

(19)



(11)

EP 4 033 182 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
12.02.2025 Bulletin 2025/07

(21) Application number: **20866814.5**

(22) Date of filing: **17.09.2020**

(51) International Patent Classification (IPC):
F25C 1/04 (2018.01) F25D 17/06 (2006.01)

(52) Cooperative Patent Classification (CPC):
F25D 17/065; F25C 1/04; F25C 1/25;
F25C 2305/022; F25C 2400/04; F25C 2400/06;
F25D 2317/061; F25D 2317/0665; F25D 2317/0682

(86) International application number:
PCT/CN2020/115756

(87) International publication number:
WO 2021/052389 (25.03.2021 Gazette 2021/12)

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

EISHERSTELLUNGSVORRICHTUNG UND KÜHLSCHRANK DAMIT

DISPOSITIF DE FABRICATION DE GLACE ET RÉFRIGÉRATEUR LE COMPORTANT

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

(30) Priority: **18.09.2019 JP 2019169312**

(43) Date of publication of application:
27.07.2022 Bulletin 2022/30

(73) Proprietors:
• **QINGDAO HAIER REFRIGERATOR CO., LTD.**
Qingdao, Shandong 266101 (CN)
• **HAIER SMART HOME CO., LTD.**
Qingdao, Shandong 266101 (CN)
• **AQUA CO., LTD**
Tokyo 103-0012 (JP)

(72) Inventor: **TOYOSHIMA, Masashi**
Tokyo 103-0012 (JP)

(74) Representative: **Winter, Brandl - Partnerschaft
mbB**
Alois-Steinecker-Straße 22
85354 Freising (DE)

(56) References cited:
CA-A1- 2 253 645 CN-A- 101 082 458
CN-A- 101 375 117 CN-A- 101 490 486
CN-A- 101 868 679 CN-A- 101 896 782
CN-A- 107 850 365 CN-A- 110 832 261
JP-A- 2017 161 086 KR-U- 20090 007 326
US-A- 5 237 837 US-A1- 2007 283 714
US-A1- 2008 295 539 US-A1- 2009 178 431

EP 4 033 182 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

TECHNICAL FIELD

[0001] The present invention relates to an ice-making device for making ice using an ice-making tray and a refrigerator having the same.

BACKGROUND

[0002] A refrigerator having an ice-making device for making ice using an ice-making tray is widely used. An ice-making device which has a plurality of ice-making trays and may make more ice is proposed to be provided in such a refrigerator (for example, refer to patent document 1). In the refrigerator described in patent document 1, the plurality of ice-making trays are arranged in a depth direction of the refrigerator to avoid an increase in a size of the ice-making device in a width direction of the refrigerator.

[0003] US 2007/283714 A1 discloses an ice tray assembly, wherein pieces of ice stored in a plurality of ice trays can be simultaneously discharged by a single motion without interfering with each other. To this end, a plurality of ice trays are vertically provided within a case, a plurality of the ice trays are connected to one another by an interoperating means to be simultaneously rotated and a driving means for rotating a plurality of the ice trays by being connected thereto.

[0004] US 2008/295539 A1 discloses a refrigerator which includes a refrigerator main body having a storage chamber, a door coupled to the refrigerator main body to be opened or closed, a cool air supplying device which generates cool air, an ice maker including an ice making tray having ice making cells to produce ice, and a cool air guide member installed in the door, coupled to the ice making tray and having a cool air line that guides the cool air supplied from the cool air supplying device to flow around the ice making tray. The cool air line disposed on the cool air guide member to supply the ice making tray guides the cool air supplied from the cool air supplying device to move along the surrounding of the ice making tray, thereby uniformly cooling down the ice making tray.

[0005] US 5,237,837 A discloses an ice making machine which includes an upright ice forming plate located above a water tank and having a cooling surface in heat exchange relationship with an evaporator attached thereto, and an ice forming surface to be supplied with water from the water tank by means of a water pump for forming the water into ice cubes. A first water supply conduit is connected to the water pump to supply the water from the water tank toward the ice forming surface of the upright plate when an ice making mode or a washing mode is selected at the ice making machine, and a second water supply conduit is arranged to introduce a portion of the water supplied from the water tank into a space above the evaporator only when the washing mode is selected at the ice making machine.

[0006] Further relevant prior art documents are CA2253645A1, KR20090007326U and JP2017161086A.

[0007] Patent document 1: JP publication No. 2003-279221.

[0008] Compared with one ice-making tray, a plane area of the plurality of ice-making trays in the refrigerator is directly proportional to a number of the ice-making trays, thus lowering a storage rate (i.e., a space utilization rate) of the refrigerator.

[0009] In view of this, the existing ice-making device and refrigerator are necessary to be improved to solve the above-mentioned problem.

15 SUMMARY

[0010] An object of the present invention is to provide an ice-making device and a refrigerator having the same, which are capable of supplying more ice while suppressing a reduction in a storage rate of the refrigerator.

[0011] The present invention is disclosed in the independent claim 1. Further embodiments are disclosed in the dependent claims.

[0012] According to the present invention, more ice can be supplied by means of a plurality of ice-making trays. Furthermore, since the plurality of ice-making trays are arranged up and down, when the ice-making trays are arranged in the refrigerator, an occupied area in a plan view can be reduced as compared with a case where the plurality of ice-making trays are arranged laterally. Since a cover is provided at an upper portion of a lower ice-making tray and configured to guide ice falling from an upper ice-making tray to fall on a side of the lower ice-making tray, even when the plurality of ice-making trays are arranged up and down, the ice from the upper ice-making tray does not interfere with the lower ice-making tray, but may fall into a storage container provided below the ice-making device.

[0013] As such, the present invention provides the ice-making device according to claim 1 being capable of supplying more ice while suppressing the reduction in the storage rate of a refrigerator.

[0014] Further, the ice-making device further comprising a gas supply portion and an air duct, wherein the gas supply portion supplies gas to an upper space of at least one of the ice-making trays, and the air duct is provided on a side of the ice-making tray and connected between the upper space of the ice-making tray supplied with the gas from the gas supply portion and the upper space of another ice-making tray.

[0015] In the ice-making device according to the present invention, when gas is supplied to at least one ice-making tray from a gas supply portion including a fan or a gas suction port, the gas may also be supplied to another ice-making tray through an air duct provided on a side of the ice-making tray. Thus, liquid stored in the plurality of ice-making trays can be efficiently cooled with a small number of gas supply portions.

[0016] Further, the ice-making tray has a plurality of ice making regions separated by a partition wall, and a slit is provided at the partition wall to allow liquid in the ice making regions to flow into the adjacent ice making regions once a liquid level exceeds a prescribed height.

[0017] In the ice-making device according to the present invention, when liquid is supplied to at least one ice making region through a slit provided at a partition wall of the ice-making tray, the liquid can also be supplied to another ice making region while stored in the ice making region.

[0018] Further, the ice-making device further comprising a liquid supply port for supplying liquid, wherein the liquid supply port is provided at at least one of the ice making regions of the uppermost ice-making tray, and a hole for dropping liquid is provided in a lower portion of at least one of the ice making regions of the upper ice-making tray other than the ice making region provided with the liquid supply port.

[0019] In the ice-making device according to the present invention, since a liquid supply port for supplying liquid is provided in at least one ice making region of the upper ice-making tray, and a hole for dropping liquid is provided in a lower portion of at least one ice making region of the upper ice-making tray other than the ice making region provided with the liquid supply port, the liquid can be efficiently supplied into all ice making regions of the upper and lower ice-making trays without using special power.

[0020] The present invention is also directed to a refrigerator according to claim 11.

[0021] As such, the refrigerator may supply more ice while suppressing the reduction in the storage rate.

[0022] The present invention has the beneficial effect that the ice-making device and the refrigerator having the same according to the present invention are capable of supplying more ice while suppressing the reduction in the storage rate of the refrigerator.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

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

FIG. 2 is a perspective view of the ice-making device shown in FIG. 1 with a bearing portion supporting rotation shafts of ice-making trays removed.

FIG. 3 is a perspective view of the ice-making device shown in FIG. 2 with a cover for guiding ice falling from the upper ice-making tray further removed.

FIG. 4 is a perspective view of the ice-making device shown in FIG. 3 with a fan and an air duct provided on a side of the ice-making trays further removed.

FIG. 5 is a side view as viewed in a direction of arrow A-A in FIG. 2.

FIG. 6 is a perspective view of the upper ice-making

tray.

FIG. 7 is a perspective view of the lower ice-making tray.

FIG. 8 is a side sectional view of a refrigerator having the ice-making device.

FIG. 9 is a side sectional view of the refrigerator to show a variant embodiment of the ice-making device.

10 Reference numerals

[0024]

2: ice-making device
 10, 10A, 10B: ice-making tray
 11: ice making region
 12: partition wall
 13: slit
 14: hole
 15: driving shaft portion
 16: non-driving shaft portion
 17: projection
 18: upper surface
 19: guide rod
 20: rotating mechanism
 22A, 22B: holding portion
 24: bearing portion
 30: cover
 34: wall
 40: fan
 42: suction port
 50: air duct
 60: liquid supply port
 70: storage container
 100: refrigerator
 110: freezing chamber
 112: opening
 114: opening
 120: cooling mechanism
 122: compressor
 124: condenser
 126: evaporator
 128: refrigerator fan
 130: liquid supply device
 132: water tank
 134: pump
 136: pipe
 Xa, Xb: rotation axis

50 DETAILED DESCRIPTION

[0025] In order to make the objects, technical solutions and advantages of the present invention more apparent, the present invention will be described in detail with reference to the accompanying drawings and specific embodiments.

[0026] Hereinafter, the embodiment of the present invention will be described in detail based on the accom-

panying drawings. In addition, a device described below serves as a device for embodying the technical idea of the present invention, and the present invention is not limited to the following content unless otherwise specified. In order to clarify the description, the sizes, positional relationships, or the like, of elements in each drawing may be exaggeratedly shown. In the specification and the accompanying drawings, the up-down direction is shown assuming a refrigerator provided on the floor.

(One embodiment of ice-making device)

[0027] FIG. 1 is a perspective view of an ice-making device 2 according to one embodiment of the present invention. FIG. 2 is a perspective view of the ice-making device 2 shown in FIG. 1 with a bearing portion 24 supporting rotation shafts of ice-making trays 10A, 10B removed. FIG. 3 is a perspective view of the ice-making device 2 shown in FIG. 2 with a cover 30 further removed, the cover 30 being configured to guide ice falling from the upper ice-making tray 10A. FIG. 4 is a perspective view of the ice-making device 2 shown in FIG. 3 with a fan 40 and an air duct 50 provided on a side of the ice-making trays 10A, 10B further removed. FIG. 5 is a side view as viewed along arrow A-A in FIG. 2. FIG. 6 is a perspective view of the upper ice-making tray 10A. FIG. 7 is a perspective view of the lower ice-making tray 10B.

[0028] Here, a case where the ice-making device 2 is provided in a refrigerator will be described as an example. The ice-making device 2 according to claim 1 has two ice-making trays 10A, 10B arranged up and down. The ice-making trays 10A, 10B are formed of a resin material having elasticity. The ice-making trays 10A, 10B have a plurality of ice making regions 11 separated by partition walls 12. A plurality of pieces of ice having shapes corresponding to shapes of inner surfaces of the ice making regions 11 can be made by freezing liquid, such as drinking water, stored in the ice making regions 11.

[0029] In the illustrated embodiment of the present invention, two ice-making trays 10A, 10B are provided, but the present invention is not limited thereto, and there may exist three or more ice-making trays provided up and down. In addition, in the present embodiment, the ice-making trays 10A, 10B are provided to be substantially completely overlapped in the up-down direction, but the present invention is not limited thereto. A plurality of ice-making trays can be provided with slight misalignment in a lateral direction in a plan view. In order to suppress an increase in an occupied area in a plan view, preferably, 70% or more, and more preferably, 80% or more, of the ice-making trays arranged up and down are overlapped.

[0030] As shown in FIG. 4, a liquid supply port 60 for supplying liquid to the ice-making tray 10A is provided above the upper ice-making tray 10A. In this case, for example, liquid stored in a container provided in the refrigerator can be supplied from the liquid supply port 60 to the ice-making tray 10A, or the liquid supply port 60 can be directly connected with a water pipe, or the like.

With reference to FIGS. 6 and 7, flow of the liquid supplied from the liquid supply port 60 to the upper ice-making tray 10 in the ice-making trays 10A, 10B will be briefly described in detail later as follows.

[0031] The liquid supplied from the liquid supply port 60 to one ice making region 11 of the upper ice-making tray 10A flows to the ice making regions 11 adjacent in sequence through a slit 13 while being stored in the ice making region 11. Further, the liquid flows down to the lower ice-making tray 10B through a hole 14 provided in one ice making region 11 of the upper ice-making tray 10A. Then, in the lower ice-making tray 10B, the liquid flows to the ice making regions 11 adjacent in sequence through a slit 13 while being stored in the ice making region 11. Thus, the liquid is stored in each ice making region 11 of the ice-making trays 10A, 10B.

[0032] A fan 40 is provided above the upper ice-making tray 10A and configured to supply gas to an upper space of the ice-making tray 10A. In the present embodiment, the cooled gas passing through an evaporator of the refrigerator is introduced into the ice-making device 2 by the fan 40 and supplied to the upper space of the ice-making tray 10A. The ice-making device 2 has an air duct 50 provided on a side of the ice-making trays 10A, 10B and connected between the upper space of the upper ice-making tray 10A and an upper space of the lower ice-making tray 10B. With such a configuration, the cold gas passing through the evaporator of the refrigerator is supplied by the fan 40, and flows through the upper space of the upper ice-making tray 10A and the upper space of the lower ice-making tray 10B. Thus, the liquid stored in the ice-making trays 10A, 10B is frozen and ice is formed. Flow of this gas is described in detail later with reference to FIG. 5.

[0033] The ice-making device 2 further has a rotating mechanism 20 for rotating the two ice-making trays 10A, 10B, and a bearing portion 24. Driving shaft portions 15 and non-driving shaft portions 16 are provided at two ends of the ice-making trays 10A, 10B. The driving shaft portions 15 of the ice-making trays 10A, 10B are mounted to holding portions 22A, 22B at an upper portion and a lower portion of the rotating mechanism 20 respectively. The holding portions 22A, 22B are rotated by an electric motor provided in the rotating mechanism 20. The non-driving shaft portions 16 of the ice-making trays 10A, 10B are inserted into an upper hole and a lower hole of the bearing portion 24 respectively.

[0034] With such a configuration, the ice-making trays 10A, 10B are rotated about rotation axes Xa, Xb by a driving force of the rotating mechanism 20 respectively. At a rotation position of the ice-making trays 10A, 10B, there exists an ice making position where upper surfaces 18 of the ice-making trays 10A, 10B face upwards and the liquid can be stored. In consideration of a liquid storage efficiency in the ice making regions 11 of the ice-making trays 10A, 10B, preferably, the upper surfaces 18 of the ice-making trays 10A, 10B are horizontal, but the upper surfaces 18 can be slightly inclined. Further, at the rota-

tion position of the ice-making trays 10A, 10B, there exists an ice release position where the ice formed in the ice making region 11 is released and falls. In the ice release position, in order to drop the ice, the upper surface 18 is required to become downward, but does not have to be horizontal, and can be inclined downwards.

[0035] The upper surfaces 18 of the ice-making trays 10A, 10B are rotated towards the upper ice making position by the driving force of the rotating mechanism 20, such that the upper surface 18 becomes downward, and projections 17 provided at end portions on the non-driving shaft portion 16 sides of the ice-making trays 10A, 10B abut against stoppers provided at the bearing portion 24. When the rotating mechanism 20 is continuously driven after the abutment, the non-driving shaft portion 16 side of the ice-making trays 10A, 10B is substantially stopped from rotating, and the driving shaft portion 15 side is continuously rotated. As such, the ice-making trays 10A, 10B made of the elastic material are twisted, and then, the ice is released from each ice making region 11 and falls down due to gravity. Therefore, a stop position where the upper surfaces 18 of the ice-making trays 10A, 10B are simultaneously twisted downwards is the ice release position.

[0036] In the present embodiment, the rotating mechanism 20 has one electric motor, and the two ice-making trays 10A, 10B are rotated simultaneously by a gear transmission mechanism. Any known ice release mechanism can be used as a mechanism for rotating and twisting the ice-making trays 10A, 10B to release the ice. A travel way of the ice falling from the ice-making trays 10A, 10B is described in detail later with reference to FIG. 5.

(Liquid flowing into ice-making trays 10A, 10B)

[0037] As shown in FIGS. 6 and 7, the ice-making trays 10A, 10B are provided with 2 rows of 5 ice making regions 11 (10 ice making regions 11 in total) which are separated by the partition wall 12. However, the arrangement of the ice making region 11 is not limited thereto. The partition wall 12 is provided with the slit 13. The slit 13 is provided from a position at a prescribed height h from a bottom surface of the ice making region 11 to an upper end of the partition wall 12. Therefore, the liquid in the ice making region 11 flows into the adjacent ice making region 11 once a liquid level exceeds the prescribed height h . Thus, when supplied to one ice making region 11 of the ice-making trays 10A, 10B, the liquid can be stored in each ice making region 11 up to the height h .

<Upper Ice-making tray 10A>

[0038] The liquid supply port 60 is provided above one of the two ice making regions 11 located at the end portion on the non-driving shaft portion 16 side of the upper ice-making tray 10A. The slits 13 are provided between two ice making regions 11 in adjacent rows located at the end

portion on the non-driving shaft portion 16 side, and between two ice making regions 11 in adjacent rows located at the end portion on the driving shaft portion 15 side. Furthermore, the slit 13 is provided between the ice making regions 11 adjacent in a row direction. Further, the hole 14 for dropping the liquid is provided in a lower portion of one of the two ice making regions 11 located at the end portion on the driving shaft portion 15 side.

[0039] With the above arrangement of the slit 13 and the hole 14, the liquid supplied from the liquid supply port 60 to one ice making region 11 at the end portion on the non-driving shaft portion 16 side flows from the non-driving shaft portion 16 side to the driving shaft portion 15 side in two groups (one for each row) as indicated by the dotted arrows in FIG. 6, and flows downwards from the hole 14 of the one ice making region 11 at the end portion on the non-driving shaft portion 16 side. Thus, the liquid having the liquid level height h is stored in the ice making regions 11 of the upper ice-making tray 10A other than the ice making region 11 having the hole 14. By providing the slit only between the ice making regions 11 of the adjacent rows at the ice making regions 11 of both end portions, the liquid may smoothly flow in two groups (one for each row).

<Lower ice-making tray 10B>

[0040] For the lower ice-making tray 10B, the slits 13 are provided between two ice making regions 11 in adjacent rows located at the end portion on the non-driving shaft portion 16 side, and between two ice making regions 11 in adjacent rows located at the end portion on the driving shaft portion 15 side. Furthermore, the slit 13 is provided between the ice making regions 11 adjacent in a row direction, and the lower ice-making tray 10B is not provided with the ice making region 11 having the hole 14.

[0041] With the above arrangement of the slit 13, the liquid flowing from the upper ice-making tray 10A downwards to one ice making region 11 at the end portion on the driving shaft portion 15 side flows from the driving shaft portion 15 side to the non-driving shaft portion 16 side in two groups (one for each row) as indicated by the dotted arrows in FIG. 7. Thus, the liquid having the liquid level height h is stored in all the ice making regions 11 of the lower ice-making tray 10B. In the lower ice-making tray 10B as well, by providing the slit only between the ice making regions 11 of the adjacent rows at the ice making regions 11 of both end portions, the liquid may smoothly flow in two groups (one for each row).

[0042] However, the above arrangement of the slits 13 in the ice-making trays 10A, 10B is merely an example, and any other arrangement of the slit 13 can be adopted depending on the arrangement of the ice making region 11. Although one hole 14 is provided at the upper ice-making tray 10A in the present embodiment, the present invention is not limited thereto, and the holes 14 for the liquid to fall can be provided at the lower portions of a plurality of ice making regions 11 of the ice-making tray

10A.

[0043] In addition, in a case of three or more ice-making trays 10 arranged up and down, the liquid supply port 60 can be provided to supply liquid to one ice making region 11 of the uppermost ice-making tray 10. In addition, the present invention is not limited to the case where the liquid is supplied from the liquid supply port 60 to one ice making region 11, and the liquid can be supplied from the liquid supply port 60 to a plurality of ice making regions 11. In this case, preferably, the slits 13 are provided in accordance with positions of the plurality of liquid supply ports 60, such that the flows of the liquid from the liquid supply ports 60 do not interfere with each other.

[0044] As above, in the case where the liquid is supplied to at least one ice making region 11 through the slit 13 provided at the partition wall 12 of the ice-making trays 10A, 10B, the liquid can be supplied to another ice making region 11 while stored in the ice making region 11.

[0045] Further, since there exists the liquid supply port 60 for supplying the liquid to at least one ice making region 11 of the uppermost ice-making tray 10A, and the hole 14 for dropping the liquid is provided in the lower portion of at least one ice making region 11 of the upper ice-making tray 10A other than the ice making region 11 provided with the liquid supply port 60, the liquid can be efficiently supplied into all the ice making regions 11 of the upper and lower ice-making trays 10A, 10B without using special power.

(Flow of gas)

[0046] The flow of the gas in the ice-making device 2 is explained with reference to FIG. 5. In FIG. 5, the flow of the gas is indicated by a dot-and-dash arrow. The upper space of the upper ice-making tray 10A is closed at the right end portion in the drawing by a wall 34 (refer to FIGS. 1 and 2). Therefore, the gas cooled by the evaporator of the refrigerator and discharged downwards by the fan 40 flows from the right side to the left side of the drawing in a lower portion of the fan 40 and the upper space of the upper ice-making tray 10A. The liquid stored in each ice making region 11 of the ice-making tray 10A is cooled by the flow of the gas discharged downwards. Then, the gas flowing in the lower portion of the fan 40 and the upper space of the ice-making tray 10A flows into the air duct 50, and the air duct 50 is provided on the side of the ice-making trays 10A, 10B and connected between the upper space of the upper ice-making tray 10A and the upper space of the lower ice-making tray 10B. The air duct 50 is provided with a flow path having a curved surface or an inclined surface, such that the gas flows smoothly with less pressure loss.

[0047] Then, the gas flows from top to bottom in the air duct 50 and flows into the upper space of the lower ice-making tray 10B. In addition, the gas flows from the left side to the right side of the drawing in the upper space of the lower ice-making tray 10B. The liquid stored in each ice making region 11 of the ice-making tray 10B is cooled

by this flow. Then, the gas flowing in the upper space of the ice-making tray 10B flows to the outside of the ice-making device 2 from an opening 32 (refer to FIGS. 1 and 2) provided in the cover 30. The gas flowing to the outside of the ice-making device 2 flows in the refrigerator, and is cooled by the evaporator of the refrigerator again.

[0048] In the present embodiment, the fan 40 is provided above the upper ice-making tray 10A, but the present invention is not limited thereto. For example, the fan 40 can be provided on the lower ice-making tray 10B side, and the gas may also flow from the lower ice-making tray 10B side to the upper ice-making tray 10A side by means of the air duct 50. Furthermore, in the case of three or more ice-making trays 10 arranged up and down, the fan 40 can be provided at one of the ice-making trays 10, or the fan 40 can be provided at a plurality of ice-making trays 10 having different heights.

[0049] As above, the ice-making device 2 has the fan 40 for supplying the gas to the upper space of at least one ice-making tray 10A, and the air duct 50 provided on the side of the ice-making trays 10A, 10B and connected between the upper space of the upper ice-making tray 10A and the upper space of the lower ice-making tray 10B. The fan 40 may also be referred to as a gas supply portion. Thus, when the gas is supplied from the fan 40 to at least one ice-making tray 10A, the gas can be supplied to the other ice-making tray 10B through the air duct 50 provided on the side of the ice-making trays 10A, 10B. Thus, the liquid stored in the ice-making trays 10A, 10B can be efficiently cooled with a small number of fans 40.

< Variant >

[0050] In the above embodiment, the ice-making device 2 has the fan 40 supplying the gas, but the present invention is not limited thereto. FIG. 9 shows a side sectional view of the refrigerator for explaining a variant of the ice-making device 2 according to claim 1. As shown in FIG. 9, in a case where a cold gas discharge port (for example, opening 112) is provided around the ice-making device 2, even without the fan 40, the same function as described above can be achieved with a suction port 42 for introducing cold gas into the ice-making device 2.

[0051] In FIG. 9, the ice-making device 2 according to claim 1 is provided near the opening 112, and the opening 112 is configured to feed the cold gas passing through the evaporator 126 of the refrigerator 100 into a freezing chamber 110. In this case, when the suction port is provided on a side of or above the upper space of the ice-making tray 10A, the gas can be sucked into the upper space of one ice-making tray 10A. In FIG. 9, the suction port 42 serving as the gas supply portion is provided on a side of the upper space of the ice-making tray 10A. In this way, the cold gas passing through the evaporator 126 can be directly sucked into the upper space of the ice-making tray 10A. In the case where the suction port 42 is provided on the side of the upper space of the ice-making tray 10A, in consideration of the flow of

the gas, preferably, the suction port is provided at a position opposite to the side where the air duct 50 is provided.

[0052] During collective expression of the case of having the fan 40 and the case of having the suction port 42, the ice-making device 2 may have the gas supply portions 40, 42 for supplying the gas to the upper space of at least one ice-making tray 10A, and the air duct 50 provided on the side of the ice-making trays 10A, 10B and connected between the upper space of the upper ice-making tray 10A and the upper space of the lower ice-making tray 10B.

(Falling of ice)

[0053] A following travel way of the ice released and dropped from the ice-making trays 10A, 10B after the ice-making trays 10A, 10B are rotated to the ice release position by the rotating mechanism 20 will be described with reference to FIG. 5. As indicated by the dotted arrow of FIG. 5, due to gravity, the ice dropped from the lower ice-making tray 10B directly falls into the storage container 70 provided below the ice-making device 2 according to claim 1. On the other hand, due to the lower ice-making tray 10B, the ice dropped from the upper ice-making tray 10A is unable to directly enter the storage container 70.

[0054] In the ice-making device 2 according to claim 1, the cover 30 is provided at an upper portion of the lower ice-making tray 10B and configured to guide the ice falling from the upper ice-making tray 10A to fall on the side of the lower ice-making tray 10B. Further, the cover 30 has a curved surface. As such, the ice falling from the upper ice-making tray 10A moves along the curved surface and falls from the side of the ice-making device 2 into the storage container 70 provided below the ice-making device 2. As such, the ice falling from the upper ice-making tray 10A can be smoothly stored in the storage container 70 while damage to the ice and a machine is avoided.

[0055] Further, the cover 30 can have a shape with both the curved surface and an inclined surface. As described above, the cover 30 is provided therein with the plurality of slit-shaped openings 32 for the gas supplied by the fan 40 to pass through.

[0056] As above, since the cover 30 is provided at the upper portion of the lower ice-making tray 10B and configured to guide the ice falling from the upper ice-making tray 10A to fall on the side of the lower ice-making tray 10B, the ice of the ice-making trays 10A, 10B arranged up and down can be accurately stored in the storage container 70. Thus, the ice-making device 2 in which the ice-making trays 10A, 10B are provided up and down is realized, and the ice-making device 2 capable of supplying more ice while suppressing a reduction in a storage rate of the refrigerator can be provided.

(Refrigerator)

[0057] FIG. 8 is a side sectional view illustrating one example of the refrigerator 100 having the ice-making device 2 according to claim 1. Next, one example of the refrigerator 100 having the ice-making device 2 according to the above embodiment will be described with reference to FIG. 8. In FIG. 8, the ice-making device 2 and a liquid supply device 130 are depicted largely as compared to the refrigerator for illustrative purposes.

[0058] The ice-making device 2 according to claim 1 is provided on a rear side of the freezing chamber 110 of the refrigerator 100, and the storage container 70 of the ice is provided below the ice-making device. The refrigerator 100 has therein the liquid supply device 130 for supplying liquid to the ice-making trays 10A, 10B of the ice-making device 2. In the liquid supply device 130, the liquid stored in a water tank 132 is supplied to a pipe 136 side by a discharge force of a pump 134. Then, the liquid flowing down through the pipe 136 is supplied from the liquid supply port 60 to the upper ice-making tray 10A of the ice-making device 2.

[0059] The refrigerator 100 has a cooling mechanism 120 which forms a cooling cycle mainly by a compressor 122, a condenser 124 and the evaporator 126 to supply the cold gas into the refrigerator. The gas circulating in the refrigerator 100 is cooled while passing through the evaporator 126. Then, as indicated by the dot-and-dash arrow, the gas cooled by a heat exchange in the evaporator 126 is blown into the freezing chamber 110 by a refrigerator fan 128 through the opening 112. A part of the gas blown into the freezing chamber 110 is sucked into the ice-making device 2 by the fan 40 of the ice-making device 2 and supplied to the upper space of the upper ice-making tray 10A. The gas sucked into the ice-making device 2 flows from the upper space of the upper ice-making tray 10A to the upper space of the lower ice-making tray 10B by means of the air duct, and flows to the outside of the ice-making device 2 from the opening provided in the cover. The outflow gas flows towards the cooling mechanism 120 side by means of an opening 114 and is cooled while passing through the evaporator 126 again. By repeating such a gas circulation, the cooled gas is supplied into the ice-making device 2 without interruption, and the liquid in the ice-making trays 10A, 10B is frozen to make ice.

[0060] As above, in the refrigerator 100 having the ice-making device 2 in which the ice-making trays 10A, 10B are provided up and down, the occupied area in a plan view can be reduced as compared with the case where the ice-making trays are laterally arranged side by side. Thus, the refrigerator capable of supplying more ice while suppressing the reduction in the storage rate can be provided. As shown in FIG. 9, the ice-making device 2 according to claim 1 can have a gas suction port 42 instead of the fan 40. In this case, by directly sucking the cold gas blown into the freezing chamber 110 through the opening 112 from the gas suction port 42 into the ice-

making device 2, the cold gas can be supplied to the upper space of the upper ice-making tray 10A.

< Variant >

[0061] In the refrigerator 100 according to the above embodiment, the ice-making device 2 is provided in the freezing chamber 110, but the present invention is not limited thereto. Since the plurality of ice-making trays 10A, 10B are provided up and down, the ice-making device 2 can be relatively easily provided in a door of the refrigerator 100. In this case, however, there may exist a risk that water in the ice-making tray is scattered due to opening and closing operations of the door.

[0062] To solve this problem, as shown in FIGS. 4 and 5, guide rods 19 can be mounted to abut against protrusions of both side surfaces of the ice-making trays 10A, 10B along the row of the ice making regions 11 (i.e., along a longer direction). The guide rods 19 extend upwards from the upper surfaces 18 of the ice-making trays 10A, 10B. Thus, the water splashed due to the opening and closing operations of the door hits the guide rods 19 and returns to the ice making regions 11 of the ice-making trays 10A, 10B along inner surfaces of the guide rods 19. By this guide rod 19, the liquid in the ice-making trays 10A, 10B can be prevented from spilling outwards even when the door is opened and closed.

[0063] Since the protrusions of the ice-making trays 10A, 10B and the guide rods 19 are formed of a flexible resin material, the protrusions and the guide rods 19 can sufficiently accommodate a stress when the ice-making trays 10A, 10B are twisted for ice release and a vibration when the refrigerator door is strongly opened and closed. As above, in the refrigerator 100 having the ice-making device 2 according to claim 1 in the door, since the guide rods 19 extending upwards from the upper surfaces 18 of the ice-making trays 10A, 10B are provided on both side surfaces in the longer direction of the ice-making trays 10A, 10B, the liquid in the ice-making trays 10A, 10B can be effectively prevented from being splashed with the opening and closing operations of the door.

(Other embodiments)

[0064] (1) A plurality of pieces of ice are made with the ice making regions 11 of the ice-making trays 10A, 10B in the above embodiment, but there may exist an ice crusher below the ice-making device 2 according to claim 1 for crushing the ice made with the ice-making device 2. (2) In the above embodiment, the liquid stored in the water tank 132 of the liquid supply device 130 is supplied to the ice-making device 2, but the ice-making device 2 can be connected to a water supply pipe, and the liquid can be directly supplied from the water supply pipe to the ice-making device 2. (3) A separate ice-making device 2 according to claim 1 being independent of the refrigerator may also be realized when there exists a cooling mechanism dedicated to the ice-making device 2.

[0065] The present invention is disclosed in the following claims.

5 Claims

1. An ice-making device (2), comprising: a plurality of ice-making trays arranged up and down and a rotating mechanism (20), wherein said plurality of ice making trays comprises an upper ice-making tray (10A) and a lower ice-making tray (10B), and wherein the rotating mechanism (20) is capable of rotating the plurality of ice-making trays between an ice making position where liquid can be stored and an ice release position where formed ice is released and dropped, wherein a cover (30) is provided at an upper portion of the lower ice-making tray (10B), **characterized in that** the cover (30) guides the ice falling from the upper ice-making tray (10A) to fall on a side of the lower ice-making tray (10B), wherein the cover (30) has a curved surface to separate the upper ice-making tray (10A) and the lower ice-making tray (10B), wherein the ice-making device (2) is configured so, that the ice falling from the upper ice-making tray (10A) moves along the curved surface of the cover (30) and falls from the side of the ice-making device (2) into a storage container (70) provided below the ice-making device (2).
2. The ice-making device (2) according to claim 1, further comprising a gas supply portion (40, 42) and an air duct (50), wherein the gas supply portion supplies gas to an upper space of at least one of the ice-making trays, and the air duct (50) is provided on a side of the at least one ice-making tray and connected between the upper space of the at least one ice-making tray supplied with the gas from the gas supply portion (40, 42) and the upper space of another ice-making tray.
3. The ice-making device (2) according to claim 1 or 2, wherein the ice-making trays have a plurality of ice making regions (11) separated by a partition wall (12), and a slit (13) is provided at the partition wall (11) to allow liquid in the ice making regions to flow into the adjacent ice making regions (11) once a liquid level exceeds a prescribed height.
4. The ice-making device (2) according to claim 3, further comprising a liquid supply port (60) for supplying liquid, wherein the liquid supply port (60) is provided at at least one of the ice making regions (11) of the upper ice-making tray, and a hole (14) for dropping liquid is provided in a lower portion of at least one of the ice making regions (11) of the upper ice-making tray (10A) being different from the ice making region provided with the liquid supply port

(60).

5. The ice-making device (2) according to claim 2, wherein the gas flowing in the upper space of the lower ice-making tray (10B) flows to the outside of the ice-making device (2) from a plurality of openings (32) provided in the cover (30).
6. The ice-making device (2) according to claim 5, wherein the cover (30) is provided with a plurality of slit-shaped openings (32) for the gas supplied by a fan (40) to pass through.
7. The ice-making device (2) according to claim 3, wherein a traveling direction of the falling ice can be changed to an obliquely downward direction by the cover (30), so as to drop the ice on the side of the lower ice-making tray (10B).
8. The ice-making device (2) according to claim 3, wherein the ice-making device (2) further has guide rods (19) mounted to abut against protrusions of both side surfaces of the ice-making trays along a length direction of the ice making regions.
9. The ice-making device (2) according to claim 8, wherein the guide rods (19) extend upwards from the upper surfaces of the ice-making trays.
10. The ice-making device (2) according to claim 8, wherein driving shaft portions (15) and non-driving shaft portions (16) are provided at two ends of the ice-making trays, the driving shaft portions (15) of the ice-making trays are mounted to holding portions (22A, 22B) at an upper portion and a lower portion of the rotating mechanism (20) respectively.
11. A refrigerator (100), comprising the ice-making device (2) according to any one of claims 1 to 10 and a storage container (70) provided below this ice-making device (2).

Patentansprüche

1. Eisherstellungsvorrichtung (2), die eine Mehrzahl von Eisherstellungsschalen, die auf und ab angeordnet sind, und einen Drehmechanismus (20) aufweist, wobei die Mehrzahl von Eisherstellungsschalen eine obere Eisherstellungsschale (10A) und eine untere Eisherstellungsschale (10B) aufweist, und wobei der Drehmechanismus (20) in der Lage ist, die Mehrzahl von Eisherstellungsschalen zwischen einer Eisherstellungsposition, in der Flüssigkeit gelagert werden kann, und einer Eisfreigabeposition, in der geformtes Eis freigegeben und fallengelassen wird, zu drehen, wobei eine Abdeckung (30) an einem oberen Abschnitt der

unteren Eisherstellungsschale (10B) vorgesehen ist, **dadurch gekennzeichnet, dass** die Abdeckung (30) das von der oberen Eisherstellungsschale (10A) fallende Eis derart führt, dass es auf eine Seite der unteren Eisherstellungsschale (10B) fällt, wobei die Abdeckung (30) eine gekrümmte Oberfläche aufweist, um die obere Eisherstellungsschale (10A) und die untere Eisherstellungsschale (10B) zu trennen, wobei die Eisherstellungsvorrichtung (2) derart ausgebildet ist, dass sich das von der oberen Eisherstellungsschale (10A) fallende Eis entlang der gekrümmten Oberfläche der Abdeckung (30) bewegt und von der Seite der Eisherstellungsvorrichtung (2) in einen unterhalb der Eisherstellungsvorrichtung (2) vorgesehenen Vorratsbehälter (70) fällt.

2. Eisherstellungsvorrichtung (2) nach Anspruch 1, die ferner einen Gaszufuhrabschnitt (40, 42) und einen Luftkanal (50) aufweist, wobei der Gaszufuhrabschnitt Gas zu einem oberen Raum von mindestens einer der Eisherstellungsschalen zuführt und der Luftkanal (50) an einer Seite der mindestens einen Eisherstellungsschale vorgesehen ist und den oberen Raum der mindestens einen Eisherstellungsschale, die mit dem Gas aus dem Gaszufuhrabschnitt (40, 42) versorgt wird, mit dem oberen Raum einer anderen Eisherstellungsschale verbindet.
3. Eisherstellungsvorrichtung (2) nach Anspruch 1 oder 2, wobei die Eisherstellungsschalen eine Mehrzahl von Eisherstellungsbereichen (11) aufweisen, die durch eine Trennwand (12) voneinander getrennt sind, und ein Schlitz (13) an der Trennwand (12) vorgesehen ist, damit Flüssigkeit in den Eisherstellungsbereichen in die angrenzenden Eisherstellungsbereiche (11) fließen kann, sobald ein Flüssigkeitspegel eine vorbestimmte Höhe überschreitet.
4. Eisherstellungsvorrichtung (2) nach Anspruch 3, die ferner eine Flüssigkeitszufuhröffnung (60) zum Zuführen von Flüssigkeit aufweist, wobei die Flüssigkeitszufuhröffnung (60) an mindestens einem der Eisherstellungsbereiche (11) der oberen Eisherstellungsschale vorgesehen ist, und ein Loch (14) zum Ablassen von Flüssigkeit in einem unteren Abschnitt von mindestens einem der Eisherstellungsbereiche (11) der oberen Eisherstellungsschale (10A) vorgesehen ist, der sich von dem Eisherstellungsbereich unterscheidet, der mit der Flüssigkeitszufuhröffnung (60) versehen ist.
5. Eisherstellungsvorrichtung (2) nach Anspruch 2, wobei das in den oberen Raum der unteren Eisherstellungsschale (10B) strömende Gas aus einer Mehrzahl von Öffnungen (32), die in der Abdeckung (30) vorgesehen sind, zur Außenseite der Eisherstellungsvorrichtung (2) strömt.

6. Eisherstellungsvorrichtung (2) nach Anspruch 5, wobei die Abdeckung (30) mit einer Mehrzahl von schlitzförmigen Öffnungen (32) versehen ist, durch die das von einem Gebläse (40) zugeführte Gas strömt. 5
7. Eisherstellungsvorrichtung (2) nach Anspruch 3, wobei eine Bewegungsrichtung des fallenden Eises durch die Abdeckung (30) in eine schräg nach unten verlaufende Richtung geändert werden kann, um das Eis auf die Seite der unteren Eisherstellungsschale (10B) fallen zu lassen. 10
8. Eisherstellungsvorrichtung (2) nach Anspruch 3, wobei die Eisherstellungsvorrichtung (2) ferner Führungsstangen (19) aufweist, die derart angebracht sind, dass sie entlang einer Längsrichtung der Eisherstellungsbereiche an Vorsprüngen beider Seitenflächen der Eisherstellungsschalen anliegen. 15
9. Eisherstellungsvorrichtung (2) nach Anspruch 8, wobei sich die Führungsstangen (19) von den oberen Flächen der Eisherstellungsschalen nach oben erstrecken. 20
10. Eisherstellungsvorrichtung (2) gemäß Anspruch 8, wobei Antriebswellenabschnitte (15) und Nichtantriebswellenabschnitte (16) an zwei Enden der Eisherstellungsschalen ausgebildet sind, wobei die Antriebswellenabschnitte (15) der Eisherstellungsschalen an Halteabschnitten (22A, 22B) jeweils an einem oberen Abschnitt und einem unteren Abschnitt des Drehmechanismus (20) angebracht sind. 25
11. Kühlschrank (100), mit der Eisherstellungsvorrichtung (2) nach einem der Ansprüche 1 bis 10 und einem unterhalb der Eisherstellungsvorrichtung (2) angeordneten Vorratsbehälter (70). 30

Revendications

1. Dispositif de fabrication de glace (2), comprenant : une pluralité de bacs de fabrication de glace agencés vers le haut et vers le bas et un mécanisme de rotation (20), dans lequel ladite pluralité de bacs de fabrication de glace comprennent un bac de fabrication de glace supérieur (10A) et un bac de fabrication de glace inférieur (10B), et 45
- dans lequel le mécanisme de rotation (20) permet de faire tourner la pluralité de bacs de fabrication de glace entre une position de fabrication de glace dans laquelle un liquide peut être stocké, et une position de libération de glace dans laquelle de la glace formée est libérée et tombe, dans lequel 50
- un couvercle (30) est disposé au niveau d'une 55

partie supérieure du bac de fabrication de glace inférieur (10B), **caractérisé en ce que** le couvercle (30) guide la glace tombant du bac de fabrication de glace supérieur (10A) pour tomber sur un côté du bac de fabrication de glace inférieur (10B), dans lequel le couvercle (30) présente une surface incurvée pour séparer le bac de fabrication de glace supérieur (10A) et le bac de fabrication de glace inférieur (10B), dans lequel le dispositif de fabrication de glace (2) est configuré de telle sorte que la glace tombant du bac de fabrication de glace supérieur (10A) se déplace le long de la surface incurvée du couvercle (30) et tombe du côté du dispositif de fabrication de glace (2) dans un récipient de stockage (70) disposé sous le dispositif de fabrication de glace (2).

2. Dispositif de fabrication de glace (2) selon la revendication 1, comprenant en outre une partie d'alimentation en gaz (40, 42) et un conduit d'air (50), dans lequel la partie d'alimentation en gaz alimente en gaz un espace supérieur d'au moins un des bacs de fabrication de glace, et le conduit d'air (50) est disposé sur un côté du au moins un bac de fabrication de glace et relié entre l'espace supérieur du au moins un bac de fabrication de glace alimenté en gaz par la partie d'alimentation en gaz (40, 42) et l'espace supérieur d'un autre bac de fabrication de glace. 25
3. Dispositif de fabrication de glace (2) selon la revendication 1 ou 2, dans lequel les bacs de fabrication de glace présentent une pluralité de régions de fabrication de glace (11) séparées par une paroi de séparation (12), et une fente (13) est ménagée au niveau de la paroi de séparation (11) pour permettre à un liquide dans les régions de fabrication de glace de s'écouler dans les régions de fabrication de glace adjacentes (11) une fois qu'un niveau de liquide dépasse une hauteur prescrite. 30
4. Dispositif de fabrication de glace (2) selon la revendication 3, comprenant en outre un orifice d'alimentation en liquide (60) pour fournir un liquide, dans lequel l'orifice d'alimentation en liquide (60) est ménagé au niveau d'au moins une des régions de fabrication de glace (11) du bac de fabrication de glace supérieur, et un trou (14) pour laisser tomber du liquide est ménagé dans une partie inférieure d'au moins une des régions de fabrication de glace (11) du bac de fabrication de glace supérieur (10A) qui est différente de la région de fabrication de glace pourvue de l'orifice d'alimentation en liquide (60). 35
5. Dispositif de fabrication de glace (2) selon la revendication 2, dans lequel le gaz s'écoulant dans l'espace supérieur du bac de fabrication de glace inférieur (10B) s'écoule vers l'extérieur du dispositif de 40

fabrication de glace (2) à partir d'une pluralité d'ouvertures (32) ménagées dans le couvercle (30).

6. Dispositif de fabrication de glace (2) selon la revendication 5, dans lequel le couvercle (30) est pourvu d'une pluralité d'ouvertures en forme de fente (32) par lesquelles passe le gaz fourni par un ventilateur (40). 5
7. Dispositif de fabrication de glace (2) selon la revendication 3, dans lequel une direction de déplacement de la glace tombante peut être modifiée vers une direction oblique vers le bas par le couvercle (30), de manière à faire tomber la glace sur le côté du bac de fabrication de glace inférieur (10B). 10
15
8. Dispositif de fabrication de glace (2) selon la revendication 3, dans lequel le dispositif de fabrication de glace (2) présente en outre des tiges de guidage (19) montées pour venir en butée contre des saillies des deux surfaces latérales des bacs de fabrication de glace le long d'une direction de la longueur des régions de fabrication de glace. 20
9. Dispositif de fabrication de glace (2) selon la revendication 8, dans lequel les tiges de guidage (19) s'étendent vers le haut à partir des surfaces supérieures des bacs de fabrication de glace. 25
10. Dispositif de fabrication de glace (2) selon la revendication 8, dans lequel des parties d'arbre d'entraînement (15) et des parties d'arbre de non-entraînement (16) sont ménagées aux deux extrémités des bacs de fabrication de glace, les parties d'arbre d'entraînement (15) des bacs de fabrication de glace sont montées sur des parties de maintien (22A, 22B) respectivement au niveau d'une partie supérieure et d'une partie inférieure du mécanisme de rotation (20). 30
35
40
11. Réfrigérateur (100), comprenant le dispositif de fabrication de glace (2) selon l'une quelconque des revendications 1 à 10 et un récipient de stockage (70) disposé sous ce dispositif de fabrication de glace (2). 45

50

55

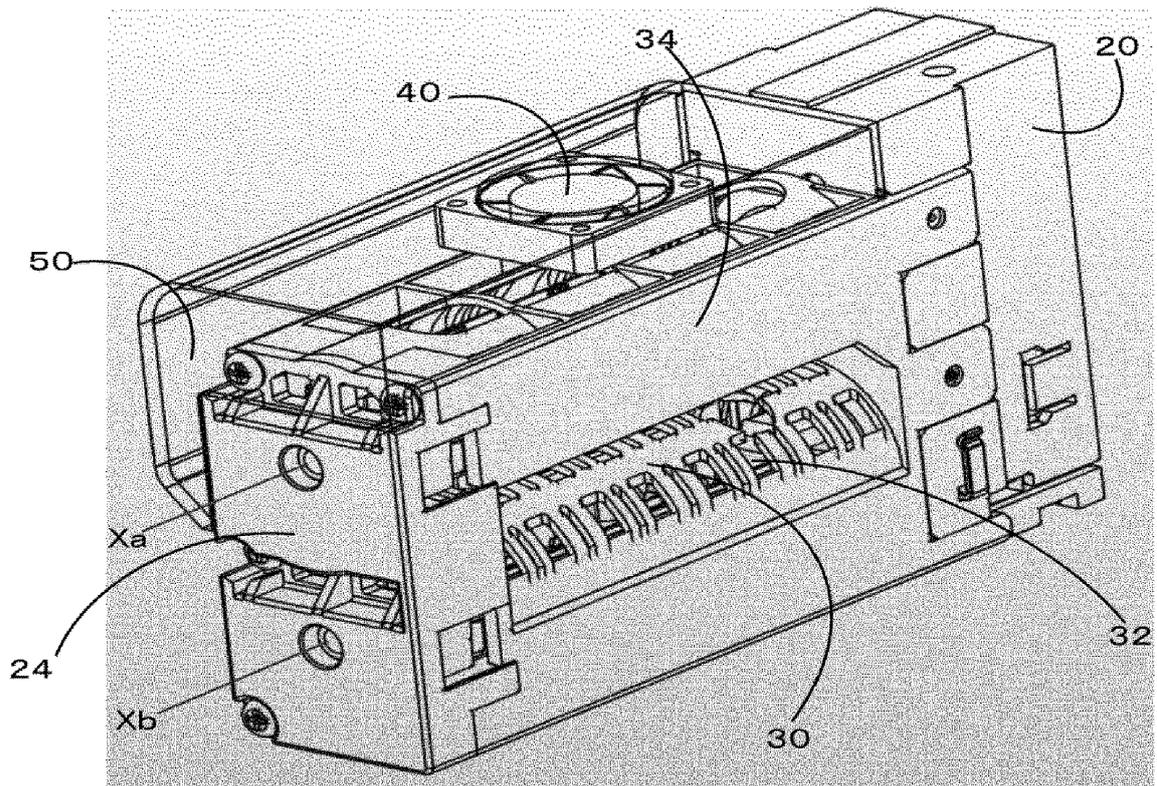


FIG.1

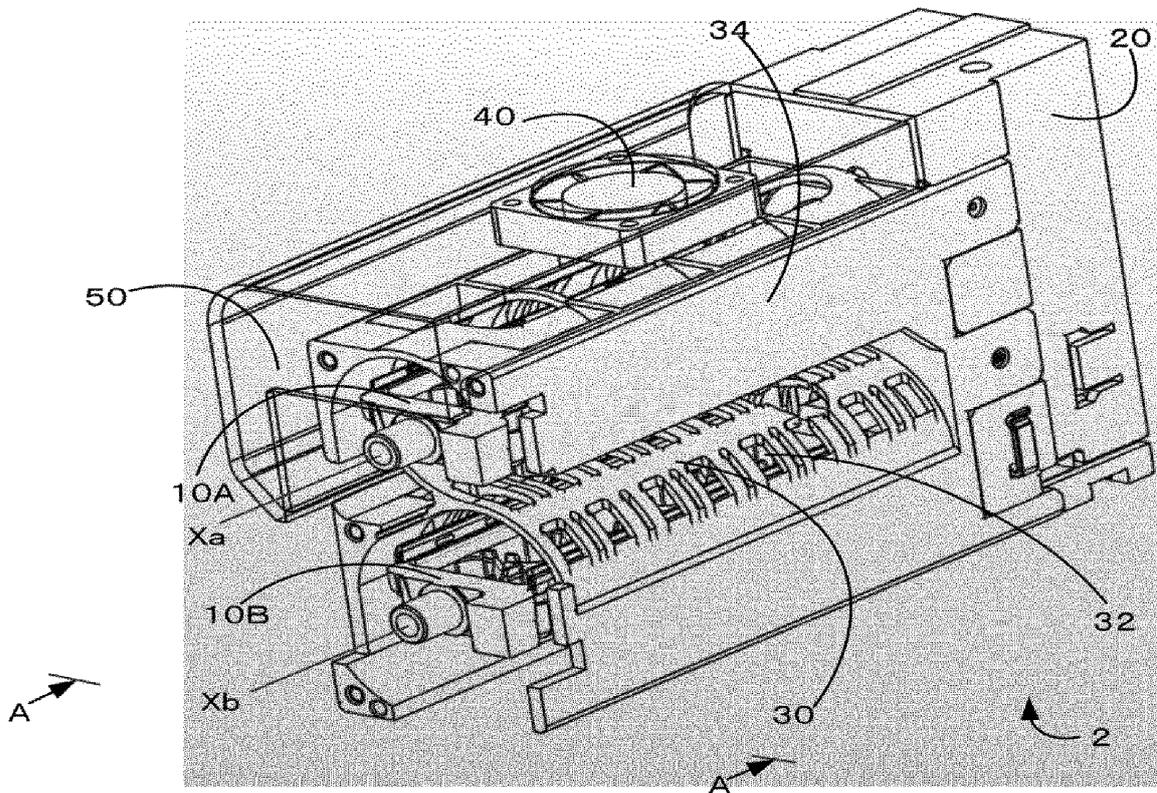


FIG.2

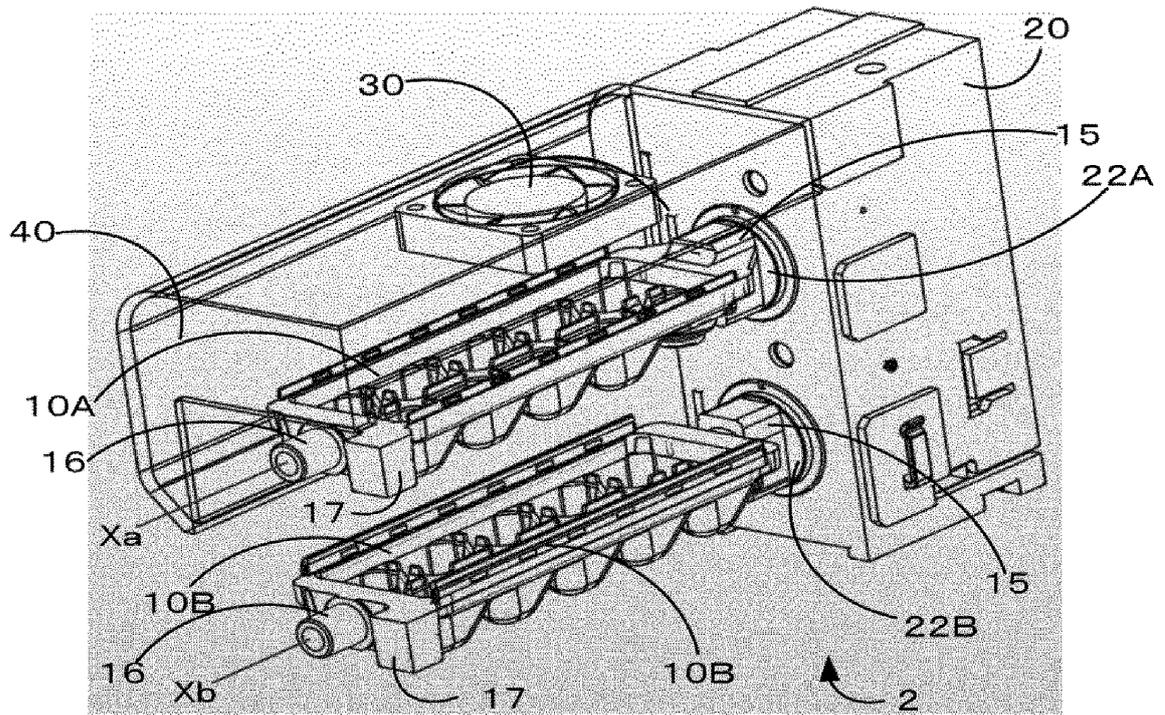


FIG.3

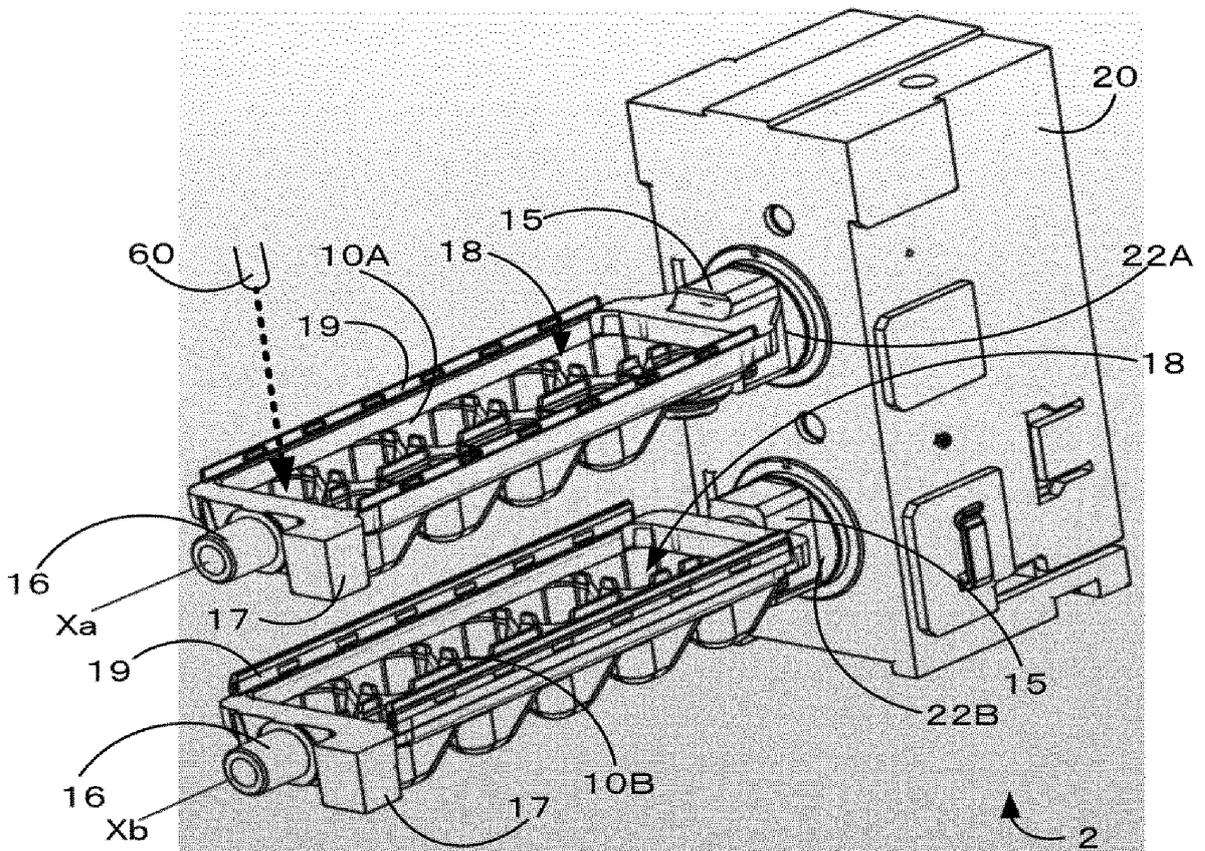


FIG.4

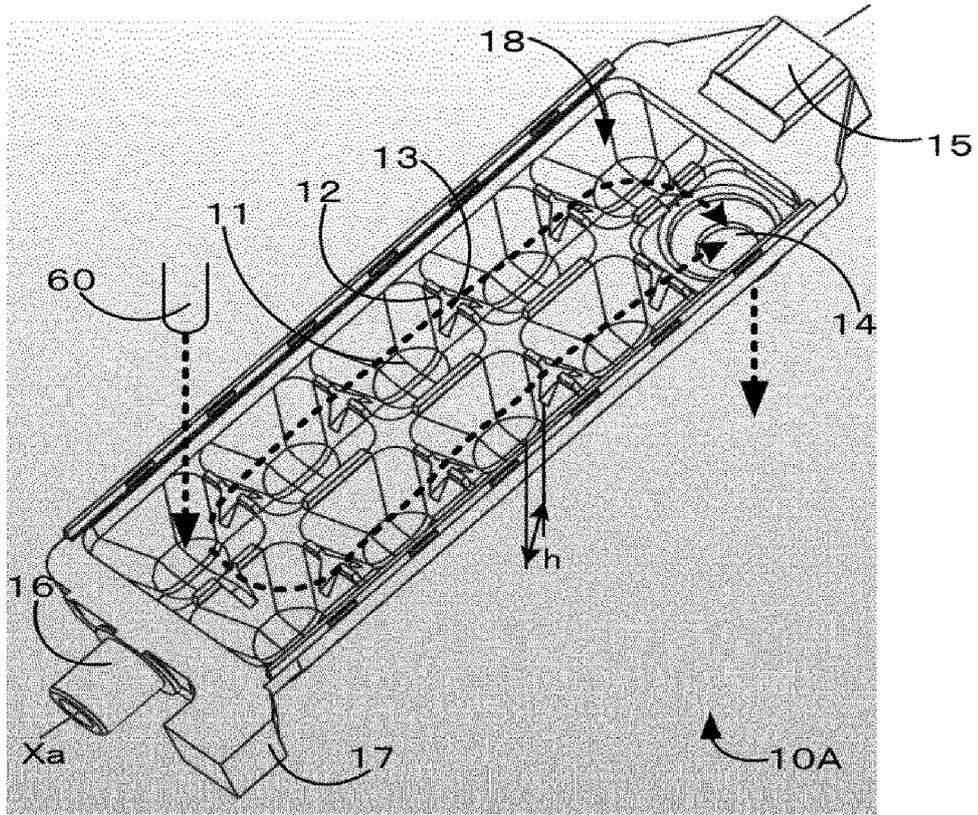


FIG. 6

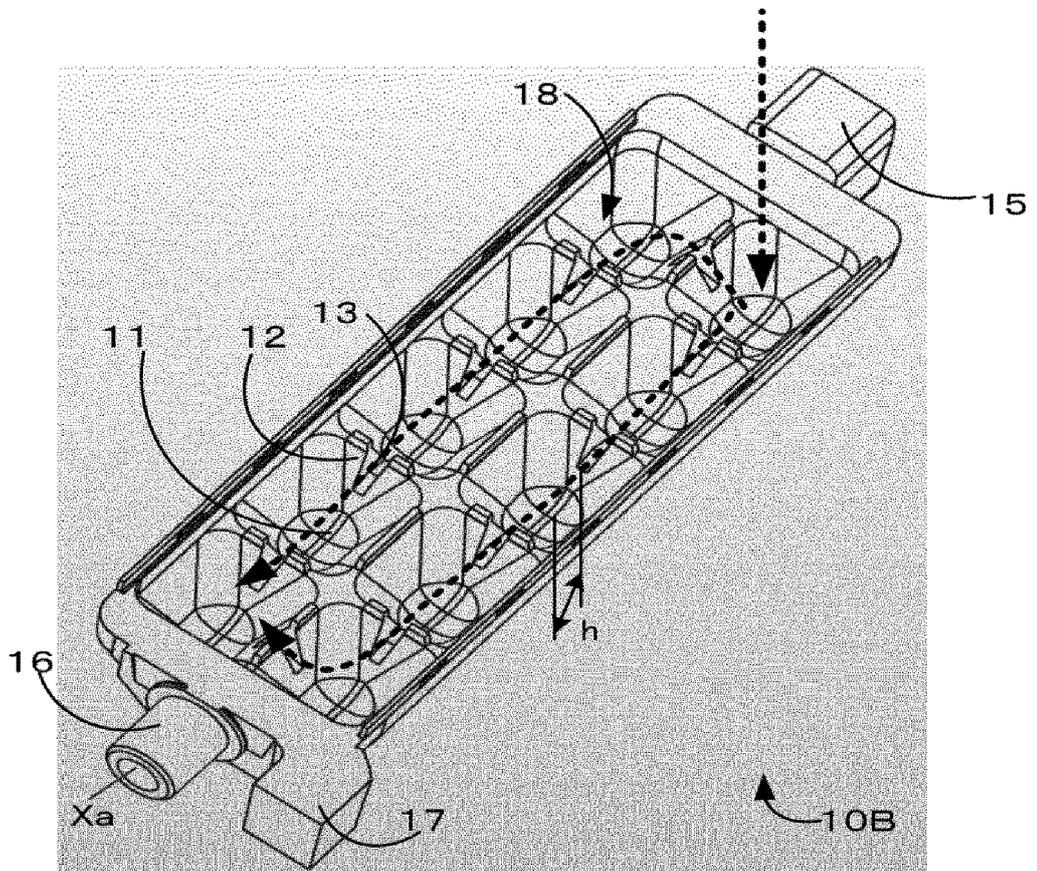


FIG.7

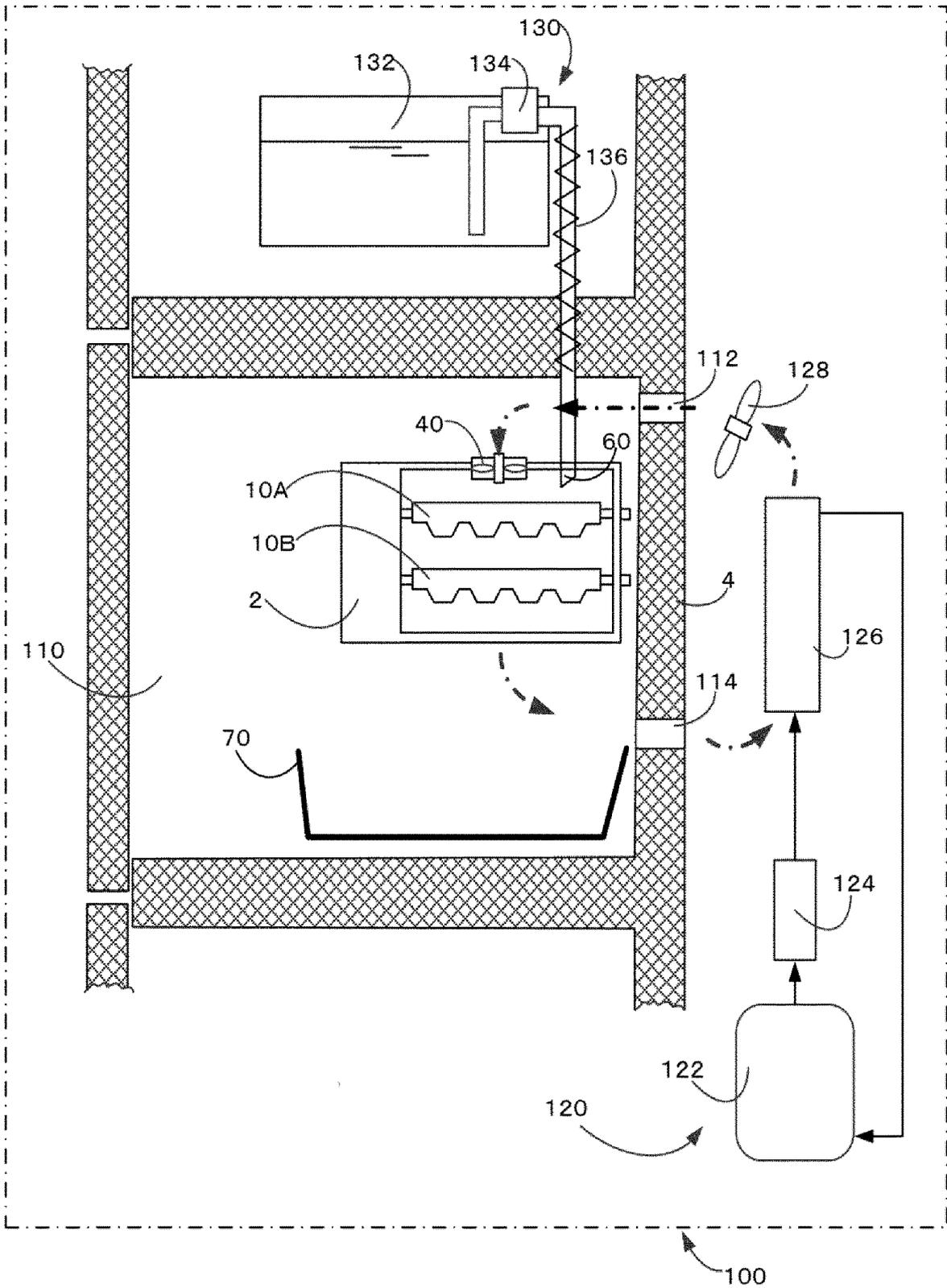


FIG.8

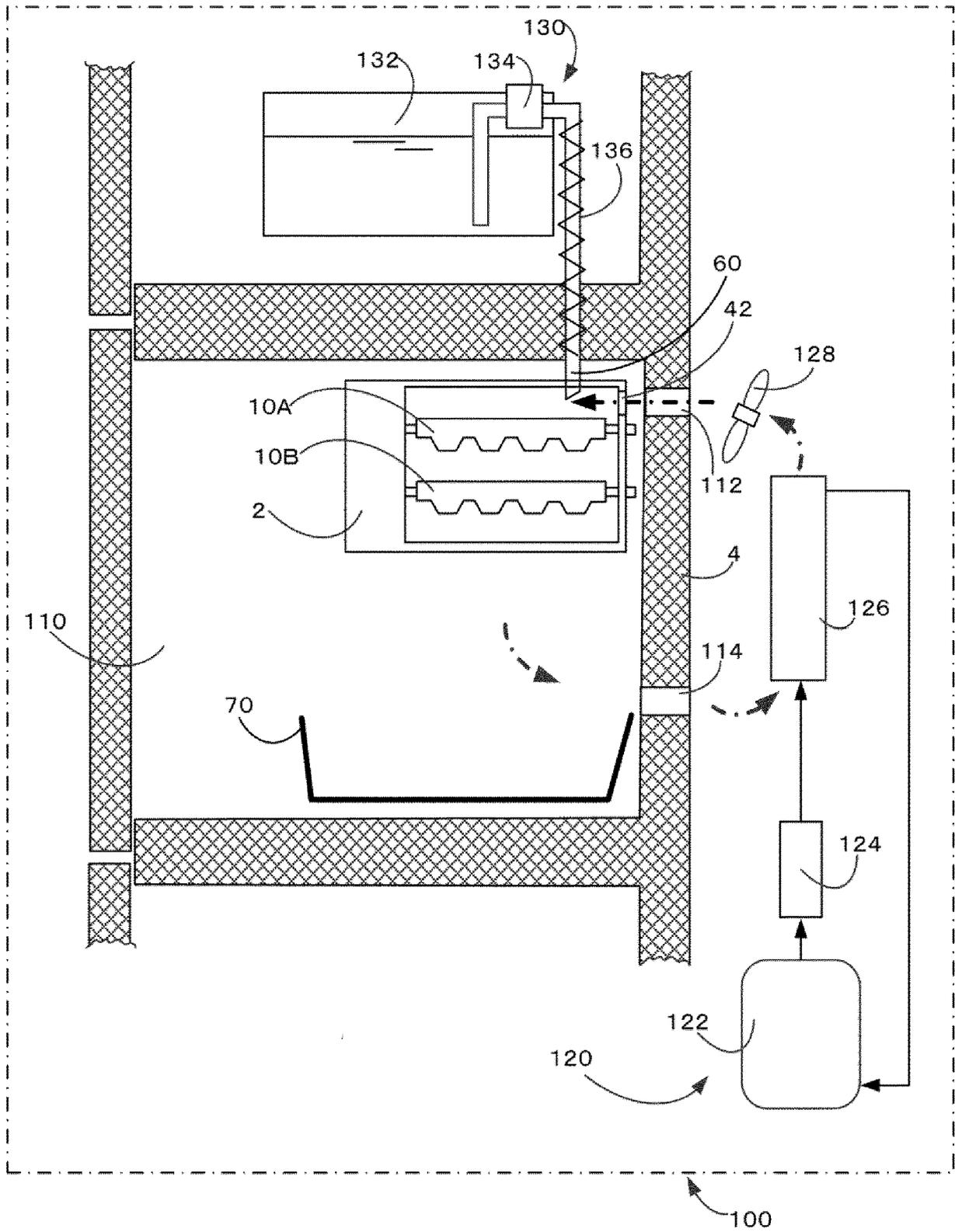


FIG.9

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 2007283714 A1 [0003]
- US 2008295539 A1 [0004]
- US 5237837 A [0005]
- CA 2253645 A1 [0006]
- KR 20090007326 U [0006]
- JP 2017161086 A [0006]
- JP 2003279221 A [0007]