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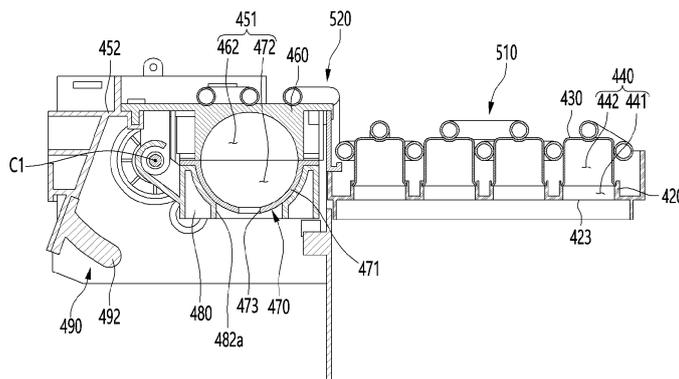
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(54) **ICE-MAKING DEVICE AND REFRIGERATOR**

(57) An ice-making device according to the present embodiment may include an ice-making unit which is provided in an ice-making chamber and is for making ice. The ice-making device may further include a water supply unit for supplying water to the ice-making unit during an ice-making process. The ice-making unit

may include a first tray having a first ice-making cell in which first ice is formed. The ice-making unit may further include a second tray having a second ice-making cell in which second ice of a different type from the first ice is formed.

【Figure 12】



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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, it only discloses technology for generating one type of ice, and does not disclose technology for generating different types of ice.

[0011] Therefore, the prior art does not disclose technology that prevents different types of ice from interfering with each other during an ice separation process or

technology that stores different types of ice separately.

[Disclosure]

5 [Technical Problem]

[0012] The present embodiment provides an ice making device and a refrigerator capable of generating different types of ice.

10 **[0013]** Alternatively or additionally, one embodiment provides an ice making device and a refrigerator that prevents interference of different types of ice during an ice separation process.

15 **[0014]** Alternatively or additionally, one embodiment provides an ice making device and a refrigerator in which different types of ice can be stored separately.

[0015] Alternatively or additionally, one embodiment provides an ice making device and a refrigerator capable of generating multiple types of ice with a single ice maker.

20 [Technical Solution]

25 **[0016]** 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.

30 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 an ice maker configured to generate ice and provided in an ice making chamber. The ice making apparatus may further include a liquid supplier configured to supply liquid (e.g., water) to the ice maker in an ice making process.

45 **[0017]** The ice maker may include a first tray including a first ice making cell in which first ice is formed. The ice maker may further include a second tray including a second ice making cell in which second ice is formed. A type of the second ice may be different from a type of the first ice.

50 **[0018]** The first ice and the second ice may be different from each other in one or more of transparency, size, and shape.

55 **[0019]** The first tray may include a plurality of first ice making cells. The second tray may include a plurality of second ice making cells.

[0020] A volume of one first ice making cell may be less than a volume of one second ice making cell. A sum of

volumes of the plurality of first ice making cells may be greater than a sum of volumes of the plurality of second ice making cells.

[0021] The first tray and the second tray may be arranged in a horizontal direction or in a vertical direction.

[0022] In a state in which the first tray is connected to the second tray, the first and second trays are disposed in the ice making chamber. Alternatively, the first tray and the second tray may be disposed in the ice making chamber while being spaced apart from each other in a horizontal direction or in a vertical direction.

[0023] At least a portion of the first ice making cell may overlap the second ice making cell in a horizontal direction or in a vertical direction.

[0024] One end of the first ice making cell may be positioned lower than one end of the second ice making cell. Another end of the first ice making cell may be positioned higher than another end of the second ice making cell. One end of the first ice making cell may be positioned lower than one end of the second ice making cell, and another end of the first ice making cell may be positioned higher than another end of the second ice making cell.

[0025] The second tray may include a second one tray that defines a second one cell which is a portion of the second ice making cell. The second tray may further include a second another tray that defines a second another cell which is another portion of the second ice making cell.

[0026] The second another tray may rotate with respect to the second one tray based on a rotation center. The second ice making cell may be positioned between the rotation center and the first ice making cell.

[0027] The first tray may include a first one tray that defines a first one cell which is a portion of the first ice making cell. The first tray may include a first another tray that defines a first another cell which is a portion of the first ice making cell. The first another tray may be coupled to the first one tray.

[0028] The second tray may include a second one tray that defines a second one cell which is a portion the second ice making cell. The second tray may include a second another tray defines a second another cell which is another portion of the second ice making cell.

[0029] The second another tray may rotate with respect to the second one tray based on a rotation center. A coupling portion of the first one tray and the first another tray may be positioned lower than a contact portion of the second one tray and the second another tray in an ice making process.

[0030] The ice making apparatus may further include a liquid supply assembly configured to supply liquid during a liquid supply process. The liquid supply assembly may be positioned higher than the first ice making cell and the second ice making cell.

[0031] The ice making apparatus may further include a heat exchanger configured to cool the ice maker. The liquid supply assembly may be positioned higher than the

heat exchanger.

[0032] The heat exchanger may include a first refrigerant pipe configured to cool the first tray. The heat exchanger may further include a second refrigerant pipe configured to cool the second tray.

[0033] The first refrigerant pipe may include a first cooling pipe in contact with the first tray. The first refrigerant pipe may further include a second cooling pipe in contact with the first tray at a different height from the first cooling pipe.

[0034] The first refrigerant pipe may include a first inlet pipe. The first refrigerant pipe may further include a first bent pipe bent and extending from the first inlet pipe. The first cooling pipe may be connected to the first bent pipe.

The second cooling pipe may be disposed lower than the first cooling pipe.

[0035] The second refrigerant pipe may include a third cooling pipe in contact with the second tray. The third cooling pipe may be disposed higher than the first cooling pipe and the second cooling pipe.

[0036] At least a portion of an inlet pipe of the first refrigerant pipe and a discharge pipe of the second refrigerant pipe may be arranged in a vertical direction or a horizontal direction. At least a portion of an inlet pipe of the first refrigerant pipe may overlap or be arranged in parallel with a discharge pipe of the second refrigerant pipe in a vertical direction or a horizontal direction.

[0037] The ice making apparatus may further include a first storage space for storing the first ice. The ice making apparatus may further include a second storage space for storing the second ice. The second storage space may be partitioned from the first storage space.

[0038] In another embodiment, a refrigerator may include a cabinet having a storage chamber. The refrigerator may further include a door that opens and closes the storage chamber. The refrigerator may further include an ice making chamber provided in the door or the cabinet.

[0039] The refrigerator may further include a first tray including a first ice making cell in which first ice is formed and provided in the ice making chamber.

[0040] The refrigerator may further include a second tray including a second ice making cell in which second ice is formed and provided in the ice making chamber.

[0041] A type of second ice may be different from a type of the first ice.

[0042] The refrigerator may further include a liquid supplier configured to supply liquid to the first tray and the second tray in an ice making process.

[0043] The refrigerator may further include a first storage space for storing the first ice. The refrigerator may further include a second storage space for storing the second ice. The second storage space may be partitioned from the first storage space.

[Advantageous Effects]

[0044] According to one embodiment, different types of

ice can be generated, and thereby user can use various types of ice.

[0045] According to one embodiment, after different types of ice are generated, ices separated in an ice separation process can be moved to a storage chamber in a separate state, thereby preventing the different types of ice from being mixed.

[0046] According to one embodiment, since different types of ice can be stored separately, there is an advantage that a user can easily use different types of ice.

[0047] According to one embodiment, since a single ice maker includes two different trays, a structure may simple and become more compact compared to a case of using two ice makers.

[Description of Drawings]

[0048]

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

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

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

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

FIG. 5 is a diagram showing a liquid supply passage in an ice making device according to the present embodiment.

FIGS. 6 and 7 are perspective views showing liquid being supplied to an ice maker.

FIGS. 8 and 9 are perspective views showing an ice maker and a heat exchanger of the present embodiment.

FIG. 10 is a diagram showing an arrangement of a first tray and a second tray.

FIG. 11 is a bottom view of an ice maker of the present embodiment.

FIG. 12 is a cross-sectional view taken along line 12-12 of FIG. 11.

FIG. 13 is an exploded perspective view of a first tray assembly according to the present embodiment.

FIG. 14 is a bottom view of a first tray assembly

according to the present embodiment.

FIG. 15 is a perspective view of a first tray assembly according to the present embodiment.

FIG. 16 is a diagram showing a state in which a second one tray is in contact with a second another tray according to the present embodiment.

FIG. 17 is a diagram showing a state in which a second another tray is spaced apart from a second one tray according to the present embodiment.

FIG. 18 is a perspective view of a second one tray according to the present embodiment.

FIG. 19 is a cross-sectional view taken along line 19-19 of FIG. 18.

FIG. 20 is a cross-sectional view taken along line 20-20 of FIG. 18.

FIG. 21 is a top view of a second one tray according to the present embodiment.

FIG. 22 is a top perspective view of a supporter according to the present embodiment.

FIG. 23 is a lower perspective view of a supporter according to the present embodiment.

FIG. 24 is a diagram showing a process in which liquid is supplied to an ice maker in an ice making process.

FIG. 25 is a diagram showing an ice maker in a state in which ice making is completed.

FIG. 26 is a diagram showing an ice maker in an ice separation process.

[Mode for Invention]

[0049] 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.

[0050] 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.

[0051] FIG. 1 is a perspective view of an ice making device according to the present embodiment. FIG. 2 is a front view showing a door of an ice making device in an opened state according to the present embodiment. FIG. 3 is a cross-sectional view showing an inside of an ice making device according to the present embodiment. FIG. 4 is a diagram showing an interior of an ice making device according to the present embodiment.

[0052] Referring to FIGS. 1 to 4, an ice making device 1 of this embodiment may be installed independently to generate ice.

[0053] 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.

[0054] The cabinet 10 may include an ice making chamber 12 that generates ice. The cabinet 10 may include a storage chamber 13 where ice is stored.

[0055] 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.

[0056] Alternatively, the ice making chamber 12 may include the storage chamber 13, or the storage chamber 13 may include the ice making chamber 12.

[0057] The cabinet 10 may include a front opening 102. The door 20 may open and close the front opening 102. For example, the door 20 may open and close the front opening 102 by rotating.

[0058] 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.

[0059] The ice making device 1 may further include an ice maker 40 located in the ice making chamber 12.

[0060] Ice generated in the ice maker 40 may fall from the ice maker 40 and be stored in the storage chamber 13.

[0061] 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.

[0062] Although not shown, an insulating material may be provided between the inner case 101 and the outer case 100.

[0063] The inner case 101 may additionally define the storage chamber 13.

[0064] The ice making chamber 12 may be formed at one side of the inner case 101.

5 **[0065]** 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.

10 **[0066]** 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.

15 **[0067]** 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.

20 **[0068]** 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.

[0069] The machine room 18 may be placed outside the inner case 101.

25 **[0070]** 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.

[0071] The bottom wall 104 may be provided with a drain hole 105 for discharging liquid.

30 **[0072]** The cooling device may include a cooler. The cooler is a source that supplies cold and/or heat, and may be referred to as a cold source and/or a heat source. The cooler may include a heat exchanger. The cooler may cool the ice making chamber. Alternatively, the cooler may cool and heat the ice making chamber. The cooling pipe 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. 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.

35 **[0073]** The cooler may include a compressor 183, a condenser 184, an expander (not shown), and a heat exchanger 50. The heat exchanger 50 may be an evaporator through which refrigerant flows.

40 **[0074]** In this embodiment, the refrigerant cycle may be capable of switching a refrigerant path using a switching valve. That is, it is possible for the refrigerant compressed in the compressor 183 to flow directly to the condenser 184 or to the evaporator by changing the refrigerant flow path. Although not limited, refrigerant from the compressor 183 may flow to the evaporator during an ice separation process. In the present invention, a refrigerant cycle capable of switching a refrigerant path can be implemented by known techniques, so detailed description will be omitted.

45 **[0075]** 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.

[0076] 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.

[0077] The heat exchanger 50 may include a refrigerant pipe through which refrigerant flows. At least a portion of the heat exchanger 50 may be located in the ice making chamber 12.

[0078] 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.

[0079] 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.

[0080] 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.

[0081] In this embodiment, the ice maker 40 may generate a single type of ice or at least two different types of ice.

[0082] Hereinafter, it will be described as an example that the ice maker 40 generates at least two different types of ice.

[0083] The ice maker may include a tray assembly. The tray assembly may include a tray that defines a space in which an ice making cell is formed. The tray assembly may include a tray case to which the tray is connected and/or coupled and/or joined and/or supported. In this specification, the present invention describes using a tray. However, the present invention may also include embodiments understood by replacing a tray assembly instead of the tray. The tray case may include a first tray case (e.g., tray cover) connected and/or coupled and/or supported and/or jointed to a first portion of the tray. The tray case may include a second tray case (e.g., tray supporter) connected and/or coupled and/or supported and/or jointed to a second portion of the tray. The ice maker 40 may include a first tray assembly 410 for generating a first type of first ice 11. The ice maker 40 may further include a second tray assembly 450 for generat-

ing a second type of second ice I2 different from the first type.

[0084] The first ice 11 and the second ice I2 may differ in one or more of shape, size, transparency, etc.

5 **[0085]** Hereinafter, it will be described as an example that the first ice I1 is polygonal ice, and the second ice I2 is spherical ice.

[0086] The storage chamber may include a first storage space 132. The storage chamber may further include a second storage space 134.

10 **[0087]** 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.

15 **[0088]** 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.

20 **[0089]** 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.

[0090] 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.

30 **[0091]** A front surface of the ice bin 14 may be arranged to be spaced apart from a rear side of the front opening 102. A bottom surface of the ice bin 14 may be spaced apart from a bottom wall 104 of the storage chamber 13.

[0092] 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.

35 **[0093]** A bottom wall 104 of the storage chamber 13 may form a floor of the second storage space 134.

40 **[0094]** 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.

45 **[0095]** 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.

50 **[0096]** 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.

[0097] 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.

[0098] 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.

[0099] 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.

[0100] 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.

[0101] 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.

[0102] The cabinet 10 may further include a guide 70 that guides ice separated from the ice maker 40 to the storage chamber 13.

[0103] 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.

[0104] For example, the guide 70 may include a first guide 710. The guide 70 may further include a second guide 730.

[0105] 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.

[0106] 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.

[0107] 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.

[0108] 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 or in a horizontal direction and may be coupled to the guide 70 or the ice maker 40.

[0109] FIG. 5 is a diagram showing a liquid supply passage in an ice making device according to the present embodiment. FIGS. 6 and 7 are perspective views showing liquid being supplied to an ice maker.

[0110] Referring to FIGS. 5 to 7, 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.

[0111] 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.

[0112] 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.

[0113] The liquid supply passage may further include a third passage 308 that guides liquid that has passed through the filter 306.

[0114] The cooling device may include a supply component to supply liquid to the ice making device. Alternatively, the supply component may include a liquid supply assembly. The supply component may supply liquid to an ice maker (e.g., tray) from a liquid source (e.g., a faucet or a liquid tank provided at an inside and/or outside of an ice making device). The liquid supply assembly may include a pipe through which the liquid flows. For example, liquid supplied from the liquid supply assembly may be supplied to a liquid supplier, which will be described later. The ice making device 1 may further include a liquid supply assembly 320. The liquid supply assembly 320 may be connected to the third passage 308.

[0115] The liquid supply assembly 320 can supply liquid to the ice maker 40 during a liquid supply process.

[0116] Alternatively, the supply component may include a liquid supplier. The supplier may supply liquid supplied from the liquid supply assembly to an ice maker (e.g., tray). The liquid supplier may include a sub liquid supplier. The sub liquid supplier may include a pipe through which the liquid flows. The sub liquid supplier may include a nozzle. The sub liquid supplier may further include a pump. The sub liquid supplier may include a sub_first liquid supplier. The sub liquid supplier may include a sub_second liquid supplier. The ice making device 1 may further include a liquid supplier 330. The liquid supplier 330 may supply liquid to the ice maker 40 during an ice making process. The liquid supplier 330 can store liquid supplied from the liquid supply assembly 320 and supply liquid to the ice maker 40.

[0117] In this embodiment, the liquid supply assembly 320 may be referred to as a first liquid supply assembly. The liquid supplier may be referred to as a second liquid supply assembly.

[0118] 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.

[0119] The liquid supplier 330 may be located at another side of the ice maker 40.

[0120] 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.

[0121] In FIGS. 5 to 7, 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.

[0122] The liquid supplier 330 may include a liquid storage 350 in which liquid is stored. The ice maker 40 may include one or more through holes 426 through which liquid passes. The liquid storage may include a wall to form a space to store the liquid. 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.

[0123] 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.

[0124] 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.

[0125] 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.

[0126] The liquid supplier 330 may further include liquid pumps 360 and 362 for pumping liquid stored in the liquid storage 350.

[0127] 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.

[0128] 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.

[0129] 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. A pumping capacity of each of the first pump 360 and the second pump 362 may be variable.

[0130] 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.

[0131] 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.

[0132] 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.

[0133] 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.

[0134] The sub_first liquid supplier 380 may supply liquid to the first tray assembly 410 from one side of the first tray assembly 410.

[0135] The sub_second liquid supplier 382 may supply liquid to the second tray assembly 450 from one side of the second tray assembly 450.

[0136] The sub_first liquid supplier 380 and the sub_second liquid supplier 382 may be located at one side of the guide 70.

[0137] 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.

[0138] 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.

[0139] 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.

[0140] A drain pipe 390 may be connected to the liquid storage 350. The drain pipe 390 may extend through the drain hole 105 into the machine room 18. The machine room 18 may be provided with a drain tube 392 connected to the drain pipe 390. The drain tube 392 can finally discharge liquid to an outside of the ice making device 1. The drain tube 390 or the drain tube 392 may be provided with a drain valve (not shown).

[0141] Hereinafter, the ice maker 40 will be described in detail.

[0142] FIGS. 8 and 9 are perspective views showing an ice maker and a heat exchanger of the present embodiment. FIG. 10 is a diagram showing an arrangement of a first tray and a second tray. FIG. 11 is a bottom view of an ice maker of the present embodiment. FIG. 12 is a cross-sectional view taken along line 12-12 of FIG. 11.

[0143] Referring to FIGS. 8 to 12, 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.

[0144] The ice maker 40 may include a first tray assembly 410 and a second tray assembly 450 as described above.

[0145] The first tray assembly 410 and the second tray

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

[0146] 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.

[0147] The first tray assembly 410 may include a first ice making cell 440.

[0148] 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.

[0149] 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.

[0150] 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.

[0151] 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.

[0152] 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.

[0153] 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.

[0154] 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.

[0155] The first one tray 420 may include a first opening 423. The first opening 423 communicates with the first one cell 441.

[0156] A number of first openings 423 may be equal to a number of first ice making cells 440.

[0157] The first one cell 441 may form another portion of an appearance of the first ice and the first another cell 442 may form a portion of an appearance of the first ice.

[0158] 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.

[0159] 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.

[0160] 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.

[0161] 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.

[0162] Each of the first one cell 441 and the first other 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.

[0163] A perimeter (or cross-sectional area) of the first one cell 441 may be greater than a perimeter (or 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.

[0164] 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.

[0165] 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.

[0166] The second tray assembly 450 may further include a second tray forming a second ice making cell 451.

[0167] 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.

[0168] 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.

[0169] 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.

[0170] For example, the second tray may form a plurality of second ice making cells 451. Accordingly, the second one tray 460 can form a plurality of second one cells 462. The second another tray 470 can form a plurality of second another cells 472.

[0171] 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 or in a vertical direction.

[0172] Alternatively, the first ice making cell 440 may be arranged so as not to overlap the second ice making cell 451 in a vertical direction.

[0173] 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.

[0174] 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.

[0175] 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.

[0176] 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.

[0177] 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.

[0178] A maximum perimeter of the first ice making cell 440 may be different from a maximum perimeter of the second ice making cell 451. For example, a maximum perimeter of the first ice making cell 440 may be less than a maximum perimeter of the second ice making cell 451.

[0179] 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.

[0180] 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.

[0181] 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.

[0182] The second another tray 470 may include a second opening 473.

[0183] 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.

[0184] 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. Accord-

ingly, the second opening 473 may serve as a liquid supply opening during an ice making process.

[0185] 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.

[0186] In an ice separation process, the second another tray 470 may be moved relative to the second one tray 460.

[0187] 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.

[0188] The second tray assembly 450 may further include a case 452 supporting the second one tray 460.

[0189] A portion of the second one tray 460 may pass through the case 452 from one side. Another portion of the second one tray 460 may be seated on the case 452.

[0190] A driver 690 for moving the second another tray 470 may be installed on the case 452.

[0191] The case 452 may include a circumferential portion 453. The circumferential portion 453 may be provided with a seating end 454. The seating end 454 may be seated on the first tray assembly 410. For example, the seating end 454 may be seated on the first one tray 420.

[0192] The second tray assembly 450 may further include a supporter 480 supporting the second another tray 470.

[0193] 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.

[0194] 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.

[0195] A diameter of the supporter opening 482a may be greater than a diameter of the second opening 473.

[0196] 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 case 452.

[0197] 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. 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.

[0198] 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.

[0199] The heat exchanger 50 may further include a second refrigerant pipe 520 located adjacent to or in contact with the second tray assembly 450.

[0200] The first refrigerant pipe 510 and the second refrigerant pipe 520 may be connected in series or in parallel. Hereinafter, an example in which the first refrigerant pipe 510 and the second refrigerant pipe 520 are connected in series will be described.

[0201] 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.

[0202] The first refrigerant pipe 510 may further include a first bent pipe 512 extending from the first inlet pipe 511.

[0203] The first refrigerant pipe 510 may further include a first cooling pipe 513 extending from the first bent pipe 512.

[0204] 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.

[0205] 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.

[0206] 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.

[0207] One straight part may contact one surface of a plurality of first another trays 430.

[0208] A plurality of straight parts 513a may be arranged at substantially the same height.

[0209] 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.

[0210] 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.

[0211] The second cooling pipe 515 may contact a side surface of the first another tray 430.

[0212] 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.

[0213] A plurality of first another trays 430 may be arranged in a plurality of columns and rows.

[0214] 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.

[0215] 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.

[0216] 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.

[0217] 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.

[0218] 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.

[0219] 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.

[0220] 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.

[0221] 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.

[0222] The liquid supply assembly 320 may be positioned higher than the third cooling pipe 523.

[0223] 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.

[0224] One or more of a plurality of straight parts 523a may extend in a direction parallel to an arrangement direction of a plurality of second ice making cells 451.

A plurality of straight parts 523a may overlap the second ice making cell 451 in a first direction. Some of the plurality of straight parts 523a may overlap the second opening 473 in the first direction. The first direction may be an arrangement direction of the second one cell and the second another cell forming the second ice making cell 451.

[0225] 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.

[0226] 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.

[0227] Another portion of the second bent pipe 524 may extend in another direction.

[0228] The second refrigerant pipe 520 may further include a second discharge pipe 525 connected to the second bent pipe 524. At least a portion of the second discharge pipe 525 may extend parallel to the first inlet pipe 511. The second discharge pipe 525 may be located at a rear side of the driver 690. That is, the second discharge pipe 525 may extend in a space between the driver 690 and a rear wall 101a of the inner case 101.

[0229] At least a portion of the second discharge pipe 525 and the first inlet pipe 511 may be arranged in the first direction.

[0230] At least a portion of the second discharge pipe 525 may overlap the first inlet pipe 511 in a vertical direction. At least a portion of the second discharge pipe 525 may be located at one side of the first inlet pipe 511.

[0231] FIG. 13 is an exploded perspective view of a first tray assembly according to the present embodiment. FIG. 14 is a bottom view of a first tray assembly according to the present embodiment. FIG. 15 is a perspective view of a first tray assembly according to the present embodiment.

[0232] Referring to FIGS. 13 to 15, the first tray assembly 410 may include a first one tray 420. The first tray assembly 410 may further include a first another tray 430.

[0233] For example, the first another tray 430 may be formed in a hexahedral shape. One end of the first another tray 430 may be provided with a bent portion 432 bent outward.

[0234] A seating groove 434 for seating the first refrigerant pipe 510 may be formed on one surface of the first another tray 430. The seating groove 434 may be formed as a portion of one surface of the first another tray 430 is recessed. For example, the first cooling pipe 513 may be seated on the seating groove 434.

[0235] The first one tray 420 may include a body plate 421 in which a plurality of first openings 423 are formed. The first one tray 420 may further include a circumferential portion 422 extending from an edge of the body plate 421.

[0236] The first one tray 420 may include a cell wall 424 extending at a periphery of each of the plurality of first openings 423.

[0237] The first one cell 441 may be formed inside the cell wall 424.

[0238] The first another tray 430 may be coupled to the cell wall 424.

[0239] The first one tray 420 and the first another tray 430 may be formed of different materials.

[0240] The first one tray 420 may be formed of a non-

metallic material. The first another tray 430 may be formed of a metal material.

[0241] To connect two bodies made of different materials, a seating groove 424a may be formed at one end of the cell wall 424 for coupling the bent portion 432 of the first another tray 430. The bent portion 432 of the first another tray 430 may be inserted into the cell wall 424 and seated on the seating groove 424a.

[0242] The body plate 421 may be provided with through holes 425 and 426 through which liquid passes. The through holes 425 and 426 may include a first through hole 425.

[0243] The through holes 425 and 426 may include a second through hole 426.

[0244] A plurality of first through holes 425 may be formed in the body plate 421. A plurality of second through holes 426 may be formed in the body plate 421.

[0245] Although not limited, a plurality of cell walls 424 may be provided between the plurality of first through holes 425.

[0246] A plurality of second through holes 426 may be arranged to be spaced apart from each other in a front and rear direction (third direction) and a left and right direction (fourth direction).

[0247] The plurality of cell walls 424 may be provided between a plurality of second through holes 426 spaced apart from each other in the third direction.

[0248] The first through hole 425 may be positioned between a plurality of second through holes 426 spaced apart from each other in a fourth direction.

[0249] The body plate 421 may be provided with a first protrusion 427 extending at a periphery of the second through hole 426. One end of the first protrusion 427 may be positioned lower than one end of the circumferential portion 422. The first protrusion 427 may be formed in a cylindrical shape with a hollow.

[0250] A portion of liquid that falls onto the first one tray 420 may directly pass through the first through hole 425. When an amount of liquid falling onto the first one tray 420 is greater than an amount of liquid passing through the first through hole 425, a level of the liquid falling onto the first one tray 420 may be increased to one end of the first protrusion 427. When a liquid level of liquid falling onto the first one tray 420 increases to one end of the first protrusion 427, liquid flows into the first protrusion 427 and then passes through the second through hole 426.

[0251] A diameter of the first through hole 425 may be less than a diameter of the second through hole 426. A number of first through holes 425 may be less than a number of second through holes 426.

[0252] The body plate 421 may be provided with a first protruding portion 425a extending at a periphery of the first through hole 425. The first protruding portion 425a serves to guide liquid downward.

[0253] The body plate 421 may be provided with a second protruding portion 427a extending downward at a periphery of the second through hole 426. The second protruding portion 427a serves to guide liquid

downward.

[0254] The second protruding portion 427a may include an inclined surface to prevent liquid from condensing and freezing.

[0255] The body plate 421 may include a first extension wall 428 disposed to entirely surround the plurality of first openings 423. The first extension wall 428 may restrict liquid from splashing outward when liquid is supplied from the sub_first liquid supplier 380. A protruding length of the first extension wall 428 may be greater than a protruding length of each of the protruding portions 425a and 427a.

[0256] FIG. 16 is a diagram showing a state in which a second one tray is in contact with a second another tray according to the present embodiment. FIG. 17 is a diagram showing a state in which a second another tray is spaced apart from a second one tray according to the present embodiment. FIG. 18 is a perspective view of a second one tray according to the present embodiment. FIG. 19 is a cross-sectional view taken along line 19-19 of FIG. 18. FIG. 20 is a cross-sectional view taken along line 20-20 of FIG. 18. FIG. 21 is a top view of a second one tray according to the present embodiment.

[0257] Referring to FIGS. 12 and 16 to 21, the second tray assembly 450 may include a second one tray 460 and a second another tray 470 as described above.

[0258] The second one tray 460 may include a sub second one tray 461 defining a second one cell 462.

[0259] The second another tray 470 may include a sub second another tray 471 defining a second another cell 472.

[0260] For example, the second one cell 462 may be formed by being depressed in a hemispherical shape on one surface 461a of the sub second one tray 461.

[0261] For example, the second another cell 472 may be formed by being depressed in a hemispherical shape on one surface 471a of the sub second another tray 471.

[0262] In an ice making process, one surface 471a of the sub second another tray 471 may contact one surface 461a of the sub second one tray 461. When one surface 471a of the sub second another tray 471 contacts one surface 461a of the sub second one tray 461, a complete second ice making cell 451 may be formed.

[0263] The second one tray 460 may include an extension 463 extending from one end of the sub second one tray 461. The extension 463 may be seated on the case 452.

[0264] The extension 463 may be provided with a coupling hole 464 through which a coupling member for coupling with the case 452 passes.

[0265] The second refrigerant pipe 520 may be in contact with one surface of the second one tray 460. A seating groove 468 on which the straight part 523a of the second refrigerant pipe 520 is seated may be formed on one surface of the second one tray 460.

[0266] Although not limited, a plurality of seating grooves 468 may be arranged to be spaced apart from each other. Each of the seating grooves 468 may extend

in a first arrangement direction parallel to an arrangement direction of the plurality of second one cells 462. The plurality of seating grooves 468 may be arranged to be spaced apart from each other in a second arrangement direction that crosses the first arrangement direction.

[0267] A plurality of seating grooves 468 may overlap the second one cell 462 in the first direction.

[0268] A portion of each of the seating grooves 468 may be formed on one surface of the sub second one tray 461. Another portion of each of the seating grooves 468 may be formed on one surface of the extension 463.

[0269] The second one tray 460 may include a pair of hinge portions 465 extending from another surface of the extension 463. A pair of hinge portions 465 may be spaced apart from each other in the first arrangement direction. Each of the hinge portions 465 may include a shaft hole 465a.

[0270] A hinge shaft 489 may be connected to a shaft hole 465a of the pair of hinge portions 465. The hinge shaft 489 may receive power from the driver 690.

[0271] The second one tray 460 may include a discharge passage 466 through which liquid that has fallen on one side of the second one tray 460 is discharged.

[0272] One surface of the extension portion 463 may be recessed. The discharge passage 466 may be formed by a passage wall 467 protruding from another surface of the extension 463. For example, the discharge passage 466 may extend in the second direction. The discharge passage 466 may extend to a side end of the extension 463.

[0273] The passage wall 467 may include a first passage wall 467a. The passage wall 467 may further include a second passage wall 467b extending obliquely from the first passage wall 467a. Liquid flowing into the discharge passage 466 may easily fall downward due to the second passage wall 467b.

[0274] The discharge passage 466 may be arranged to communicate with any one of a plurality of seating grooves 468. That is, a portion of the second refrigerant pipe 520 may be arranged to overlap the discharge passage 466 in the first direction.

[0275] The second one tray 460 may further include one or more air holes 469. The air hole 469 may extend from the sub second one tray 461 in the first direction. The air hole 469 allows air bubbles contained in liquid supplied to the second one cell 462 of the sub second one tray 461 during an ice making process to be discharged to an outside. The air hole 469 may be formed with a diameter such that air bubbles are discharged but liquid is not discharged.

[0276] Although not limited, an air hole 469 may be disposed between two seating grooves 468.

[0277] Although not limited, a vertical central axis A1 of the second one cell 462 (the second ice making cell 451) may pass through one of the plurality of seating grooves 468.

[0278] The vertical central axis A1 may pass through one end of the second one cell 462.

[0279] The vertical central axis A1 may pass through the second refrigerant pipe 523. That is, the second refrigerant pipe 523 may be disposed on the vertical central axis A1. Accordingly, ice may be generated from one end of the second one cell 462 and grow to another side.

[0280] Air holes 469 may be located on both sides of the vertical central axis A1. Alternatively, the vertical central axis A1 may extend between two air holes 469.

[0281] FIG. 22 is a top perspective view of a supporter according to the present embodiment. FIG. 23 is a lower perspective view of a supporter according to the present embodiment.

[0282] Referring to FIGS. 16 to 23, the second another tray 470 may include an extension 473 extending from one side of the sub second another tray 471. The extension 473 may include a coupling hole 474 to be coupled to a supporter 480 by a coupling member.

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

[0284] The supporter body 481 may include a body wall 481a forming the receiving portion 482.

[0285] The extension 473 may be seated on one surface of the supporter body 481. One surface of the supporter body 481 may be provided with a coupling protrusion 486 to be inserted into the coupling hole 474.

[0286] 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 (parallel to the third direction). The pair of hinge portions 465 may be positioned between the pair of hinge bodies 483.

[0287] The hinge body 483 may include a shaft hole 484 through which the hinge shaft 489 passes.

[0288] 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.

[0289] The shaft cover 485 may be rounded so as not to interfere with the hinge shaft 489 when the shaft cover 485 is moved 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.

[0290] In an ice making process, the shaft cover 485 may be located on one side of the hinge shaft 489. Accordingly, liquid can be prevented from splashing toward the hinge shaft 489.

[0291] 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 surface of the supporter body 481.

[0292] The supporter 480 may further include a barrier 487 to prevent liquid from splashing toward the coupling portion 488. The barrier 487 may protrude from a side surface of the supporter body 481. The barrier 487 may

be spaced apart from the coupling portion 488. A protrusion length of the barrier 487 may be greater than a protrusion length of the coupling portion 488.

[0293] The supporter 481 may further include an opening wall 482b extending at a periphery of the supporter opening 482a. The opening wall 482b may be formed in a ring shape or an arc shape.

[0294] The opening wall 482b may restrict liquid from splashing outward when liquid is supplied to the second another tray 470.

[0295] FIG. 24 is a diagram showing a process in which liquid is supplied to an ice maker in an ice making process. FIG. 25 is a diagram showing an ice maker in a state in which ice making is completed. FIG. 26 is a diagram showing an ice maker in an ice separation process.

[0296] Referring to FIGS. 5 to 7, 12, and 24 to 26, a process by which ice is generated in an ice maker will be described.

[0297] 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.

[0298] 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.

[0299] 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.

[0300] After the liquid supply process is completed, an ice making process begins.

[0301] In the ice making process, liquid is supplied to the ice maker 40 by the liquid supplier 330. In the ice making process, a cooler operates and low-temperature refrigerant may flow into the heat exchanger 50.

[0302] 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 a phase-changed into ice, and as a size of phase-changed ice increases, thereby ice is generated.

[0303] When the ice making process starts, one or more of the first and second pumps 360 and 362 may operate.

[0304] When the first pump 360 operates, liquid may be supplied to the first tray assembly 410 through the sub_first liquid supplier 380. The sub_first liquid supplier 380 may include one or more first liquid supply nozzles 381.

[0305] The first liquid supply nozzle 381 is positioned at one side of the first tray assembly 410. Liquid sprayed from the first liquid supply nozzle 381 is supplied to a first ice making cell 440 of the first tray assembly 410.

[0306] 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 one surface of the first another tray 430. A portion of liquid in 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.

[0307] 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 liquid, a transparency of generated ice can be increased.

[0308] In the ice making process, first ice I1 may grow to an inside of the first one cell 441.

[0309] When the second pump 362 operates, liquid may be supplied to the second tray assembly 450 through the sub_second liquid supplier 382. The sub_second liquid supplier 382 may include one or more second liquid supply nozzles 383.

[0310] The second liquid supply nozzle 383 is positioned at one side of the second tray assembly 450. Liquid sprayed from the second liquid supply nozzle 383 is supplied to a second ice making cell 451 of the second tray assembly 450.

[0311] 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.

[0312] Liquid supplied to the second ice making cell 451 flows toward an inner side of the second one tray 460. Some of the liquid within the second ice making cell 451 may be frozen by the second refrigerant pipe 520. Unfrozen liquid falls downward again through the second opening 473. Liquid that falls downward through the second opening 473 is stored again in the liquid storage 350.

[0313] As liquid is sprayed into the second ice making cell 451, a portion of the liquid is frozen. In a process of spraying liquid into the second one tray 460 or ice produced in the second one tray 460, air bubbles in the liquid are discharged. When air bubbles in the liquid are discharged from liquid, a transparency of generated ice can be increased.

[0314] At a beginning of an ice making process, air bubbles in the liquid may be discharged from the second ice making cell 451 through the air hole 469 of the second one tray 460.

[0315] At this time, a transparency of first ice I1 generated in the first ice making cell 440 and a transparency of second ice I2 generated in the second ice making cell 451 may be different.

[0316] A transparency of ice is related to an ice making

speed or ice making time. An ice making speed may be related to an amount of cold transferred to each ice making cell 440 and 451. The faster an ice making speed, the lower a transparency of the ice.

[0317] In this embodiment, an ice making time of the second ice I2 may be greater than an ice making time of the first ice I1. Accordingly, a transparency of the second ice I2 may be greater than that of the first ice I1.

[0318] In the ice making process, second ice I2 may grow from the second one tray 460 to an extent of covering one side of a second opening 473 of the second another tray 470.

[0319] 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.

[0320] When the ice separation process starts, a flow direction of refrigerant is switched by the cooler so that high-temperature refrigerant compressed in the compressor 183 may flow into the heat exchanger 50. High-temperature refrigerant flowing into the heat exchanger 50 may be heat exchanged with the ice maker 40. When high-temperature refrigerant flows into the heat exchanger 50, heat may be transferred to the ice maker 40.

[0321] 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. The first ice I1 that fell onto the guide 70 may be stored in the first storage space 132.

[0322] 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.

[0323] 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.

[0324] 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. 26).

[0325] 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.

[0326] 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.

[0327] 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.

[0328] 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.

[0329] 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.

[0330] 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. The liquid supply process may be performed after a drain process is completed.

[0331] Meanwhile, it is also possible to apply technology applied to the ice making device to a refrigerator. That is, the refrigerator may include some or all of the components of the ice making device 1.

[0332] 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.

[0333] 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.

[0334] In this embodiment, the cooler in the ice making device 1 may be replaced with a cooler (a refrigerant cycle) that cools the storage chamber of the refrigerator.

[0335] 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:

an ice maker configured to generate ice and provided in an ice making chamber; and
a liquid supplier configured to supply liquid to the ice maker in an ice making process,

wherein the ice maker comprises a first tray including a first ice making cell in which first ice is formed, and a second tray including a second ice making cell in which second ice of a different type from the first ice is formed.

2. The ice making device of claim 1, wherein the first ice and the second ice are different from each other in one or more of transparency, size, and shape.

3. The ice making device of claim 2, wherein the first tray comprises a plurality of first ice making cells, and the second tray comprises a plurality of second ice making cells,

wherein a volume of one first ice making cell is less than a volume of one second ice making cell.

4. The ice making device of claim 3, wherein a sum of volumes of the plurality of first ice making cells is greater than a sum of volumes of the plurality of second ice making cells.

5. The ice making device of claim 1, wherein the first tray and the second tray are arranged in a horizontal direction or in a vertical direction.

6. The ice making device of claim 5, wherein in a state in which the first tray is connected to the second tray, the first and second trays are disposed in the ice making chamber.

7. The ice making device of claim 5, wherein the first tray and the second tray are disposed in the ice making chamber while being spaced apart from each other in a horizontal direction or in a vertical direction.

8. The ice making device of claim 5, wherein at least a portion of the first ice making cell overlaps the second ice making cell in a horizontal direction or in a vertical direction.

9. The ice making device of claim 5, wherein one end of the first ice making cell is positioned lower than one end of the second ice making cell,

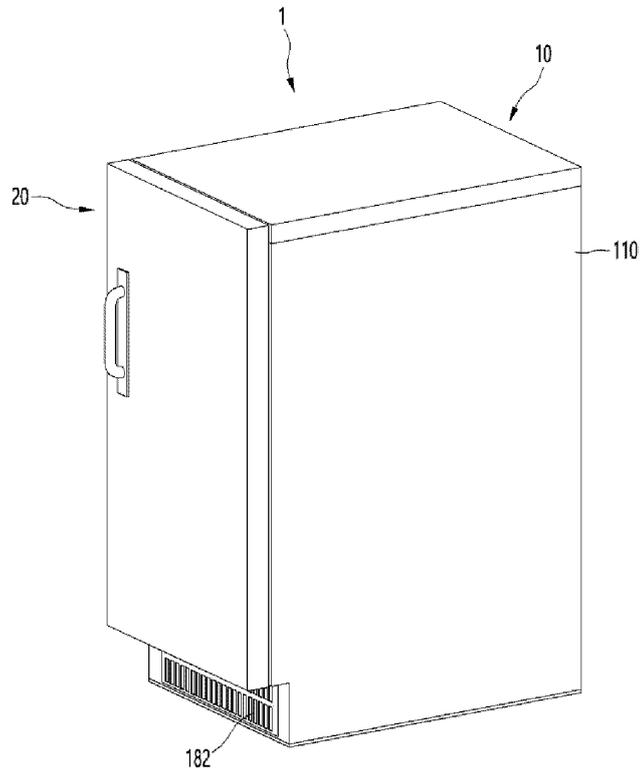
another end of the first ice making cell is positioned higher than another end of the second ice making cell, or

one end of the first ice making cell is positioned lower than one end of the second ice making cell and another end of the first ice making cell is positioned higher than another end of the second ice making cell.

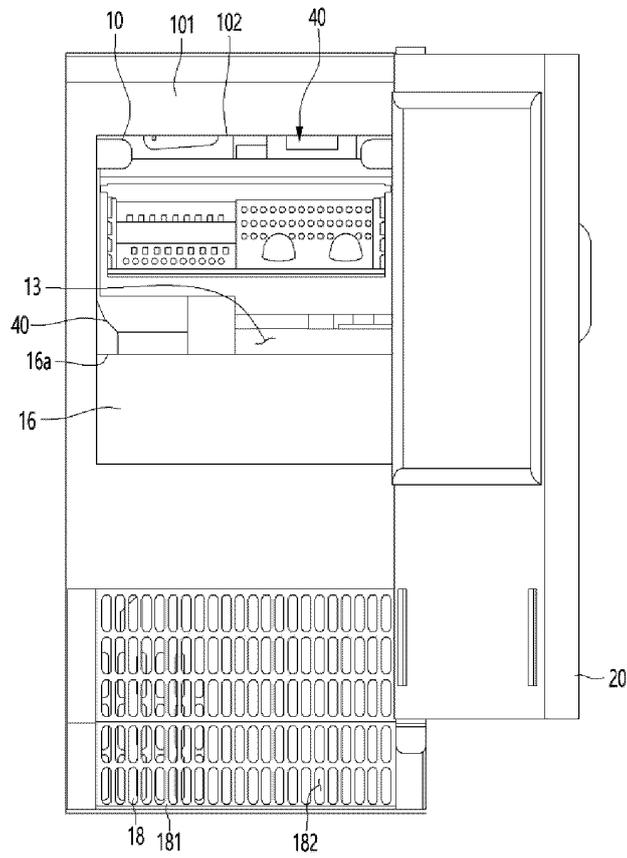
10. The ice making device of claim 5, wherein the second tray comprises an upper tray that defines a second one cell which is a portion of the second ice making cell, and

- a lower tray that defines a second another cell which is another portion of the second ice making cell and rotatable with respect to the upper tray based on a rotation center, and wherein the second ice making cell is positioned between the rotation center and the first ice making cell.
- 5
11. The ice making device of claim 5, wherein the first tray comprises: a first one tray that defines a first one cell which is a portion of the first ice making cell, and
- 10
- a first another tray that defines a first another cell which is another portion of the first ice making cell and coupled to the first one tray, wherein the second tray comprises: a second one tray that defines a second one cell which is a portion of the second ice making cell, and
- 15
- a second another tray that defines a second another cell which is another portion of the second ice making cell, wherein a coupling portion of the first one tray and the first another tray is positioned lower than a contact portion of the second one tray and the second another tray in an ice making process.
- 20
- 25
12. The ice making device of claim 1, further comprising a liquid supply assembly configured to supply liquid during a liquid supply process, wherein the liquid supply assembly is positioned higher than the first ice making cell and the second ice making cell.
- 30
13. The ice making device of claim 12, further comprising a heat exchanger configured to cool the ice maker, and wherein the liquid supply assembly is positioned higher than the heat exchanger.
- 35
14. The ice making device of claim 1, further comprising a heat exchanger configured to cool the ice maker, and wherein the heat exchanger comprises a first refrigerant pipe configured to cool the first tray, and a second refrigerant pipe configured to cool the second tray.
- 40
- 45
15. The ice making device of claim 14, wherein the first refrigerant pipe comprises a first cooling pipe in contact with the first tray, and a second cooling pipe in contact with the first tray at a different height from the first cooling pipe.
- 50
16. The ice making device of claim 15, wherein the first refrigerant pipe comprises a first inlet pipe, and a first bent pipe bent and extending from the first inlet pipe, and wherein the first cooling pipe is connected to the first
- 55
- bent pipe and the second cooling pipe is disposed lower than the first cooling pipe.
17. The ice making device of claim 15, wherein the second refrigerant pipe comprises a third cooling pipe in contact with the second tray, and wherein the third cooling pipe is disposed higher than the first cooling pipe and the second cooling pipe.
18. The ice making device of claim 14, wherein at least a portion of an inlet pipe of the first refrigerant pipe and a discharge pipe of the second refrigerant pipe are arranged in a vertical direction or in a horizontal direction.
19. The ice making device of claim 18, wherein at least a portion of an inlet pipe of the first refrigerant pipe overlaps a discharge pipe of the second refrigerant pipe in a vertical direction or a horizontal direction or is arranged in parallel with a discharge pipe of the second refrigerant pipe.
20. The ice making device of claim 1, further comprising a first storage space for storing the first ice, and a second storage space for storing the second ice and partitioned from the first storage space.
21. An ice making device comprising:
- a cabinet having a storage chamber;
- a door that opens and closes the storage chamber;
- an ice making chamber provided in the door or the cabinet;
- a first tray provided in the ice making chamber and including a first ice making cell in which first ice is formed;
- a second tray provided in the ice making chamber and including a second ice making cell in which second ice of a different type from the first ice is formed; and
- a liquid supplier configured to supply liquid to the first tray and the second tray in an ice making process.

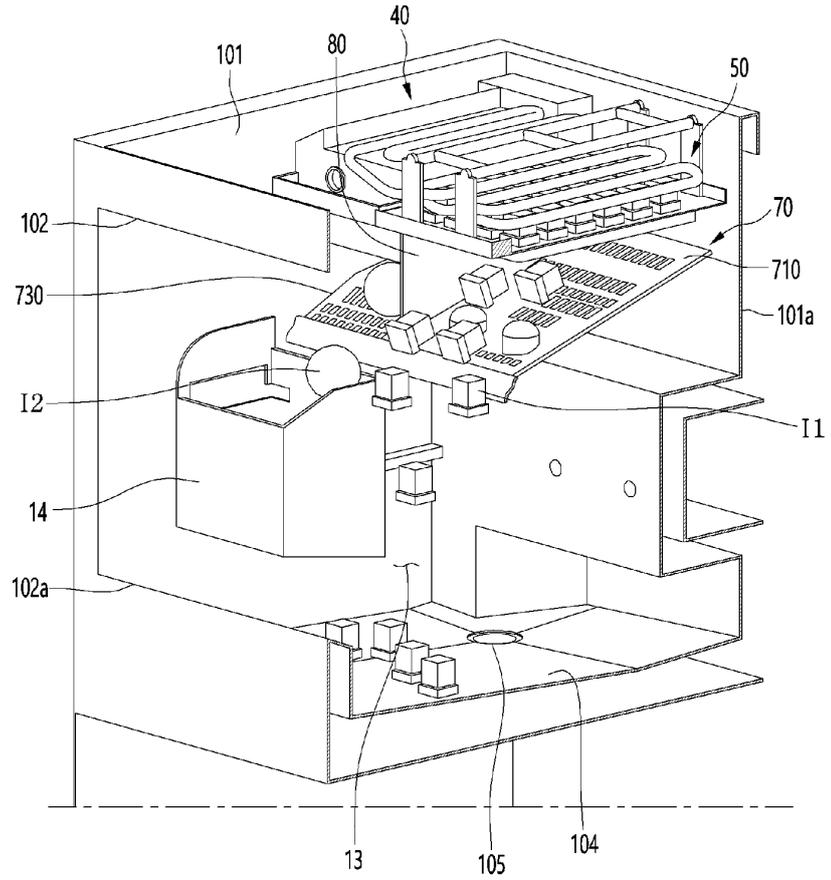
【Figure 1】



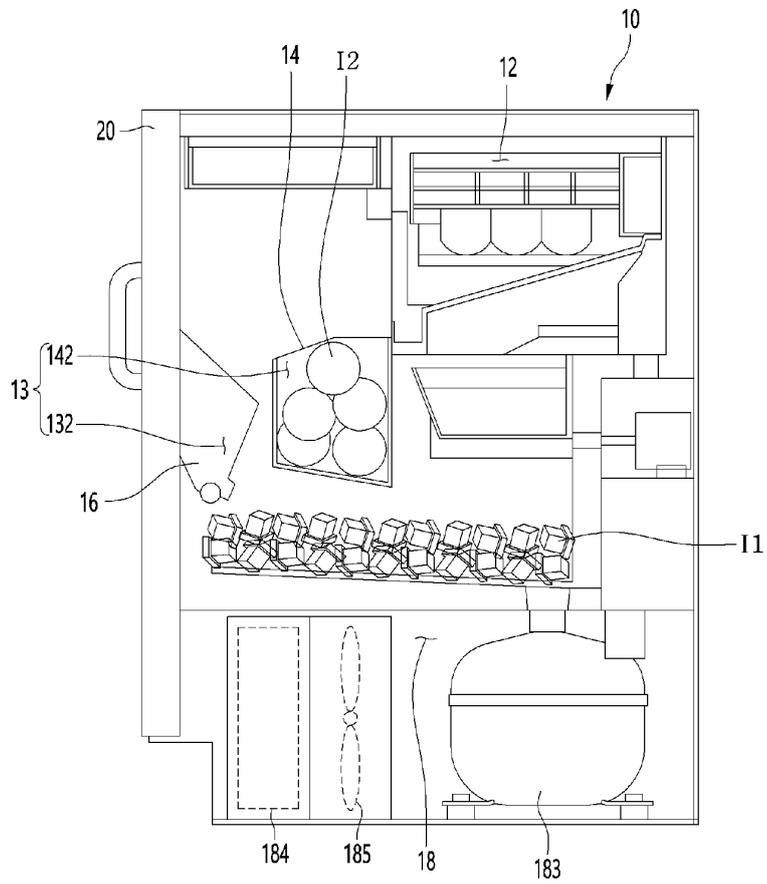
【Figure 2】



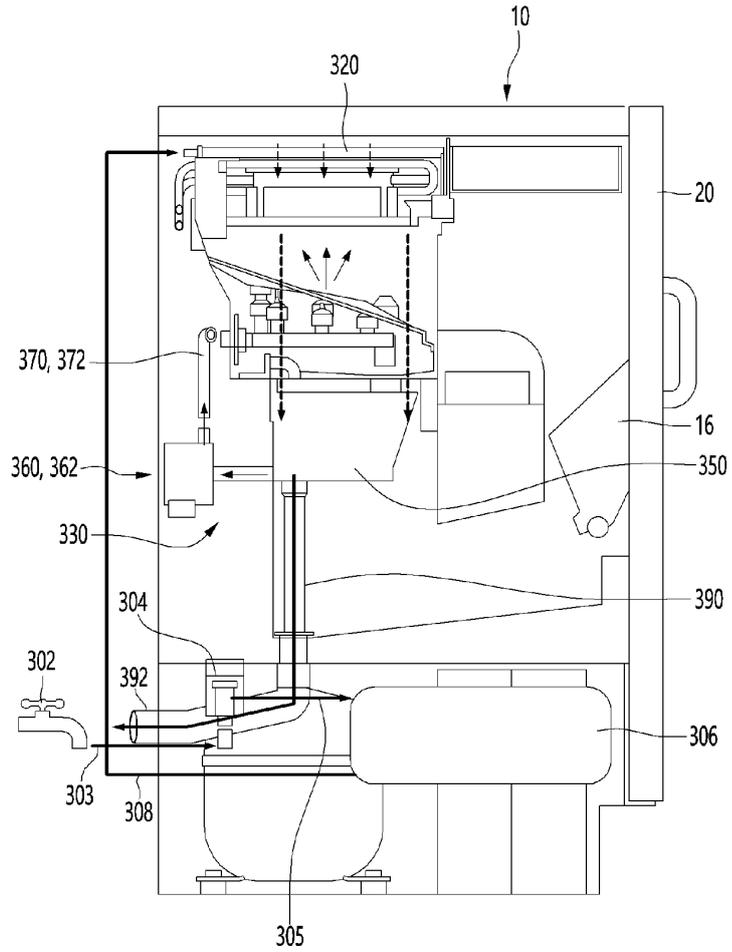
【Figure 3】



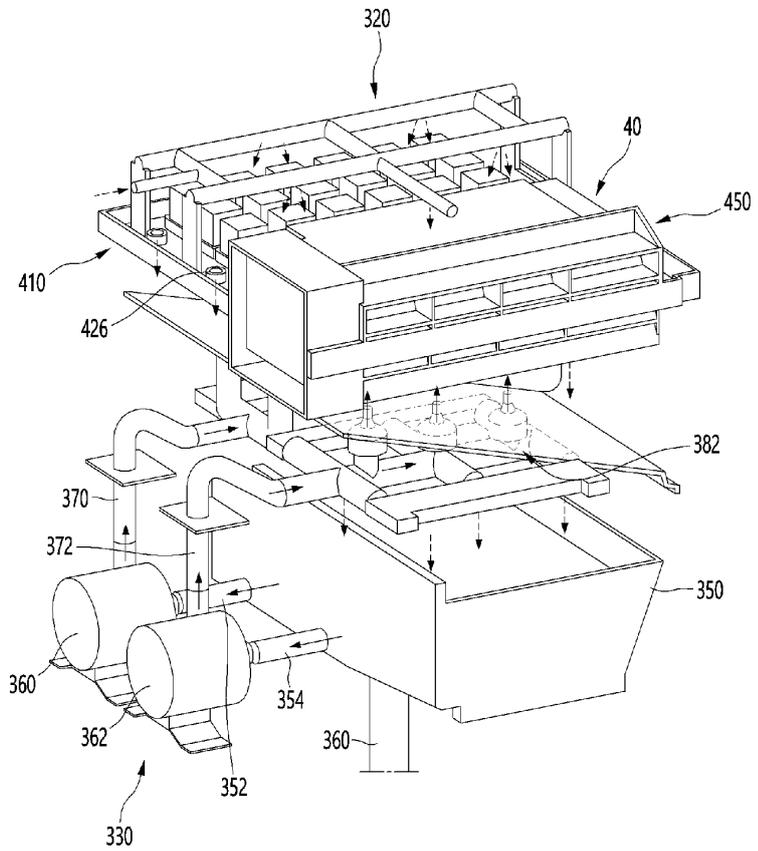
【Figure 4】



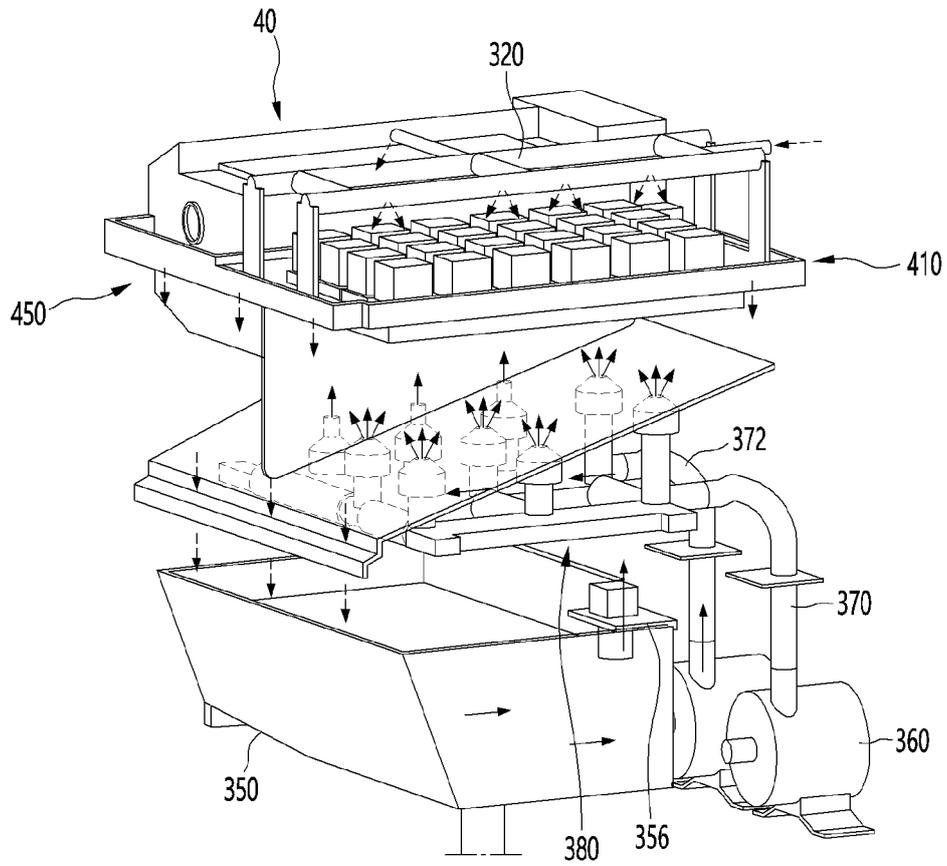
【Figure 5】



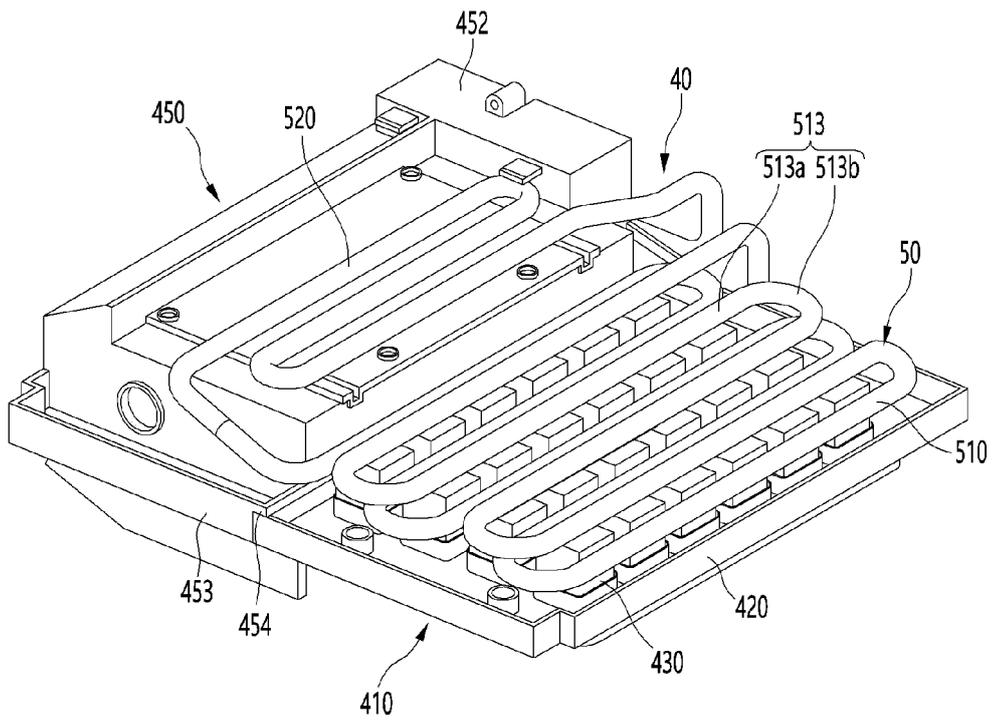
【Figure 6】



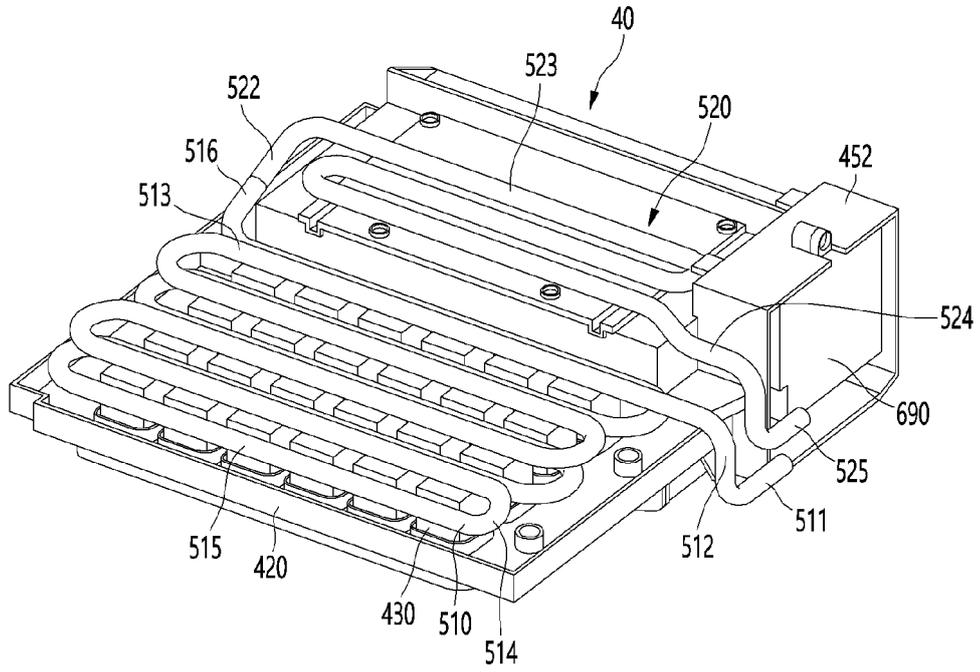
【Figure 7】



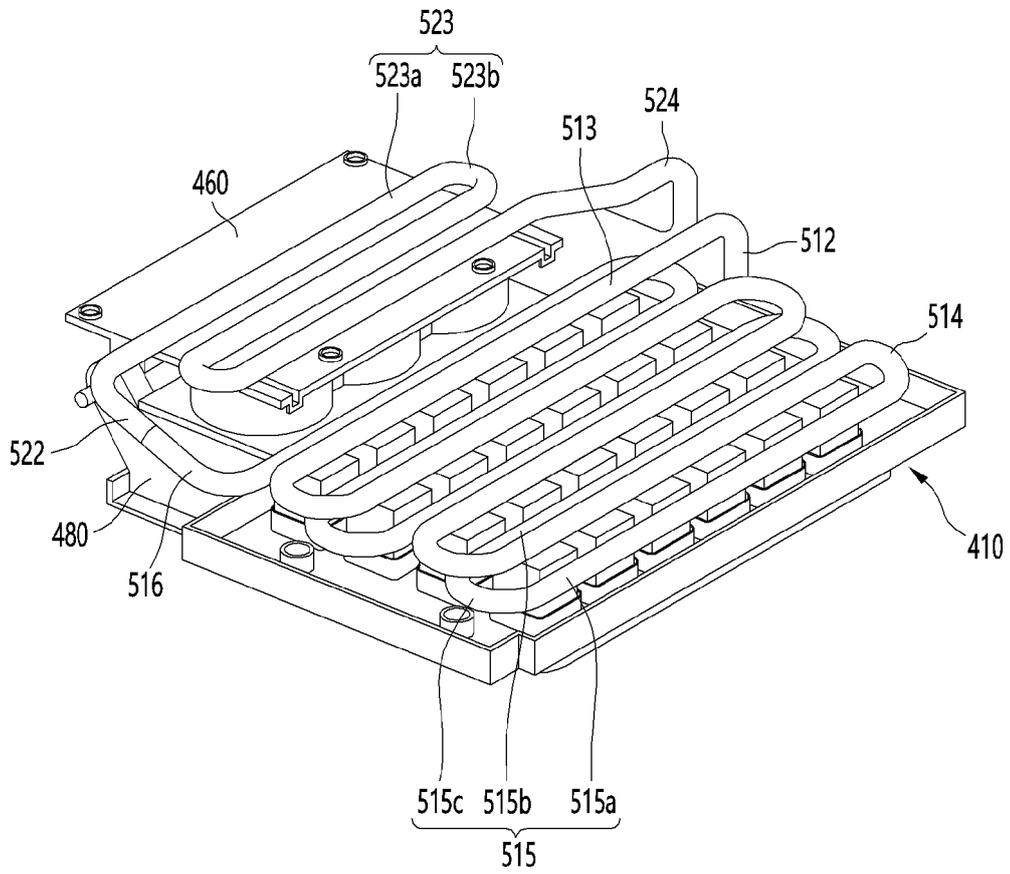
【Figure 8】



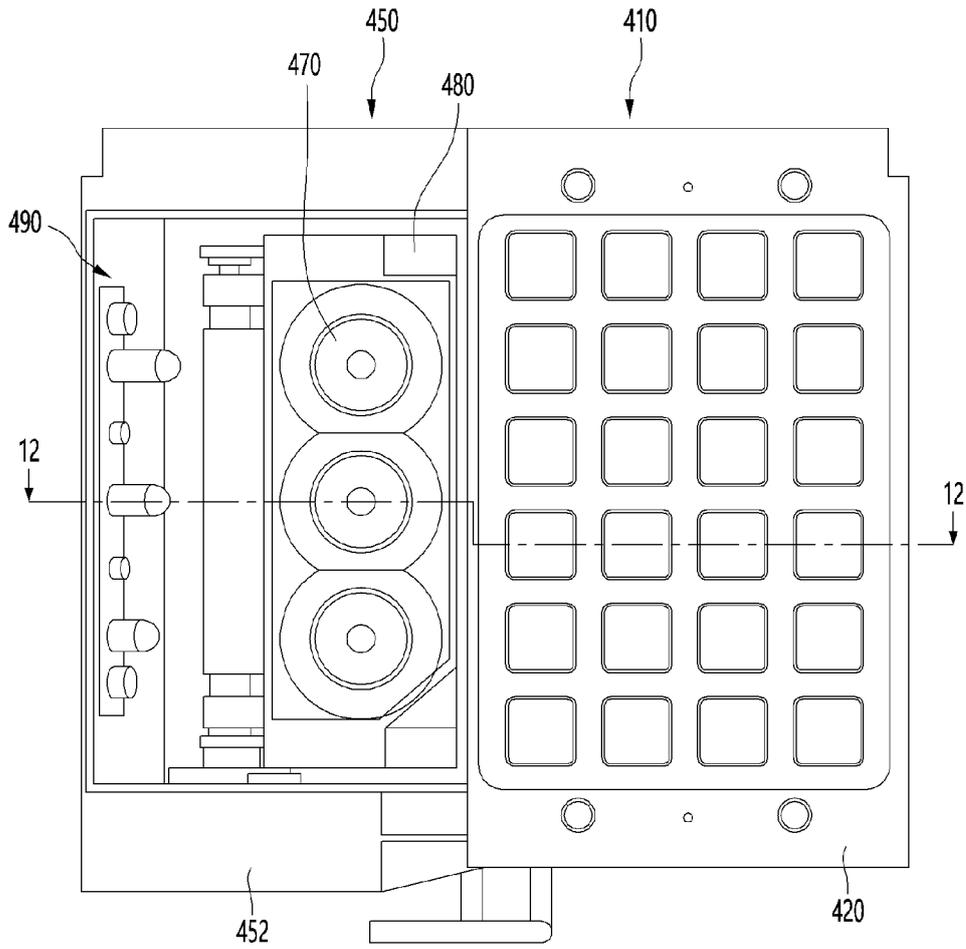
【Figure 9】



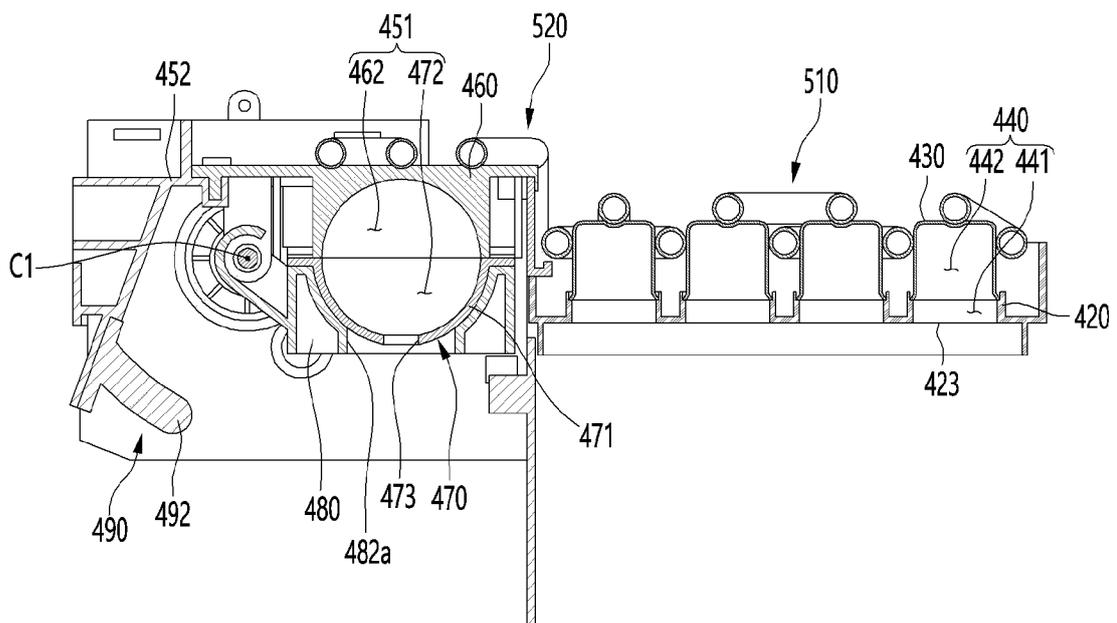
【Figure 10】



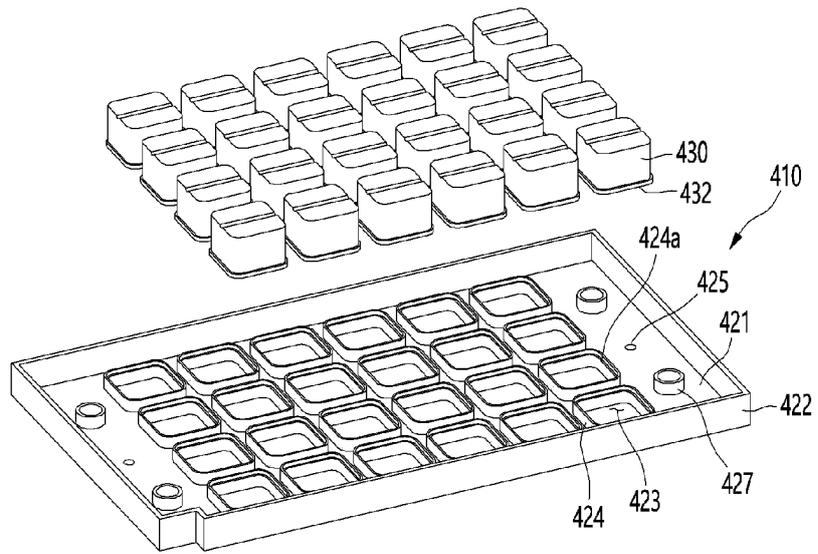
【Figure 11】



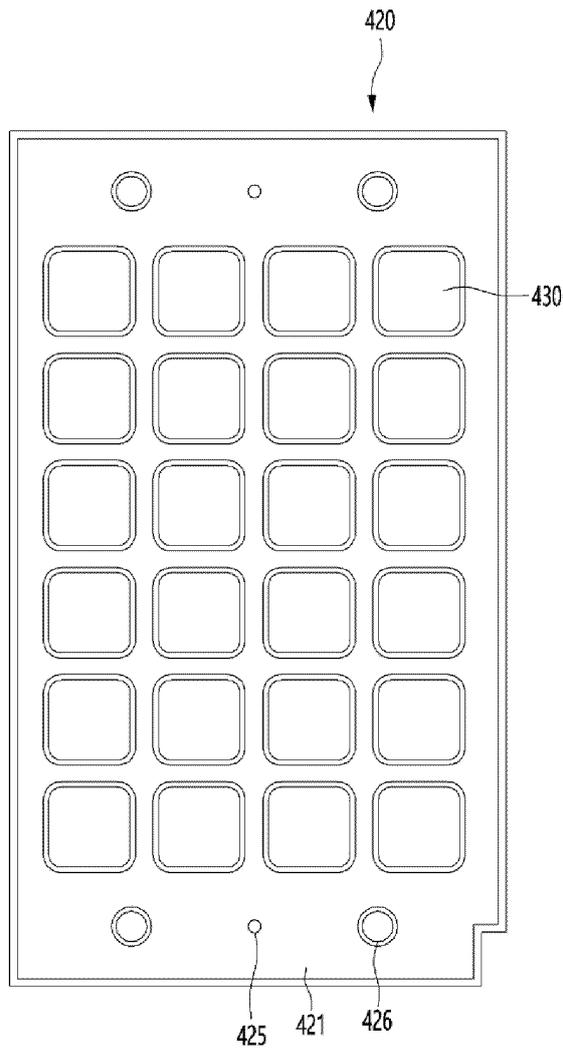
【Figure 12】



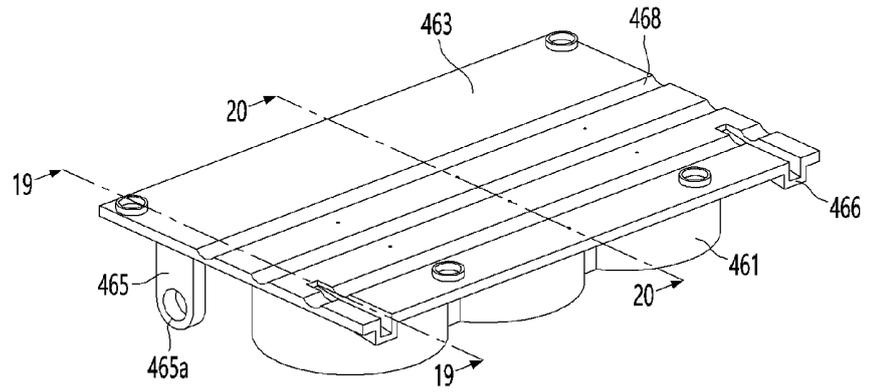
【Figure 13】



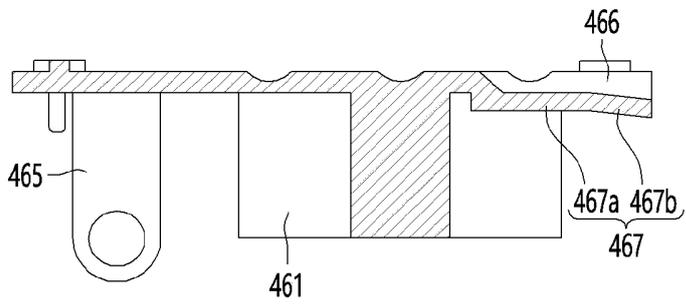
【Figure 14】



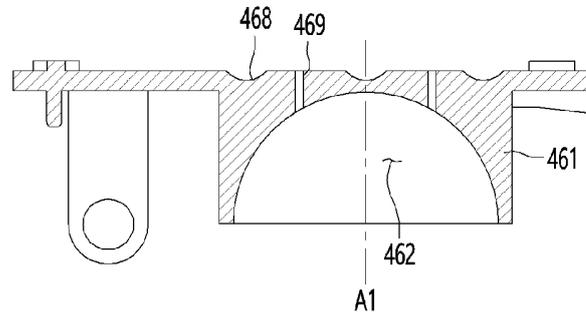
【Figure 18】



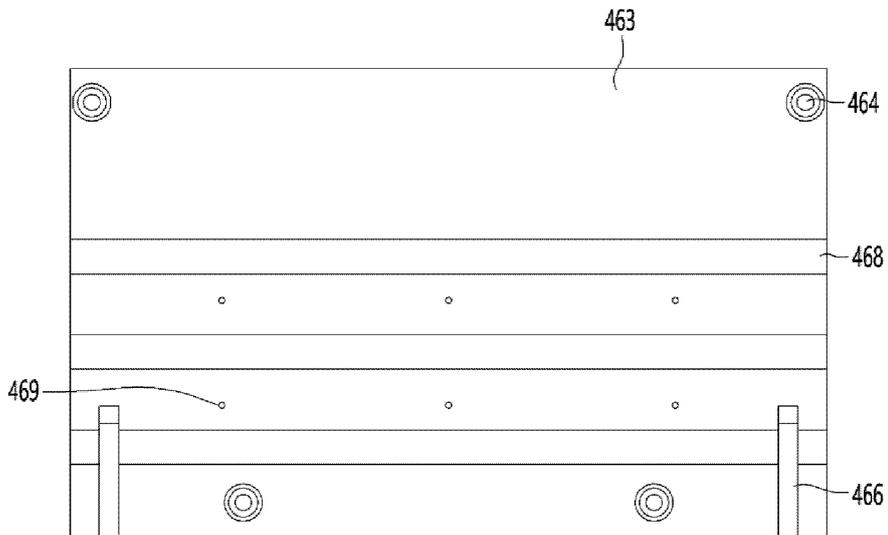
【Figure 19】



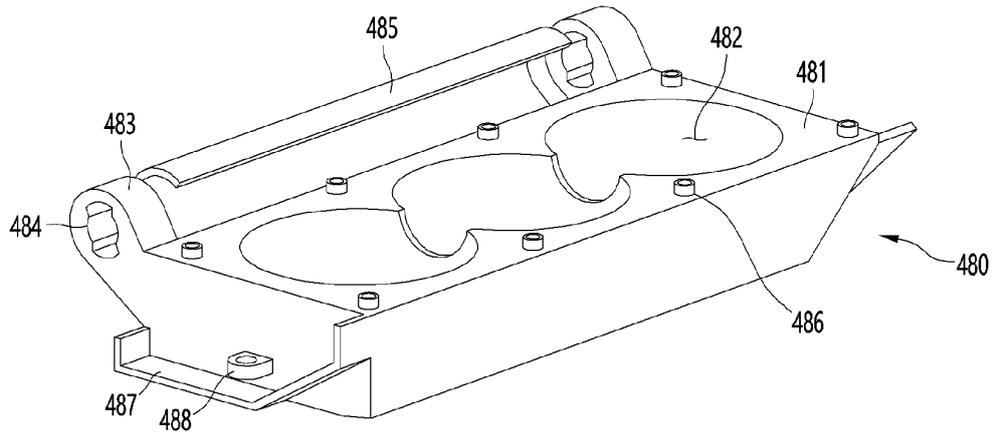
【Figure 20】



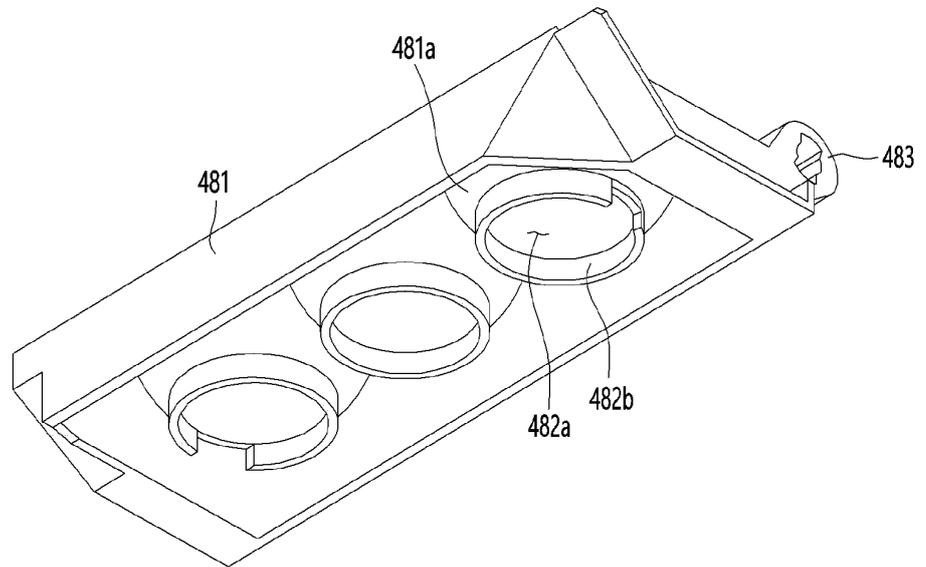
【Figure 21】



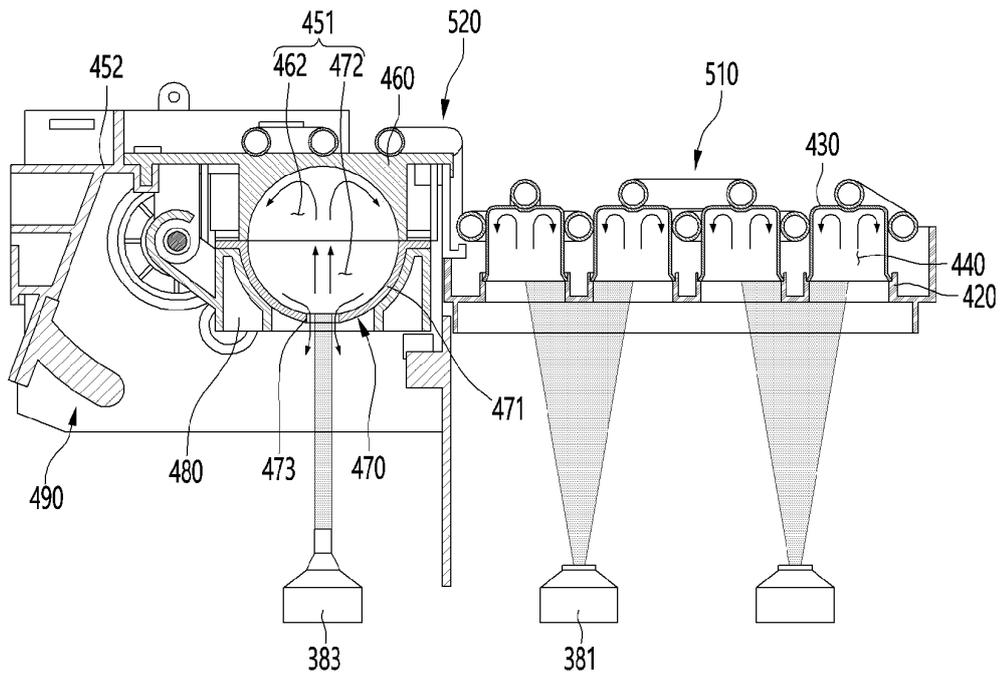
【Figure 22】



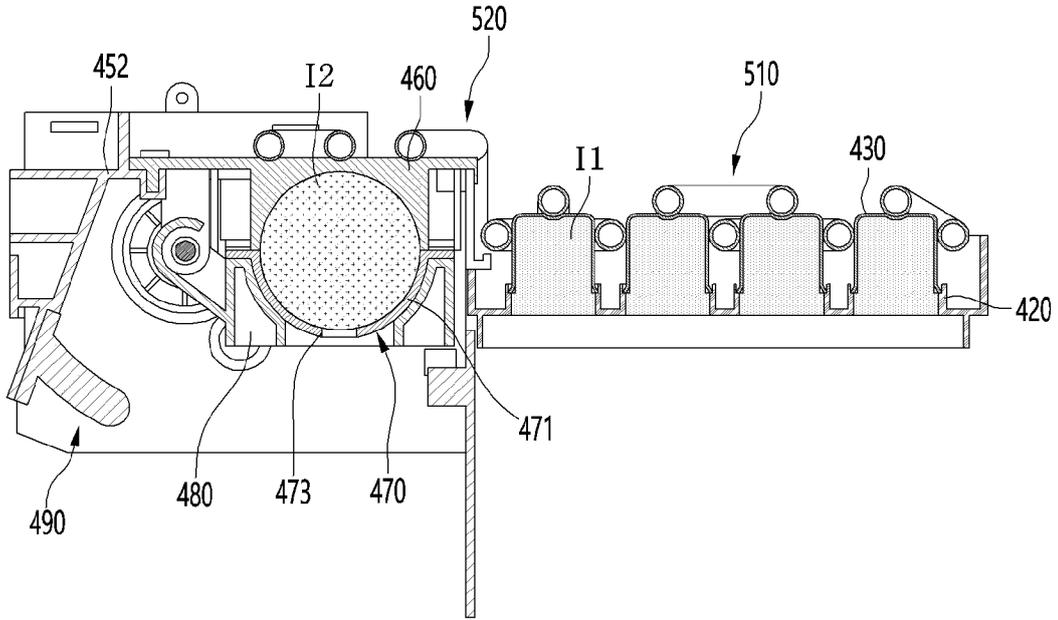
【Figure 23】



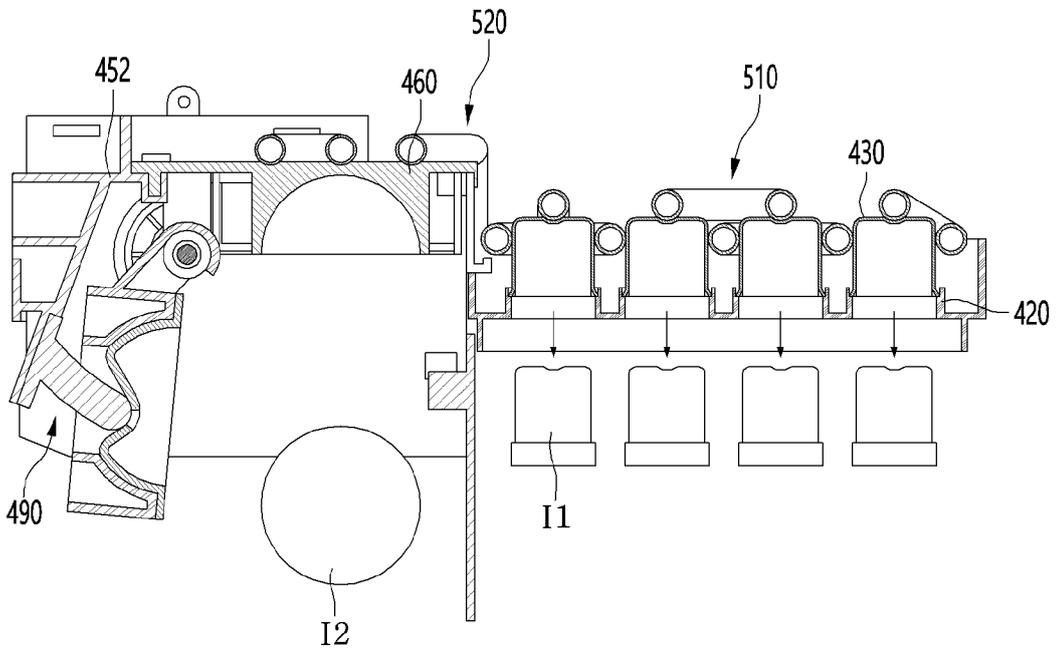
【Figure 24】



【Figure 25】



【Figure 26】



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2023/002725

5	<p>A. CLASSIFICATION OF SUBJECT MATTER</p> <p>F25C 1/24(2006.01)i; F25C 1/25(2018.01)i; F25C 1/18(2006.01)i; F25C 5/182(2018.01)i; F25D 23/12(2006.01)i</p> <p>According to International Patent Classification (IPC) or to both national classification and IPC</p>																																					
10	<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols)</p> <p>F25C 1/24(2006.01); F25C 1/045(2018.01); F25C 1/10(2006.01); F25C 1/12(2006.01); F25C 1/22(2006.01); F25C 1/25(2018.01); F25C 5/02(2006.01); F25C 5/18(2006.01)</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>Korean utility models and applications for utility models: IPC as above Japanese utility models and applications for utility models: IPC as above</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)</p> <p>eKOMPASS (KIPO internal) & keywords: 제빙장치(ice maker), 급수(water supply), 제빙셀(ice making cell), 2종(two types), 트레이(tray), 냉매관(refrigerant pipe), 체적(volume)</p>																																					
15	<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category*</th> <th style="width: 70%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 20%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">X</td> <td>JP 2006-105479 A (SANYO ELECTRIC CO., LTD.) 20 April 2006 (2006-04-20) See paragraphs [0021], [0023], [0027], [0031]-[0032] and [0042] and figures 1-2, 8 and 15.</td> <td style="text-align: center;">1-9,12,20-21</td> </tr> <tr> <td style="text-align: center;">Y</td> <td></td> <td style="text-align: center;">10-11,13-19</td> </tr> <tr> <td colspan="3" style="border-top: 1px dashed black;"></td> </tr> <tr> <td style="text-align: center;">Y</td> <td>KR 10-2021-0005799 A (LG ELECTRONICS INC.) 15 January 2021 (2021-01-15) See paragraphs [0099]-[0102] and figure 6.</td> <td style="text-align: center;">10-11</td> </tr> <tr> <td colspan="3" style="border-top: 1px dashed black;"></td> </tr> <tr> <td style="text-align: center;">Y</td> <td>KR 10-1556705 B1 (KAISER CO., LTD.) 02 October 2015 (2015-10-02) See paragraphs [0004]-[0005] and figures 1 and 6.</td> <td style="text-align: center;">11,13-19</td> </tr> <tr> <td colspan="3" style="border-top: 1px dashed black;"></td> </tr> <tr> <td style="text-align: center;">X</td> <td>KR 10-2000-0032977 A (DAEWOO ELECTRONICS CO., LTD.) 15 June 2000 (2000-06-15) See paragraphs [0025]-[0037] and figure 3.</td> <td style="text-align: center;">1-9,12,20-21</td> </tr> <tr> <td colspan="3" style="border-top: 1px dashed black;"></td> </tr> <tr> <td style="text-align: center;">X</td> <td>KR 10-1443976 B1 (TONGYANG MAGIC INC.) 23 September 2014 (2014-09-23) See paragraph [0001], claim 1 and figure 1.</td> <td style="text-align: center;">1-9,12,20</td> </tr> <tr> <td colspan="3" style="border-top: 1px dashed black;"></td> </tr> </tbody> </table>		Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	JP 2006-105479 A (SANYO ELECTRIC CO., LTD.) 20 April 2006 (2006-04-20) See paragraphs [0021], [0023], [0027], [0031]-[0032] and [0042] and figures 1-2, 8 and 15.	1-9,12,20-21	Y		10-11,13-19				Y	KR 10-2021-0005799 A (LG ELECTRONICS INC.) 15 January 2021 (2021-01-15) See paragraphs [0099]-[0102] and figure 6.	10-11				Y	KR 10-1556705 B1 (KAISER CO., LTD.) 02 October 2015 (2015-10-02) See paragraphs [0004]-[0005] and figures 1 and 6.	11,13-19				X	KR 10-2000-0032977 A (DAEWOO ELECTRONICS CO., LTD.) 15 June 2000 (2000-06-15) See paragraphs [0025]-[0037] and figure 3.	1-9,12,20-21				X	KR 10-1443976 B1 (TONGYANG MAGIC INC.) 23 September 2014 (2014-09-23) See paragraph [0001], claim 1 and figure 1.	1-9,12,20			
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Y	KR 10-2021-0005799 A (LG ELECTRONICS INC.) 15 January 2021 (2021-01-15) See paragraphs [0099]-[0102] and figure 6.	10-11																																				
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40	<p><input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.</p> <table style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>* Special categories of cited documents:</p> <p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“D” document cited by the applicant in the international application</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“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)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%; vertical-align: top;"> <p>“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</p> <p>“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</p> <p>“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</p> <p>“&” document member of the same patent family</p> </td> </tr> </table>		<p>* Special categories of cited documents:</p> <p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“D” document cited by the applicant in the international application</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“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)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p>	<p>“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</p> <p>“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</p> <p>“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</p> <p>“&” document member of the same patent family</p>																																		
<p>* Special categories of cited documents:</p> <p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“D” document cited by the applicant in the international application</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“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)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p>	<p>“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</p> <p>“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</p> <p>“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</p> <p>“&” document member of the same patent family</p>																																					
50	<p>Date of the actual completion of the international search</p> <p style="text-align: center;">01 June 2023</p>	<p>Date of mailing of the international search report</p> <p style="text-align: center;">02 June 2023</p>																																				
55	<p>Name and mailing address of the ISA/KR</p> <p style="text-align: center;">Korean Intellectual Property Office Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208</p> <p>Facsimile No. +82-42-481-8578</p>	<p>Authorized officer</p> <p>Telephone No.</p>																																				

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