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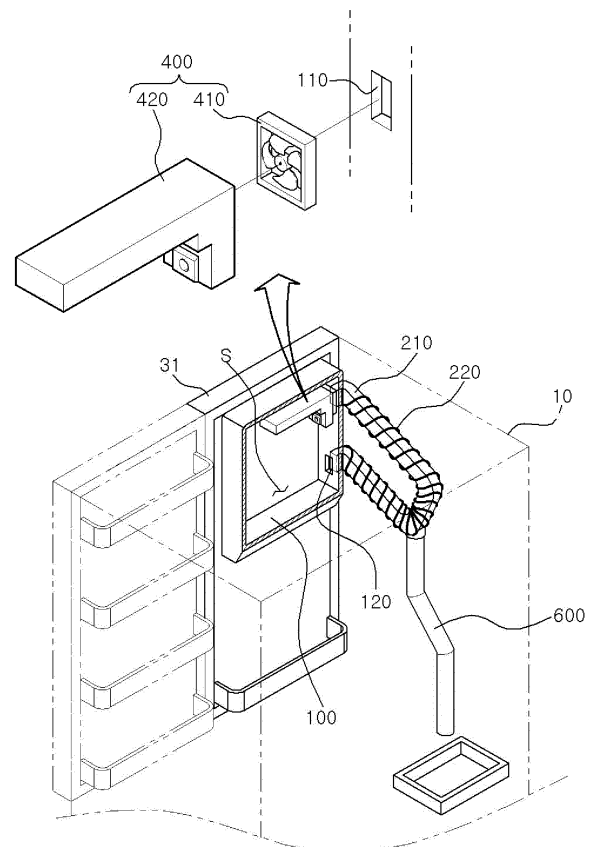
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(54) **ICE-MAKING DEVICE**

(57) An ice making device for a refrigerator including a cold air generation system and a circulation unit. An ice maker is disposed within an ice-making room and configured to produce ice. The cold air generation system can supply cold air to the ice-making room in the ice making device. A circulation unit is disposed within the ice-making room to drive cold air into the ice-making room. The circulation unit may include a fan motor and an air guide.

FIG. 2



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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is based on and claims priority from Korean Patent Application No. 10-2016-0053263, filed on April 29, 2016, the disclosure of which is incorporated herein in its entirety by reference for all purposes.

TECHNICAL FIELD

[0002] Embodiments of the present disclosure relate to an ice-making device.

BACKGROUND

[0003] A refrigerator is an appliance used for storing food or other times at low temperature, e.g., in a frozen state or refrigerated.

[0004] The interior of the refrigerator is cooled by cold air circulating therein. Cold air can be continuously generated as a refrigerant recycles through compression, condensation, expansion and evaporation. Cold air supplied in the refrigerator is uniformly distributed by convection.

[0005] In general, a top-mount-type refrigerator has a freezer located on top of a refrigeration compartment. In contrast, a bottom-freezer-type refrigerator has a freezer located under the refrigeration compartment. This enables a user to conveniently access the refrigeration compartment. On the other hand, this may be inconvenient for a user to access the freezer, if the user has to bend or lower his or her body to reach, e.g., to take out ice pieces.

[0006] Some bottom-freezer-type refrigerators have an ice dispenser disposed in a refrigeration compartment door located at the upper side of the refrigerator. As the ice-making device is also disposed in the door of the refrigeration compartment, cooling efficiency of the ice-making device typically is unsatisfactory.

SUMMARY

[0007] Embodiments of the present disclosure provide an ice-making device for a refrigerator that offers improved cooling efficiency.

[0008] According to one embodiment, an ice making device includes an ice-making room having an internal space; a cold air generation system configured to supply a cold air into the ice-making room; an ice maker disposed within the ice-making room and configured to produce ice; a circulation unit disposed within the ice-making room to circulate the cold air supplied into the ice-making room, wherein the circulation unit includes a fan motor configured to blow the cold air and an air guide configured to guide the cold air blown by the fan motor along a moving route.

[0009] The air guide may include: a first route portion

configured to guide the cold air toward an inside of the ice maker; and a second route portion configured to guide the cold air toward an outside of the ice maker.

[0010] The first route portion may face an upper surface of the ice maker and have at least one first cold air flow hole formed on one surface of the first route portion facing the upper surface of the ice maker.

[0011] The second route portion may face a side surface of the ice maker and have at least one second cold air flow hole formed on one surface of the second route portion.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Fig. 1 is a perspective view illustrating the configuration of an exemplary refrigerator according to one embodiment of the present disclosure.

Fig. 2 is a partial perspective view illustrating the configuration of the exemplary refrigerator according to one embodiment of the present disclosure.

Fig. 3 is a configuration view illustrating the configuration of an exemplary ice-making device according to one embodiment of the present disclosure, which is viewed from the interior of the refrigerator.

Fig. 4 is a block diagram illustrating an exemplary cold air generation system disposed in the ice-making device according to one embodiment of the present disclosure.

Fig. 5 is a perspective view of an air guide in the exemplary ice-making device according to one embodiment of the present disclosure.

Fig. 6 is a bottom perspective view of the air guide in the exemplary ice-making device according to one embodiment of the present disclosure.

Fig. 7 illustrates a state in which cold air circulates through the ice-making device according to one embodiment of the present disclosure.

DETAILED DESCRIPTION

[0013] In the following detailed description, reference is made to the accompanying drawings, which form a part hereof. The illustrative embodiments described in the detailed description, drawings, and claims are not meant to be limiting. Other embodiments may be utilized, and other changes may be made, without departing from the spirit or scope of the subject matter presented here.

[0014] One or more exemplary embodiments of the present disclosure will be described more fully hereinafter with reference to the accompanying drawings, in which one or more exemplary embodiments of the disclosure can be easily determined by those skilled in the art. As those skilled in the art will realize, the described exemplary embodiments may be modified in various different ways, all without departing from the spirit or scope of the present disclosure, which is not limited to the ex-

emplary embodiments described herein.

[0015] It is noted that the drawings are schematic and are not necessarily dimensionally illustrated. Relative sizes and proportions of parts in the drawings may be exaggerated or reduced in size, and a predetermined size is merely exemplary and not limiting. The same reference numerals designate the same structures, elements, or parts illustrated in two or more drawings in order to exhibit similar characteristics.

[0016] The exemplary drawings of the present disclosure illustrate ideal exemplary embodiments of the present disclosure in more detail. As a result, various modifications of the drawings are expected. Accordingly, the exemplary embodiments are not limited to a specific form of the illustrated region, and for example, may include a modification of form due to manufacturing.

[0017] Preferred embodiments of the present disclosure will now be described in detail with reference to the accompanying drawings.

[0018] Fig. 1 is a perspective view of a refrigerator 1 according to one embodiment of the present disclosure. Fig. 2 is a partial perspective view of the refrigerator 1 according to one embodiment of the present disclosure. Fig. 3 is a configuration view of an ice-making device 2 according to one embodiment of the present disclosure, which is viewed from the interior of the refrigerator 1. Fig. 4 is a block diagram illustrating a cold air generation system 200 in the ice-making device 2 according to one embodiment of the present disclosure.

[0019] Referring to Figs. 1 to 4, the refrigerator 1 according to one embodiment of the present disclosure may include an ice-making device 2 configured to produce ice, a refrigerator main body 10 constituting an outer body, and refrigerator doors 30 disposed on a front surface of the refrigerator main body 10 and configured to selectively open and close the refrigerator main body 10. Herein detailed descriptions of the embodiments are made with reference to a bottom-freezer-type refrigerator in which a refrigeration compartment 11 is positioned at an upper side and a freezer 12 is positioned at a lower side. However, it will be appreciated that the present disclosure can be applied in various types of refrigerators that are well known in the art.

[0020] The refrigerator main body 10 may include an upper refrigeration compartment 11 and a lower freezer 12 divided by a barrier 20.

[0021] The refrigerator doors 30 may selectively open and close the refrigeration compartment 11 and the freezer 12. For example, the refrigerator doors 30 may include a refrigeration compartment door 31 configured to selectively seal the refrigeration compartment 11 and a freezer door 32 configured to selectively seal the freezer 12.

[0022] The ice-making device 2 can produce ice and may be installed in the refrigerator 1. The ice-making device 2 may include, for example, an ice-making room 100, a cold air generation system 200, an ice maker 300 and a circulation unit 400.

[0023] The ice-making room 100 includes an outer

shell that defines an internal space S. The ice-making room 100 may be disposed in, for example, the refrigeration compartment door 31 of the refrigerator 1. However, the location of the ice-making room 100 may vary in different embodiments.

[0024] Cold air may be supplied to the ice-making room 100. For example, the ice-making room 100 may communicate with the cold air generation system 200 and may receive cold air from the cold air generation system 200. For this purpose, the ice-making room 100 may include an intake port 110 and an exhaust port 120 for cold air. Cold air generated in the cold air generation system 200 may be introduced into the ice-making room 100 through the intake port 110. Cold air circulates through the interior of the ice-making room 100 and may be supplied back to the cold air generation system 200 through the exhaust port 120 and may be cooled again. To increase the efficiency of cold air circulation, the intake port 110 may be positioned higher than the exhaust port 120.

[0025] The cold air generation system 200 can supply cold air to the ice-making room 100. The cold air generation system 200 may be disposed in the refrigerator main body 10, for example, in the lower sidewall of the refrigerator main body 10.

[0026] The cold air generation system 200 may include, for example, a cooling duct 210 disposed in a sidewall of the refrigerator main body 10 as a cooling flow path, an evaporation coil 220 surrounding at least a portion of the cooling duct 210 to generate cold air through heat exchange with a refrigerant, a compressor 230 configured to convert the refrigerant discharged from the evaporation coil 220 to a gas phase having high temperature and high pressure, a condenser 240 configured to the gas-phase refrigerant to a liquid-phase refrigerant having high pressure, an expansion valve 250 configured to adiabatically expand and depressurize the liquid-phase refrigerant and to supply the liquid-phase refrigerant to the evaporation coil 220, and a heater (not shown) used to defrost the cooling duct 210.

[0027] The cooling duct 210 may be selectively brought into communication with the ice-making room 100 depending on the opening or closing of the refrigerator main body 10 by the refrigerator doors 30 and may supply cold air to the ice-making room 100. For example, if the refrigerator doors 30 are closed, the cooling duct 210 may be in communication with the ice-making room 100 and may supply cold air to the ice-making room 100.

[0028] In this regard, the opposite end portions of the cooling duct 210 may communicate with the ice-making room 100. For example, a first duct hole 211 coupled to the intake port 110 of the ice-making room 100 may be disposed in one end portion of the cooling duct 210 and a second duct hole 212 coupled to the exhaust port 120 of the ice-making room 100 may be disposed in the other end portion of the cooling duct 210. Thus, the cold air passed through the first duct hole 211 may be introduced into the ice-making room 100 through the intake port 110. Cold air may be circulated through the ice-making room

100 and may be discharged through the exhaust port 120. Cold air may be introduced into the cooling duct 210 through the second duct hole 212.

[0029] A water drain portion 600 may be coupled to the cooling duct 210 and can discharge water in the cooling duct 210 (e.g., generated from defrosting) to the outside.

[0030] The heater may include an insulation tape and surround at least a portion of the surface of the cooling duct 210 and may be configured to apply heat to the cooling duct 210.

[0031] In the compressor 230, the condenser 240, the expansion valve 250 and the evaporation coil 220, a heat exchange process using a refrigerant may take place and include compression, condensation, expansion and evaporation. Thus, air in the cooling duct 210 may be cooled into cold air by exchanging heat with the refrigerant in the evaporation coil 220. In this regard, the cooling flow path is long enough to cool the air into cold air. Thus, air may remain in the cooling flow path for a sufficient time to be cooled into cold air which has a temperature capable of freezing water e.g., 14 degrees C below zero or less).

[0032] The ice maker 300 may be disposed within the ice-making room 100 to produce ice. For example, the ice maker 300 may receive water from an external water source (not shown) and the water freezes into ice by cold air supplied into the ice-making room 100. The cold air generation system 200 and the ice maker 300 may be implemented in any other suitable configurations that are well known in art.

[0033] Hereinafter, the configuration of the exemplary circulation unit 400 disposed in the ice-making device 2 according to one embodiment of the present disclosure will be described with reference to Figs. 5 to 7.

[0034] Fig. 5 is a perspective view of an air guide in the exemplary ice-making device according to one embodiment of the present disclosure. Fig. 6 is a bottom perspective view of the air guide in the exemplary ice-making device according to one embodiment of the present disclosure. Fig. 7 illustrates a state in which cold air circulates through the ice-making device according to one embodiment of the present disclosure.

[0035] Referring to Figs. 5 to 7, the circulation unit 400 is configured to circulate cold air and may be disposed within the ice-making room 100. As an example, the circulation unit 400 may include a fan motor 410 configured to blow cold air supplied into the ice-making room 100 and an air guide 420 configured to guide cold air along a cold air moving route.

[0036] The fan motor 410 may be disposed at the front end of the intake port 110 of the ice-making room 100. The air guide 420 may be disposed at the front end of the fan motor 410. Thus, cold air supplied from the cooling duct 210 may be pushed to circulate through the ice-making room 100. In this regard, the fan motor 410 may be implemented in any suitable manner that is well known in the art.

[0037] The air guide 420 configured to guide cold air along a cold air moving route may be disposed at the front end of the fan motor 410. The air guide 420 may guide cold air along a plurality of routes, thereby improving the cooling efficiency of the ice maker 300.

[0038] The air guide 420 may include, for example, a first route portion 421 configured to guide cold air toward the inside of the ice maker 300 and a second route portion 422 configured to guide cold air to the outside of the ice maker 300.

[0039] In this regard, the first route portion 421 may face the upper surface of the ice maker 300. At least one first cold air flow hole 421a may be disposed on one surface of the first route portion 421 facing the upper surface of the ice maker 300.

[0040] The first cold air flow hole 421a may guide cold air toward an ice production portion (not shown) disposed inside the ice maker 300. Thus, the first cold air flow hole 421a enables cold air having a low temperature just exited from the cooling duct 210 to be preferentially supplied to the ice maker 300, thereby improving the cooling efficiency of the ice maker 300.

[0041] The first cold air flow hole 421a may be disposed along the longitudinal direction of the first route portion 421. For example, a plurality of first cold air flow holes 421a may be spaced apart from each other and disposed along the longitudinal direction of the first route portion 421. The shape and number of the first cold air flow holes 421a may vary in different embodiments.

[0042] On the other hand, the second route portion 422 may face the side surface of the ice maker 300. At least one second cold air flow hole 422a may be disposed at one side of the second route portion 422. The second cold air flow hole 422a may face an ice bucket 500 disposed at the lower side of the ice maker 300. Cold air can flow to the ice bucket 500 through the second cold air flow hole 422a.

[0043] The second route portion 422 may guide cold air along a route differing from the first route portion 421. For example, the second route portion 422 may guide cold air toward one side of the ice-making room 100 where the ice maker 300 is not disposed. For this purpose, at least one second cold air flow hole 422a may be disposed in the second route portion 422.

[0044] The total area of the first cold air flow holes 421a may be set larger than the total area of the second cold air flow hole 422a. Thus, the cold air may mainly flow along the first route portion 421 (see Fig. 7).

[0045] The end portion of the first route portion 421 and the end portion of the second route portion 422 may be coupled to each other. The first route portion 421 and the second route portion 422 may be injection-molded into one piece. The air guide 420 may have a substantially L-like shape overall. In this case, the fan motor 410 may be coupled to one or both of the first route portion 421 and the second route portion 422 to blow cold air toward the air guide 420.

[0046] An ice bucket 500 configured to store ice pro-

duced in the ice maker 300 may be disposed below the ice maker 300. A sensor (not shown) may be disposed in the ice bucket 500 to determine the amount of ice stored in the ice bucket 500.

[0047] The ice-making device 2 according to one embodiment of the present disclosure includes the air guide 420 that can guide and distribute cold air. Cold air having a lowest temperature is preferentially supplied to the ice maker 300, thereby improving the cooling efficiency of the ice-making device 2.

[0048] In addition, cold air introduced into the ice-making room 100 through the intake port 110 may be delivered to the ice bucket 500 disposed under the ice maker 300 through the second route portion 422. Thus, the temperature in the ice bucket 500 may be maintained without requiring an additional cooling device or an additional cold air guide. As a result, ice in the ice bucket 500 can remain frozen.

[0049] From the foregoing, it will be appreciated that various embodiments of the present disclosure have been described herein for purposes of illustration, and that various modifications may be made without departing from the scope and spirit of the present disclosure. The exemplary embodiments disclosed in the specification of the present disclosure do not limit the present disclosure. The scope of the present disclosure will be interpreted by the claims below, and it will be construed that all techniques within the scope equivalent thereto belong to the scope of the present disclosure.

Claims

1. An ice-making device comprising:

an ice-making room comprising an internal space;
a cold air generation system connected to the ice-making room and configured to supply cold air into the ice-making room; and
an ice maker disposed in the ice-making room and configured to produce ice;
a circulation unit disposed in the ice-making room and being operable to facilitate cold air circulation in the ice-making room,
wherein the circulation unit comprises: a fan motor configured to drive cold air; and an air guide configured to guide a cold air flow.

2. The ice-making device of Claim 1, wherein the air guide comprises

a first route portion configured to guide cold air toward an inside of the ice maker; and
a second route portion configured to guide cold air toward an outside of the ice maker.

3. The ice-making device of Claim 2, wherein the first

route portion faces an upper surface of the ice maker and comprises at least one first cold air flow hole formed on one surface of the first route portion facing the upper surface of the ice maker.

4. The ice-making device of Claim 2, wherein the second route portion faces a side surface of the ice maker and comprises at least one second cold air flow hole formed on one surface of the second route portion.

5. The ice-making device of Claim 4, wherein a total area of the first cold air flow hole is greater than a total area of the second cold air flow hole.

6. The ice-making device of Claim 2, wherein the fan motor is coupled to one of the first route portion and the second route portion to drive cold air toward the air guide.

7. The ice-making device of Claim 2, wherein the first route portion and the second route portion are injection-molded as one piece.

8. The ice-making device of Claim 1, wherein the air guide has a substantially L-like overall shape.

9. The ice-making device of Claim 1 further comprising:

an ice bucket disposed under the ice maker and configured to store ice produced in the ice maker.

10. The ice-making device of Claim 1, wherein the cold air generation system comprises:

a cooling duct providing a cold air flow path;
an evaporation coil surrounding at least a portion of the cooling duct to generate cold air through heat exchange by using a refrigerant;
a compressor configured to phase-convert the refrigerant discharged from the evaporation coil to a gas-phase refrigerant;
a condenser configured to phase-convert a gas-phase refrigerant to a liquid-phase refrigerant;
an expansion valve configured to depressurize the liquid-phase refrigerant and to supply the liquid-phase refrigerant to the evaporation coil; and
a heater configured to defrost the cooling duct.

11. The ice-making device of Claim 1, wherein the ice-making room comprises:

an intake port operable to receive cold air generated in the cold air generation system; and
an exhaust port operable to discharge cold air from the ice-making room, wherein the exhaust

port is disposed below the intake port.

- 12.** The ice-making device of Claim 11, wherein the fan motor is disposed at a front end of the intake port and the air guide is disposed at a front end of the fan motor. 5

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FIG. 1

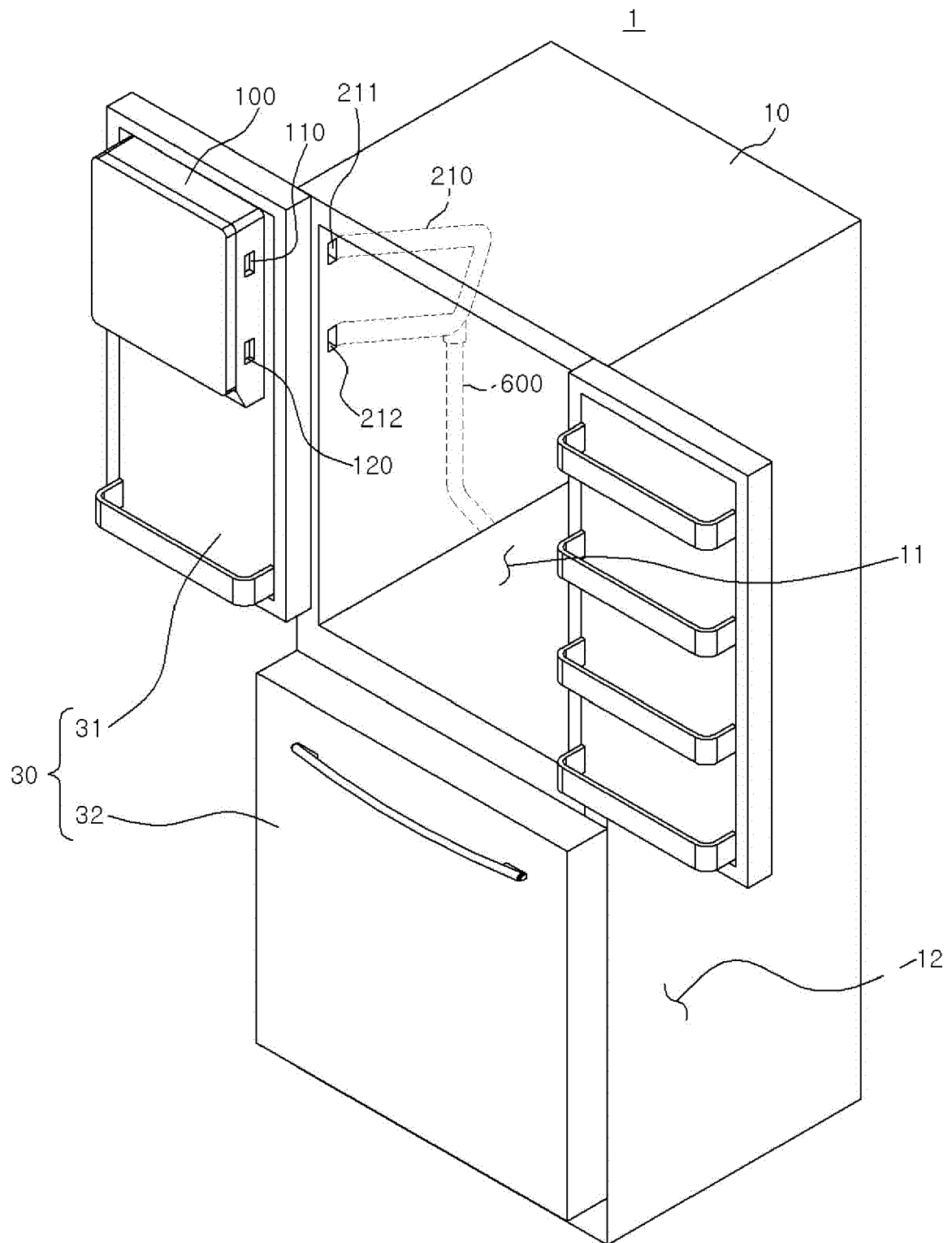


FIG. 2

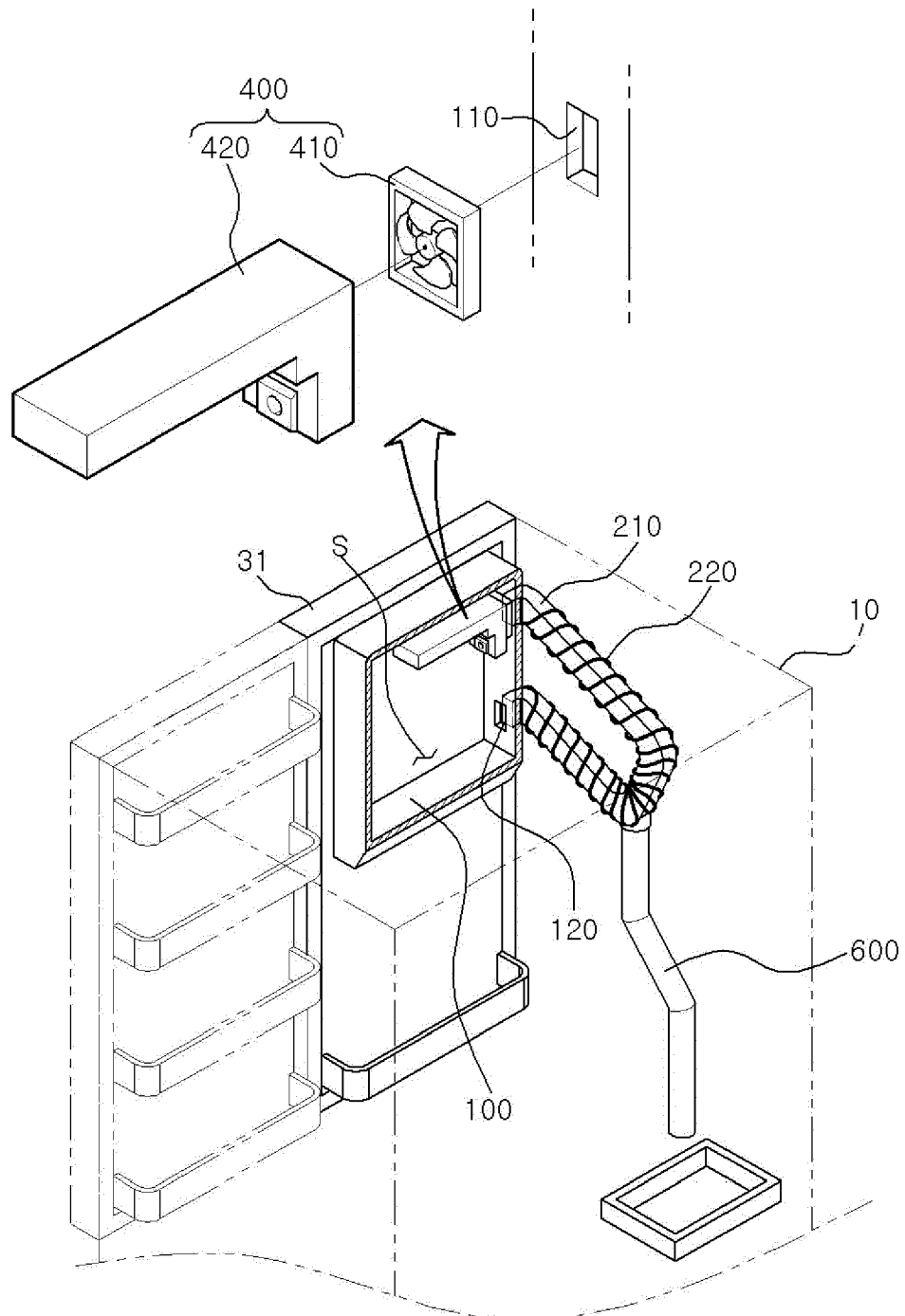


FIG. 3

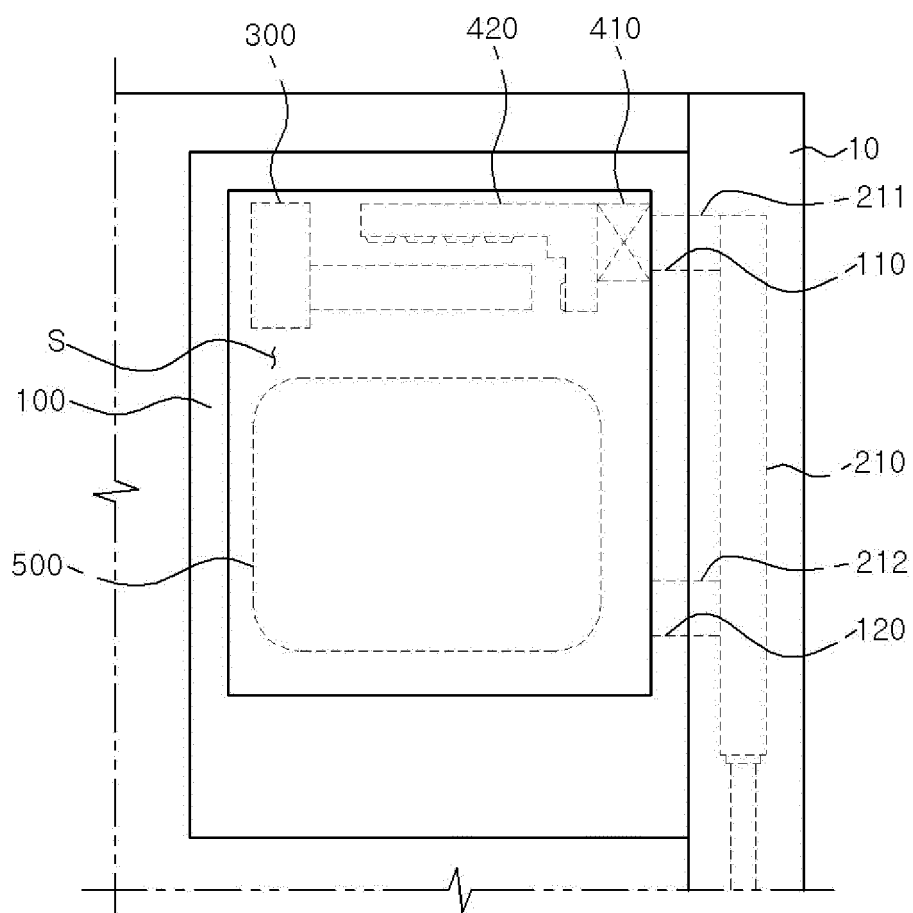


FIG. 4

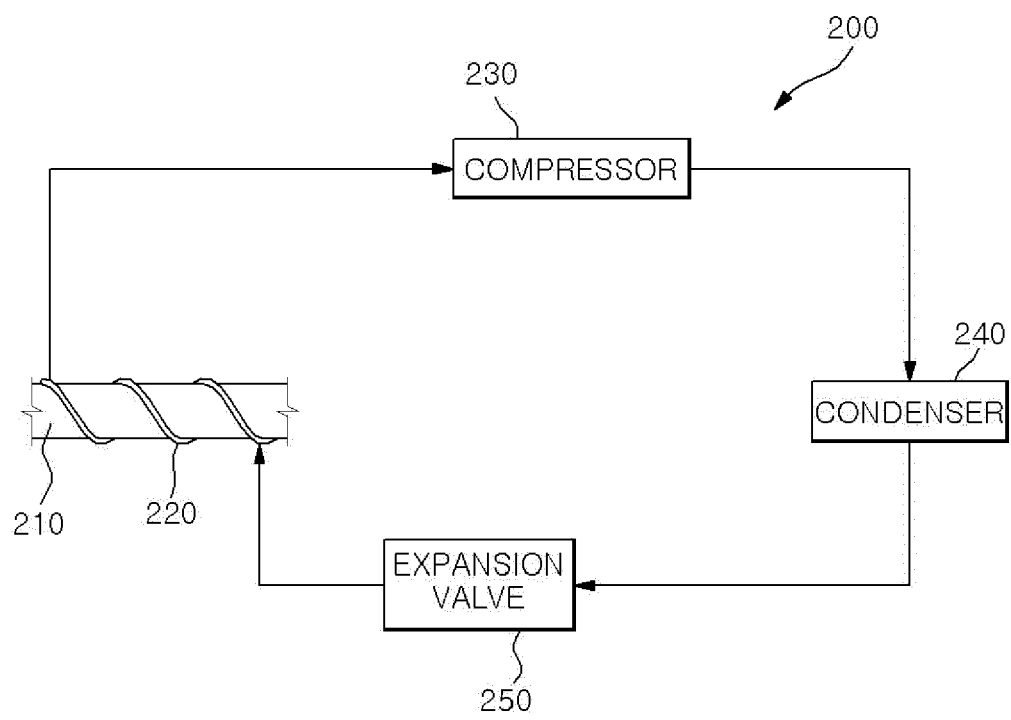


FIG. 5

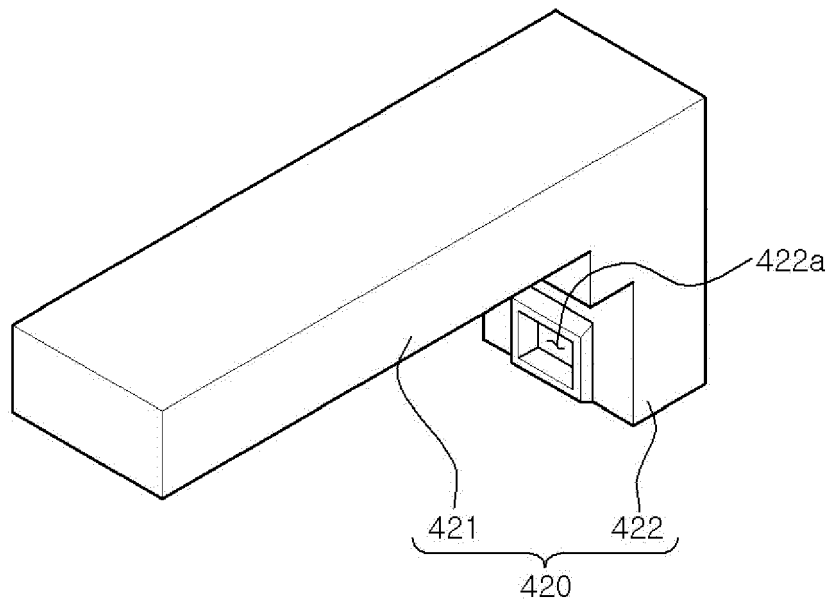


FIG. 6

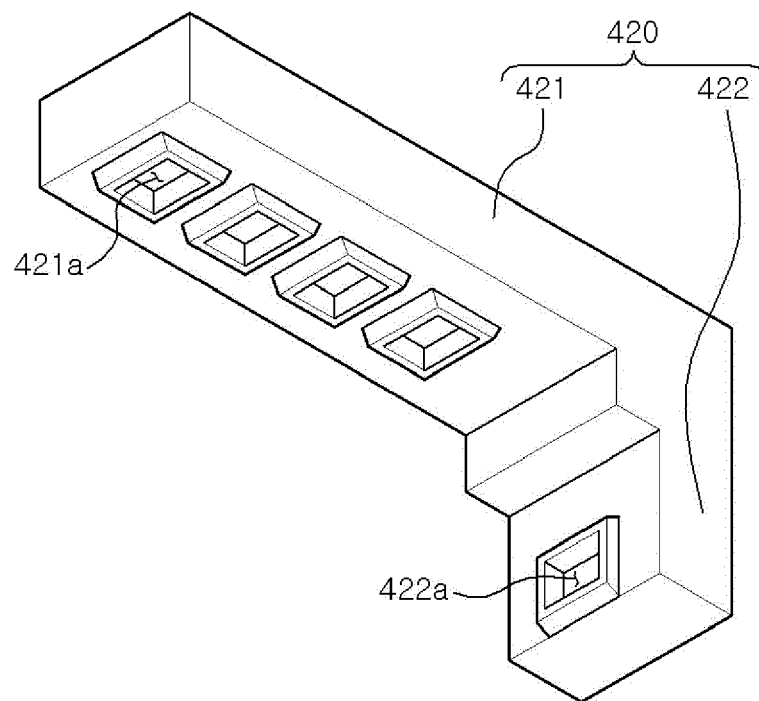
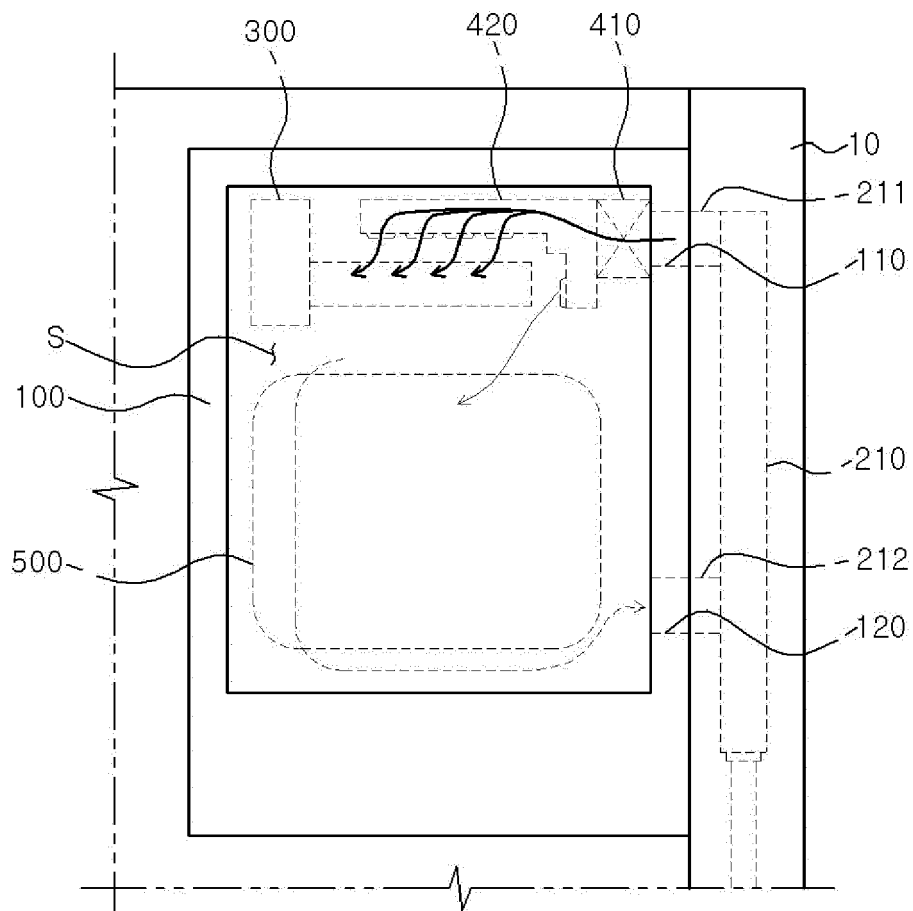


FIG. 7





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Application Number
EP 17 16 6405

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Place of search The Hague		Date of completion of the search 31 August 2017	Examiner Bejaoui, Amin
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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