(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 787 309 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.10.2014 Bulletin 2014/41

(51) Int Cl.:
F25D 17/06 *(2006.01)* ***F25D 25/02*** *(2006.01)*

(21) Application number: **13190125.8**

(22) Date of filing: **24.10.2013**

(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
Designated Extension States:
BA ME

(30) Priority: **01.04.2013 KR 20130035087**

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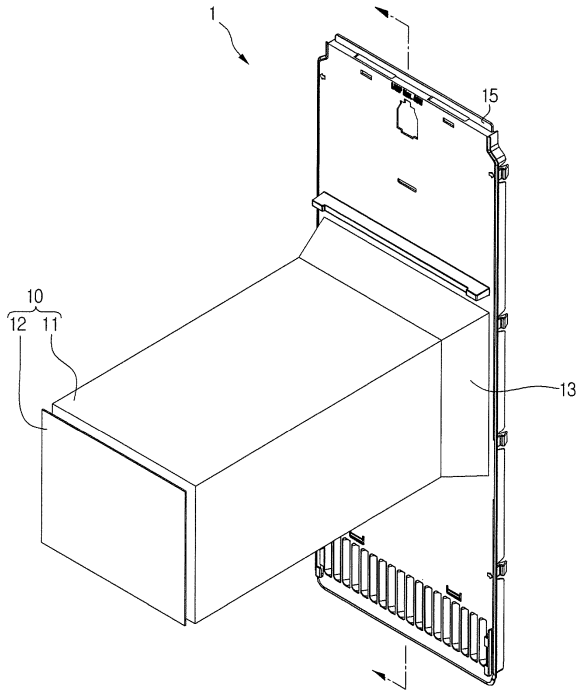
(54) Refrigerator

(57) A refrigerator including a main body with a first storage compartment and a first evaporation compartment provided within the main body in order to cool the first storage compartment. The refrigerator also includes a second storage compartment independently provided in the first storage compartment and maintained at a temperature lower than a temperature of the first storage compartment; and a second evaporation compartment located at a rear side of the second storage compartment to cool the second storage compartment.

FIG.1



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Description

Background

1. Field

[0001] The present disclosure relates to a refrigerator.

2. Description of the related art

[0002] Generally, a refrigerator is an electronic appliance that can store foods at a low temperature within an internal storage space which is shielded by a door from an external environment. To this end, the refrigerator is configured to cool the internal storage space to keep the stored foods in an optimal state by using cool air generated by a heat exchange with a coolant that is circulated in a cooling cycle.

[0003] Recently, with increase in food shelf life and a tendency to purchase higher-grade products, the refrigerator size has gradually enlarged and the refrigerator has become more multi-functioned. Refrigerators having various structures and convenient user equipment have been introduced.

[0004] Particularly, consumer requirements for additional storage space capable of cooling foods at a temperature lower than the temperature of a freezing compartment have increased.

Summary

[0005] The present disclosure has been made in an effort to provide a refrigerator with a space separate from a refrigerating compartment or a freezing compartment which may deep-cool food at a temperature lower than a temperature in a freezing compartment within a short time period.

[0006] A refrigerator according to one embodiment of the present invention comprises: a main body with a first storage compartment; a first evaporation compartment provided within the main body in order to cool the first storage compartment; a second storage compartment independently provided in the first storage compartment and maintained at a temperature lower than a temperature of the first storage compartment; and a second evaporation compartment located at a rear side of the second storage compartment to cool the second storage compartment, the second evaporation compartment including a cold air outlet and a cold air inlet.

[0007] According to one embodiment of the present invention, the following effects are created.

[0008] First, by providing a drawer assembly which may be provided inside a freezing compartment and cooled at a temperature lower than a temperature in the freezing compartment, food requiring storage at various temperatures may be effectively stored.

[0009] Second, since a separate evaporation means for rapidly cooling is provided, a state of a deep freezing compartment may be uniformly maintained regardless of a load state of a refrigerating compartment or a freezing compartment.

Brief description of the drawings

[0010]

FIG. 1 is a perspective view illustrating a deep freezing compartment system according to one embodiment of the present invention.

FIG. 2 is an exploded perspective view illustrating the deep freezing compartment system according to one embodiment of the present invention.

FIG. 3 is a longitudinal cross-sectional view of a refrigerator with a deep freezing compartment according to one embodiment of the present invention.

FIG. 4 is a longitudinal cross-sectional view of a refrigerator illustrating a structure of a deep evaporation compartment according to another embodiment of the present invention.

Detailed Description

[0011] In the following detailed description of the preferred embodiments, reference is made to the accompanying drawings in which is shown by way of illustration specific preferred embodiments in which the invention may be practiced. The embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, and it is understood that other embodiments may be utilized. Logical, structural, mechanical, electrical, and chemical changes may be made without departing from the scope of the invention. To avoid details not necessary to enable those skilled in the art to practice the invention, the description may omit certain information known to those skilled in the art. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present disclosure is defined only by the appended claims.

[0012] A deep freezing compartment according to the embodiments of the present invention can be applied to all types of refrigerators. For example, the deep freezing compartment according to one embodiment of the present invention can be applied to all of a top mount type refrigerator in which the freezing compartment is provided on the top of a cooling compartment, a bottom freezer type refrigerator in which the freezing compartment is provided on the bottom of the cooling compartment, and a side-by-side type refrigerator in which the freezing compartment and the cooling compartment are provided at left and right sides.

[0013] A refrigerator according to one embodiment of the present invention comprises: a main body with a first storage compartment; a first evaporation compartment provided within the main body in order to cool the first storage compartment; a second storage compartment independently provided in the first storage compartment

and maintained at a temperature lower than a temperature of the first storage compartment; and a second evaporation compartment located at a rear side of the second storage compartment to cool the second storage compartment, the second evaporation compartment including a cold air outlet and a cold air inlet.

[0014] The refrigerator according to one embodiment of the present invention further comprises: a first evaporator disposed in the first evaporation compartment; a second evaporator disposed in the second evaporation compartment; and a cooling fan disposed in the first evaporation compartment.

[0015] According to one embodiment of the present invention, the first evaporator and the second evaporator include fin-tube type heat exchangers.

[0016] According to one embodiment of the present invention, the second storage compartment includes: a case communicating with the second evaporation compartment and insulated from the first evaporation compartment; and a drawer, wherein the drawer includes: a storage box received in the case and having a cold air hole at a rear side thereof; and a door formed at a front side of the storage box.

[0017] The refrigerator according to one embodiment of the present invention further comprises a main grille to partition the first evaporation compartment and the first storage compartment, wherein the second evaporation compartment is fixed to a front side of the main grille.

[0018] According to one embodiment of the present invention, the rear side of the case is in contact with a front side of the second evaporation compartment, and the second storage compartment and the second evaporation compartment communicate with each other through the cold air inlet and the cold air outlet.

[0019] According to one embodiment of the present invention, the rear side of the case is in contact with the main grille, such that the second evaporation compartment is completely received inside the case.

[0020] According to one embodiment of the present invention, the first storage compartment is a freezing compartment maintained at a below freezing temperature, and the second storage compartment is a deep freezing compartment maintained at a temperature lower than the temperature in the freezing compartment.

[0021] FIG. 1 is a perspective view illustrating a deep freezing compartment system according to one embodiment of the present invention, FIG. 2 is an exploded perspective view illustrating the deep freezing compartment system, and FIG. 3 is a longitudinal cross-sectional view of a refrigerator with a deep freezing compartment according to one embodiment of the present invention.

[0022] Referring to FIGS. 1 to 3, a deep freezing compartment system 1 according to one embodiment of the present invention includes a deep freezing compartment 10 maintained at a temperature lower than the freezing compartment temperature, and a cooling module for cooling the inside of the deep freezing compartment 10.

[0023] The refrigerator with the deep freezing compartment system 1 according to one embodiment of the present invention includes a freezing compartment 20 and a refrigerating compartment (not illustrated) in a main body 30. Main body 30 comprises an outer case 303, an inner case 301, and an insulation layer 302 interposed therebetween. Additionally, the deep freezing compartment 10 is provided at one side of freezing compartment 20 formed in main body 30. A main grille 15 is installed at the front of inner case 301, and a main evaporator 18 for cooling the refrigerating compartment and the freezing compartment 20 is disposed between main grille 15 and inner case 301. Accordingly, a space formed between main grille 15 and inner case 301, that is, a space in which main evaporator 18 is disposed may be defined as a main evaporation compartment 31. Main evaporator 18 may be a fin-tube type evaporator.

[0024] The cold air cooled through main evaporator 18 is supplied to freezing compartment 20 and the refrigerating compartment along a cold-air path. Additionally, the cold air supplied to freezing compartment 20 flows into main evaporation compartment 31 again through a cold-air collecting hole 151 formed at a lower end side of main grille 15. Condensate water generated from main evaporation compartment 31 is discharged to a machine compartment 32 formed at a lower end of main body 30 through a drain hole (not illustrated). In addition, one or a plurality of main evaporators 18 may be provided according to a capacity of the refrigerator. For example, in the case of a refrigerator having a small capacity, a single main evaporator 18 is applied, and the cold air may move to the refrigerating compartment and the freezing compartment through the cold-air path. In the case of a refrigerator having a large capacity, a main evaporator for a refrigerating compartment and a main evaporator for a freezing compartment are separately provided, and as a result, the cold air cooled by the main evaporator for a refrigerating compartment may be supplied to only the refrigerating compartment, and the cold air cooled by the main evaporator for a freezing compartment may be supplied to only the freezing compartment. In this case, since the cold air in the refrigerating compartment does not flow into the freezing compartment side, there is an advantage in that food smells in the refrigerating compartment do not flow into the freezing compartment.

[0025] Meanwhile, in freezing compartment 20 or the refrigerating compartment, a storage means for storing food may be provided. For example, in freezing compartment 20, a plurality of shelves 201 in which food or containers may be placed are disposed inside freezing compartment 20 at intervals in a vertical direction, and a storage box 202 to store the food may be provided.

[0026] Deep freezing compartment 10 according to embodiment of the present invention may be provided at one side inside freezing compartment 20, and provided between the shelves.

[0027] Meanwhile, the cooling module which maintains a temperature of the deep freezing compartment at a temperature lower than the temperature of the freezing

compartment includes a deep evaporator 16, a deep evaporation compartment 13 in which deep evaporator 16 is received, and a deep fan 14 received in deep evaporation compartment 13 to circulate the cold air. Deep evaporator 16 may be a fin-tube type heat exchanger, and may be connected in parallel to main evaporator 18. Accordingly, an opening of a switching valve may be controlled so that a coolant flows toward the deep evaporator 16 when a deep freezing is performed.

[0028] Deep evaporation compartment 13 may be a housing having a box shape forming a predetermined compartment. A fan housing in which deep fan 14 is received protrudes from the front side of deep evaporation compartment 13. An ejecting grille 133 is formed at the front side of fan housing 131. Additionally, a return grille 132 is formed at a front side of the lower end of fan housing 131 so that the cold air returns to deep evaporation compartment 13.

[0029] Further, deep evaporation compartment 13 is fixed to a front side of a support plate defined as a shroud 17. Shroud 17 is fixed to and installed on main grille 15. In main grille 15, a shroud installation hole 152 for installing shroud 17 may be formed.

[0030] Meanwhile, deep freezing compartment 10 is configured by an insulation wall to form a compartment therein, and includes a case 11 with an open front and rear sides and a drawer 12 which is slidably inserted into and discharged from case 11. Case 11 may be fixed to a wall surface of freezing compartment 20 or to shelves 201. Additionally, the rear side of case 11 contacts the front side of the deep evaporation compartment 13. That is, only fan housing 131 protruding from the front side of deep evaporation compartment 13 and return grille 132 are received inside case 11, and a space, in which deep evaporator 16 is received, is disposed outside case 11.

[0031] Drawer 12 includes a storage box 121 to hold food, and a door 122 vertically provided at the front side of storage box 121. A plurality of cold-air holes 124 are formed on the rear side of storage box 121, and a slide rail 123 may be formed at both sides. Additionally, guide rails 111 are formed at both sides in case 11, and slide rail 123 of storage box 121 is engaged to guide rail 111. When storage box 121 is inserted into case 11 or discharged from case 11, slide rail 123 horizontally moves along the guide rail 111. Instead of slide rail 123, a roller may be installed, and a roller guide may be installed at an inner side of case 11, or both the slide rail and the roller may be used.

[0032] When storage box 121 is completely received in case 11, a rear edge of door 122 is completely in contact with the front side of case 11 so as to prevent the cold air from being leaked outside. Although not illustrated, in order to prevent cold-air leakage, a sealing member may be surrounded at the rear side of door 122 contacting the front side of case 11. The sealing member may be surrounded at the front side of case 11. Additionally, a length of storage box 121 may be extended so that the rear side of storage box 121 is in contact with or slightly separated from the front side of fan housing 131 while storage box 121 is completely received in case 11.

[0033] A cooling process of deep freezing compartment 10 according to one embodiment of the present invention utilizing the above configuration will be described.

[0034] First, when a command for deep cooling is inputted, or it is determined that a temperature of the deep freezing compartment is higher than a set temperature, a deep cooling operation is automatically performed. The deep cooling operation means that a freezing cycle operation in which the coolant flows to main evaporator 18 is switched into a freezing cycle operation in which the coolant flows to deep evaporator 16. Since deep evaporator 16 is connected in parallel to main evaporator 18, through a switching operation or opening control of the switching valve, the coolant is controlled to flow toward deep evaporator 16. Further, in the case where coolant circulation through main evaporator 18 is required while a load of the refrigerating compartment and the freezing compartment is increased, some amount of coolant flows toward main evaporator 18 by the opening control of the valve, and the remainder may flow toward deep evaporator 16. In another method, before the deep cooling starts, first, the coolant flows toward main evaporator 18 to supercool the refrigerating compartment at a temperature lower than the set temperature, and thereafter, a flow of the coolant may be switched toward deep evaporator 16 for deep cooling.

[0035] When the coolant flows toward deep evaporator 16 and thus, a temperature in deep evaporation compartment 13 is cooled to the set temperature, deep compartment fan 14 received in fan housing 131 is operated, and the cold air inside deep evaporation compartment 13 is ejected into deep freezing compartment 10 by an operation of deep compartment fan 14. In this case, the ejected cold air is guided toward storage box 121 through the rear side of case 11. Additionally, some of the cold-air holes 124 formed at the rear side of storage box 121 may function as a cold air outlet. Herein, an operation timing of deep compartment fan 14 may be set to be a time after a temperature of deep evaporation compartment 13 decreases to the set temperature, or may be set to a time when the coolant starts to flow to deep evaporator 16.

[0036] Meanwhile, the cold air supplied to storage box 121 returns to deep evaporation compartment 13 through cold-air holes 124 and return grille 132 again. In addition, deep evaporation compartment 13 is completely insulated from the main evaporation compartment 31 in which the main evaporator is received. Accordingly, since the cold air of main evaporation compartment 31 having a relatively high temperature does not flow into deep evaporation compartment 13, the deep evaporation compartment 13 may be cooled to the set temperature within a short time.

[0037] FIG. 4 is a longitudinal cross-sectional view of a refrigerator illustrating a structure of a deep evaporation compartment according to another embodiment of the

present invention.

[0038] Referring to FIG. 4, a structure of a deep evaporation compartment according to another embodiment is the same as that of the above embodiment, but there is a difference in that the entire deep evaporation compartment 13 is received inside deep freezing compartment 10.

[0039] More specifically, a rear side of case 11 contacts main grille 15, and deep evaporation compartment 13 is completely received inside case 11. Accordingly, deep evaporation compartment 13 is positioned inside case 11, and as a result, there is an advantage in that insulation performance improves.

[0040] In other words, in the case of the structure illustrated in FIG. 3, a wall surface of the evaporation compartment in which deep evaporator 16 is received is substantially in contact with an internal air of freezing compartment 20 and thus, a part of the cold air of deep evaporation compartment 13 may be used to cool freezing compartment 20. However, in the other embodiment, deep evaporation compartment 13 may be wholly used just to cool the inside of case 11, that is, the deep freezing compartment.

[0041] Meanwhile, a first evaporator may comprise, among other things, main evaporator 18 described in the embodiments of FIGS. 1 to 4, and a second evaporator may comprise, among other things, deep evaporator 16. Additionally, a first storage compartment may comprise, among other things, freezing compartment 20, and a second storage compartment may comprise, among other things, deep freezing compartment 10 provided in freezing compartment 20.

Claims

1. A refrigerator, comprising:

a main body (30) with a first storage compartment (20);
a first evaporation compartment (31) provided within the main body, being configured to cool the first storage compartment (20);
a second storage compartment (10) independently provided in the first storage compartment (20) and configured to be maintained at a temperature lower than a temperature of the first storage compartment (20); and
a second evaporation compartment (13) located at a rear side of the second storage compartment (10) and configured to cool the second storage compartment (10), the second evaporation compartment (13) including a cold air outlet (133) and a cold air inlet (132).

2. The refrigerator of claim 1, further comprising:

a first evaporator (18) disposed in the first evaporation compartment (31);
a second evaporator (16) disposed in the second evaporation compartment (13); and
a cooling fan (14) disposed in the second evaporation compartment (13).

3. The refrigerator of claim 2, wherein the first evaporator (18) and the second evaporator (16) include fin-tube type heat exchangers.

4. The refrigerator of any of claims 1 to 3, wherein the second storage compartment (10) includes:

a case (11) communicating with the second evaporation compartment (13) and insulated from the first evaporation compartment (31); and
a drawer (12) including:

a storage box (121) received in the case and having a cold air hole (124) on a rear side thereof; and
a door (122) formed at a front side of the storage box.

5. The refrigerator of any of claims 1 to 4, further comprising:

a main grille (15) arranged to partition the first evaporation compartment (31) and the first storage compartment (20),
wherein the second evaporation compartment (13) is fixed to a front side of the main grille (15).

6. The refrigerator of claim 4 or 5, insofar as referring to claim 4, wherein a rear side of the case (11) is in contact with a front side of the second evaporation compartment (13),
and wherein the second storage compartment (10) and the second evaporation compartment (13) are arranged to communicate with each other through the cold air inlet (132) and the cold air outlet (133).

7. The refrigerator of claim 6, wherein the rear side of the case (11) is in contact with the main grille (15), such that the second evaporation compartment (13) is completely received inside the case (11).

8. The refrigerator of any of preceding claims, wherein the first storage compartment (20) is a freezing compartment configured to be maintained at or below a freezing temperature, and the second storage compartment (10) is a deep freezing compartment configured to be maintained at a temperature lower than the temperature in the freezing compartment.

9. The refrigerator of any of preceding claims, wherein the first evaporation compartment (31) is provided at one side of the main body (30).

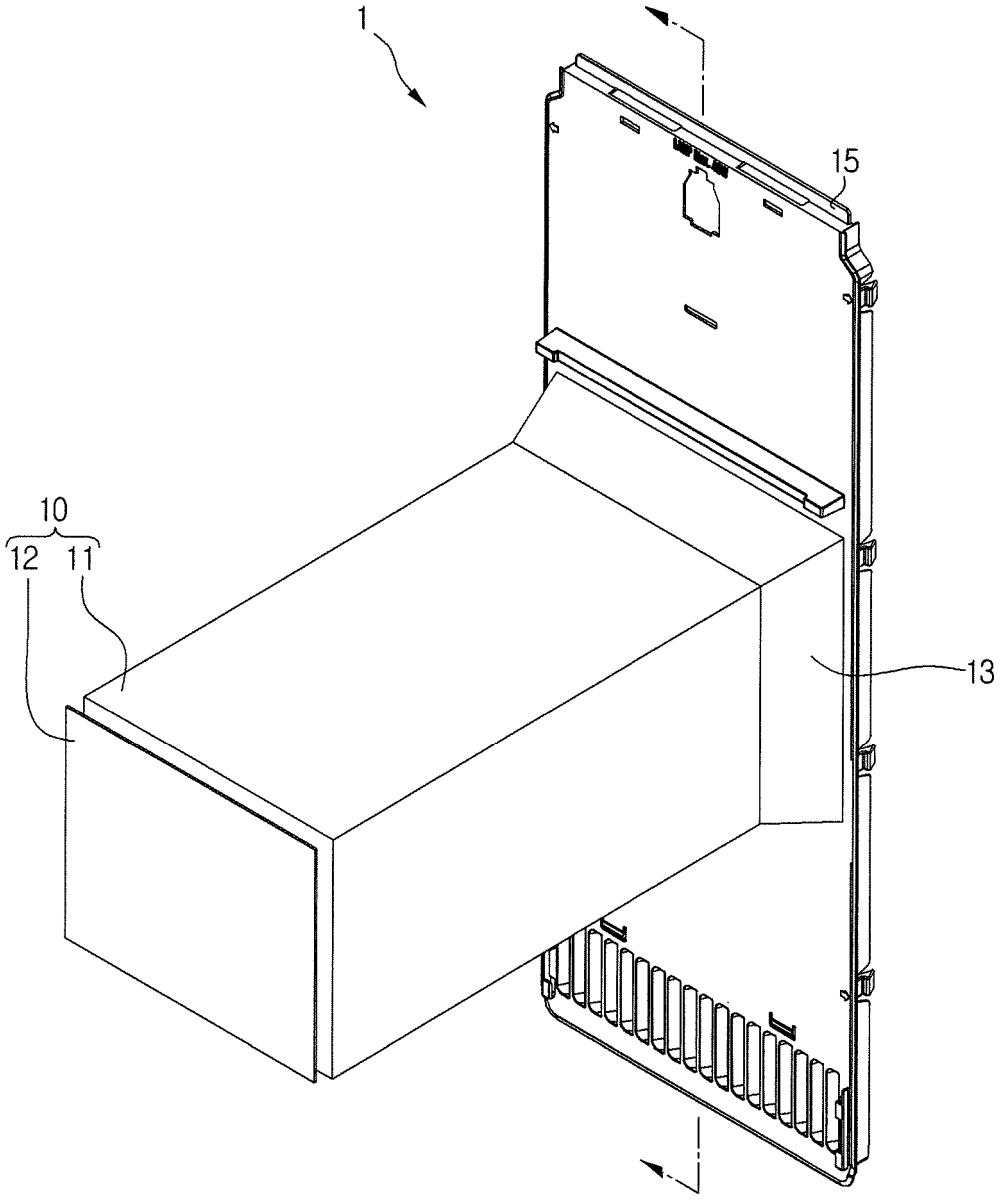
10. The refrigerator of any of claims 1 to 7 and 9, wherein the first storage compartment (20) includes a freezing compartment.

11. The refrigerator of any of claims 1 to 7 and 9 to 10, wherein the second storage compartment (10) includes a deep freezing compartment.

12. The refrigerator of any of claims 2 to 11, insofar as referring to claim 2, wherein the first evaporator (18) comprises a main evaporator.

13. The refrigerator of any of claims 2 to 11, insofar as referring to claim 2, wherein the second evaporator (16) comprises a deep evaporator.

FIG.1



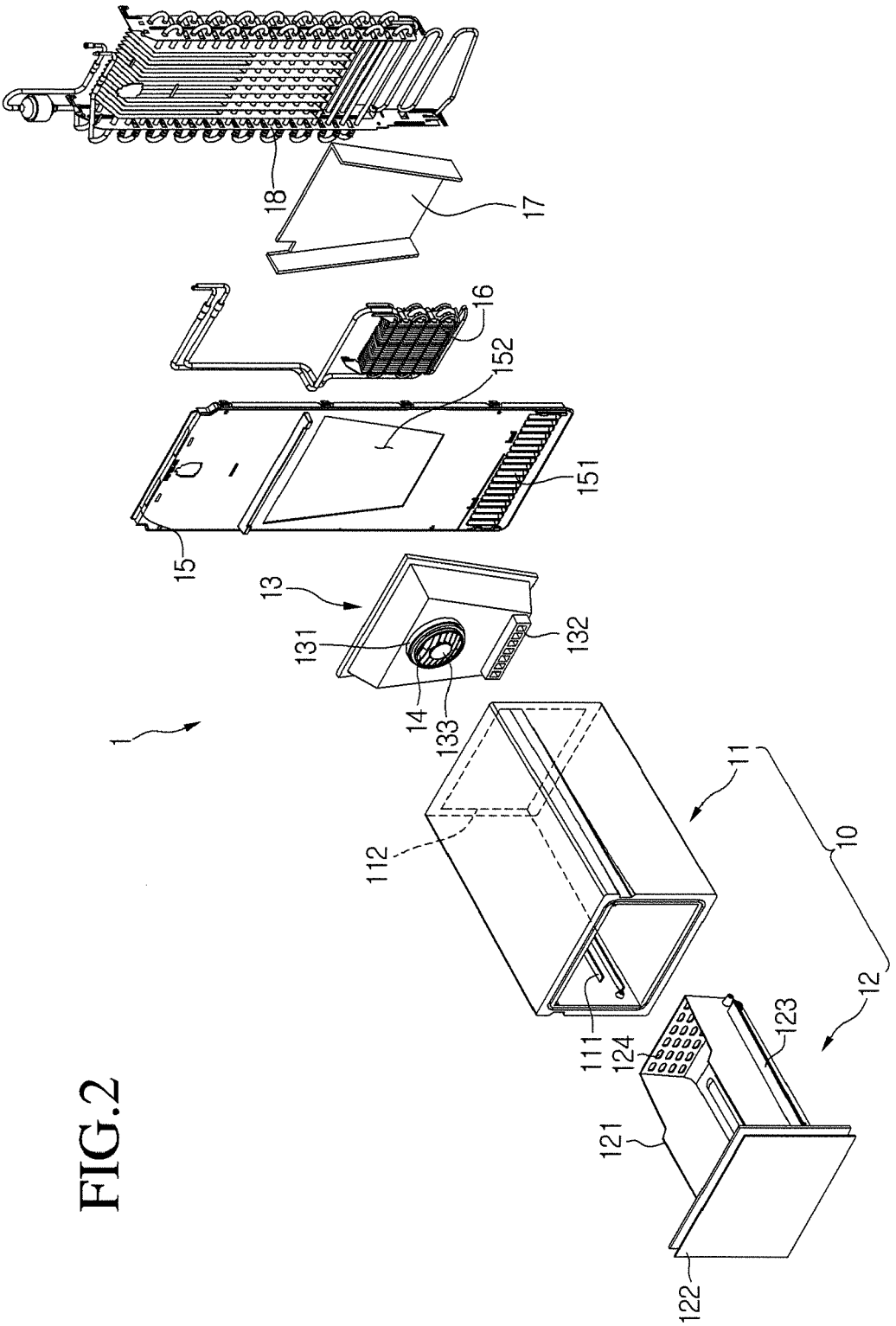

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FIG.2

FIG.3

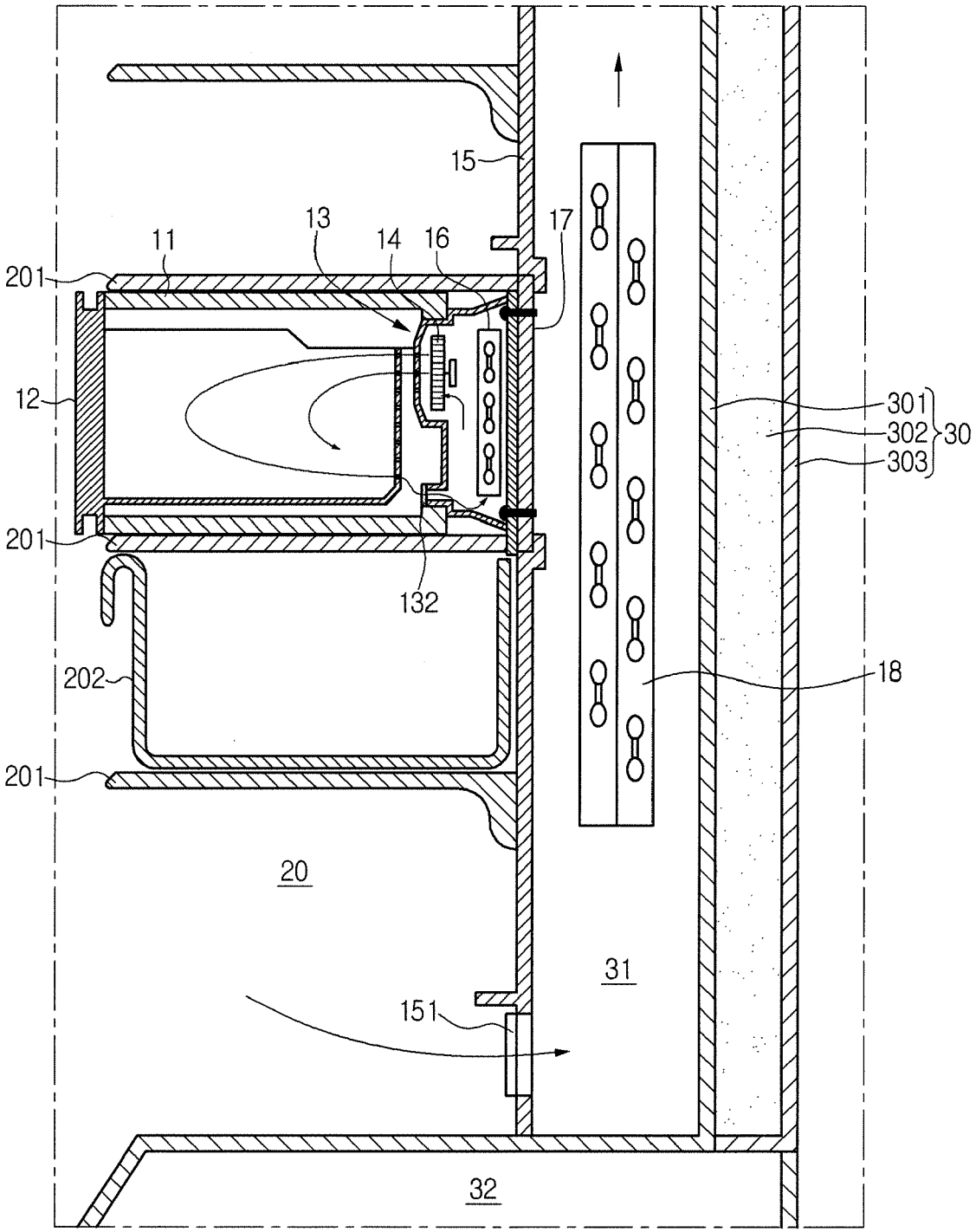
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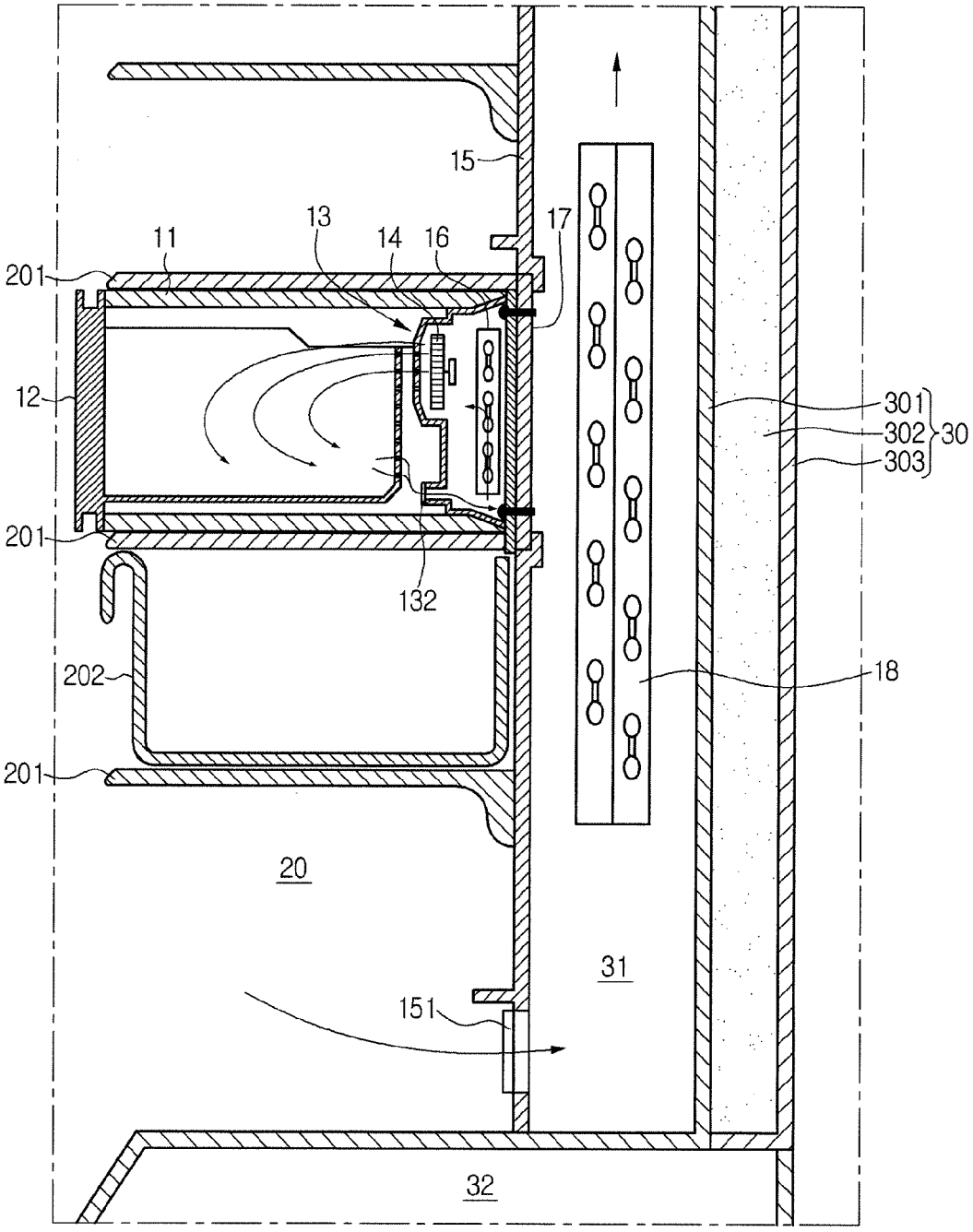
FIG.4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