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(54) ICE-MAKING DEVICE AND REFRIGERATOR WITH SAME

(57) Disclosed are an ice-making device capable of supplying more ice while suppressing a decrease in the storage rate of a refrigerator, and a refrigerator with same. The ice-making device (2) is provided with a plurality of ice-making discs (10A, 10B) that are arranged at high and low positions, and a rotating mechanism, wherein the rotating mechanism can enable the plurality of ice-making discs (10A, 10B) to rotate, and rotation between an ice-making position where a liquid can be stored and accumulated and an ice-releasing position where formed ice is enabled to be released and drop down can be achieved; and a cover (30) is provided on an upper portion of the ice-making disc (10B) located at the low position, and the cover (30) is used for guiding ice that drops from the ice-making disc (10A) located at the high position such that same drops down from a side of the ice-making disc (10B) located at the low position.

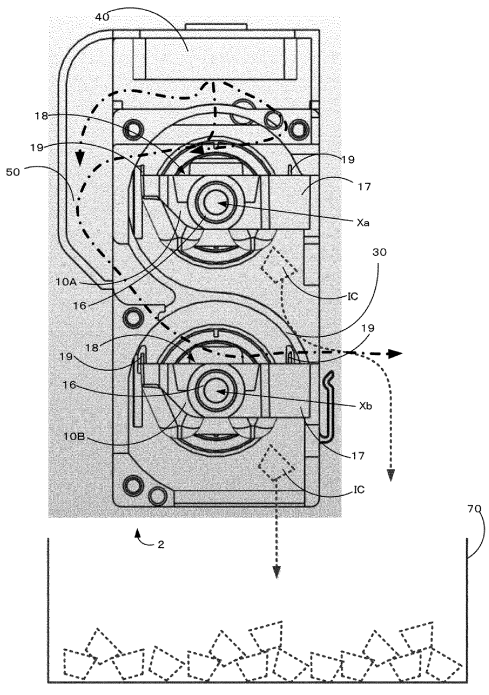

FIG.5

EP 4 033 182 A1

Description

TECHNICAL FIELD

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

BACKGROUND

[0002] A refrigerator having an ice-making device for making ice using an ice-making disc is widely used. An ice-making device which has a plurality of ice-making discs 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 discs 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.

(Prior art document)

(Patent document)

[0003] Patent document 1: JP publication No. 2003-279221.

[0004] Compared with one ice-making disc, a plane area of the plurality of ice-making discs in the refrigerator is directly proportional to a number of the ice-making discs, thus lowering a storage rate (i.e., a space utilization rate) of the refrigerator.

[0005] In view of this, the existing ice-making device and refrigerator are necessary to be improved to solve the above-mentioned problem.

SUMMARY

[0006] 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.

[0007] The present invention is directed to an ice-making device comprising a plurality of ice-making discs arranged up and down and a rotating mechanism, wherein the rotating mechanism is capable of rotating the plurality of ice-making discs between an ice making position where liquid can be stored and an ice release position where formed ice is released and dropped, a cover is provided at an upper portion of the lower ice-making disc, and the cover guides the ice falling from the upper ice-making disc to fall on a side of the lower ice-making disc.

[0008] According to the present invention, more ice can be supplied by means of a plurality of ice-making discs. Furthermore, since the plurality of ice-making discs are arranged up and down, when the ice-making discs 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 discs are arranged laterally. Since a cover is provided at an upper portion of a lower ice-making disc and configured to guide ice falling from an upper ice-making disc to fall on a side of the lower ice-making disc, even when the plurality of ice-making discs are arranged up and down, the ice from the upper ice-making disc does not interfere with the lower ice-making disc, but may fall into a storage container provided below the ice-making device.

[0009] As such, the present invention provides the ice-making device capable of supplying more ice while suppressing the reduction in the storage rate of the refrigerator.

[0010] 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 discs, and the air duct is provided on a side of the ice-making disc and connected between the upper space of the ice-making disc supplied with the gas from the gas supply portion and the upper space of another ice-making disc.

[0011] In the ice-making device according to the present invention, when gas is supplied to at least one ice-making disc from a gas supply portion including a fan or a gas suction port, the gas may also be supplied to another ice-making disc through an air duct provided on a side of the ice-making disc. Thus, liquid stored in the plurality of ice-making discs can be efficiently cooled with a small number of gas supply portions.

[0012] Further, the ice-making disc 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.

[0013] 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 disc, the liquid can also be supplied to another ice making region while stored in the ice making region.

[0014] 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 disc, 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 disc other than the ice making region provided with the liquid supply port.

[0015] 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 an uppermost ice-making disc, and a hole for dropping liquid is provided in a lower portion of at least one ice making region of the upper ice-making disc 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 discs without using special power.

[0016] The present invention is also directed to a refrigerator comprising the ice-making device.

[0017] As such, the refrigerator may supply more ice while suppressing the reduction in the storage rate.

[0018] 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

[0019]

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 discs 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 disc 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 discs 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 disc.

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

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.

Reference numerals

[0020]

2: ice-making device
10, 10A, 10B: ice-making disc
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

DETAILED DESCRIPTION

[0021] 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.

[0022] Hereinafter, the embodiment of the present invention will be described in detail based on the accompanying 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)

[0023] 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 discs 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 disc 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 discs 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 disc 10A. FIG. 7 is a perspective view of the lower ice-making disc 10B.

[0024] 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 has two ice-making discs 10A, 10B arranged up and down. The ice-making discs 10A, 10B are formed of a resin material having elasticity. The ice-making discs 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.

[0025] In the illustrated embodiment of the present invention, two ice-making discs 10A, 10B are provided, but the present invention is not limited thereto, and there may exist three or more ice-making discs provided up and down. In addition, in the present embodiment, the ice-making discs 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 discs 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 discs arranged up and down are overlapped.

[0026] As shown in FIG. 4, a liquid supply port 60 for supplying liquid to the ice-making disc 10A is provided above the upper ice-making disc 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 disc 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 disc 10 in the ice-making discs 10A, 10B will be briefly described in detail later as follows.

[0027] The liquid supplied from the liquid supply port 60 to one ice making region 11 of the upper ice-making disc 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 disc 10B through a hole 14 provided in one ice making region 11 of the upper ice-making disc 10A. Then, in the lower ice-making disc 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 discs 10A, 10B.

[0028] A fan 40 is provided above the upper ice-making disc 10A and configured to supply gas to an upper space of the ice-making disc 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 disc 10A. The ice-making device 2 has an air duct 50 provided on a side of the ice-making discs 10A, 10B and connected between the upper space of the upper ice-making disc 10A and an upper space of the lower ice-making disc 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 disc 10A and the upper space of the lower ice-making disc 10B. Thus, the liquid stored in the ice-making discs 10A, 10B is frozen and ice is formed. Flow of this gas is described in detail later with reference to FIG. 5.

[0029] The ice-making device 2 further has a rotating mechanism 20 for rotating the two ice-making discs 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 discs 10A, 10B. The driving shaft portions 15 of the ice-making discs 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 discs 10A, 10B are inserted into an upper hole and a lower hole of the bearing portion 24 respectively.

[0030] With such a configuration, the ice-making discs 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 discs 10A, 10B, there exists an ice making position where upper surfaces 18 of the ice-making discs 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 discs 10A, 10B, preferably, the upper surfaces 18 of the ice-making discs 10A, 10B are horizontal, but the upper surfaces 18 can be slightly inclined. Further, at the rotation position of the ice-making discs 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.

[0031] The upper surfaces 18 of the ice-making discs 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 discs 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 discs 10A, 10B is substantially stopped from rotating, and the driving shaft portion 15 side is continuously rotated. As such, the ice-making discs 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 discs 10A, 10B are simultaneously twisted downwards is the ice release position.

[0032] In the present embodiment, the rotating mechanism 20 has one electric motor, and the two ice-making discs 10A, 10B are rotated simultaneously by a gear transmission mechanism. However, the present inven-

tion is not limited thereto, and the two ice-making discs 10A, 10B can be rotated separately. Any known ice release mechanism can be used as a mechanism for rotating and twisting the ice-making discs 10A, 10B to release the ice. A travel way of the ice falling from the ice-making discs 10A, 10B is described in detail later with reference to FIG. 5.

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

[0033] As shown in FIGS. 6 and 7, the ice-making discs 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 discs 10A, 10B, the liquid can be stored in each ice making region 11 up to the height h.

<Upper Ice-making disc 10A>

[0034] 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 disc 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.

[0035] 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 disc 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 disc 10B>

[0036] For the lower ice-making disc 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 disc 10B is not provided with the ice making region 11 having the hole 14.

[0037] With the above arrangement of the slit 13, the liquid flowing from the upper ice-making disc 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 disc 10B. In the lower ice-making disc 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).

[0038] However, the above arrangement of the slits 13 in the ice-making discs 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 disc 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 disc 10A.

[0039] In addition, in a case of three or more ice-making discs 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 disc 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.

[0040] 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 discs 10A, 10B, the liquid can be supplied to another ice making region 11 while stored in the ice making region 11.

[0041] 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 disc 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 disc 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 discs 10A, 10B without using special power.

(Flow of gas)

[0042] 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 disc 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 disc 10A. The liquid stored in each ice making region 11 of the ice-making disc 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 disc 10A flows into the air duct 50, and the air duct 50 is provided on the side of the ice-making discs 10A, 10B and connected between the upper space of the upper ice-making disc 10A and the upper space of the lower ice-making disc 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.

[0043] Then, the gas flows from top to bottom in the air duct 50 and flows into the upper space of the lower ice-making disc 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 disc 10B. The liquid stored in each ice making region 11 of the ice-making disc 10B is cooled by this flow. Then, the gas flowing in the upper space of the ice-making disc 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.

[0044] In the present embodiment, the fan 40 is provided above the upper ice-making disc 10A, but the present invention is not limited thereto. For example, the fan 40 can be provided on the lower ice-making disc 10B side, and the gas may also flow from the lower ice-making disc 10B side to the upper ice-making disc 10A side by means of the air duct 50. Furthermore, in the case of three or more ice-making discs 10 arranged up and down, the fan 40 can be provided at one of the ice-making discs 10, or the fan 40 can be provided at a plurality of ice-making discs 10 having different heights.

[0045] 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 disc 10A, and the air duct 50 provided on the side of the ice-making discs 10A, 10B and connected between the upper space of the upper ice-making disc 10A and the upper space of the lower ice-making disc 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 disc 10A, the gas can be supplied to the other ice-making disc 10B through the air duct 50 provided on the side of the ice-making discs 10A, 10B. Thus, the liquid stored in the ice-making discs 10A, 10B can be efficiently cooled with a small number of fans 40.

<Variant>

[0046] 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. 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.

[0047] In FIG. 9, the ice-making device 2 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 disc 10A, the gas can be sucked into the upper space of one ice-making disc 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 disc 10A. In this way, the cold gas passing through the evaporator 126 can be directly sucked into the upper space of the ice-making disc 10A. In the case where the suction port 42 is provided on the side of the upper space of the ice-making disc 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.

[0048] 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 disc 10A, and the air duct 50 provided on the side of the ice-making discs 10A, 10B and connected between the upper space of the upper ice-making disc 10A and the upper space of the lower ice-making disc 10B.

(Falling of ice)

[0049] A following travel way of the ice released and dropped from the ice-making discs 10A, 10B after the ice-making discs 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 disc 10B directly falls into the storage container 70 provided below the ice-making device 2. On the

other hand, due to the lower ice-making disc 10B, the ice dropped from the upper ice-making disc 10A is unable to directly enter the storage container 70.

[0050] In the ice-making device 2 according to the present embodiment, the cover 30 is provided at an upper portion of the lower ice-making disc 10B and configured to guide the ice falling from the upper ice-making disc 10A to fall on the side of the lower ice-making disc 10B. Further, the cover 30 in the present embodiment has a curved surface. As such, the ice falling from the upper ice-making disc 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 disc 10A can be smoothly stored in the storage container 70 while damage to the ice and a machine is avoided.

[0051] However, the cover 30 does not necessarily have the curved surface, and can have any other shape as long as a traveling direction of the falling ice can be changed to an obliquely downward direction, so as to drop the ice on the side of the lower ice-making disc 10B. For example, by using a planar cover 30 with an inclined surface, the traveling direction of the falling ice can also be changed to the obliquely downward direction. Further, the cover 30 can have a shape with both the curved surface and the 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.

[0052] As above, since the cover 30 is provided at the upper portion of the lower ice-making disc 10B and configured to guide the ice falling from the upper ice-making disc 10A to fall on the side of the lower ice-making disc 10B, the ice of the ice-making discs 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 discs 10A, 10B are provided up and down can be 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)

[0053] FIG. 8 is a side sectional view illustrating one example of the refrigerator 100 having the ice-making device 2. 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.

[0054] The ice-making device 2 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 discs 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 disc 10A of the ice-making device 2.

[0055] 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. Apart 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 disc 10A. The gas sucked into the ice-making device 2 flows from the upper space of the upper ice-making disc 10A to the upper space of the lower ice-making disc 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 discs 10A, 10B is frozen to make ice.

[0056] As above, in the refrigerator 100 having the ice-making device 2 in which the ice-making discs 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 discs 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 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 disc 10A.

<Variant>

[0057] 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 discs 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 disc is scattered due to opening and closing operations of the door.

[0058] 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 discs 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 discs 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 discs 10A, 10B along inner surfaces of the guide rods 19. By this guide rod 19, the liquid in the ice-making discs 10A, 10B can be prevented from spilling outwards even when the door is opened and closed.

[0059] Since the protrusions of the ice-making discs 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 discs 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 the above embodiment in the door, since the guide rods 19 extending upwards from the upper surfaces 18 of the ice-making discs 10A, 10B are provided on both side surfaces in the longer direction of the ice-making discs 10A, 10B, the liquid in the ice-making discs 10A, 10B can be effectively prevented from being splashed with the opening and closing operations of the door.

(Other embodiments)

[0060] (1) A plurality of pieces of ice are made with the ice making regions 11 of the ice-making discs 10A, 10B in the above embodiment, but there may exist an ice crusher below the ice-making device 2 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 independent of the refrigerator may also be realized when there exists a cooling mechanism dedicated to the ice-making device 2.

[0061] So far, a person skilled in the art shall know that although a plurality of exemplary embodiments of the present invention have been described above in detail, various variations and improvements can be directly determined or deducted from the content disclosed by the present invention without departing from the spirit and scope of the present invention. Therefore, all those variations and improvements shall be deemed to be covered by the scope of the present invention.

Claims

1. An ice-making device, comprising: a plurality of ice-making discs arranged up and down and a rotating mechanism, wherein the rotating mechanism is capable of rotating the plurality of ice-making discs between an ice making position where liquid can be stored and an ice release position where formed ice is released and dropped, a cover is provided at an upper portion of the lower ice-making disc, and the cover guides the ice falling from the upper ice-making disc to fall on a side of the lower ice-making disc.

2. The ice-making device according to claim 1, 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 discs, and the air duct is provided on a side of the ice-making disc and connected between the upper space of the ice-making disc supplied with the gas from the gas supply portion and the upper space of another ice-making disc.

3. The ice-making device according to claim 1 or 2, wherein the ice-making disc 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.

4. The ice-making device according to claim 3, 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 disc, 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 disc other than the ice making region provided with the liquid supply port.

5. A refrigerator, comprising the ice-making device according to any one of claims 1 to 4.

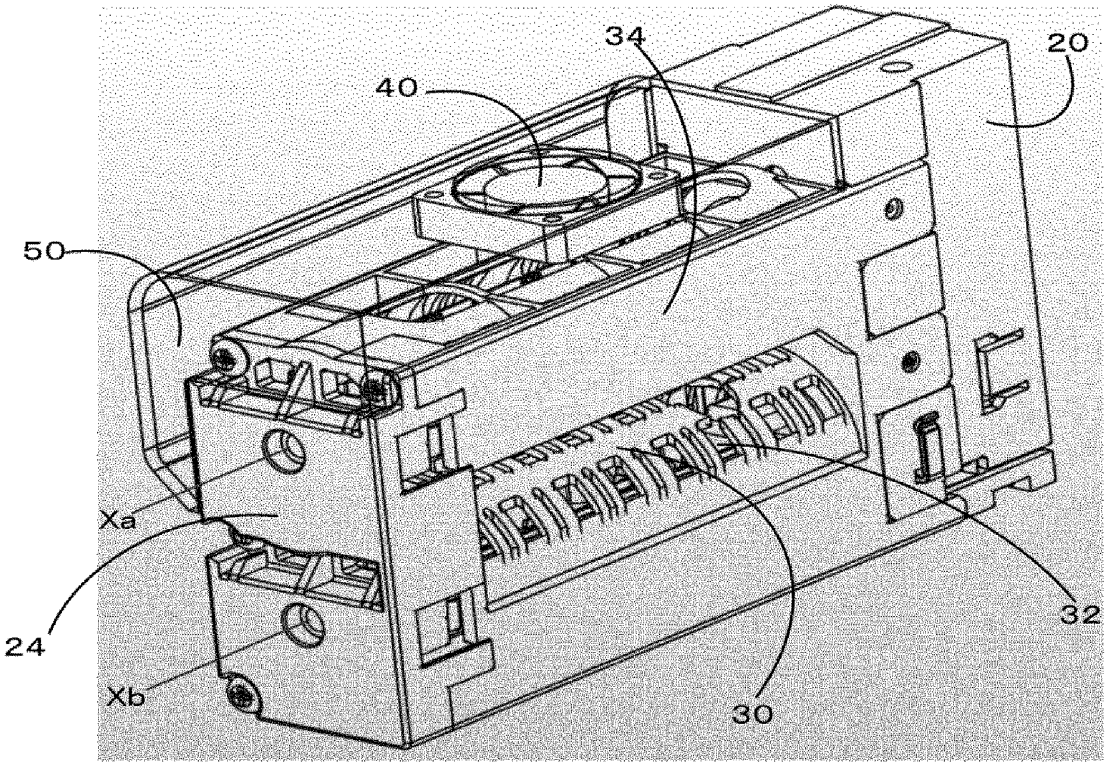

FIG.1

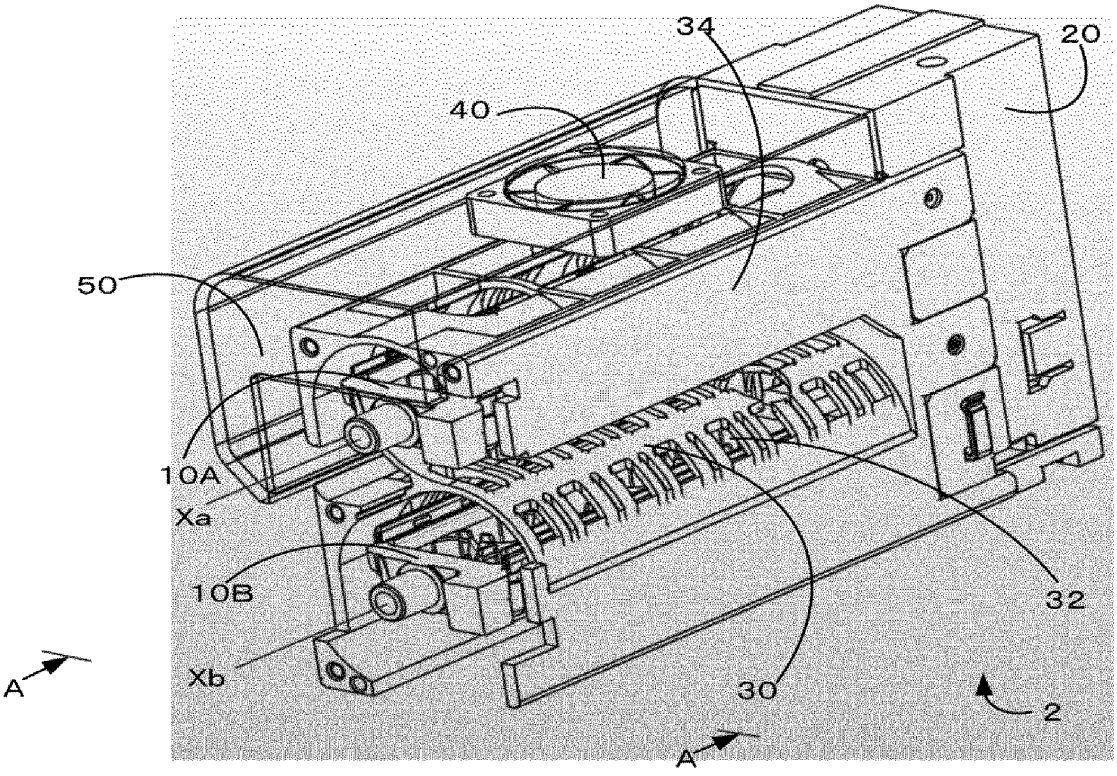

FIG.2

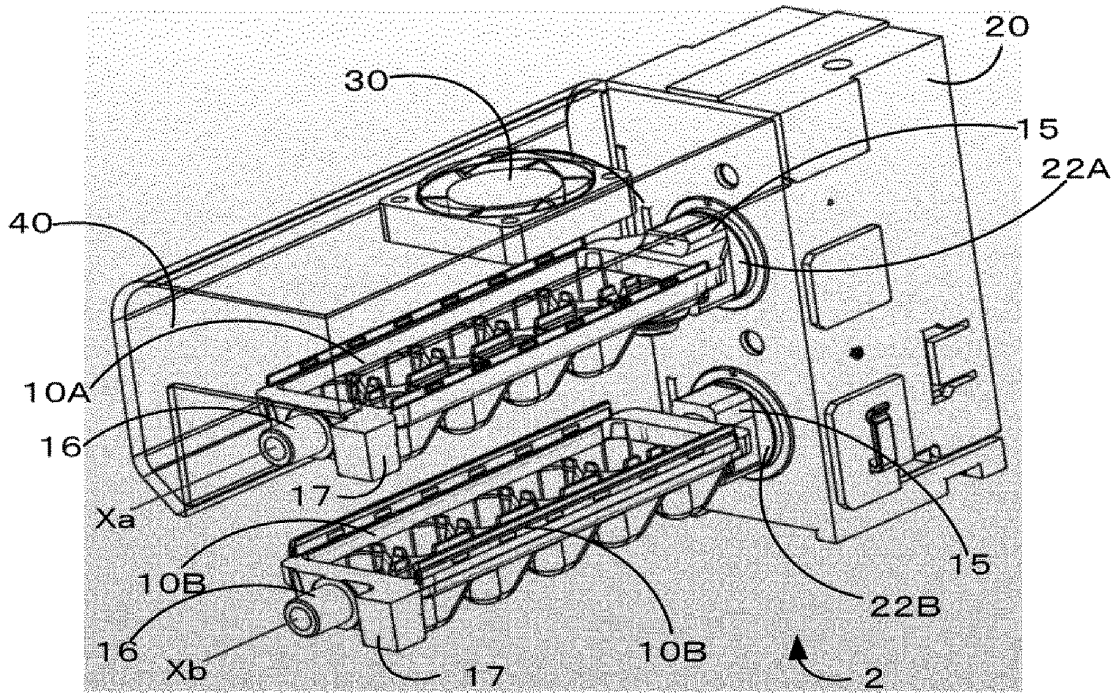
20
30
15
22A
40
10A
16
17
Xa
15
10B
22B
16
Xb
17
10B
2

FIG.3

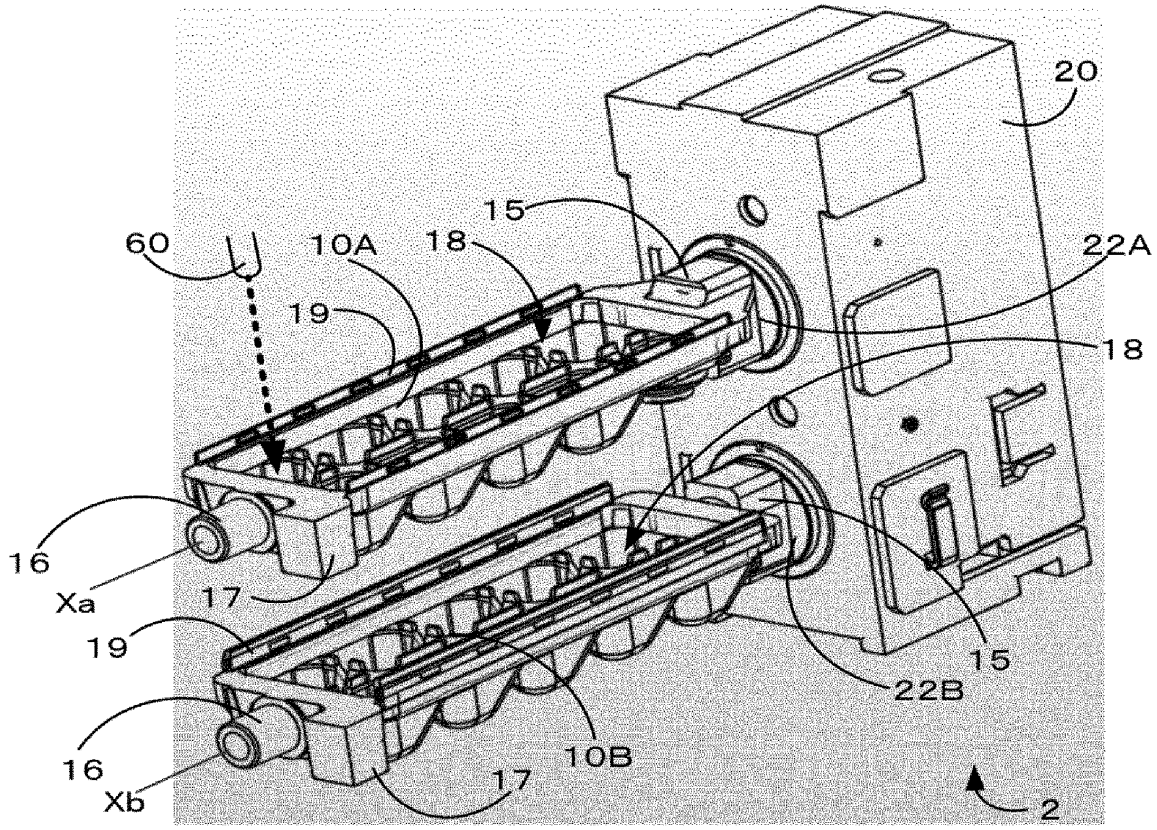
20
15
60
10A
18
22A
19
18
16
Xa
17
19
15
22B
16
Xb
17
10B
2

FIG.4

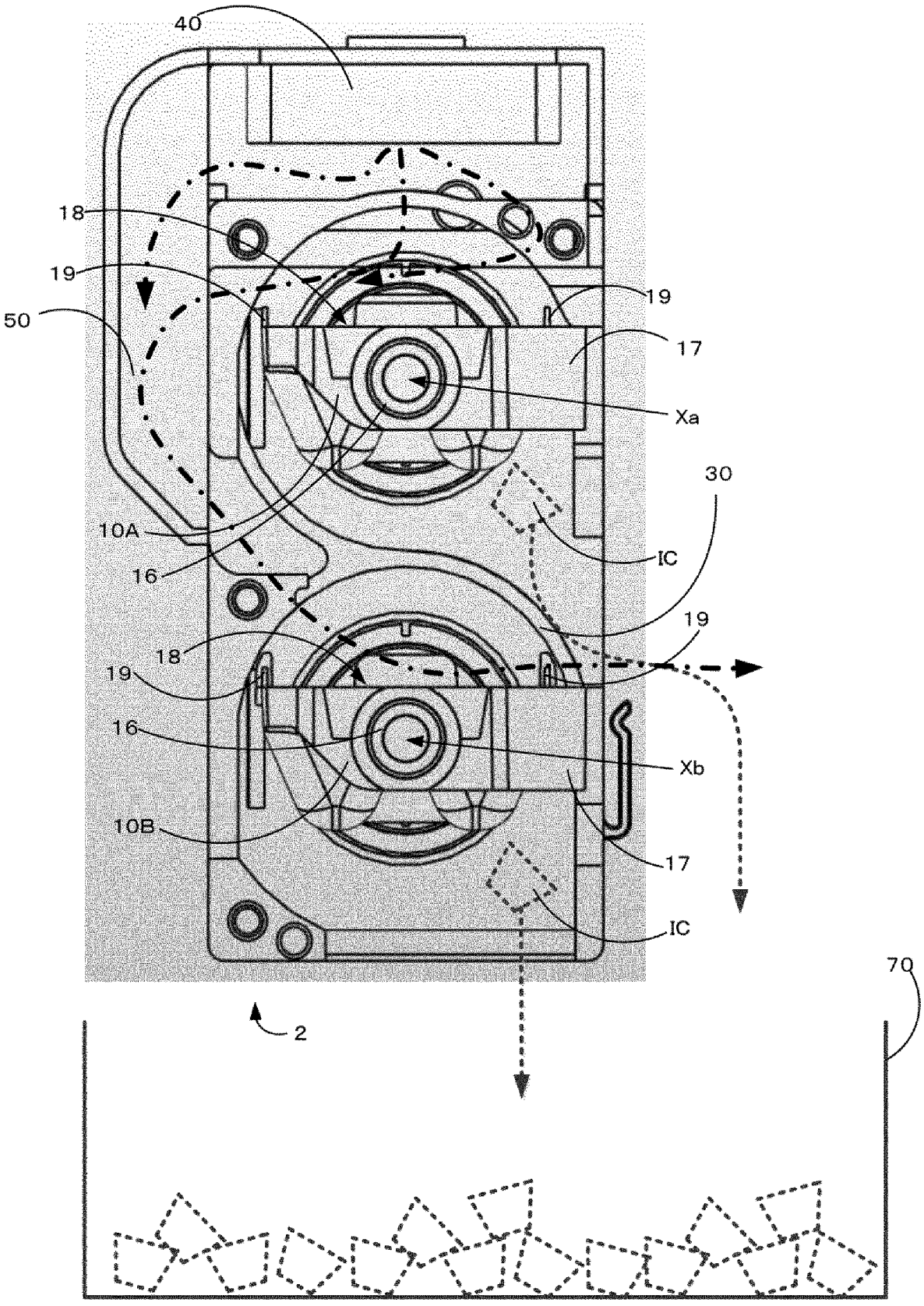

FIG.5

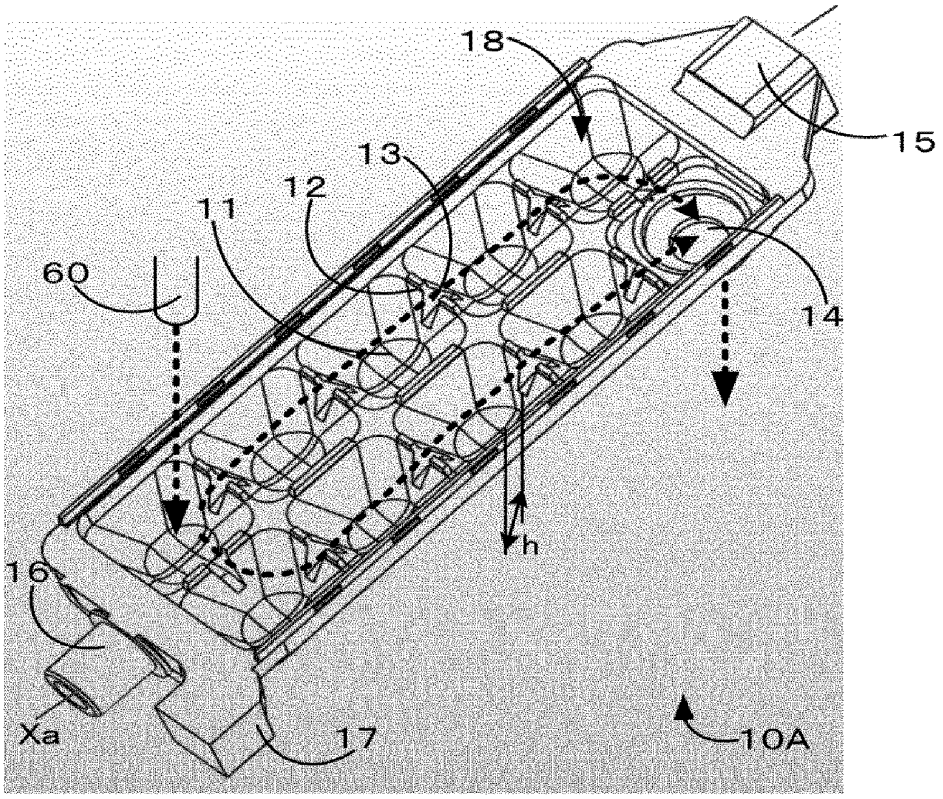

FIG.6

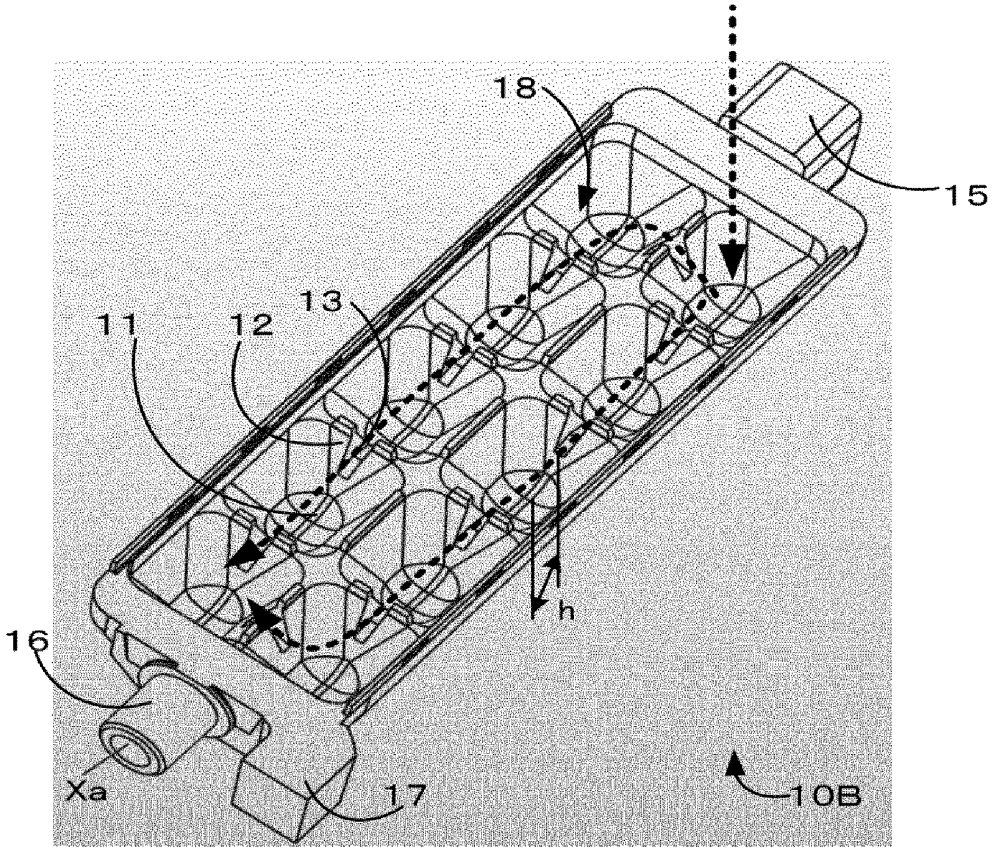

FIG.7

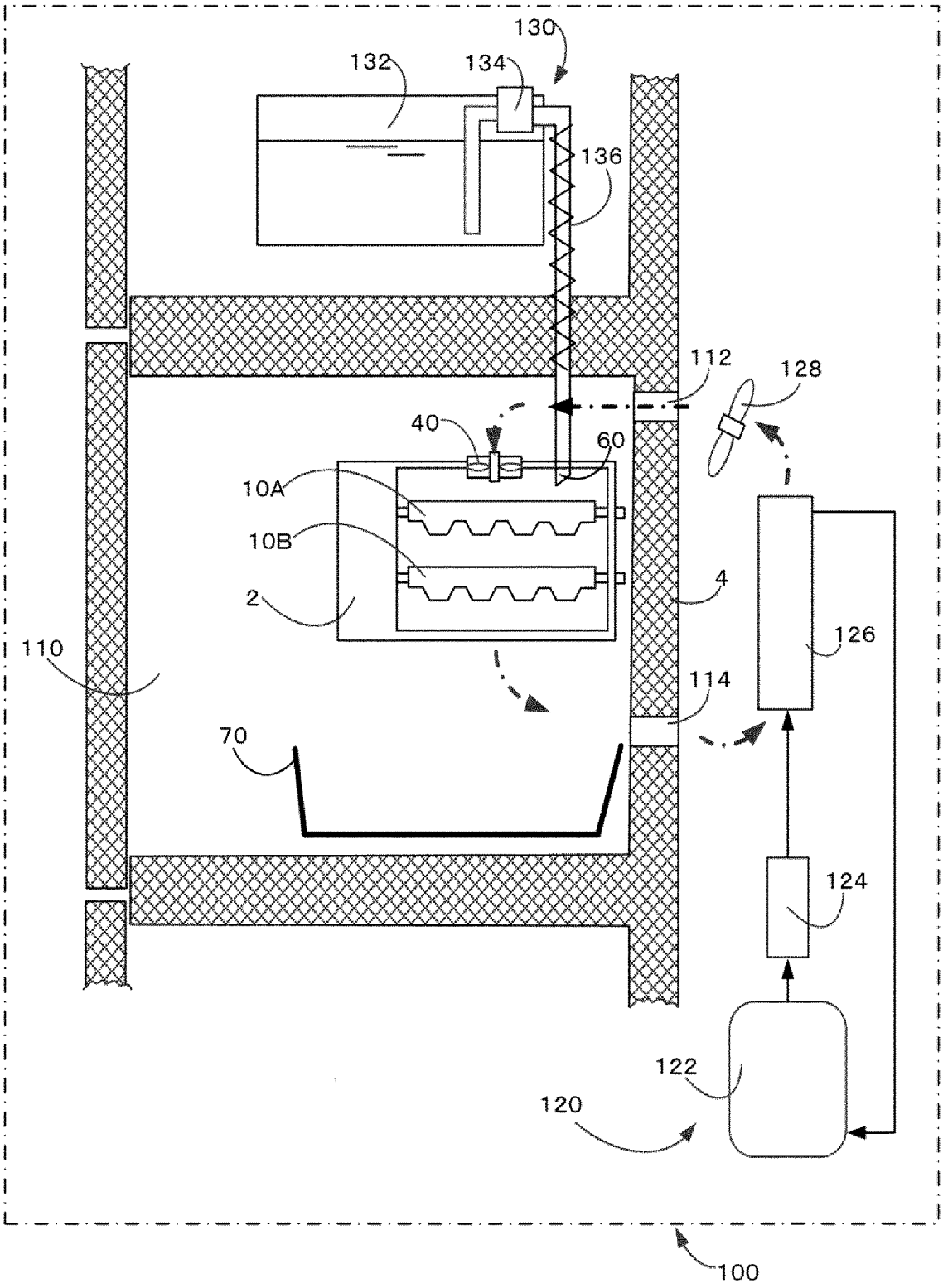
130
132
134
136
112
128
40
60
10A
10B
2
4
110
126
114
70
124
122
120
100

FIG.8

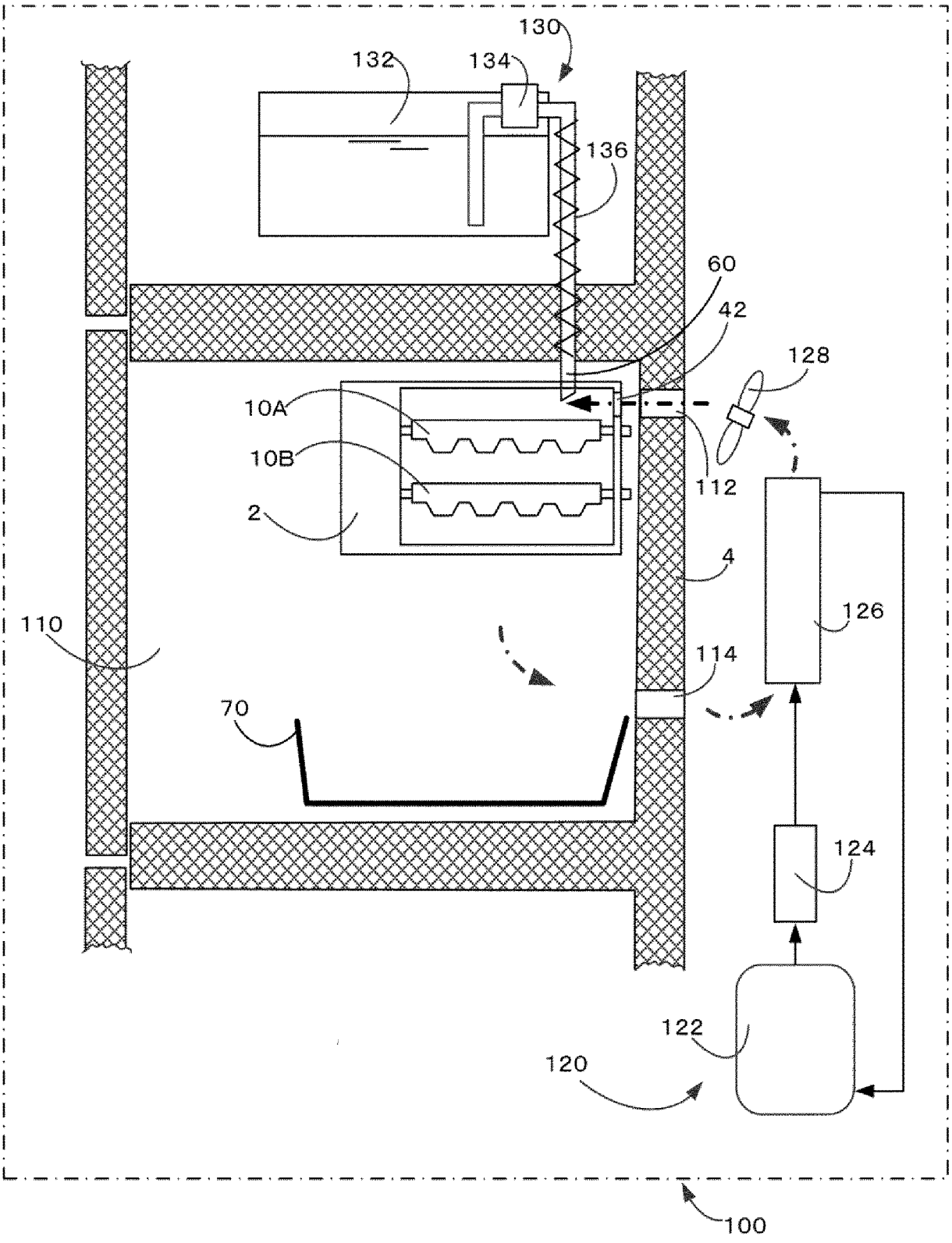
130
132
134
136
60
42
128
10A
10B
2
112
4
110
126
114
70
124
122
120
100

FIG.9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2020/115756

A. CLASSIFICATION OF SUBJECT MATTER

F25C 1/24(2018.01)i; F25C 5/185(2018.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F25C

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

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

DWPI; CNABS; CNTXT; SIPOABS; Patentics: 海尔, 制冰, 冰盘, 冰块, 冰盒, 冰格, 制冰机, 冰箱, 冰柜, 倾, 旋, 转, 上, 下, 盖, 罩, 水, 液, 孔, ice, freez+, making, mould, tray, cover, lid, rotat+, pivot+, tilt+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 101082458 A (LG ELECTRONICS INC.) 05 December 2007 (2007-12-05) description, pages 5-9, and figures 1-4	1-5
Y	CN 101868679 A (HOSHIZAKI ELECTRIC CO., LTD.) 20 October 2010 (2010-10-20) description, paragraph [0041], and figure 5	1-5
A	CN 107850365 A (SAMSUNG ELECTRONICS CO., LTD.) 27 March 2018 (2018-03-27) entire document	1-5
A	CN 110832261 A (SHARP CORPORATION) 21 February 2020 (2020-02-21) entire document	1-5
A	CN 101375117 A (LG ELECTRONICS INC.) 25 February 2009 (2009-02-25) entire document	1-5
A	CN 101896782 A (LG ELECTRONICS INC.) 24 November 2010 (2010-11-24) entire document	1-5
A	CN 101490486 A (LG ELECTRONICS INC.) 22 July 2009 (2009-07-22) entire document	1-5
A	US 2009178431 A1 (SAMSUNG ELECTRONICS CO., LTD.) 16 July 2009 (2009-07-16) entire document	1-5

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

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"P" document published prior to the international filing date but later than the priority date claimed
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 November 2020	**18 December 2020**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China**	Authorized officer
Facsimile No. **(86-10)62019451**	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2020/115756

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				CN	101082458	B	01 September 2010
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				AU	2016339616	B2	15 August 2019
				US	10365026	B2	30 July 2019
				US	2017108258	A1	20 April 2017
				EP	3295099	A1	21 March 2018
				AU	2016339616	A1	04 January 2018
CN	110832261	A	21 February 2020	TW	I652438	B	01 March 2019
				JP	WO2019012715	A1	21 May 2020
				WO	2019012715	A1	17 January 2019
				TW	201908674	A	01 March 2019
CN	101375117	A	25 February 2009	CN	101375117	B	11 May 2011
				KR	100792069	B1	04 January 2008
				CN	101097106	A	02 January 2008
				CN	101097106	B	29 September 2010
				US	2008006048	A1	10 January 2008
				KR	20080001321	A	03 January 2008
CN	101896782	A	24 November 2010	KR	20090063655	A	18 June 2009
				EP	2223026	A1	01 September 2010
				KR	101482256	B1	13 January 2015
				CN	101896782	B	11 January 2012
				WO	2009078583	A1	25 June 2009
				US	2010269532	A1	28 October 2010
				EP	2223026	B1	15 August 2018
CN	101490486	A	22 July 2009	EP	3296667	A1	21 March 2018
				KR	100863389	B1	13 October 2008
				EP	3296668	A1	21 March 2018
				EP	2054681	B1	08 August 2018
				KR	20080018304	A	28 February 2008
				EP	3406991	A1	28 November 2018
				US	8689578	B2	08 April 2014
				US	2010037646	A1	18 February 2010
				WO	2008023911	A1	28 February 2008
				EP	2054681	A1	06 May 2009
				CN	101490486	B	13 April 2011
US	2009178431	A1	16 July 2009	US	8443619	B2	21 May 2013
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