 is closed.

[0164] The one side surface of the door liner 70 may include a first side surface portion 72 and a second side surface portion 74 having different widths in a front-rear direction. A width in the front-rear direction of the second side surface portion 74 may be formed greater than a width of the first side surface portion 72. At least one of the cold-air inlet 75 and the cold-air outlet 76 may be formed in the second side surface portion 74 of the door liner 70. The second side surface portion 74 may protrude further toward the refrigerating space 18 than the first side surface portion 72.

[0165] The first refrigerating space door 20 may in-

clude an ice-making space door 60 opening and closing the ice-making space 25. The ice-making space door 60 may be an insulating door in which an insulating material is provided inside. The ice-making space door 60 may be rotatably connected to the first refrigerating space door 20 by a hinge.

[0166] A first basket 62 capable of storing food may be provided in the ice-making space door 60. It is possible that a second basket 65 is provided in the first refrigerating space door 20. For example, the second basket 65 may be located below the first basket 62. A length in the front-rear direction of the second basket 65 may be shorter than a length in the front-rear direction of the first basket 62. The second basket 65 may overlap the dispenser 40 in the front-rear direction.

[0167] A component space 63 accommodating components may be formed in the first refrigerating space door 20. In the component space 63, at least one of a valve 68 adjusting flow of water, a filter, and a water tank 69 storing water may be accommodated. The component space 63 may be formed by the door liner 70. Alternatively, the component space 63 may be formed by a separate wall connected to the door liner 70. The first refrigerating space door 20 may include a cover member 64 covering the component space 63. A holder 67 to which the filter is coupled may be provided in the component space 63.

[0168] The cover member 64 may include an opening 64a. Through the opening 64a, the filter may be coupled to the holder 67. The second basket 65 may cover the opening 64a. When the second basket 65 is separated, the opening 64a may be exposed. The holder 67 may be exposed through the opening 64a.

[0169] FIG. 4 is a perspective view showing an example state of an ice maker disposed inside an ice-making space in a state in which an ice-making space door is separated from a first refrigerating space door, and FIG. 5 is a view showing an example configuration of an ice maker and a cold-air circulation duct to the ice maker.

[0170] Referring to FIGS. 4 and 5, a refrigerating space door 20 may include an ice-making space 25 accommodating an ice maker 100. The refrigerating space door 20 may include a plurality of walls 80 defining the ice-making space 25.

[0171] The plurality of walls may constitute at least a part of the door liner 70.

[0172] The plurality of walls may include a lower wall 80a defining a lower portion of the ice-making space 25, an upper wall 80b defining an upper portion of the ice-making space 25, and two side walls 81 defining both side portions of the ice-making space 25. The plurality of walls may further include a front wall 80c defining a front surface of the ice-making space 25.

[0173] The lower wall 80a may include a take-out portion 84 for taking out ice stored in the ice bin 500 to the dispenser 40.

[0174] The ice maker 100 may be located between the upper wall 80b and the ice bin 500. For example, the ice maker 100 may be disposed adjacent to the upper wall 80b.

[0175] A first duct 90 connected to the cold-air inlet 75 to supply cold air to the ice-making space 25 may be provided in the side wall 81. For example, the first duct 90 is embedded in the side wall 81 and may not be exposed to the ice-making space 25. The first duct 90 may extend upward from the cold-air inlet 75 to an upper portion of the refrigerating space door 20 in which the ice maker 100 is located. The first duct 90 can be referred to as a door duct.

[0176] The first duct 90 includes a duct discharge portion 91 discharging cold air, and cold air discharged from the duct discharge portion 91 may flow into a cold-air duct 400 of the ice maker 100.

[0177] A supply portion 82 guiding cold air to the cold-air duct 400 may be formed in the side wall 81. The duct discharge portion 91 is connected to the supply portion 82, and the cold-air duct 400 may be connected to the duct discharge portion 91 through the supply portion 82.

[0178] A return portion 83 for sending cold air of the ice-making space 25 to the cold-air outlet 76 may be formed in the side wall 81. For example, the return portion 83 may be formed at a height at which the ice bin 500 is located.

[0179] A second duct 95 may be connected to the return portion 83. The second duct 95 may include a duct inlet portion 96 introducing cold air discharged through the return portion 83. The duct inlet portion 96 may be directly or indirectly connected to the return portion 83. For example, the second duct 95 is embedded in the side wall 81 and may not be exposed to the ice-making space 25. The second duct 95 extends downward from the return portion 83 to a lower portion of the refrigerating space door 20, and may be connected to the cold-air outlet 76.

[0180] The ice maker 100 may include an ice-making part 200 performing an operation of receiving water, cooling the water in a tray assembly 240, and de-icing cooled ice.

[0181] The ice maker 100 may include a compression part 300 configured to transfer ice de-iced from the tray assembly 240 and recombine or compress transferred ice to manufacture ice in the third state. The ice in the third state may be ice having a predetermined thickness. The ice in the third state may have, for example, a cylindrical or polygonal column shape corresponding to an inner surface shape of a cylinder 360 or a discharge pipe 370 to be described later.

[0182] The ice maker 100 may include a cold-air duct 400 supplying cold air to the ice-making part 200. The cold-air duct 400 may be understood as being disposed between the side wall 81 and the tray assembly 240 to be described later.

[0183] Hereinafter, a detailed configuration of the ice maker 100 will be described with reference to drawings.

[0184] FIG. 6 is a front perspective view showing an example configuration of an ice maker and an ice-making space bracket, FIG. 7 is a rear perspective view showing an example configuration of the ice maker and the ice-

making space bracket, and FIG. 8 is an exploded perspective view showing an example configuration of the ice maker and the ice-making space bracket.

[0185] Referring to FIGS. 6 to 8, an ice maker 100 may be installed in the ice-making space 25 of the refrigerating space door 20. The refrigerating space door 20 may include an ice-making space plate 85 forming at least a part of the wall 80 of the ice-making space 25. The ice-making space plate 85 may include the lower wall 80a and the front wall 80c.

[0186] The ice maker 100 may be supported by the front wall 80c of the ice-making space 25. The ice maker 100 may be coupled to the front wall 80c by a wall coupling portion 329. A plurality of wall coupling portions 329 may be provided on both sides of the ice maker 100. For example, the wall coupling portion 329 may be understood as a fastening device provided in the compression part 300.

[0187] The ice maker 100 is supported on an upper portion of the front wall 80c, and the ice bin 500 may be located below the ice maker 100. The refrigerating space door 20 may include a take-out motor to provide driving force to discharge ice stored in the ice bin 500 to the dispenser 40.

[0188] The wall 80 of the ice-making space 25 may include a motor accommodating portion 86 surrounding the take-out motor. The take-out motor is connected to a gear assembly located in front of the front wall 80c, and when the gear assembly operates by driving of the take-out motor, an auger of the ice bin 500 operates so that ice may be taken out. The front wall 80c may include a through portion 87 through which a shaft connecting the gear assembly and the ice bin 500 passes. Ice discharged from the ice bin 500 may be discharged to the dispenser 40 through the take-out portion 84 of the lower wall 80a.

[0189] The ice maker 100 may include an ice-making part 200 including a first motor 210. The first motor 210 may be named an "ice-making motor" providing driving force to move a tray assembly 240 (see FIG. 9) in order to move the tray assembly 240.

[0190] The ice-making part 200 may include ice-making brackets 220 and 230 forming a cold-air flow path. A cold-air duct 400 is connected to one side of the ice-making brackets 220 and 230, and cold air supplied through the cold-air duct 400 may flow through a cold-air flow path formed inside the ice-making brackets 220 and 230. The cold-air duct 400 may be defined as a "first cold-air duct", and the ice-making brackets 220 and 230 may also be defined as a "second cold-air duct".

[0191] The first motor 210 may be connected to the ice-making brackets 220 and 230.

[0192] The ice-making brackets 220 and 230 may include a first bracket 220 forming an accommodating space of the tray assembly 240. The cold-air duct 400 is connected to the first bracket 220, and cold air supplied through the cold-air duct 400 may flow into the accommodating space. The cold-air duct 400 may include an inlet portion 420 connected to the supply portion 82 of the side wall 81.

[0193] The ice-making brackets 220 and 230 may include a second bracket 230 connected to the first bracket 220 and forming a cold-air flow path together with the first bracket 220. For example, one side portion of the first bracket 220 is opened, and the opened one side portion may be covered by the second bracket 230 so that a cold-air flow path may be formed therein.

[0194] The second bracket 230 may form an accommodating space in which a gear assembly 235 and 236 (see FIG. 9) interworking by driving of the first motor 210 is accommodated.

[0195] The first bracket 220 and the second bracket 230 may be connected in a front-rear direction. The first motor 210 is connected to one side of the second bracket 230, and the gear assembly 235 and 236 may interwork by driving of the first motor 210. For example, the first motor 210 and the second bracket 230 may be disposed in the front-rear direction.

[0196] The ice-making space plate 85 may include a support wall 85a for supporting the ice-making part 200. The support wall 85a constitutes an upper portion of the ice-making space plate 85, and the ice-making part 200 may be supported on an upper portion of the ice-making space plate 85 through the support wall 85a.

[0197] The ice-making brackets 220 and 230 may include a plate coupling portion 229 supported by the ice-making space plate 85. For example, the plate coupling portion 229 is provided in the first bracket 220 and may be coupled to a coupling hole 88 formed in the support wall 85a.

[0198] For example, the plate coupling portion 229 may include a rib protruding from the first bracket 220. In some examples, the plate coupling portion 229 provided in the ice-making brackets 220 and 230 may be provided in various forms, for example, a boss or a fastening hole to which a fastening member is coupled. Correspondingly, the coupling hole 88 of the ice-making space plate 85 may also be provided in a form of a rib or a boss.

[0199] A plurality of plate coupling portions 229 may be provided at a plurality of points of the ice-making brackets 220 and 230.

[0200] The ice-making part 200 may include a reservoir 250 storing water. The reservoir 250 may supply water to the tray assembly 240.

[0201] The first bracket 220 may include a communication portion 221b guiding a water supply pipe 120 (see FIG. 11A) to supply water to the reservoir 250. The communication portion 221b may be formed on a surface of the first bracket 220 facing the front wall 80c.

[0202] For example, the water supply pipe 120 is inserted into the communication portion 221b, and at least a part of the water supply pipe 120 may extend into the ice-making brackets 220 and 230.

[0203] The ice maker 100 may include a compression part 300 including a second motor 310. The second motor

310 may be named a "compression motor" providing driving force to move a piston 335 (see FIG. 12) for compressing or recombining ice.

[0204] The compression part 300 may include a first bracket 320 connected to the second motor 310. The first bracket 320 may support parts constituting the compression part 300.

[0205] The compression part 300 may include a discharge port 328 for discharging ice manufactured in the ice maker 100 to the ice bin 500. For example, the discharge port 328 is formed on a lower surface of the first bracket 320, and ice discharged through the discharge port 328 may fall into the ice bin 500.

[0206] The compression part 300 may include a cylinder 360 defining a movement space of ice (powdered ice) generated in the ice-making part 200. Ice introduced into the cylinder 360 may be compressed or recombined by a reciprocating piston 335 into molded ice having a predetermined volume.

[0207] The compression part 300 may include a transfer pipe 340 provided at an inlet side of the cylinder 360 and configured to transfer ice (powdered ice) discharged from the ice-making part 200 to the cylinder 360. A space for accommodating the powdered ice is formed inside the transfer pipe 340, and the powdered ice may move into the cylinder 360. In some examples, the compression part 300 includes a transfer passage or duct, and the transfer pipe 340 is an example of the transfer passage or duct.

[0208] The ice described herein may include frozen ice fragments or powder produced by mechanically separating a frozen ice body from the ice-making body and subsequently compressing the fragments or powder into a shaped ice piece. The ice fragments or powdered ice may have a water content and density suitable for the subsequent ice compressing or shaping operations described herein.

[0209] The compression part 300 may include a discharge pipe 370 provided at an outlet side of the cylinder 360 and providing a predetermined resistance so that ice present in the cylinder 360 is compressed or recombined.

[0210] For example, to provide the resistance, the discharge pipe 370 may be formed such that a cross-sectional area decreases based on a direction in which ice moves.

[0211] The discharge pipe 370 may be made of an elastically deformable material, for example, a silicone material, to provide the resistance.

[0212] An outlet of the discharge pipe 370 is opened, and molded ice compressed or recombined while passing through the discharge pipe 370 may be discharged through the opened outlet of the discharge pipe 370.

[0213] The compression part 300 may include a cutter wall 380 disposed at a position spaced apart from the outlet of the discharge pipe 370 by a predetermined distance and interfering with molded ice discharged through the discharge pipe 370. The cutter wall 380 is supported by the first bracket 320 and may be disposed adjacent to an upper side of the discharge port 328.

[0214] The cutter wall 380 includes an inclined surface facing the discharge pipe 370, and molded ice discharged from the discharge pipe 370 may be cut while interfering with the inclined surface. Then, the cut ice may fall into the ice bin 500 through the discharge port 328.

[0215] FIG. 9 is an exploded perspective view showing an example configuration of an ice-making part of an ice maker, FIG. 10 is an exploded perspective view showing an example configuration of a tray assembly and a reservoir, FIG. 11A is a view showing an example state when a tray assembly is at a first position, and FIG. 11B is a view showing an example state when the tray assembly is at a second position.

[0216] In some examples, referring to FIGS. 9 and 10, the ice-making part 200 may include a tray assembly 240 forming an ice-making space.

[0217] The tray assembly 240 may include a tray 241 receiving water to perform ice-making. The tray 241 may be provided to be movable by receiving power from the first motor 210. For example, the tray 241 may be provided to be rotatable.

[0218] The tray 241 may include peripheral surfaces 242a and 242b forming a water storage space. The peripheral surfaces 242a and 242b may be understood as including a cell for ice generation.

[0219] For example, the tray 241 may have a drum shape having a peripheral surface. The peripheral surface may form an outer circumferential surface of the drum. That is, the peripheral surfaces 242a and 242b may be understood as extending in a circumferential direction to form the outer circumferential surface of the tray 241.

[0220] In another aspect, the tray 241 may have a disk shape or a plate shape including both side walls and a peripheral surface. In some examples, the tray 241 may be referred to as an ice-making body or a rotating body having a disk shape, a plate shape, a fan shape, an arc shape, a cylindrical shape, etc.

[0221] The peripheral surfaces 242a and 242b may include a first peripheral surface 242a forming a water storage space. The first peripheral surface 242a may form at least a part of the outer circumferential surface of the tray 241. When the first peripheral surface 242a is at a position facing the reservoir 250, the first peripheral surface 242a may include a surface contacting water stored in the reservoir 250. In some examples, the first peripheral surface 242a may be referred to as a circumferential portion or a peripheral portion of the ice-making body (e.g., tray 241) configured to receiver water.

[0222] The first peripheral surface 242a may be disposed adjacent to the first blade 280 so that ice generated on the first peripheral surface 242a contacts the first blade 280.

[0223] The first peripheral surface 242a may include at least one of a first part defining a recessed portion and a second part defining a protruding portion so as to increase a contact area of water cooling area. The first

part may include a recess 241a, and the second part may include a protrusion 241b.

[0224] When a recessed portion of the first peripheral surface 242a is viewed as a reference position, it may be understood that the first peripheral surface 242a includes the protrusion 241b, and when a protruding portion of the first peripheral surface 242a is viewed as a reference position, it may be understood that the first peripheral surface 242a includes the recess 241a.

[0225] Due to configurations of the recess 241a and the protrusion 241b, the first peripheral surface 242a may be understood as including an uneven structure.

[0226] A plurality of recesses 241a and a plurality of protrusions 241b may each be provided. The plurality of recesses 241a (see FIG. 16) and the plurality of protrusions 241b (see FIG. 16) may have a structure in which they are alternately arranged. The recesses 241a may be recessed relative to the protrusions 241b. In some examples, the recesses 241a are defined at the peripheral surfaces 242a such that the protrusions 241b are formed between the recesses 241a. In some examples, the protrusions 241b are disposed at the peripheral surfaces 242a such that the recesses 241a are formed between the protrusions 241b.

[0227] The peripheral surfaces 242a and 242b may include a second peripheral surface 242b. When the second peripheral surface 242b is at a position facing the reservoir 250, the second peripheral surface 242b may include a surface that does not contact water stored in the reservoir 250.

[0228] The second peripheral surface 242b may be disposed relatively far away from the first blade 280 so that ice generated on the second peripheral surface 242b does not contact the first blade 280.

[0229] A center distance from a center of the tray 241 to the second peripheral surface 242b, that is, a radius distance of the second peripheral surface 242b, may be formed less than a distance center distance from the center of the tray 241 to the first peripheral surface 242a, that is, a radius distance of the first peripheral surface 242a. For example, the second peripheral surface 242b may have a shape cut from an edge of the first peripheral surface 242a in a direction toward the center of the tray 241.

[0230] When the first peripheral surface 242a is at a position to be frozen by contacting cold air, the second peripheral surface 242b is disposed to face the reservoir 250. At this time, since the second peripheral surface 242b does not contact water of the reservoir 250, the reservoir 250 may not be cooled by the tray 241 forming a low temperature. Accordingly, freezing of water stored in the reservoir 250 may be prevented.

[0231] At least one first peripheral surface 242a may be provided. For example, a plurality of first peripheral surfaces 242a are provided, and the second peripheral surface 242b may be disposed between the plurality of first peripheral surfaces 242a based on the circumferential direction of the tray 241.

[0232] At least one second peripheral surface 242b may be provided. For example, a plurality of second peripheral surfaces 242b are provided, and the first peripheral surface 242a may be disposed between the plurality of second peripheral surfaces 242b based on the circumferential direction of the tray 241.

[0233] The tray 241 may include side walls 244 also referred to as side surfaces. The side wall 244 may include a portion extending in a radial direction of the tray 241.

[0234] A plurality of side walls 244, for example, two side walls 244, may be provided to form both side surfaces of the tray 241. The two side walls 244 may be disposed spaced apart in an axial direction of the first motor 210. The peripheral surfaces 242a and 242b may be formed between the two side walls 244.

[0235] The tray 241 may include an inner circumferential wall 244a connected to the side wall 244. The inner circumferential wall 244a is understood to form an inner circumferential surface of the tray 241, and may include a surface opposite to the peripheral surfaces 242a and 242b with respect to the side wall 244.

[0236] A bar 249 is coupled to the tray 241 as a "central shaft" of the tray 241. The bar 249 may have a non-circular shape.

[0237] The bar 249 may be disposed to pass through a central portion or a rotational center portion of the tray 241. The central portion of the tray 241 includes a central bracket 243, and the central bracket 243 may have a shape surrounding at least a part of the bar 249.

[0238] The bar 249 is coupled to gear assemblies 235 and 236, and may rotate in interworking with the gear assemblies 235 and 236. For example, the bar 249 may be integrally formed with the gear assemblies 235 and 236, or may be provided to be separable.

[0239] Another example is proposed. The bar 249 is removed, and a central shaft protruding from the gear assemblies 235 and 236 may be directly coupled to the central bracket 243 of the tray 241.

[0240] The tray 241 may include extension walls 243a extending from the central bracket 243 toward the side walls 244. The extension wall 243a may, for example, extend in a radial direction from the central bracket 243.

[0241] A plurality of extension walls 243a are provided, and the plurality of extension walls 243a may be disposed spaced apart from each other in a circumferential direction.

[0242] Directions will be defined. Throughout the specification, an "axial direction" means a direction in which a shaft of the first motor 210 or the second motor 310 extends, and a "radial direction" means a direction of a radius crossing the axial direction.

[0243] The tray 241 may form tray holes 245 (tray openings). The tray hole 245 may be understood as a hole penetrating in the axial direction of the tray 241. Through the tray hole 245, cold air flows so that a cooling area of the tray 241 may increase.

[0244] The tray hole 245 may be understood as a

space defined by the central bracket 243, the plurality of extension walls 243a, and the inner circumferential wall 244a. A plurality of tray holes 245 are formed, and the plurality of tray holes 245 may be disposed in a circumferential direction of the tray 241.

[0245] The tray assembly 240 may include tray covers 246 and 247 connected to the tray 241. The tray covers 246 and 247 may be provided on both side walls 244 of the tray 241.

[0246] The tray covers 246 and 247 are disposed to cover at least one side of the tray 241 and may function to prevent water of the reservoir 250 from flowing into the tray holes 245 of the tray 241.

[0247] The tray covers 246 and 247 may be made of a material having low thermal conductivity so that generation of ice is limited. For example, the material having low thermal conductivity may include a non-metal material. A plastic material may be proposed as an example of the non-metal material.

[0248] The tray cover 246 and 247 may include a first tray cover 246 provided on one side wall 244 of the tray 241. The first tray cover 246 may include a first cover wall 246a covering the one side wall 244 of the tray 241. A radial length or width of the first cover wall 246a may be formed greater than a radial length or width of the side wall 244 of the tray 241 so as to prevent water from flowing into the tray hole 245 of the tray 241.

[0249] The first tray cover 246 may include a first through hole 246b through which the central bracket 243 of the tray 241 passes. The first through hole 246b may be axially aligned with the central bracket 243 of the tray 241.

[0250] The first tray cover 246 may include a first extension wall 246c extending from the first through hole 246b toward the first cover wall 246a. The first extension wall 246c may extend in a radial direction to cover the extension walls 243a of the tray 241. The first extension wall 246c may be provided in a plurality corresponding to the extension walls 243a.

[0251] The first tray cover 246 may include a first inner circumferential wall 246d connected to the first cover wall 246a. The first inner circumferential wall 246d may be understood to form an inner circumferential surface of the first tray cover 246.

[0252] The first tray cover 246 may include a first cover fastening portion 246e protruding from the first inner circumferential wall 246d. The first cover fastening portion 246e may include a boss, and a predetermined fastening member may pass through the boss and be fastened to a second cover fastening portion 247e of the second tray cover 247. In some examples, the shape of the first cover fastening portion 246e is not limited thereto, and as long as it may be coupled to the second cover fastening portion 247e, it may also be provided in a shape of a rib or a locking protrusion.

[0253] The first tray cover 246 may include a first communication portion 246f communicating with the tray hole 245 of the tray 241. Cold air may pass through the tray hole 245 via the first communication portion 246f.

[0254] The tray covers 246 and 247 may include a second tray cover 247 provided on the other side wall 244 of the tray 241. The second tray cover 247 may include a second cover wall 247a covering the other side wall 244 of the tray 241. A radial length or width of the second cover wall 247a may be formed greater than a radial length or width of the side wall 244 of the tray 241 so as to prevent water from flowing into the tray hole 245 of the tray 241.

[0255] A configuration of the second tray cover 247 is substantially similar to a configuration of the first tray cover 246. The second tray cover 247 may include a second through hole 247b corresponding to the first through hole 246b of the first tray cover 246.

[0256] The second tray cover 247 may include a second extension wall 247c corresponding to the first extension wall 246c of the first tray cover 246.

[0257] The second tray cover 247 may include a second inner circumferential wall 247d corresponding to the first inner circumferential wall 246d of the first tray cover 246.

[0258] The second tray cover 247 may include a second cover fastening portion 247e corresponding to the first cover fastening portion 246e of the first tray cover 246.

[0259] The second tray cover 247 may include a second communication portion 247f communicating with the tray hole 245 (tray opening) of the tray 241. Cold air may pass through the second communication portion 247f via the first communication portion 246f and the tray hole 245.

[0260] In another aspect, the first tray cover 246 and the second tray cover 247 may be understood as one component of a "tray" in a broad sense. In this case, the tray assembly 240 may be referred to as a "tray", the tray 241 may be referred to as a "tray part", and the first and second tray covers 246 and 247 may constitute a part of the tray assembly 240.

[0261] In some implementations, the first and second tray covers 246 and 247 are not provided, and the tray assembly 240 may be configured to include only the tray 241.

[0262] The ice-making part 200 may include the first bracket 220 forming a first accommodating space 220a for the tray assembly 240.

[0263] The first bracket 220 may include a first wall 221 supported by the ice-making space plate 85. The first wall 221 may be understood as a wall shielding at least a portion of one side surface of the tray assembly 240.

[0264] In another aspect, the first wall 221 may be disposed to support the tray 241. The first wall 221 may include an insertion hole 221a into which at least a portion of the tray 241 is inserted to support the tray 241. For example, the central bracket 243 of the tray 241 may be rotatably inserted into the insertion hole 221a.

[0265] The first wall 221 may include communication portion 221b guiding the water supply pipe 120. The

water supply pipe 120 is inserted into the communication portion 221b, and at least a part of the water supply pipe 120 may be located in the first accommodating space 220a.

[0266] The first wall 221 may form at least a portion of a wall guiding flow of cold air introduced through the cold-air duct 400.

[0267] The ice-making part 200 may include a second wall 222 connected to the first wall 221. The second wall 222 is connected to an end portion of the first wall 221, for example, an upper end portion, and may protrude in a direction toward the first motor 210. The second wall 222 may form an upper end portion of the ice-making part 200.

[0268] The ice-making part 200 may include a third wall 223 connected to the first wall 221. The third wall 223 is connected to an end portion of the first wall 221, for example, a lower end portion, and may protrude in a direction toward the first motor 210. The third wall 223 may form a lower end portion of the ice-making part 200.

[0269] The ice-making part 200 may include a fourth wall 224 and a fifth wall 225 connected to the third wall 223. The fourth wall 224 is connected to one side of the third wall 223, and the fifth wall 225 may be connected to the other side of the third wall 223. For example, the fourth wall 224 and the fifth wall 225 may protrude at both ends of the third wall 223. In some examples, any one of the first to fifth walls that contacts the reservoir may be referred to as a supporting wall. For example, the third wall 223 may be a supporting wall that supports a bottom of the reservoir 250, and the fourth wall 224 and the fifth wall 225 may be extending walls protruding from the supporting wall .

[0270] The ice-making part 200 may include a second accommodating space 220b in which the reservoir 250 is placed. The second accommodating space 220b may be understood as a space defined by the third wall 223, the fourth wall 224, and the fifth wall 225. The second accommodating space 220b may be formed below the first accommodating space 220a.

[0271] The reservoir 250 may include a case having a predetermined capacity, and a heater 255 provided in a wall of the case and providing heat so that water stored in the reservoir 250 is not frozen. The heater 255 may be named a "reservoir heater".

[0272] The ice-making part 200 may include a water supply guide wall 224a guiding water supplied from the water supply pipe 120 to the reservoir 250. The water supply guide wall 224a may form at least a portion of the fourth wall 224.

[0273] The water supply guide wall 224a may be located adjacent to a discharge portion of the water supply pipe 120, and may include an inclined surface guiding a flow of water discharged from the water supply pipe 120. The inclined surface of the water supply guide wall 224a may extend to be inclined with respect to a direction from the communication portion 221b toward the reservoir 250.

[0274] Water discharged from the water supply pipe 120 falls onto the inclined surface, and the fallen water flows downward at a low speed along the inclined surface and may flow into the reservoir 250.

[0275] The ice-making part 200 may include a first blade 280 contacting ice made to separate ice made in the tray 241. The first blade 280 may be located adjacent to a rotation path of the tray 241. In particular, the first blade 280 may be located adjacent to the first peripheral surface 242a when the tray 241 rotates.

[0276] The first blade 280 may be provided in the fifth wall 225. For example, the reservoir 250 is disposed on an inner surface of the fifth wall 225, and the first blade 280 may be coupled to a surface of the fifth wall 225.

[0277] The ice-making part 200 may include a second blade 285 contacting frozen ice to separate frozen ice from the tray assembly 240.

[0278] The second blade 285 may be located adjacent to both side walls of the tray assembly 240 so as to scrape frozen ice on both side walls, that is, the first cover wall 246a and the second cover wall 247a.

[0279] A plurality of second blades 285 may be provided, and one second blade 285 may be provided in the first wall 221. Another second blade 285 may be provided in an outer wall of the second bracket 230, for example, an outer wall of the gear bracket 231.

[0280] The first blade 280 and the second blade 285 may be disposed at positions spaced apart from each other, for example, disposed opposite to each other based on a center of the tray assembly 240. With this configuration, it may be possible to prevent a cold-air flow path formed in the ice-making part 200 from being interfered with by the first and second blades 280 and 285.

[0281] In detail, cold air introduced through the cold-air duct 400 flows from an area in which the second blade 285 is located to an opposite area in which the first blade 280 is located based on the center of the tray assembly 240. If the first and second blades 280 and 285 are disposed in one side area based on the center of the tray assembly 240, there is a problem in that these blades act as flow-path resistance. In some implementations, by disposing the first and second blades 280 and 285 on both sides of the tray assembly 240, an effect of reducing resistance of cold-air flow may appear.

[0282] While the tray assembly 240 rotates, frozen ice contacting the second blade 285 is separated from the tray assembly 240, and the separated ice may flow into the reservoir 250.

[0283] So that ice separated by the second blade 285 may flow into the reservoir 250, the second blade 285 may be disposed at a position adjacent to the reservoir 250. For example, based on a height direction with respect to a ground supporting the refrigerator, the reservoir 250 is disposed below the tray assembly 240 and the second blade 285 may be disposed at a position lower than a center of the tray assembly 240.

[0284] In another aspect, the second blade 285 may be disposed at a position overlapped in an up-down direc-

tion with respect to an opened upper end of the reservoir 250. The opened upper end of the reservoir 250 may be understood as an end portion into which water flows.

[0285] A cold-air flow path through which cold air introduced from the cold-air duct 400 flows may be formed inside the first bracket 220. At least a portion of the cold-air flow path may be formed in the first accommodating space 220a.

[0286] The first bracket 220 may include a first opening 224b to which the cold-air duct 400 is coupled and which forms a cold-air inlet portion. The first opening 224b may be formed in a fourth wall 224 also referred to as a side wall of the first bracket 220. For example, the first opening 224b may be formed on a side on which the water supply guide wall 224a is provided, and may be located above the water supply guide wall 224a.

[0287] The first opening 224b and the reservoir 250 may be located opposite to each other based on the center of the tray 241. For example, the first opening 224b may be formed at a position higher than the center of the tray 241, and the reservoir 250 may be disposed at a position lower than the center of the tray 241. With such a configuration, it may be possible to prevent cold air introduced through the first opening 224b from directly flowing into the reservoir 250.

[0288] The ice-making part 200 may include a guide wall 226 disposed to guide cold air to the peripheral surfaces 242a and 242b of the tray 241. The guide wall 226 is provided in the first wall 221 and may be formed to be rounded corresponding to a curvature of the peripheral surfaces 242a and 242b.

[0289] A first portion of the guide wall 226 may be connected to the first wall 221, and a second portion may be connected to the second wall 222.

[0290] The guide wall 226 and the first opening 224b may be located opposite to each other based on the center of the tray 241. Accordingly, since air supplied to an outer circumferential surface peripheral surface of the tray 241 through the first opening 224b is guided by the guide wall 226 located opposite to the first opening 224b, it may be possible to form cold-air flow path along the outer circumferential surface peripheral surface of the tray 241.

[0291] A space between the guide wall 226 and the first blade 280 forms a second opening 227 (see FIG. 25) through which powdered ice separated from the tray 241 is discharged, and cold air guided by the guide wall 226 may be diffused to the ice-making space 25 through the second opening 227.

[0292] The ice-making part 200 may include gear assemblies 235 and 236 interworking with the first motor 210. The gear assemblies 235 and 236 may include a driving gear 235 connected to the first motor 210 and a driven gear 236 interworking with the driving gear 235.

[0293] The number of gear teeth of the driving gear 235 is formed less than the number of gear teeth of the driven gear 236, so that the gear assemblies 235 and 236 may constitute a reduction gear. Accordingly, torque for rotating the tray assembly 240 may increase.

[0294] The ice-making part 200 may include the second bracket 230 accommodating the gear assemblies 235 and 236. The second bracket 230 may shield an opened one side of the first bracket 220 to form a cold-air flow path within the ice-making bracket 220 and 230.

[0295] The second bracket 230 may include the gear bracket 231 supporting the gear assemblies 235 and 236. The gear bracket 231 includes a bracket wall 231a covering the opened one side of the first bracket 220, and the bracket wall 231a may form at least one surface of the cold-air flow path.

[0296] The gear assemblies 235 and 236 may be rotatably supported by the bracket wall 231a. A hole to which a shaft of the first motor 210 is connected is formed in a first center portion 235a of the driving gear 235, and the shaft of the first motor 210 may be supported by the bracket wall 231a through the hole.

[0297] The bar 249 may be connected to a second center portion 236a of the driven gear 236 through the bracket wall 231a. A hole to which the bar 249 is connected is formed in the second center portion 236a of the driven gear 236, and the bar 249 may be supported by the bracket wall 231a through the hole.

[0298] The first center portion 235a and the second center portion 236a may each include a bracket forming a hole.

[0299] The second bracket 230 may include a gear cover 232 connected to the gear bracket 231. The gear cover 232 may shield an opened one side of the gear bracket 231. The gear bracket 231 and the gear cover 232 may constitute a "gear housing".

[0300] For example, the gear cover 232 may be fastened to the gear bracket 231. The gear bracket 231 may include a first fastening portion 231b fastened to the gear cover 232, and the gear cover 232 may include a second fastening portion 232a fastened to the first fastening portion 231b. A predetermined fastening member may be coupled to the first fastening portion 231b and the second fastening portion 232a.

[0301] The gear bracket 231 may include a first coupling portion 231c fastened to the first bracket 220. The first bracket 220 may include a second coupling portion 222a fastened to the first coupling portion 231c. A predetermined fastening member may be coupled to the first coupling portion 231c and the second coupling portion 222a.

[0302] The gear cover 232 may be coupled to the first motor 210. The first motor 210 includes a fastening rib 215, and the gear cover 232 may include a fastening boss 237 coupled to the fastening rib 215. A predetermined fastening member may pass through the fastening rib 215 and be coupled to the fastening boss 237.

[0303] The gear cover 232 may include a first through portion 232b through which the shaft of the first motor 210 passes. The shaft of the first motor 210 may be coupled to the first center portion 235a of the driving gear 235 through the first through portion 232b. The first center

portion 235a of the driving gear 235 may be rotatably supported by the first through portion 232b.

[0304] The gear cover 232 may include a second through portion 232c by which the second center portion 236a of the driven gear 236 is supported. The second center portion 236a of the driven gear 236 may be rotatably supported by the second through portion 232c.

[0305] When the first motor 210 rotates, the driving gear 235 and the driven gear 236 interwork, and the bar 249 connected to the driven gear 236 may rotate. According to rotation of the bar 249, the tray assembly 240 may rotate.

[0306] The operation of the tray assembly 240 will be described with reference to FIGS. 11a and 11b. FIG. 11A illustrates a state in which the tray assembly 240 is at an ice-making position (a first position), and FIG. 11B illustrates a state in which the tray assembly 240 is at a water-supply position (a second position).

[0307] Referring to FIG. 11A, based on driving of the first motor 210, the tray assembly 240 may be at the ice-making position. At the ice-making position, a first peripheral surface 242a of the tray 241 may not be immersed in the reservoir 250 and may be located in a first accommodation space 220a of the first bracket 220. For example, as illustrated in FIG. 11A, two first peripheral surfaces 242a may be located on both upper sides of the reservoir 250.

[0308] At the ice-making position, water supplied to the first peripheral surface 242a may be cooled by cold air supplied through the cold-air duct 400 and may undergo a phase change into thin ice. A state of ice cooled on the first peripheral surface 242a may be referred to as a first state. The ice in the first state may be formed to a predetermined height on surfaces of a recess 241a and a protrusion 241b provided on the first peripheral surface 242a. The ice in the first state may be understood as ice having a thin layer thickness.

[0309] When a predetermined time elapses at the ice-making position, the first motor 210 may be driven so that the tray assembly 240 rotates. For example, as illustrated in FIG. 11A, the tray assembly 240 may rotate counterclockwise.

[0310] During rotation of the tray assembly 240, when the first peripheral surface 242a is at a position where the first blade 280 is provided, the first blade 280 may contact ice formed on the first peripheral surface 242a. In the contact process, the ice may be separated from the first peripheral surface 242a and may be de-iced.

[0311] The de-iced ice may be introduced into the compression part 300, in particular into the transfer pipe 340. The de-iced ice may have a shape of powdered ice, and such a state of ice may be referred to as a second state.

[0312] The de-icing process may be performed during a section in which the tray 241 makes one rotation (a 360-degree rotation), so that ice formed on the two first peripheral surfaces 242a may be separated by the first blade 280.

[0313] In some examples, in this process, the first peripheral surface 242a on which de-icing has been completed may further rotate and pass the water-supply position as illustrated in FIG. 11B. While passing the water-supply position, water may be supplied to the first peripheral surface 242a.

[0314] In detail, the tray assembly 240 rotates counterclockwise from the position of FIG. 11A, de-icing is performed on the first peripheral surface 242a, and the tray assembly 240 moves to the position of FIG. 11B. At this time, the first peripheral surface 242a is immersed in or contacted with water of the reservoir 250. Water that contacts the first peripheral surface 242a may remain on the first peripheral surface 242a due to surface tension.

[0315] Such a water-supply operation may be performed until water is supplied to the two first peripheral surfaces 242a. That is, when the tray assembly 240 makes one rotation from the position of FIG. 11A, the de-icing operation and the water-supply operation may be performed.

[0316] FIG. 12 is an exploded perspective view illustrating an example configuration of the compression part of the ice maker, FIG. 13 is a perspective view illustrating an example configuration of the transfer pipe and a gear device, FIG. 14 is a plan view illustrating an example configuration of the transfer pipe and the gear device, FIG. 15A is a view illustrating an example state in which the piston is at a first position and de-iced ice from the tray assembly falls into the transfer pipe, and FIG. 15B is a view illustrating a state in which the piston moves to a second position and ice in the transfer pipe is compressed by the piston.

[0317] In some examples, referring to FIGS. 12 to 14, the ice maker 100 may include a compression part 300 for compressing or recombining ice (powdered ice, ice in the second state) de-iced from the ice-making part 200.

[0318] The compression part 300 may include a second motor 310 for providing driving force. The second motor 310 may include a motor shaft 312.

[0319] The compression part 300 may include a pinion gear 315 coupled to the motor shaft 312 and rotating according to driving of the second motor 310. The pinion gear 315 may include a shaft coupling portion 314 coupled to the motor shaft 312.

[0320] The compression part 300 may include a rack gear 330 interworking with the pinion gear 315. The rack gear 330 may include a bar-shaped rack body 331 and a first gear 332 formed on the rack body 331 and interworking with the pinion gear 315.

[0321] The rack gear 330 may include a rail 334 guiding movement of the rack gear 330. For example, the rail 334 may be provided at a lower end portion of the rack body 331. The rail 334 may move along a rail groove 324a provided in a fastening wall 324 of the first bracket 320.

[0322] The compression part 300 may include a piston 335 that moves together with the rack gear 330. The piston 335 may include a portion extending in a direction

corresponding to an extension direction of the rack gear 330, and may be provided to be capable of reciprocating motion. The piston 335 may move only up to an inlet side of the cylinder 360, or at least a portion of the piston 335 may move so as to be inserted into the cylinder 360.

[0323] For example, the piston 335 may have a substantially cylindrical shape corresponding to an internal shape of a second part 342 of the transfer pipe 340.

[0324] The compression part 300 may include a coupling bracket 336 provided at one side of the piston 335 and coupling the piston 335 and the rack gear 330. The coupling bracket 336 may be coupled to the rack body 331. The coupling bracket 336 may include a rack fastening portion 336a, and the rack body 331 may include a bracket fastening portion 331a. A predetermined fastening member may couple the rack fastening portion 336a and the bracket fastening portion 331a.

[0325] The compression part 300 may include a transfer pipe 340 forming an accommodation space 341a for ice in the second state powdered ice. The transfer pipe 340 may be disposed at an inlet side of the cylinder 360.

[0326] The transfer pipe 340 may include a first part 341 having the accommodation space 341a. The first part 341 may form an opening so that the ice in the second state may be introduced.

[0327] The transfer pipe 340 may include a second part 342 having an internal space communicating with the accommodation space 341a. The piston 335 may be inserted into the second part 342.

[0328] The second part 342 may have an inner diameter slightly larger than an outer diameter of the piston 335 so that the piston 335 may reciprocate in an inserted state. For example, the second part 342 may have a hollow cylindrical shape.

[0329] The second part 342 may be positioned below the transfer pipe 340 with respect to a gravity direction. Ice introduced into the first part 341 may move downward by the gravity and may be introduced into the internal space of the second part 342. The piston 335 may reciprocate in the internal space of the second part 342.

[0330] The transfer pipe 340 may be supported by the first bracket 320. The transfer pipe 340 may include a fastening portion 343 provided at the first part 341. The fastening portion 343 may be coupled to a transfer pipe fastening portion 321d of the first bracket 320 by a predetermined fastening member. By fastening the fastening portion 343 and the transfer pipe fastening portion 321d, an upper portion of the transfer pipe 340 may be stably supported by the first bracket 320.

[0331] A plurality of fastening portions 343 may be provided, and the plurality of fastening portions 343 may be provided at upper and lower portions of the transfer pipe 340. In FIG. 13, fastening portions 343a, 343b, and 343c are illustrated.

[0332] The transfer pipe 340 may include a protrusion 344, and the first bracket 320 may include a protrusion groove 321e accommodating the protrusion 344. The protrusion 344 may be provided at a lower position than the fastening portion 343, for example at the second part 342. After the protrusion 344 is inserted into the protrusion groove 321e for temporary assembly, the fastening portion 343 may be fastened to the transfer pipe fastening portion 321d.

[0333] The compression part 300 may include a lever 350 movably provided to guide movement of ice in the transfer pipe 340. For example, the lever 350 may be rotatably provided. The lever 350 may be referred to as a transfer guide device.

[0334] The lever 350 may include a rotation bar 351 forming a rotational center of the lever 350. The rotation bar 351 may be rotatably inserted into a bar support portion 345 of the transfer pipe 340. The bar support portion 345 may protrude from the first part 341 and may have a rib shape having a recessed groove into which the rotation bar 351 is fitted.

[0335] The lever 350 may include a plate 352 extending from the rotation bar 351. The plate 352 may be provided at a central portion of the rotation bar 351. The plate 352 may rotate about the rotation bar 351 so as to move into the transfer pipe 340.

[0336] The transfer pipe 340 may form an opening 341b through which the plate 352 passes. The plate 352 may move into or out of the transfer pipe 340 through the opening 341b.

[0337] The transfer pipe 340 may include a stopper 347 provided outside the opening 341b. The stopper 347 may have a shape bent along at least a portion of a circumference of the plate 352. The stopper 347 may limit a movement distance of the plate 352 when the plate 352 moves outward from the transfer pipe 340. The plate 352 may move outward only to a position interfering with the stopper 347.

[0338] The plate 352 may include a rounded portion 352a extending with a predetermined curvature. A curved direction of the rounded portion 352a may correspond to a direction facing downward inside the transfer pipe 340.

[0339] By the rounded portion 352a, ice present inside the transfer pipe 340 may be pressed downward. Accordingly, ice present in the first part 341 may be moved to the second part 342 by the lever 350.

[0340] A hole 354 may be formed in the rounded portion 352a. The hole 354 is for preventing a situation in which ice introduced into the transfer pipe 340 is blocked by the rounded portion 352a and movement toward a lower portion of the transfer pipe 340 is restricted. Ice may move to a lower side of the rounded portion 352a through the hole 354.

[0341] The compression part 300 may include a spring 358 providing a restoring force to the lever 350. The spring 358 may be provided at one end among both ends of the rotation bar 351. For example, the spring 358 may include a torsion spring.

[0342] The spring 358 may provide a restoring force so that the lever 350 returns to the outside of the transfer pipe 340 when the linkage with the second gear 333 is

released while the lever 350 has moved to the inside of the transfer pipe 340 through linkage with the second gear 333.

[0343] A spring support portion 351a may be provided on the rotation bar 351, and one side of the spring 358 may be supported by the spring support portion 351a.

[0344] The spring support portion 351a may protrude in a direction intersecting an extension direction of the rotation bar 351 at a position adjacent to both ends of the rotation bar 351. The restoring force of the spring 358 may be transmitted to the lever 350 through the spring support portion 351a.

[0345] The compression part 300 may include a third gear 355 transmitting power to the lever 350. The third gear 355 may be connected to the other end of the rotation bar 351. The other end may be understood as an end opposite to the one end at which the spring 358 is provided.

[0346] The third gear 355 may engage with the second gear 333 provided on the rack gear 330. The second gear 333 may be positioned laterally of the first gear 332. The first gear 332 and the second gear 333 may be axially arranged on an upper surface of the rack body 331.

[0347] The first gear 332 may be configured to have gear teeth for a predetermined length in a direction from a first end toward a second end of the rack body 331, that is, toward the cylinder 360. The second gear 333 may be configured to have gear teeth for a predetermined length in a direction from the second end toward the first end of the rack body 331. The number of gear teeth of the second gear 333 may be less than the number of gear teeth of the first gear 332.

[0348] The compression part 300 may include the cylinder 360 disposed at an outlet side of the transfer pipe 340. Ice collected at a lower portion of the transfer pipe 340 may be moved into the cylinder 360 by the piston 335.

[0349] The cylinder 360 may also be understood as constituting a portion of a transfer pipe in a broad sense in that it guides movement of ice. Accordingly, the transfer pipe 340 may be referred to as a first transfer pipe, and the cylinder 360 may be referred to as a second transfer pipe.

[0350] The compression part 300 may include a discharge pipe 370 provided at an outlet side of the cylinder 360 and providing a force for compressing or recombining ice transferred in the cylinder 360. For example, the discharge pipe 370 may be configured so that a cross-sectional area decreases in a direction in which ice is discharged.

[0351] The discharge pipe 370 may be formed of an elastically deformable material to provide resistance in a direction opposite to a transfer direction of ice. For example, the discharge pipe 370 may be formed of silicone.

[0352] Since the piston 335 presses one side of ice present in the cylinder 360 and resistance is provided on the other side by the discharge pipe 370, compression or recombination of powdered ice may be achieved. Compressed powdered ice may be formed into ice having a predetermined shape (third state, molded ice) and may be discharged through a discharge portion of the discharge pipe 370.

[0353] The molded ice discharged from the discharge portion may interfere with a cutter wall 380 spaced apart from the discharge pipe 370 by a set distance, and in this process the molded ice may be cut. A distance between the discharge pipe 370 and the cutter wall 380 may be determined according to an ice size desired by a consumer. The cut molded ice may be introduced into an ice bin 500 through a discharge port 328 of the first bracket 320.

[0354] The compression part 300 may include compression brackets 320 and 327 for supporting the plurality of components described above.

[0355] The compression brackets 320 and 327 may include the first bracket 320 forming a first through-hole 321a through which the motor shaft 312 of the second motor 310 passes. The first bracket 320 may include a first wall 321 extending so as to face the ice-making space plate 85. For example, the first wall 321 may form a vertical wall extending in a vertical direction. The first through-hole 321a may be formed in the first wall 321.

[0356] The first bracket 320 may include a second wall 322 forming the discharge port 328. The second wall 322 may be connected to a lower end of the first bracket 320 and may extend in a direction away from the ice-making space plate 85. For example, the second wall 322 may form a horizontal wall extending in a horizontal direction.

[0357] The compression brackets 320 and 327 may include the second bracket 327 coupled to the first bracket 320. A space in which the rack gear 330 and the piston 335 are positioned may be formed between the first bracket 320 and the second bracket 327.

[0358] The first wall 321 may include a plurality of fastening portions.

[0359] The plurality of fastening portions may include a first fastening portion 321b coupled to a first fastening portion 328a of the second bracket 327. The first fastening portion 321b may protrude from the first wall 321 and may include a boss to which a fastening member is coupled. The first fastening portion 328a of the second bracket 327 may include a hole into which the fastening member is inserted.

[0360] The plurality of fastening portions may include a second fastening portion 321c coupled to a second fastening portion 328b of the second bracket 327. The second fastening portion 321c may be formed in a fastening wall 324 provided at a position spaced apart from the first wall 321 in a direction toward the second bracket 327. For example, the second fastening portions 328b and 321c may include holes. A predetermined fastening member may be fastened to the second fastening portions 328b and 321c.

[0361] An upper surface of the fastening wall 324 may include a guide surface guiding sliding of the coupling bracket 336. Since the coupling bracket 336 is supported

on the guide surface, stable reciprocating motion of the rack gear 330 and the piston 335 may be achieved. In some examples, the coupling bracket 336 may be disposed to be slightly spaced apart from the upper surface of the fastening wall 324.

[0362] The fastening wall 324 may include the rail groove 324a guiding movement of the rail 334 of the rack gear 330. The rail groove 324a may be formed on a surface of the fastening wall 324 facing the rack gear 330 among a plurality of surfaces defining the fastening wall 324. At least a portion of the rail 334 may be fitted into the rail groove 324a, and the rail 334 may move along the rail groove 324a.

[0363] The second bracket 327 may include a bracket wall 327a covering at least a portion of the rack gear 330 and the piston 335. The bracket wall 327a may include a second through-hole 327b in which a central portion 315a of the pinion gear 315 is rotatably supported. For example, the central portion 315a may be inserted into the second through-hole 327b.

[0364] Next, a process in which powdered ice generated in the ice-making part 200 and supplied to the compression part 300 is compressed will be described with reference to FIGS. 15A to 15B.

[0365] A position of the piston 335 illustrated in FIG. 15A is defined as a first position. At the first position, the second motor 310 is in a stopped state, and the first motor 210 of the ice-making part 200 is driven so that powdered ice I1 may be supplied into the transfer pipe 340. The state of FIG. 15A may be maintained for a first predetermined time.

[0366] After the first predetermined time elapses, when the second motor 310 is driven in a forward direction, the piston 335 moves in a direction toward the cylinder 360 by engagement of the pinion gear 315 and the first gear 332 (forward movement of the piston), and in this process, as illustrated in FIG. 15B, powdered ice collected in a lower portion of the transfer pipe 340, that is, in the second part 342, is moved into the cylinder 360.

[0367] In FIG. 15B, the piston 335 is illustrated as moving only up to an inlet side of the cylinder 360. In some examples, at least a portion of the piston 335 may be inserted into the cylinder 360. A position of the piston 335 in FIG. 15B is defined as a second position.

[0368] In the state of FIG. 15B, when the second motor 310 is driven in a reverse direction, the piston 335 may move in a direction away from the cylinder 360 (rearward movement of the piston). The rack gear 330 moves together with the piston 335, and at an end of movement of the rack gear 330, the second gear 333 may engage with the third gear 355. Accordingly, the third gear 355 rotates clockwise based on FIG. 15C, and thus the lever 350 rotates clockwise about the rotation bar 351.

[0369] When the lever 350 rotates, the plate 352 and the rounded portion 352a move into the accommodation space 341a of the transfer pipe 340 and transfer powdered ice present in the transfer pipe 340. For example, ice present in an upper portion of the transfer pipe 340, that is, in the first part 341, may be pressed downward and moved toward a lower portion of the transfer pipe 340, that is, toward the second part 342. A position of the piston 335 in FIG. 15C is defined as a third position.

[0370] In the state of FIG. 15C, when the second motor 310 is driven in the forward direction, the piston 335 may move in a direction toward the cylinder 360. When the rack gear 330 moves for movement of the piston 335, engagement between the second gear 333 and the third gear 355 is released, and by restoring force of the spring 358, the lever 350 moves to an upright position as illustrated in FIG. 15A. Then, the piston 335 may return to the first position.

[0371] By repeating the processes of FIGS. 15A to 15D, powdered ice may undergo compression or recombination within an internal space of the cylinder 360 and may be manufactured into molded ice I2, that is, ice in a third state. When pressure sufficient to pass through the discharge pipe 370 is applied to the molded ice I2 by the piston 335, the molded ice I2 may be discharged through the discharge pipe 370. In some examples, the third state ice may be heated before being discharged from discharge pipe 370 and generate fourth state ice. In some examples, the temperature of ice may sequentially increase from the first state ice to the fourth state ice based on the locations of ice. For example, the first state ice on the ice-making body may have a first temperature, and the second state ice separated from the ice-making body may have a second temperature higher than or equal to the first temperature. The third state ice molded into shape at an inlet side of the cylinder has a third temperature higher than or equal to the second temperature, and the fourth state ice at an outlet side of the cylinder may have a fourth temperature higher than the third temperature.

[0372] Ice discharged from the discharge pipe 370 interferes with the cutter wall 380 and is cut to a predetermined size, and the cut ice may be introduced into the ice bin 500.

[0373] FIG. 16 is a perspective view showing an example configuration of an ice-making part of an ice maker.

[0374] Referring to FIG. 16, an ice-making part 200 may include a reservoir 250 in which water is stored. The reservoir 250 may be installed in a first bracket 220. For example, the reservoir 250 may be supported by a plurality of walls provided in the first bracket 220. The plurality of walls may include a third wall 223 supporting a bottom surface of the reservoir 250.

[0375] The plurality of walls may include a fourth wall 224 and a fifth wall 225 supporting both side surfaces of the reservoir 250. A distance by which the fourth wall 224 and the fifth wall 225 are spaced apart may be formed to be slightly greater than a width of the reservoir 250 in a lateral direction.

[0376] The first bracket 220 may include a first wall 221 facing a front surface of the reservoir 250, and at least a portion of a heater 255 may be positioned between the

first wall 221 and the front surface of the reservoir 250.

[0377] A rear portion of the first bracket 220 may be open. The open rear portion of the first bracket 220 may be covered by a second bracket 230.

[0378] The second bracket 230 may include a gear bracket 231, and the gear bracket 231 may include a bracket wall 231a facing a rear surface of the reservoir 250. At least another portion of the heater 255 may be positioned between the bracket wall 231a and the rear surface of the reservoir 250.

[0379] As described above, the reservoir 250 may be installed in a space defined by the first bracket 220 and the second bracket 230, for example, a lower space, and may be stably supported by the first and second brackets 220 and 230.

[0380] Without providing a separate reservoir 250, a closed lower space defined by the first bracket 220 and the second bracket 230 may be used as a water storage space.

[0381] The ice-making part 200 may include a tray 241 that is movably provided. During movement of the tray 241, at least a portion of the tray 241 may move into an internal space of the reservoir 250.

[0382] The tray 241 may include a first circumferential surface 242a supplied with water stored in the reservoir 250. The first circumferential surface 242a may form a contact section that contacts water stored in the reservoir 250.

[0383] The first circumferential surface 242a of the tray 241 may include a portion extending in a rounded manner. For example, the first circumferential surface 242a may include a portion having an arc shape.

[0384] The tray 241 may include a second circumferential surface 242b forming a non-contact section that does not contact water stored in the reservoir 250.

[0385] The second circumferential surface 242b may have a shape different from that of the first circumferential surface 242a. For example, curvature or a radius of curvature of the second circumferential surface 242b may be formed to be different from curvature or a radius of curvature of the first circumferential surface 242a.

[0386] A distance from a center portion of the tray 241, that is, a center bracket 243, to the first circumferential surface 242a may be greater than a distance from the center bracket 243 to the second circumferential surface 242b. Accordingly, during rotation of the tray 241, the first circumferential surface 242a may be positioned in the internal space of the reservoir 250, while the second circumferential surface 242b may not be positioned in the internal space of the reservoir 250.

[0387] The tray 241 may have a drum shape.

[0388] The reservoir 250 may be positioned below the tray 241 and may include an open upper end through which at least a portion of the tray 241 passes. When the tray 241 rotates, the first circumferential surface 242a of the tray 241 may be immersed in water stored in the reservoir 250 through the open upper end of the reservoir 250.

[0389] The ice-making part 200 may include a first opening 224b through which cold air is introduced, and a cold-air duct 400 may be connected to the first opening 224b. A cold-air flow path toward the circumferential surfaces 242a and 242b of the tray 241 may be defined from the first opening 224b, and the reservoir 250 may be disposed on an opposite side of the cold-air flow path.

[0390] The first opening 224b may be disposed on a first side with respect to a center of the tray 241, and the reservoir 250 may be disposed on a second side with respect to the center of the tray 241. The second side may be opposite to the first side. For example, the first opening 224b may be disposed above the tray 241, and the reservoir 250 may be disposed below the tray 241. Accordingly, cold air introduced through the cold-air duct 400 may be prevented from directly flowing into the reservoir 250, thereby preventing water in the reservoir 250 from freezing.

[0391] A first blade 280 may be disposed outside the circumferential surface of the tray 241. The first blade 280 may be installed on the fifth wall 225 of the first bracket 220. The fifth wall 225 may be disposed to face one side surface of the reservoir 250.

[0392] A tip 225a of the fifth wall 225, that is, an upper end portion, may face the circumferential surface of the tray 241. A gap between the tip 225a and the circumferential surface of the tray 241 may be small. In some examples, for rotation of the tray 241, the tray 241 and the tip 225a may be spaced apart by a distance sufficient to avoid interference. With this configuration, cold air flowing along the circumferential surface of the tray 241 may be prevented from being supplied to the reservoir 250.

[0393] Hereinafter, configurations of the reservoir 250 and the heater 255 will be described in more detail with reference to the drawings.

[0394] FIG. 17 is a left perspective view showing an example configuration of a reservoir and a heater, FIG. 18 is a right perspective view showing an example configuration of a reservoir and a heater, FIG. 19 is a bottom perspective view showing an example configuration of a reservoir and a heater, FIG. 20 is a left side view showing an example configuration of a reservoir and a heater, FIG. 21 is a cross-sectional view taken along line 21-21 of FIG. 20, and FIG. 22 is a bottom view showing an example configuration of a reservoir and a heater.

[0395] Referring to FIGS. 17 to 22, a reservoir 250 may include a storage space 250a for water. For example, the reservoir 250 may have a case shape with an open top.

[0396] The reservoir 250 may include a plurality of surfaces forming the storage space 250a, and portions where the plurality of surfaces meet may form edges of the reservoir 250. A surface of the reservoir 250 may constitute a wall forming an exterior of the reservoir 250.

[0397] The plurality of surfaces may include a first surface 251. For example, the first surface 251 may form one side wall of the reservoir 250 and may be disposed to face the fifth wall 225 of the first bracket 220.

[0398] The plurality of surfaces of the reservoir 250 may include second surfaces 252. For example, a plurality of second surfaces 252 may be provided to form a front surface and a rear surface of the reservoir 250 and may extend from both sides of the first surface 251. The front surface and the rear surface of the reservoir 250 may be understood as walls facing both side walls of the tray assembly 240.

[0399] One of the second surfaces 252 may be disposed to face the first wall 221 of the first bracket 220 and may form a front wall of the reservoir 250. Another one of the second surfaces 252 may be disposed to face the gear bracket 231 of the second bracket 230 and may form a rear wall of the reservoir 250.

[0400] The plurality of surfaces of the reservoir 250 may include a third surface 253. For example, the third surface 253 may form the other side wall of the reservoir 250 and may be disposed to face the fourth wall 224 of the first bracket 220.

[0401] The plurality of surfaces of the reservoir 250 may include a fourth surface 254. For example, the fourth surface 254 may form a bottom surface of the reservoir 250 and may be disposed to face the third wall 223 of the first bracket 220.

[0402] A length of the second surface 252 in one direction may be formed to be greater than a length of the first surface 251 in the one direction. For example, the one direction may be an up-down direction. A lower end of the second surface 252 may be supported by the third wall 223 of the first bracket 220 and may be positioned lower than the first surface 251.

[0403] A lower end of the third surface 253 may be formed at the same height as the lower end of the second surface 252.

[0404] To prevent interference between the circumferential surface 242a of the tray 241 and the reservoir 250 when at least a portion of the tray 241 is positioned in the internal space of the reservoir 250 during movement of the tray 241, the fourth surface 254 of the reservoir 250 may have a recessed shape.

[0405] The recessed shape may be a U-shape or a V-shape.

[0406] The ice-making part 200 may include a heater 255 installed adjacent to the reservoir 250 and configured to provide heat to prevent water in the reservoir 250 from freezing. For example, the heater 255 may include a cord heater extending with a predetermined length.

[0407] The heater 255 may be installed on a surface of the reservoir 250. For example, the heater 255 may be installed on at least one of the plurality of surfaces 251 to 254 of the reservoir 250.

[0408] The heater 255 may be installed on an outer surface of the reservoir 250. Accordingly, the heater 255 may not contact water stored in the reservoir 250.

[0409] When the heater 255 is installed on an inner surface of the reservoir 250, that is, an inner surface of the reservoir 250 on which the storage space 250a is formed, the temperature of water may rapidly increase and ice-making performance may deteriorate. Thus, the heater 255 may be installed on the outer surface of the reservoir 250 to provide heat.

[0410] The heater 255 may include a plurality of parts (hereinafter, "heater parts") distinguished according to installation positions. For example, the plurality of heater parts may be integrally formed while being connected to each other. The electrical terminals may be provided at both ends of the plurality of heater parts to receive electric power.

[0411] As another example, the plurality of heater parts may be configured as separate heaters, and electrical terminals may be connected to both ends of each heater. Output of each heater may be independently controlled, and the output of each heater may be set to be the same or different.

[0412] The heater 255 may include a portion disposed in a space between a surface of the reservoir 250 and surrounding components to prevent freezing from occurring in the components around the reservoir 250.

[0413] The plurality of heater parts will be described.

[0414] The heater 255 may include a first part 256a disposed between a side wall of the tray assembly 240 and one of the second surfaces 252 of the reservoir 250. The one of the second surfaces 252 may be disposed to face the side wall of the tray assembly 240, and the first part 256a may be installed on an outer side of the one of the second surfaces 252.

[0415] When freezing occurs in a space between the side wall of the tray assembly 240 and a surface of the reservoir 250, a binding force may be generated in the tray assembly 240, which may restrict rotation of the tray assembly 240. Accordingly, freezing may be prevented by heat provided from the first part 256a.

[0416] The heater 255 may include a second part 256b disposed between another one of the second surfaces 252 of the reservoir 250 and the second bracket 230. The another one of the second surfaces 252 may be disposed to face the second bracket 230, and the second part 256b may be installed on an outer side of the another one of the second surfaces 252.

[0417] Due to the first part 256a and the second part 256b of the heater 255, a predetermined amount of heat may be provided to the plurality of second surfaces 252 of the reservoir 250, that is, the front and rear surfaces, and freezing on the side wall of the tray assembly 240 may be prevented by the heat.

[0418] In particular, the side wall of the tray assembly 240 may readily cool the second surfaces 252 of the reservoir 250 while forming a low temperature. In addition, a cold-air flow path may be formed between the ice-making brackets 220 and 230 and the second surfaces 252 of the reservoir 250, so that an area of the second surfaces 252 exposed to cold air may be large. Accordingly, the second surfaces 252 may be highly likely to form a low temperature.

[0419] Therefore, the heater 255 may include at least the first and second parts 256a and 256b installed on at

least the plurality of second surfaces 252, and output of the first and second parts 256a and 256b may be the greatest among the plurality of heater parts.

[0420] The heater 255 may include a third part 257 providing heat to the fourth surface 254 of the reservoir 250. The third part 257 may include a portion bent or extending in a rounded manner corresponding to the recessed shape of the fourth surface 254.

[0421] Heat may be provided to the bottom surface of the reservoir 250 by the third part 257, and due to a characteristic that hot heat rises, it may be easy to maintain the temperature of water stored in the storage space 250a at temperatures above 0 °C. In particular, the temperature of water may be maintained in the temperatures above 0 °C even in a sub-zero temperature environment inside the ice-making part 200.

[0422] A surface of the reservoir 250 may include a groove portion 252a through which the heater 255 passes. The groove portion 252a may be formed between the second surface 252 and the third surface 253, and a portion of the heater 255 may extend from an outer surface of the second surface 252 to a bottom side of the fourth surface 254 through the groove portion 252a. The groove portion 252a may be formed on both sides of the reservoir 250.

[0423] For example, a connecting portion between the first part 256a and the third part 257 of the heater 255 may pass through one of the groove portions 252a. A connecting portion between the second part 256b and the third part 257 of the heater 255 may pass through another one of the groove portions 252a.

[0424] The first part 256a, the second part 256b, and the third part 257 of the heater 255 may be integrally formed. Based on an extension path of the heater 255, the third part 257 may be positioned between the first and second parts 256a and 256b. That is, both ends of the third part 257 may be respectively connected to the first and second parts 256a and 256b.

[0425] The heater 255 may include both ends 255a and 255b, and the both ends 255a and 255b may extend to the outside of the ice-making part 200 to be connected to an electrical device. For example, a first end 255a of the ends 255a and 255b may form an end of the first part 256a, and a second end 255b may form an end of the second part 256b.

[0426] The ice-making part 200 may include a temperature sensor 260a capable of sensing a temperature of water stored in the reservoir 250.

[0427] The temperature sensor 260a may be installed on a surface of the reservoir 250. For example, the temperature sensor 260a may be installed on the fourth surface 254 of the reservoir 250. The temperature sensor 260a may indirectly sense the temperature of water via the temperature of the surface of the reservoir 250.

[0428] The temperature sensor 260a may be installed on an outer side of the surface of the reservoir 250. For example, the temperature sensor 260a may be disposed on an outer side of the fourth surface 254 of the reservoir 250, that is, on a bottom of the fourth surface 254.

[0429] The temperature sensor 260a may be disposed between the second surfaces 252 on both sides of the reservoir 250. Since the second surfaces 252 are supported by the third wall 223 of the first bracket 220, cold air around the tray 241 may be blocked by the second surfaces 252 and flow toward the temperature sensor 260a may be restricted. Accordingly, by cold air flowing to the temperature sensor 260a, causing erroneous detection may be prevented.

[0430] The temperature sensor 260a may be eccentrically disposed in one direction with respect to a center portion of the reservoir 250. A direction in which the temperature sensor 260a is eccentrically disposed may be a direction closer to the first opening 224b. That is, by installing the temperature sensor 260a in an area having a high likelihood that the reservoir 250 may be overcooled by cold air introduced through the first opening 224b and sensing the temperature of water, it is possible to determine whether a temperature of the reservoir 250 is maintained in the positive range, that is, in the temperatures above 0 °C.

[0431] For example, among the first opening 224b and the first blade 280 which are disposed opposite to each other with respect to a center of the tray 241, the temperature sensor 260a may be installed at a position closer to the first opening 224b than to the first blade 280.

[0432] The refrigerator may include a controller configured to adjust an output of the heater 255 based on a value sensed by the temperature sensor 260a. When the value sensed by the temperature sensor 260a is equal to or less than a predetermined value, the controller may increase the output of the heater 255 to prevent water in the reservoir 250 from freezing.

[0433] In some examples, when the value sensed by the temperature sensor 260a is equal to or less than the predetermined value, the controller may recognize that water in the reservoir 250 is insufficient and may control a water supply device such that water is supplied to the reservoir 250 through a water supply pipe 120. This is because, when water is insufficient, a heat capacity of the reservoir 250 may decrease and thus the temperature is highly likely to decrease.

[0434] FIG. 23 is a front view showing an example configuration of a reservoir and a heater, and FIG. 24 is a front view showing an example state in which a reservoir and a heater are installed in a bracket of an ice maker.

[0435] In some implementations, referring to FIG. 23, the heater 255 may include heater lines arranged in multiple rows on a surface of the reservoir 250. For example, at least one of a first part 256a and a second part 256b of the heater 255 may include heater lines arranged in multiple rows.

[0436] The reservoir 250 may be disposed below the tray 241 such that a lower portion of the tray 241 is immersed in or contacted with water in the reservoir 250, and a direction in which the heater 255 is arranged

in multiple rows may be a direction in which the tray and the reservoir are disposed, for example, an up-down direction.

[0437] The plurality of heater lines provided in the heater 255 may include a first line 2561 disposed adjacent to an open upper end of the reservoir 250 and a second line 2562 spaced apart from the first line 2561 in a direction toward a fourth surface 254 forming a bottom surface.

[0438] A height H1 from a lower end portion of the reservoir 250 to the bottom surface, that is, the fourth surface 254, of the reservoir 250 may be defined as a first height. The lower end portion of the reservoir 250 may be understood as a lower end portion of the second surface 252 or a lower end portion of the third surface 253, and is indicated by an extension line ℓo in FIG. 23.

[0439] A height H2 from the lower end portion of the reservoir 250 to the second line 2562 of the heater 255 may be defined as a second height, and a height H3 from the lower end portion of the reservoir 250 to the first line 2561 of the heater 255 may be defined as a third height. In some examples, the third height may be greater than the second height.

[0440] As described above, the heater 255 may include the plurality of heater lines 2561 and 2562 arranged in multiple rows, thereby uniformly transferring heat through the surface of the reservoir 250.

[0441] The fourth surface 254 may have a recessed shape so as to prevent interference with the reservoir 250 when at least a portion of the tray 241 moves into an internal space of the reservoir 250.

[0442] The fourth surface 254 may include a first inner surface portion 254a extending downwardly and obliquely from the first surface 251. The first inner surface portion 254a may extend downwardly and obliquely at a first angle from a lower end portion of the first surface 251 and may have a first length.

[0443] The fourth surface 254 may include a second inner surface portion 254b extending from the first inner surface portion 254a toward the third surface 253. For example, the second inner surface portion 254b may extend in a horizontal direction without being inclined. The second inner surface portion 254b may form a deepest bottom portion of the reservoir 250.

[0444] The fourth surface 254 may include a third inner surface portion 254c extending upwardly and obliquely from the second inner surface portion 254b toward the third surface 253. The third inner surface portion 254c may extend upwardly and obliquely at a second angle from an end portion of the second inner surface portion 254b and may have a second length.

[0445] The first angle may be greater than the second angle, and the first length may be shorter than the second length.

[0446] During rotation, at least a portion of the tray 241 may move into the internal space of the reservoir 250 via a side of the first surface 251 of the reservoir 250. In this case, the tray 241 may rotate while being adjacent to the reservoir 250 to an extent that it does not interfere with an upper edge of the first surface 251. This is because, when a rotation path of the tray 241 is excessively spaced apart from the upper edge of the reservoir 250, cold air may be introduced into the reservoir 250 through the spaced space, thereby increasing a possibility that the reservoir 250 may freeze.

[0447] To prevent interference with a bottom surface of the reservoir when the at least a portion of the tray 241 moves into the internal space of the reservoir 250 via the side of the first surface 251, the downward inclination angle (first angle) of the first inner surface portion 254a may be relatively increased and the length (first length) thereof may be formed to be short.

[0448] In some examples, after the at least a portion of the tray 241 passes through the second inner surface portion 254b, which is the lowest bottom surface, the length (second length) of the third inner surface portion 254c may be formed to be relatively long and the upward inclination angle (second angle) thereof may be formed to be relatively small so as not to interfere with the third inner surface portion 254c.

[0449] Due to the inclined shape of the fourth surface 254, the bottom surface of the reservoir 250 may have a recessed shape recessed downwardly, and thus water may gather at a lowest recessed portion of the reservoir 250, thereby facilitating supply of water to the tray 241 and minimizing remaining water.

[0450] In some examples, referring to FIG. 24, the heater 255 may be disposed along a perimeter of the reservoir 250.

[0451] An installation area of the heater 255 may be formed differently depending on areas of the reservoir 250. That is, based on a plurality of areas of the reservoir 250, an amount (or volume) in which the heater 255 is installed may be formed to be different from each other.

[0452] Based on the installation area (or volume) of the heater 255, an installation area of the heater 255 positioned closer to the first opening 224b of the first bracket 220 may be greater than an installation area of the heater 255 positioned farther from the first opening 224b.

[0453] A center of the tray 241 and a center of the reservoir 250 may be eccentric with respect to each other. A direction of eccentricity may be a direction in which air is introduced through the first opening 224b and discharged through the second opening 227, that is, a left-right direction.

[0454] For example, an extension line ℓc passing through the center of the tray 241 may pass a point closer to the first surface 251 than to the third surface 253 of the reservoir 250.

[0455] With respect to the extension line ℓc passing through the center of the tray 241, since a first portion A of the reservoir 250 positioned closer to the first opening 224b may form a lower temperature than a second portion B of the reservoir 250 positioned farther from the first opening 224b, an installation area of the heater 255 installed in the first portion A may be formed to be greater

than an installation area of the heater 255 installed in the second portion B.

[0456] Accordingly, more heat may be provided to the first portion A than to the second portion B of the reservoir 250 through the heater 255, and thus it may be easy to maintain an overall temperature of the reservoir 250 in the positive range, that is, in the temperatures above 0 °C.

[0457] The first blade 280 for scraping ice formed on the circumferential surface of the tray 241 may be disposed opposite to the first opening 224b with respect to the extension line ℓc passing through the center of the tray 241.

[0458] Based on the installation area of the heater 255, an installation area of the heater 255 installed in the second portion B of the reservoir 250 positioned closer to the first blade 280 may be smaller than an installation area of the heater 255 installed in the first portion A of the reservoir 250 positioned farther from the first blade 280.

[0459] Since the first blade 280 scrapes ice after ice-making is completed, if a large amount of heat is provided toward the first blade 280, there is a concern that the formed ice may melt. Therefore, in an area close to the first blade 280 (the A area), the installation area of the heater 255 may be formed to be small so that a large amount of heat is not provided toward the first blade 280 side.

[0460] With respect to a point 242a1 at which the first circumferential surface 242a and the second circumferential surface 242b of the tray 241 meet, an angle formed by a tangent of the first circumferential surface 242a and a tangent of the second circumferential surface 242b may form an acute angle. If the angle forms an obtuse angle, water droplets may gather at the point 242a1 and undesired freezing may occur.

[0461] In some implementations, the angle may be formed as an acute angle, thereby preventing formation of water droplets at the point 242a1.

[0462] FIG. 25 is a left side view showing an example configuration of an ice-making part of an ice maker, and FIG. 26 is a cross-sectional view taken along line 26-26 of FIG. 25.

[0463] Referring to FIGS. 25 and 26, both end portions of the ice-making brackets 220 and 230 may form openings through which cold air passes. A first opening 224b connected to a discharge portion 430 of a cold-air duct 400 may be formed at one end portion of the ice-making brackets 220 and 230. A second opening 227 may be formed at the other end portion of the ice-making brackets 220 and 230.

[0464] The first opening 224b may be understood as an opening for introducing cold air, and the second opening 227 may be understood as an opening for discharging cold air. The second opening 227 may function as an opening through which ice separated from the tray 241 is discharged.

[0465] The first opening 224b may be formed on one side surface of the first bracket 220, and at least a portion of a circumferential surface 242a and 242b of the tray 241, particularly at least a portion of the first circumferential surface 242a, may be disposed to face the first opening 224b.

[0466] The second opening 227 may be formed on the other side surface of the second bracket 220. The other side surface of the second bracket 220 may be a surface opposite to the one side surface on which the first opening 224b is formed. That is, the one side surface and the other side surface of the second bracket 220 may be disposed to face each other. Cold air introduced through the first opening 224b may cool the tray 241 while passing along the circumferential surfaces 242a and 242b of the tray 241, and may be discharged through the second opening 227.

[0467] The second opening 227 may be defined as a space between a guide wall 226 provided on one side portion of the first bracket 220 and the first blade 280. The guide wall 226 may be formed to be rounded corresponding to a curvature of the first circumferential surface 242a of the tray 241, and may guide cold air flowing along a second wall 222 of the first bracket 220 toward the first circumferential surface 242a.

[0468] In other words, the second opening 227 may be understood as a space between the guide wall 226 and a fifth wall 225 on which the first blade 280 is mounted.

[0469] The first blade 280 may include a blade body 281 mounted on the fifth wall 225 and a tip 283 provided at an end portion of the blade body 281. The tip 283 may have a shape in which a cross-sectional area of an end portion thereof decreases so as to readily scrape ice formed on the first circumferential surface 242a.

[0470] For example, the first circumferential surface 242a may have a plurality of recesses 241a and a plurality of protrusions 241b alternately arranged in an axial direction. A plurality of tips 283 may be provided to be spaced apart in the axial direction such that at least a portion of each tip 283 may be inserted into each of the plurality of recesses 241a. The recesses 241a may be recessed relative to the protrusions 241b. In some examples, the recesses 241a are defined at the first circumferential surface 242a such that the protrusions 241b are formed between the recesses 241a. In some examples, the protrusions 241b are disposed at the first circumferential surface 242a such that the recesses 241a are formed between the protrusions 241b.

[0471] An end portion of the blade body 281 may include a flat surface configured to scrape ice formed on the protrusions 241b.

[0472] Ice formed on the first circumferential surface 242a may be separated by the first blade 280, and the separated ice may be discharged through the second opening 227. The discharged ice may be introduced into a compression part 300.

[0473] The first bracket 220 may include a first accommodation space 220a in which the tray assembly 240 is accommodated. An axial width of the first accommodation space 220a may be formed to be greater than an axial

width of the tray assembly 240.

[0474] An air passage through which cold air flows may be formed between an outer wall of the tray assembly 240 and walls of the ice-making brackets 220 and 230.

[0475] For example, a first tray cover 246 of the tray assembly 240 and a gear bracket 231 may be spaced apart from each other by a first distance S1, and a first side air passage may be formed in a space spaced apart by the first distance S1.

[0476] A second tray cover 247 of the tray assembly 240 and a first wall 221 of the first bracket 220 may be spaced apart from each other by a second distance S2, and a second side air passage may be formed in a space spaced apart by the second distance S2. As such, since cold air supplied through the first and second side air passages may cool side walls of the tray assembly 240, cooling of the tray 241 may be rapidly performed and thus ice-making performance may be improved.

[0477] The tray 241 may be made of a material having high thermal conductivity to facilitate cooling. For example, the tray 241 may be made of a metallic material. As examples of the metallic material, steel or aluminum may be proposed.

[0478] The ice-making part 200 may include a second blade 285 configured to separate ice frozen on side walls of the tray assembly 240. A plurality of second blades 285 may be provided to scrape ice formed on both side walls of the tray assembly 240.

[0479] Among the plurality of second blades 285, one may be installed on the first wall 221 of the first bracket 220, and another may be installed on a wall of the gear bracket 231.

[0480] When the tray assembly 240 rotates, a side wall of the tray assembly 240 may overlap an internal space of the reservoir 250 so that ice separated from the side wall of the tray assembly 240 by the second blade 285 may flow into the reservoir 250.

[0481] In another example, the first and second tray covers 246 and 247 may be removed. In this case, the side wall of the tray assembly 240 may refer to a side wall of the tray 241.

[0482] FIG. 27 is a front view showing an example configuration of a tray, a reservoir, and a heater when the tray is at a first position, FIG. 28 is a front view showing an example configuration of a tray, a reservoir, and a heater when the tray is at a second position, and FIG. 29 is a cross-sectional view showing an example of an internal configuration of the ice-making part when the tray is at the second position.

[0483] Referring to FIG. 27, when the tray 241 is at the first position (an ice-making position), the first circumferential surface 242a of the tray 241 may face laterally, and the second circumferential surface 242b may face upward and downward. In this case, since the first circumferential surface 242a is exposed to the cold-air passage inside the ice-making brackets 220 and 230, water supplied to the first circumferential surface 242a may be frozen to form ice.

[0484] A lower end of the second circumferential surface 242b may face the reservoir 250. Since a distance from a center of the tray 241 to the second circumferential surface 242b is small, the second circumferential surface 242b may not be immersed in or contacted with water stored in the reservoir 250.

[0485] For example, when an extension line $\ell 1$ passing through a maximum water level of the reservoir 250 is referred to as a "first extension line", and an extension line $\ell 2$ passing through a lowermost end 240a of the tray assembly 240 at the first position of the tray 241 is referred to as a "second extension line", the second extension line $\ell 2$ may be formed at a higher position than the first extension line $\ell 1$. Accordingly, the second circumferential surface 242b may pass through the reservoir 250 in a state in which water is not supplied thereto.

[0486] The first and second tray covers 246 and 247 described above may be optionally provided. When the first and second tray covers 246 and 247 are provided, a lowermost end of the first and second tray covers 246 and 247 covering the second circumferential surface 242b may form the lowermost end of the tray assembly 240, and may not be immersed in or contacted with water stored in the reservoir 250.

[0487] When the first and second tray covers 246 and 247 are not provided, a lowermost end of the second circumferential surface 242b of the tray 241 may form the lowermost end of the tray assembly 240, and may not be immersed in or contacted with water stored in the reservoir 250.

[0488] When the tray 241 further rotates counterclockwise from the first position, ice formed on the first circumferential surface 242a may be separated by the first blade 280, and the first circumferential surface 242a and the second circumferential surface 242b may be switched to the second position of FIG. 28.

[0489] Referring to FIGS. 28 and 29, when the tray 241 is at the second position (a water supply position), the first circumferential surface 242a of the tray 241 may face upward and downward, and the second circumferential surface 242b may face laterally.

[0490] Among two first circumferential surfaces 242a, a lower first circumferential surface 242a may face the reservoir 250. A distance from the center of the tray 241 to the first circumferential surface 242a may be formed such that the first circumferential surface 242a is immersible in or contactable with water stored in the reservoir 250.

[0491] When an extension line $\ell 3$ passing through a lowermost end of the first circumferential surface 242a at the second position of the tray 241 is referred to as a "third extension line", the third extension line $\ell 3$ may be formed at a lower position than the first extension line $\ell 1$ passing through the maximum water level of the reservoir 250. Accordingly, water in the reservoir 250 may be supplied to the first circumferential surface 242a. For example, the first circumferential surface 242a may be wetted to form a water film.

[0492] During rotation of the tray 241, states of the tray

241 at the first position and the second position may be repeatedly performed. Accordingly, the first circumferential surface 242a may be supplied with water to form a space or surface for ice-making, whereas the second circumferential surface 242b may not be supplied with water and thus may not form a space or surface for ice-making.

[0493] FIG. 30 is a view showing an example configuration of a reservoir.

[0494] Referring to FIG. 30, the reservoir 250 may include a temperature sensor 260a installed on an inner side of a surface of the reservoir. For example, as shown in FIG. 30, the temperature sensor 260a may be installed on an inner surface of the second surface 252.

[0495] In another example, the temperature sensor 260a may be installed on the first surface 251 or the third surface 253.

[0496] A height at which the temperature sensor 260a is installed in the reservoir 250 may be formed at a position lower than the maximum water level $\ell 1$ of the reservoir 250. In this case, the temperature sensor 260a may directly sense the temperature of water by contacting water stored in the reservoir 250.

[0497] In another example, the height at which the temperature sensor 260a is installed in the reservoir 250 may be formed at a position higher than the maximum water level $\ell 1$ of the reservoir 250. In this case, the temperature sensor 260a may indirectly sense the temperature of water through the surface of the reservoir 250 without contacting water stored in the reservoir 250.

[0498] A density per unit area of the heater 255 in an area where the temperature sensor 260a is disposed may be smaller than a density per unit area of the heater 255 in an area where the temperature sensor 260a is not disposed. Accordingly, it is possible to prevent erroneous sensing at the temperature sensor 260a due to heat generated by the heater 255. For instance, the density per unit area of the heater 255 may be defined by a ratio of a total area or length occupied by the heater 255 in a unit area. In some cases, the density per unit area of the heater 255 may be inverse-proportional to a distance between wound portions of the heater 255 arranged in an area.

[0499] FIG. 30 illustrates a state in which the temperature sensor 260a is disposed at a position adjacent to the first surface 251. An installation area (or volume) of the heater 255 in an area adjacent to the first surface 251 may be smaller than an installation area (or volume) of the heater 255 in an area adjacent to the third surface 253.

[0500] FIG. 31 is a cross-sectional view showing an example configuration of an ice-making part.

[0501] Referring to FIG. 31, an ice-making part 200a may include a first wall 1221 supporting the tray assembly 240. The first wall 1221 may correspond to the first wall 221 of the first bracket 220 described in the above examples.

[0502] The first wall 1221 may include a first part 1223 forming an upper portion of the first wall 1221. The first part 1223 may include a protrusion 1221a1 forming an insertion hole 1221a.

[0503] The first wall 1221 may include a second part 1224 extending from the first part 1223 in an axial direction with a step.

[0504] The first wall 1221 may include a third part 1225 extending from the second part 1224 to cover an outer area of a heater 1255. A lower end of the third part 1225 may form a lower end of the first wall 1221.

[0505] Due to configurations of the second part 1224 and the third part 1225, the first wall 1221 may be bent and extend outward from the reservoir 250 by a size of the heater 255.

[0506] The first part 1223 of the first wall 1221 may include a portion forming the same plane as a surface of the reservoir 250, for example, the second surface 252. For example, an extension line $\ell 41$ extending along an inner surface of the first part 1223 may pass through an inner surface of the second surface 252 of the reservoir 250. With such a configuration, it is possible to prevent ice separated from the first wall 1221 or the side wall of the tray assembly 240 from being introduced into the reservoir 250 and freezing near the surface of the reservoir 250.

[0507] The ice-making part 200a may include a gear bracket 1231 supporting the tray assembly 240. The gear bracket 1231 may correspond to the gear bracket 231 described in the above examples.

[0508] The gear bracket 1231 may include a first part 1233 forming an upper portion of the gear bracket 1231. The first part 1233 may include a protrusion 1231a1 forming an insertion hole 1231a.

[0509] The gear bracket 1231 may include a second part 1234 extending from the first part 1233 in an axial direction with a step.

[0510] The gear bracket 1231 may include a third part 1235 extending from the second part 1234 to cover an outer area of a heater 1255. A lower end of the third part 1235 may form a lower end of the gear bracket 1231.

[0511] Due to configurations of the second part 1234 and the third part 1235, the gear bracket 1231 may be bent and extend outward from the reservoir 250 by a size of the heater 255.

[0512] The first part 1233 of the gear bracket 1231 may include a portion forming the same plane as a surface of the reservoir 250, for example, the second surface 252. For example, an extension line $\ell 42$ extending along an inner surface of the first part 1233 may pass through an inner surface of the second surface 252. With such a configuration, it is possible to prevent ice separated from the gear bracket 1231 or the side wall of the tray assembly 240 from being introduced into the reservoir 250 and freezing near the surface of the reservoir 250.

[0513] FIG. 32 is a control flowchart illustrating an example method of controlling a reservoir heater. FIG. 33 is a control flowchart illustrating an example method of controlling a reservoir heater. FIG. 34 is a control flowchart illustrating an example method of controlling a

reservoir heater.

[0514] Referring to FIGS. 32 to 34, in order to wet a surface of a tray 241 with water, a reservoir 250 may be provided at a lower portion of the tray 241, and a predetermined amount of water may be supplied such that, as the tray 241 rotates, a lower portion of the tray 241 is immersed in or contacted with water stored in the reservoir 250.

[0515] Since the reservoir 250 is disposed in a storage space having a subzero temperature, water in the reservoir 250 may be likely to freeze. To prevent freezing, a heater 255 may be disposed at a lower portion and/or a side portion of the reservoir 250, and the heater 255 may be controlled using a temperature sensor 260a.

[0516] That is, the present disclosure relates to a refrigerator control method, and more particularly, to a method of controlling the heater 255 installed to prevent water in the reservoir 250, which is provided for supplying water to the tray 241, from freezing. For this purpose, the temperature sensor 260a may be mounted to the reservoir 250, and the heater 255 may be controlled such that the temperature of the water in the reservoir 250 is maintained above 0°C.

[0517] In addition, whether water is present in the reservoir may be determined using a separate temperature sensor, and water supply may be controlled accordingly.

[0518] For example, when no water is present in the reservoir 250 or when a water level of the reservoir 250 becomes lower than a predetermined water level, a temperature sensed by the temperature sensor 260a rapidly decreases. At this time, the temperature sensor 260a may be exposed to air rather than being immersed in or contacted with the water of the reservoir 250. A controller connected to the temperature sensor 260a and the heater 255 may determine that no water is present in the reservoir 250 or that the water level is lower than the predetermined water level.

[0519] In some examples, when the temperature sensor 260a is mounted on a bottom of the reservoir 250 and is disposed adjacent to the heater 255, if there is no water, the temperature sensed by the temperature sensor 260a may rapidly increase. In this case, the controller may also determine that no water is present in the reservoir 250 or that the water level is lower than the predetermined water level.

[0520] In some examples, when no temperature sensor is provided in the reservoir 250, an output of the heater may be varied based on an operating condition of the refrigerator. For example, the output of the heater 255 may be determined based on an ice-making storage temperature to control the heater 255, and in a defrost mode, an ice-making operation may be stopped and the output of the heater 255 may be reduced.

[0521] Further, when an ice-full state is detected, ice making is unnecessary, and thus, after water in the reservoir is completely consumed, the heater 255 may be turned off to minimize power consumption.

[0522] Referring to FIG. 32, initial control of the heater 255 is started (S101). Then, water in the reservoir 250 wets the tray 241, and ice making is performed at the tray 241 (S102). Ice formed on a circumferential surface of the tray 241 is separated from the tray 241, and compression is performed in a compression part 300 (S103).

[0523] In this process, a temperature sensed by the temperature sensor 260a is compared with a reference temperature to determine whether no water is present in the reservoir 250 or whether the water level of the reservoir 250 is lower than a predetermined water level (S105).

[0524] For example, when the temperature sensed by the temperature sensor 260a is lower than the reference temperature, it may be determined that no water is present in the reservoir 250 or that the water level is lower than the predetermined water level.

[0525] As another example, when the temperature sensed by the temperature sensor 260a is higher than the reference temperature, it may be determined that no water is present in the reservoir 250 or that the water level is lower than the predetermined water level.

[0526] When it is determined in step S105 that no water is present in the reservoir 250 or that the water level is lower than the predetermined water level, water is supplied to the reservoir 250 (S106). In this case, water may be supplied by a predetermined amount. After water is supplied, step S102 may be performed again.

[0527] In some examples, when it is determined in step S105 that water is present in the reservoir 250 or that the water level is higher than the predetermined water level, without supplying water to the reservoir 250, the output of the heater 255 may be controlled (S104). In this case, the heater 255 may be controlled such that water in the reservoir 250 is maintained above 0°C. Control of the heater 255 may be performed as feedback control using temperature of the reservoir 250 sensed by the temperature sensor 260a.

[0528] In some implementations, when the temperature sensed by the temperature sensor 260a is lower than a first reference temperature, the output of the heater may be controlled to increase. Also, when the temperature sensed by the temperature sensor 260a is lower than the first reference temperature, water may be supplied to the reservoir. Further, when the temperature sensed by the temperature sensor 260a is higher than a second reference temperature, the output of the heater may be controlled to decrease. Also, when the temperature sensed by the temperature sensor is higher than the second reference temperature, water may be supplied to the reservoir 250. Here, the second reference temperature may be greater than or equal to the first reference temperature. As another example, the first reference temperature may be greater than or equal to the second reference temperature.

[0529] Referring to FIG. 33, the temperature of the reservoir may be measured by the temperature sensor 260a (S201). Then, it is determined whether the tem-

perature of the reservoir is lower than a target temperature (T_target) (S202).

[0530] When the reservoir temperature is lower than the target temperature (T_target), the output or of the heater 255 is controlled to increase (S203). In some examples, when the reservoir temperature is higher than the target temperature (T_target), the output of the heater 255 is controlled to decrease (S204).

[0531] In some implementations, a necessity of water supply to the reservoir 250 may be determined based on a change in the temperature measured by the temperature sensor 260a.

[0532] Ice making is performed at the tray. Then, the temperature may be sensed by the temperature sensor 260a for each unit time. The temperature may be sensed for each stage, and the "unit time" may refer to a time interval between at least one stage in which the ice is formed and another subsequent stage.

[0533] For example, a temperature at a stage before ice making is performed in the tray 241 and a temperature after ice making is completed in the ice-making tray may be sensed. As another example, a temperature at a stage before ice making is performed in the tray 241 and a temperature after ice making is completed, frozen ice is separated, and compression is completed in the compression part may be sensed.

[0534] When the temperature is sensed by the temperature sensor 260a, a temperature change per unit time may be calculated. Then, based on the temperature change per unit time, the necessity of water supply may be determined. In the determination step, when the temperature change per unit time is lower than a first reference value (e.g., -2°C), water may be supplied to the reservoir. In some examples, when the temperature change per unit time is higher than the first reference value (e.g., -2°C), ice making may be continued without supplying water to the reservoir 250. In addition, when the temperature change per unit time is higher than a second reference value (e.g., +2°C), water may be supplied to the reservoir 250. In some examples, when the temperature change per unit time is lower than the second reference value (e.g., +2°C), ice making may be continued without supplying water to the reservoir 250.

[0535] Referring to FIG. 34, first, the temperature of the reservoir may be measured by the temperature sensor 260a (S301). For example, the reservoir temperature may be measured before an ice-making and compression operation are performed, and the reservoir temperature may be measured after the ice-making and compression operation are performed.

[0536] Then, it is determined whether the reservoir temperature has increased or decreased by at least a predetermined temperature (e.g., ±2°C) after the ice-making and compression operation (S302) are performed. That is, a change in the reservoir temperature before and after the ice-making and compression operation may be measured.

[0537] When it is determined in step S302 that the reservoir temperature has increased or decreased by at least the predetermined temperature (e.g., ±2°C) after the ice-making and compression operation are performed, it is determined that no water is present in the reservoir 250 or that the water level is lower than the predetermined water level, and water may be supplied to the reservoir 250 (S303).

[0538] In some examples, when it is determined that the reservoir temperature has not increased or decreased by at least the predetermined temperature after the ice-making and compression operation are performed, it is determined that water is present in the reservoir 250 or that the water level is higher than the predetermined water level, and ice making is performed without supplying water to the reservoir 250 (S304).

[0539] Further, while ice making is performed, the output of the heater 255 may be controlled. In this case, to prevent freezing in the reservoir 250, when the reservoir temperature is equal to or lower than a predetermined value, the heater output may be increased, and when the reservoir temperature is equal to or higher than the predetermined value, the heater output may be decreased, such that the reservoir temperature is maintained at a substantially constant temperature.

[0540] When the temperature sensor 260a of the reservoir 250 is exposed to air and the temperature rapidly decreases, it may be determined that no water is present and water supply may be performed. Also, when the temperature sensor 260a of the reservoir 250 is disposed adjacent to the heater 255 and the temperature rapidly increases, it may be determined that no water is present and water supply may be performed.

[0541] Further, excluding temperature factors sensed by the temperature sensor 260a, the heater 255 may be variably controlled based on various factors. Here, variable control of the heater output may include switching the heater 255 from an ON state to an OFF state or from an OFF state to an ON state. In some examples, the heater 255 may be variably controlled based on various factors in addition to temperature factors sensed by the temperature sensor 260a.

[0542] The heater 255 may be variably controlled based on a change in cooling capacity. The cooling capacity may include a compressor output, a damper opening degree that controls a flow of cold air, a refrigerant valve opening degree, and a fan output. When the cooling capacity increases, the output of the heater 255 may be controlled to increase, and when the cooling capacity decreases, the output of the heater 255 may also be controlled to decrease.

[0543] In addition, when a target temperature of the freezing space 19 is changed by a notch change, the output of the heater 255 may be variably controlled. That is, when the target temperature of the freezing space 19 decreases, the output of the heater 255 may be controlled to increase, and when the target temperature of the freezing space 19 increases, the output of the heater 255 may be controlled to decrease.

[0544] Further, in a refrigerator including one compressor and two evaporators for lowering temperatures of the freezing space 19 and the refrigerating space 18, when a target temperature of the refrigerating space 18 is changed by a notch change, the output of the heater 255 may also be variably controlled. That is, when the target temperature of the refrigerating space 18 decreases, the output of the heater 255 may be controlled to increase, and when the target temperature of the refrigerating space 18 increases, the output of the heater 255 may be controlled to decrease.

[0545] Further, the heater 255 may be variably controlled based on a change in an ambient temperature (RT) of an installation space of the refrigerator. That is, when the ambient temperature (RT) decreases, the output of the heater 255 may be controlled to decrease, and when the ambient temperature (RT) increases, the output of the heater 255 may also be controlled to increase.

[0546] Further, the output of the heater 255 may be variably controlled based on whether a refrigerator door is opened.

[0547] The refrigerator door may include a freezing space door and a refrigerating space door. In general, when the refrigerating space door is opened, an internal temperature rises. Accordingly, when opening of the refrigerating space door is detected, the output of the heater 255 may be controlled to decrease.

[0548] In some examples, when the ambient temperature (RT) of the installation space is lower than the internal temperature, opening the refrigerating space door may cause the internal temperature to decrease. In this case, when opening of the refrigerating space door is detected, the output of the heater 255 may be controlled to increase.

[0549] Further, after opening the refrigerator door, when a door-load operation is performed and thus the cooling capacity increases, the output of the heater 255 may be controlled to increase. When the door-load operation is terminated and thus the cooling capacity decreases, the output of the heater 255 may also be controlled to decrease.

[0550] Further, before a defrost operation is started, when cooling capacity increases while the internal temperature is lowered in advance so that the internal temperature is not excessively increased during the defrost operation, the output of the heater 255 may be controlled to increase.

[0551] When cooling capacity decreases due to the defrost operation, the output of the heater 255 may be controlled to decrease. When cooling capacity increases upon termination of the defrost operation, the output of the heater 255 may be controlled to increase.

[0552] Further, upon initial application of power to the refrigerator, the output of the heater 255 may be controlled to increase.

[0553] Further, when an ice-full state is detected, the output of the heater 255 may be controlled to decrease, and when the ice-full state is released, the output of the heater 255 may be controlled to increase.

[0554] Further, in a situation where ice is not generated for reasons other than the ice-full state, the output of the heater 255 may be controlled to decrease, and when ice generation is resumed, the output of the heater 255 may be controlled to increase.

[0555] When an excessive heater output is applied to the heater for reservoir 250, due to an increase in a temperature in the reservoir 250, an amount of ice produced may be reduced, thereby degrading ice-making performance. In some examples, when the heater output is insufficient, freezing may occur due to a decrease in the temperature in the reservoir 250, and ice making may stop.

[0556] In the present disclosure, by performing feedback control of the heater output according to conditions, an optimal amount of heat may be applied to the reservoir 250. In addition, it is possible to determine whether water supply to the reservoir 250 is started using the reservoir temperature and to respond promptly. Further, even when no temperature sensor is provided, feedback control may be performed based on an operating state of the refrigerator to apply an optimal output of the heater to the reservoir 250.

[0557] FIG. 35 is a perspective view schematically illustrating an example structure of an ice-making part, and FIG. 36 is a front view schematically illustrating an example structure of an ice-making part, and FIG. 37 is a front view schematically illustrating an example structure of an ice-making part.

[0558] In the following description, the refrigerator of the present disclosure may be implemented such that all components other than a spraying unit 260 are the same as or similar to those shown in FIGS. 1 to 15D.

[0559] Further, various combinations are possible depending on various shapes of the tray, whether a reservoir is provided, and whether the spraying unit is provided, and accordingly various implementations may be derived. That is, with the reservoir provided, the spraying unit 260 may be additionally provided such that water supply by the reservoir and water supply by the spraying unit 260 are performed simultaneously or selectively.

[0560] In some implementations, the spraying unit 260 sprays water to a circumferential surface 242 of the tray 241. However, the scope of the present disclosure is not limited thereto, and other implementations of water supply in addition to a spraying method may be provided as long as water is supplied to the circumferential surface 242 of the tray 241.

[0561] Referring to FIGS. 35 to 37, in some implementations, ice making may be performed without a reservoir. In addition, instead of the reservoir, the spraying unit 260 configured to spray a fluid (water) toward the tray 241 may be installed at one side of the tray 241. In some implementations, the spraying unit 260 is provided while the reservoir is also provided.

[0562] The tray 241 may be a rotating body, and the spraying unit 260 may be a stationary body. The spraying

unit 260 may include a spray nozzle 261 configured to spray water onto the tray 241. The spraying unit 260 may include a pump, a motor, and the like such that water is sprayed through the spray nozzle 261.

[0563] The spraying unit 260 may include an adjusting means for adjusting a size of water droplet particles sprayed through the spray nozzle 261. The spraying unit 260 may include an adjusting means for adjusting an amount of water sprayed from the spraying unit 260 to the circumferential surface of the tray.

[0564] The spraying unit 260 may be connected to a water supply tank 270 storing water to be supplied to the tray 241 and may receive water through a water supply hose 271. Alternatively, the spraying unit 260 may be directly connected to a water source and may receive water from the water source through the water supply hose 271.

[0565] The spraying unit 260 may spray water to the circumferential surface 242 of the tray 241 at a fixed position. Alternatively, the spraying unit 260 may spray water to the circumferential surface 242 of the tray 241 while moving along the circumferential surface 242 of the tray 241.

[0566] The spraying unit 260 may be disposed at a single position, or a plurality of spraying units 260 may be provided. The plurality of spraying units 260 may be disposed to be spaced apart from each other along a circumferential direction of the circumferential surface 242 of the tray 241.

[0567] Further, when the spraying unit 260 is disposed adjacent to the circumferential surface 242 of the tray 241 and an excessive amount of water is sprayed at one time, water may not remain on the tray 241 and may flow down, thereby freezing on other components, or the water sprayed onto the tray 241 may flow down without being completely frozen. In some examples, when an excessively small amount of water is sprayed onto the circumferential surface 242 of the tray 241, an amount of ice produced may decrease.

[0568] In some examples, an appropriate amount of water may be uniformly sprayed only onto the circumferential surface 242 of the tray 241. For this purpose, various parameters such as a size and position of the spray nozzle 261, a particle size of sprayed water droplets, a spraying pressure, and an amount of sprayed water may be variously set.

[0569] In addition, a rotation speed of the tray 241 may be appropriately set. If the tray 241 rotates too fast, a problem may occur in that ice-separating from the tray may performed while the water sprayed onto the tray 241 is not completely frozen. In some examples, if the rotation speed of the tray 241 is too slow, a problem may occur in that an ice-making speed and an amount of ice produced may decrease.

[0570] For example, when the temperature of the freezing space is lower than a reference temperature, a driving motor may be controlled such that the rotation speed of the tray 241 increases, and when the temperature of the freezing space is higher than the reference temperature, the rotation speed of the tray 241 may be controlled to decrease. Further, when the temperature of the freezing space is higher than the reference temperature, rotation of the tray 241 may be temporarily stopped.

[0571] That is, the rotation speed of the tray 241 may be controlled such that water sprayed onto the circumferential surface 242 of the tray 241 by the spraying unit 260 may be sufficiently frozen before reaching a first blade 280. The tray 241 may rotate while being connected to the driving motor during a process in which water is sprayed from the spraying unit 260, the sprayed water is frozen, and frozen ice is separated. In a freezing stage of the water, the driving motor may be controlled such that the rotation speed of the tray 241 decreases or the tray 241 stops rotating.

[0572] For example, the circumferential surface 242 of the tray 241 may be formed to be smooth without forming unevenness. As another example, the circumferential surface 242 may have unevenness formed in at least a partial section such that supplied water does not flow down and is retained. The unevenness may be formed in various directions and shapes including a circumferential direction and an axial direction.

[0573] The circumferential surface 242 may be disposed adjacent to the first blade 280 such that ice formed on the circumferential surface 242 contacts the first blade 280. The ice-making part may include the first blade 280 contacting frozen ice to separate the frozen ice from the tray assembly 240, and the first blade 280 and the spraying unit 260 may be disposed opposite to each other.

[0574] For example, the first blade 280 may be disposed at a lower portion of one side with respect to a rotational center of the tray 241, and the spraying unit 260 may be disposed at an upper portion of the other side. Referring to FIG. 36, when the tray 241 rotates counterclockwise, the spraying unit 260 may spray water at an upper right portion of the tray 241, and the first blade 280 may be disposed at a lower left portion of the tray 241 to perform ice-separating.

[0575] When the spraying unit 260 sprays water at the upper right portion of the tray 241 and the tray 241 rotates counterclockwise, water supplied to the tray 241 remains at an upper side of the tray 241 while the tray 241 rotates by a half turn, so that the water does not flow down from the tray 241, and ice making may be performed on the circumferential surface 242 during that time.

[0576] Further, when the first blade 280 is disposed to be spaced apart from the spraying unit 260 as much as possible, the water supplied to the tray 241 may remain on the circumferential surface 242 as long as possible before being separated by the first blade 280, and thus ice-separating may be performed after ice making is more reliably completed. In this sense, referring to FIG. 36, when the tray 241 rotates counterclockwise, the spraying unit 260 may spray water at the upper right portion of the tray 241, and the first blade 280 may be disposed at a lower center portion of the tray 241 or a

lower right portion of the tray 241 to perform ice-separating.

[0577] The first blade 280 may be disposed adjacent to a rotation path of the tray 241. In particular, the first blade 280 may be disposed adjacent to the circumferential surface 242 when the tray 241 rotates. The circumferential surface 242 may form unevenness in an axial direction, i.e., a recess 241a and a protrusion 241b.

[0578] Referring to FIG. 35, based on driving of the driving motor, the tray 241 may rotate. In the spraying unit 260, water may be sprayed and supplied to the circumferential surface 242 of the tray 241 through the spray nozzle 261. As the tray 241 rotates, even when the spraying unit 260 is fixed and sprays water, water may be supplied to the entire circumferential surface 242 of the tray 241.

[0579] Further, due to cold air supplied through a cold air duct, water supplied to the circumferential surface 242 may be cooled and phase-changed into a thin ice state. A state of the ice cooled on the circumferential surface 242 may be referred to as a "first state." The ice in the first state may be formed on surfaces of the recess 241a and the protrusion 241b provided on the circumferential surface 242.

[0580] While ice making of the water supplied to the circumferential surface 242 is performed as described above, the tray 241 may stop or rotate. Specifically, after water is supplied to the circumferential surface 242 of the tray 241, while ice making is performed on the circumferential surface 242, the driving motor may be controlled such that the tray 241 does not rotate and stops rotating. Alternatively, after water is supplied to the circumferential surface 242 while the tray 241 rotates, the driving motor may be controlled such that the tray 241 maintains the rotational operation while ice making is performed.

[0581] Alternatively, after water is supplied to the circumferential surface 242 while the tray 241 rotates at a first speed, while ice making is performed, the driving motor may be controlled such that the tray 241 rotates at a second speed lower than the first speed. Alternatively, the driving motor may be controlled such that the tray 241 rotates at a third speed higher than the first speed while ice making is performed.

[0582] Alternatively, after water is supplied to the circumferential surface 242 while the tray 241 rotates in one direction, while ice making is performed, the driving motor may be controlled such that the tray 241 maintains rotation in the one direction.

[0583] Alternatively, after water is supplied to the circumferential surface 242 while the tray 241 rotates in one direction, while ice making is performed, the driving motor may be controlled such that the tray 241 rotates in another direction opposite to the one direction.

[0584] As an example, the tray 241 may stop while ice making of the water supplied to the circumferential surface 242 is performed. That is, after water is supplied to the circumferential surface 242 of the tray 241, while ice making is performed on the circumferential surface 242, the driving motor may be controlled such that the tray 241 stops rotating.

[0585] After a predetermined time elapses after water is supplied to the circumferential surface 242 of the tray 241, ice making may be completed. When ice making is completed on the circumferential surface 242, the driving motor may be controlled such that the tray 241 rotates again.

[0586] When the tray 241 rotates again, the first blade 280 may contact ice formed on the circumferential surface 242. During the contact, the ice may be separated from the circumferential surface 242. The separated ice may be introduced into the compression part 300, particularly a transfer pipe 340. The separating process may be performed while the tray 241 rotates by at least one rotation (360 degrees) such that ice formed on the circumferential surface 242 may be separated by the first blade 280.

[0587] In some examples, after separating is completed, the circumferential surface 242 may further rotate, and the spraying unit 260 may spray water again to supply water to the circumferential surface 242 of the tray 241. Water supplied to the circumferential surface 242 may remain on the recess 241a and the protrusion 241b due to surface tension. Such a water supply operation may be performed until the tray 241 rotates by one rotation (360 degrees) or more and water is supplied to the entire circumferential surface 242.

[0588] When water is supplied to the circumferential surface 242 of the tray 241, the tray 241 stops and ice making is performed again. In this case, the tray may rotate in a water supply stage, stop in an ice-making stage, and rotate in an ice-separating stage.

[0589] As another example, the tray 241 may continuously rotate while ice making of the water supplied to the circumferential surface 242 is performed. That is, after water is supplied to the circumferential surface 242 while the tray 241 rotates, the driving motor may be controlled such that the tray 241 maintains rotational operation while ice making is performed.

[0590] After water is supplied to the circumferential surface 242 of the tray 241, ice making may be completed after a predetermined time elapses. When water is supplied to the circumferential surface 242 of the tray 241, ice making may be simultaneously performed on the circumferential surface 242. While the tray 241 rotates by one rotation, water is sprayed from the spraying unit 260 so that water supply and ice making are simultaneously performed and ice making may be completed.

[0591] Alternatively, while the tray 241 rotates by one rotation, water is sprayed from the spraying unit 260 so that water supply and ice making are simultaneously performed, and with water supply stopped, the tray 241 may further rotate to complete ice making.

[0592] The first blade 280 may contact ice formed on the circumferential surface 242. During the contact, the ice may be separated from the circumferential surface 242. The ice-separating process may be performed while

the tray 241 rotates by at least one rotation (360 degrees) such that ice formed on the circumferential surface 242 may be separated by the first blade 280.

[0593] After ice-separating is completed, the circumferential surface 242 may further rotate, and the spraying unit 260 may spray water again to supply water to the circumferential surface 242 of the tray 241. Water supplied to the circumferential surface 242 may remain on the recess 241a and the protrusion 241b due to surface tension. Such a water supply operation may be performed until the tray 241 rotates by one rotation (360 degrees) or more and water is supplied to the entire circumferential surface 242.

[0594] While water is supplied to the circumferential surface 242 of the tray 241, ice making may be performed simultaneously. In some implementations, when the tray 241 rotates by one rotation, water supply, ice making, and ice-separating may be performed simultaneously. Accordingly, continuous ice making and harvesting are possible.

[0595] That is, while the tray 241 continuously rotates, water is sprayed onto the circumferential surface 242 from the spraying unit 260 disposed at one side of the tray 241. When water is sprayed onto the circumferential surface 242, the sprayed water is frozen on the circumferential surface 242, and ice frozen on the circumferential surface 242 may be separated by the first blade 280. Water may be sprayed again from the spraying unit 260 onto the circumferential surface 242, and the freezing and ice-separating processes may be repeatedly performed.

[0596] In some implementations, when the tray 241 rotates by one rotation, water supply and ice making may be simultaneously performed, and when the tray 241 further rotates, additional ice making may be continued and the ice-separating may be performed.

[0597] In some implementations, the first blade 280 may be movably provided. The first blade 280 may move away from the circumferential surface 242 of the tray 241 and then move closer to the circumferential surface 242 of the tray 241. In some implementations, where water supply, ice making, and ice-separating are simultaneously performed during one rotation of the tray 241, the first blade 280 may be maintained fixed at a first position.

[0598] In some implementations, where water supply and ice making are performed during one rotation of the tray 241, and when the tray 241 further rotates, additional ice making is continued and the ice-separating is then performed, the first blade 280 may stand by at a second position farther from the circumferential surface 242 of the tray 241 than the first position, and when ice making is completed, the first blade 280 may move to the first position to separate ice on the circumferential surface 242.

[0599] In some examples, when the reservoir is omitted and the spraying unit 260 is provided as described above, water introduced into the spraying unit 260 may freeze due to an ambient temperature, or the spray nozzle 261 may be blocked, causing difficulty in water spraying. To solve such a problem, the present disclosure may include a heater 265 such that water in the spraying unit 260 may be maintained above 0°C.

[0600] The heater 265 may be installed in the spraying unit 260, and since the heater 265 supplies heat to the spraying unit 260, it may be referred to as a "spraying-unit heater." The spraying unit 260 may have various shapes, and for example, may be formed in a cylindrical shape.

[0601] The heater 265 may have various forms. For example, the heater 265 may be provided in a line shape, and may be provided as a cord heater. As another example, the heater 265 may be provided as a planar heater. Various example heaters may be provided as long as the heater 265 converts electrical energy into thermal energy to supply heat to the spraying unit 260.

[0602] When the heater 265 has a line shape, the heater 265 may be installed on an outer surface of the spraying unit 260. The heater 265 may be installed on the outer surface of the spraying unit 260 by a winding method.

[0603] The heater 265 may be formed in a wire shape and may be wound in a spiral shape around the outer surface of the spraying unit 260. The heater 265 may be installed to wrap around the outer surface of the spraying unit 260 multiple times. After being wound on the outer surface of the spraying unit 260, the heater 265 may be covered with, for example, aluminum tape and fixed to the outer surface of the spraying unit 260.

[0604] The heater 265 may be embedded inside the spraying unit 260 such that the heater 265 is not exposed to an outer circumferential surface or an inner circumferential surface of the spraying unit 260, or may be installed on the inner circumferential surface of the spraying unit 260.

[0605] The spraying unit 260 may be formed of a thermally conductive material. For example, the spraying unit 260 may be formed of a metal material such as aluminum.

[0606] A wire may be connected to the heater 265, and on/off control of the heater 265 may be performed by a separate controller, and an output of the heater 265 and on/off time of the heater 265 may be controlled. The controller may control the heater 265 such that a temperature of the spraying unit 260 or a temperature of water in the spraying unit 260 is maintained above 0°C.

[0607] A separate temperature sensor may be provided in the spraying unit 260 to sense a temperature of the spraying unit 260 or a temperature of water in the spraying unit 260, and the controller may control the heater 265 based on temperature sensed by the temperature sensor.

[0608] For example, when the temperature of the spraying unit 260 or the temperature of water in the spraying unit 260 sensed by the temperature sensor is below 0°C, the controller may control the heater 265 to be turned on. As another example, when the sensed tem-

perature is above 0°C, the controller may control the heater 265 to be turned off.

[0609] As still another example, when the sensed temperature is below 0°C, the controller may control the output of the heater 265 to increase. In some examples, when the sensed temperature is above 0°C, the controller may control the output of the heater 265 to decrease.

[0610] In addition, when water is supplied to the circumferential surface 242 of the tray 241 by the spraying method, water may also be sprayed toward a periphery of the circumferential surface 242, which may cause freezing. To prevent such a problem, blocking walls may be installed at both sides of the circumferential surface 242 such that water sprayed from the spraying unit 260 does not escape outward from the circumferential surface 242 or flow down.

[0611] The blocking walls may be formed within a range that does not cause interference with the first blade 280 during rotation of the tray 241. Further, to avoid interference between the blocking walls and the first blade 280 during rotation of the tray 241, ice making may be performed while alternating the rotation direction of the tray 241 to clockwise direction and counter-clockwise directions

[0612] According to the present disclosure as described above, water is sprayed onto the circumferential surface of the rotating tray, and the sprayed water may be frozen on the circumferential surface of the tray. As the tray rotates, the frozen ice is separated by the blade, and the separated ice may be transferred to the compression part. Accordingly, water supply by the spraying method, freezing, and separating may be continuously performed while the tray rotates without a separate waiting time.

[0613] Further, freezing may be performed over the entire circumferential surface of the tray. Accordingly, continuous ice making may be performed over the entire tray surface without a waiting time, and a larger amount of powdered ice may be generated per unit time. As a result, a supply amount of powdered ice increases, thereby increasing a production speed of compressed ice, and a user may be provided with a large amount of compressed ice per unit time.

Claims

1. A refrigerator comprising:

a cabinet that defines a storage space;
a door configured to open and close at least a portion of the storage space;
an ice-making body provided at the cabinet or the door, the ice-making body having a peripheral portion configured to receive water and to generate ice;
a reservoir provided at a first side of the ice-making body and configured to store water to be supplied to the peripheral portion of the ice-making body; and
a heater disposed at the reservoir and configured to provide heat to the reservoir.

2. The refrigerator of claim 1, wherein the reservoir comprises a plurality of surfaces that defines a water storage space, and the heater is disposed on at least one of the plurality of surfaces.

3. The refrigerator of claim 1 or 2, wherein the reservoir comprises a surface that defines a water storage space, and the heater is disposed at an outside of the surface of the reservoir and configured to remain out of contact with the water in the water storage space.

4. The refrigerator of any one of claims 1 to 3, wherein the reservoir comprises a bottom surface that defines a bottom of the reservoir, and the heater is disposed at the bottom surface.

5. The refrigerator of any one of claims 1 to 4, wherein the reservoir comprises a surface having a predetermined height that defines a water level of the water in the reservoir, and the heater is disposed at the surface of the reservoir.

6. The refrigerator of any one of claims 1 to 5, wherein the reservoir comprises (i) a first surface defining a bottom surface of the reservoir and (i) a plurality of second surfaces that protrude from the bottom surface, and
wherein the heater is disposed on at least two surfaces among the first surface and the plurality of second surfaces of the reservoir.

7. The refrigerator of any one of claims 1 to 6, wherein the reservoir comprises a surface facing one surface of the ice-making body, and the heater is disposed on the surface of the reservoir and configured to keep the one surface of the ice-making body from reaching a freezing temperature.

8. The refrigerator of any one of claims 1 to 7, wherein the heater comprises a plurality of heater lines that are disposed on a surface of the reservoir and arranged in multiple rows on the surface of the reservoir.

9. The refrigerator of any one of claims 1 to 8, further comprising an ice-making bracket that accommodates the ice-making body and defines an opening configured to receive cooled air for cooling at least one of the ice-making body or the water received in the peripheral portion,
wherein the heater comprises a first portion disposed adjacent to the opening and a second portion disposed farther from the opening than the first portion.

10. The refrigerator of claim 9, wherein the reservoir defines a first installation area for the first portion of the heater and a second installation area for the second portion of the heater, the first installation area being greater than the second installation area.

11. The refrigerator of any one of claims 1 to 10, further comprising a blade disposed adjacent to the peripheral portion of the ice-making body and configured to separate the ice from the peripheral portion of the ice-making body,
wherein the heater comprises a first portion disposed adjacent to the blade and a second portion disposed farther from the blade than the first portion.

12. The refrigerator of claim 11, wherein an installation area of the second portion of the heater is greater than an installation area of the first portion of the heater.

13. The refrigerator of any one of claims 1 to 12, further comprising a temperature sensor disposed on a surface of the reservoir and configured to sense a temperature of the water stored in the reservoir,
wherein the temperature sensor is disposed at an outside of the surface of the reservoir and configured to remain out of contact with the water stored in the reservoir.

14. The refrigerator of any one of claims 1 to 12, further comprising a temperature sensor disposed on a surface of the reservoir and configured to sense a temperature of the water stored in the reservoir,
wherein the temperature sensor is disposed at an inside of the surface of the reservoir at a position lower than a maximum water level of the reservoir, the temperature sensor being configured to contact the water stored in the reservoir.

15. The refrigerator of claim 13 or 14, wherein the reservoir comprises a first region in which the temperature sensor is disposed and a second region in which the temperature sensor is absent, and
wherein a density per unit area of the heater disposed in the first region of the reservoir is less than a density per unit area of the heater disposed in the second region of the reservoir.

FIG. 1A

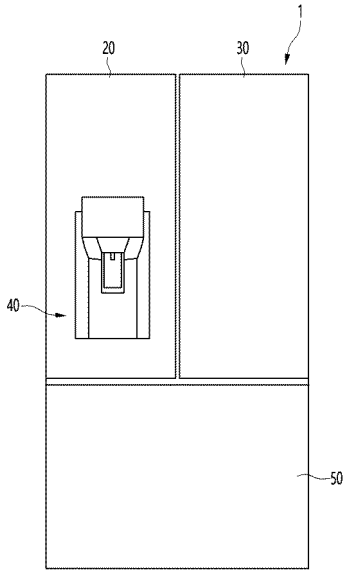


FIG. 1B

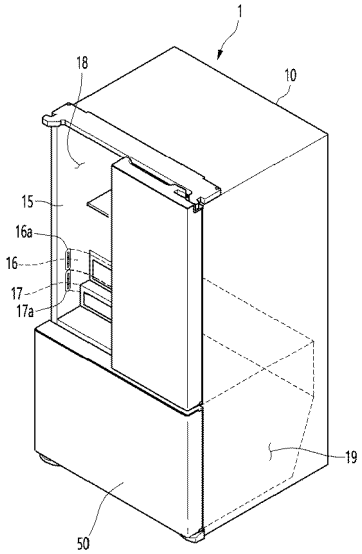


FIG. 2A

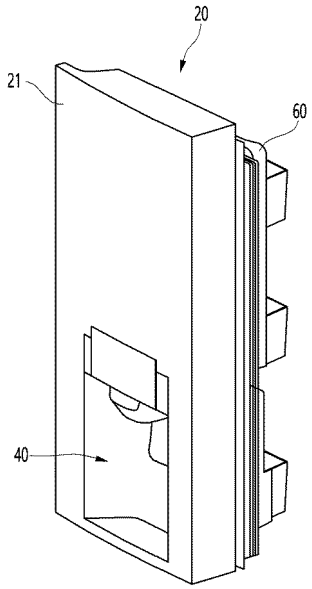


FIG. 2B

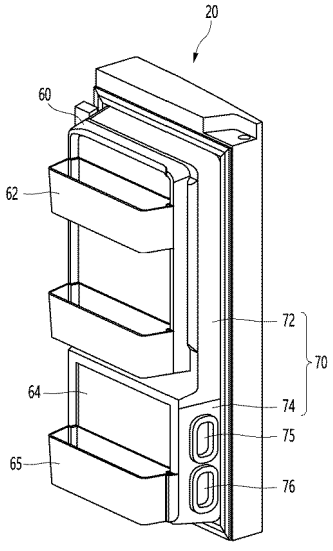


FIG. 3A

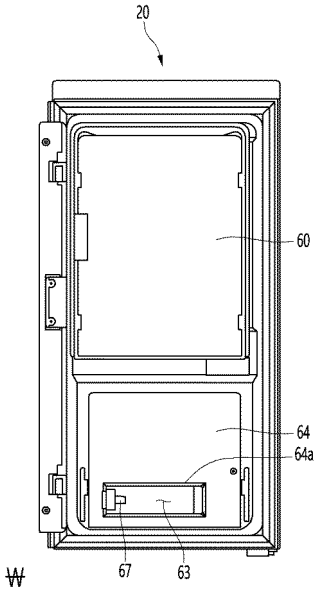


FIG. 3B

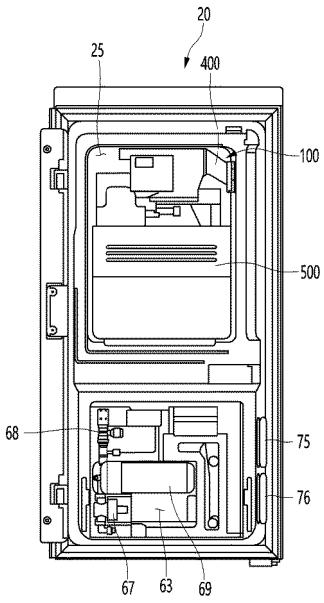


FIG. 4

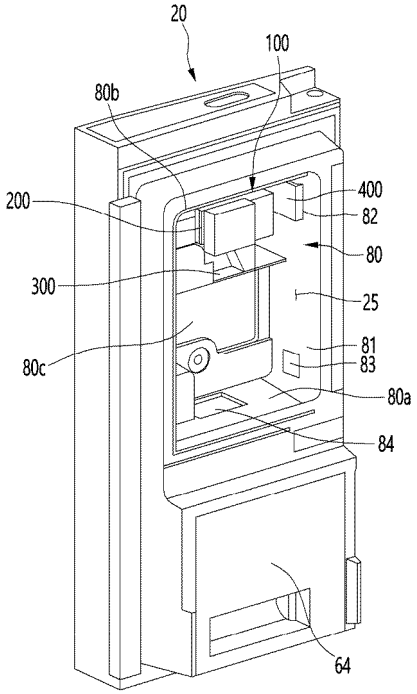

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80b
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400
82
80
300
25
81
83
80c
80a
84
64

FIG. 5

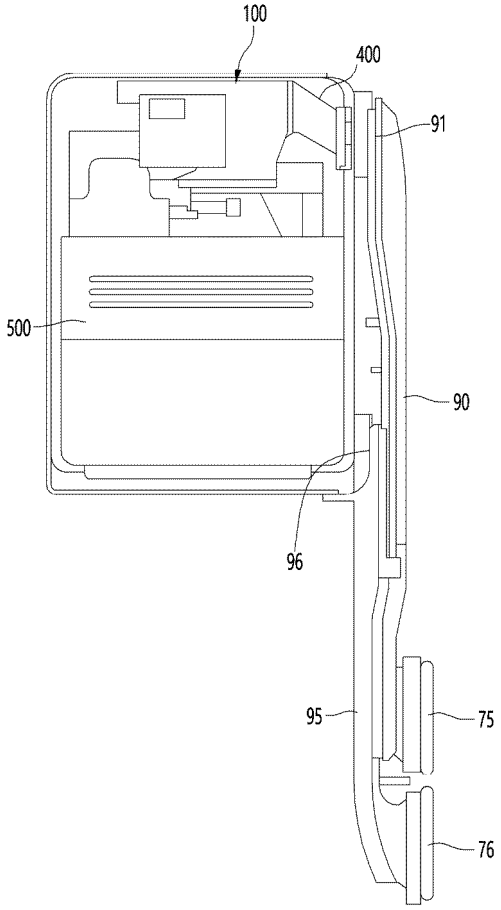

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91
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90
96
95
75
76

FIG. 6

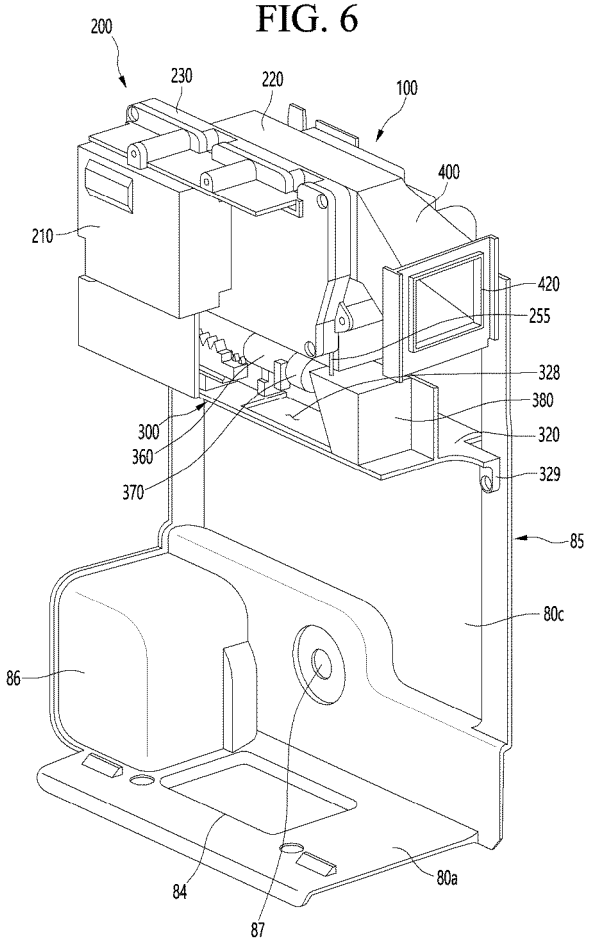

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230
220
100
400
210
420
255
328
380
320
329
300
360
370
85
80c
86
84
87
80a

FIG. 7

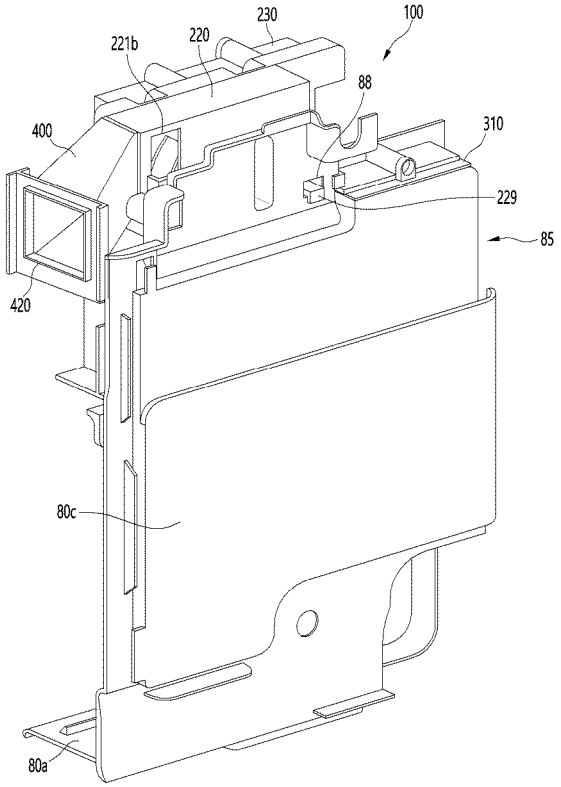

230
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221b
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88
400
310
229
85
420
80c
80a

FIG. 8

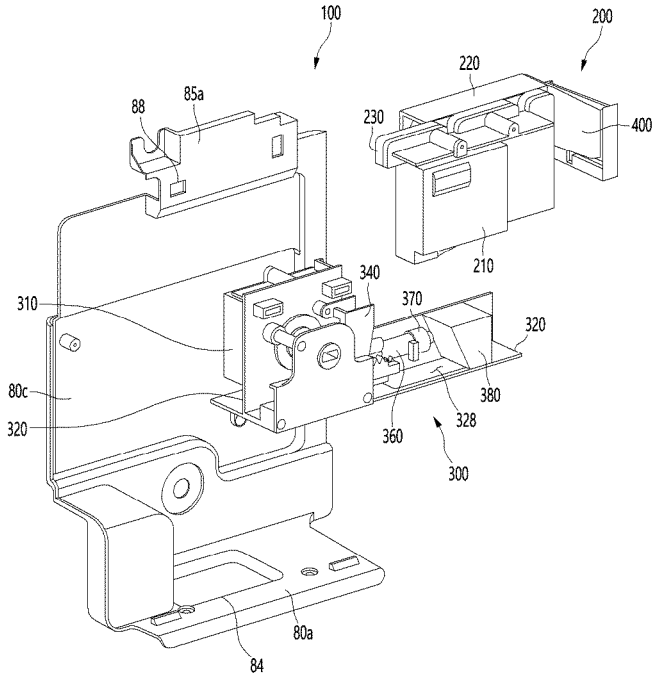

100
200
220
88
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370
310
320
80c
380
320
328
360
300
80a
84

FIG. 9

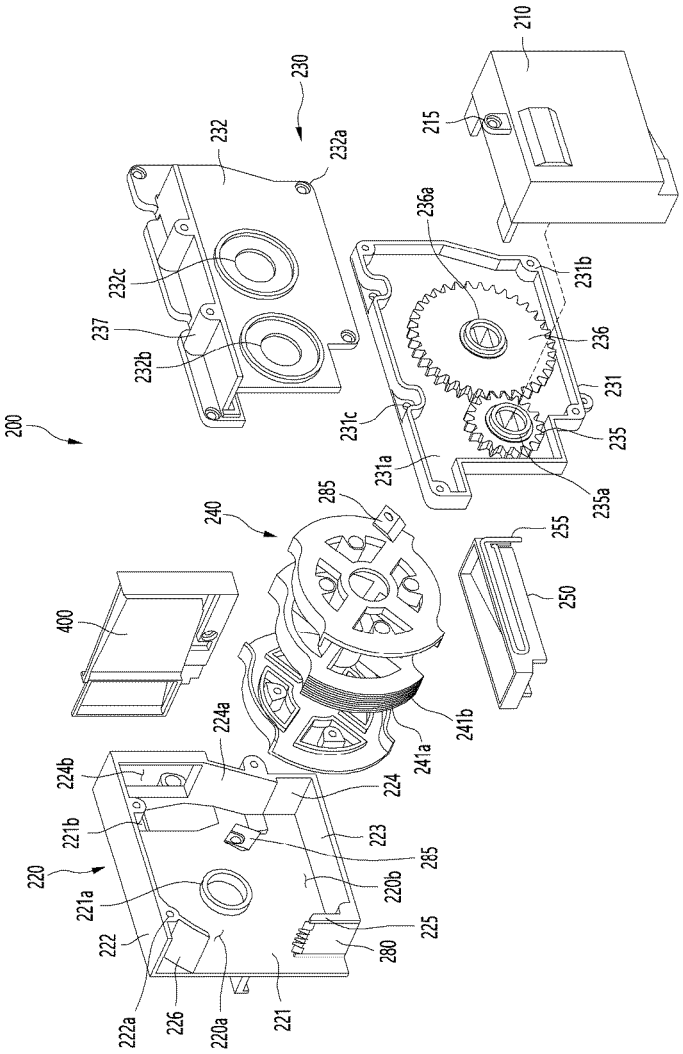

210
230
215
232
232a
236a
231b
232c
237
236
232b
231
231c
235
200
231a
235a
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255
250
400
241b
224a
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222a
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220a
221

FIG. 10

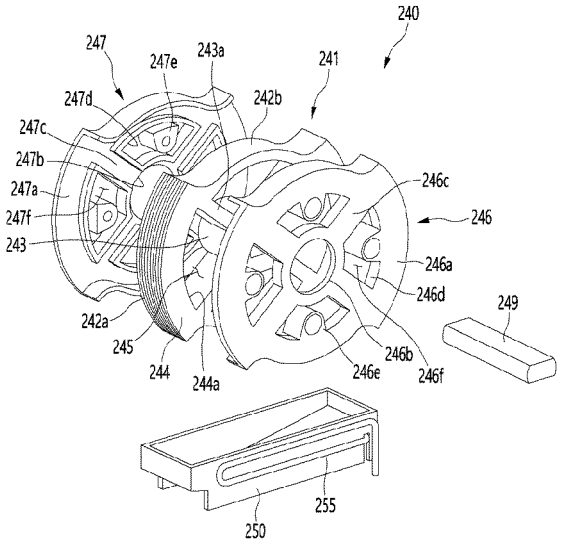


FIG. 11A

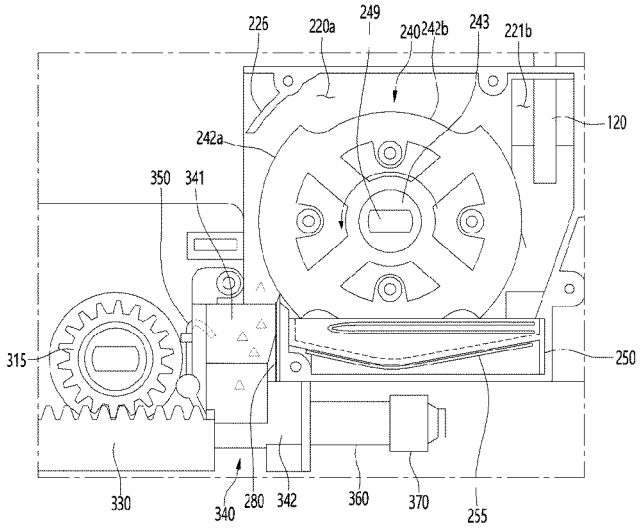


FIG. 11B

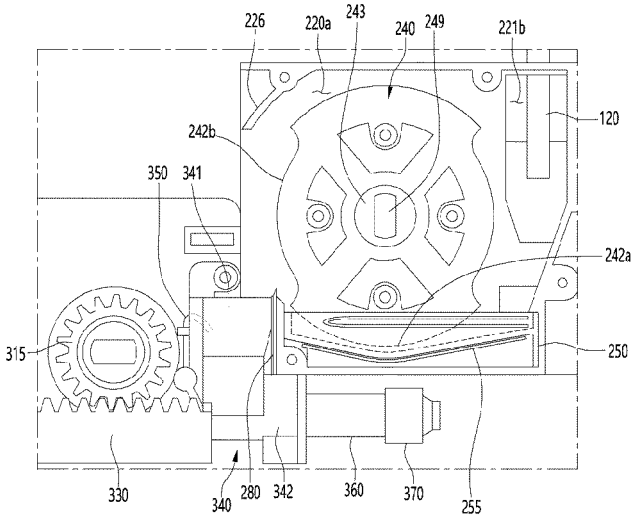


FIG. 12

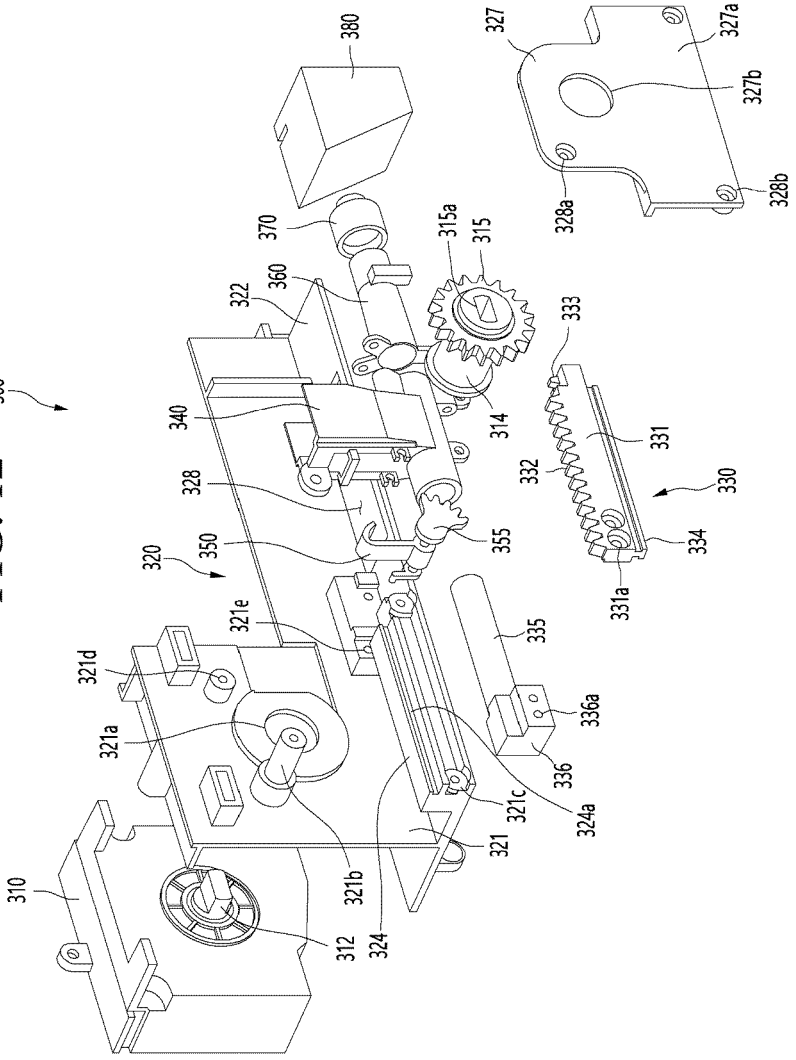

300
310
312
320
321
321a
321b
321c
321d
321e
322
324
324a
327
327a
327b
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328a
328b
330
331
331a
332
333
334
335
336
336a
340
344
345
347
350
351
351a
352
355
358
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315a
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341a
341b
342
343
343a
343b
343c

FIG. 13

FIG. 14

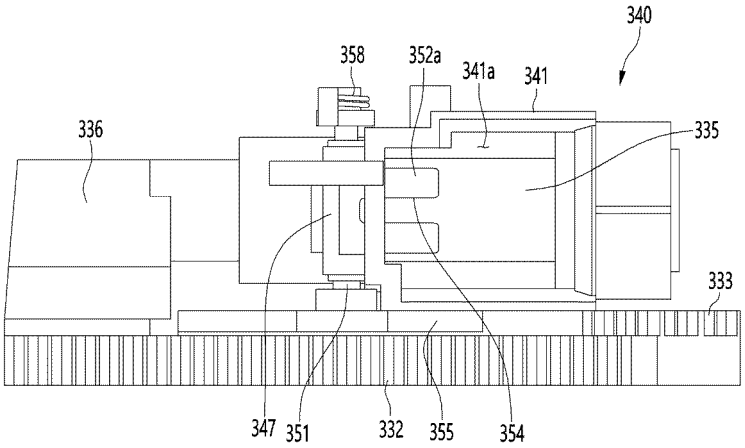


FIG. 15A

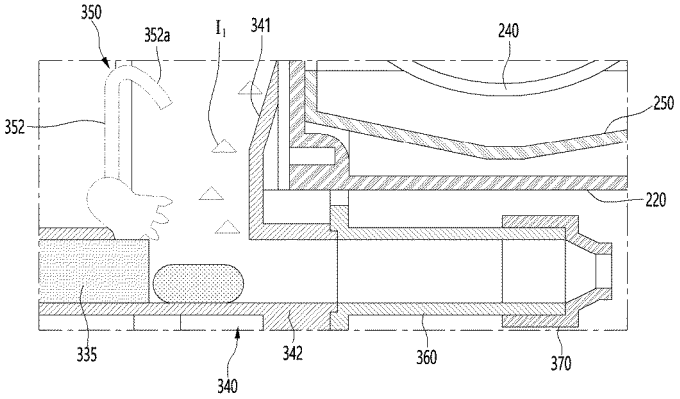


FIG. 15C

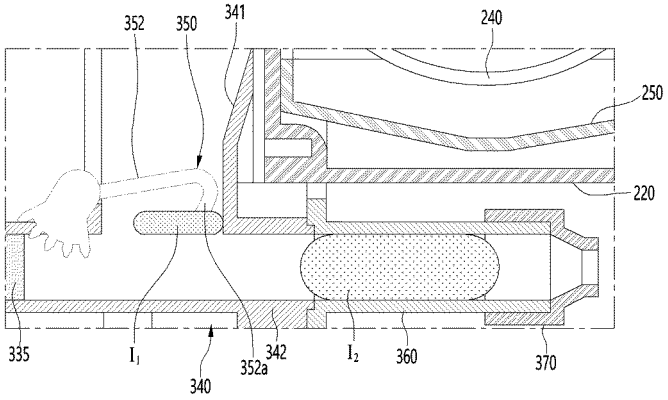


FIG. 15D

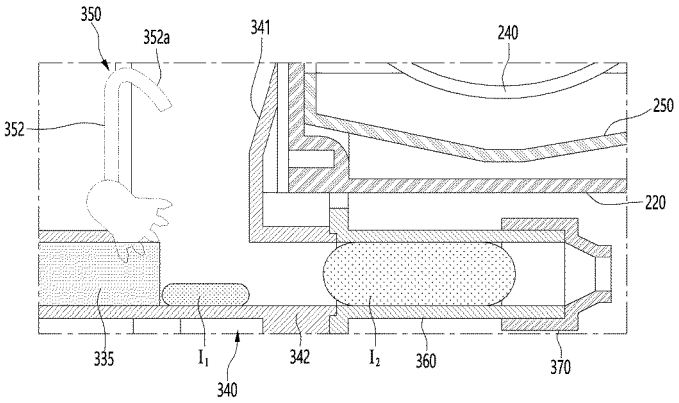


FIG. 16

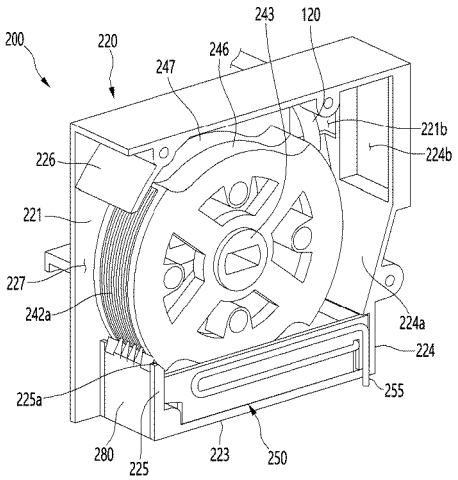


FIG. 17

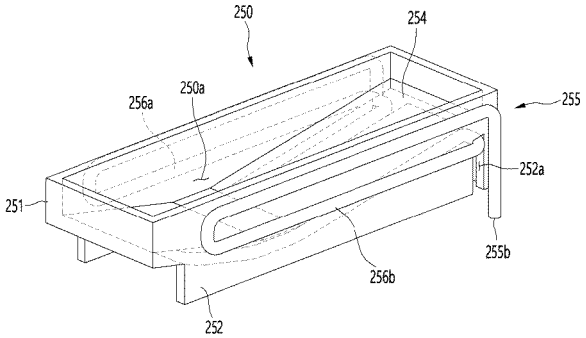


FIG. 18

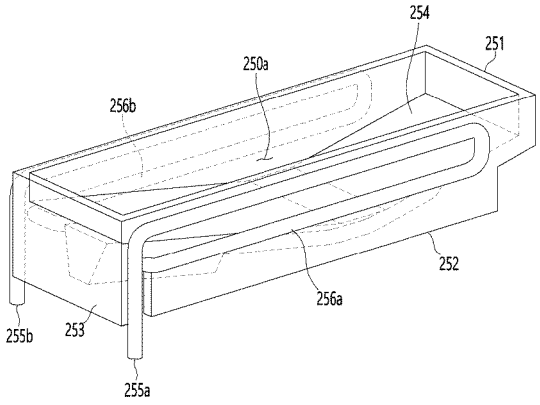


FIG. 19

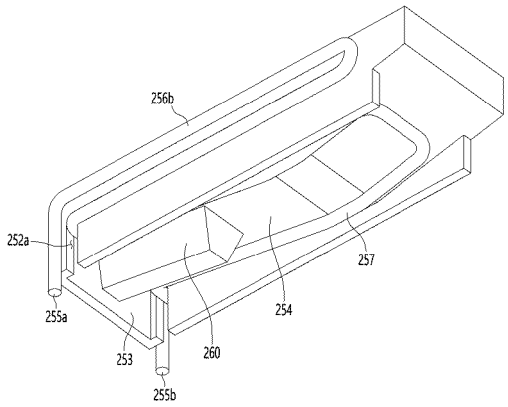


FIG. 20

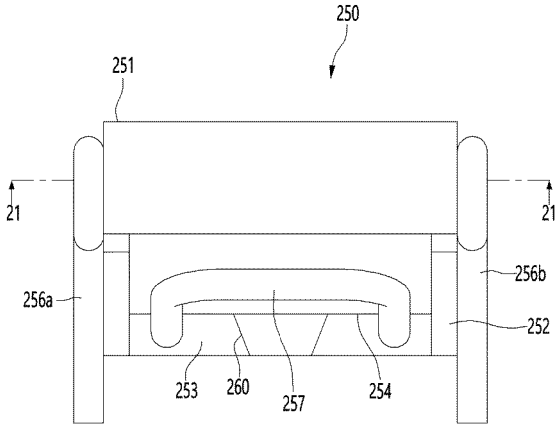


FIG. 21

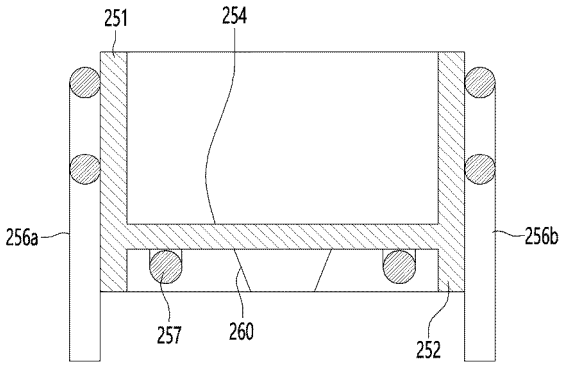


FIG. 22

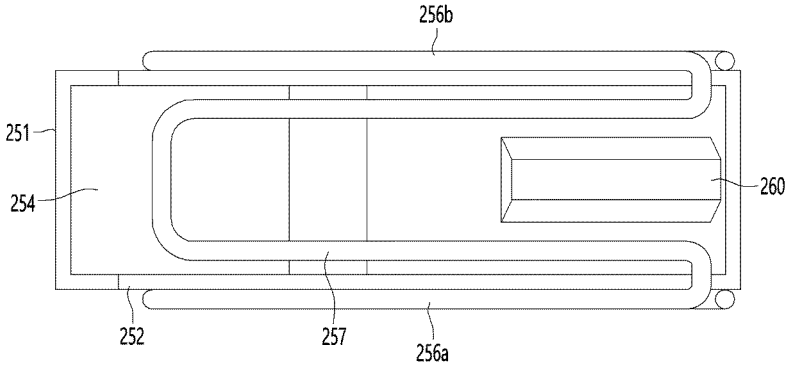


FIG. 23

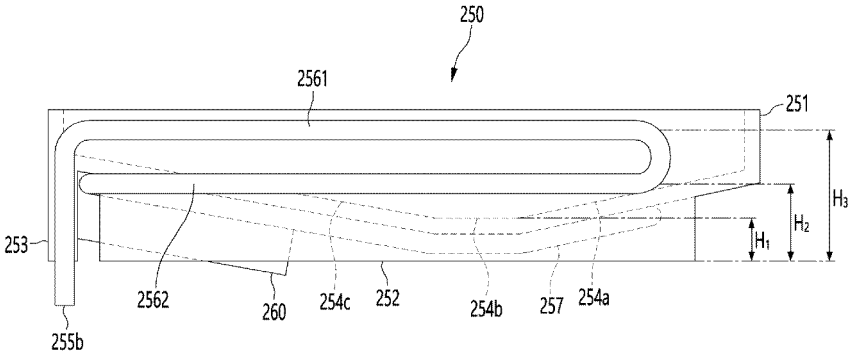


FIG. 24

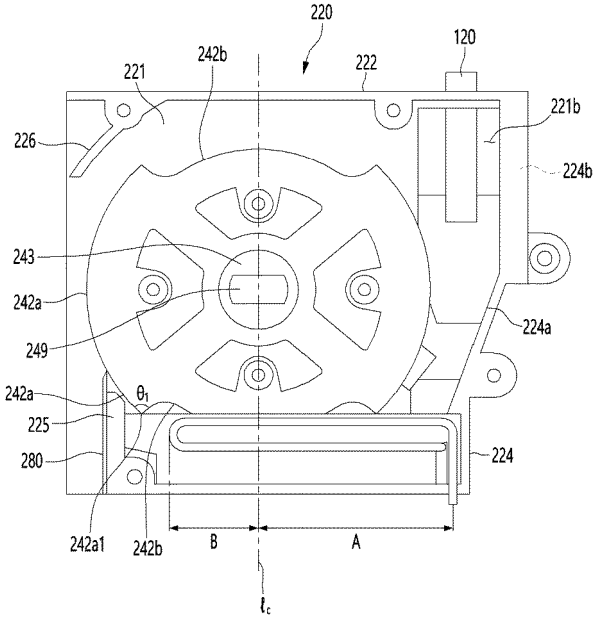

220
120
242b
221
222
221b
226
224b
243
242a
224a
249
242a
θ1
225
280
224
242a1
242b
B
A
ℓc

FIG. 25

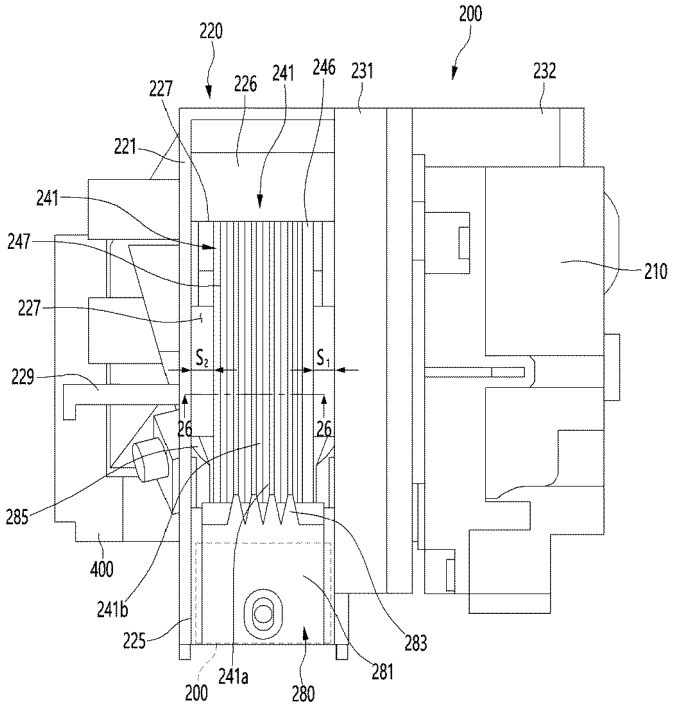

200
220
227
226
241
246
231
232
221
241
247
210
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S2
S1
229
26
26
285
400
241b
225
241a
200
280
283
281

FIG. 26

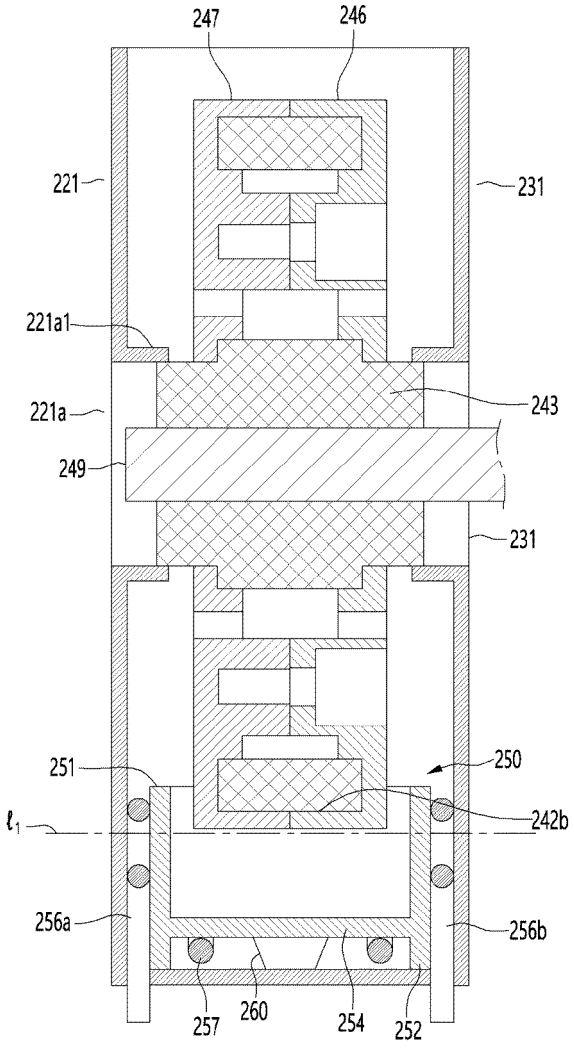

247
246
221
231
221a1
243
221a
249
231
251
250
242b
ℓ_1
256a
256b
257
260
254
252

FIG. 27

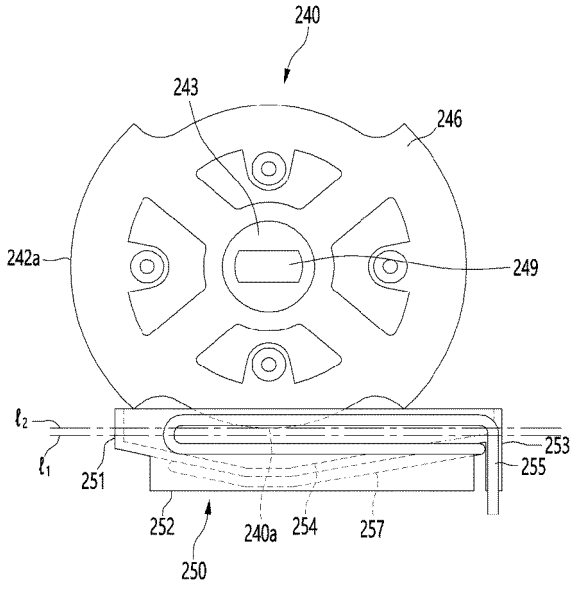

240
243
246
242a
249
ℓ_2
253
ℓ_1
251
255
252
240a
254
257
250

FIG. 28

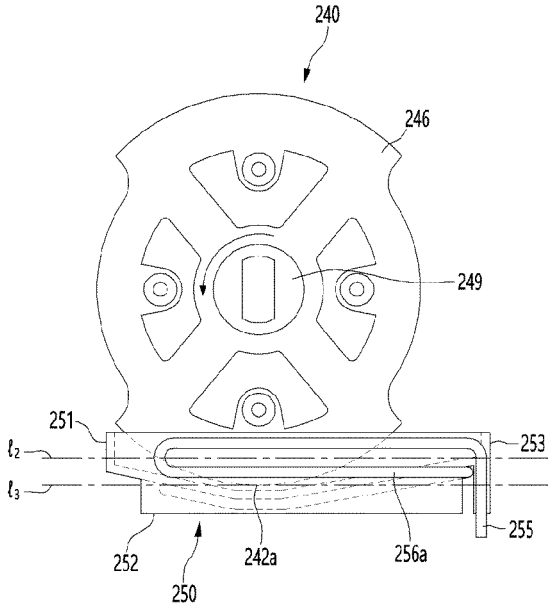

240
246
249
251
253
ℓ_2
ℓ_3
255
252
242a
256a
250

FIG. 29

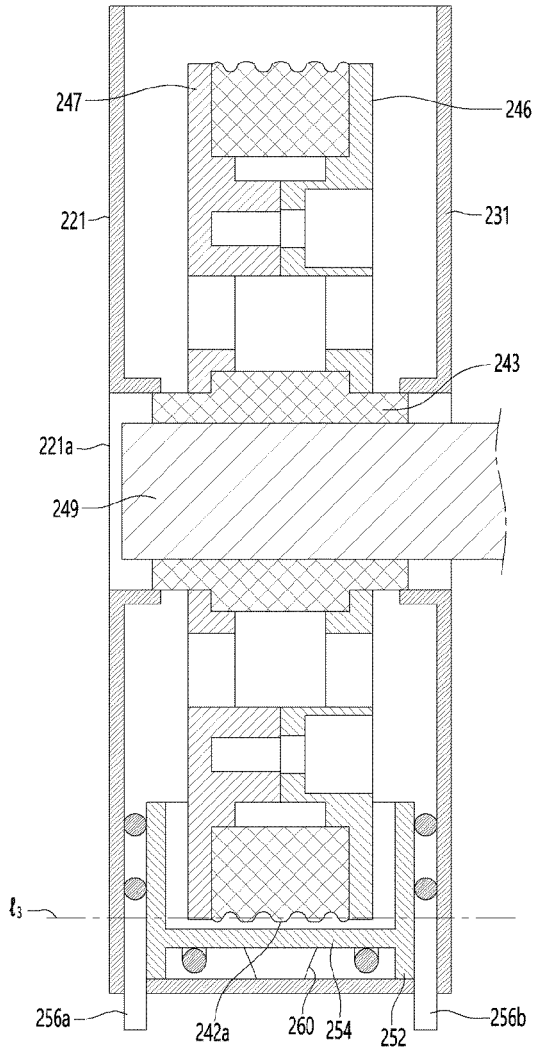

247
246
221
231
243
221a
249
ℓ_3
256a
242a
260
254
252
256b

FIG. 30

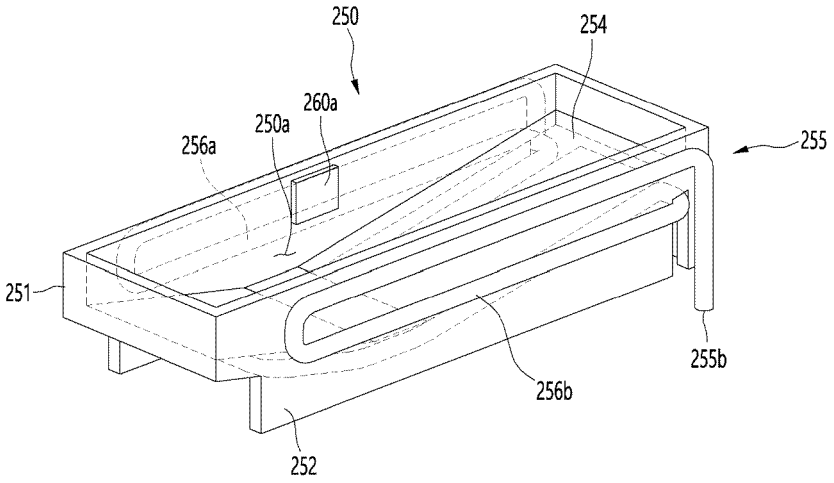

250
254
260a
250a
256a
255
251
255b
256b
252

FIG. 31

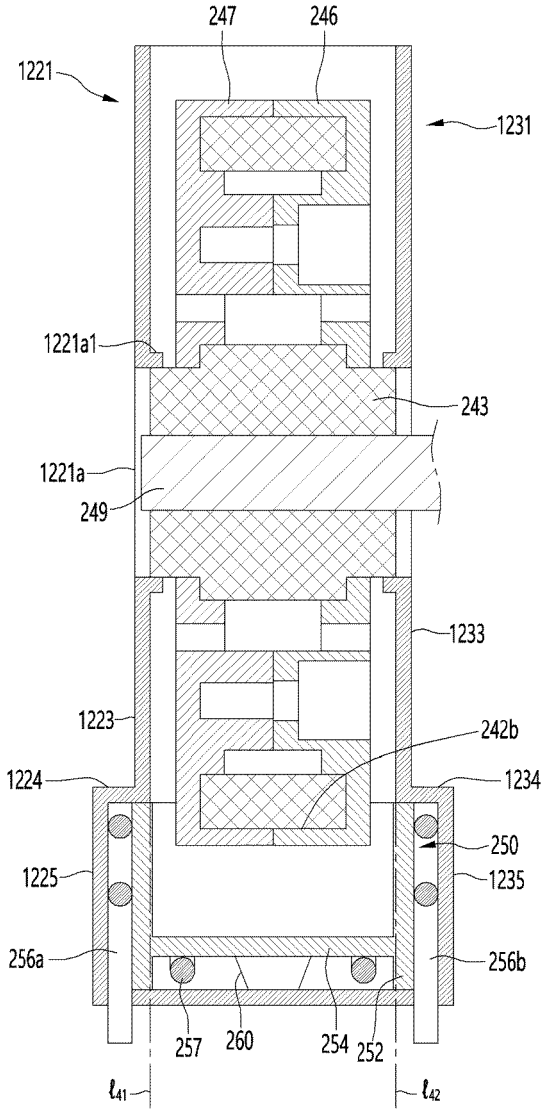

247
246
1221
1231
1221a1
243
1221a
249
1233
1223
242b
1224
1234
250
1225
1235
256a
256b
257
260
254
252
ℓ_{41}
ℓ_{42}

FIG. 32

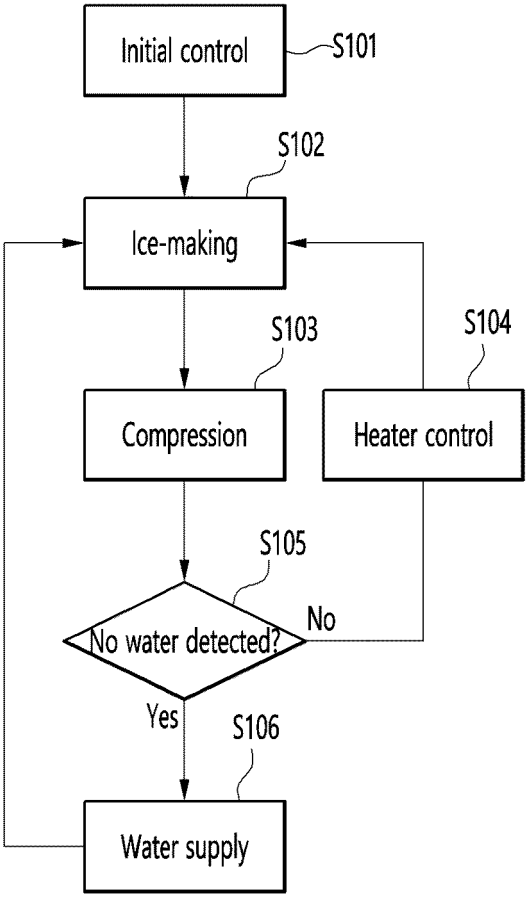

Initial control
S101
S102
Ice-making
S103
S104
Compression
Heater control
S105
No water detected?
No
Yes
S106
Water supply

FIG. 33

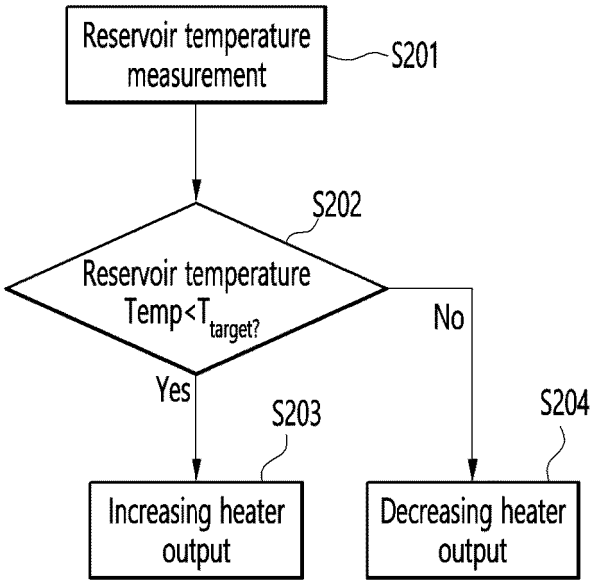

Reservoir temperature measurement
S201
S202
Reservoir temperature Temp<T target?
No
Yes
S203
S204
Increasing heater output
Decreasing heater output

FIG. 34

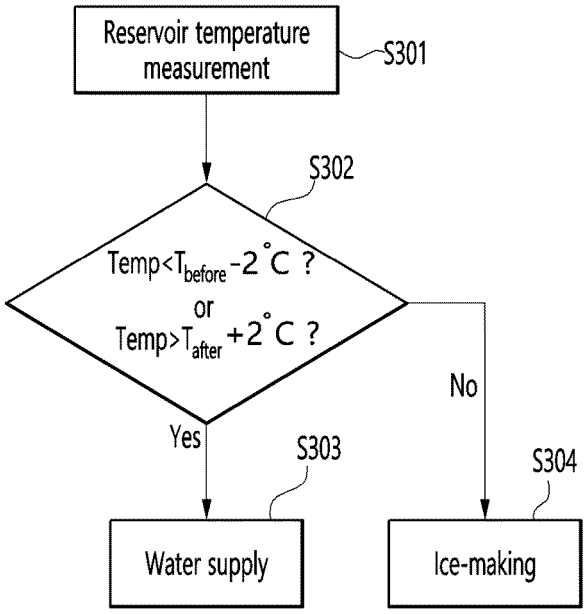

Reservoir temperature measurement
S301
S302
Temp<T_{before} -2°C ?
or
Temp>T_{after} +2°C ?
No
Yes
S303
S304
Water supply
Ice-making

FIG. 35

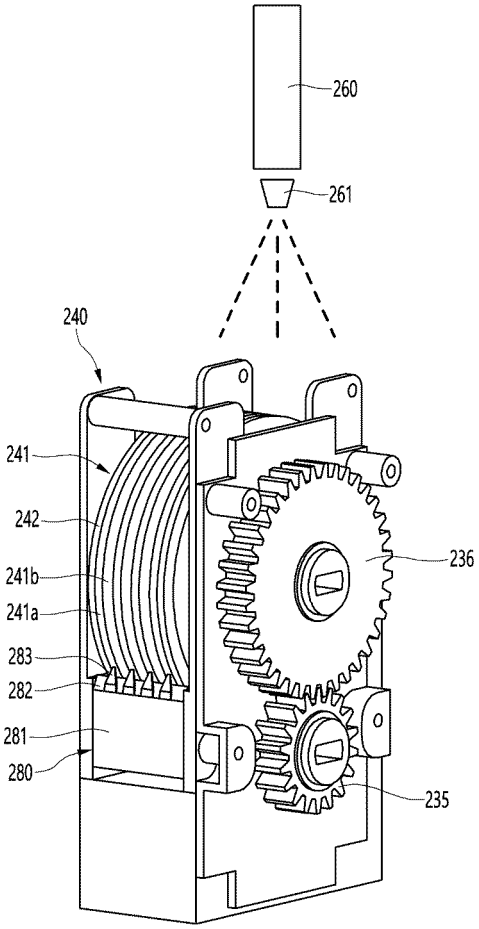

260
261
240
241
242
241b
241a
283
282
281
280
236
235

FIG. 36

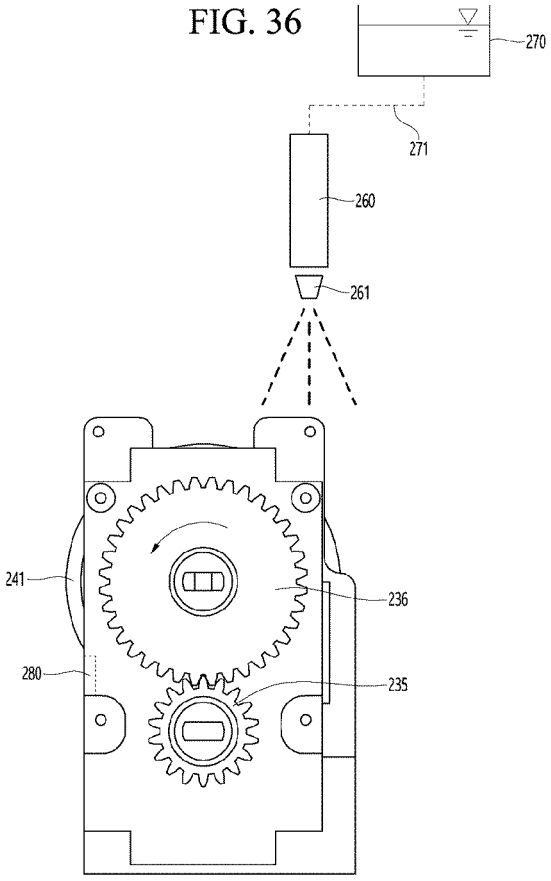
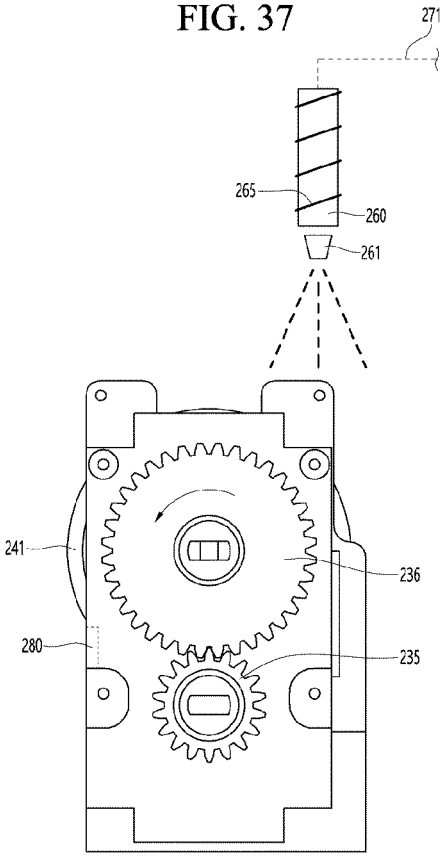


FIG. 37



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EUROPEAN SEARCH REPORT

Application Number
EP 26 16 9218

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2010/319366 A1 (KIM SEONG-JAE [KR] ET AL) 23 December 2010 (2010-12-23) * paragraph [0038] - paragraph [0067]; figures 1-11 *	1-15	INV. F25C1/24 F25C5/08 F25C5/20 F25C1/25 F25C5/04 F25D23/02
Y	CA 3 096 279 A1 (ELECTROLUX DO BRASIL SA [BR]) 24 October 2019 (2019-10-24) * page 10, line 1 - page 10, line 8; figures 1-11 *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

F25C
F25D

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
The Hague	13 July 2026	Kolev, Ivelin

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13-07-2026

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010319366 A1	23-12-2010	CN 102803873 A	28-11-2012
		EP 2446202 A2	02-05-2012
		KR 20100137302 A	30-12-2010
		US 2010319366 A1	23-12-2010
		WO 2010150977 A2	29-12-2010
CA 3096279 A1	24-10-2019	BR 112020021334 A2	09-02-2021
		CA 3096279 A1	24-10-2019
		KR 20200142512 A	22-12-2020
		US 2021033328 A1	04-02-2021
		WO 2019200443 A1	24-10-2019

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