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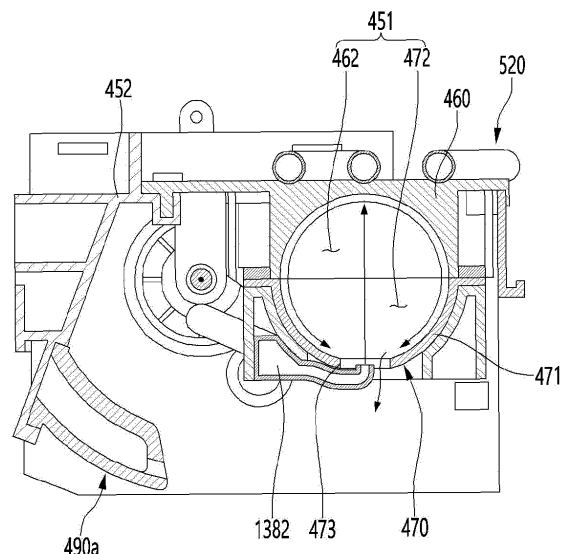
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(54) **ICE-MAKING APPARATUS AND REFRIGERATOR**

(57) An ice-making apparatus of the present embodiment may include a first tray unit forming a part of an ice-making cell, which is a space in which water is phase-changed into ice by cold. The ice-making apparatus may form another portion of the ice-making cell and be in contact with the first tray unit in the ice-making process, and may further include a second tray unit disposed to be spaced apart from the first tray unit during an ice-separating process. The ice-making apparatus may further include a water supply unit for supplying water to the ice-making cell.

[Figure 28]



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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]** In addition, in the prior literature, it is not possi-

ble to generate ice in a shape of a sphere other than a cube shape.

**[0012]** An automatic ice maker capable of generating spherical ice is disclosed in Korean Patent Publication Patent No. 10-2020-0057604 that is a prior art document.

**[0013]** 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.

**[0014]** 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]

**[0015]** The present embodiment provides an ice making device and a refrigerator that can generate highly transparent ice without operating a heater.

**[0016]** Alternatively or additionally, one embodiment provides an ice making device and a refrigerator that improve ice separating efficiency by supplying liquid to an ice maker during an ice separation process.

**[0017]** Alternatively or additionally, one embodiment provides an ice making device and a refrigerator that can reduce ice separation time by improving ice separation performance.

**[0018]** 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.

[Technical Solution]

**[0019]** 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 one embodiment, an ice making device may include a second one tray that defines a portion of an ice making cell that is a space in which liquid (e.g., water) is phase-changed into ice by cold.

**[0020]** The ice making device may further include 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.

**[0021]** The ice making device may further include a sub liquid supplier configured to supply liquid to the ice making cell. The ice making device may include a driver connected to the second another tray.

**[0022]** A position of at least a portion of the sub liquid supplier may change during the ice separation process.

**[0023]** The sub liquid supplier may include a liquid supply hole that supplies liquid. A position of the liquid supply hole during the ice making process may be different from a position of the liquid supply hole during the ice separation process.

**[0024]** The sub liquid supplier or the liquid supply hole may be arranged to supply liquid into the ice making cell through an opening formed at one side of the second another tray.

**[0025]** While the second another tray moves in a first direction, the sub liquid supplier or the liquid supply hole may move in a same direction as the first direction. While the second another tray moves in a second direction, the sub liquid supplier or the liquid supply hole may move in a same direction as the second direction.

**[0026]** The ice making device may further include a supporter configured to support the second another tray. The sub liquid supplier may be coupled to the supporter or the second another tray.

**[0027]** The liquid supply hole may be arranged to be aligned with an opening formed at one side of the second another tray. A diameter of the liquid supply hole may be less than a diameter of the opening.

**[0028]** The supporter may further include a supporter opening aligned with the liquid supply hole and the opening.

**[0029]** The supporter may include a hinge body that provides a center of rotation. A liquid supply tube may be connected to the sub liquid supplier to guide liquid to the sub liquid supplier. The hinge body may be provided with a rib extended to fix a position of the liquid supply tube.

**[0030]** The sub liquid supplier may include an inlet pipe. The sub liquid supplier may further include a common pipe connected to the inlet pipe. The sub liquid supplier may further include supply pipes extended from the common pipe and a number of supply pipes is equal to a number of ice making cells.

**[0031]** The supporter may include a supporter opening. The common pipe may be located radially outside the supporter opening. The supply pipe may extend from the common pipe toward a central portion of the supporter opening.

**[0032]** The ice making device may further include a pusher provided spaced apart from the second another tray at a predetermined distance. While the second another tray moves in a first direction during an ice separation process, the supply pipe may be moved in a direction closer to the pusher.

**[0033]** The pusher may provide a path along which the supply pipe moves during an ice separation process.

**[0034]** An opening may be formed at one side of the second another tray through which liquid passes. The supporter may include a supporter opening in communication with the opening. The sub liquid supplier may be coupled to the supporter to cover the supporter opening.

**[0035]** An opening may be formed at one side of the second another tray through which liquid passes. The sub liquid supplier may include an inlet pipe. The sub liquid supplier may further include a distribution pipe connected to the inlet pipe and having a liquid supply hole aligned with the opening.

**[0036]** The sub liquid supplier may further include a coupling body to be coupled to the supporter.

**[0037]** The coupling body may include a first body extending from the distribution pipe. The coupling body may further include a second body extending from the first body in a direction crossing the first body.

**[0038]** The coupling body may further include a coupling extension extending from the second body and coupled to the supporter.

**[0039]** The sub liquid supplier may further include a protrusion disposed around the liquid supply hole and inserted into an opening of the second another tray. One surface of the protrusion may be rounded to form a portion of the ice making cell.

**[0040]** The sub liquid supplier may further include an outlet opening through which liquid supplied to the ice making cell is discharged. The outlet opening may be formed to pass through the protrusion.

**[0041]** The ice making device may further include a heater configured to supply heat to the ice making cell during an ice separation process.

**[0042]** The sub liquid supplier may support the heater or a heater coupling portion to which the heater is coupled. The second another tray may include a heater coupling portion to which the heater is coupled. The heater coupling portion may pass through an opening of the second another tray. The sub liquid supplier may be arranged to surround the heater coupling portion.

**[0043]** In another embodiment, an ice making device may include a second one tray that defines a portion of an ice making cell which is a space in which liquid is phase-changed into ice by cold. The ice making device may further include a second another tray having an opening and that defines another portion of the ice making cell,

and is 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 ice making device may further include a sub liquid supplier including a liquid supply hole for supplying liquid to the ice making cell through the opening. The ice making device may further include a driver connected to the second another tray.

**[0045]** The ice making device may further include a supporter configured to support the second another tray. The supporter may include a supporter opening aligned with the opening. The supporter may further include an opening wall provided at a periphery of the supporter opening.

**[0046]** The opening wall may include a slot to prevent interference with a component in the ice separation process.

**[0047]** The supporter may include a hinge body to which a hinge shaft that receives a rotational force of the driver is connected. For example, a shaft cover may be provided between the plurality of hinge bodies to cover the hinge shaft. The shaft cover may be rounded.

**[0048]** 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. The refrigerator may further include an ice making device that generates ice using the cold. The ice making device may include some or all of the components described above.

#### [Advantageous Effects]

**[0049]** 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.

**[0050]** According to one embodiment, liquid is supplied to the ice maker in an ice separation process, thereby improving ice separation efficiency and improving ice separation performance.

**[0051]** As an ice separation performance is improved, moving time can be reduced.

**[0052]** According to one embodiment, since, in an ice separation process, a pusher presses ice within the ice making cell or a tray, there is an advantage in that ice can be completely separated from the ice making cell.

**[0053]** 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.

**[0054]** According to one embodiment, since a sub liquid supplier is installed in a supporter, liquid can be stably supplied to an ice making cell, and a phenomenon of liquid splashing can be minimized.

**[0055]** According to one embodiment, since a heater

may operate in an ice separation process, ice separation performance may be improved.

**[0056]** According to one embodiment, while liquid is continuously supplied to an ice making cell during an ice making process, liquid may be prevented from flowing toward a heater.

#### [Description of Drawings]

10 **[0057]**

FIG. 1 is a perspective view of an ice making device according to the present invention.

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

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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.

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FIG. 5 is a refrigerant cycle diagram constituting a cooler.

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

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

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FIG. 9 is a perspective view showing an arrangement of a first tray assembly and a second tray assembly in a first embodiment.

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FIGS. 10 and 11 are perspective views showing an ice maker and a cooler according to a first embodiment.

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FIG. 12 is a bottom view of an ice maker according to a first embodiment.

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

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FIG. 14 is a diagram showing a state in which a sub first liquid supplier and a sub second liquid supplier are separated according to a first embodiment.

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FIG. 15 is a top perspective view of a supporter according to a first embodiment.

FIG. 16 is a lower perspective view of a supporter according to a first embodiment.

FIG. 17 is a diagram showing a process in which liquid is supplied to an ice maker during an ice making process.

FIG. 18 is a diagram showing liquid being supplied from a sub\_first liquid supplier to a first ice making cell. 5

FIG. 19 is a diagram showing liquid being supplied from a sub\_second liquid supplier to a second ice making cell. 10

FIG. 20 is a diagram showing a positional relationship between a supporter and a guide during an ice separation process. 15

FIG. 21 is a diagram showing liquid being supplied to an ice maker according to a second embodiment.

FIG. 22 is a bottom perspective view of a second tray assembly according to a second embodiment. 20

FIG. 23 is a perspective view of a supporter according to a second embodiment. 25

FIG. 24 is a diagram showing a sub\_second liquid supplier installed on a supporter according to a second embodiment.

FIG. 25 is a cross-sectional view taken along line 25-25 in FIG. 24. 30

FIG. 26 is a perspective view of a pusher according to a second embodiment. 35

FIG. 27 is a diagram showing a connector being coupled to a sub\_first liquid supplier according to a second embodiment.

FIG. 28 is a diagram showing a process in which liquid is supplied to an ice maker during an ice making process according to a second embodiment. 40

FIG. 29 is a bottom perspective view of a second tray assembly according to a third embodiment. 45

FIG. 30 is a view showing a second another tray, a supporter, and a sub\_second liquid supplier according to a third embodiment.

FIG. 31 is a bottom perspective view of second another tray according to a third embodiment.

FIG. 32 is a top perspective view of a supporter according to a third embodiment. 50

FIG. 33 is a bottom perspective view of a supporter according to a third embodiment. 55

FIG. 34 is a perspective view of a sub second liquid supplier according to a third embodiment.

FIG. 35 is a perspective view showing a heater mounted on a second another tray according to a third embodiment.

FIG. 36 is a perspective view showing a sub second liquid supplier coupled to a supporter according to a third embodiment.

FIG. 37 is a cross-sectional view taken along line 37-37 in FIG. 36.

FIG. 38 is a cross-sectional view taken along line 38-38 in FIG. 36.

FIG. 39 is a diagram showing a state in which ice making is completed in a second tray assembly according to a third embodiment.

FIG. 40 is a diagram showing a second tray assembly in an ice separation process according to a third embodiment.

FIG. 41 is a view showing a state in which a sub second liquid supplier covers a heater coupling portion of a second another tray according to a fourth embodiment.

FIG. 42 is a perspective view of a sub second liquid supplier in a fourth embodiment.

[Mode for Invention]

**[0058]** 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.

**[0059]** 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.

**[0060]** In this specification, 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. an ice making device may include some or all of a tray defining an ice making cell that is a space in which liquid is phase-changed into ice, a cooler for supplying cold to the ice making cell, a sub liquid supplier for supplying liquid to the ice making cell, and a controller. The cooling device may include a cooler.

**[0061]** 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.

**[0062]** The ice making device may further include an ice separation assembly.

**[0063]** The tray may include a first tray. The tray may further include a second tray.

**[0064]** The first tray and the second tray may generate different types of ice.

**[0065]** The liquid supplier may independently supply liquid to each of the first tray and the second tray.

**[0066]** The liquid supplier may be configured to simultaneously supply liquid to the first tray and the second tray.

**[0067]** The liquid supplier may include a pump for pumping liquid.

**[0068]** 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. 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. the present invention may include a heat exchanger.

**[0069]** 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.

**[0070]** 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.

**[0071]** 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.

**[0072]** The ice separation assembly includes at least one of a heater for heating the tray, a pusher 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.

**[0073]** 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.

**[0074]** 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.

**[0075]** 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.

**[0076]** Referring to FIGS. 1 to 5, an ice making device 1 of this embodiment may be installed independently to generate ice.

**[0077]** 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.

**[0078]** 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.

**[0079]** 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.

**[0080]** Alternatively, the ice making chamber 12 may include the storage chamber 13, or the storage chamber 13 may include the ice making chamber 12.

**[0081]** The cabinet 10 may include a front opening 102. The door 20 can open and close the front opening 102. For example, the door 20 may open and close the front opening 102 by rotating.

**[0082]** 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.

**[0083]** The ice making device 1 may further include an ice maker 40 located in the ice making chamber 12.

**[0084]** Ice generated in the ice maker 40 may fall from the ice maker 40 and be stored in the storage chamber 13.

**[0085]** 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.

**[0086]** Although not shown, an insulating material may be provided between the inner case 101 and the outer case 100.

**[0087]** The inner case 101 may additionally define the storage chamber 13.

**[0088]** The ice making chamber 12 may be formed at one side of the inner case 101.

**[0089]** 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.

**[0090]** 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.

**[0091]** 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.

**[0092]** 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.

**[0093]** The machine room 18 may be placed outside the inner case 101.

**[0094]** 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.

**[0095]** The bottom wall 104 may be provided with a drain hole 105 for discharging liquid.

**[0096]** 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.

**[0097]** 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.

**[0098]** 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.

**[0099]** 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.

**[0100]** Refrigerant flowing through the heat exchanger 50 may flow through an accumulator 189 and then into

the compressor 183.

**[0101]** 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.

**[0102]** 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.

**[0103]** 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.

**[0104]** 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.

**[0105]** 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.

**[0106]** 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.

**[0107]** In this embodiment, the ice maker 40 may generate a single type of ice or at least two different types of ice.

**[0108]** Hereinafter, it will be described as an example that the ice maker 40 generates at least two different types of ice.

**[0109]** 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 I1. 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.

**[0110]** The first ice I1 and the second ice I2 may differ in one or more of shape, size, transparency, etc.

**[0111]** Hereinafter, it will be described as an example that the first ice I1 is polygonal ice, and the second ice I2 is spherical ice.

**[0112]** 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.

**[0113]** 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.

**[0114]** 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.

**[0115]** 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 I1 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.

**[0116]** A front surface of the ice bin 14 may be arranged to be spaced apart from a rear 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.

**[0117]** 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 I1 stored in the first storage space 132 may surround the ice bin 14.

**[0118]** A bottom wall 104 of the storage chamber 13 may form a floor of the second storage space 134.

**[0119]** 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.

**[0120]** 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.

**[0121]** 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.

**[0122]** 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.

**[0123]** 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.

**[0124]** 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.

**[0125]** 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.

**[0126]** 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.

**[0127]** The cabinet 10 may further include a guide 70 that guides ice separated from the ice maker 40 to the storage chamber 13.

**[0128]** The guide 70 may be arranged to be spaced apart from the ice maker 40. The guide 70 may guide a first ice I1 separated from the first tray assembly 410. The guide 70 may guide a second ice I2 separated from the second tray assembly 450.

**[0129]** For example, the guide 70 may include a first guide 710. The guide 70 may further include a second guide 730.

**[0130]** 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.

**[0131]** 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.

**[0132]** 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.

**[0133]** 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.

**[0134]** FIG. 6 is a diagram showing a liquid supply passage in an ice making device according to a first embodiment of the present invention. FIGS. 7 and 8 are perspective views showing liquid being supplied to an ice maker according to a first embodiment.

**[0135]** 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.

**[0136]** 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.

**[0137]** 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.

**[0138]** The liquid supply passage may further include a third passage 308 that guides liquid that has passed through the filter 306.

**[0139]** 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. For example, liquid supplied from the liquid supply assembly may be supplied to a liquid supplier, which will be described later. The liquid supply assembly 320 may be connected to the third passage 308.

**[0140]** The liquid supply assembly 320 can supply liquid to the ice maker 40 during a liquid supply process.

**[0141]** 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 can store liquid supplied from the liquid supply assembly 320 and supply liquid to the ice maker 40.

**[0142]** 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.

**[0143]** 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.

**[0144]** The liquid supplier 330 may be located at another side of the ice maker 40.

**[0145]** 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.

**[0146]** 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.

**[0147]** 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.

**[0148]** 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.

**[0149]** 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.

**[0150]** 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.

**[0151]** The liquid supplier 330 may further include liquid pumps 360 and 362 for pumping liquid stored in the liquid storage 350.

**[0152]** In this embodiment, in an ice making process, liquid stored in the liquid storage 350 may be pumped by the liquid pumps 360 and 362 and supplied to the ice maker 40.

**[0153]** The liquid pumps 360 and 362 may include a first pump 360. The liquid pumps 360 and 362 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.

**[0154]** 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.

**[0155]** 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.

**[0156]** 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.

**[0157]** The sub liquid supplier may include a sub\_first liquid supplier. The sub liquid supplier may include a sub\_second liquid supplier. 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.

**[0158]** The liquid supplier 330 may further include a sub second liquid supplier 382 for supplying liquid pumped by the second pump 362 to the second tray assembly 450.

**[0159]** The sub\_first liquid supplier 380 may supply liquid to the first tray assembly 410 from one side of the first tray assembly 410.

**[0160]** The sub\_second liquid supplier 382 may supply liquid to the second tray assembly 450 from one side of the second tray assembly 450.

**[0161]** The sub\_first liquid supplier 380 and the sub second liquid supplier 382 may be located at one side of the guide 70.

**[0162]** 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.

**[0163]** 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.

**[0164]** 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.

**[0165]** 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.

**[0166]** Hereinafter, the ice maker 40 will be described in detail.

**[0167]** FIG. 9 is a perspective view showing an arrangement of a first tray assembly and a second tray assembly in a first embodiment. FIGS. 10 and 11 are perspective views showing an ice maker and a heat exchanger according to a first embodiment. FIG. 12 is a bottom view of an ice maker according to a first embodiment. FIG. 13 is a cross-sectional view taken along line 13-13 in FIG. 12.

**[0168]** 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.

**[0169]** The ice maker 40 may include a first tray assembly 410 and a second tray assembly 450 as described above.

**[0170]** 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.

**[0171]** 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.

**[0172]** 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.

**[0173]** The first tray assembly 410 may include a first ice making cell 440.

**[0174]** 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.

**[0175]** 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.

**[0176]** 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.

**[0177]** 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.

**[0178]** The first one cell 441 may be formed by the first one tray 420. The first another cell 442 may be formed by the first another tray 430.

**[0179]** 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.

**[0180]** 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.

**[0181]** The first one tray 420 may include a first opening 423. The first opening 423 communicates with the first one cell 441.

**[0182]** A number of first openings 423 may be equal to a number of first ice making cells 440.

**[0183]** The first one cell 441 may form another portion of an appearance of the first ice. The first another cell 442 may form a portion of an appearance of the first ice.

**[0184]** 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.

**[0185]** 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.

**[0186]** 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.

**[0187]** 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.

**[0188]** 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.

**[0189]** 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.

**[0190]** 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.

**[0191]** 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.

**[0192]** The first one tray 420 may include through holes 421 and 425 through which liquid passes.

**[0193]** The second tray assembly 450 may include a second tray forming a second ice making cell 451.

**[0194]** 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.

**[0195]** 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.

**[0196]** 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.

**[0197]** For example, the second tray may form a plur-

ality 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.

**[0198]** 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.

**[0199]** 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 hinge shaft 489. The hinge shaft 489 may provide a rotation center C1 of the second another tray 470.

**[0200]** 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.

**[0201]** 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.

**[0202]** A contact surface of the second one tray 460 and the second another tray 470 may have a different height from a coupling 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 coupling portion of the first one tray 420 and the first another tray 430.

**[0203]** 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.

**[0204]** 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.

**[0205]** 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.

**[0206]** 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.

**[0207]** 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.

**[0208]** The second another tray 470 may include a

second opening 473.

**[0209]** 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.

**[0210]** 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. Accordingly, the second opening 473 may serve as a liquid supply opening during an ice making process.

**[0211]** 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.

**[0212]** In an ice separation process, the second another tray 470 may be moved relative to the second one tray 460.

**[0213]** 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.

**[0214]** 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.

**[0215]** 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. Alternatively, the bracket 452 may be supported by a separate inner housing received in the inner case 101.

**[0216]** The bracket 452 may provide a space to accommodate at least a portion of the second one tray 460 and the second another tray 470.

**[0217]** A portion of the second one tray 460 may pass through the bracket 452. Another portion of the second one tray 460 may be seated on the bracket 452.

**[0218]** A driver 690 for moving the second another tray 470 may be installed on the bracket 452.

**[0219]** The bracket 452 may include a circumferential portion 635. The circumferential portion 635 may be provided with a seating end 636. The seating end 636 may be seated on the first tray assembly 410. For example, the seating end 636 may be seated on the first one tray 420. When the seating end 636 is seated on the first one tray 420, a portion of the first tray assembly 410 may be positioned at the same height as a portion of the second tray assembly 450.

**[0220]** The bracket 452 may include a liquid through hole 634 through which liquid passes.

**[0221]** The second tray assembly 450 may further include a supporter 480 supporting the second another tray 470.

**[0222]** 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.

**[0223]** 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.

5 **[0224]** A diameter of the supporter opening 482a may be greater than a diameter of the second opening 473.

**[0225]** 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.

10 **[0226]** 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.

15 **[0227]** 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.

**[0228]** 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.

20 **[0229]** 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 rotation of the second another tray 470 will be described as an example.

25 **[0230]** The second tray assembly 450 may further include a case 498 supporting the second another tray 470 at another side. The case 498 may be seated on the second another tray 470. In an ice making position, the second one tray 460 may penetrate the case 498 and contact the second another tray 470.

30 **[0231]** For example, a coupling member may pass through the case 498 and the second another tray 470 and be coupled to the supporter 480.

**[0232]** 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. For example, the pusher 490 may be installed on the bracket 452. The pusher 490 may press the second another tray 470 or press the second ice in an ice separation process.

35 **[0233]** 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.

40 **[0234]** When the second another tray 470 is pressed by the pushing column 492, 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.

**[0235]** 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.

**[0236]** The heat exchanger 50 may further include a second refrigerant pipe 520 located adjacent to or in contact with the second tray assembly 450.

**[0237]** The first refrigerant pipe 510 and the second refrigerant pipe 520 may be connected in series or in parallel.

**[0238]** 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 one 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.

**[0239]** The first refrigerant pipe 510 may further include a first bent pipe 512 extending from the first inlet pipe 511 toward one side.

**[0240]** The first refrigerant pipe 510 may further include a first cooling pipe 513 extending from the first bent pipe 512.

**[0241]** 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.

**[0242]** 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.

**[0243]** 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.

**[0244]** One straight part may contact one surface of a plurality of first another trays 430.

**[0245]** A plurality of straight parts 513a may be arranged at substantially the same height.

**[0246]** 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.

**[0247]** 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.

**[0248]** The second cooling pipe 515 may contact a side surface of the first one tray 420.

**[0249]** 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.

**[0250]** A plurality of first another trays 430 may be arranged in a plurality of columns and rows.

**[0251]** 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.

**[0252]** 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.

**[0253]** 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.

**[0254]** 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.

**[0255]** 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.

**[0256]** 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.

**[0257]** 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.

**[0258]** 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.

**[0259]** The liquid supply assembly 320 may be positioned higher than the third cooling pipe 523.

**[0260]** 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.

**[0261]** 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 vertical direction. Some of the plurality of straight parts 523a may overlap the second opening 473 in a vertical direction.

**[0262]** 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.

**[0263]** 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.

**[0264]** Another portion of the second bent pipe 524 may extend in another direction.

**[0265]** 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 one 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.

**[0266]** At least a portion of the second discharge pipe 525 and the first inlet pipe 511 may be arranged in an arrangement direction (first direction) of the second one cell and the second another cell.

**[0267]** 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.

**[0268]** 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.

**[0269]** 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.

**[0270]** FIG. 14 is a diagram showing a state in which a sub first liquid supplier and a sub second liquid supplier are separated according to a first embodiment.

**[0271]** Referring to FIG. 14, a sub\_first liquid supplier 380 of this embodiment may be connected to the sub\_second liquid supplier 382. However, an internal flow passage of the sub\_first liquid supplier 380 may be divided from an internal flow passage of the sub second liquid supplier 382.

**[0272]** The ice making device 1 may further include a connector 386 connected to the sub second liquid supplier 382. The connector 386 may be located at an opposite side of the sub first liquid supplier 380 with respect to the sub second liquid supplier 382.

**[0273]** The sub\_first liquid supplier 380, the sub\_second liquid supplier 382, and the connector 386 may be arranged in a second direction that crossed the first direction.

**[0274]** An assembly to which the sub first liquid supplier 380, the sub second liquid supplier 382, and the connector 386 are connected is mounted on the inner case 101 or mounted on an inner housing (not shown) dis-

posed within the inner case 101).

**[0275]** Alternatively, the connector 386 may be omitted, and the sub second liquid supplier 382 may be directly mounted on the inner case 101.

5 **[0276]** The sub\_first liquid supplier 380 may include a first extension 384h used for mounting. To ensure stable seating of the sub\_first liquid supplier 380, a plurality of first extensions 384h may be arranged to be spaced apart from each other.

10 **[0277]** The connector 386 may include a second extension 386b used for mounting. To ensure stable seating of the connector 386, a plurality of second extensions 386b may be arranged to be spaced apart from each other.

15 **[0278]** The sub\_first liquid supplier 380 may further include a first liquid supply pipe 384 through which liquid flows. The first liquid supply pipe 384 may receive liquid from the first pump 360.

**[0279]** The sub\_first liquid supplier 380 may further include a first liquid supply nozzle 381 coupled to the first liquid supply pipe 384. The first liquid supply nozzle 381 may spray liquid into the first ice making cell 440.

20 **[0280]** The first liquid supply pipe 384 may include a first common pipe 384a. The first common pipe 384a may extend in a front and rear direction.

25 **[0281]** The first liquid supply pipe 384 may further include a first branch pipe 384e branched from the first common pipe 384a. For example, a plurality of first branch pipes 384e may extend in both directions from the first common pipe 384a.

30 **[0282]** The first liquid supply pipe 384 may further include a distribution pipe connected to the plurality of first branch pipes 384e.

35 **[0283]** The distribution pipe may include a first distribution pipe 384f located at one side of the first common pipe 384a. The distribution pipe may include a second distribution pipe 384g located at the other side of the first common pipe 384a. The first extension 384h may extend from the second distribution pipe 384g.

40 **[0284]** Each of the distribution pipes 384f and 384g may be provided with a first individual pipe extending in one direction. For example, the first individual pipe may include a first pipe 384b, a second pipe 384c, and a third pipe 384d. It should be noted that in this embodiment, there is no limit to a number of pipes constituting the first individual pipe. A height of some of the first pipe 384b, second pipe 384c, and third pipe 384d may be different from a height of another of the first pipe 384b, second pipe 384c, and third pipe 384d.

50 **[0285]** The first liquid supply nozzle 381 may be connected to each of the first pipe 384b, the second pipe 384c, and the third pipe 384d. Therefore, the liquid flowing through the first common pipe 384a is distributed to the first pipe 384b, the second pipe 384c, and the third pipe 384d and then supplied to the first ice making cell 440 through the first liquid supply nozzle 381.

**[0286]** The sub\_first liquid supplier 380 may further include a first connection portion 384i to be connected

to the sub second liquid supplier 382. For example, the first connection portion 384i may extend from the first distribution pipe 384f. For example, a plurality of first connection portions 384i may extend from the first distribution pipe 384f in a direction away from the second distribution pipe 384g.

**[0287]** The sub\_second liquid supplier 382 may include a second liquid supply pipe 385 through which liquid flows. The second liquid supply pipe 385 may receive liquid from the second pump 362.

**[0288]** The sub\_second liquid supplier 382 may further include a second liquid supply nozzle 383 coupled to the second liquid supply pipe 385. The second liquid supply nozzle 383 may spray liquid into the second ice making cell 451.

**[0289]** The second liquid supply pipe 385 may include a second common pipe 385a. The second common pipe 385a may extend in a front and rear direction. The second common pipe 385a may be arranged parallel to the first common pipe 384a.

**[0290]** The second liquid supply pipe 385 may include a second individual pipe extending from the second common pipe 385a.

**[0291]** The second individual pipe may include, for example, a fourth pipe 385b. The second individual pipe may further include a fifth pipe 385c. The second individual pipe may further include a sixth pipe 385d. It should be noted that in this embodiment, there is no limit to a number of pipes constituting the second individual pipe. A height of some of the fourth pipe 385b, the fifth pipe 385c, and the sixth pipe 385d may be different from a height of another of the fourth pipe 385b, the fifth pipe 385c, and the sixth pipe 385d.

**[0292]** The second liquid supply nozzle 383 may be connected to each of the fourth pipe 385b, the fifth pipe 385c, and the sixth pipe 385d. Accordingly, the liquid flowing through the second common pipe 385a is distributed to the fourth pipe 385b, the fifth pipe 385c, and the sixth pipe 385d and then supplied to the second ice making cell through the second liquid supply nozzle 383.

**[0293]** The sub\_second liquid supplier 382 may further include a second connection portion 385e to be connected to the first connection portion 384i.

**[0294]** The second connection portion 385e may extend from the second common pipe 385a. For example, a plurality of second connection portions 385e may extend toward the sub first liquid supplier 380.

**[0295]** One of the first connection portion 384i and the second connection portion 385e may be inserted into the other of the first connection portion 384i and the second connection portion 385e. For example, FIG. 14 shows that a diameter of the second connection portion 385e is greater than a diameter of the first connection portion 384i, so that the first connection portion 384i may be inserted into the second connection portion 385e.

**[0296]** The sub\_second liquid supplier 382 may further include a third connection portion 385f to be connected to the connector 386. The third connection portion 385f may

extend from the second common pipe 385a. The third connection portion 385f may extend from the second common pipe 385a in an opposite direction to the second connection portion 385e. For example, a plurality of third connection portions 385f may extend toward the connector 386.

**[0297]** The connector 386 may include a fourth connection portion 386a to be connected to the third connection portion 385f. One of the third connection portion 385f and the fourth connection portion 386a may be inserted into the other of the third connection portion 385f and the fourth connection portion 386a. For example, FIG. 14 shows that a diameter of the third connection portion 385f is greater than a diameter of the fourth connection portion 386a, so that the fourth connection portion 386a may be inserted into the third connection portion 385f.

**[0298]** Meanwhile, since at least one of shape or size of the first ice making cell 440 is different from that of the second ice making cell 451, a structure of the first liquid supply nozzle 381 may be different from a structure of the first liquid supply nozzle 383.

**[0299]** In this embodiment, liquid sprayed from one first liquid supply nozzle 381 may be supplied to a plurality of first ice making cells 440. On the other hand, liquid sprayed from one second liquid supply nozzle 383 may be supplied to one second ice making cell 451.

**[0300]** That is, a number of first liquid supply nozzles 381 may be less than a number of first ice making cells 440. On the other hand, a number of second liquid supply nozzles 383 may be equal to a number of second ice making cells 451.

**[0301]** Therefore, the first liquid supply nozzle 381 may be called a spray-type nozzle. The second liquid supply nozzle 383 may be called a direct type nozzle.

**[0302]** The first liquid supply nozzle 381 can supply liquid through an open type tray. On the other hand, in a case of the second tray, the second liquid supply nozzle 383 can supply liquid to a closed type tray.

**[0303]** FIG. 15 is a top perspective view of a supporter according to a first embodiment. Fig. 16 is a lower perspective view of a supporter according to a first embodiment.

**[0304]** Referring to FIGS. 13, 15, and 16, the second another tray 4740 may include the sub second another tray 471 forming the second another cell 472.

**[0305]** The supporter 480 may include a supporter body 481 that forms a receiving portion 482 for receiving the sub second another tray 471.

**[0306]** The supporter body 481 may include a body wall 481a forming the receiving portion 482.

**[0307]** An upper surface of the supporter body may be provided with a coupling protrusion passing through the second another tray 470.

**[0308]** The supporter 480 may further include a hinge body 483 to which the hinge shaft 489 is coupled. A pair of hinge bodies 483 may be spaced apart from each other in a direction parallel to an extension direction of the hinge

shaft 489. A plurality of hinge portions may be located between the pair of hinge bodies 483.

**[0309]** The hinge body 483 may include a shaft hole 484 through which the hinge shaft 489 passes.

**[0310]** The supporter 480 may further include a shaft cover 485 to cover the hinge shaft 489. The shaft cover 485 may be positioned between the pair of hinge bodies 483.

**[0311]** The shaft cover 485 may be rounded so as not to interfere with the hinge shaft 489 when the shaft cover 485 is rotated while covering the hinge shaft 489. For example, the shaft cover 485 may be rounded to surround the hinge shaft 489 while being spaced apart from the hinge shaft 489.

**[0312]** During an ice making process, the shaft cover 485 may be positioned at one side of the hinge shaft 489. Accordingly, liquid may be prevented from splashing toward the hinge shaft 489.

**[0313]** Although not shown, the supporter 480 may further include a coupling portion 488 for coupling an elastic member. The coupling portion 488 may protrude from a side of the supporter body 481.

**[0314]** The supporter 480 may further include a barrier 487 to prevent liquid from splashing toward the elastic member coupling portion 488. The barrier 487 may protrude from a side of the supporter body 481. The barrier 487 may be positioned spaced apart from one side of the coupling portion 488. A protrusion length of the barrier 487 may be greater than a protrusion length of the coupling portion 488.

**[0315]** The supporter 481 may further include an opening wall 482b extending from a periphery of the supporter opening 482a. The opening wall 482b may be formed in a ring shape or an arc shape.

**[0316]** The opening wall 482b may further include a slot to prevent interference with a component during an ice separation process. For example, the component may be a pusher.

**[0317]** The opening wall 482b may restrict liquid from splashing outward when liquid is supplied to the second another tray 470.

**[0318]** FIG. 17 is a diagram showing a process in which liquid is supplied to an ice maker during an ice making process. FIG. 18 is a diagram showing liquid being supplied from a sub first liquid supplier to a first ice making cell. FIG. 19 is a diagram showing liquid being supplied from a sub second liquid supplier to a second ice making cell. FIG. 20 is a diagram showing a positional relationship between a supporter and a guide during an ice separation process.

**[0319]** Referring to FIGS. 1 to 20 a process of generating ice in the ice making device 1 will be described.

**[0320]** 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.

**[0321]** 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.

**[0322]** The 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.

**[0323]** After the liquid supply process is completed, an ice making process starts.

**[0324]** In the ice making process, liquid is supplied to the ice maker 40 by the liquid supplier 330. Additionally, during the ice making process, a cooler operates and low-temperature refrigerant may flow into the heat exchanger 50.

**[0325]** In an ice making process of this embodiment, while liquid is supplied to each ice making cell 440 and 451, a portion of supplied liquid is phase-changed into ice, and a size of the phase-changed ice increases, thereby generating ice.

**[0326]** When the ice making process starts, one or more of the first and second pumps 360 and 362 may operate.

**[0327]** When the first pump 360 operates, liquid may be supplied to the first tray assembly 410 through the sub first liquid supplier 380.

**[0328]** The first liquid supply nozzle 381 is located at one side of the first tray assembly 410. Liquid sprayed from the first liquid supply nozzle 381 is supplied to the first ice making cell 440 of the first tray assembly 410.

**[0329]** Liquid sprayed from the first liquid supply nozzle 381 is supplied to the first ice making cell 440 through a first opening 423 of the first one tray 420. Liquid supplied to the first ice making cell 440 flows toward an upper surface of the first another tray 430.

**[0330]** Liquid sprayed from the first liquid supply nozzle 381 may be supplied to a plurality of first ice making cells 440. Although not limited, liquid sprayed from one first liquid supply nozzle 381 may be supplied to four first ice making cells 440.

**[0331]** 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.

**[0332]** 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 the liquid into the first one tray 420 or the first another tray 430, air bubbles in the liquid may be discharged from the liquid. When air bubbles in the liquid are discharged from the liquid, a transparency of generated ice can be increased.

**[0333]** During the ice making process, the first ice I1 may grow to an inside of the first one cell 441.

**[0334]** When the second pump 362 operates, liquid may be supplied to the second tray assembly 450 through the sub second liquid supplier 382.

**[0335]** The second liquid supply nozzle 383 may be located at one side of the second tray assembly 450. Liquid sprayed from the second liquid supply nozzle 383 is supplied to the second ice making cell 451 of the second tray assembly 450.

**[0336]** Liquid sprayed from the second liquid supply nozzle 383 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.

**[0337]** As described above, liquid sprayed from one second liquid supply nozzle 383 may be directly supplied to one second ice making cell 451.

**[0338]** Accordingly, a through hole for discharging liquid formed in the second liquid supply nozzle 383 may be aligned with the supporter opening 482a and the second opening 473 in a vertical direction.

**[0339]** Liquid supplied to the second ice making cell 451 flows toward an inner one surface of the second one tray 460. A portion 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.

**[0340]** As liquid is sprayed into the second ice making cell 451, a portion of the liquid is frozen. In a process of spraying the liquid into the second one tray 460 or ice generated in the second one tray 460, air bubbles in the liquid are released from the liquid. It can be. When air bubbles in the liquid are discharged from the liquid, a transparency of generated ice can be increased.

**[0341]** A transparency of the first ice I1 generated in the first ice making cell 440 and a transparency of the second ice I2 generated in the second ice making cell 451 may be different.

**[0342]** During the ice making process, the second ice I2 may grow from the second one tray 460 toward the second another tray 470. Generated ice may grow to an extent of covering one side of a second opening 423a of the second another tray 470.

**[0343]** When an ice making process is completed, an ice separation process is performed. 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.

**[0344]** When the ice separation process starts, a flow direction of refrigerant is switched by a valve so that high-temperature refrigerant compressed in a compressor 183 can flow to 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.

**[0345]** 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.

**[0346]** The second ice I2 may be separated from at least the second one tray 460 by heat transferred to the ice maker 40.

**[0347]** 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.

**[0348]** Next, the driver 690 may operate to separate the second ice I2 from the second tray assembly 450. By operating the driver 690, the second another tray 470 may be moved in a forward direction (clockwise direction with respect to FIG. 17).

**[0349]** 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.

**[0350]** On the other hand, when the second ice I2 has been separated from the second one tray 460 by the 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.

**[0351]** 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.

**[0352]** During an ice separation process, the supporter 480 moves in a direction closer to the guide 70. Since the supporter 480 is provided with an inclined surface 481d, interference between the supporter 480 and the guide 70 can be prevented.

**[0353]** After the second another tray 470 is moved in the forward direction, the second another tray 470 is moved in a reverse direction (counterclockwise direction in the drawing) by the driver 690 and in contact with the second one tray 460.

**[0354]** 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.

**[0355]** 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.

**[0356]** FIG. 21 is a diagram showing liquid being supplied to an ice maker according to a second embodiment. FIG. 22 is a bottom perspective view of a second tray assembly according to a second embodiment.

**[0357]** FIG. 23 is a perspective view of a supporter according to a second embodiment. FIG. 24 is a diagram showing a sub second liquid supplier installed on a supporter according to a second embodiment. FIG. 25 is a cross-sectional view taken along line 25-25 in FIG. 24.

**[0358]** The present embodiment is the same as the first embodiment in other portions, but is different therefrom in a shape of the sub second liquid supplier. Accordingly, only a changed structure related to the sub second liquid supplier will be described, and a description of the first embodiment will be used for the same configuration as the first embodiment.

**[0359]** Referring to FIGS. 21 to 25, unlike the first embodiment, in a second embodiment, the sub\_second liquid supplier 1382 may be mounted on the second tray assembly 450.

**[0360]** A liquid supply tube 373 connected to the sub second liquid supplier 1382 may be connected to the second connection pipe 372. The liquid supply tube 373 may be formed of a material whose shape is deformable.

**[0361]** For example, the sub\_second liquid supplier 1382 may be installed on the supporter 480a and moved together with the supporter 480a.

**[0362]** 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 in the second direction.

**[0363]** The supporter 480a may include a supporter body 481 that forms a receiving portion 482 for receiving the sub second another tray 471.

**[0364]** 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.

**[0365]** 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.

**[0366]** The case 498 may be seated on the tray extension 475 that is seated on the body extension 481b. A case 498 may include a case opening 498a through which the second one tray 460 passes.

**[0367]** The case 498 may further include a coupling hole 498b through which the coupling member passes. The coupling member may pass through the coupling

hole 498b and the tray extension 475 and be coupled to the supporter 480a.

**[0368]** 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 1382 may be formed between the circumferential wall 481c and the body wall 481a.

**[0369]** The circumferential wall 481c may be provided with an inclined surface 481d to prevent the supporter 480a from interfering with the guide 70 while the supporter 480a moves in an ice separation process.

**[0370]** The supporter 480a may further include an opening wall 482b extending from a periphery of the supporter opening 482a. The opening wall 482b may be formed in a ring shape or an arc shape.

**[0371]** The supporter 480a 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.

**[0372]** The hinge bodies 483 and 483a may include a shaft hole 484 through which the shaft 489 passes.

**[0373]** Meanwhile, the sub second liquid supplier 1382 may include an inlet pipe 1384. The inlet pipe 1384 may be connected to the liquid supply tube 373. Although not limited, the inlet pipe 1384 may be formed in a straight shape or may be bent one or more times.

**[0374]** An inlet of the inlet pipe 1384 may be referred to as a first through hole.

**[0375]** The sub\_second liquid supplier 1382 may further include a common pipe 1385 connected to the inlet pipe 1384.

**[0376]** For example, the common pipe 1385 may extend in a direction parallel to an arrangement direction of the second ice making cells 451.

**[0377]** The common pipe 1385 may be coupled to the supporter 480a.

**[0378]** For example, the common pipe 1385 may be located in a space 485 between the circumferential wall 481c and the body wall 481a.

**[0379]** A coupling rib 1387 may protrude from the common pipe 1385. The supporter 480a may be provided with a coupling portion 486 for coupling with the coupling rib 1387. For example, the coupling portion 486 may be located between two adjacent second another cells 472.

**[0380]** The coupling portion 486 may protrude from the supporter 480a. An end of the coupling portion 486 may be provided with a coupling protrusion 486a aligned with the coupling rib 1387. A portion of the coupling protrusion 486a may be inserted into the coupling rib 1387. In this state, a coupling member may be coupled to the coupling rib 1387 and the coupling protrusion 486a.

**[0381]** The circumferential wall 481c may be provided with a pipe opening 481e through which the inlet pipe 1384 passes.

**[0382]** The sub\_second liquid supplier 1382 may

further include one or more supply pipes 1386 extending from the common pipe 1385.

**[0383]** A number of supply pipes 1386 may be equal to a number of the second ice making cells 451.

**[0384]** The common pipe 1385 may be located radially outside the supporter opening 482a. The supply pipe 1386 may extend from the common pipe 1385 and be aligned with the supporter opening 482a. The supply pipe 1386 may extend from the common pipe 1385 toward a center of the supporter opening 482a.

**[0385]** The supply pipe 1386 may be aligned with the second opening 473.

**[0386]** Although not limited, the supply pipe 1386 may be located in a central portion of the second opening 473.

**[0387]** A slot 482c may be formed in the opening wall 482b for the supply pipe 1386 to pass through. The slot 482c can prevent the supply pipe 1386 from interfering with the opening wall 482b.

**[0388]** The supply pipe 1386 may include a liquid supply hole 1386c (or second through hole).

**[0389]** The liquid supply hole 1386c can be referred to as a second through hole. The liquid supply hole 1386c may be arranged such that liquid is supplied into the second ice making cell 451 via the second opening 473 formed in the second another tray 470.

**[0390]** For example, the liquid supply hole 1386c may be located in the supporter opening 482a or the second opening 473. The liquid supply hole 1386c may be located in or correspond to a central portion of the second opening 473.

**[0391]** A diameter of the liquid supply hole 1386c may be greater than a diameter of the second opening 473. Accordingly, a portion of the liquid supplied to the second ice making cell 251 may flow downward from the second opening 473 through an outer area of the liquid supply hole 1386c. Additionally, liquid supplied through the liquid supply hole 1386c can be prevented from interfering with liquid discharged from the second ice making cell 251 through the second opening 473.

**[0392]** When the liquid supply hole 1386c is located in the supporter opening 482a or in the second opening 473, liquid can be stably supplied into the second ice making cell 451, so that a size of the second opening 473 can be reduced.

**[0393]** In this embodiment, a position of the supporter 480a may be changed during an ice making process and an ice separation process. Accordingly, a position of the supply pipe 1386 mounted on the supporter 480a may also be changed.

**[0394]** Since the second another tray 470 is seated on the supporter 480a, the supply pipe 1386 can move in the same direction as a moving direction of the second another tray 470.

**[0395]** Although not limited, the supply pipe 1386 may include a first portion 1386a extending from the common pipe 1385. The supply pipe 1386 may further include a second portion 1386b that extends from the first portion 1386a and is bent at one point.

**[0396]** In another aspect, it can be understood that the sub second liquid supplier 1382 of this embodiment comprises a first through hole (inlet of the inlet pipe), a second through hole 1386c, and a connection pipe to connect a first through hole and the second through hole 1386c. In this case, a connection pipe may include at least a portion of the inlet pipe, a common pipe, and at least a portion of a discharge pipe.

**[0397]** Meanwhile, a liquid supply tube 373 connected to the inlet pipe 1384 may extend in a direction parallel or almost parallel to an arrangement direction of the second ice making cells 451.

**[0398]** Among a 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 rib 484a may be rounded or bent one or more times to form a space in which the liquid supply tube 373 can be positioned.

**[0399]** According to this embodiment, when the supporter 480a is moved, the liquid supply tube 373 is also moved. When the liquid supply tube 373 is located close to the hinge body 483a that provides a rotation center of the supporter 480a, a phenomenon of bending of the liquid supply tube 373 can be minimized.

**[0400]** Fig. 26 is a perspective view of a pusher according to a second embodiment.

**[0401]** Referring to FIGS. 22 and 26, a pusher 490a of this embodiment may be mounted on the bracket 452.

**[0402]** The bracket 452 may include an inclined wall 455. The pusher 490a may be mounted on the inclined wall 455, for example.

**[0403]** A seating groove 455a may be formed in the inclined wall 455 for seating the pusher 490a.

**[0404]** The pusher 490a may include a plate 491 seated on the seating groove 455a. The pushing column 492 may extend from the plate 491.

**[0405]** A coupling protrusion 456 may be formed in 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, the protrusion hole 495 may be located between two adjacent pushing columns 492.

**[0406]** A coupling boss 457 may be formed in the seating groove 455a. The plate 491 may be provided with a boss coupling portion 496 to which the coupling boss 457 is coupled. 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, a coupling member can be coupling to the boss coupling portion 496 and the coupling boss 457.

**[0407]** The pusher 490a may be located at one side of the second another tray 470. The pusher 490a may provide a path 493 that allows a component to move through an interior. The path 493 may be formed on the pushing column 492.

**[0408]** The pusher 490a may further include a wall

493d that provides a position at which a component that has passed through the path 493 stops. The wall 493d may include a hole 494. Although not limited, the component may be a portion of the sub second liquid supplier 1382.

**[0409]** For example, the component may be the supply pipe 1386.

**[0410]** In another aspect, the pusher 490a may include an opening that allows a component to move through an interior.

**[0411]** The opening may be formed at one side of the pusher 490a. At least a portion of the component may be disposed at one side of the pusher 490a, and the opening may be formed at one side of the pusher 490a.

**[0412]** Alternatively, at least a portion of the component may be disposed at the other side of the pusher 490a, and the opening may be formed at the other side of the pusher 490a.

**[0413]** The opening may be provided facing a non-opened wall, so that a component may be stopped by the wall.

**[0414]** Fig. 27 is a diagram showing a connector being coupled to a sub first liquid supplier according to a second embodiment.

**[0415]** Referring to FIG. 27, a sub first liquid supplier 380 and a connector 386 of this embodiment are the same as a sub first liquid supplier and a connector mentioned in the first embodiment.

**[0416]** However, the sub first liquid supplier 380 and the connector 386 may be connected by an intermediate member 2385. The intermediate member 2385 may be disposed at a position corresponding to the sub second liquid supplier in the first embodiment.

**[0417]** The intermediate member 2385 may include a first connection part 2386 to be connected to the sub first liquid supplier 380. The intermediate member 2385 may further include a second connection part 2387 to be connected to the connector 386.

**[0418]** As another example, it is possible to omit the intermediate member 2385, and in this case, the sub first liquid supplier 380 can be directly connected to the connector 386.

**[0419]** FIG. 28 is a diagram showing a process in which liquid is supplied to an ice maker during an ice making process according to a third embodiment.

**[0420]** Referring to FIG. 28, in this embodiment, 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.

**[0421]** 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. The liquid flowing along the liquid supply passage is supplied to the ice maker 40 through the liquid supply assembly 320.

**[0422]** The 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.

5 **[0423]** After the liquid supply process is completed, an ice making process starts.

**[0424]** In the ice making process, the pumps 360 and 362 may be turned on simultaneously or sequentially.

10 **[0425]** 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.

**[0426]** Liquid sprayed from the sub first liquid supplier 380 may be supplied to the first ice making cell 440 through the first opening 423 of the first one tray 420.

15 **[0427]** When the second pump 362 operates, liquid can be supplied to the second tray assembly 450 through the sub second liquid supplier 1382.

**[0428]** Liquid sprayed from the sub second liquid supplier 1382 is supplied to the second ice making cell 451 through a supporter opening 482a of the supporter 480a and a second opening 473 of the second another tray 470.

20 **[0429]** In this embodiment, since the sub second liquid supplier 1382 is mounted on the supporter 480a, liquid can be intensively supplied to the second ice making cell 451.

**[0430]** When the ice making process is completed, an ice separation process may be performed.

30 **[0431]** When an ice separation process starts, high-temperature refrigerant compressed by a 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.

35 **[0432]** The first ice I1 may be separated from the first tray assembly 410 by 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.

40 **[0433]** 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. 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.

45 **[0434]** Next, the driver 690 may operate to separate the second ice I2 from the second tray assembly 450.

50 **[0435]** That is, after generation of the second ice in the second ice making cell 251 is completed, the controller moves the second another tray 470 to an ice separation position in a first direction (clockwise direction with respect to FIG. 28) to remove ice from the second ice making cell 251. The controller moves the second another tray 470 in a second direction after movement of the second another tray in a first direction.

55 **[0436]** In a process of rotating the second another tray 470 to an ice separation position, the pusher 490a presses the second another tray 470, so that the second

ice I2 may be separated from the second another tray 470 and fall.

**[0437]** Alternatively, depending on a size of the second opening 473, it is possible for the pusher 490a to directly press the second ice I2 through the second another tray 470. Alternatively, it is possible for the pusher 490a to contact the second another tray 470 and the second ice I2.

**[0438]** During an ice separation process, the sub\_second liquid supplier 1382 may move in a direction closer to the pusher 490a.

**[0439]** As described above, since the pusher 490a includes a path 393, the sub\_second liquid supplier 1382 can move without interfering with the pusher 490a during an ice separation process. For example, the supply pipe 1386 may be moved while received in the pushing column 492.

**[0440]** After the second another tray 470 is rotated in the first direction, the second another tray 470 is rotated in a second direction (counterclockwise direction in the drawing) by the driver to contact the second one tray 460.

**[0441]** FIG. 29 is a bottom perspective view of a second tray assembly according to a third embodiment. FIG. 30 is a view showing a second another tray, a supporter, and a sub\_second liquid supplier according to a third embodiment. FIG. 31 is a bottom perspective view of a second another tray according to a third embodiment.

**[0442]** FIG. 32 is a top perspective view of a supporter according to a third embodiment. FIG. 33 is a bottom perspective view of a supporter according to a third embodiment.

**[0443]** The present embodiment is the same as the second embodiment in other portions, but is different therefrom in a shape of the sub second liquid supplier. Accordingly, only a changed structure related to the sub second liquid supplier will be described, and a description of the second embodiment will be used for the same configuration as the second embodiment.

**[0444]** Referring to FIGS. 29 to 33, in this embodiment, a sub second liquid supplier 3382 may be mounted on the second tray assembly 450a. For example, the sub second liquid supplier 3382 may be mounted on a supporter 1480.

**[0445]** A liquid supply tube 373 may be connected to the sub second liquid supplier 3382. The liquid supply tube 373 may be formed of a material whose shape is deformable.

**[0446]** The second another tray 1470 of this embodiment may include a sub second another tray 1471 forming a second another cell 472. The second another tray 1470 may further include a tray extension 1473 extending from the sub second another tray 1471. A coupling boss 1475 may be formed on the tray extension 1473 for coupling a coupling member for coupling with the supporter 1480. A coupling hole 1475a may be formed at a position corresponding to the coupling boss 1475.

**[0447]** The supporter 1480 may include a supporter body 1481 that forms a receiving portion 1482 for receiving

the sub second another tray 1471. A supporter opening 1482a may be formed in the supporter body 1481.

**[0448]** The supporter body 1481 may include a body wall 1481a forming the receiving portion 1482. For example, the body wall 1481a may be formed in a hemispherical shape or a shape similar to a hemisphere. The supporter opening 1482a may be formed in the body wall 1481a.

**[0449]** The supporter body 1481 may further include a body extension 1481b extending from the body wall 1481a. The tray extension 1473 may be seated on the body extension 1481b. The body extension 1481b may include a coupling protrusion 1487a aligned with the coupling boss 1475. A coupling member penetrating the coupling boss 1475 may be coupled to the coupling protrusion 1487a.

**[0450]** The supporter body 1481 may further include a circumferential wall 1481c extending from the body wall 1481b. The circumferential wall 1481c may be spaced apart from the body wall 1481a. The circumferential wall 1481c may be provided with an opening 1481e through which a portion of the sub second liquid supplier 3382 passes.

**[0451]** The supporter 1480 may be provided with a coupling portion 1486 for coupling to the sub\_second liquid supplier 3382. For example, the coupling portion 1486 may protrude from the body wall 1481a.

**[0452]** A second tray assembly 450a of this embodiment may further include a heater 1490 (see FIG. 35). The heater 1490 may provide heat to the second another tray 1470 in an ice separation process. A second ice can be separated from the second another tray 1470 by heat provided from the heater 1490.

**[0453]** For example, the heater 1490 may be coupled to the second another tray 1470. second another tray 1470 may further include a heater coupling portion 1476 to which the heater 1490 is coupled. For example, the heater coupling portion 1476 may be formed on the sub second another tray 1471. The heater coupling portion 1476 may extend along a circumference of the second opening 473.

**[0454]** The heater coupling portion 1476 may protrude from the sub second another tray 1471. The heater coupling portion 1476 may include a receiving groove 1477 for receiving the heater 1490. The receiving groove 1477 may be formed as one surface of the heater coupling portion 1476 is depressed.

**[0455]** A heater 1476 received in the receiving groove 1447 may surround a second another cell 472. For example, the heater 1476 may surround the second another cell 472. Accordingly, a portion of the heater 1476 may be rounded, thereby increasing a contact area between the heater 1476 and the second another tray 1470.

**[0456]** The receiving groove 1447 may include, for example, a curved part 1447a and a straight part 1477b.

**[0457]** The heater coupling portion 1476 may further include a slot 1478 through which the heater 1490 passes.

**[0458]** FIG. 34 is a perspective view of a sub\_second liquid supplier according to a third embodiment. FIG. 35 is a perspective view showing a heater mounted on a second another tray according to a third embodiment. FIG. 36 is a perspective view showing a sub second liquid supplier coupled to a supporter according to a third embodiment. FIG. 37 is a cross-sectional view taken along line 37-37 in FIG. 36. FIG. 38 is a cross-sectional view taken along line 38-38 in FIG. 36.

**[0459]** In FIGS. 37 and 38, a supporter is omitted.

**[0460]** Referring to FIGS. 34 to 38, the sub second liquid supplier 3382 may include an inlet pipe 3383. The inlet pipe 3383 may be connected to a liquid supply tube 373 described in the second embodiment. Although not limited, the inlet pipe 3383 may be formed in a straight shape or may be bent one or more times.

**[0461]** An inlet of the inlet pipe 3383 may be referred to as a first through hole.

**[0462]** The inlet pipe 3383 may pass through an opening 1481e of the circumferential wall 1481c.

**[0463]** The sub\_second liquid supplier 3382 may further include a distribution pipe 3384 connected to the inlet pipe 3383. For example, the distribution pipe 3384 may extend in a direction parallel to an arrangement direction of the second ice making cell 451.

**[0464]** The sub\_second liquid supplier 3382 may include a liquid supply hole 3391 (or a second through hole). The liquid supply hole 3391 may be formed in the distribution pipe 3384.

**[0465]** A plurality of liquid supply holes 3391 may be provided in numbers corresponding to a plurality of second ice making cells 451. The liquid supply hole 3391 may be aligned with the second opening 473 of the second another tray 470.

**[0466]** The sub\_second liquid supplier 3382 may further include an outlet opening 3392 through which liquid supplied to the second ice making cell 451 passes. To prevent liquid sprayed from the liquid supply hole 3391 to the second ice making cell 451 from interfering with liquid discharged through the outlet opening 3392, the liquid supply hole 3391 is aligned with a second opening 473 of the second another tray 470. The outlet opening 3392 may be located at one side of the liquid supply hole 3391. For smooth flow of liquid, the sub\_second liquid supplier 3382 may include a plurality of outlet openings 3392. For example, the liquid supply hole 3391 may be located between two outlet openings 3392. A size of the outlet opening 3392 may be greater than a diameter of the liquid supply hole 3391.

**[0467]** The sub\_second liquid supplier 3382 may be coupled to the supporter 1480 to cover the supporter opening 1482a.

**[0468]** The sub\_second liquid supplier 3382 may further include a coupling body 3386 to be coupled to the supporter 1480. The coupling body 3386 may be located at one side of the distribution pipe 3384.

**[0469]** The coupling body 3386 may include a first body 3387 extending from the distribution pipe 3384. The first

body 3387 may support the heater coupling portion 1476 or the heater 1490 coupled to the heater coupling portion 1476.

**[0470]** The coupling body 3386 may further include a second body 3388 extending from the first body 3387. The second body 3388 may extend along an edge of the first body 3387.

**[0471]** When the sub second liquid supplier 3382 is coupled to the supporter 1480, the second body 3388 may cover a side circumference of the heater coupling portion 1476.

**[0472]** Accordingly, the second body 3388 may be formed in a shape corresponding to the heater coupling portion 1476. For example, the second body 3388 may include a curved part 3387a and a straight part 3387b.

**[0473]** The coupling body 3386 may include a slot 3393 through which the heater 1490 passes.

**[0474]** The coupling body 3386 may further include a coupling extension 3389 for coupling to the supporter 1480. For example, a plurality of coupling extensions 3389 may extend from the second body 3388. For example, the coupling extension 3389 may extend from the curved portion 3387a. A coupling hole 3389a may be formed in the coupling extension 3389 for the coupling member to pass through. The coupling hole 3389a may be aligned with the coupling portion 1486 of the supporter 1480. Accordingly, the coupling member passing through the coupling hole 3389a may be coupled to the coupling portion 1486.

**[0475]** The sub\_second liquid supplier 3382 may further include a protrusion 3390 inserted into the second opening 473. The protrusion 3390 may be located around the liquid supply hole 3391. The protrusion 3390 may protrude from the first body 3387. The protrusion 3390 may be formed in a size corresponding to the second opening 473. For example, the protrusion 3390 may be formed in a cylindrical shape. When the protrusion 3390 is located in the second opening 473, the protrusion 3390 can form the second another cell 472. Accordingly, one surface of the protrusion 3390 may be rounded toward one side. One surface of the protrusion 3390 may form a hemispherical second another cell 472 together with the sub second another tray 471.

**[0476]** Since the protrusion 3390 is located in the second opening 473, the outlet opening 3392 can pass through the protrusion 3390 in the first direction so that liquid in the second another cell 472 passes through.

**[0477]** The protrusion 3390 may be spaced apart from the second body 3388. The protrusion 3390 may be located between a pair of curved parts in the second body 3388.

**[0478]** Meanwhile, when the second another tray 1470 is seated on the supporter 1480, the heater coupling portion 1476 may pass through the supporter opening 1482a. The heater coupling portion 1476 may protrude after passing through the supporter opening 1482a.

**[0479]** The heater 1490 may be coupled to the heater coupling portion 1476. When the sub second liquid sup-

plier 3382 is coupled to the supporter 1480, the coupling body 3386 may surround the heater coupling portion 1476. At this time, a portion of the heater 1490 may be arranged to surround an outer circumference of the protrusion 3390.

**[0480]** FIG. 39 is a diagram showing a state in which ice making is completed in a second tray assembly according to a third embodiment. FIG. 40 is a diagram showing a second tray assembly in an ice separation process according to a third embodiment.

**[0481]** Referring to FIGS. 39 and 40, when a second ice is generated in the second tray assembly 450a, an ice separation process may be performed. In this embodiment, an ice separation process may include a heating process and a movement process.

**[0482]** In the heating process, the heater 1490 may operate and heat may be supplied from the second refrigerant pipe.

**[0483]** Then, one side of the second ice can be separated from the second one tray 460. Another side of the second ice can be separated from the second another tray 1470.

**[0484]** When an operation of the heater 1490 is completed, the movement process may be performed.

**[0485]** In the movement process, the supporter 1480 may be moved in a clockwise direction in the drawing by the driver 690. In this embodiment, since the second ice can be separated from the second another tray 1470 by the heater 1490, a pusher of the second embodiment can be omitted.

**[0486]** FIG. 41 is a view showing a state in which a sub second liquid supplier covers a heater coupling portion of a second another tray according to a fourth embodiment. FIG. 42 is a perspective view of a sub second liquid supplier in a fourth embodiment.

**[0487]** The present embodiment is the same as the third embodiment in other portions, but is different therefrom in a shape of the sub second liquid supplier. Accordingly, only a changed structure related to the sub second liquid supplier will be described, and a description of the third embodiment will be used for the same configuration as the third embodiment.

**[0488]** Referring to FIGS. 41 and 42, a sub second liquid supplier 3382a of this embodiment may include an inlet pipe 3383a extending in a straight line from a distribution pipe 3384. According to this embodiment, since an inlet pipe 3383a and a distribution pipe 3384 are arranged in a straight line, there is an advantage that internal liquid flow resistance is minimized.

**[0489]** This embodiment may also include a protrusion 3390a inserted into the second opening 473 of the second another tray 1470. The protrusion 3390a may be formed around the liquid supply hole 3391a. An outlet opening 3392a is disposed around the liquid supply hole 3391a and can pass through the protrusion 3390a in a vertical direction.

**[0490]** Meanwhile, the sub second liquid supplier mentioned in the above is located at one side of the supporter,

but it is also possible to be coupled with the second another tray rather than directly coupled to the supporter.

**[0491]** Meanwhile, a control method of an ice making device mentioned above can be equally applied even when the ice maker includes one tray assembly.

**[0492]** The ice making device may be applied to a 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. An ice making chamber may be disposed in the storage chamber and/or door. It is also possible to apply technology applied to the ice making device 1 to a refrigerator. That is, the refrigerator may include some or all of the components of the ice making device 1.

**[0493]** 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, and a door that opens and closes the storage chamber. An ice making chamber may be provided in the cabinet or door.

**[0494]** An ice maker 40 may be provided in the ice making chamber with the same structure or a similar form as the ice maker 40 of this embodiment.

**[0495]** 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 of the refrigerator.

**[0496]** 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, or location to suit characteristics of the refrigerator.

## Claims

1. An ice making device comprising:

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;  
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; and  
a sub liquid supplier configured to supply liquid to the ice making cell.

2. The ice making device of claim 1, wherein a position of at least a portion of the sub liquid supplier is changed during the ice separation process.

3. The ice making device of claim 2, wherein the sub liquid supplier comprises a liquid supply hole that supplies liquid, and  
a position of the liquid supply hole during the ice

making process is different from a position of the liquid supply hole during the ice separation process.

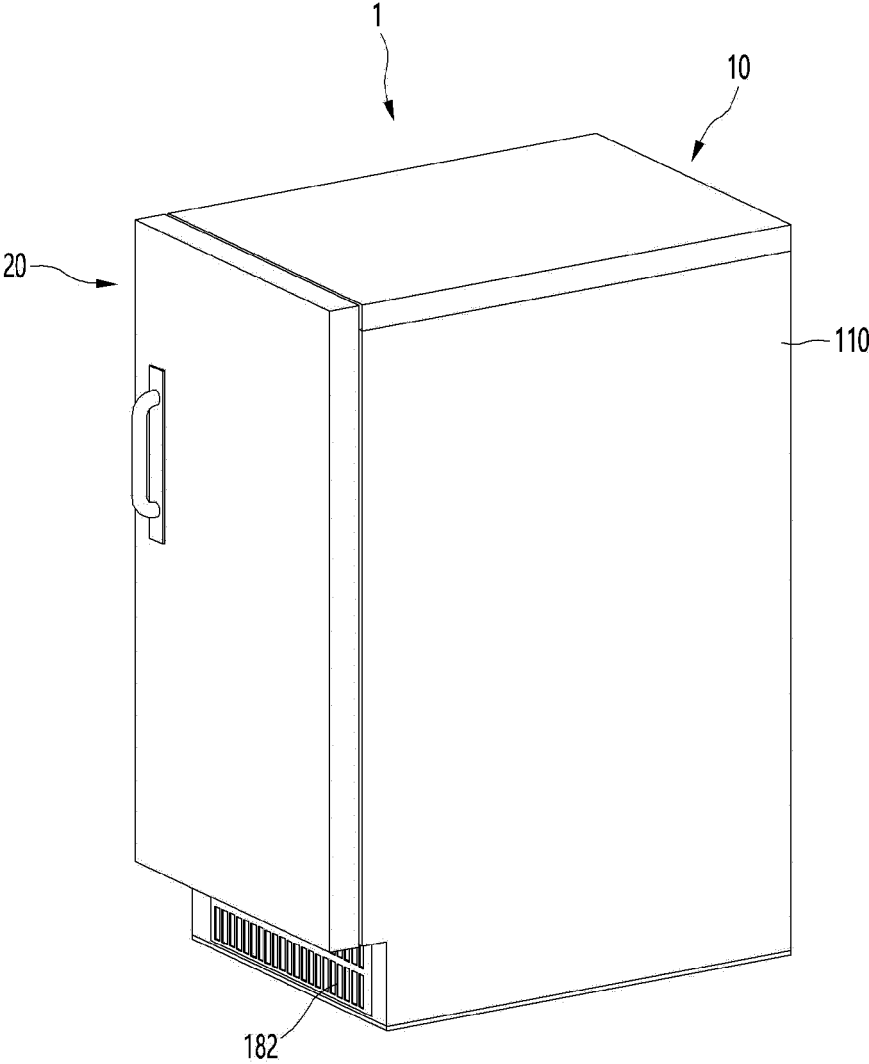
4. The ice making device of claim 2,  
wherein the sub liquid supplier is arranged to supply liquid into the ice making cell through an opening formed at one side of the second another tray. 5
5. The ice making device of claim 2,  
wherein while the second another tray moves in a first direction, the sub liquid supplier moves in the first direction. 10
6. The ice making device of claim 5,  
wherein while the second another tray moves in a second direction, the sub liquid supplier moves in the second direction. 15
7. The ice making device of claim 1,  
further comprising a supporter configured to support the second another tray, and wherein the sub liquid supplier is coupled to the supporter or the second another tray. 20
8. The ice making device of claim 7,  
wherein the sub liquid supplier comprises a liquid supply hole that supplies liquid, and wherein the liquid supply hole is arranged to be aligned with an opening formed at one side of the second another tray. 30
9. The ice making device of claim 8,  
wherein a diameter of the liquid supply hole is less than a diameter of the opening. 35
10. The ice making device of claim 8,  
wherein the supporter further comprises a supporter opening aligned with the liquid supply hole and the opening. 40
11. The ice making device of claim 7,  
wherein the supporter comprises a hinge body that provides a center of rotation, a liquid supply tube is connected to the sub liquid supplier to guide liquid to the sub liquid supplier, and the hinge body is provided with a rib to fix a position of the liquid supply tube. 45
12. The ice making device of claim 7,  
wherein the sub liquid supplier comprises an inlet pipe, a common pipe connected to the inlet pipe, and supply pipes extended from the common pipe, 55

wherein a number of the supply pipes is equal to a number of ice making cells.

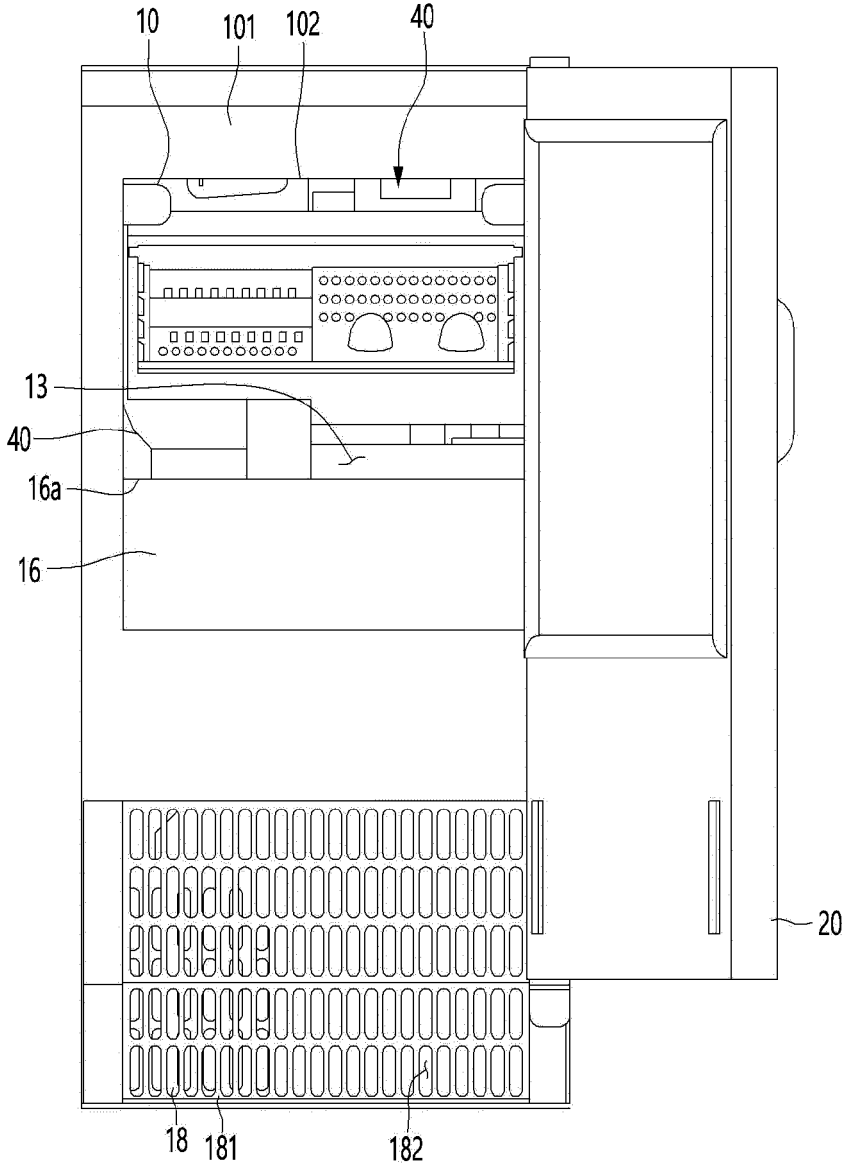
13. The ice making device of claim 12,  
wherein the supporter comprises a supporter opening, the common pipe is located radially outside the supporter opening, and each of the supply pipes extends from the common pipe toward a central portion of the supporter opening.
14. The ice making device of claim 12,  
further comprising a pusher provided spaced apart from the second another tray by a predetermined distance, wherein while the second another tray moves in a first direction during an ice separation process, the supply pipes are moved in a direction closer to the pusher.
15. The ice making device of claim 12,  
wherein the pusher is configured to provide a path along which the supply pipes move during an ice separation process.
16. The ice making device of claim 7,  
wherein an opening is formed at one side of the second another tray through which liquid passes, the supporter comprises a supporter opening in communication with the opening, and the sub liquid supplier is coupled to the supporter to cover the supporter opening.
17. The ice making device of claim 7,  
wherein an opening is formed at one side of the second another tray through which liquid passes, and wherein the sub liquid supplier comprises an inlet pipe, and a distribution pipe connected to the inlet pipe and having a liquid supply hole aligned with the opening.
18. The ice making device of claim 17,  
wherein the sub liquid supplier further comprises a coupling body to be coupled to the supporter.
19. The ice making device of claim 18,  
wherein the coupling body comprises a first body extending from the distribution pipe, and a second body extending from the first body in a direction crossing the first body.

- 20.** The ice making device of claim 19,  
wherein the coupling body further comprises a coupling extension extending from the second body and coupled to the supporter.
- 21.** The ice making device of claim 19,  
wherein the sub liquid supplier further comprises a protrusion disposed around the liquid supply hole and inserted into an opening of the second another tray.
- 22.** The ice making device of claim 21,  
wherein one surface of the protrusion is rounded to form a portion of the ice making cell.
- 23.** The ice making device of claim 19,  
wherein the sub liquid supplier further comprises an outlet opening through which liquid supplied to the ice making cell is discharged.
- 24.** The ice making device of claim 7,  
  
further comprising a heater configured to supply heat to the ice making cell during an ice separation process, and  
wherein the sub liquid supplier is configured to support the heater or a heater coupling portion to which the heater is coupled.
- 25.** The ice making device of claim 24,  
  
wherein the second another tray comprises a heater coupling portion to which the heater is coupled, and  
wherein the heater coupling portion passes through an opening of the second another tray and the sub liquid supplier is arranged to surround the heater coupling portion.
- 26.** An ice making device comprising:  
  
a second one tray that defines a portion of an ice making cell which is a space in which liquid is phase-changed into ice by cold;  
a second another tray having an opening and that defines another portion of the ice making cell, and that is 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 including a liquid supply hole for supplying liquid to the ice making cell through the opening; and  
a driver configured to move the second another tray.
- 27.** The ice making device of claim 26,  
  
further comprising a supporter configured to support the second another tray,  
wherein the supporter comprises a supporter opening aligned with the opening, and  
wherein the supporter comprises an opening wall provided at a periphery of the supporter opening.
- 28.** The ice making device of claim 27,  
wherein the opening wall comprises a slot to prevent interference with a component in the ice separation process.
- 29.** The ice making device of claim 27,  
  
wherein the supporter comprises a pair of hinge bodies to which a hinge shaft that receives a rotational force of the driver is connected, and  
wherein a shaft cover is provided between the pair of hinge bodies to cover the hinge shaft.

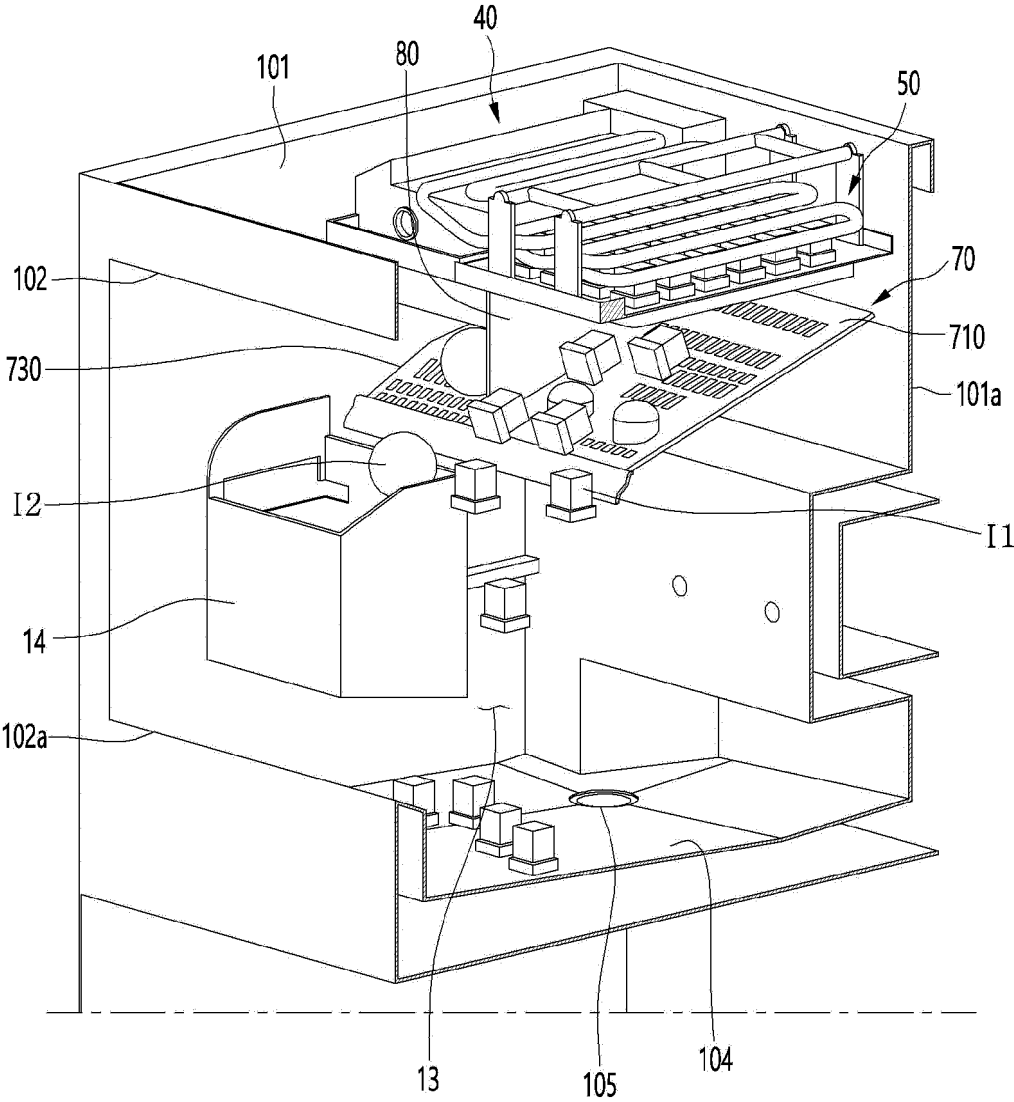
【Figure 1】



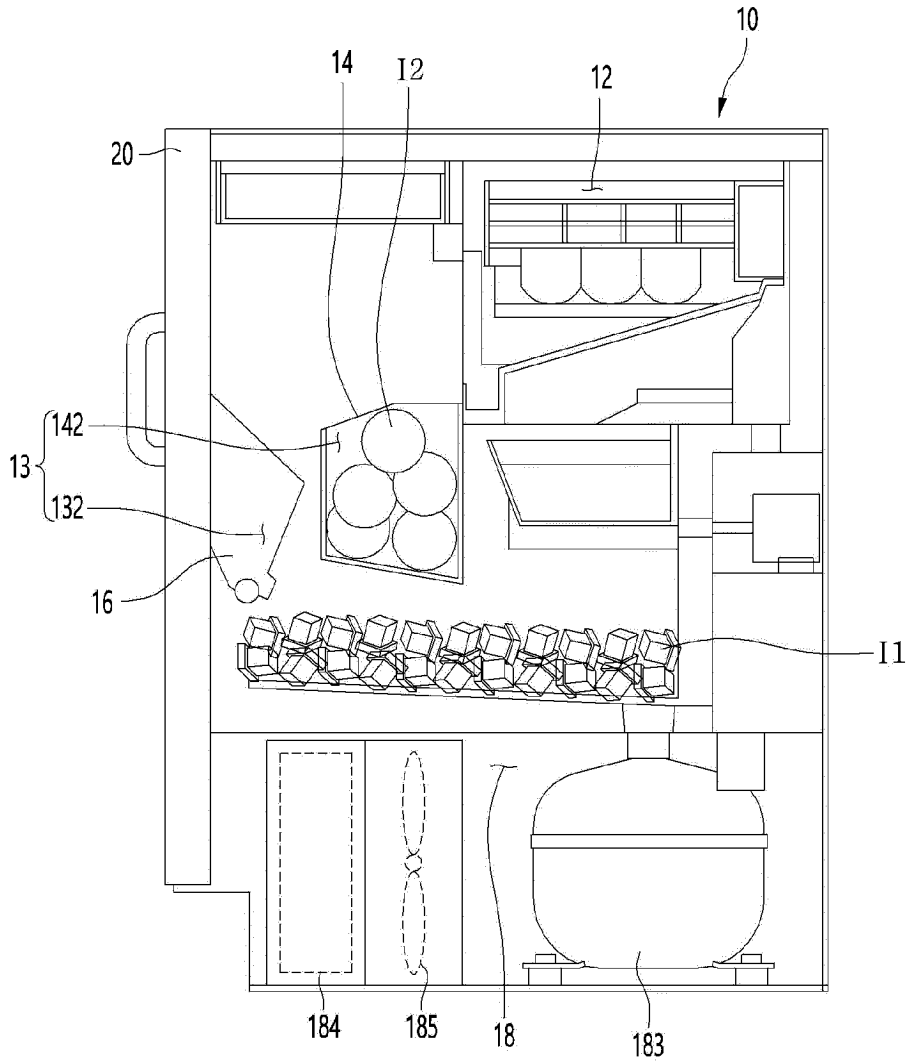
【Figure 2】



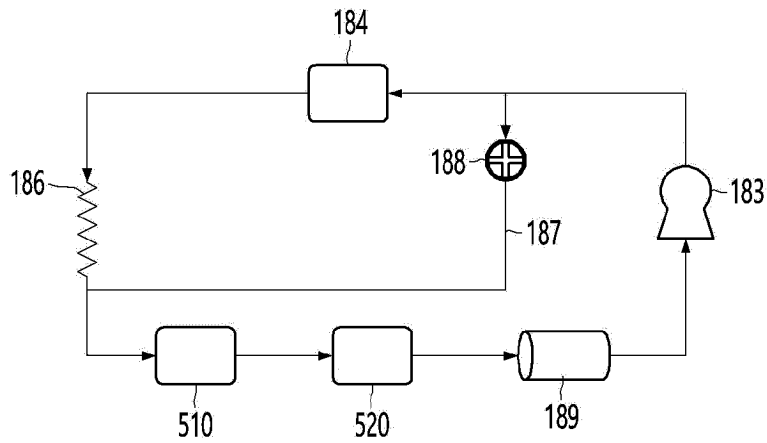
【Figure 3】



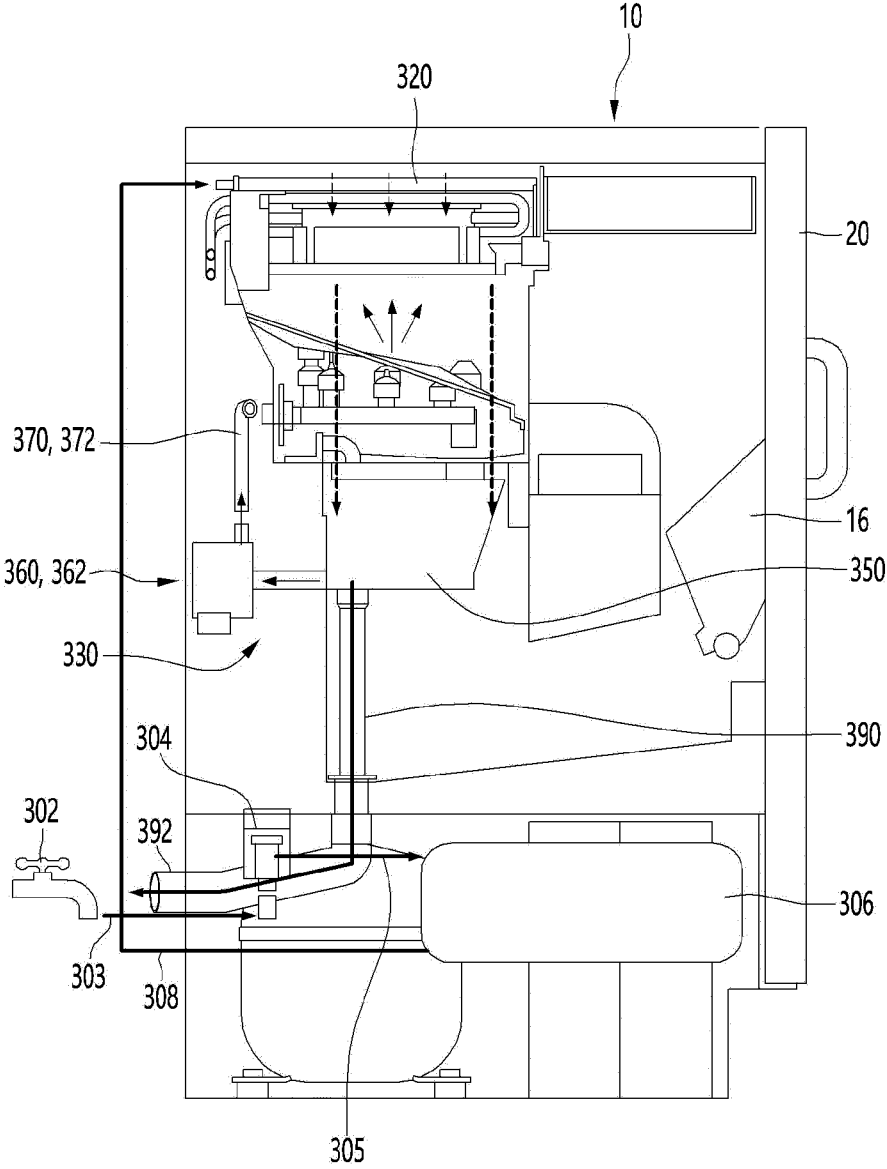
【Figure 4】



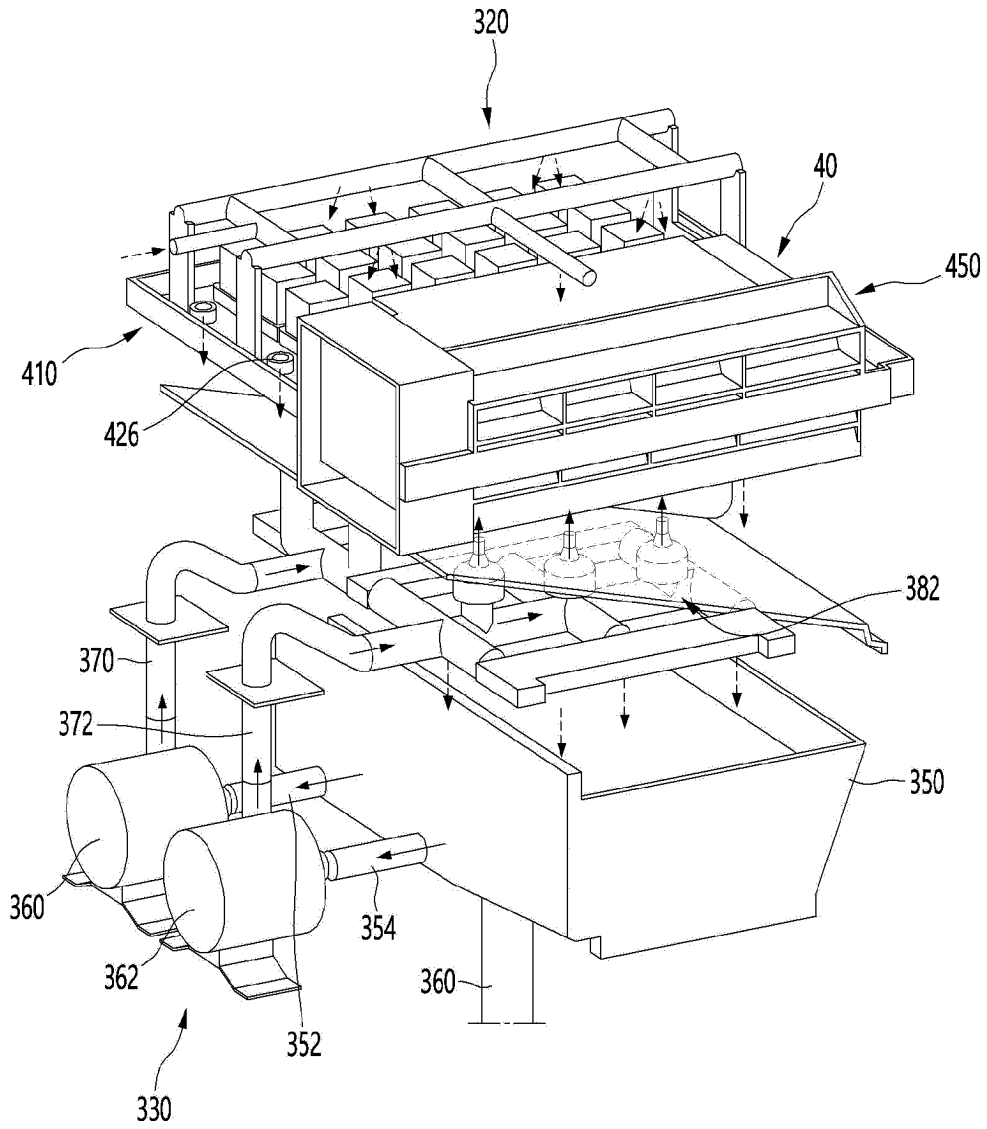
【Figure 5】



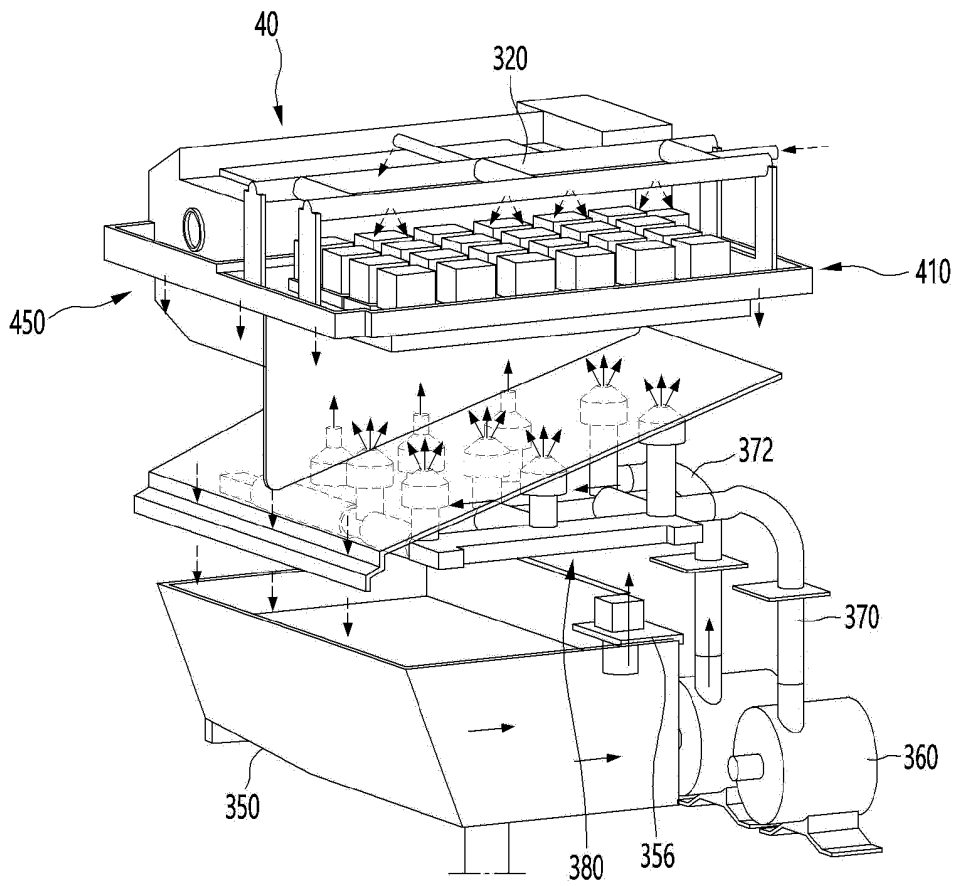
【Figure 6】



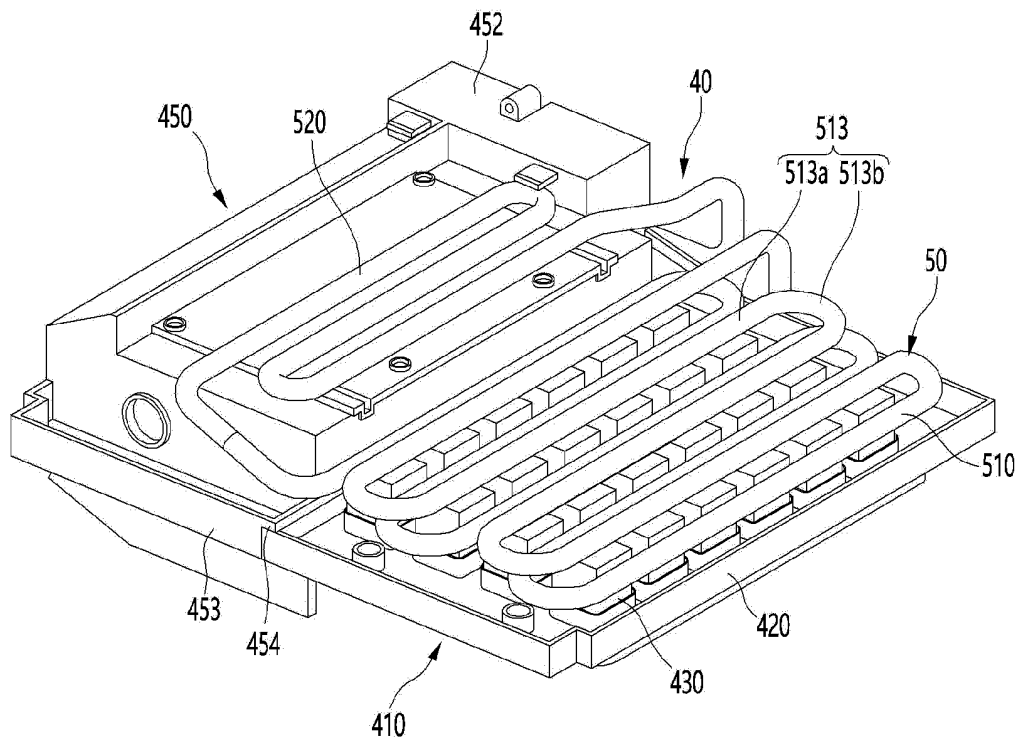
【Figure 7】



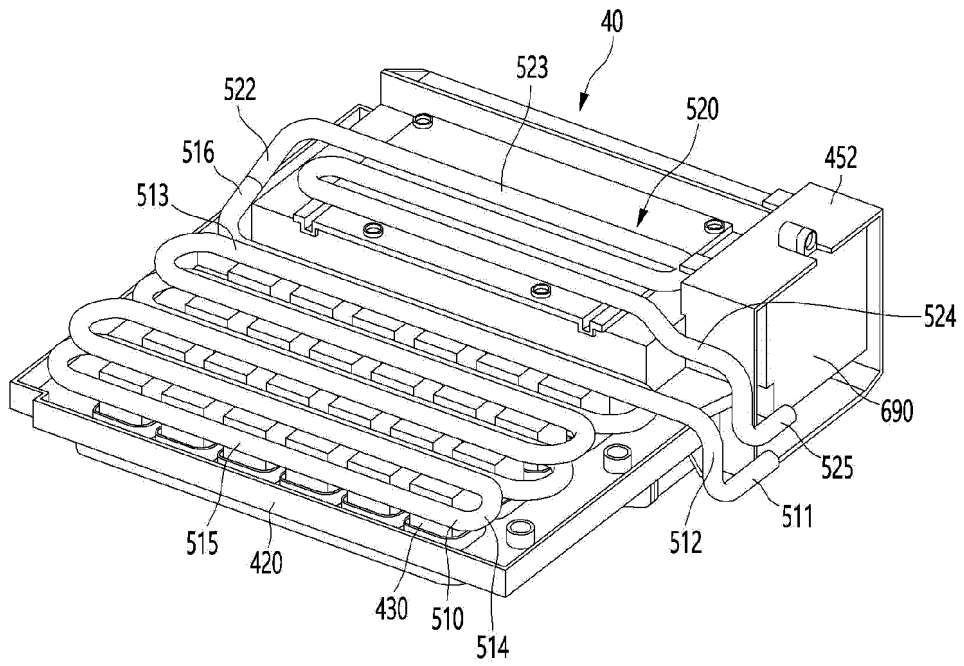
【Figure 8】



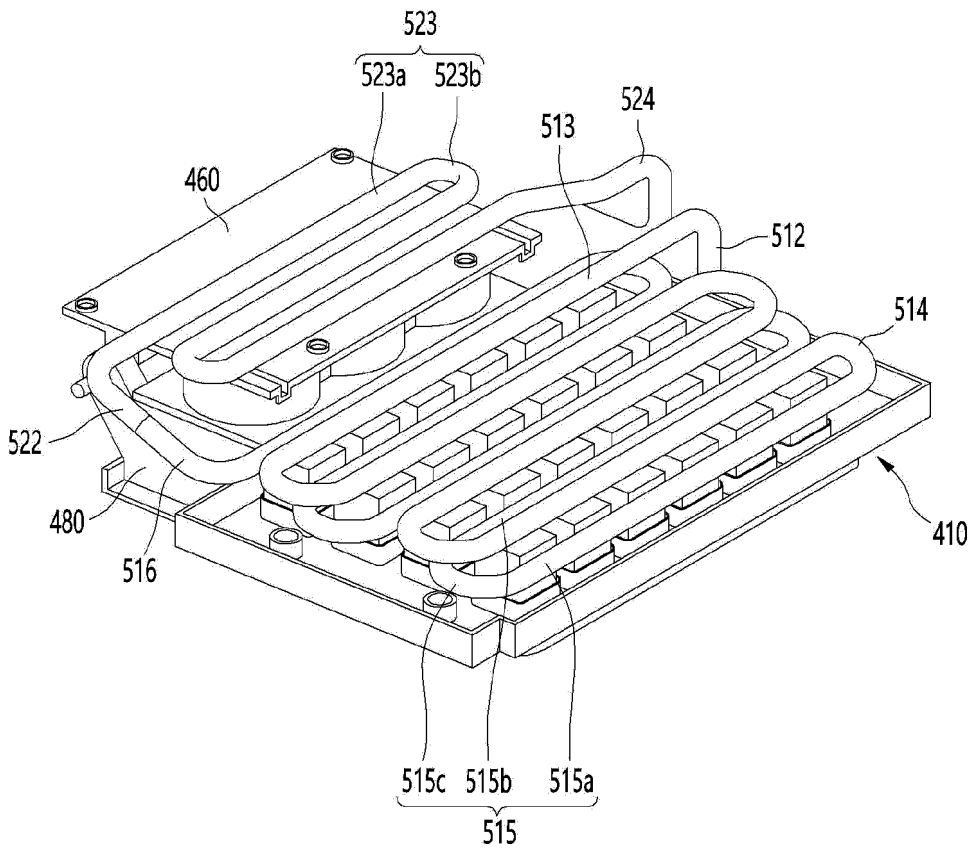
【Figure 9】



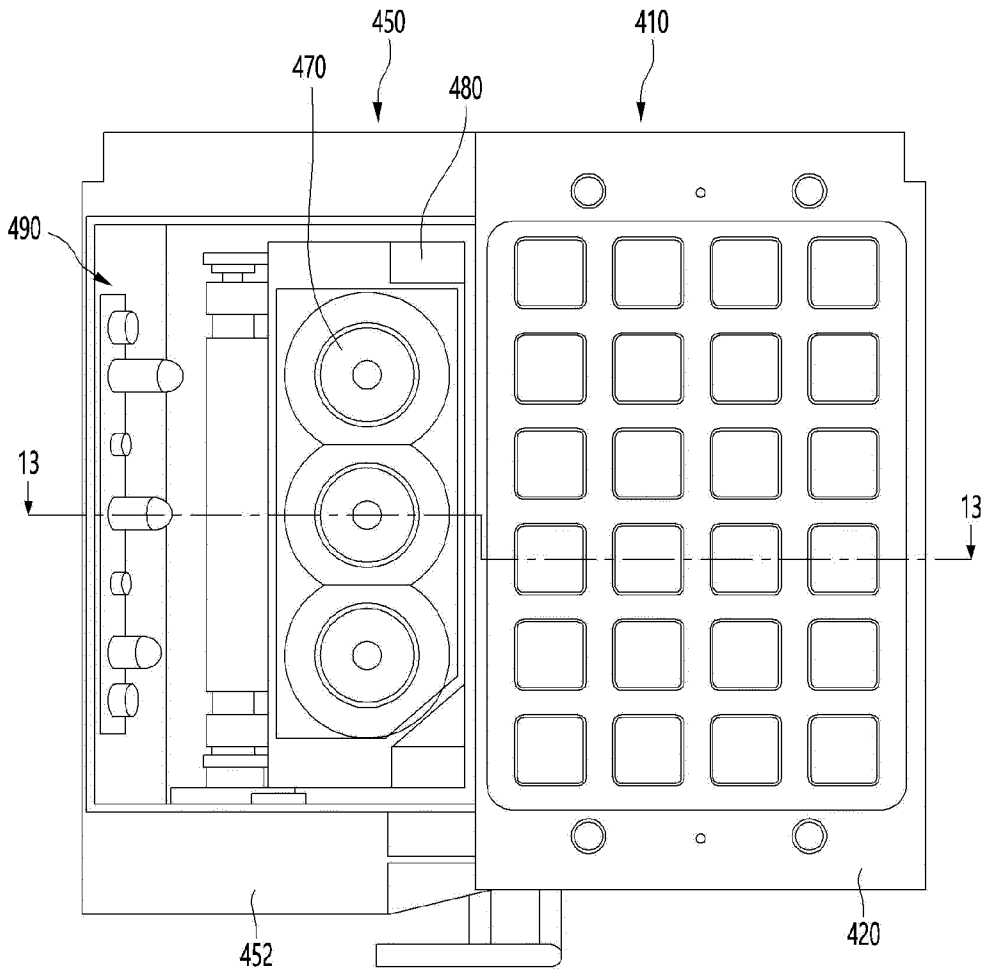
【Figure 10】



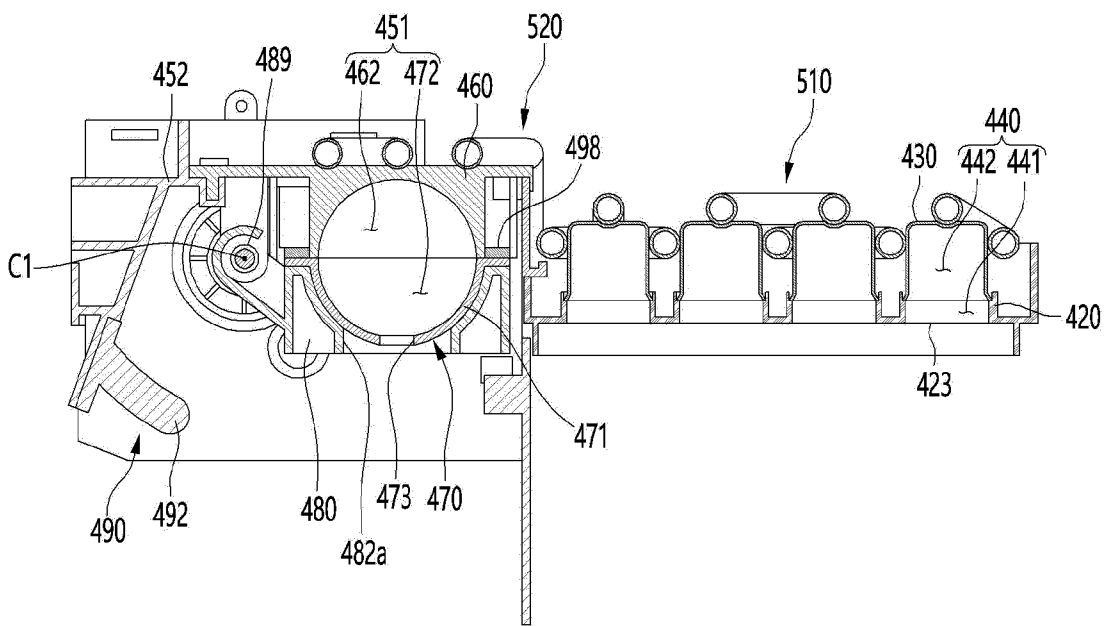
【Figure 11】



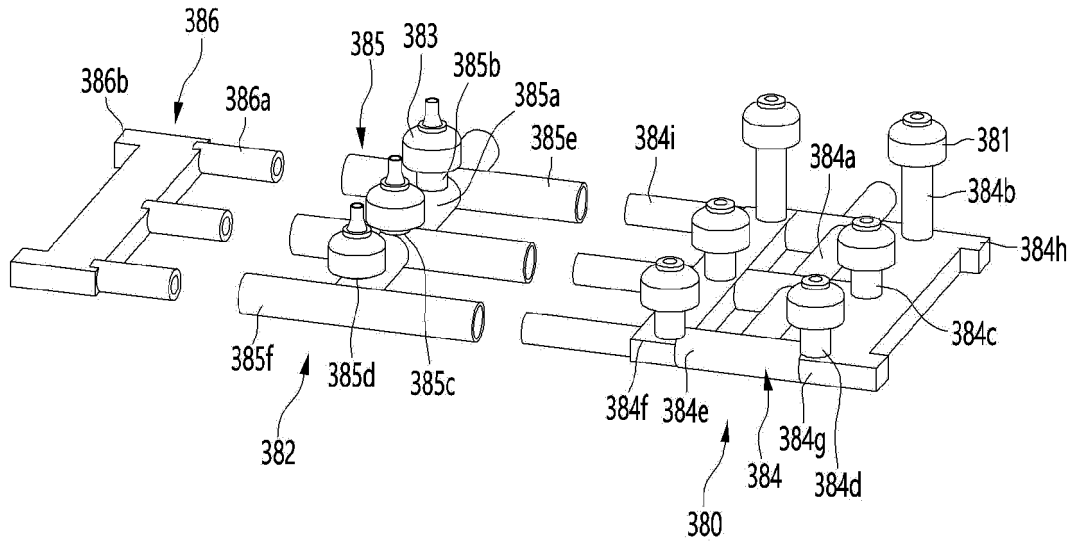
【Figure 12】



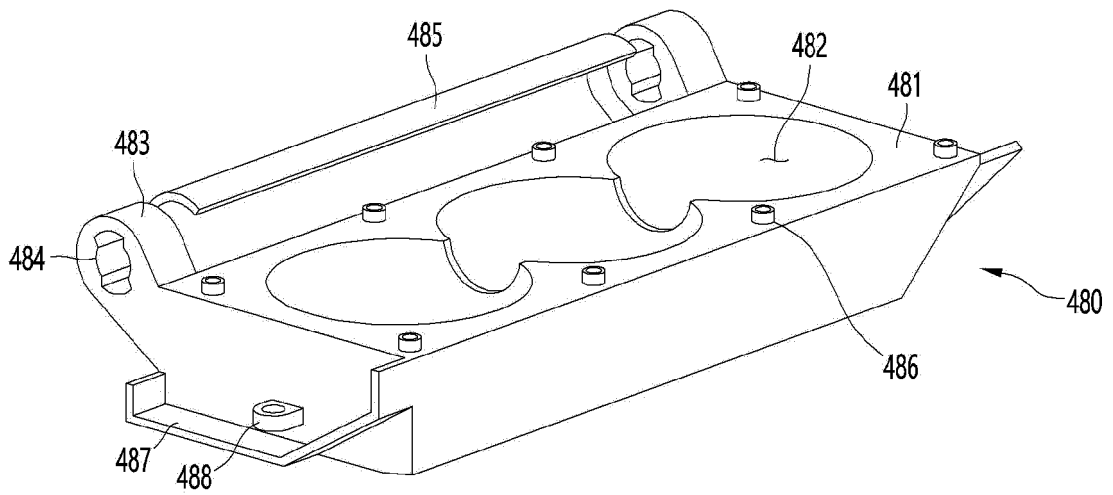
【Figure 13】



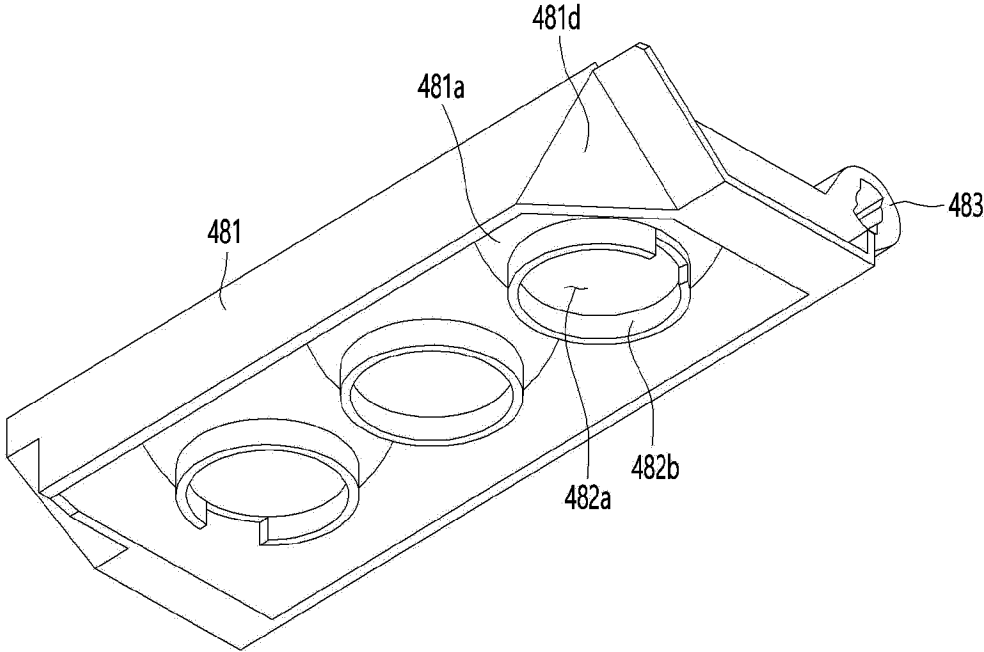
【Figure 14】



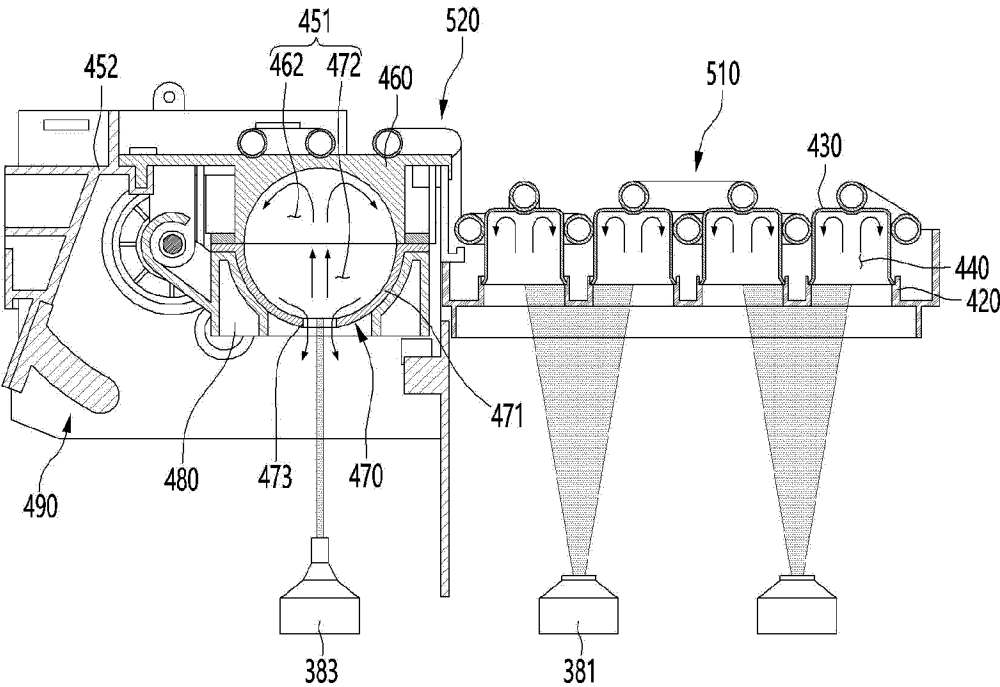
【Figure 15】



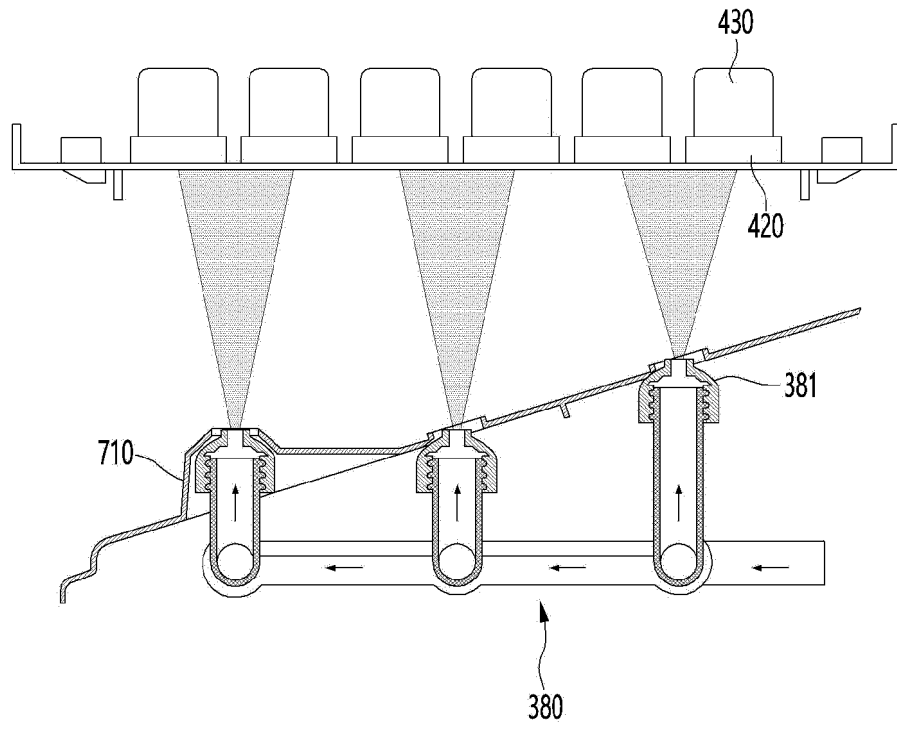
【Figure 16】



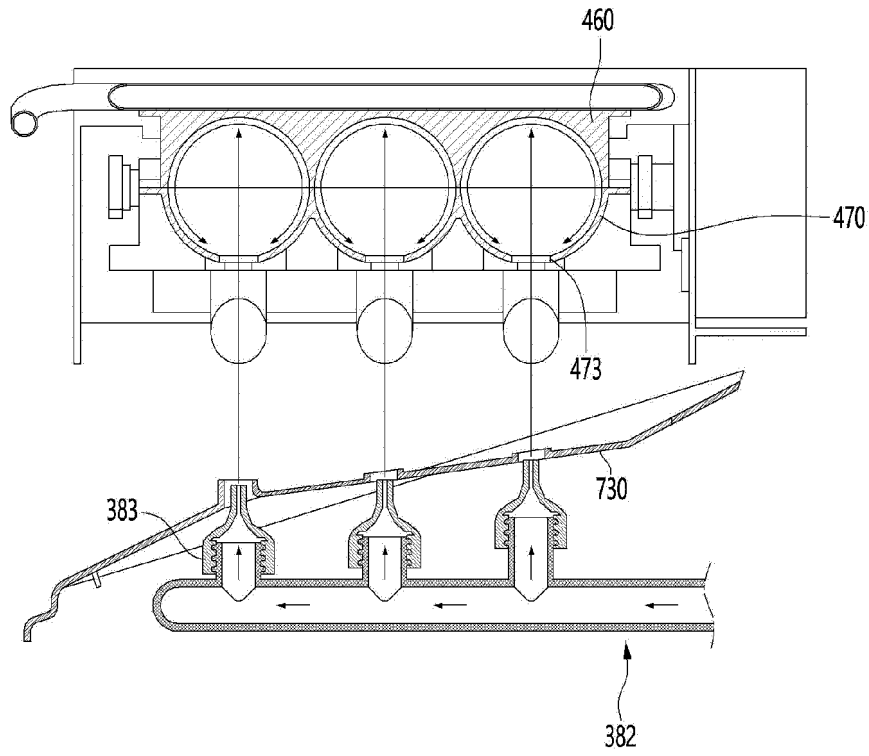
【Figure 17】



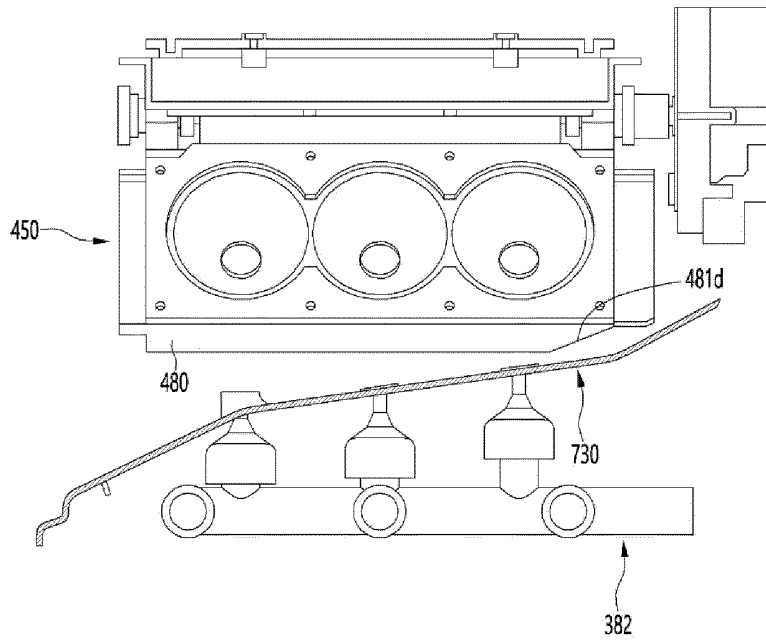
【Figure 18】



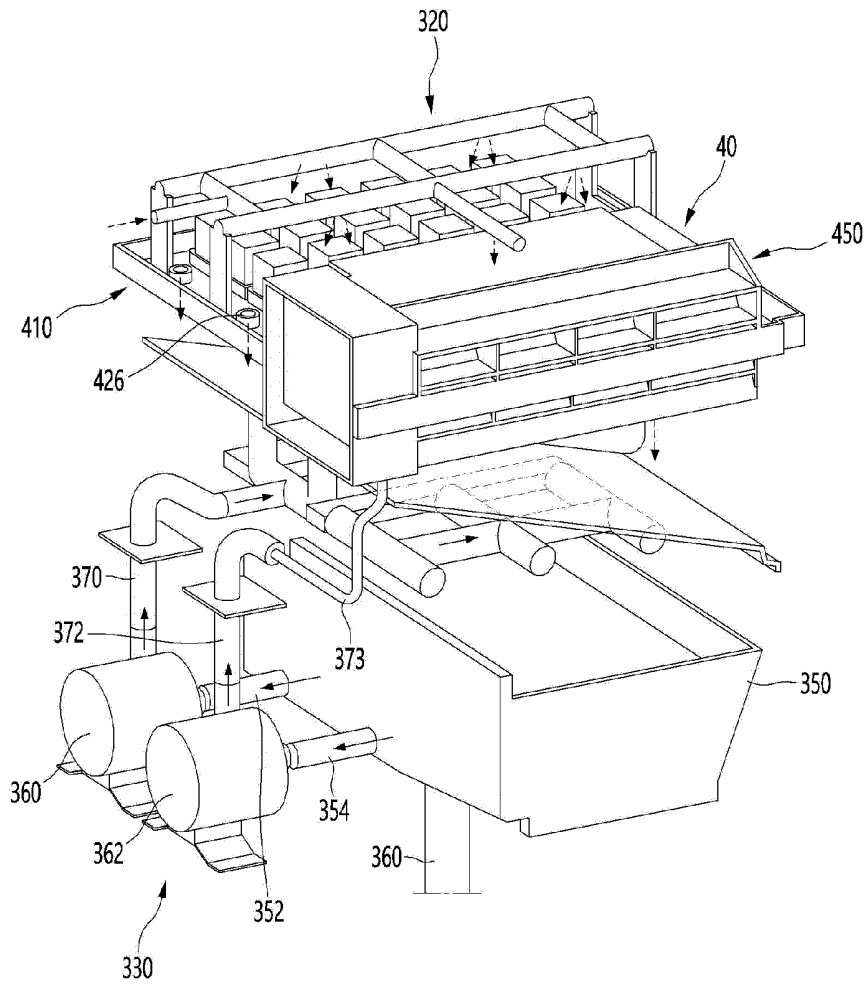
【Figure 19】



【Figure 20】

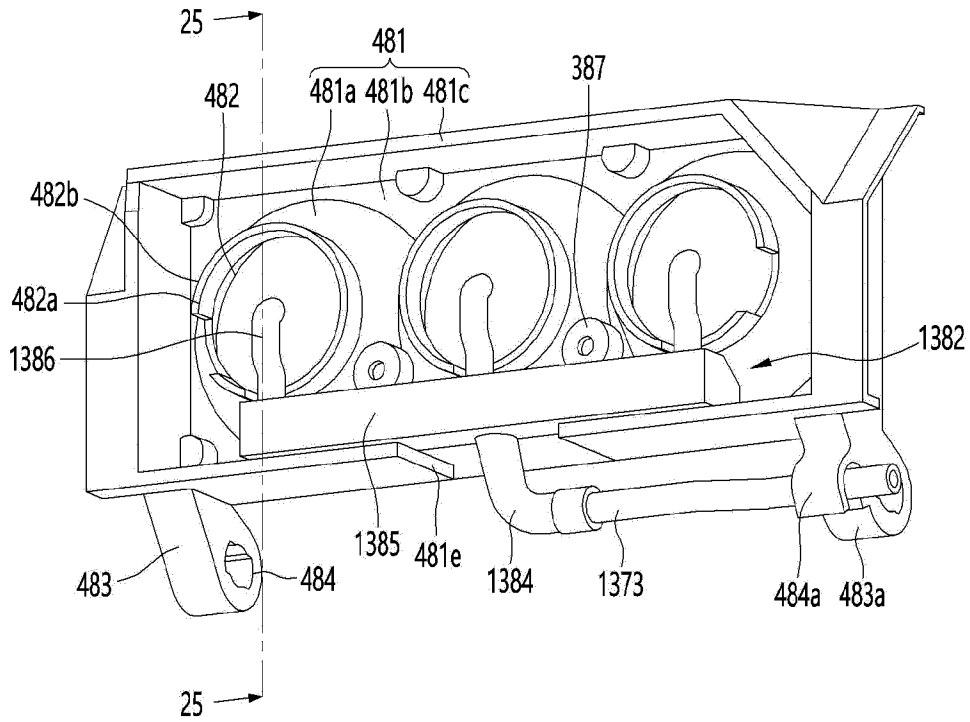


【Figure 21】

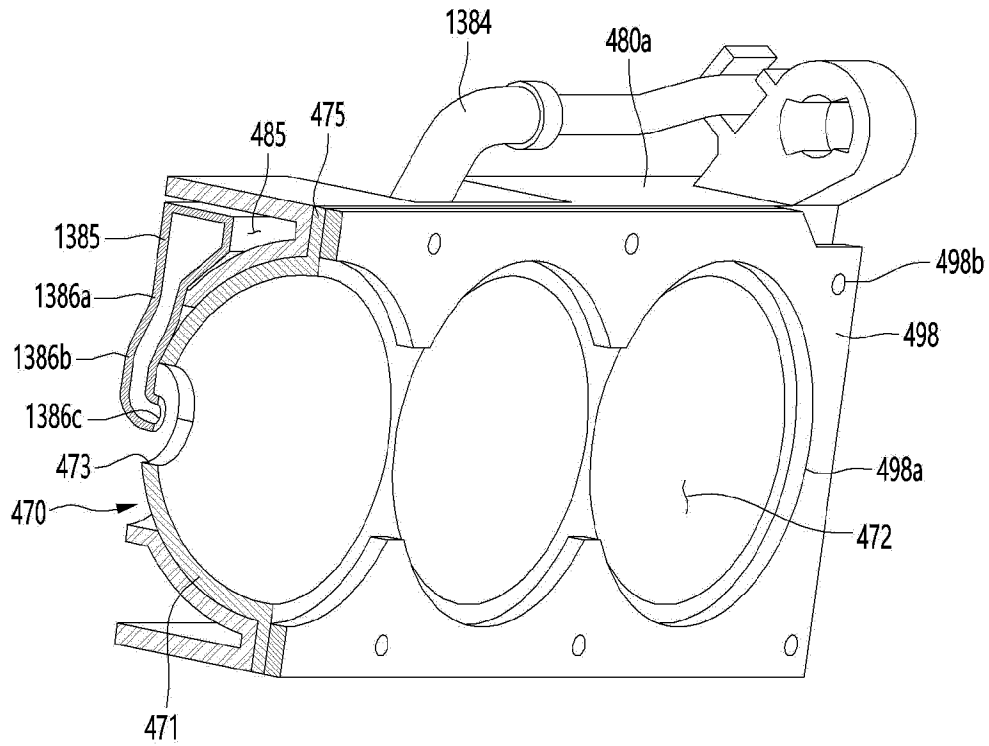




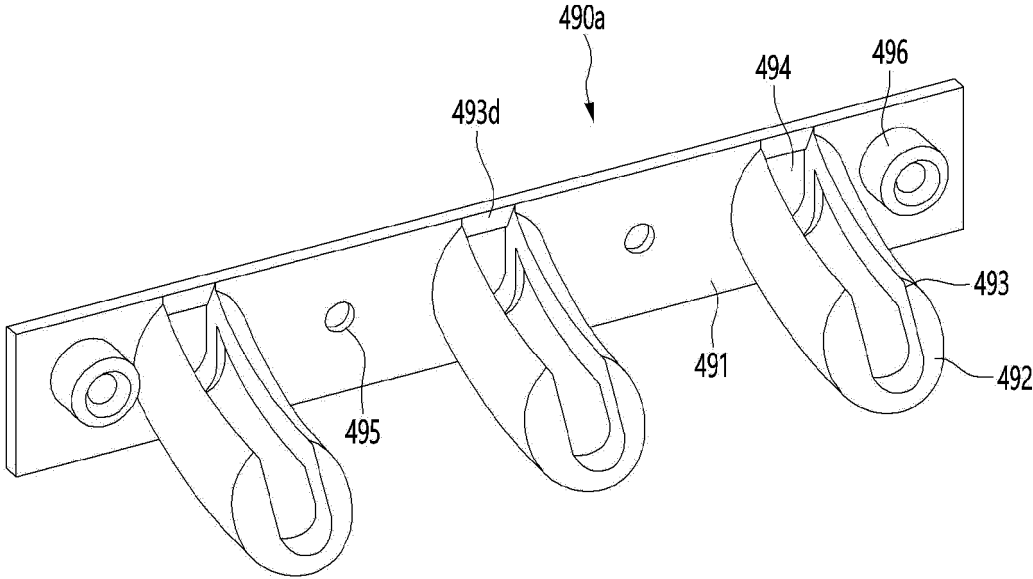
【Figure 24】



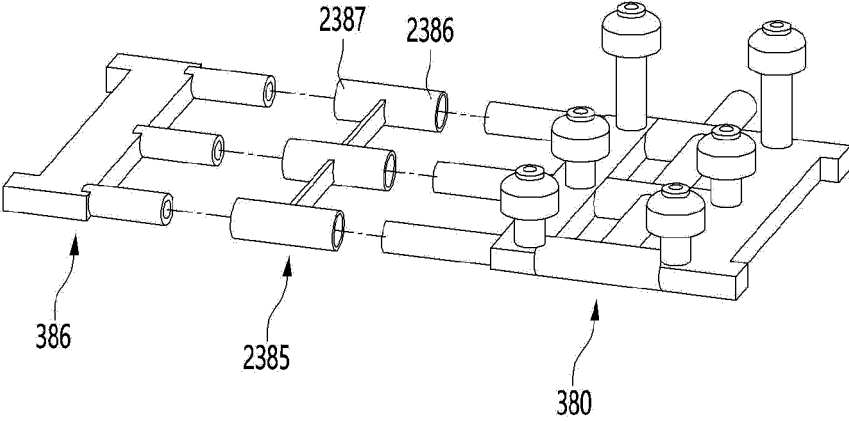
【Figure 25】



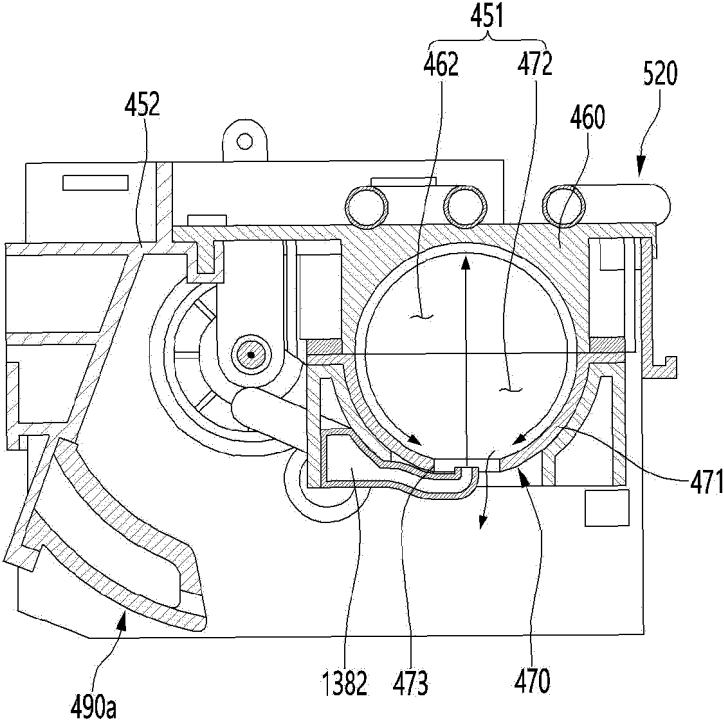
【Figure 26】



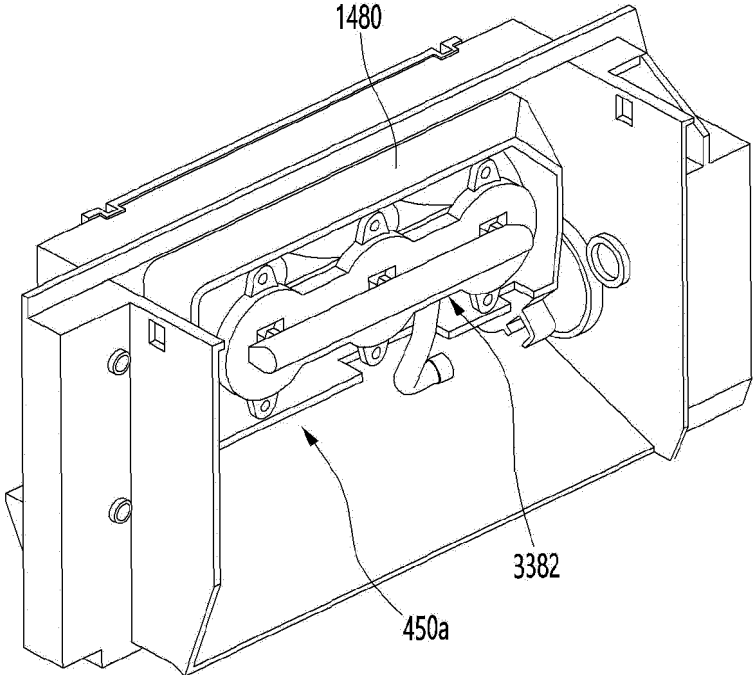
【Figure 27】



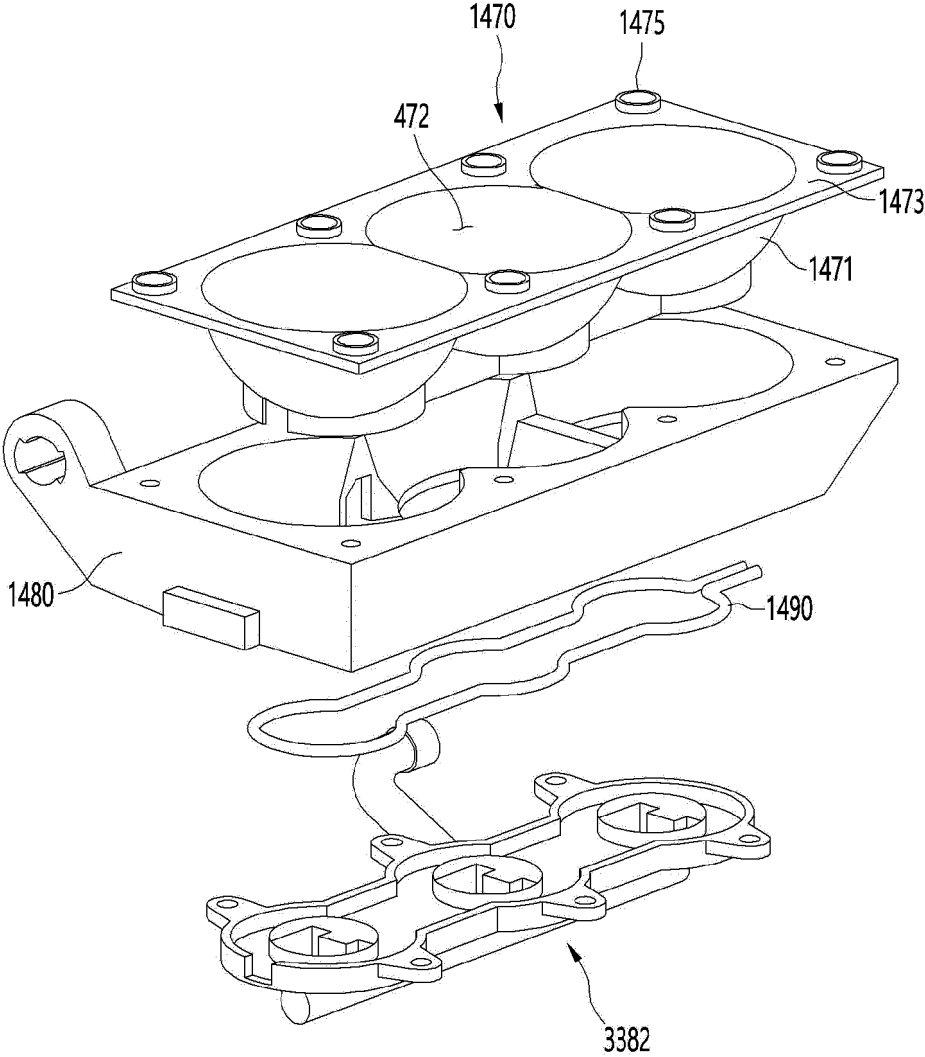
【Figure 28】



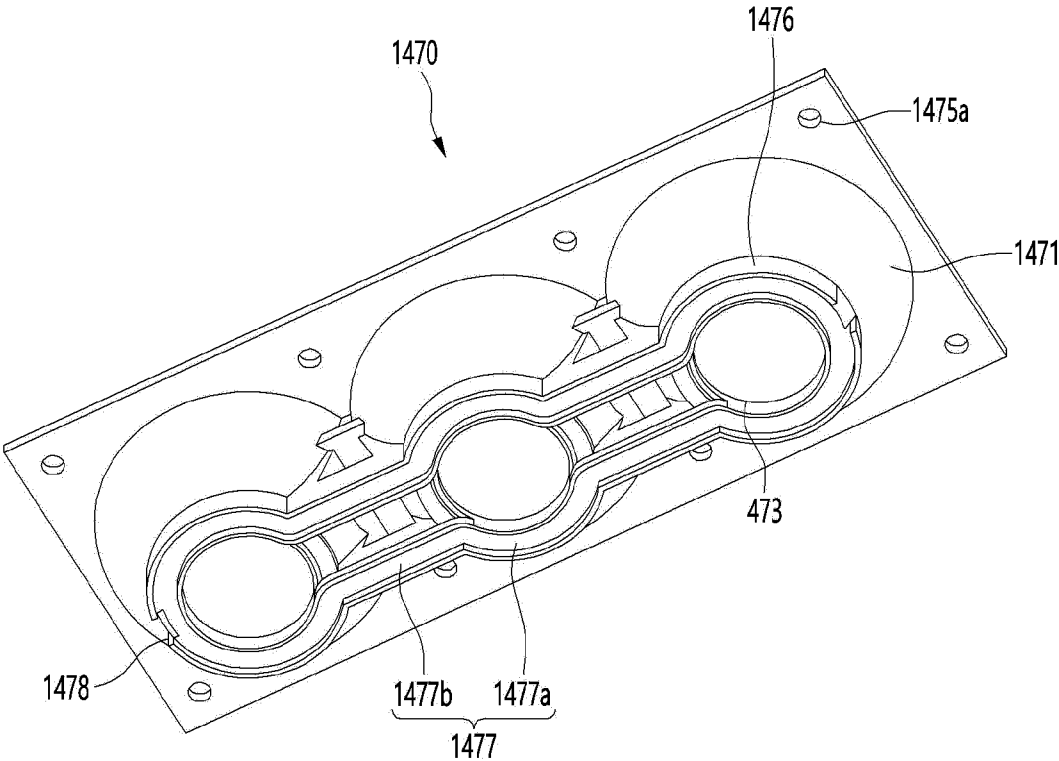
【Figure 29】



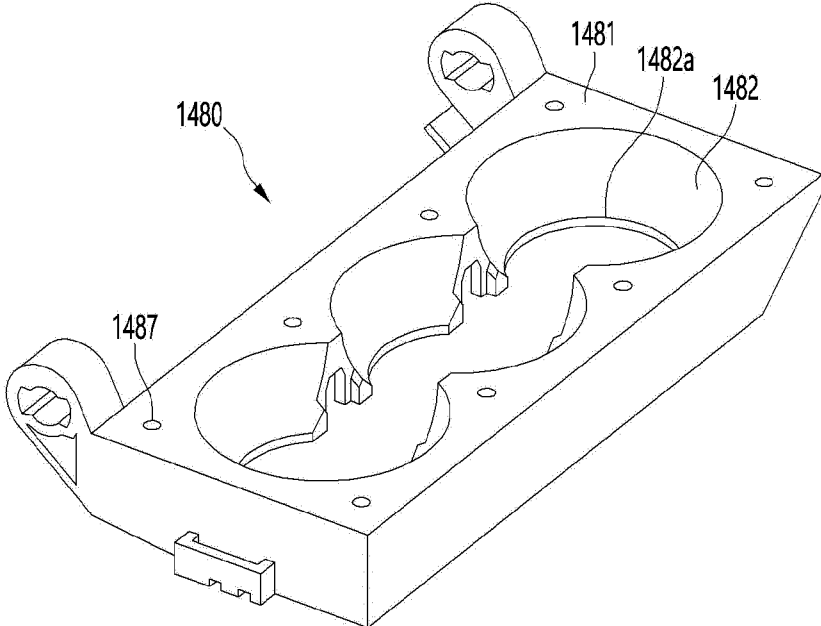
【Figure 30】



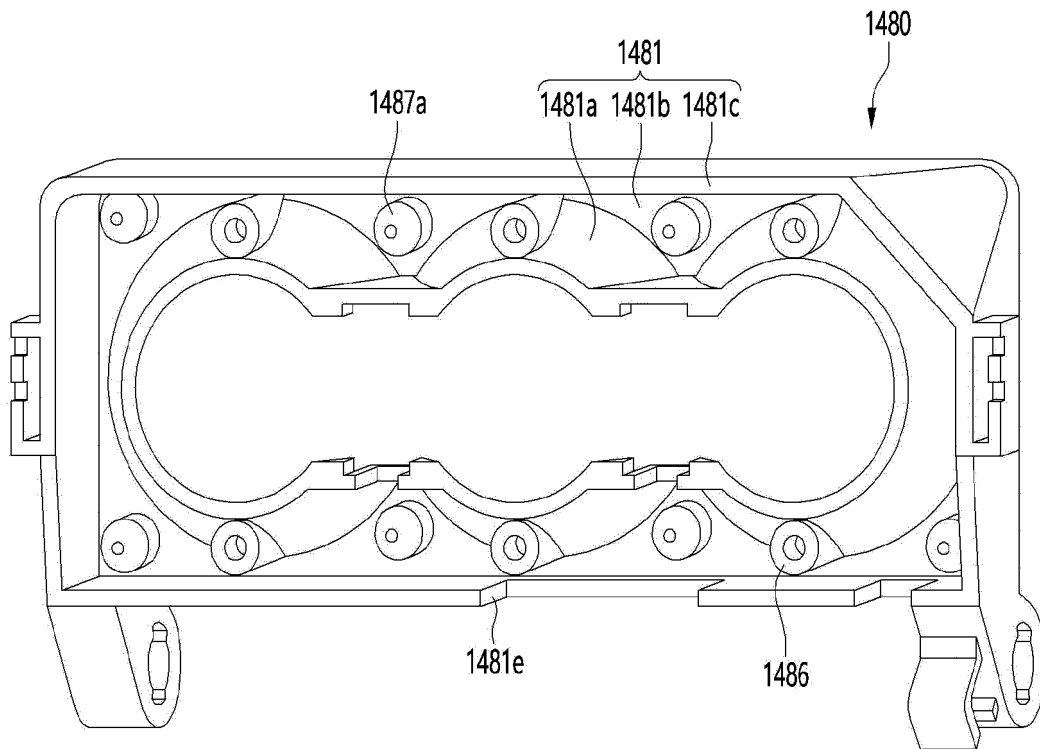
【Figure 31】



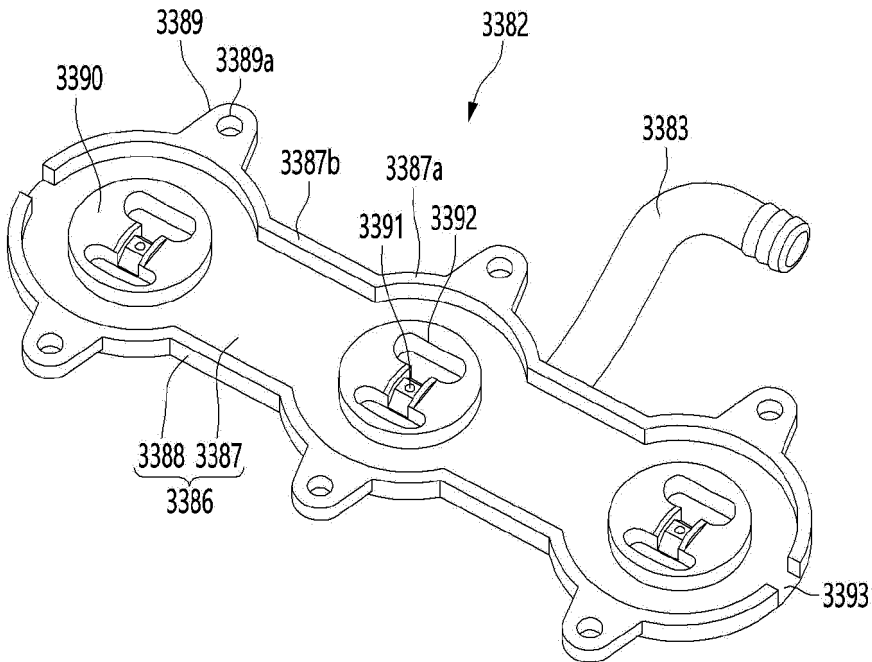
【Figure 32】



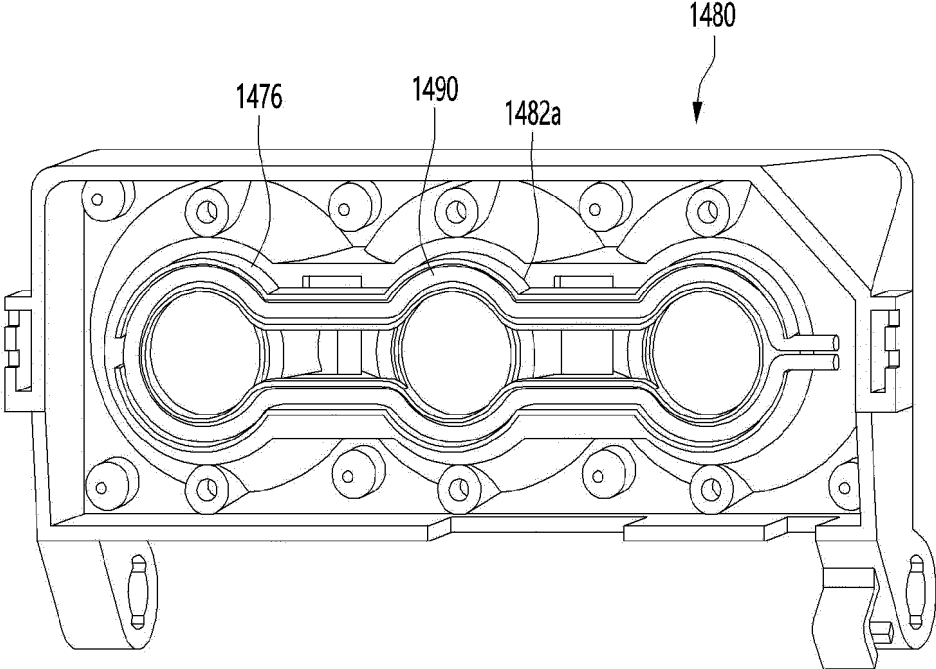
【Figure 33】



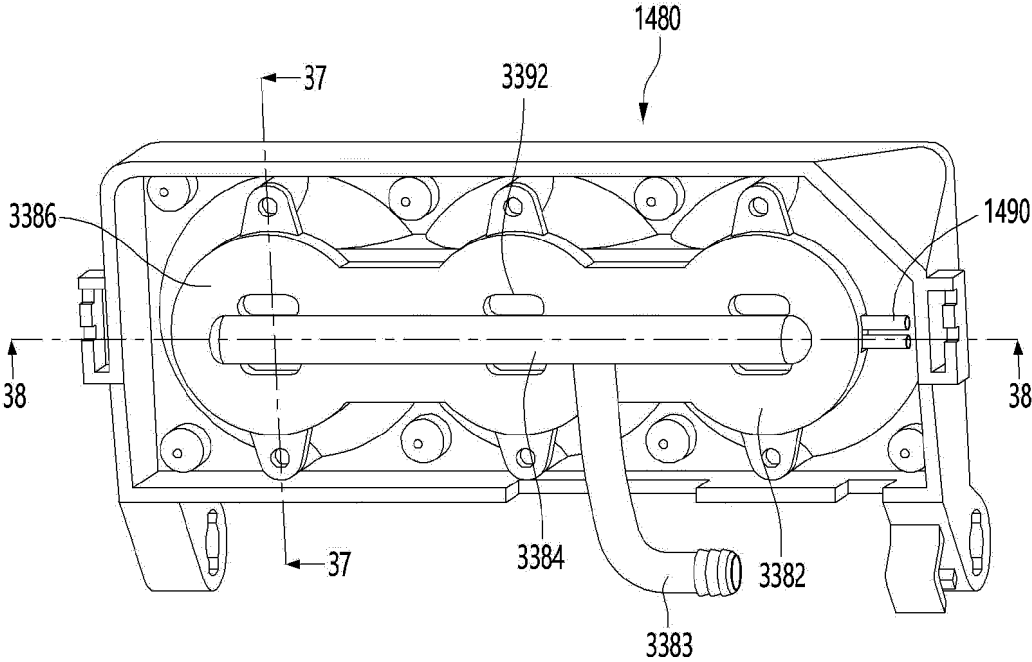
【Figure 34】



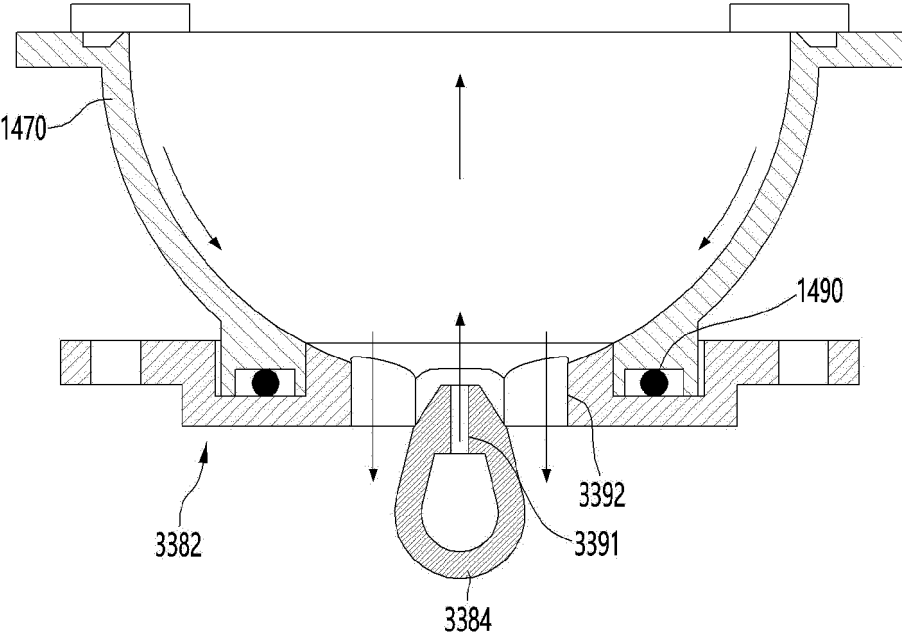
【Figure 35】



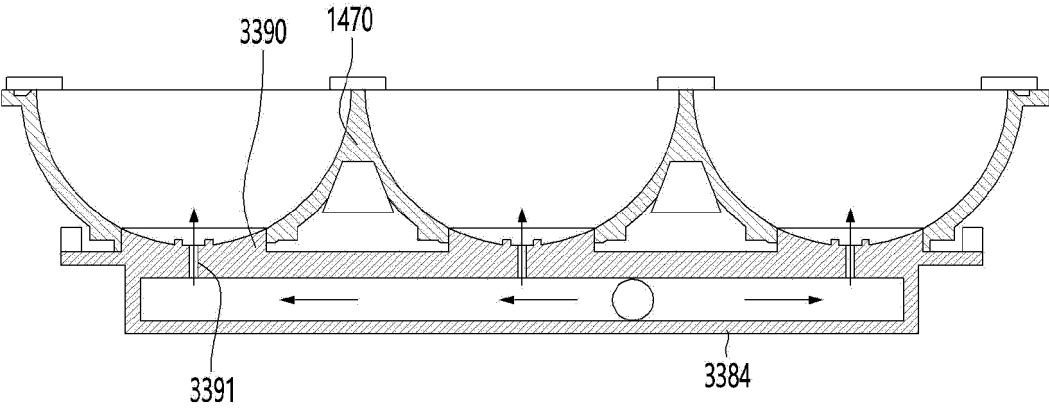
【Figure 36】



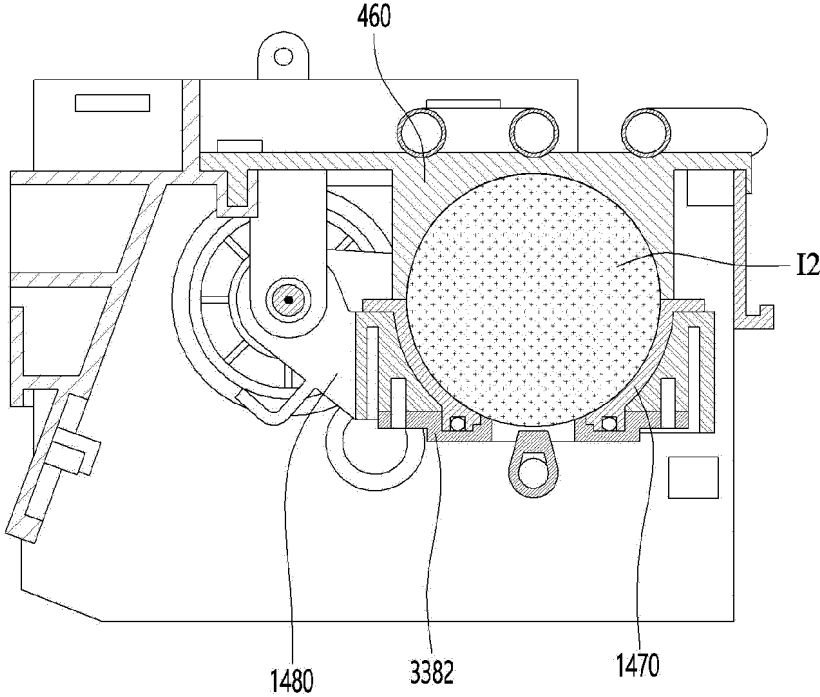
【Figure 37】



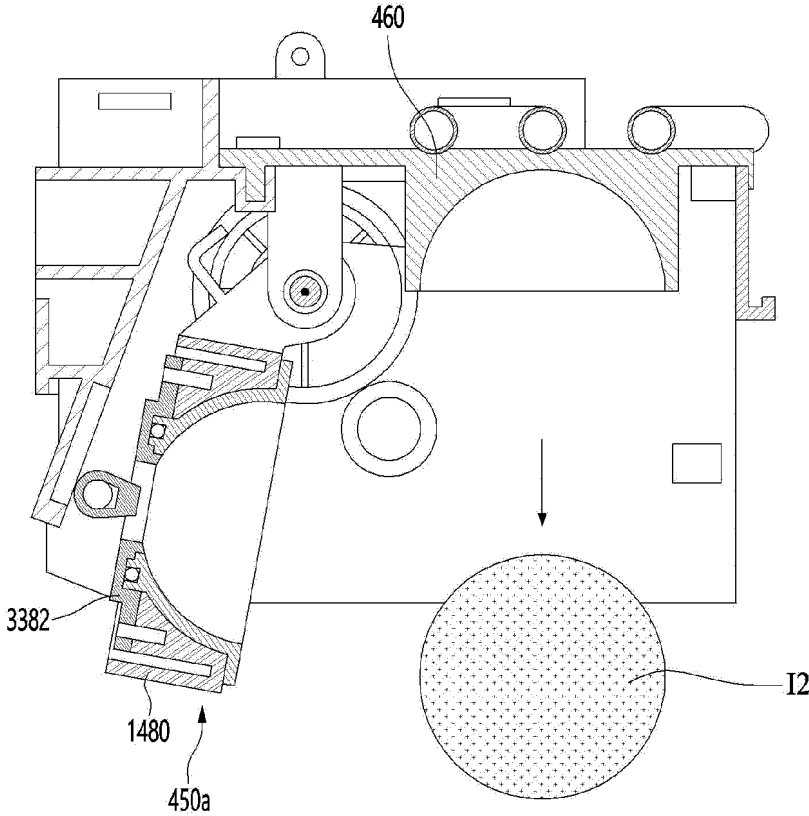
【Figure 38】



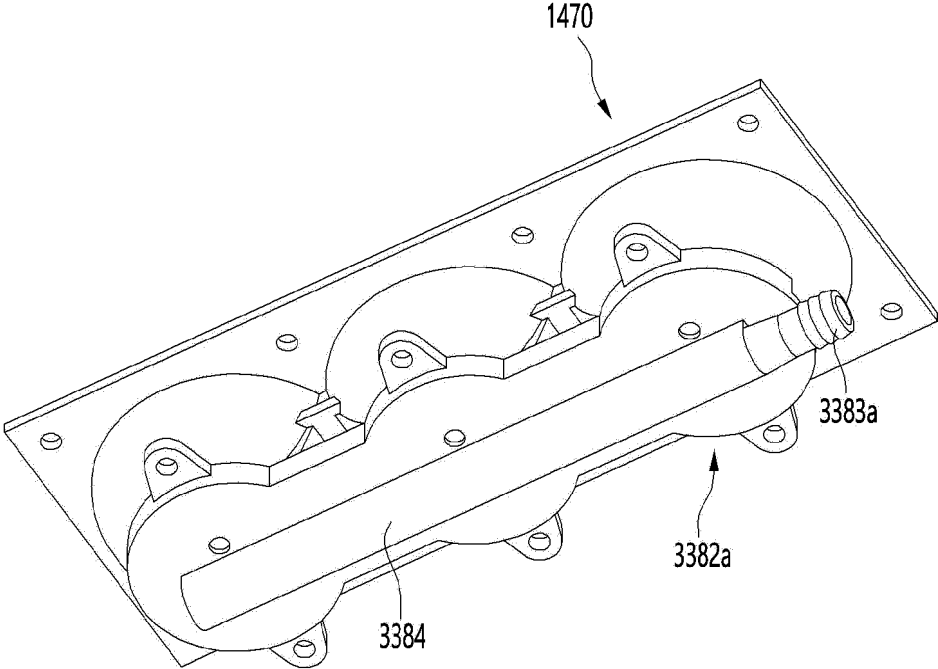
【Figure 39】



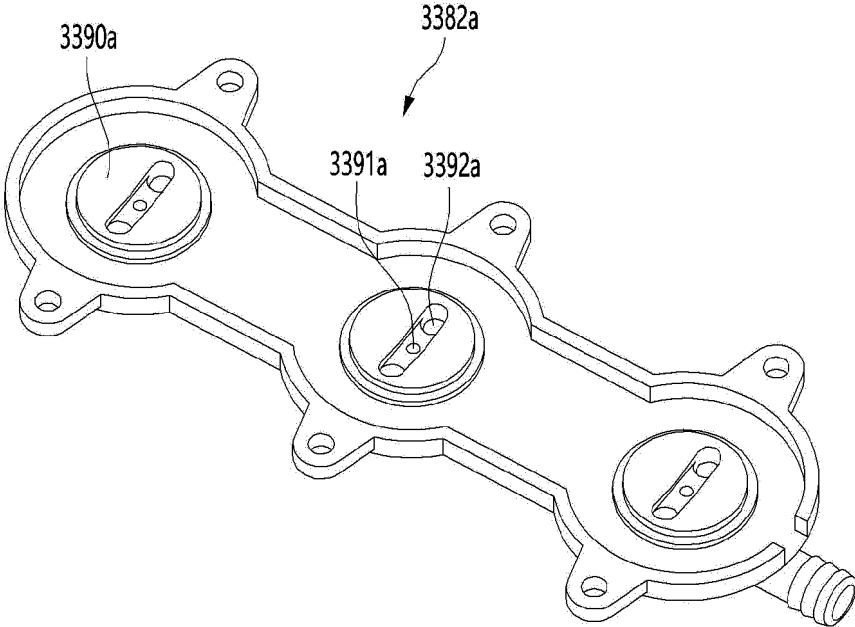
【Figure 40】



【Figure 41】



【Figure 42】



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**A. CLASSIFICATION OF SUBJECT MATTER**  
**F25C 1/24(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

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**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
 F25C 1/24(2006.01); F25C 1/04(2006.01); F25C 1/18(2006.01); F25C 1/22(2006.01); F25C 1/25(2018.01);  
 F25C 5/08(2006.01); F25C 5/18(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

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Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
 eKOMPASS (KIPO internal) & keywords: 제빙(ice making), 서포터(supporter), 트레이(tray), 히터(heater), 푸셔(push), 급수(water supplying)

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**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 [0086]-[0087], [0092], [0117], [0134], [0166]-[0167], [0220], [0229] and [0255], claim 1 and figures 9-12.	1,26-27,29
Y		2-4,28
A		5-25
Y	JP 2008-095997 A (DAIWA INDUSTRIES LTD.) 24 April 2008 (2008-04-24) See paragraph [0004], claim 1 and figures 1-2.	2-4
Y	KR 10-2020-0057599 A (LG ELECTRONICS INC.) 26 May 2020 (2020-05-26) See paragraph [0446] and figure 25.	28
A	KR 20-1993-0015191 U (LG ELECTRONICS INC.) 27 July 1993 (1993-07-27) See claim 1 and figure 3.	1-29

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

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* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "D" document cited by the applicant in the international application "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
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Date of the actual completion of the international search <b>24 May 2023</b>	Date of mailing of the international search report <b>24 May 2023</b>
Name and mailing address of the ISA/KR <b>Korean Intellectual Property Office Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208</b> Facsimile No. +82-42-481-8578	Authorized officer  Telephone No.

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	JP 2013-234811 A (PANASONIC CORP.) 21 November 2013 (2013-11-21) See paragraphs [0031]-[0033], claims 1-3 and figures 4-5.	1-29

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