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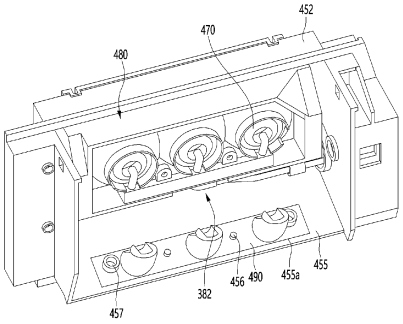
(54) ICE MAKER AND REFRIGERATOR

(57) A refrigerator according to the present embodiment may include a storage compartment in which articles are stored. The refrigerator may further include a cooler for supplying cold to the storage compartment. The refrigerator may further include a first tray portion forming a portion of an ice-making cell, which is a space in which water is phase-changed into ice by the cold. The refrigerator may further include a second tray portion which forms another portion of the ice-making cell and is disposed to be in contact with the first tray portion during an ice-making process and to be spaced apart from the first tray portion during an ice-separating process. The refrigerator may further include a water supply portion for supplying water to the ice-making cell. The refrigerator may further include a controller controlling the supply of cold to the storage compartment. The refrigerator may further include a pusher spaced apart from the second tray portion by a predetermined distance.

【Figure 14】



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Description

[Technical Field]

[0001] The present disclosure relates to an ice making device and a refrigerator.

[Background Art]

[0002] In general, a refrigerator is a home appliance for storing food at a low temperature in a storage space that is covered by a refrigerator door. The refrigerator is configured to keep stored food in an optimal state by cooling the inside of the storage space using cold air generated through heat exchange with a refrigerant circulating in a refrigeration cycle.

[0003] The refrigerator may be placed independently in a kitchen or a living room or may be accommodated in a kitchen cabinet.

[0004] The refrigerator is gradually becoming larger and more multi-functional in accordance with the change in dietary life and the trend of higher quality products. Refrigerators including various structures and convenience devices that take user convenience into consideration are being released.

[0005] An automatic ice maker is disclosed in Japanese Registration Patent No. 5687018 that is a prior art document.

[0006] The automatic ice maker includes an ice making chamber for forming ice, an evaporator disposed at an upper side of the ice making chamber, a water tray disposed at a lower side of the ice making chamber and rotatably supported on a support shaft, an ice making water tank assembled at a lower side of the water tray, a supply pump connected to one side of the ice making water tank, a guide member disposed at one side of the ice making water tank and being rotatable, and an ice storage compartment for storing ice.

[0007] In an ice making process, water is supplied from a supply pump while the water tray closes a space of the ice making chamber, and the water supplied to the ice making cell may be cooled by an evaporator.

[0008] In an ice separation process, high-temperature gas is supplied to the evaporator to heat the ice making cell, and at the same time, the water tray is tilted downward, and in a process of tilting the water tray downward, the guide member is rotated to cover an upper side of the water tray.

[0009] As the ice making cell is heated, ice is separated from the ice making cell, falls to an upper side of the guide member, and finally moves to the ice storage compartment.

[0010] However, in the prior art, during an ice making process, high- temperature gas is supplied to the evaporator to heat the ice making cell, but it does not disclose a technology for separating ice from the water tray in case the ice is not separated.

[0011] An ice maker capable of generating spherical ice is disclosed in Korean Patent Publication No. 10-2020-0057604 that is a prior art document.

[0012] The ice maker includes an upper assembly including one tray defining an upper chamber that is a part of an ice chamber; a lower assembly rotatable relative to the upper assembly and including another tray defining a lower chamber that is another part of the ice chamber and a supporter supporting another tray and having a lower opening, and a lower ejector having a lower pushing bar that penetrates the lower opening and presses another tray when the lower assembly is rotated to an open position for ice separation.

[0013] However, in the case of the ice maker, since the lower ejector presses another tray during an ice separation process, a structure for water supply cannot be installed in the supporter. Therefore, in the case of the ice maker, the water supply is installed in an upper assembly, and in order to generate transparent ice, there is a disadvantage that a heater must be placed and the heater must be operated during an ice making process.

[Disclosure]

[Technical Problem]

[0014] The present embodiment provides an ice making device and a refrigerator that can generate highly transparent ice without operating a heater.

[0015] Alternatively or additionally, one embodiment provides an ice making device and a refrigerator in which a sub liquid supplier installed on a supporter is prevented from interfering with a pusher during an ice making separation.

[0016] Alternatively or additionally, one embodiment provides an ice making device and a refrigerator in which bending of a tube through which liquid flows during movement of the second another tray is minimized.

[Technical Solution]

[0017] In one embodiment, a refrigerator may include a storage chamber where an item is stored. The refrigerator may further include a cooler for supplying cold to the storage chamber.

[0018] The refrigerator may further include a second one tray that defines a portion of an ice making cell that is a space in which liquid is phase-changed into ice by the cold. The refrigerator may further include a second another tray that defines another portion of the ice making cell and may be arranged to be in contact with the second one tray during an ice making process and to be spaced apart from the second one tray during an ice separation process.

[0019] The refrigerator may further include a sub liquid supplier configured to supply liquid to the ice making cell. The refrigerator may further include a driver connected to the second another tray.

[0020] The refrigerator may further include a controller

configured to control a supply of cold to the storage chamber. The refrigerator may further include a pusher spaced apart from the second another tray by a predetermined distance.

[0021] At least a portion of the sub liquid supplier may be movably provided to be located at different positions during the ice making process and the ice separation process.

[0022] The controller may control the second another tray to move to an ice separation position in a first direction to take out ice from the ice making cell after ice making in the ice making cell is completed and then move the second another tray in a second direction.

[0023] The first direction is different from the second direction. The first direction is a direction opposite to the second direction.

[0024] At least a portion of the sub liquid supplier may be disposed at one side of the second another tray.

[0025] The sub liquid supplier may include a first through hole through which liquid is introduced. The sub liquid supplier may further include a second through hole through which liquid is discharged. The sub liquid supplier may further include a pipe connecting the first through hole and the second through hole.

[0026] The second through hole may be arranged to supply liquid into the ice making cell through an opening formed at one side of the second another tray.

[0027] The second through hole may be movably provided to be located at different positions during the ice making process and the ice separation process.

[0028] The second through hole may be provided so that a position of the second through hole changes while the second another tray moves.

[0029] While the second another tray moves in a first direction, the second through hole may move in the first direction. While the second another tray moves in a second direction, the second through hole may move in the second direction.

[0030] In another embodiment, a refrigerator may include a storage chamber where an item is stored. The refrigerator may further include a cooler for supplying cold to the storage chamber.

[0031] The refrigerator may further include a second one tray that defines a portion of an ice making cell that is a space in which liquid is phase-changed into ice by cold. The refrigerator may further include a second another tray that defines another portion of the ice making cell and may be arranged to be in contact with the second one tray during an ice making process and to be spaced apart from the second one tray during an ice separation process.

[0032] The refrigerator may further include a controller that controls a supply of cold to the storage chamber. The refrigerator may further include a pusher spaced apart from the second another tray by a predetermined distance. The pusher may provide a path for a component to move.

[0033] The refrigerator may further include a sub liquid supplier for supplying liquid to the ice making cell. The refrigerator may further include a driver connected to the second another tray. The component may be a portion of the sub liquid supplier.

[0034] The pusher may be provided at one side of the second another tray.

[0035] The pusher may provide a through hole that allows a component to move through an interior.

[0036] The through hole may include a first through hole that allows the component to enter an inside of the pusher. The through hole may further include a hollow space provided so that a component passing through the first through hole passes through an inside of the pusher.

[0037] The through hole may include a second through hole that provides a position at which a component passing through the hollow space stops.

[0038] The pusher may include a wall that provides a position at which a component passing through the hollow space stops.

[0039] The pusher may have an opening formed therein so that a component can be moved therethrough. The opening may be formed at one side of the pusher.

[0040] At least a portion of the component may be disposed at one side of the pusher, and the opening may be formed at one side of the pusher. At least a portion of the component may be disposed at another side of the pusher, and the opening may be formed at another side of the pusher.

[0041] The opening may be provided to face an unopened wall.

[0042] In further another embodiment, a refrigerator may include a storage chamber where an item is stored. The refrigerator may further include a cooler for supplying cold to the storage chamber.

[0043] The refrigerator may further include a second one tray that defines a portion of an ice making cell that is a space in which liquid is phase-changed into ice by cold. The refrigerator may further include a second another tray that defines another portion of the ice making cell and may be arranged to be in contact with the second one tray during an ice making process and to be spaced apart from the second one tray during an ice separation process.

[0044] The refrigerator may further include a controller that controls a supply of cold to the storage chamber. The refrigerator may further include a pusher spaced apart from the second another tray by a predetermined distance.

[0045] At least a portion of the pusher may be provided to be separated from ice generated in the ice making cell during the ice making process, and may be provided to contact ice generated in the ice making cell during the ice separation process.

[0046] The controller may move the second another tray in a state in which ice generated in the ice making cell is in contact with at least a portion of the sub liquid supplier in the ice separation process.

[0047] After ice generated in the ice making cell comes

into contact with at least a portion of the sub liquid supplier, the controller may move the second another tray so that ice is spaced apart from the sub liquid supplier again. Alternatively, the controller may move the second another tray so that ice generated in the ice making cell or the second another tray is in contact with the pusher.

[0048] The controller may move the second another tray so that ice generated in the ice making cell in the ice separation process is in contact with at least a portion of the pusher.

[0049] The controller may move the second another tray so that ice generated in the ice making cell in the ice separation process is in contact with at least a portion of the sub liquid supplier after ice is in contact with at least a portion of the pusher. The controller may move the second another tray so that ice generated in the ice making cell is spaced apart from the sub liquid supplier again after ice is in contact with at least a portion of the sub liquid supplier.

[0050] The controller may move the second another tray so that ice generated in the ice making cell in the ice separation process is in contact with at least a portion of the sub liquid supplier and at least a portion of the pusher. The controller may move the second another tray so that ice generated in the ice making cell is spaced apart from the sub liquid supplier again after ice is in contact with at least a portion of the sub liquid supplier and at least a portion of the pusher.

[0051] In further another embodiment, an ice making device may include a second one tray that defines a portion of an ice making cell for generating ice. The ice making device may further include a second another tray that defines another portion of the ice making cell and may be in contact with the second one tray during an ice making process and spaced apart from the second one tray during an ice separation process.

[0052] The ice making device may further include a sub liquid supplier for supplying liquid to the ice making cell. The ice making device may further include a driver connected to the second another tray. The ice making device may further include a pusher spaced apart from the second another tray by a predetermined distance.

[0053] The sub liquid supplier may include a first through hole through which liquid is introduced. The sub liquid supplier may further include a second through hole through which liquid is discharged. The sub liquid supplier may further include a pipe connecting the first through hole and the second through hole.

[0054] The second through hole may be arranged to supply liquid into the ice making cell through an opening formed at one side of the second another tray.

[0055] The second through hole may be provided to be movable so as to be located at different positions during the ice making process and the ice separation process. The second through hole may be provided so that a position of the second through hole changes while the second another tray moves.

[0056] While the second another tray moves in a first direction, the second through hole may move in the first direction. While the second another tray moves in a second direction, the second through hole may move in the second direction.

[0057] The pusher may provide a path for a component to move.

[0058] The pusher may include a through hole that allows a component to move through an interior.

[0059] The pusher may include a first through hole for the component to enter an inside of the pusher and a hollow space provided for a component passing through the first through hole to pass through an inside of the pusher. The pusher may include a second through hole that provides a position at which a component passing through the hollow space stops. The pusher may include a wall that provides a position at which a component passing through the hollow space stops.

[0060] The pusher may include an opening formed therein so that a component can be moved therethrough. The opening may be formed at one side of the pusher. At least a portion of the component may be disposed at one side of the pusher, and the opening may be formed at one side of the pusher. Alternatively, at least a portion of the component may be disposed at another side of the pusher, and the opening may be formed at another side of the pusher.

[Advantageous Effects]

[0061] According to one embodiment, since, during an ice making process, liquid is supplied from a sub liquid supplier to the ice making cell, there is an advantage in that ice with high transparency can be generated without operating a heater.

[0062] According to one embodiment, since a through hole of a sub liquid supplier is aligned with an opening of the second tray assembly at an ice making position, there is an advantage in that liquid can be intensively supplied to the ice making cell.

[0063] According to one embodiment, since a pusher presses ice within the ice making cell or a tray during an ice separation process, there is an advantage in that ice can be completely separated from the ice making cell.

[0064] According to one embodiment, since a pusher provides a movement path for a sub liquid supplier, a sub liquid supplier installed on a supporter can be prevented from interfering with a pusher during an ice separation process.

[0065] According to one embodiment, since a tube through which liquid flows is disposed adjacent to a rotation center of a second another tray, bending of the tube can be minimized.

[Description of Drawings]

[0066]

FIG. 1 is a perspective view of an ice making device

according to one embodiment of the present invention.

FIG. 2 is a front view showing a door of an ice making device in an opened state according to one embodiment of the present invention.

FIG. 3 is a cross-sectional view showing an inside of an ice making device according to one embodiment of the present invention.

FIG. 4 is a diagram showing an interior of an ice making device according to one embodiment of the present invention.

FIG. 5 is a refrigerant cycle diagram constituting a cooler according to one embodiment of the present invention.

FIG. 6 is a diagram showing a liquid supply passage in an ice making device according to one embodiment of the present invention.

FIGS. 7 and 8 are perspective views showing liquid being supplied to an ice maker.

FIG. 9 is a perspective view showing an arrangement of a first tray assembly and a second tray assembly according to one embodiment of the present invention.

FIGS. 10 and 11 are perspective views showing an ice maker and a heat exchanger according to one embodiment of the present invention.

FIG. 12 is a bottom view of an ice maker according to one embodiment of the present invention.

FIG. 13 is a cross-sectional view taken along line 13-13 in FIG. 12.

FIG. 14 is a bottom perspective view of a second tray assembly of the present embodiment.

FIG. 15 is a perspective view of a supporter according to the present embodiment.

FIG. 16 is a diagram showing a sub_second liquid supplier installed on a supporter according to the present embodiment.

FIG. 17 is a cross-sectional view taken along line 17-17 of FIG. 16.

FIG. 18 is a perspective view of a pusher of the present embodiment.

FIG. 19 is a control block diagram of an ice making device of the present embodiment.

FIG. 20 is a diagram showing a process in which liquid is supplied to an ice maker during an ice making process.

FIG. 21 is a diagram showing an ice maker in an ice separation process.

[Mode for Invention]

[0067] Hereinafter, some embodiments of the present disclosure will be described in detail with reference to the accompanying drawings. It should be noted that when components in the drawings are designated by reference numerals, the same components have the same reference numerals as far as possible even though the components are illustrated in different drawings. Further, in description of embodiments of the present disclosure, when it is determined that detailed descriptions of well-known configurations or functions disturb understanding of the embodiments of the present disclosure, the detailed descriptions will be omitted.

[0068] Also, in the description of the embodiments of the present disclosure, the terms such as first, second, A, B, (a) and (b) may be used. Each of the terms is merely used to distinguish the corresponding component from other components, and does not delimit an essence, an order or a sequence of the corresponding component. It should be understood that when one component is "connected", "coupled", "joined" or "supported" to another component, the former may be directly connected, coupled, jointed or supported to the latter or may be "connected", coupled", "joined" or "supported" to the latter with a third component interposed therebetween.

[0069] The present invention relates to a cooling device. The cooling device may include a refrigerator including at least one refrigerating chamber. The cooling device may include a freezer including at least one freezing chamber. The freezer may include an ice making device. A component or a control method of the ice making device may be applied to the cooling device. The cooling device may include a storage chamber (e.g., main body) in which an item is stored. The cooling device may include a door that opens and close the storage chamber. The cooling device may include an ice making device. The cooling device may include an ice making chamber. The ice making chamber may be defined as a space in which at least a portion of an ice maker. The ice making chamber may be disposed in the storage chamber and/or the door. The cooling device may include an ice maker. In this specification, an ice making device may include a tray defining an ice making cell that is a space in which liquid is phase-changed into ice. An ice making device may further include a cooler for supplying cold to the ice making cell. An ice making device may further include a liquid supplier for supplying liquid to the ice making cell. The ice making device may further include a controller.

[0070] The cooling device may include a cooler. The cooler is a source that supplies cold and/or heat, and may be referred to as a cold source and/or a heat source. The cooler may include a heat exchanger. The cooler may cool the ice making chamber. Alternatively, the cooler may cool and heat the ice making chamber. The heat exchanger may include at least one of a pipe to supply the cold and/or heat, a refrigerant pipe through which refrigerant flows, an evaporator refrigerant pipe through which refrigerant flows, or a thermoelectric element to supply the cold and/or heat.

[0071] The ice making device may further include an ice separation assembly.

[0072] The tray may include a first tray. The tray may further include a second tray.

[0073] The first tray and the second tray may generate different types of ice.

[0074] The liquid supplier may independently supply liquid to each of the first tray and the second tray. The liquid supplier may be configured to simultaneously supply liquid to the first tray and the second tray.

[0075] The liquid supplier may include a pump for pumping liquid.

[0076] The cooler may be defined as a means for cooling the ice making cell and including at least one of an evaporator or a thermoelectric element. The evaporator may be located adjacent to or in contact with the tray. Alternatively, cold air cooled by the cooler may be supplied to the tray and liquid is phase-changed into ice in the ice making cell.

[0077] The cooler may cool the first tray. The cooler may cool the second tray. The cooler may cool the first tray and the second tray independently or simultaneously.

[0078] The cooler may optionally include a valve for controlling a flow of refrigerant, a fan for flowing cold air, or a damper for controlling a flow of cold air within the two spaces.

[0079] The controller may adjust a cooling power (or output) of the cooler. The cooling power of the cooler may be an output of a thermoelectric element, an amount of cold supplied to the tray, or a cooling power of the compressor (or output or frequency) or an amount of refrigerant flowing into an evaporator. The cold may include at least cold air.

[0080] The ice separation assembly includes at least one of a heater for heating the tray, a pusher (or ejector) for pressing at least a portion of the tray, a refrigerant pipe through which refrigerant flows to heat the tray, a liquid supply assembly for supplying liquid to an outside of the tray, or a driver for moving at least a portion of the tray.

[0081] The ice separation assembly may separate ice from each of the first tray and the second tray independently or simultaneously separate ice from the first tray and the second tray.

[0082] For example, a power of a driver is transmitted simultaneously to the first tray and the second tray, heat from a heater or a refrigerant pipe is transmitted simultaneously to the first tray and the second tray, or liquid is transmitted simultaneously to the first tray and the second tray.

[0083] FIG. 1 is a perspective view of an ice making device according to the present invention. FIG. 2 is a front view showing a door of an ice making device in an opened state according to the present invention. FIG. 3 is a cross-sectional view showing an inside of an ice making device according to this embodiment. FIG. 4 is a diagram showing an interior of an ice making device according to this embodiment. FIG. 5 is a refrigerant cycle diagram constituting a cooler.

[0084] Referring to FIGS. 1 to 5, an ice making device 1 of this embodiment may be installed independently to generate ice.

[0085] The ice making device 1 may include a cabinet 10 that forms an external shape. The ice making device 1 may further include a door 20 connected to the cabinet 10.

[0086] The cabinet 10 may include an ice making chamber 12 that generates ice. The cabinet 10 may further include a storage chamber 13 where ice is stored.

[0087] The ice making chamber 12 and the storage chamber 13 may be partitioned by a partition member. The ice making chamber 12 and the storage chamber 13 may be communicated through a communication hole in the partition member. Alternatively, the ice making chamber 12 and the storage chamber 13 may be communicated without a partition member.

[0088] Alternatively, the ice making chamber 12 may include the storage chamber 13, or the storage chamber 13 may include the ice making chamber 12.

[0089] The cabinet 10 may include a front opening 102. The door 20 may open and close the front opening 102. For example, the door 20 may open and close the front opening 102 by rotating.

[0090] When the door 20 opens the front opening 102, a user can access the storage chamber 13 through the front opening 102. The user can take out ice stored in the storage chamber 13 to an outside through the front opening 102.

[0091] The ice making device 1 may further include an ice maker 40 located in the ice making chamber 12.

[0092] Ice generated in the ice maker 40 may fall from the ice maker 40 and be stored in the storage chamber 13.

[0093] The cabinet 10 may further include an inner case 101 defining the ice making chamber 12. The cabinet 10 may further include an outer case 110 disposed outside the inner case 101.

[0094] Although not shown, an insulating material may be provided between the inner case 101 and the outer case 100.

[0095] The inner case 101 may additionally define the storage chamber 13.

[0096] The ice making chamber 12 may be formed at one side of the inner case 101.

[0097] The ice maker 40 may be located close to a rear wall 101a of the inner case 101. When the ice maker 40 is located close to a rear wall 101a of the inner case 101, usability of the storage chamber 13 can be increased.

[0098] To facilitate a user's access to the storage chamber 13, ice generated by the ice maker 40 may fall in a direction closer to the door 20.

[0099] The cabinet 10 may further include a machine room 18 divided from the storage chamber 13. For example, the machine room 18 may be located at one side of the storage chamber 13.

[0100] Although not limited, a portion of the storage chamber 13 may be located between the ice making chamber 12 and the machine room 18. A volume of the storage chamber 13 may be greater than a volume of the ice making chamber 12 and a volume of the machine room 18.

[0101] The machine room 18 may be placed outside

the inner case 101.

[0102] The inner case 101 may include a bottom wall 104 that forms a bottom of the storage chamber 13. The machine room 18 may be located at one side of the bottom wall 104.

[0103] The bottom wall 104 may be provided with a drain hole 105 for discharging liquid.

[0104] A portion of a cooler may be located in the machine room 18. For example, the cooler may be a refrigerant cycle for circulating refrigerant.

[0105] The cooler may include a compressor 183, a condenser 184, an expander 186, and a heat exchanger 50. The heat exchanger 50 may be an evaporator through which refrigerant flows.

[0106] In this embodiment, a flow of refrigerant in the refrigerant cycle may be controlled by a valve 188. The refrigerant cycle may include a bypass pipe 187 for bypassing refrigerant discharged from the compressor 183 to an inlet of the heat exchanger 50. The valve 188 may be provided in the bypass pipe 187.

[0107] When the valve 188 is turned off, refrigerant compressed in the compressor 183 may flow directly to the condenser 184. When the valve 188 is turned on, some or all of refrigerant compressed in the compressor 183 may be bypassed through the bypass pipe 187 and flow directly into the heat exchanger 50. Although not limited, refrigerant from the compressor 183 may flow to the evaporator during an ice separation process.

[0108] Refrigerant flowing through the heat exchanger 50 may flow through an accumulator 189 and then into the compressor 183.

[0109] The compressor 183 and the condenser 184 may be located in the machine room 18. The machine room 18 may be provided with a condenser fan 185 to allow air to pass through the condenser 184. For example, the condenser fan 185 may be disposed between the condenser 184 and the compressor 183.

[0110] A front grille 180 in which an air hole 182 is formed may be provided at a front of the cabinet 10. A plurality of air holes 182 may be formed in the front grille 180. The front grille 180 may be located at one side of the front opening 102. When the door 20 closes the front opening 102, the door 20 may cover a portion of the front grille 180.

[0111] The heat exchanger 50 may include refrigerant pipes 510 and 520 through which refrigerant flows. At least a portion of the heat exchanger 50 may be located in the ice making chamber 12.

[0112] At least a portion of the heat exchanger 50 may be in contact with the ice maker 40. That is, liquid supplied to the ice maker 40 may be phase-changed into ice by low-temperature refrigerant flowing through the heat exchanger 50. Alternatively, the heat exchanger 50 may be located adjacent to the ice maker 40.

[0113] A cooling type in which the heat exchanger 50 directly contacts the ice maker 40 to generate ice can be referred to as a direct cooling type.

[0114] As another example, air that has heat-exchanged with the heat exchanger 50 is supplied to the ice maker 40, and liquid in the ice maker 40 can be phase-changed into ice by the cooling air. A cooling type of generating ice by supplying cooling air can be called an indirect cooling type or an air cooling type. In a case of the indirect cooling type, it is possible that the heat exchanger 50 is not located in the ice making chamber 12. However, a guide duct that guides cooling air heat-exchanged with the heat exchanger 50 to the ice making chamber 12 may be additionally provided.

[0115] In this embodiment, the ice maker 40 may generate a single type of ice or at least two different types of ice.

[0116] Hereinafter, it will be described as an example that the ice maker 40 generates at least two different types of ice.

[0117] The ice maker may include a tray assembly. The tray assembly may include a tray that defines a space in which an ice making cell is formed. The tray assembly may include a tray case to which the tray is connected and/or coupled and/or joined and/or supported. In this specification, the present invention describes using a tray. However, the present invention may also include embodiments understood by replacing a tray assembly instead of the tray. The tray case may include a first tray case (e.g., tray cover) connected and/or coupled and/or supported and/or jointed to a first portion of the tray. The tray case may include a second tray case (e.g., tray supporter) connected and/or coupled and/or supported and/or jointed to a second portion of the tray. The ice maker 40 may include a first tray assembly 410 for generating a first type of first ice 11. The ice maker 40 may further include a second tray assembly 450 for generating a second type of second ice I2 different from the first type.

[0118] Of course, the ice maker 40 may include only one of a first tray assembly 410 and a second tray assembly 450, which will be described later.

[0119] The first ice 11 and the second ice I2 may differ in one or more of shape, size, transparency, etc.

[0120] Hereinafter, it will be described as an example that the first ice 11 is polygonal ice, and the second ice I2 is spherical ice.

[0121] The storage chamber may include a first storage space 132. The storage chamber may further include a second storage space 134.

[0122] Ice generated in the first tray assembly 410 may be stored in the first storage space 132. Ice generated in the second tray assembly 450 may be stored in the second storage space 134.

[0123] Although not limited, the second storage space 134 may be defined by the ice bin 14. That is, an internal space of the ice bin 14 may serve as the second storage space 134. The ice bin 14 may be fixed or detachably coupled to the inner case 101.

[0124] The ice bin 14 may also be referred to as a partition member that divides the storage chamber 13 into the first storage space 132 and the second storage

space 134.

[0125] A volume of the first storage space 132 may be greater than a volume of the second storage space 134. Although not limited, a size of the first ice 11 stored in the first storage space 132 may be smaller than a size of the second ice I2 stored in the second storage space 134.

[0126] A front surface of the ice bin 14 may be arranged to be spaced apart from one side of the front opening 102. A bottom surface of the ice bin 14 may be spaced apart from a bottom wall 104 of the storage chamber 13.

[0127] Accordingly, the first ice I1 may be located at one side of the ice bin 14. The first ice I1 may also be located at another side of the ice bin 14. The first ice 11 stored in the first storage space 132 may surround the ice bin 14.

[0128] A bottom wall 104 of the storage chamber 13 may form a floor of the second storage space 134.

[0129] A bottom wall 104 of the storage chamber 13 may be positioned lower than one end 102a of the front opening 102. A bottom surface of the ice bin 14 may be positioned higher than one end 102a of the front opening 102.

[0130] The ice bin 14 may be located adjacent to one surface (left surface in the drawing) of left and right surfaces of the inner case 101. The second tray assembly 450 may be located adjacent to the one surface. Accordingly, ice separated from the second tray assembly 450 may be stored in the second storage space 134 of the ice bin 14. Ice separated from the first tray assembly 410 may be stored in the first storage space 132 outside the second storage space 134.

[0131] When an amount of first ice stored in the first storage space 132 increases, to prevent the first ice from being unintentionally discharged through the front opening 102 when the door 20 is opened, the cabinet 10 may further include an opening cover 16. The opening cover 16 may be rotatably provided to the inner case 101. The opening cover 16 may cover one side of the front opening 102.

[0132] The opening cover 16 can be received in the storage chamber 13 when the door 20 is closed. When the door 20 is opened, other end of the opening cover 16 may be rotated with respect to one end so that the other end protrudes to an outside of the storage chamber 13.

[0133] The opening cover 16 may be elastically supported by, for example, an elastic member (not shown). When the door 20 is opened, the opening cover 16 can be rotated by the elastic member.

[0134] The opening cover 16 may be formed in a convex shape toward the door 20. Accordingly, although not limited, the first ice may be filled in the first storage space 132 up to one end 16a of the opening cover 16.

[0135] When the opening cover 16 is rotated, a portion of the first ice is drawn out of the storage chamber 13 while being located within the convex portion of the opening cover 16, so that a user can easily obtain the first ice.

[0136] Of course, it is also possible to omit the opening cover 16 by varying a height of one end 102a of the front opening 102.

[0137] The cabinet 10 may further include a guide 70 that guides ice separated from the ice maker 40 to the storage chamber 13.

[0138] The guide 70 may be arranged to be spaced apart from the ice maker 40. The guide 70 may guide a first ice 11 separated from the first tray assembly 410. The guide 70 may guide a second ice I2 separated from the second tray assembly 450.

[0139] For example, the guide 70 may include a first guide 710. The guide 70 may further include a second guide 730.

[0140] The first ice I1 separated from the first tray assembly 410 may fall onto the first guide 710. The first ice I1 may be moved to the first storage space 132 by the first guide 710.

[0141] The second ice I2 separated from the second tray assembly 450 may fall onto the second guide 730. The second ice I2 may be moved to the second storage space 134 by the second guide 730.

[0142] One end of the ice bin 14 may be positioned adjacent to one end of the second guide 730 so that the second ice I2 is moved to the second storage space 134.

[0143] The ice making device 1 may further include a partition plate 80 to prevent the first ice and the second ice that fall onto the guide 70 from being mixed. The partition plate 80 extends in a vertical direction and may be coupled to the guide 70 or the ice maker 40.

[0144] FIG. 6 is a diagram showing a liquid supply passage in an ice making device according to the present invention. FIGS. 7 and 8 are perspective views showing liquid being supplied to an ice maker.

[0145] Referring to FIGS. 6 to 8, the ice making device 1 may include a liquid supply passage for guiding liquid supplied from a liquid source 302 to the ice maker 40. The liquid source (e.g., water source) may include a faucet or a liquid tank provided at an inside and/or outside of the ice making device.

[0146] The liquid supply passage may include a first passage 303 connected to the liquid source 302. A liquid supply valve 304 may be provided in the first passage 303. By operating the liquid supply valve 304, a supply of liquid from the liquid source 302 to the ice making device 1 can be controlled. A supply flow rate when liquid is supplied to the ice making device 1 can be controlled by operating the liquid supply valve 304.

[0147] The liquid supply passage may further include a second passage 305 connected to the liquid supply valve 304. The second passage 305 may be connected to a filter 306. For example, the filter 306 may be located in the machine room 18.

[0148] The liquid supply passage may further include a third passage 308 that guides liquid that has passed through the filter 306.

[0149] The cooling device may include a supply component to supply liquid to the ice making device. Alternatively, the supply component may include a liquid

supply assembly. The supply component may supply liquid to an ice maker (e.g., tray) from a liquid source (e.g., a faucet or a liquid tank provided at an inside and/or outside of an ice making device). The liquid supply assembly may include a pipe through which the liquid flows. For example, liquid supplied from the liquid supply assembly may be supplied to a liquid supplier, which will be described later. The ice making device 1 may further include a liquid supply assembly 320. The liquid supply assembly 320 may be connected to the third passage 308.

[0150] The liquid supply assembly 320 can supply liquid to the ice maker 40 during a liquid supply process.

[0151] Alternatively, the supply component may include a liquid supplier. The supplier may supply liquid supplied from the liquid supply assembly to an ice maker (e.g., tray). The liquid supplier may include a sub liquid supplier. The sub liquid supplier may include a pipe through which the liquid flows. The sub liquid supplier may include a nozzle. The sub liquid supplier may further include a pump. The sub liquid supplier may include a sub_first liquid supplier. The sub liquid supplier may include a sub _second liquid supplier. The ice making device 1 may further include a liquid supplier 330. The liquid supplier 330 may supply liquid to the ice maker 40 during an ice making process. The liquid supplier 330 can store liquid supplied from the liquid supply assembly 320 and supply liquid to the ice maker 40.

[0152] In this embodiment, the liquid supply assembly 320 may be referred to as a first liquid supply assembly. The liquid supplier 330 may be referred to as a second liquid supply assembly.

[0153] The liquid supply assembly 320 may be located at one side of the ice maker 40. Liquid supplied from the liquid supply assembly 320 may fall onto the ice maker 40.

[0154] The liquid supplier 330 may be located at another side of the ice maker 40.

[0155] The liquid supplier 330 may be spaced apart from the liquid supply assembly 320. The liquid supplier 330 can store liquid supplied from the liquid supply assembly 320 and supply liquid to the ice maker 40.

[0156] In FIGS. 6 to 8, a dotted line shows a flow of liquid supplied from the liquid supply assembly 320, and a solid line shows a flow of liquid supplied from the liquid supplier 330.

[0157] The liquid supplier 330 may include a liquid storage 350 in which liquid is stored. The liquid storage may include a wall to form a space to store the liquid. The ice maker 40 may include one or more through holes 426 through which liquid passes. Liquid supplied from the liquid supply assembly 320 and dropped toward the ice maker 40 may be stored in the liquid storage 350 after passing through the through hole 426. The guide 70 may be provided with a plurality of through holes through which liquid passing through the ice maker 40 passes.

[0158] In a state in which the liquid supply valve 304 is turned on, liquid supplied from the liquid supply assembly 320 falls to one side of the ice maker 40, passes through the ice maker 40, and then may be stored in the liquid storage 350.

[0159] The liquid storage 350 may be provided with a liquid level detector 356 that detects a liquid level. When a liquid level of the liquid storage 350 detected by the liquid level detector 356 reaches a reference liquid level, the liquid supply valve 304 may be turned off.

[0160] In this specification, a process from when the liquid supply valve 304 is turned on to when the liquid supply valve 304 is turned off may be referred to as a liquid supply process. For example, the liquid supply valve 304 may be turned off when a liquid level of the liquid storage 350 detected by the liquid level detector 356 reaches a reference liquid level.

[0161] The liquid supplier 330 may further include liquid pumps for pumping liquid stored in the liquid storage 350.

[0162] In this embodiment, in an ice making process, liquid stored in the liquid storage 350 may be pumped by the liquid pumps and supplied to the ice maker 40.

[0163] The liquid pumps may include a first pump 360. The liquid pumps may further include a second pump 362. When the first pump 360 operates, liquid may be supplied to the first tray assembly 410. When the second pump 362 operates, liquid may be supplied to the second tray assembly 450.

[0164] The first pump 360 and the second pump 362 may operate independently. Pumping capacities of the first pump 360 and the second pump 362 may be the same or different.

[0165] The liquid supplier 330 may further include first connection pipes 352 and 354 connecting each of the pumps 360 and 362 and the liquid storage 350.

[0166] The first connection pipes 352 and 354 may be connected to the liquid storage 350 at the same or similar height to a bottom of the liquid storage 350.

[0167] The liquid supplier 330 may further include a sub_first liquid supplier 380 for supplying liquid pumped by the first pump 360 to the first tray assembly 410.

[0168] The liquid supplier 330 may further include a sub_second liquid supplier 382 (see FIG. 12) for supplying liquid pumped by the second pump 362 to the second tray assembly 450.

[0169] The sub_first liquid supplier 380 may supply liquid to the first tray assembly 410 from one side of the first tray assembly 410.

[0170] The sub_second liquid supplier 382 may supply liquid to the second tray assembly 450 from one side of the second tray assembly 450.

[0171] The sub_first liquid supplier 380 may be located at one side of the guide 70. The sub_second liquid supplier 382 may be provided on the second tray assembly 450.

[0172] The liquid supplier 330 may further include second connection pipes 370 and 372 connecting each of the pumps 360 and 362 and each of the sub liquid suppliers 380 and 382.

[0173] Liquid supplied from the sub_first liquid supplier 380 to the first tray assembly 410 may be used to generate ice. Liquid that falls again from the first tray assembly 410 may be stored in the liquid storage 350 after passing through the guide 70.

[0174] Liquid supplied from the sub_second liquid supplier 382 to the second tray assembly 450 may be used to generate ice. Liquid that falls again from the second tray assembly 450 may be stored in the liquid storage 350 after passing through the guide 70.

[0175] A drain pipe 360 may be connected to the liquid storage 350. The drain pipe 360 may extend through the drain hole 105 into the machine room 18. The machine room 18 may be provided with a drain tube 362 connected to the drain pipe 360. The drain tube 362 can finally discharge liquid to an outside of the ice making device 1.

[0176] A liquid supply tube 373 connected to the sub_second liquid supplier 382 may be connected to the second connection pipe 372. The liquid supply tube 373 may be formed of a material whose shape is deformable.

[0177] Hereinafter, the ice maker 40 will be described in detail.

[0178] FIG. 9 is a perspective view showing an arrangement of a first tray assembly and a second tray assembly according to one embodiment of the present invention. FIGS. 10 and 11 are perspective views showing an ice maker and a heat exchanger according to one embodiment of the present invention.

[0179] FIG. 12 is a bottom view of an ice maker according to one embodiment of the present invention. FIG. 13 is a cross-sectional view taken along line 13-13 in FIG. 12.

[0180] Referring to FIGS. 9 to 13, the heat exchanger 50 may contact the ice maker 40. For example, the heat exchanger 50 may be located at one side of the ice maker 40.

[0181] The ice maker 40 may include a first tray assembly 410 and a second tray assembly 450 as described above.

[0182] The first tray assembly 410 and the second tray assembly 450 may be arranged in a horizontal direction. It is also possible for the first tray assembly 410 and the second tray assembly 450 to be arranged in a vertical direction. The first tray assembly 410 and the second tray assembly 450 may be installed in the cabinet 10 while being connected to each other. That is, the first tray assembly 410 and the second tray assembly 450 can be modularized.

[0183] As another example, the first tray assembly 410 and the second tray assembly 450 may be installed in the cabinet 10 in a separated state. The first tray assembly 410 and the second tray assembly 450 may be positioned close to each other in a horizontal direction.

[0184] The first tray assembly 410 may include a first ice making cell 440.

[0185] In this embodiment, an ice making cell refers to a space where ice is generated. One ice may be generated in one ice making cell.

[0186] The first tray assembly 410 may include a first tray. The first tray may include a first one tray 420. The first tray may further include a first another tray 430 coupled to the first one tray 420.

[0187] For example, the first tray may form a plurality of first ice making cells 440. A plurality of first another trays 430 may be coupled to the first one tray 420.

[0188] The first ice making cell 440 may be defined by one cell or by a plurality of cells. For example, the first ice making cell 440 may include a first one cell 441 and a first another cell 442. Although not limited, the first one cell may be one of a first lower cell and a first upper cell. The first another cell may be another one of the first lower cell and the first upper cell. The first one cell may be one of a first left cell or a first right cell. The first another cell may be another one of the first left cell and the first right cell. Although not limited, it is possible that terms of first one cell and first another cell are opposite to each other.

[0189] The first one cell 441 may be formed by the first one tray 420. The first one cell 442 may be formed by the first another tray 430.

[0190] For example, the first one tray 420 may form a plurality of first one cells 441. Each of the plurality of first another trays 430 may form a first another cell 442.

[0191] Accordingly, when the plurality of first another trays 430 are coupled to a single first one tray 420, a plurality of first ice making cells 440 may be formed.

[0192] The first one tray 420 may include a first opening 423. The first opening 423 communicates with the first one cell 441.

[0193] A number of first openings 423 may be equal to a number of first ice making cells 440.

[0194] The first one cell 441 may form another portion of an appearance of the first ice and the first another cell 442 may form a portion of an appearance of the first ice.

[0195] After the first another tray 430 is coupled to the first one tray 420, separation of the first another tray 430 from the first one tray 420 may be restricted.

[0196] Liquid supplied from the sub_first liquid supplier 380 may pass through the first opening 423 and be supplied to the first ice making cell 440. Accordingly, the first opening 423 may serve as a liquid supply opening during an ice making process.

[0197] A portion of liquid supplied to the first ice making cell 440 may fall to a lower part of the first tray assembly 410 through the first opening 423. Accordingly, the first opening 423 may serve as a liquid outlet opening during an ice making process.

[0198] Ice generated in the first ice making cell 440 may be separated from the first tray assembly 410 through the first opening 423 in an ice separation process. Accordingly, the first opening 423 may serve as an ice outlet opening during an ice separation process.

[0199] Each of the first one cell 441 and the first another cell 442 may be formed, for example, in a hexahedral shape. A volume of the first one cell 441 and a volume of the first another cell 442 may be the same or different.

[0200] A horizontal perimeter (or horizontal cross-sectional area) of the first one cell 441 may be greater than a horizontal perimeter (or horizontal cross-sectional area) of the first another cell 442 so that first ice can be discharged through the first opening 423 after the first ice is generated in the first ice making cell 440.

[0201] That is, during a liquid supply process, an ice making process, or an ice separation process, the first another tray 430 and the first one tray 420 are maintained in a coupled state, so that a shape of the first ice making cell 440 can be maintained.

[0202] The heat exchanger 50 may be in contact with the first another tray 430 so that ice is firstly generated in the first another cell 442.

[0203] The first one tray 420 may include through holes 421 and 425 through which liquid passes.

[0204] The second tray assembly 450 may include a second tray forming a second ice making cell 451.

[0205] The second tray may be defined by one tray or by a plurality of trays. For example, the second tray may include a second one tray 460 and a second another tray 470. Although not limited, the second one tray may be an upper tray or a left tray. The second another tray 470 may be a lower tray, or a right tray. It is also possible that terms of the second one tray 460 and the second another tray 470 are opposite to each other.

[0206] The second ice making cell 451 may be defined by one cell or by a plurality of cells. For example, the second ice making cell 451 may include a second one cell 462 and a second another cell 472.

[0207] The second one tray 460 can form the second one cell 462. The second another tray 470 may form the second another cell 472. For example, each of the second one cell 462 and the second another cell 472 may be formed in a hemispherical shape.

[0208] For example, the second tray may form a plurality of second ice making cells 451. Accordingly, the second one tray 460 can form a plurality of second one cells 462. The second another tray 470 can form a plurality of second another cells 472.

[0209] A portion of the first ice making cell 440 may be located at the same height as the second ice making cell 451. For example, at least a portion of the first ice making cell 440 may be arranged to overlap the second ice making cell 451 in a horizontal direction.

[0210] The second ice making cell 451 may be disposed between a rotation center C1 of the second another tray 470 and the first ice making cell 440. The second another tray 470 may be connected to a driver 690 by a shaft 489. The shaft 489 may provide a rotation center C1 of the second another tray 470.

[0211] A height of one end of the first ice making cell 440 and one end of the second ice making cell 451 may be different. For example, one end of the first ice making cell 440 may be positioned lower than one end of the second ice making cell 451.

[0212] A height of the other end of the first ice making cell 440 and the other end of the second ice making cell 451 may be different. For example, the other end of the first ice making cell 440 may be positioned higher than the other end of the second ice making cell 451.

[0213] A contact surface of the second one tray 460 and the second another tray 470 may have a different height from a joining portion of the first one tray 420 and the first another tray 430. For example, a contact surface of the second one tray 460 and the second another tray 470 may be positioned higher than a joining portion of the first one tray 420 and the first another tray 430.

[0214] A height of the first ice making cell 440 and a height of the second ice making cell 451 may be different. For example, a height of the first ice making cell 440 may be less than a height of the second ice making cell 451.

[0215] A maximum horizontal perimeter of the first ice making cell 440 may be different from a maximum horizontal perimeter of the second ice making cell 451. For example, a maximum horizontal perimeter of the first ice making cell 440 may be less than a maximum horizontal perimeter of the second ice making cell 451.

[0216] A number of first ice making cells 440 may be different from a number of second ice making cells 451. For example, a number of first ice making cells 440 may be greater than a number of second ice making cells 451.

[0217] A volume of the first ice making cell 440 may be different from a volume of the second ice making cell 451. A volume of the first ice making cell 440 may be less than a volume of the second ice making cell 451.

[0218] A sum of volumes of the plurality of first ice making cells 440 may be different from a sum of volumes of the plurality of second ice making cells 451. For example, a sum of volumes of the plurality of first ice making cells 440 may be greater than a sum of volumes of the plurality of second ice making cells 451.

[0219] The second another tray 470 may include a second opening 473.

[0220] A liquid supply process and an ice making process may be performed in a state in which the second one tray 460 and the second another tray 470 are in contact to form the second ice making cell 451.

[0221] The sub_second liquid supplier 382 may be located at one side of the second opening 473. Alternatively, a portion of the sub_second liquid supplier 382 may be located in the second opening 473.

[0222] Liquid supplied from the sub _second liquid supplier 382 may pass through the second opening 473 and be supplied to the second ice making cell 451.

[0223] Accordingly, the second opening 473 may serve as a liquid supply opening during an ice making process.

[0224] A portion of liquid supplied to the second ice making cell 451 may fall to a lower part of the second tray assembly 450 through the second opening 473. Accordingly, the second opening 473 may serve as a liquid outlet opening during an ice making process.

[0225] In an ice separation process, the second another tray 470 may be moved relative to the second one tray 460.

[0226] The first opening 423 and the second opening

473 may be located at different heights. For example, the first opening 423 may be located higher than the second opening 473.

[0227] The second tray assembly 450 may further include a bracket 452 supporting the second one tray 460. The bracket 452 may be fixed in position within the ice making chamber 12.

[0228] The bracket 452 may be supported by a wall forming the ice making chamber 12. For example, the bracket 452 may be supported by the inner case 101.

[0229] The second tray assembly 450 may further include a supporter 480 supporting the second another tray 470.

[0230] In a state in which the second another tray 470 is seated on the supporter 480, the supporter 480 and the second another tray 470 may be moved together. For example, the supporter 480 may be movably connected to the second one tray 460.

[0231] The sub_second liquid supplier 382 may be installed on the supporter 480.

[0232] The supporter 480 may include a supporter opening 482a through which liquid passes. The supporter opening 482a may be aligned with the second opening 473.

[0233] A diameter of the supporter opening 482a may be greater than a diameter of the second opening 473.

[0234] The first ice may be discharged from the first ice making cell through the first opening 423. On the other hand, the second ice cannot be discharged from the second ice making cell through the second opening 473.

[0235] In a case of the first tray in this embodiment, the first ice may be discharged from the first ice making cell through the first opening 423 during an ice separation, so that the first tray may be called an open type tray.

[0236] In a case of an open type tray, a diameter or size of an opening may be equal to or greater than a diameter or size of the first ice making cell.

[0237] On the other hand, in a case of the second tray, since the second ice cannot be discharged to an outside from the second ice making cell through the second opening 473, the second tray may be called a closed type tray.

[0238] In a case of a closed type tray, in order to separate ice, one or more of the second one tray 460 and the second another tray 470 may be moved or the second one tray 460 and the second another tray 470 may be configured to be separated from each other. In this embodiment, a movement of the second another tray 470 will be described as an example.

[0239] The second tray assembly 450 may further include a case 498 supporting the second another tray 470 at one side. The case 498 may be seated on the second another tray 470. At an ice making position, the second one tray 460 may pass through the case 498 and contact the second another tray 470.

[0240] For example, a coupling member may pass through the case 498 and the second another tray 470 and be coupled to the supporter 480.

[0241] The second tray assembly 450 may further include a pusher 490 for separating ice from the second another tray 470 in an ice separation process. The pusher 490 may press the second another tray 470 or press the second ice in an ice separation process.

[0242] The pusher 490 may include a pushing column 492. When the second another tray 470 and the supporter 480 are moved in an ice separation process, the pushing column 492 passes through the supporter opening 482a of the supporter 480 to press the second another tray 470 or the second ice.

[0243] When the second another tray 470 is pressed by the pushing column, a shape of the second another tray 470 is deformed and the second ice may be separated from the second another tray 470. To enable deformation of the second another tray 470, the second another tray 470 may be formed of a non-metallic material. In terms of ease of deformation, the second another tray 470 may be formed of a flexible material.

[0244] A structure of the pusher 490 will be described later with reference to the drawings

[0245] Meanwhile, the heat exchanger 50 may include a first refrigerant pipe 510 that is in contact with or adjacent to the first tray assembly 410.

[0246] The heat exchanger 50 may further include a second refrigerant pipe 520 located adjacent to or in contact with the second tray assembly 450.

[0247] The first refrigerant pipe 510 and the second refrigerant pipe 520 may be connected in series or in parallel.

[0248] The first refrigerant pipe 510 may include a first inlet pipe 511. The first inlet pipe 511 may be located at one side of the first one tray 420. The first inlet pipe 511 may extend at a position adjacent to the driver 690. The first inlet pipe 511 may extend from a rear side of the driver 690. That is, the first inlet pipe 511 may extend in a space between the driver 690 and a rear wall 101a of the inner case 101.

[0249] The first refrigerant pipe 510 may further include a first bent pipe 512 extending from the first inlet pipe 511.

[0250] The first refrigerant pipe 510 may further include a first cooling pipe 513 extending from the first bent pipe 512.

[0251] The first cooling pipe 513 may be in contact with one surface of the first another tray 430. Accordingly, the first another tray 430 may be cooled by refrigerant flowing through the first cooling pipe 513.

[0252] The first cooling pipe 513 may include a plurality of straight parts 513a. The first cooling pipe 513 may further include a curved shaped connection part 513b connecting ends of two adjacent straight parts 513a.

[0253] The first inlet pipe 511 may be located adjacent to a boundary portion between the first tray assembly 410 and the second tray assembly 450. The first cooling pipe 513 may extend from the boundary portion in a direction away from the second tray assembly 450.

[0254] One straight part may contact one surface of a plurality of first another trays 430.

[0255] A plurality of straight parts 513a may be arranged at substantially the same height.

[0256] The first refrigerant pipe 510 may further include a first connection pipe 514 extending from an end of the first cooling pipe 513. The first connection pipe 514 may extend to be lower in height than the first cooling pipe 513.

[0257] The first refrigerant pipe 510 may further include a second cooling pipe 515 connected to the first connection pipe 514. The second cooling pipe 515 may be located lower than the first cooling pipe 513.

[0258] The second cooling pipe 515 may contact a side surface of the first another tray 430.

[0259] The second cooling pipe 515 may include a plurality of straight parts 515a and 515b. The second cooling pipe 515 may further include a curved shaped connection portion 515c connecting two adjacent straight parts 515a and 515b.

[0260] A plurality of first another trays 430 may be arranged in a plurality of columns and rows.

[0261] Among a plurality of straight parts 515a and 515b, a portion of straight parts 515a may contact one side of the first another tray 430 in one row. Among the plurality of straight parts 515a and 515b, another straight part 515b may contact the first another trays 430 of two adjacent rows, respectively.

[0262] For example, the portion of the straight part 515a may contact a first surface of a first another tray in a first row. For example, another straight part 515b may contact a second surface of a first another tray in a first row and a first surface of a first another tray in a second row.

[0263] The first refrigerant pipe 510 may further include a first discharge pipe 516. The first discharge pipe 516 may extend from an end of the second cooling pipe 515. The first discharge pipe 516 may extend toward the second tray assembly 450. A height of the first discharge pipe 516 may be variable in an extension direction.

[0264] The second refrigerant pipe 520 may receive refrigerant from the first discharge pipe 516. A height of the first discharge pipe 516 may be variable in an extension direction. The second refrigerant pipe 520 may be a pipe formed integrally with the first discharge pipe 516 or may be a pipe coupled to the second discharge pipe 516.

[0265] The second refrigerant pipe 520 may include a second inlet pipe 522 connected to the first discharge pipe 516. The second inlet pipe 522 may be located at an opposite side of the driver 690 in the second tray assembly 450.

[0266] The second refrigerant pipe 520 may further include a third cooling pipe 523. The third cooling pipe 523 may extend from the second inlet pipe 522.

[0267] A portion of the second refrigerant pipe 520 (for example, the third cooling pipe 523) may be positioned higher than one end of the second ice making cell 451.

[0268] The third cooling pipe 523 may contact the second one tray 460. Therefore, the second one tray 460 may be cooled by refrigerant flowing through the third cooling pipe 523. For example, the third cooling pipe 523 may contact an upper surface of the second one tray 460.

[0269] The liquid supply assembly 320 may be positioned higher than the third cooling pipe 523.

[0270] The third cooling pipe 523 may include a plurality of straight parts 523a. The third cooling pipe 523 may further include a curved shaped connection part 523b connecting two adjacent straight parts 523a.

[0271] One or more of a plurality of straight parts 523a may extend in a direction parallel to an arrangement direction of a plurality of second ice making cells 451. A plurality of straight parts 523a may overlap the second ice making cell 451 in a first direction. Some of the plurality of straight parts 523a may overlap the second opening 473 in a vertical direction. The first direction may be an arrangement direction of the second one cell and the second another cell forming the second ice making cell 451.

[0272] The third cooling pipe 523 may be located higher than the first cooling pipe 513. The third cooling pipe 523 may be located higher than the second cooling pipe 515.

[0273] The second refrigerant pipe 520 may further include a second bent pipe 524 extending from an end of the third cooling pipe 523. A portion of the second bent pipe 524 may extend from an end of the third cooling pipe 523 along one side of the driver 690.

[0274] Another portion of the second bent pipe 524 may extend in another direction.

[0275] The second refrigerant pipe 520 may further include a second discharge pipe 525 connected to the second bent pipe 524. At least a portion of the second discharge pipe 525 may extend parallel to the first inlet pipe 511. The second discharge pipe 525 may be located at a rear side of the driver 690. That is, the second discharge pipe 525 may extend in a space between the driver 690 and a rear wall 101a of the inner case 101.

[0276] At least a portion of the second discharge pipe 525 and the first inlet pipe 511 may be arranged in the first direction.

[0277] At least a portion of the second discharge pipe 525 may overlap the first inlet pipe 511 in the first direction. At least a portion of the second discharge pipe 525 may be located at one side of the first inlet pipe 511.

[0278] In this embodiment, the liquid supply assembly 320 may supply liquid to the ice maker 40 during a liquid supply process. The liquid supply assembly 320 may supply liquid to the ice maker 40 during an ice separation process.

[0279] When ice making is completed in the ice maker 40, the ice maker 40 may be maintained at a sub-zero temperature. The liquid supply assembly 320 can supply liquid supplied from an external liquid source 302 to the ice maker 40. Since liquid supplied from the external liquid source 302 may be liquid having normal temperature or liquid having a temperature similar to a normal temperature, liquid may be supplied from the liquid supply assembly 320 to the ice maker 40 in an ice separation process to increase a temperature of the ice maker 40.

[0280] FIG. 14 is a bottom perspective view of a second tray assembly of the present embodiment. FIG. 15 is a perspective view of a supporter according to the present embodiment. FIG. 16 is a diagram showing a sub _second liquid supplier installed on a supporter according to the present embodiment. FIG. 17 is a cross-sectional view taken along line 17-17 of FIG. 16.

[0281] Referring to FIGS. 14 to 17, the sub_second liquid supplier 382 may be installed on the supporter 480 and moved together with the supporter 480.

[0282] The second another tray 470 may include a sub second another tray 471 forming a second another cell 472. The second another tray 470 may further include a tray extension 475 extending from the sub second another tray 471.

[0283] The supporter 480 may include a supporter body 481 that forms a receiving portion 482 for receiving the sub second another tray 471.

[0284] The supporter body 481 may include a body wall 481a forming the receiving portion 482. For example, the body wall 481a may be formed in a hemispherical shape or a shape similar to a hemisphere. The supporter opening 482a may be formed in the body wall 481a.

[0285] The supporter body 481 may further include a body extension 481b extending from the body wall 481a. The tray extension 475 may be seated on the body extension 481b.

[0286] The case 498 may be seated on the tray extension 475 mounted on the body extension 481b. The case 498 may include a case opening 498a through which the second one tray 460 passes.

[0287] The case 498 may further include a coupling hole 498b through which a coupling member passes. The coupling member may pass through the coupling hole 498b and the tray extension 475 and be coupled to the supporter 480.

[0288] The supporter body 481 may further include a circumferential wall 481c extending from the body wall 481b. The circumferential wall 481c may be spaced apart from the body wall 481a. Accordingly, a space 485 for receiving the sub _second liquid supplier 382 may be formed between the circumferential wall 481c and the body wall 481a.

[0289] The circumferential wall 481c may be provided with an inclined surface 481d to prevent the supporter 480 from interfering with the guide 70 while moving in an ice separation process.

[0290] The supporter 480 may further include an opening wall 482b extending around the supporter opening 482a. The opening wall 482b may be formed in a ring shape or an arc shape.

[0291] The supporter 480 may further include hinge bodies 483 and 483a to which the shaft 489 is coupled. A plurality of hinge bodies 483 and 483a may be spaced apart from each other in a direction parallel to an extension direction of the shaft 489.

[0292] The hinge bodies 483 and 483a may include a shaft hole 484 through which the shaft 489 passes.

[0293] Meanwhile, the sub_second liquid supplier 382 may include an inlet pipe 384. The inlet pipe 384 may be connected to the liquid supply tube 373. Although not limited, the inlet pipe 384 may be formed in a straight shape or may be bent one or more times.

[0294] An inlet of the inlet pipe 384 may be referred to as the first through hole.

[0295] The sub _second liquid supplier 382 may further include a common pipe 385 connected to the inlet pipe 384.

[0296] For example, the common pipe 385 may extend in a direction parallel to an arrangement direction of the second ice making cells 451.

[0297] The common pipe 385 may be coupled to the supporter 480.

[0298] For example, the common pipe 385 may be located in a space 485 between the circumferential wall 481c and the body wall 481a.

[0299] A coupling rib 387 may be formed to protrude in a horizontal direction on the common pipe 385. The supporter 480 may be provided with a coupling portion 486 for coupling with the coupling rib 387. For example, the coupling portion 486 may be located between two adjacent second another cells 472.

[0300] The coupling portion 486 may protrude from the supporter 480. An end of the coupling portion 486 may be provided with a coupling protrusion 486a aligned with the coupling rib 387. A portion of the coupling protrusion 486a may be inserted into the coupling rib 387. In this state, a coupling member may be coupled to the coupling rib 387 and the coupling protrusion 486a.

[0301] The circumferential wall 481c may be provided with a pipe opening 481e through which the inlet pipe 384 passes.

[0302] The sub_second liquid supplier 382 may further include one or more discharge pipes 386 extending from the common pipe 385.

[0303] A number of discharge pipes 386 may be equal to a number of second ice making cells 251.

[0304] The discharge pipe 386 may extend from the common pipe 385 and be aligned with the supporter opening 482a. The discharge pipe 386 may be aligned with the second opening 473.

[0305] Although not limited, the discharge pipe 386 may be located in a central portion of the second opening 473.

[0306] A slot 482c through which the discharge pipe 386 passes may be formed in the opening wall 482b. The slot 482c can prevent the discharge pipe 386 from interfering with the opening wall 482b.

[0307] The discharge pipe 386 may include a discharge hole 386c. The discharge hole 386c may be referred to as a second through hole.

[0308] The discharge hole 386c may be arranged to supply liquid into the second ice making cell 251 via a second opening 473 formed in the second another tray 470.

[0309] For example, the discharge hole 386c may be

located in the supporter opening 482a or in the second opening 473.

[0310] A diameter of the discharge hole 386c may be less than a diameter of the second opening 473. Accordingly, a portion of liquid supplied to the second ice making cell 251 may flow downward from the second opening 473 through an outer area of the discharge hole 386c. Additionally, liquid supplied through the discharge hole 386c can be prevented from interfering with liquid discharged from the second ice making cell 251 through the second opening 473.

[0311] In addition, when the discharge hole 386c is located in the supporter opening 482a or the second opening 473, liquid can be stably supplied into the second ice making cell 251, so that a size of the opening 473 can be reduced.

[0312] In this embodiment, a position of the supporter 480 may be changed during an ice making process and an ice separation process. Accordingly, a position of the discharge pipe 386 mounted on the supporter 480 may also be changed.

[0313] Since the second another tray 470 is seated on the supporter 480, the discharge pipe 386 can move in the same direction as a moving direction of the second another tray 470.

[0314] Although not limited, the discharge pipe 386 may include a first portion 386a extending from the common pipe 385. The discharge pipe 386 may further include a second portion 386b extending from the first portion 386a and is bent at one point.

[0315] In another aspect, the sub_second liquid supplier 382 of this embodiment may include a first through hole (inlet of the inlet pipe), a second through hole 386c, and a connection pipe that connects the first through hole and the second through hole. In this case, the connection pipe may include at least a portion of the inlet pipe, a common pipe, and at least a portion of the discharge pipe.

[0316] Meanwhile, the liquid supply tube 373 connected to the inlet pipe 384 may extend in a direction parallel or almost parallel to an arrangement direction of the second ice making cells 251.

[0317] Among the plurality of hinge bodies 483 and 483a, one hinge body 483a may be provided with a rib 484a for fixing a position of the liquid supply tube 373. The rib 484a may extend from the hinge body 483a. The liquid supply tube 373 may be located between the hinge body 483a and the rib 484a. The ribs 484a may be extended roundly or bent one or more times to form a space in which the liquid supply tube 373 can be positioned.

[0318] According to this embodiment, when the supporter 480 moves, the liquid supply tube 373 also moves. When the liquid supply tube 373 is positioned close to a hinge body 483a, which provides a center of rotation of the supporter 480, bending of the liquid supply tube 373 can be minimized.

[0319] FIG. 18 is a perspective view of a pusher of the present embodiment.

[0320] Referring to FIGS. 14 and 18, a pusher 490 of this embodiment may be mounted on the bracket 452.

[0321] The bracket 452 may include an inclined wall 455. For example, the pusher 490 may be mounted on the inclined wall 455.

[0322] A seating groove 455a for seating the pusher 490 may be formed in the inclined wall 455.

[0323] The pusher 490 may include a plate 491 seated on the seating groove 455a. The pushing column 492 may extend from the plate 491.

[0324] A coupling protrusion 456 may be formed on the seating groove 455a. The plate 491 may be provided with a protrusion hole 495 through which the coupling protrusion 456 passes. Although not limited, a protruding hole 495 may be located between two adjacent pushing columns 492. A coupling boss 457 may be formed on the seating groove 455a. The plate 491 may be provided with a boss coupling portion 496 to which the coupling boss 457 is coupled.

[0325] The boss coupling portion 496 may protrude from the plate 491. The coupling boss 457 may be inserted into the boss coupling portion 496. In this state, the coupling member can be coupled to the boss coupling portion 496 and the coupling boss 457.

[0326] The pusher 490 may be located at one side of the second another tray 470. The pusher 490 may provide a path that allows a component to move through an interior.

[0327] For example, the pusher 490 may include a through hole 492 that allows a component to move through an interior. For example, the through hole 493 may be provided in the pushing column 492.

[0328] The through hole 493 may include a first through hole 493a that allows the component to enter an inside of the pusher 490.

[0329] The through hole 493 may further include a hollow space 493b provided so that a component passing through the first through hole 493a passes through an inside of the pusher 490.

[0330] The through hole 493 may further include a second through hole 493c that provides a position at which a component passing through the hollow space 493b stops.

[0331] The pusher 490 may further include a wall 493d that provides a position at which a component passing through the hollow space 493b stops. The wall 493d may include a hole 494.

[0332] Although not limited, the component may be a portion of the sub _second liquid supplier 382. For example, the component may be the discharge pipe 486.

[0333] In another aspect, the pusher 490 may include an opening formed therein so that a component can be moved therethrough.

[0334] The opening may be formed at one side of the pusher 490. At least a portion of the component may be disposed at one side of the pusher 490, and the opening may be formed at one side of the pusher 490.

[0335] Alternatively, at least a portion of the component may be disposed at another side of the pusher 490, and

the opening may be formed at another side of the pusher 490.

[0336] The opening can be provided facing a non-open wall, so that a component can be stopped by a wall.

[0337] FIG. 19 is a control block diagram of an ice making device of the present embodiment. FIG. 20 is a diagram showing a process in which liquid is supplied to an ice maker during an ice making process. FIG. 21 is a diagram showing an ice maker in an ice separation process.

[0338] Referring to FIGS. 14 to 19, an ice making device 1 of this embodiment may further include a controller 190. The controller 190 may control the liquid supply valve 304 during a liquid supply process.

[0339] The controller 190 may control a supply of cold during an ice making process. For example, the controller 190 may control a cooler during an ice making process. For example, the controller 190 may vary a cooling power of the cooler.

[0340] Although not limited, the controller 190 may variably control an output of at least one of the compressor 183 or the condenser fan 185 (or fan driver).

[0341] For example, the compressor 183 may be an inverter compressor capable of variable frequency.

[0342] The controller 190 may control the first pump 360 and/or the second pump 362 during the ice making process. The controller 190 may independently control the first pump 360 and the second pump 362.

[0343] The controller 190 may control an ice separation assembly in an ice separation process. For example, the ice separation process may include one or more of the liquid supply assembly 320 and the refrigerant pipes 510 and 520. The controller 190 may control liquid discharge from the liquid supply assembly 320 by controlling the liquid supply valve 304 in an ice separation process. The controller 190 may control the valve 188 to allow high-temperature refrigerant to flow to the refrigerant pipes 510 and 520 in an ice separation process.

[0344] The controller 190 may control the driver 690 in an ice separation process. The controller 190 may control a position of the sub_second liquid supplier 382 by controlling the driver 690. That is, a position of the sub_second liquid supplier 382 during an ice making process may be different from a position of the sub _second liquid supplier 382 during an ice separation process. Since the sub _second liquid supplier 382 is positioned to be movable, a position of the sub_second liquid supplier 382 is variable. For example, since the sub_second liquid supplier 382 is installed on the supporter 480, a position of the sub_second liquid supplier 382 may be changed.

[0345] The ice making device 1 may further include a first temperature sensor 191 for detecting a temperature of the first ice making cell 440 or a temperature around the first ice making cell 440.

[0346] The ice making device 1 may further include a second temperature sensor 192 for detecting a temperature of the second ice making cell 451 or the temperature around the second ice making cell 451.

[0347] The controller 190 may determine whether ice making in the first tray assembly 410 is completed based on a temperature detected by the first temperature sensor 191.

[0348] The controller 190 may determine whether ice making in the second tray assembly 450 is completed based on a temperature detected by the second temperature sensor 192.

[0349] Hereinafter, a series of processes by which ice is generated in an ice maker will be described.

[0350] A process for generating ice may include a liquid supply process. A process for generating ice may further include an ice making process. A process for generating ice may further include an ice separation process.

[0351] When the liquid supply process starts, the liquid supply valve 304 is turned on and liquid supplied from an external liquid source 302 flows along the liquid supply passage. Liquid flowing along the liquid supply passage is supplied to the ice maker 40 through the liquid supply assembly 320.

[0352] Liquid supplied to the ice maker 40 falls downward from the ice maker 40 and is stored in the liquid storage 350. When a liquid level of liquid stored in the liquid storage 350 reaches a reference liquid level, the liquid supply valve 304 is turned off and the liquid supply process is completed.

[0353] After the liquid supply process is completed, an ice making process begins.

[0354] In the ice making process, a cooler operates and low-temperature refrigerant may flow into the heat exchanger 50. For example, the compressor 183 may be turned on. Of course, the condenser fan 185 may also be turned on. Alternatively, the compressor 183 and the condenser fan 185 may be turned on before the ice making process and remain turned on during the ice making process. The valve 188 can be turned off.

[0355] In the ice making process, liquid may be supplied to the ice maker 40 by the liquid supplier 330.

[0356] A controller, which will be described later, may turn on the pumps 360 and 362 simultaneously or sequentially.

[0357] For example, when the first pump 360 operates, liquid may be supplied to the first tray assembly 410 through the sub_first liquid supplier 380.

[0358] Liquid sprayed from the sub_first liquid supplier 380 is supplied to the first ice making cell 440 of the first tray assembly 410.

[0359] Liquid supplied to the first ice making cell 440 flows toward an upper surface of the first another tray 430. A portion of liquid within the first ice making cell 440 is frozen by the first refrigerant pipe 510. Unfrozen liquid falls downward again through the first opening 423. Liquid that falls downward through the first opening 423 is stored in the liquid storage 350 again.

[0360] During the ice making process, ice is generated at one side of the first ice making cell 440 and grows toward the other side. As liquid is sprayed into the first ice making cell 440, a portion of the liquid is frozen. In a

process of spraying liquid into the first one tray 420 or the first another tray 430, air bubbles in the liquid may be discharged from the liquid.

[0361] When the second pump 362 operates, liquid may be supplied to the second tray assembly 450 through the sub_second liquid supplier 382.

[0362] Liquid sprayed from the sub _second liquid supplier 382 is supplied into the second ice making cell 451 through a supporter opening 482a of the supporter 480 and a second opening 473 of the second another tray 470.

[0363] Liquid supplied to the second ice making cell 451 flows toward an inner side of the second one tray 460. Some of the liquid within the second ice making cell 451 may be frozen by the second refrigerant pipe 520. Unfrozen liquid falls downward again through the second opening 473. Liquid that falls downward through the second opening 473 is stored again in the liquid storage 350.

[0364] While performing the ice making process, the controller may determine whether ice making is completed in the tray assembly.

[0365] The ice making process may be determined to be completed when a temperature detected by the temperature sensor for detecting a temperature of each tray assembly reaches an end reference temperature.

[0366] When an ice making process is completed, an ice separation process is performed.

[0367] According to a liquid supply amount controlled in the ice making process, a second ice I2 generated in the second ice making cell 451 may contact the sub_second liquid supplier 382 or be spaced apart from the sub_second liquid supplier 382. That is, since an end of the sub_second liquid supplier 382 is located adjacent to or on the second opening 473, when ice making is completed, the second ice I2 may be in contact with the sub _second liquid supplier 382.

[0368] Of course, even if the second ice I2 remains in contact with the sub_second liquid supplier 382 after completion of an ice making process, the second ice I2 may be separated from the sub_second liquid supplier 382 during an ice separation process.

[0369] When the ice separation process starts, the valve 188 may be turned on. When the valve 188 is turned on, high-temperature refrigerant compressed in the compressor 183 may flow into the heat exchanger 50. High-temperature refrigerant flowing into the heat exchanger 50 may be heat exchanged with the ice maker 40. When high-temperature refrigerant flows into the heat exchanger 50, heat may be transferred to the ice maker 40.

[0370] The first ice I1 may be separated from the first tray assembly 410 by the heat transferred to the ice maker 40. When the first ice I1 is separated from the first tray assembly 410, the first ice I1 may fall onto the guide 70. The first ice I1 that fell onto the guide 70 may be stored in the first storage space 132.

[0371] The second ice I2 may be separated from at least a surface of the second one tray 460 by heat transferred to the ice maker 40.

[0372] As time passes, or when a temperature of each tray assembly reaches a set temperature, a flow of high-temperature refrigerant to the heat exchanger 50 may be blocked.

[0373] Next, the driver 690 may operate to separate the second ice I2 from the second tray assembly 450.

[0374] That is, the controller 190 may control the second another tray 470 to move to an ice separation position in a first direction (clockwise direction based on FIG. 13) to take out ice from the second ice making cell 251 after generation of the second ice is completed in the second ice making cell 251 and then moves the second another tray 470 in a second direction. The second direction may be different from the first direction. For example, the second direction may be opposite to the first direction.

[0375] When the second ice I2 is separated from the second one tray 460 and second another tray 470 by high-temperature refrigerant flowing into the heat exchanger 50, the second another tray 470 may be moved while second ice I2 is supported on the second another tray 470. In this case, when the second another tray 470 moves at an angle of approximately 90 degrees, the second ice I2 may fall from the second another tray 470.

[0376] On the other hand, when the second ice I2 has been separated from the second one tray 460 by high-temperature refrigerant flowing into the heat exchanger 50 but has not yet been separated from the second another tray 470, the pusher 490 presses the second another tray 470 and the second ice I2 may be separated from the second another tray 470 and falls downward while the second another tray 470 moves to an ice separation angle.

[0377] Alternatively, according to a size of the second opening 473, the pusher 490 may pass through penetrate the second another tray 470 and directly press the second ice I2. Alternatively, the pusher 490 may be in contact with the second another tray 470 and the second ice I2.

[0378] For example, after completion of ice making, when a second ice I2 generated in the second ice making cell 451 comes into contact with the sub_second liquid supplier 382, the second another tray 470 may be moved in a state in which the second ice I2 is in contact with the liquid supply 382.

[0379] Next, when the second another tray is moved beyond an angle at which one end of the sub _second liquid supplier 382 passes through the end of the pusher 490, or when the second another tray 470 is moved to an extent that a portion of the sub_second liquid supplier 382 is inserted into the pusher 490, the sub_second liquid supplier 382 may be spaced apart from the second ice I2. That is, the second another tray 470 may be further moved so that the sub_second liquid supplier 382 is spaced apart from the second ice I2.

[0380] Alternatively, at least a portion of the pusher 490 may be in contact with the second ice I2 or the second

another tray 470. That is, the second another tray 470 may be further moved so that at least a portion of the pusher 490 is in contact with the second ice I2 or the second another tray 470.

[0381] As another example, after completion of ice making, if a second ice I2 generated in the second ice making cell 451 is not in contact with the sub_second liquid supplier 382, the second another tray 470 may be moved in a state in which the second ice I2 is not in contact with the sub_second liquid supplier 382.

[0382] When the second another tray 470 is moved beyond a position where one end of the sub _second liquid supplier 382 passes an end of the pusher 490, or when the second another tray 470 is moved to an extent that a portion of the sub _second liquid supplier 382 is inserted into the pusher 490, the pusher 490 may come into contact with the second ice I2.

[0383] After the pusher 490 is in contact with the second ice I2, the sub _second liquid supplier 382 is in contact with the second ice I2 during a movement of the second another tray 470. In this case, a relative movement of the sub_second liquid supplier 382 and the second another tray 470 may be possible. By changing a material or structure of the sub_second liquid supplier 382, the sub_second liquid supplier 382 moves together with the supporter 480, but at least in some sections where the supporter 480 moves, if a relative movement of the sub_second liquid supplier 382 and the second another tray 470 or supporter 480 is possible, it is also possible for the sub _second liquid supplier 382 to contact the second ice I2 in a state in which the sub _second liquid supplier is spaced apart from the second ice I2.

[0384] Additionally, the sub_second liquid supplier 382 may be spaced apart from the second ice I2 by an additional movement of the second another tray 470.

[0385] As another example, after completion of ice making, when the second ice I2 generated in the second ice making cell 451 comes into contact with the sub_second liquid supplier 382, the second another tray 470 may be moved in a state in which the second ice I2 is in contact with the sub_second liquid supplier 382. In this state, during a movement of the second another tray 470, the pusher 490 may also contact the second ice I2.

[0386] Then, the sub _second liquid supplier may be spaced apart from the second ice I2 by an additional movement of the second another tray 470.

[0387] As described above, since the pusher 490 includes a through hole or an opening, the sub_second liquid supplier 382 may move without interfering with the pusher 490 during an ice separation process. For example, the discharge pipe 386 may be moved while received in the pushing column 492.

[0388] When the second ice I2 is separated from the second tray assembly 450, the second ice I2 may fall onto the guide 70. The second ice I2 that fell onto the guide 70 may be stored in the second storage space 134.

[0389] After the second another tray 470 is moved in the first direction, the second another tray 470 is moved in a second direction (counterclockwise direction in the drawing) by the driver 690 and in contact with the second one tray 460.

[0390] When an ice separation process is performed once or a set number of times, liquid in the liquid storage 350 may be discharged to an outside through the drain pipe 390 and the drain tube 392 (drain process). That is, the drain valve can be turned on for a certain period of time when the liquid drain condition is satisfied.

[0391] A next liquid supply process may be started after a drain process is performed. When the drain process is performed intermittently, if a drain condition is not satisfied, a liquid supply process may be performed immediately after the ice separation process is performed. If a drain condition is satisfied, a drain process may be performed after the ice separation process is performed, and the liquid supply process may be performed after a drain process is completed.

[0392] Meanwhile, it is also possible to apply technology applied to the ice making device to a refrigerator. That is, the refrigerator may include some or all of the components of the ice making device 1.

[0393] First, the ice maker 40 in the ice making device 1 can be applied to the refrigerator. The refrigerator may include a cabinet having a storage chamber where an item is stored, and a door that opens and closes the storage chamber. An ice making chamber may be provided in the cabinet or door.

[0394] An ice maker 40 may be provided in the storage chamber or the ice making chamber with the same structure or a similar form as the ice maker 40 of this embodiment.

[0395] In a case of the refrigerator, it is also possible to include only one of a first tray assembly and a second tray assembly. According to a number of tray assemblies, a number of corresponding pumps or liquid supplies may also vary.

[0396] A cooler may provide cold to the storage chamber. The storage chamber may be provided with a storage chamber temperature sensor. When the ice making chamber is positioned in the storage chamber, the ice making chamber may be a portion of the storage chamber or may be separated from the storage chamber to receive cold. The controller may control a supply of cold to the storage chamber or control a supply of cold to the ice making chamber.

[0397] In this embodiment, the cooler in the ice making device 1 may be replaced with a cooler or a refrigerant cycle that cools the storage chamber.

[0398] A guide 70, a liquid supply assembly 320, and a liquid supplier 330 provided in the ice making device 1 may also be applied to the refrigerator or may be modified in shape, size, location or number to suit characteristics of the refrigerator.

Claims

1. A refrigerator comprising:

   a storage chamber where an item is stored;
   a cooler configured to supply cold to the storage chamber;
   a second one tray that defines a portion of an ice making cell that is a space in which liquid is phase-changed into ice by the cold;
   a second another tray that defines another portion of the ice making cell and arranged to be in contact with the second one tray during an ice making process and to be spaced apart from the second one tray during an ice separation process;
   a sub liquid supplier configured to supply liquid to the ice making cell;
   a controller configured to control a supply of cold to the storage chamber; and
   a pusher spaced apart from the second another tray by a predetermined distance.

2. The refrigerator of claim 1, wherein at least a portion of the sub liquid supplier is movably provided to be located at different positions during the ice making process and the ice separation process.

3. The refrigerator of claim 2, wherein the controller is configured to control the second another tray to move to an ice separation position in a first direction to take out ice from the ice making cell after an ice making in the ice making cell is completed and then move the second another tray in a second direction.

4. The refrigerator of claim 3, wherein the first direction is different from the second direction.

5. The refrigerator of claim 4, wherein the first direction is a direction opposite to the second direction.

6. The refrigerator of claim 1, wherein at least a portion of the sub liquid supplier is disposed at one side of the second another tray.

7. The refrigerator of claim 6, wherein the sub liquid supplier comprises:

   a first through hole through which liquid is introduced,
   a second through hole through which liquid is discharged, and
   a pipe connecting the first through hole and the second through hole.

8. The refrigerator of claim 7, wherein the second through hole is arranged to supply liquid into the ice making cell through an opening formed at one side of the second another tray.

9. The refrigerator of claim 7, wherein the second through hole is movably provided to be located at different positions during the ice making process and the ice separation process.

10. The refrigerator of claim 7, wherein the second through hole is provided so that a position of the second through hole changes while the second another tray moves.

11. The refrigerator of claim 7, wherein while the second another tray moves in a first direction, the second through hole moves in the first direction.

12. The refrigerator of claim 10, wherein while the second another tray moves in a second direction, the second through hole moves in the second direction.

13. A refrigerator comprising:

   a storage chamber where an item is stored;
   a cooler configured to supply cold to the storage chamber;
   a second one tray that defines a portion of an ice making cell that is a space in which liquid is phase-changed into ice by the cold;
   a second another tray that defines another portion of the ice making cell and arranged to be in contact with the second one tray during an ice making process and to be spaced apart from the second one tray during an ice separation process;
   a sub liquid supplier configured to supply liquid to the ice making cell;
   a controller configured to control a supply of cold to the storage chamber; and
   a pusher spaced apart from the second another tray by a predetermined distance,
   wherein the pusher provides a path for a component to move.

14. The refrigerator of claim 13, wherein the pusher is disposed at one side of the second another tray.

15. The refrigerator of claim 14, wherein the pusher comprises a through hole that allows the component to move through an interior.

16. The refrigerator of claim 15, wherein the through hole comprises a first through hole for the component to enter an inside of the pusher; and
   a hollow space provided for the component passing through the first through hole to pass through an inside of the pusher.

17. The refrigerator of claim 16, wherein the through hole

comprises a second through hole that provides a position at which the component passing through the hollow space stops.

18. The refrigerator of claim 16,
wherein the pusher comprises a wall that provides a position at which the component passing through the hollow space stops.

19. The refrigerator of claim 15, wherein the pusher comprises an opening formed therein so that the component moves therethrough.

20. The refrigerator of claim 19, wherein the opening is formed at one side of the pusher.

21. The refrigerator of claim 20, wherein at least a portion of the component is disposed at one side of the pusher and the opening is formed at one side of the pusher, or
at least a portion of the component is disposed at another side of the pusher, and the opening is formed at another side of the pusher.

22. The refrigerator of claim 20, wherein the opening is provided to face an unopened wall.

23. A refrigerator comprising:

a storage chamber where an item is stored;
a cooler configured to supply cold to the storage chamber;
a second one tray that defines a portion of an ice making cell that is a space in which liquid is phase-changed into ice by the cold;
a second another tray that defines another portion of the ice making cell and arranged to be in contact with the second one tray during an ice making process and to be spaced apart from the second one tray during an ice separation process;
a sub liquid supplier configured to supply liquid to the ice making cell;
a controller configured to control a supply of cold to the storage chamber; and
a pusher spaced apart from the second another tray by a predetermined distance,
wherein at least a portion of the pusher is provided to be separated from the ice generated in the ice making cell during the ice making process, and provided to contact the ice generated in the ice making cell during the ice separation process.

24. The refrigerator of claim 23, wherein the controller is configured to move the second another tray in a state in which the ice generated in the ice making cell is in contact with at least a portion of the sub liquid supplier in the ice separation process.

25. The refrigerator of claim 24, wherein after the ice generated in the ice making cell comes into contact with at least a portion of the sub liquid supplier, the controller is configured to move the second another tray so that the ice is spaced apart from the sub liquid supplier again.

26. The refrigerator of claim 24, wherein the controller is configured to move the second another tray so that the ice generated in the ice making cell or the second another tray is in contact with the pusher.

27. The refrigerator of claim 23, wherein the controller is configured to move the second another tray so that the ice generated in the ice making cell in the ice separation process is in contact with at least a portion of the pusher.

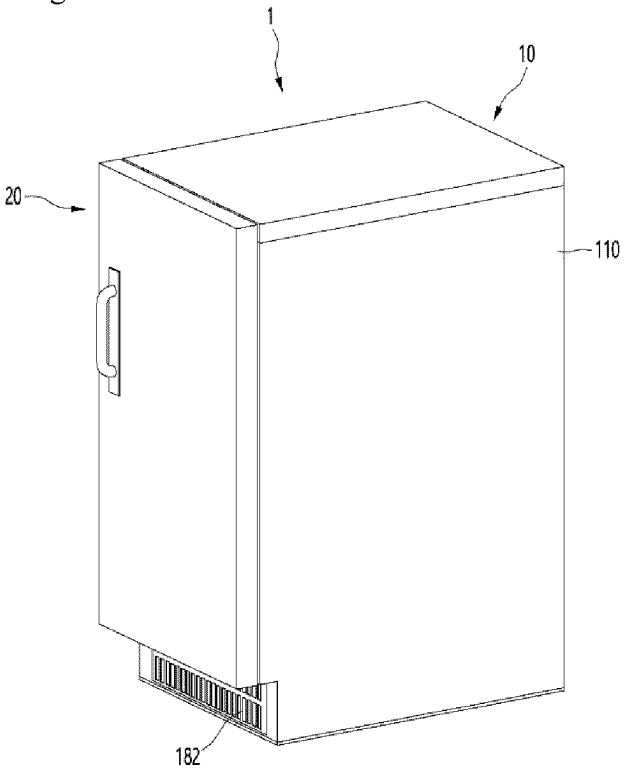
28. The refrigerator of claim 26, wherein the controller is configured to move the second another tray so that the ice generated in the ice making cell in the ice separation process is in contact with at least a portion of the sub liquid supplier after the ice is in contact with at least a portion of the pusher.

29. The refrigerator of claim 28, wherein the controller is configured to move the second another tray so that the ice generated in the ice making cell is spaced apart from the sub liquid supplier again after the ice is in contact with at least a portion of the sub liquid supplier.

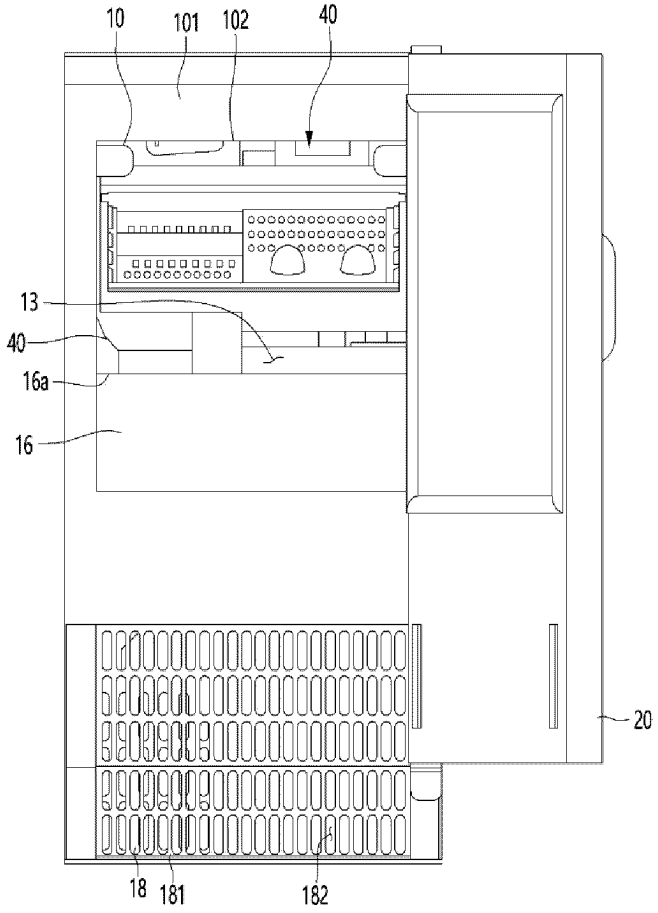
30. The refrigerator of claim 23, wherein the controller is configured to move the second another tray so that the ice generated in the ice making cell in the ice separation process is in contact with at least a portion of the sub liquid supplier and at least a portion of the pusher.

31. The refrigerator of claim 30, wherein the controller is configured to move the second another tray so that the ice generated in the ice making cell is spaced apart from the sub liquid supplier again after the ice is in contact with at least a portion of the sub liquid supplier and at least a portion of the pusher.

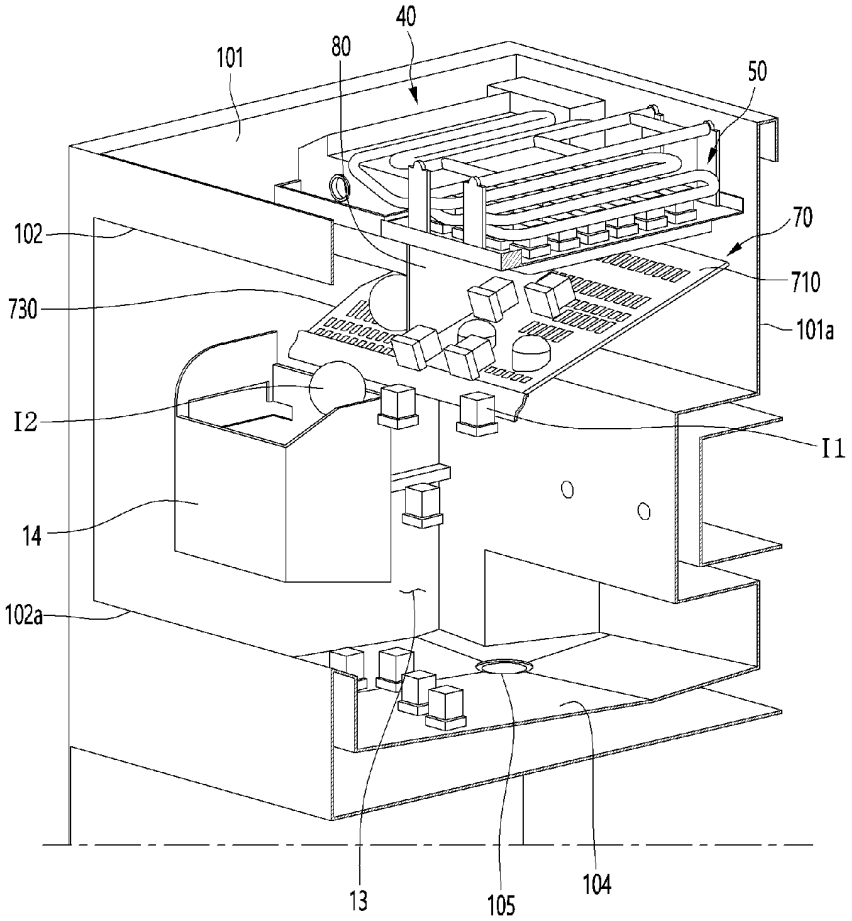
【Figure 1】



【Figure 2】



【Figure 3】



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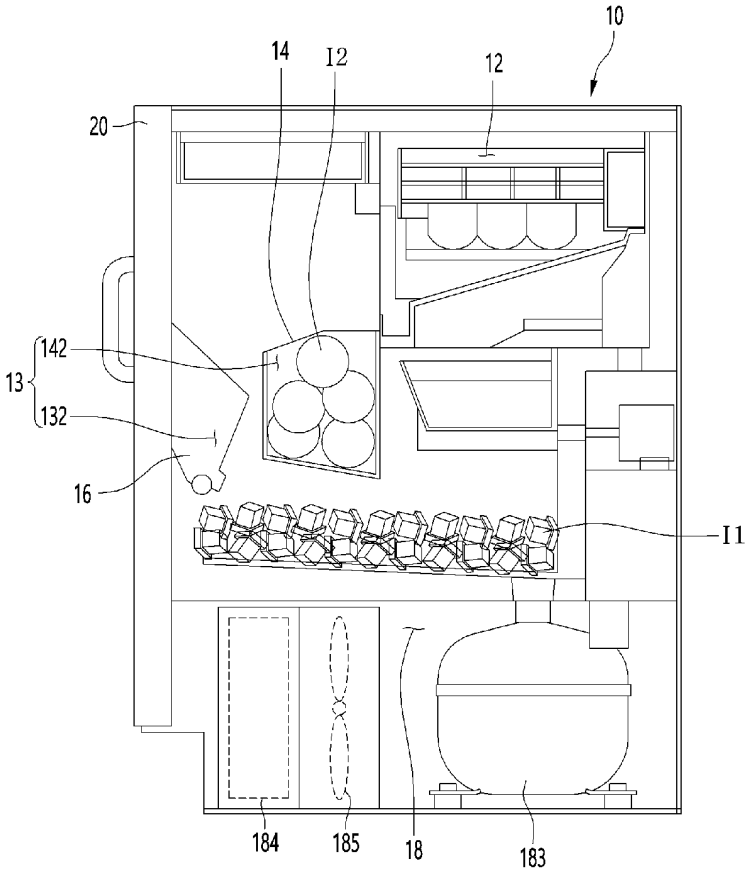

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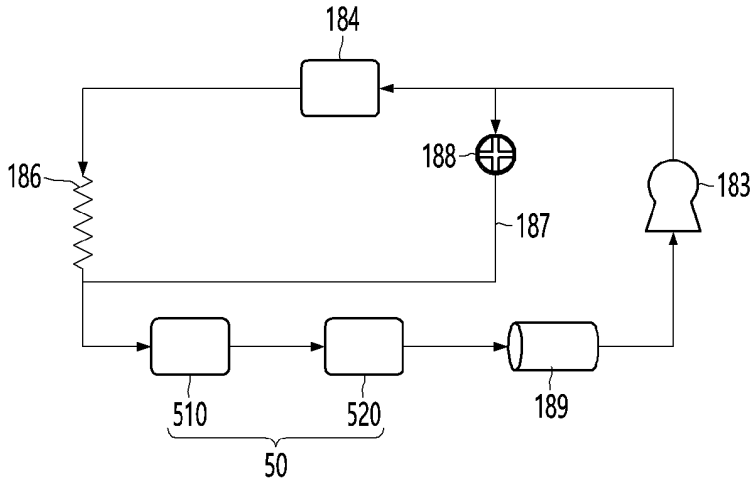

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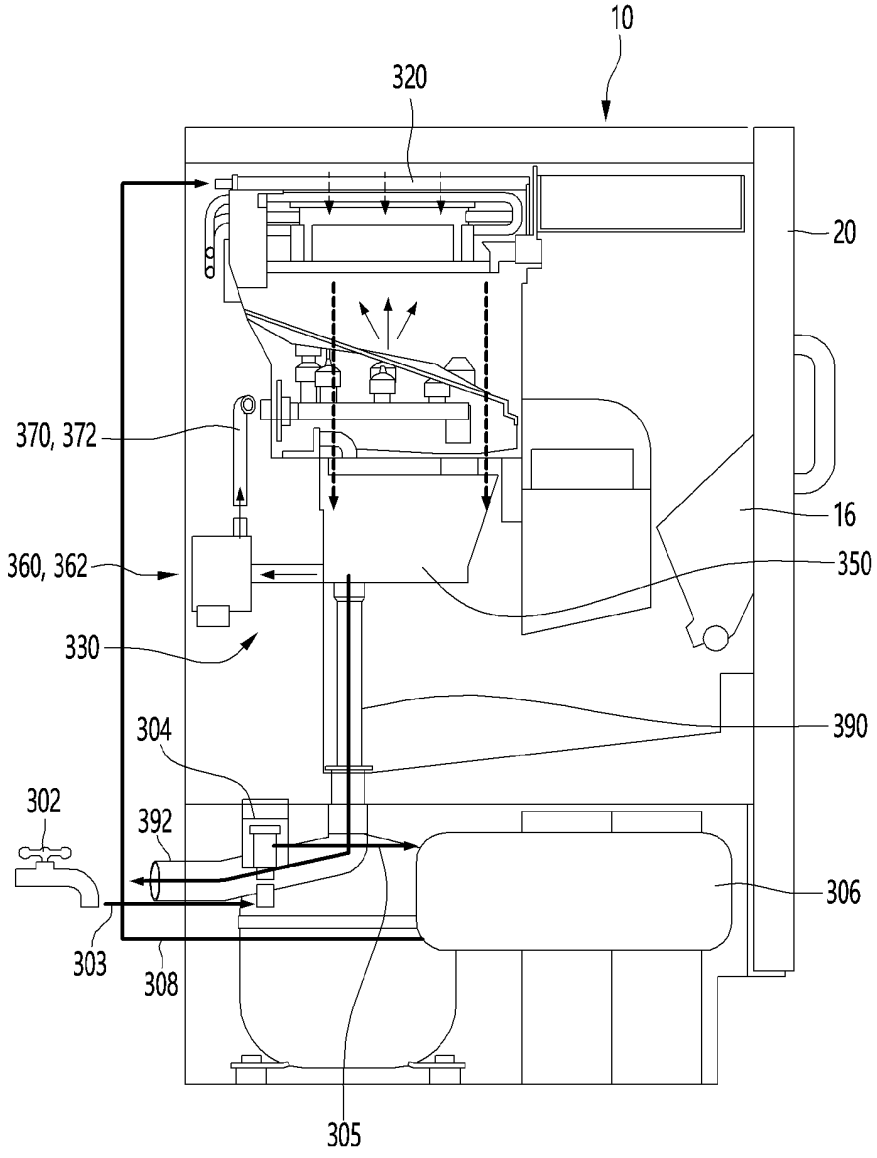

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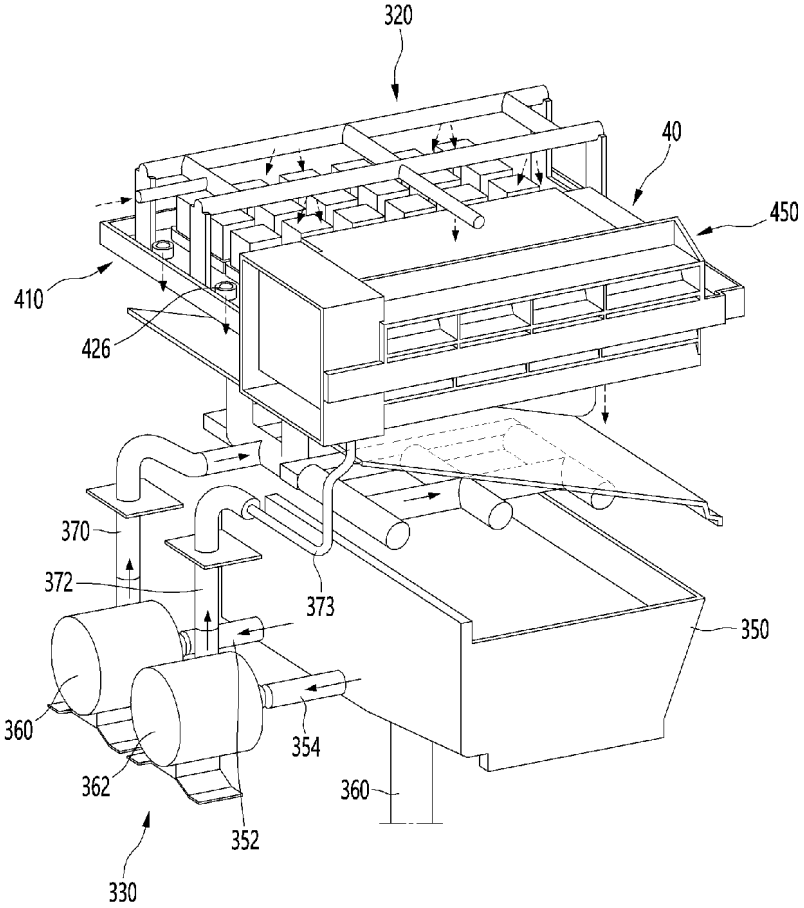

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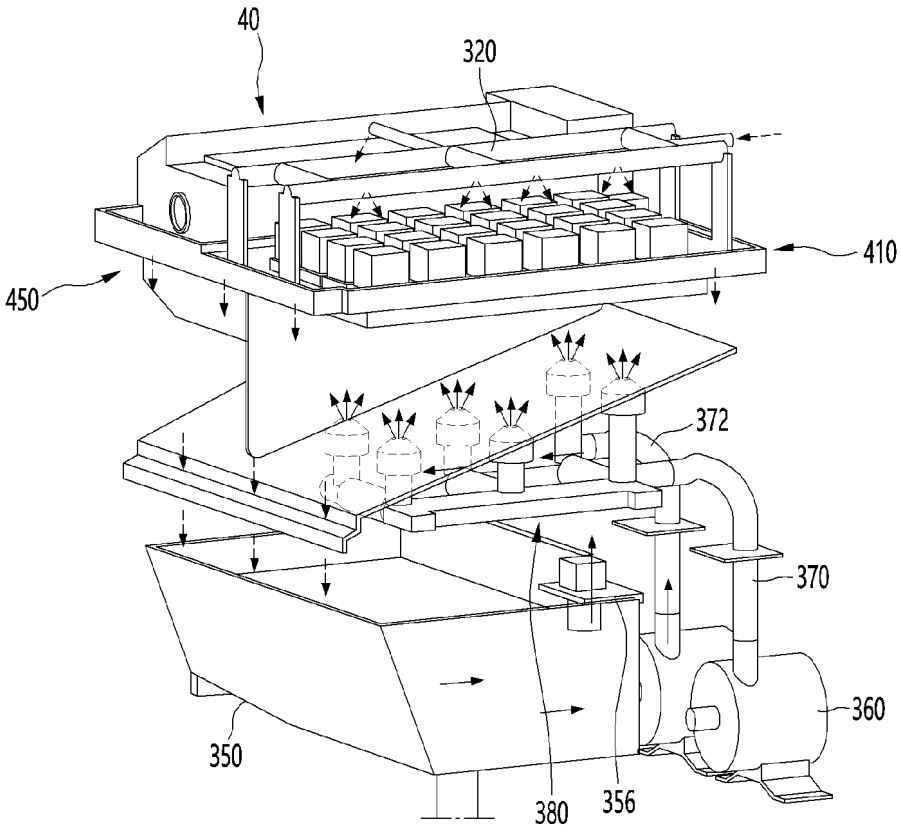

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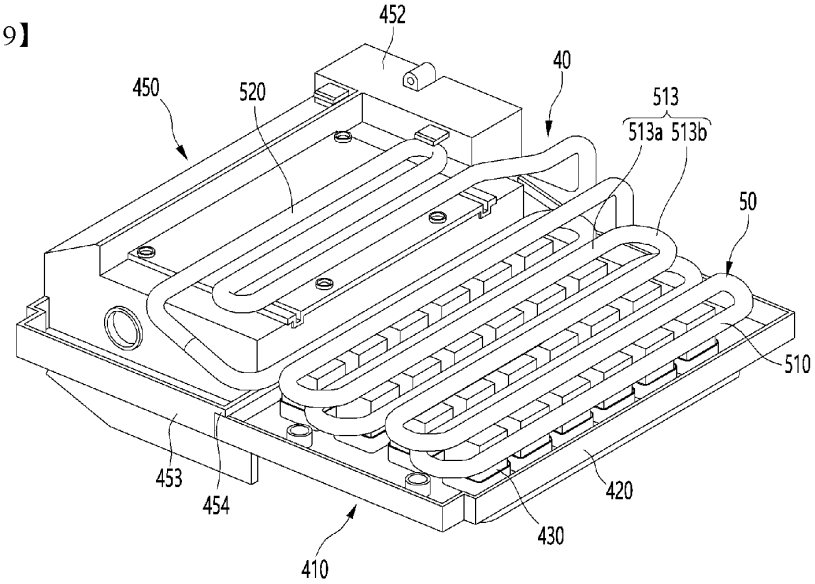
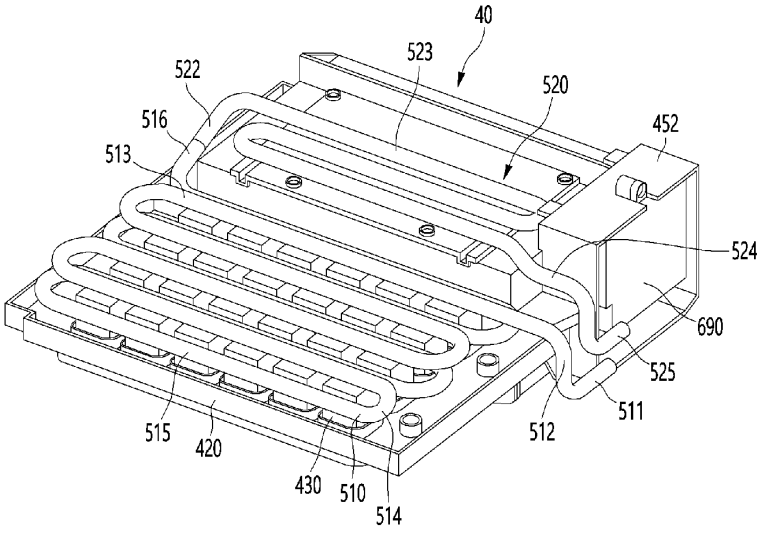
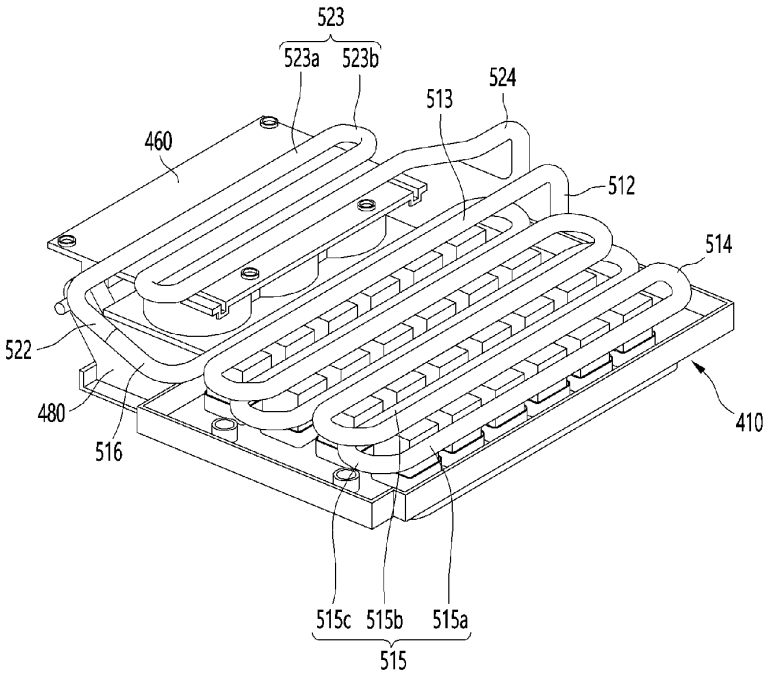


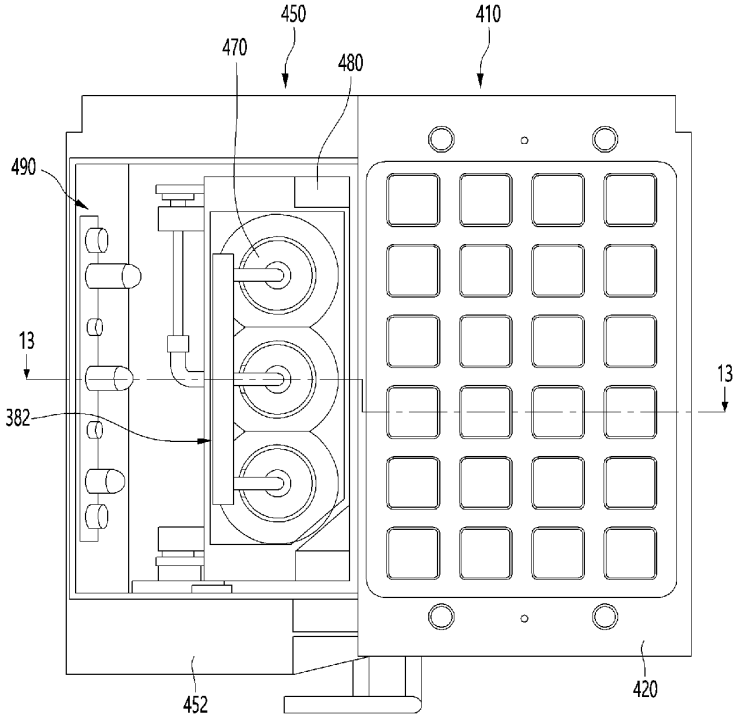
【Figure 10】



【Figure 11】



【Figure 12】



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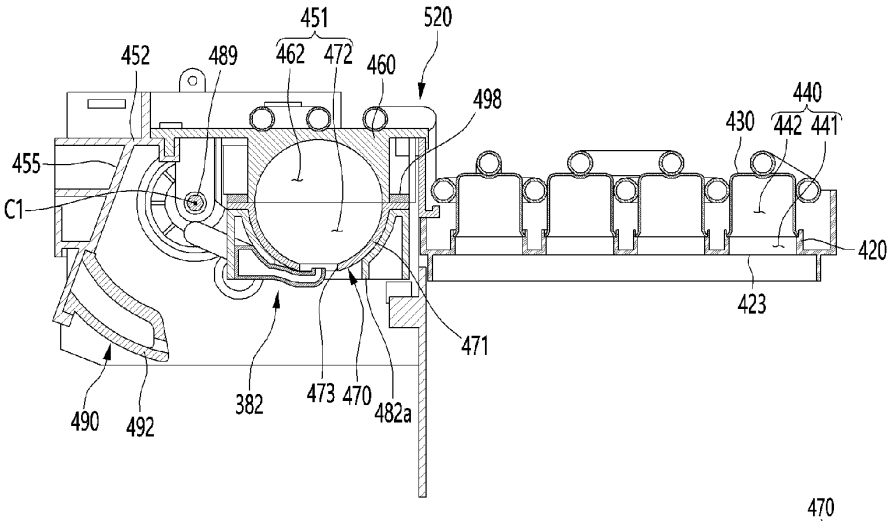

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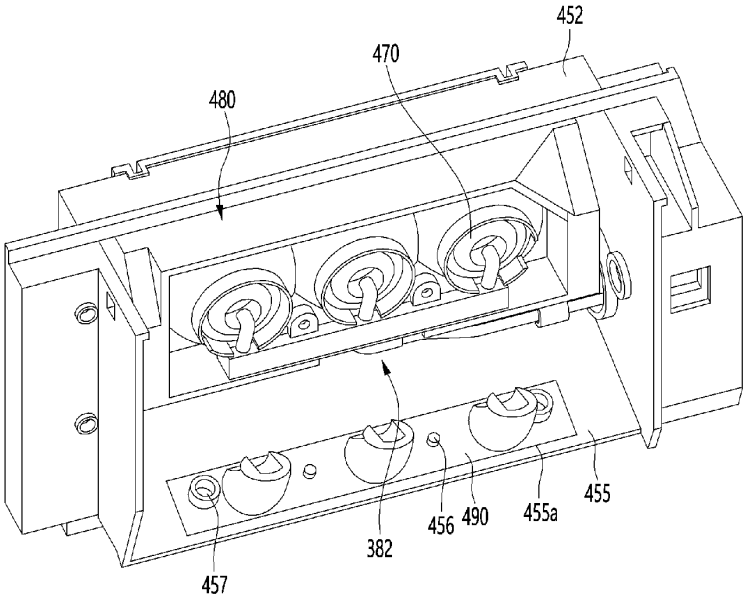
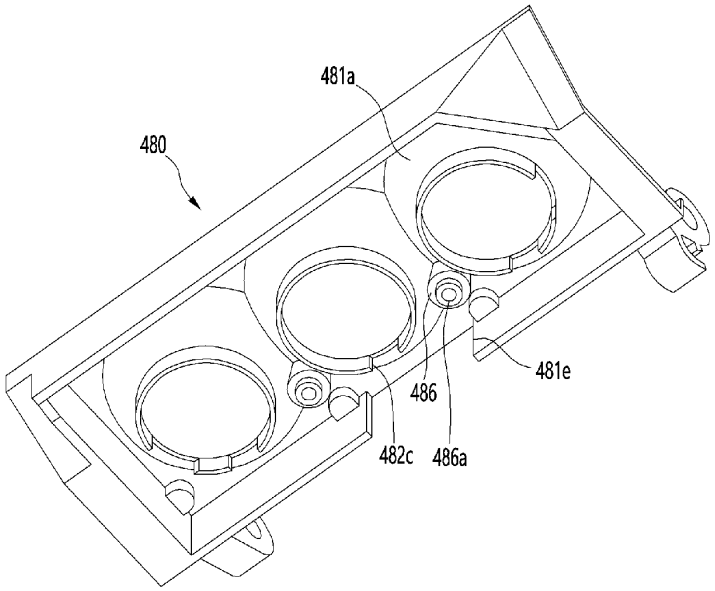
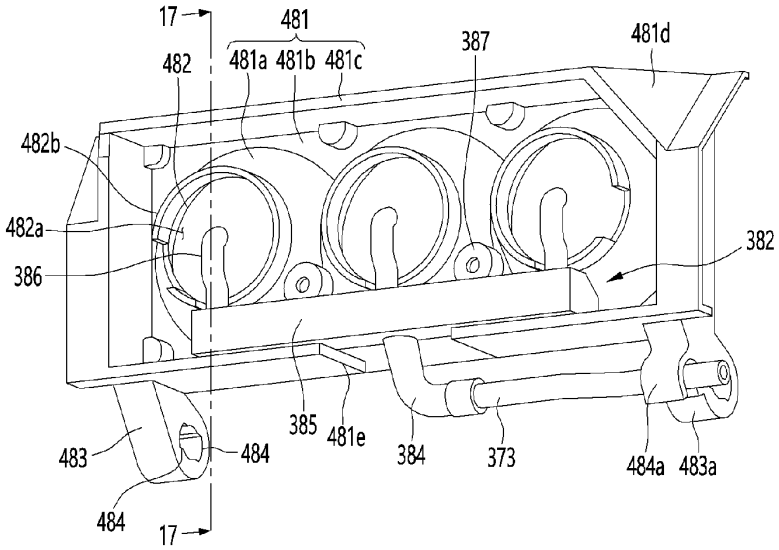


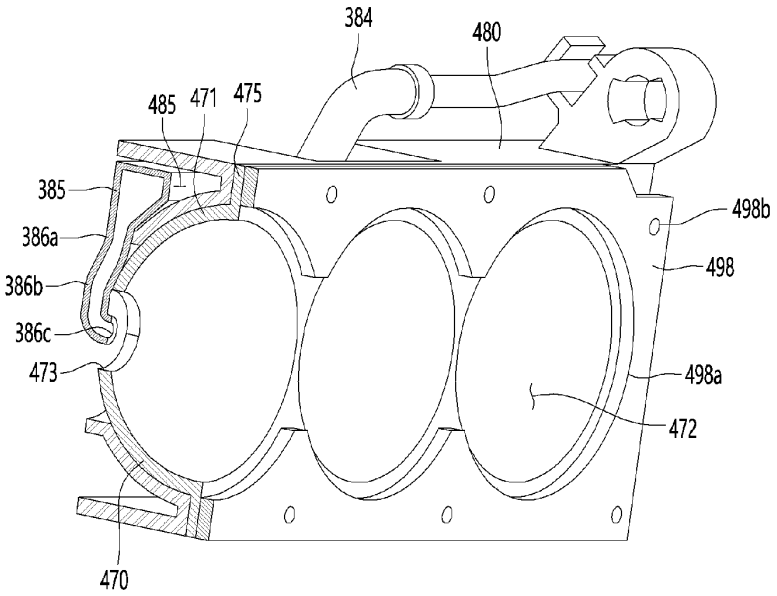
【Figure 15】



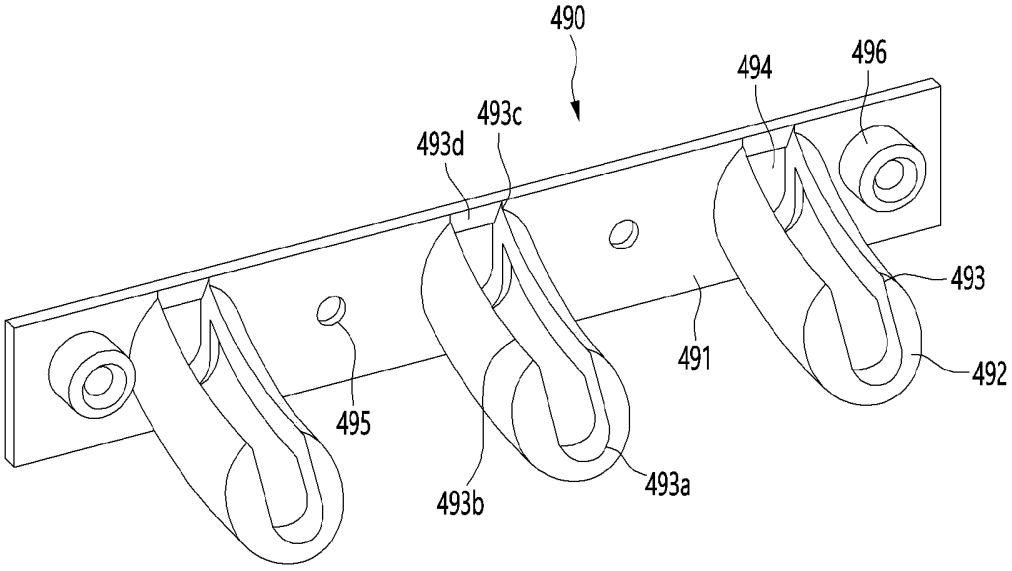
【Figure 16】



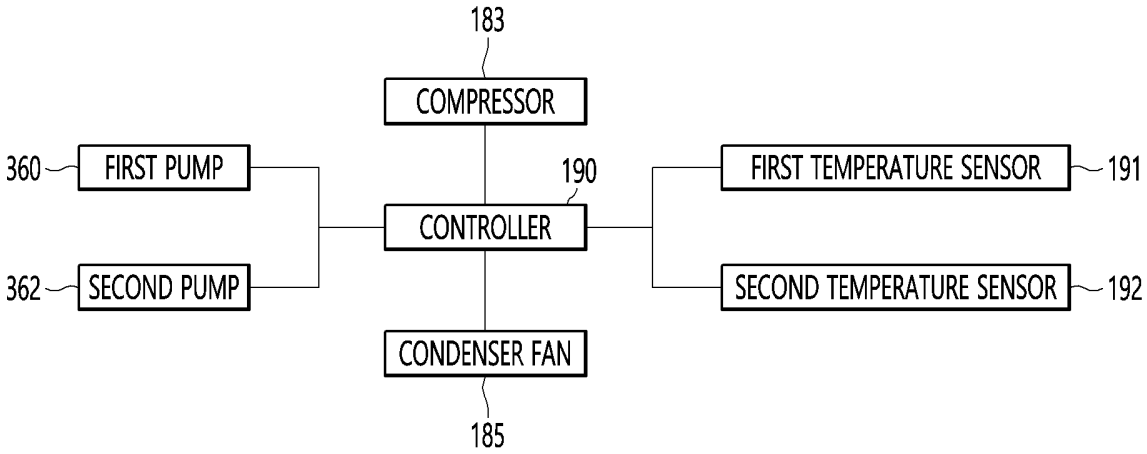
【Figure 17】



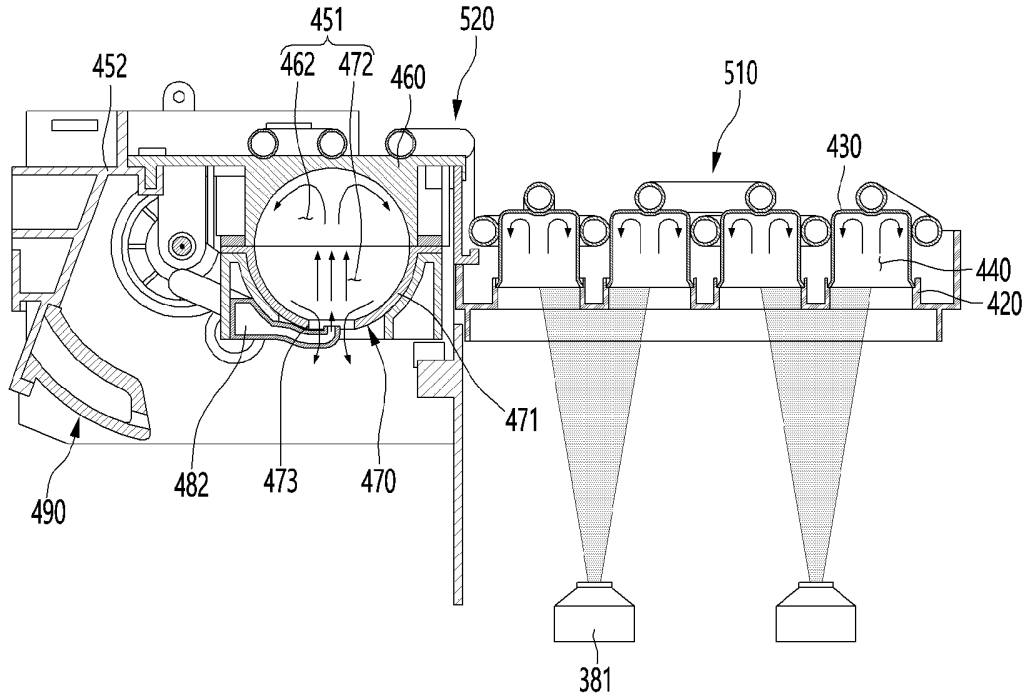
【Figure 18】



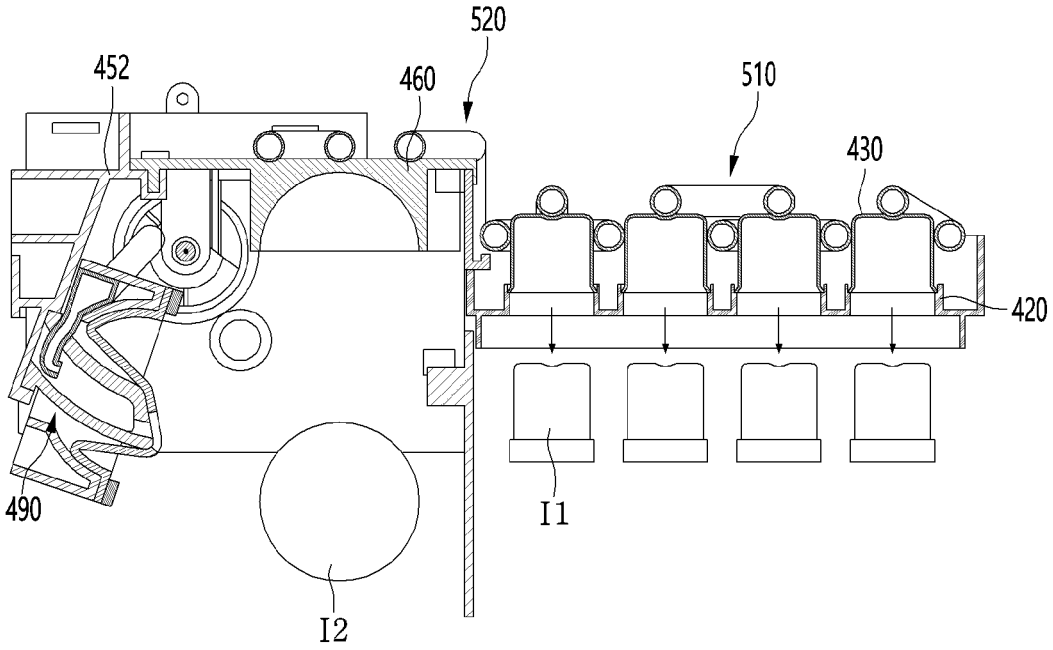
【Figure 19】



【Figure 20】



【Figure 21】



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2023/002707

A. CLASSIFICATION OF SUBJECT MATTER

F25C 1/24(2006.01)i; **F25D 23/04**(2006.01)i; **F25D 23/12**(2006.01)i; **F25C 1/25**(2018.01)i; **F25C 5/04**(2006.01)i; **F25C 5/08**(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F25C 1/24(2006.01); F25C 1/18(2006.01); F25C 1/243(2018.01); F25C 1/246(2018.01); F25C 5/02(2006.01); F25D 11/02(2006.01)

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

Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords: 회전(rotate), 제빙(making ice), 가압(press), 푸서(pusher), 냉각기(cooling), 트레이(tray), 냉장고(refrigerator), 정지부(stopper), 가이드(guide)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-2021-0030018 A (LG ELECTRONICS INC.) 17 March 2021 (2021-03-17) See paragraphs [0076]-[0080], [0107]-[0111], [0254]-[0257] and [0303]-[0306], claims 1 and 16 and figures 4, 8-12 and 19-22.	1,13-14,23-31
Y		6-8
A		2-5,9-12,15-22
Y	KR 10-2003-0040433 A (SOMURA, Katsuzo) 22 May 2003 (2003-05-22) See paragraphs [0015]-[0022] and figure 22.	6-8
A	WO 2018-141617 A1 (ARCELIK ANONIM SIRKETI) 09 August 2018 (2018-08-09) See claim 1 and figures 1-2.	1-31
A	KR 10-2010-0137304 A (LG ELECTRONICS INC.) 30 December 2010 (2010-12-30) See paragraphs [0030]-[0043] and figure 11.	1-31

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

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"P" document published prior to the international filing date but later than the priority date claimed
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 May 2023	**26 May 2023**
Name and mailing address of the ISA/KR **Korean Intellectual Property Office** **Government Complex-Daejeon Building 4, 189 Cheongsa-ro, Seo-gu, Daejeon 35208** Facsimile No. **+82-42-481-8578**	Authorized officer Telephone No.

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International application No.
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

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