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

(11) **EP 3 290 836 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
07.03.2018 Bulletin 2018/10

(21) Application number: **15890601.6**

(22) Date of filing: **30.10.2015**

(51) Int Cl.:
F25D 21/06 *(2006.01)*

(86) International application number:
PCT/CN2015/093402

(87) International publication number:
WO 2016/173226 (03.11.2016 Gazette 2016/44)

(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
Designated Validation States:
MA

(30) Priority: **29.04.2015 CN 201510213293**

(71) Applicant: **Qingdao Haier Joint Stock Co., Ltd**
Qingdao, Shandong 266101 (CN)

(72) Inventors:
- **MA, Jian**
  Qingdao
  Shandong 266101 (CN)
- **TAO, Haibo**
  Qingdao
  Shandong 266101 (CN)
- **LIU, Jianru**
  Qingdao
  Shandong 266101 (CN)
- **QI, Feifei**
  Qingdao
  Shandong 266101 (CN)
- **JI, Lisheng**
  Qingdao
  Shandong 266101 (CN)

(74) Representative: **dompatent von Kreisler Selting Werner -**
Partnerschaft von Patent- und Rechtsanwälten mbB
Deichmannhaus am Dom
Bahnhofsvorplatz 1
50667 Köln (DE)

(54) FREEZING AND REFRIGERATING DEVICE AND DEFROSTING CONTROL METHOD THEREOF

(57) The present invention relates to a freezing and refrigerating device and a defrosting control method thereof. The freezing and refrigerating device comprises a box body and a door body. At least one storage compartment, an air supply path supplying cooling air flow to the storage compartment, an air return path enabling the air flow from the storage compartment to pass, a cooling chamber and an air discharging path are defined in the box body, wherein the cooling chamber communicates with the air supply path and the air return path, and contains an evaporator, a blower and a defrosting heater, and the air discharging path communicates with the cooling chamber and an ambient space. The air supply path and the air discharging path are respectively provided with an air supply door and an air discharging door for selectively connecting or blocking the air supply path and the air return path. The present invention further provides a defrosting control method of the freezing and refrigerating device. The method comprises the steps of receiving a defrosting signal, starting the defrosting heater located on the evaporator, closing the air supply door, and opening the air discharging door so that hot air generated by defrosting can be discharged to the ambient space.

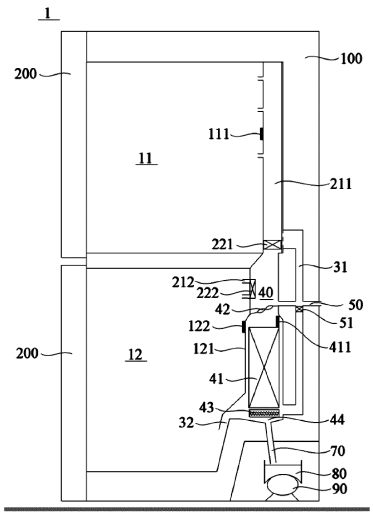

Fig. 1

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Description

TECHNICAL FIELD

[0001] The present invention is related to defrosting technologies of evaporators, and more particularly, to a freezing and refrigerating device and a defrosting control method thereof.

BACKGROUND

[0002] Usually, after a freezing and refrigerating device, such as a fridge or the like, operates for a certain period, the surface of its evaporator frosts. The frost affects the heat exchange between the evaporator and the air inside the fridge and reduces the refrigerating efficiency of the evaporator. Therefore, defrosting must be performed after the fridge operates for a certain period.

[0003] In the prior arts, usually defrosting of an evaporator is performed by heating. However, hot air generated during defrosting cannot be discharged out of the fridge. In this case, on one hand, the hot air may enter the storage compartment of the fridge via air inlets, and the temperature in the storage compartment rises, affecting the freshness and freezing time of food. On the other hand, after the defrosting for the evaporator ends, if refrigerating is performed to the storage compartment again, the temperature in the storage compartment can be restored to the temperature before the defrosting is performed after a long period, thereby increasing the energy consumption of the fridge.

SUMMARY

[0004] A first aspect of this invention aims to overcome at least one defect of existing freezing and refrigerating devices, and provides a freezing and refrigerating device. The freezing and refrigerating device of this invention can discharge the hot air generated by defrosting out of the freezing and refrigerating device, so that temperature rise in the storage compartment due to the defrosting hot air can be avoided, preservation time of food is extended and the energy consumption of the freezing and refrigerating device is reduced.

[0005] A further object of the first aspect of this invention is to shorten the defrosting time of the freezing and refrigerating device to improve the defrosting effect.

[0006] Another object of the first aspect of this invention is to automatically stop the defrosting for the evaporator.

[0007] One object of a second aspect of this invention is to provide a defrosting control method of a freezing and refrigerating device.

[0008] According to the first aspect of this invention, this invention provides a freezing and refrigerating device, comprising a box body and a door body pivotably connected to the box body, wherein inside the box body are defined: at least one storage compartment for storing articles; an air supply path configured to supply cooling air flow to the at least one storage compartment; an air return path configured to allow the air flow from the at least one storage compartment to pass; a cooling chamber which communicates with the air supply path and the air return path, and contains an evaporator for cooling the air entering the cooling chamber from the air return path, a blower for driving the air inside the cooling chamber to flow towards the air supply path and a defrosting heater provided on the evaporator; and an air discharging path communicating with the cooling chamber and an ambient space so that the air in the cooling chamber is directly discharged to the ambient space, wherein the air supply path and the air return path are respectively provided with an air supply door and an air discharging door for selectively connecting or blocking the air supply path and the air return path.

[0009] Optionally, the air discharging path is provided with an air discharging pump therein for driving the air in the cooling chamber to flow towards the ambient space.

[0010] Optionally, one end of the air discharging path communicating with the cooling chamber is located downstream of the blower in the air flowing direction.

[0011] Optionally, the at least one storage compartment comprises a refrigerating compartment and a freezing compartment that are provided in a vertical direction relative to each other, and the cooling chamber is located behind the freezing compartment and is separated therefrom by a rear cover plate of the freezing compartment.

[0012] Optionally, the air supply path comprises a refrigerating air feeding passage located behind the refrigerating compartment and a freezing air inlet provided at the rear cover plate of the freezing compartment, and the air supply door comprises a refrigerating air feeding door provided inside the refrigerating air feeding passage and a freezing air feeding door provided at the freezing air inlet.

[0013] Optionally, the air return path comprises a refrigerating air return passage, which extends from the bottom of the refrigerating compartment to an air return opening part of the cooling chamber and intersects with the air discharging path; and the air discharging door is provided at an intersection of the refrigerating air return passage and the air discharging path, such that when the air discharging door is in a first state, the refrigerating air return passage is connected and the air discharging path is blocked, and when the air discharging door is in a second state, the refrigerating air return passage is blocked and the air discharging path is connected.

[0014] Optionally, a top of the evaporator is provided with a first temperature sensor to detect a temperature of the top of the evaporator.

[0015] Optionally, the defrosting heater is provided on the bottom of the evaporator and faces a groove provided in the bottom of the cooling chamber, such that defrosting water generated during defrosting flows into a water collecting box provided at the bottom of the box body via a water discharging pipe communicating with the groove.

[0016] According to the second aspect of this invention, this invention also provides a defrosting control method of a freezing and refrigerating device, the method comprising: step A: receiving a defrosting signal instructing the evaporator of the freezing and refrigerating device to perform defrosting; step B: starting the defrosting heater located on the evaporator; step C: closing the air supply door located in the air supply path of the freezing and refrigerating device to block the air supply path; and step D: opening the air discharging door located in the air discharging path of the freezing and refrigerating device to connect the air discharging path, such that hot air generated by the defrosting heater when performing heating and defrosting is directly discharged to the ambient space via the air discharging path.

[0017] Optionally, after the step A, the method further comprises step E: starting the air discharging pump in the air discharging path to drive the hot air in the cooling chamber to be discharged to the ambient space via the air discharging path.

[0018] Optionally, after the step E, the method further comprises step F: when the temperature of the top of the evaporator reaches a first predetermined temperature, stopping the defrosting heater.

[0019] Optionally, after the step F, the method further comprises step G: when the defrosting heater is stopped for a predetermined time period, closing the air discharging pump and the air discharging door.

[0020] In the freezing and refrigerating device of this invention, as the air supply path communicating with the cooling chamber and the storage compartment is provided with an air supply door, and the air discharging path communicating with the cooling chamber and the ambient space is provided with an air discharging door, when defrosting is performed to the evaporator in the cooling chamber, the air supply door can block the air supply path, preventing the hot air generated when the defrosting heater heats and defrosts from flowing into the storage compartment via the air supply path. In addition, the air discharging path can be opened by the air discharging door, so that hot air generated by defrosting is directly discharged to the ambient space via the air discharging path. Therefore, the freezing and refrigerating device of this invention can prevent the temperature in the storage compartment from increasing due to the defrosting hot air, and extend the preservation time of food. In addition, the defrosting operations of the evaporator hardly affect the temperature in the storage compartment. After the defrosting for the evaporator ends, if refrigerating is performed to the storage compartment again, the temperature in the storage compartment can be restored to the temperature before the defrosting is performed in a short period, thereby reducing the energy consumption of the freezing and refrigerating device.

[0021] Further, in the freezing and refrigerating device of this invention, as the air discharging path is provided with an air discharging pump therein for driving the air in the cooling chamber to flow towards the ambient space, the hot air generated by defrosting can be discharged in time, improving the air flow, shortening the defrosting time of the freezing and refrigerating device and improving the defrosting effect.

[0022] Further, in the freezing and refrigerating device of this invention, as a top of the evaporator is provided with a first temperature sensor to detect a temperature of the top of the evaporator in real time, the defrosting condition can be determined. When the temperature of the top of the evaporator reaches a predetermined temperature, the defrosting heater is stopped, thereby automatically stopping the defrosting operations for the evaporator.

[0023] The above and other objects, advantages and features of the invention will be understood by those skilled in the art more clearly with reference to the detailed description of the embodiments of this invention below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] The followings will describe some embodiments of this invention in detail in an exemplary rather than restrictive manner with reference to the accompanying drawings. The same reference signs in the drawings represent the same or similar parts. Those skilled in the art shall understand that these drawings are only schematic ones of this invention, and may not be necessarily drawn according to the scales. In the drawings:

Fig. 1 is a schematic view of a freezing and refrigerating device according to an embodiment of this invention;

Fig. 2 is a schematic view of a freezing and refrigerating device in a refrigerating state according to an embodiment of this invention;

Fig. 3 is a schematic view of a freezing and refrigerating device in a defrosting state according to an embodiment of this invention;

Fig. 4 is a schematic view of a freezing and refrigerating device according to another embodiment of this invention;

Fig. 5 is a schematic view of a freezing and refrigerating device according to yet another embodiment of this invention;

Fig. 6 is a flow chart of a defrosting control method of a freezing and refrigerating device according to an embodiment of this invention; and

Fig. 7 is a flow chart of a defrosting control method of a freezing and refrigerating device according to another embodiment of this invention.

DETAILED DESCRIPTION

[0025] Fig. 1 is a schematic view of a freezing and refrigerating device according to an embodiment of this invention. As shown in Fig. 1, the freezing and refrigerating device 1 comprises a box body 100 and a door body 200 pivotably connected to the box body 100. Inside the box body 100 are defined: at least one storage compartment for storing articles, an air supply path, an air return path and a cooling chamber 40. The air supply path is configured to supply cooling air flow to the at least one storage compartment. The air return path is configured to allow the air flow from the at least one storage compartment to pass. The cooling chamber 40 communicates with the air supply path and the air return path, and contains an evaporator 41 for cooling the air entering the cooling chamber 40 from the air return path, a blower 42 for driving the air inside the cooling chamber 40 to flow towards the air supply path and a defrosting heater 43 provided on the evaporator. In particular, the box body 100 further defines an air discharging path 50 communicating with the cooling chamber 40 and an ambient space, so that the air in the cooling chamber 40 can be directly discharged to the ambient space. The air supply path and the air discharging path 50 are respectively provided therein with an air supply door and an air discharging door 51 respectively to selectively connect or block the air supply path and the air discharging path 50.

[0026] In the freezing and refrigerating device 1 of this invention, as the air supply path communicating with the cooling chamber 40 and the storage compartment is provided with an air supply door, and the air discharging path 50 communicating with the cooling chamber 40 and the ambient space is provided with an air discharging door 51, when defrosting is performed to the evaporator 41 in the cooling chamber 40, the air supply door can block the air supply path, preventing the hot air generated when the defrosting heater 43 heats and defrosts from flowing into the storage compartment via the air supply path. In addition, the air discharging path 50 can be opened by the air discharging door 51, so that hot air generated by defrosting is directly discharged to the ambient space via the air discharging path 50. Therefore, the freezing and refrigerating device 1 of this invention can prevent the temperature in the storage compartment from increasing due to the defrosting hot air, and extend the preservation time of food. In addition, the defrosting operations of the evaporator 41 hardly affect the temperature in the storage compartment. After the defrosting for the evaporator 41 ends, if refrigerating is performed to the storage compartment again, the temperature in the storage compartment can be restored to the temperature before the defrosting is performed in a short period, thereby reducing the energy consumption of the freezing and refrigerating device 1.

[0027] In some embodiments of this invention, one end of the air discharging path 50 communicating with the cooling chamber 40 is located downstream of the blower 42 in the air flowing direction. Thus, when the evaporator 41 needs defrosting, the blower 42 may continue working at a low power to drive the hot air generated by defrosting to be discharged to the ambient space via the air discharging path 50 located downstream of the blower 42, saving an additional driving member and simplifying the structure of the freezing and refrigerating device 1.

[0028] In some embodiments of this invention, the at least one storage compartment comprises a refrigerating compartment 11 and a freezing compartment 12 that are provided in a vertical direction relative to each other, and the cooling chamber 40 is located behind the freezing compartment 12 and is separated therefrom by a rear cover plate 121 of the freezing compartment 12. The air supply path comprises a refrigerating air feeding passage 211 located behind the refrigerating compartment 11 and a freezing air inlet 212 provided at the rear cover plate 121 of the freezing compartment 12, and the air supply door comprises a refrigerating air feeding door 221 provided inside the refrigerating air feeding passage 211 and a freezing air feeding door 222 provided at the freezing air inlet 212. That is, in the embodiments of this invention, the cooling chamber 40 communicates with the refrigerating compartment 11 and the freezing compartment 12 via the refrigerating air feeding passage 211 and the freezing air inlet 212 respectively.

[0029] Further, the cooling chamber 40 comprises an air feeding opening part communicating with the air supply path to supply cooling air flow to the at least one storage compartment via the air feeding opening part. Specifically, the air feeding opening part comprises a refrigerating air feeding opening communicating with an air inlet end of the refrigerating air feeding passage 211 and a freezing air feeding opening communicating with the freezing air inlet 212. The refrigerating air feeding opening and the freezing air feeding opening are located downstream of the evaporator 41 in the air flowing direction to allow the air cooled by the evaporator 41 to pass. Further, the refrigerating air feeding door 221 may be provided at the air inlet end of the refrigerating air feeding passage 211. Those skilled in the art shall understand that in other embodiments of this invention, the refrigerating air feeding door 221 may be provided at any position in the refrigerating air feeding passage 211, or at an air inlet of the refrigerating compartment 11.

[0030] In some embodiments of this invention, the air return passage may comprise a refrigerating air return passage 31 and a freezing air return passage 32. The air return opening part of the cooling chamber 40 may comprise a refrigerating air return opening communicating with the refrigerating air return passage 31 and a freezing air return opening communicating with the freezing air return passage 32. The air return opening part is located upstream of the evaporator 41 in the air flowing direction, or the refrigerating air return opening and the freezing air return opening are located upstream of the evaporator 41 in the air flowing direction, to guide the air from the refrigerating compartment 11 and the freezing

compartment 12 to the evaporator 41 for cooling. The refrigerating air return passage 31 extends from the bottom of the refrigerating compartment 11 to the air return opening part of the cooling chamber 40.

[0031] Further, the refrigerating air return passage 31 is located behind the cooling chamber 40, and intersects with the air discharging path 50 communicating with the cooling chamber 40 and the ambient space. The air discharging door 51 is provided at an intersection of the refrigerating air return passage 31 and the air discharging path 50, such that when the air discharging door 51 is in a first state (a closed state), the refrigerating air return passage 31 is connected and the air discharging path 50 is blocked, and when the air discharging door 51 is in a second state (an opened state), the refrigerating air return passage 31 is blocked and the air discharging path 50 is connected. Thus, the air discharging door 51 can simultaneously control the connecting or blocking of the refrigerating air return passage 31 and the air discharging path 50, reducing the number of air doors and simplifying the structure of the freezing and refrigerating device 1 to some extent.

[0032] In some embodiments of this invention, a top of the evaporator 41 is provided with a first temperature sensor 411 to detect a temperature of the top of the evaporator 41. When the temperature of the top of the evaporator 41 reaches a first predetermined temperature, it is determined that defrosting of the evaporator 41 ends. Therefore, the defrosting heater 43 can be controlled automatically to stop heating the evaporator 41 based on the temperature data detected by the first temperature sensor 411 to realize smart control.

[0033] Further, rear cover plates of the refrigerating compartment 11 and the freezing compartment 12 may be provided with second and third temperature sensors 111, 122 to detect the temperatures in the refrigerating compartment 11 and the freezing compartment 12 respectively.

[0034] In some embodiments of this invention, the defrosting heater 43 may be provided on the bottom of the evaporator 41 and faces a groove 44 provided in the bottom of the cooling chamber 40, such that defrosting water generated during defrosting flows into a water collecting box 80 provided at the bottom of the box body 100 via a water discharging pipe 70 communicating with the groove 44. The water collecting box 80 is provided on a compressor 90. When the compressor 90 works, water in the water collecting box 80 is evaporated by the heat generated by the compressor.

[0035] Fig. 2 is a schematic view of a freezing and refrigerating device in a refrigerating state according to an embodiment of this invention. The arrows in this figure represent the air flowing directions. When the freezing and refrigerating device 1 is in a refrigerating state, the compressor 90, the evaporator 41 and the blower 42 are in operation states. The refrigerating air feeding door 221 and the freezing air feeding door 222 are opened to connect the refrigerating air feeding passage 211 and the freezing air inlet 212 respectively. The air flow cooled by the evaporator 41 sequentially passes the freezing air feeding opening, the air supply door and the air supply path of the cooling chamber 40, and flows into the storage compartment. That is, in this embodiment, the cooling air flow sequentially passes the refrigerating air feeding opening, the refrigerating air feeding door 221, the refrigerating air feeding passage 211 and the air inlet of the refrigerating compartment, and flows into the refrigerating compartment 11. The cooling air flow sequentially passes the freezing air feeding opening, the freezing air feeding door 222, the freezing air feeding inlet 212, and flows into the freezing compartment 12. The air in the storage compartment passes the air return path to return to the cooling chamber, is cooled by the evaporator 41 and flows into the storage compartment again. Thus, the air circulation path is formed. That is, in this embodiment, the air in the refrigerating compartment 11 passes the refrigerating air return passage 31 to return to the air return opening part of the cooling chamber 40, is cooled by the evaporator 41 and flows into the refrigerating compartment 11 again. Thus, the air circulation path in the refrigerating compartment 11 is formed. The air in the freezing compartment 12 passes the freezing air return passage 32 to return to the air return opening part of the cooling chamber 40, is cooled by the evaporator 41 and flows into the freezing compartment 12 again. Thus, the air circulation path in the freezing compartment 12 is formed. In addition, the air discharging door 51 is closed to block the air discharging path 50 and prevent the air flow cooled by the evaporator 41 from flowing to the ambient space.

[0036] Further, when the second temperature sensor 111 detects that the temperature in the refrigerating compartment 11 reaches a second predetermined value, the freezing and refrigerating device 1 may control the refrigerating air feeding door 221 to close; when the third temperature sensor 122 detects that the temperature in the freezing compartment 12 reaches a third predetermined value, the freezing and refrigerating device 1 may control the freezing air feeding door 222 to close, thereby realizing automatic control of the cooling of the storage compartment.

[0037] Fig. 3 is a schematic view of a freezing and refrigerating device in a defrosting state according to an embodiment of this invention. The arrows in this figure represent the air flowing directions. When the freezing and refrigerating device 1 is in a defrosting state, the compressor 90 and the evaporator 41 are stopped. The defrosting heater 43 is started to heat the evaporator 41. The air discharging door 51 is opened, such that the hot air generated by defrosting is directly discharged to the ambient space via the air discharging path 50. The refrigerating air feeding door 221 and the freezing air feeding door 222 are closed to block the refrigerating air feeding passage 211 and the freezing air inlet 212, preventing the hot air generated by defrosting from entering the refrigerating compartment 11 and the freezing compart-

ment 12 and avoiding influence to food preservation due to temperature fluctuations. The air in the ambient space may sequentially pass the water collecting box 80, the water discharging pipe 70 and the groove 44 to enter the cooling chamber 40, thereby forming an air circulation path when performing defrosting to the evaporator 41. Further, when performing defrosting to the evaporator 41, the blower 42 may stop, and the hot air generated during defrosting may be discharged to the ambient space via the air discharging path 50 in a natural heat radiation manner. Preferably, the blower 42 may work at a low power, so that the hot air generated during defrosting is discharged to the ambient space via the air discharging path 50 in a compulsory manner.

[0038] Fig. 4 is a schematic view of a freezing and refrigerating device in an air discharging state according to another embodiment of this invention. In other embodiments of this invention, the air discharging path 50 is provided with an air discharging pump 52 therein for driving the air in the cooling chamber 40 to flow towards the ambient space. One end of the air discharging path 50 communicating with the cooling chamber 40 may be located upstream or downstream of the blower 42 in the air flowing direction. When the evaporator 41 needs defrosting, the air discharging pump 52 may be started to drive the hot air generated during defrosting to be discharged to the ambient space via the air discharging path 50. At this time, the blower 42 may stop. Other structural features of the freezing and refrigerating device 1 in this embodiment of this invention are the same as those in the embodiment shown in Fig. 1, and will not be repeated.

[0039] Fig. 5 is a schematic view of a freezing and refrigerating device according to yet another embodiment of this invention. In this embodiment of this invention, the at least one storage compartment comprises a freezing compartment 12, and the cooling chamber 40 is located behind the freezing compartment 12. The air supply path comprises a freezing air inlet 212 provided at the rear cover plate 121 of the freezing compartment 12. The air return path comprises a freezing air return passage 32 located at the bottom of the freezing compartment 12. The air supply door comprises a freezing air feeding door 222 provided at the freezing air inlet 212. Other structural features of the freezing and refrigerating device 1 in this embodiment of this invention are the same as those in the embodiment shown in Fig. 1, and will not be repeated.

[0040] Fig. 6 is a flow chart of a defrosting control method of a freezing and refrigerating device according to an embodiment of this invention. In this embodiment, the defrosting control method comprises: step A: receiving a defrosting signal instructing the evaporator 41 of the freezing and refrigerating device 1 to perform defrosting; step B: starting the defrosting heater 43 located on the evaporator 41; step C: closing the air supply door located in the air supply path of the freezing and refrigerating device 1 to block the air supply path; and step D: opening the air discharging door 51 located in the air discharging path 50 of the freezing and refrigerating device 1 to connect the air discharging path 50, such that hot air generated by the defrosting heater 43 when performing heating and defrosting is directly discharged to the ambient space via the air discharging path 50.

[0041] Those skilled in the art shall understand that in this embodiment, there is no chronological order between the steps C and D. In other words, after starting the defrosting heater 43, the air supply door may be closed, and then the air discharging door 51 is opened; or the air discharging door 51 is opened first, and then the air supply door is closed.

[0042] Fig. 7 is a flow chart of a defrosting control method of a freezing and refrigerating device according to another embodiment of this invention. In other embodiments, after the step A, the method further comprises step E: starting the air discharging pump 52 in the air discharging path 50 to drive the hot air in the cooling chamber 40 to be discharged to the ambient space via the air discharging path 50. The blower may stop at this time, and only the air discharging pump 52 drives the air flow. Those skilled in the art shall understand that in this embodiment, there is no chronological order between the steps E and (C, D). In other words, the steps E and (C, D) may be performed in any order or simultaneously.

[0043] After the step E, the method further comprises step F: when the temperature of the top of the evaporator 41 reaches a first predetermined temperature, stopping the defrosting heater 43. In this step, the first temperature sensor 411 provided at the top of the evaporator 41 may detect the temperature of the top of the evaporator 41. The first predetermined temperature may be the temperature when defrosting for the evaporator 41 ends.

[0044] Further, after the step F, the method further comprises step G: when the defrosting heater 43 is stopped for a predetermined time period, closing the air discharging pump 52 and the air discharging door 51. When the defrosting heater 43 is stopped for a predetermined time period, the hot air generated during defrosting of the evaporator 41 is basically completely discharged to the ambient space. Closing the air discharging pump 52 and the air discharging door 51 at this time can prevent excessive heat exchange between the air in the freezing and refrigerating device and the air in the ambient space, and improve the cooling performance of the freezing and refrigerating device.

[0045] Those skilled in the art shall understand that the freezing and refrigerating device 1 of this invention may be a fridge, a refrigerating cabinet, a wine cabinet, a refrigerating tank or other devices having a freezing or refrigerating function or having a freezing or refrigerating compartment.

[0046] Although multiple embodiments of this invention have been illustrated and described in detail, those skilled in the art may make various modifications and variations to the invention based on the content disclosed by this invention or the content derived therefrom without departing from the spirit and scope of the invention. Thus, the scope of this invention should be understood and

deemed to include these and other modifications and variations.

Claims

1. A freezing and refrigerating device, comprising a box body and a door body pivotably connected to the box body, wherein inside the box body are defined:

   at least one storage compartment for storing articles;
   an air supply path configured to supply cooling air flow to the at least one storage compartment;
   an air return path configured to allow the air flow from the at least one storage compartment to pass;
   a cooling chamber which communicates with the air supply path and the air return path, and contains an evaporator for cooling the air entering the cooling chamber from the air return path, a blower for driving the air inside the cooling chamber to flow towards the air supply path and a defrosting heater provided on the evaporator; and
   an air discharging path communicating with the cooling chamber and an ambient space so that the air in the cooling chamber is directly discharged to the ambient space, wherein
   the air supply path and the air return path are respectively provided with an air supply door and an air discharging door for selectively connecting or blocking the air supply path and the air return path.

2. The freezing and refrigerating device of claim 1, wherein the air discharging path is provided with an air discharging pump therein for driving the air in the cooling chamber to flow towards the ambient space.

3. The freezing and refrigerating device of claim 1, wherein one end of the air discharging path communicating with the cooling chamber is located downstream of the blower in the air flowing direction.

4. The freezing and refrigerating device of claim 1, wherein the at least one storage compartment comprises a refrigerating compartment and a freezing compartment that are provided in a vertical direction relative to each other, and the cooling chamber is located behind the freezing compartment and is separated therefrom by a rear cover plate of the freezing compartment.

5. The freezing and refrigerating device of claim 4, wherein the air supply path comprises a refrigerating air feeding passage located behind the refrigerating compartment and a freezing air inlet provided at the rear cover plate of the freezing compartment, and the air supply door comprises a refrigerating air feeding door provided inside the refrigerating air feeding passage and a freezing air feeding door provided at the freezing air inlet.

6. The freezing and refrigerating device of claim 4, wherein the air return path comprises a refrigerating air return passage, which extends from the bottom of the refrigerating compartment to an air return opening part of the cooling chamber and intersects with the air discharging path; and
   the air discharging door is provided at an intersection of the refrigerating air return passage and the air discharging path, such that when the air discharging door is in a first state, the refrigerating air return passage is connected and the air discharging path is blocked, and when the air discharging door is in a second state, the refrigerating air return passage is blocked and the air discharging path is connected.

7. The freezing and refrigerating device of claim 1, wherein a top of the evaporator is provided with a first temperature sensor to detect a temperature of the top of the evaporator.

8. The freezing and refrigerating device of claim 1, wherein the defrosting heater is provided on the bottom of the evaporator and faces a groove provided in the bottom of the cooling chamber, such that defrosting water generated during defrosting flows into a water collecting box provided at the bottom of the box body via a water discharging pipe communicating with the groove.

9. A defrosting control method of a freezing and refrigerating device of any of claims 1-8, the method comprising:

   step A: receiving a defrosting signal instructing the evaporator of the freezing and refrigerating device to perform defrosting;
   step B: starting the defrosting heater located on the evaporator;
   step C: closing the air supply door located in the air supply path of the freezing and refrigerating device to block the air supply path; and
   step D: opening the air discharging door located in the air discharging path of the freezing and refrigerating device to connect the air discharging path, such that hot air generated by the defrosting heater when performing heating and defrosting is directly discharged to the ambient space via the air discharging path.

10. The defrosting control method of claim 9, after the step A, further comprising: step E: starting the air discharging pump in the air discharging path to drive

the hot air in the cooling chamber to be discharged to the ambient space via the air discharging path.

11. The defrosting control method of claim 10, after the step E, further comprising: step F: when the temperature of the top of the evaporator reaches a first predetermined temperature, stopping the defrosting heater.

12. The defrosting control method of claim 11, after the step F, further comprising: step G: when the defrosting heater is stopped for a predetermined time period, closing the air discharging pump and the air discharging door.

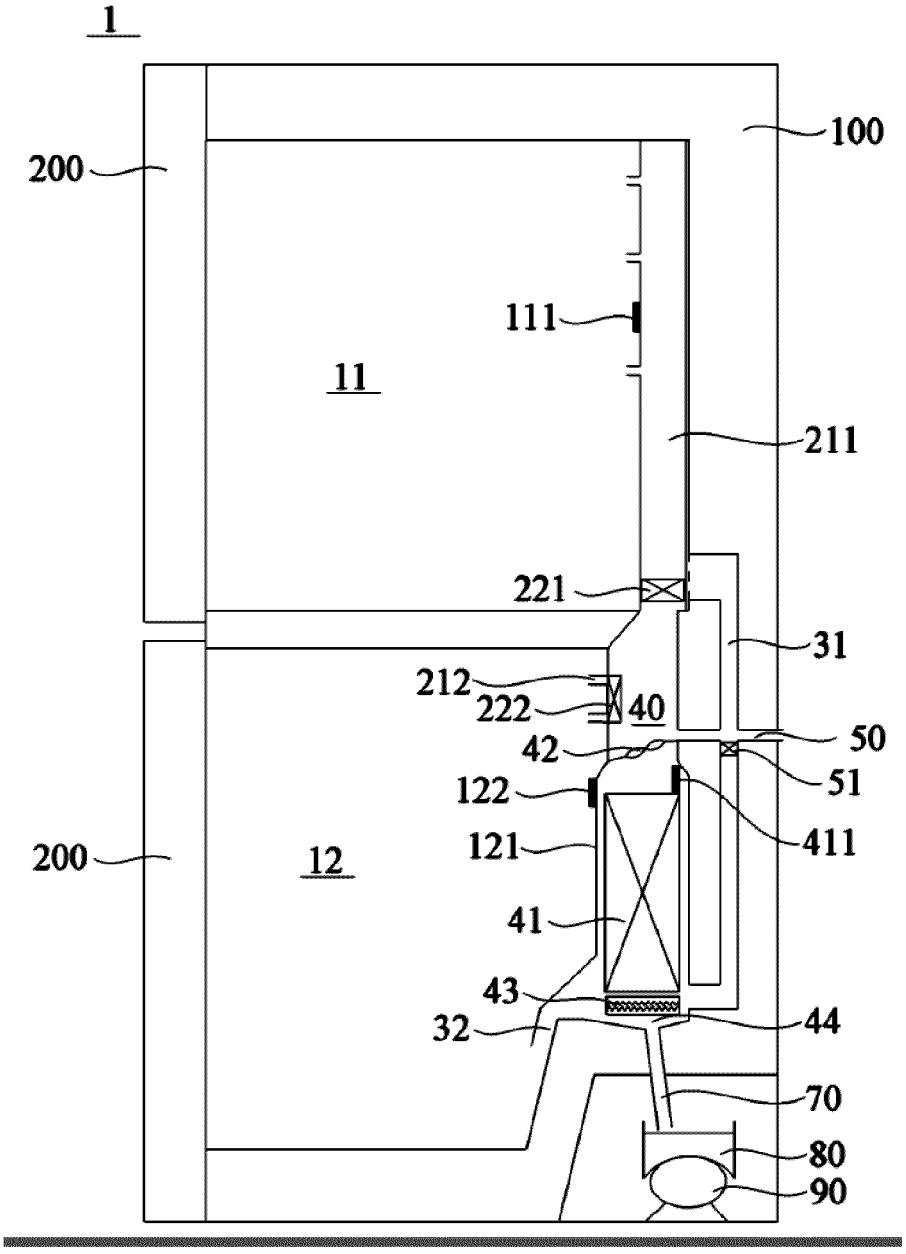
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Fig. 1

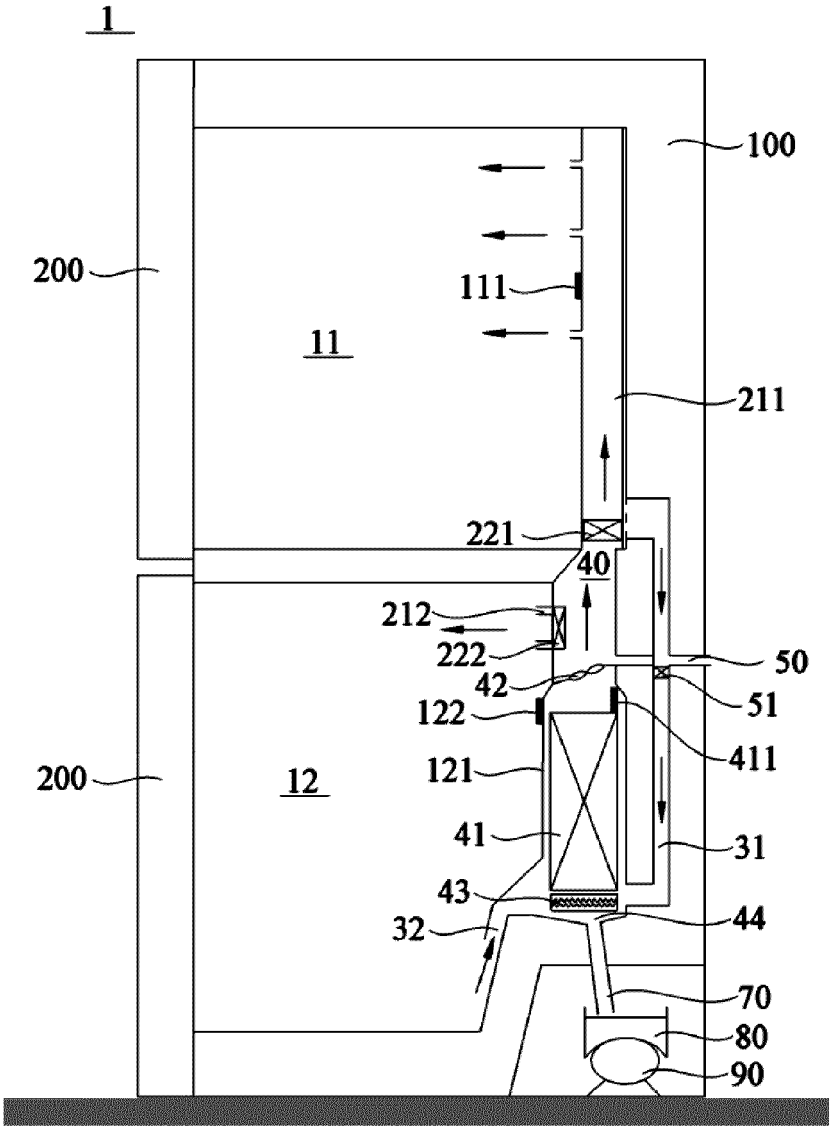
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Fig. 2

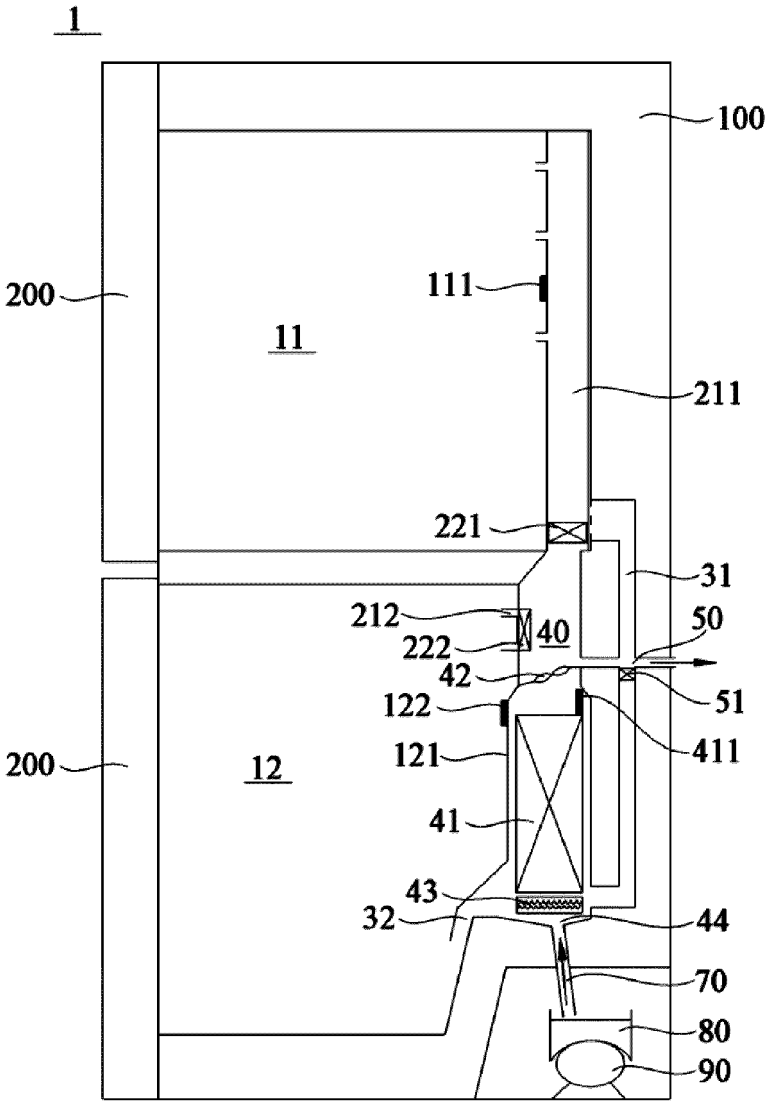
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Fig. 3

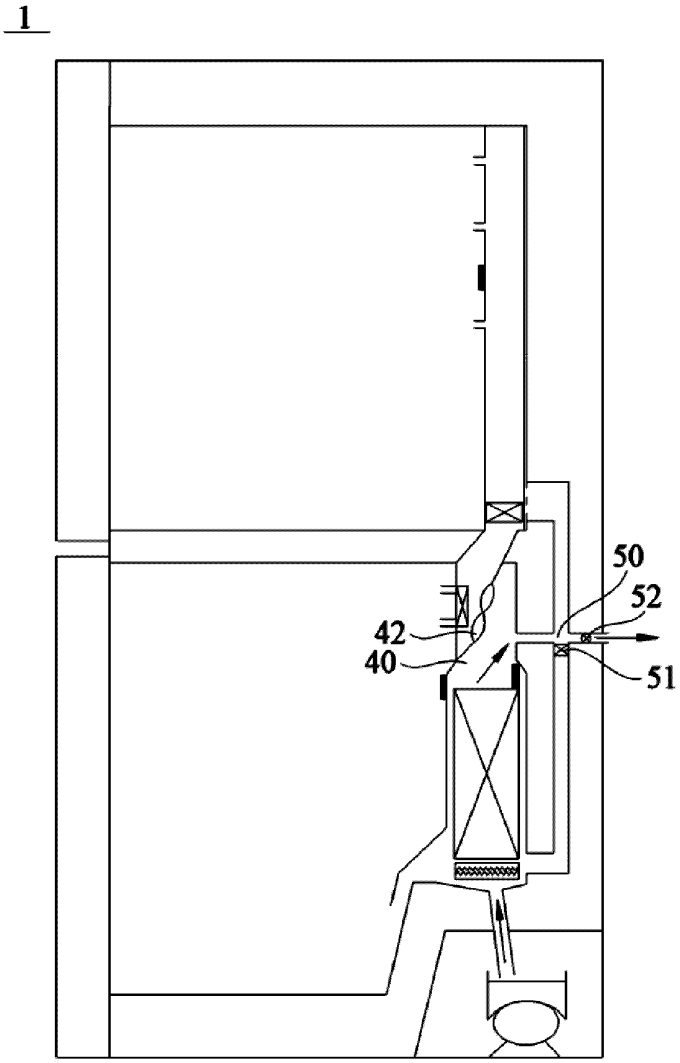

Fig. 4

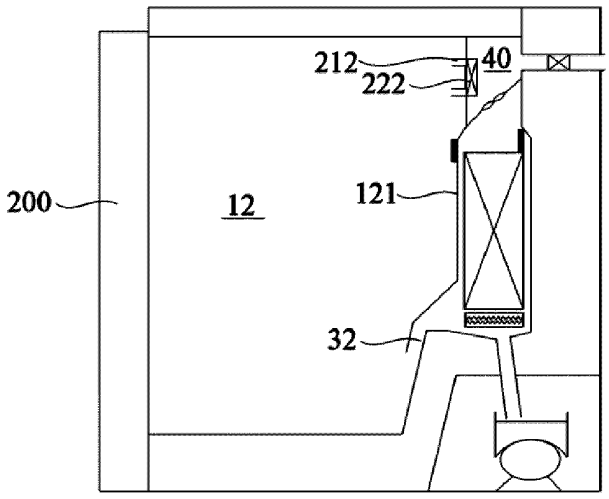

Fig. 5

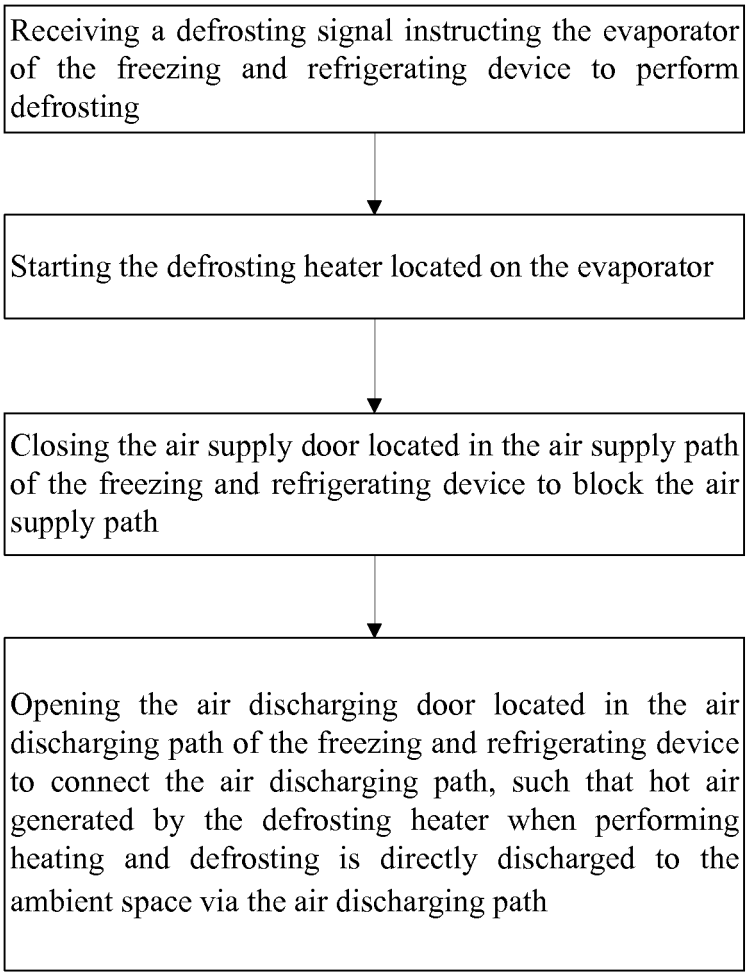
Receiving a defrosting signal instructing the evaporator of the freezing and refrigerating device to perform defrosting
Starting the defrosting heater located on the evaporator
Closing the air supply door located in the air supply path of the freezing and refrigerating device to block the air supply path
Opening the air discharging door located in the air discharging path of the freezing and refrigerating device to connect the air discharging path, such that hot air generated by the defrosting heater when performing heating and defrosting is directly discharged to the ambient space via the air discharging path

Fig. 6

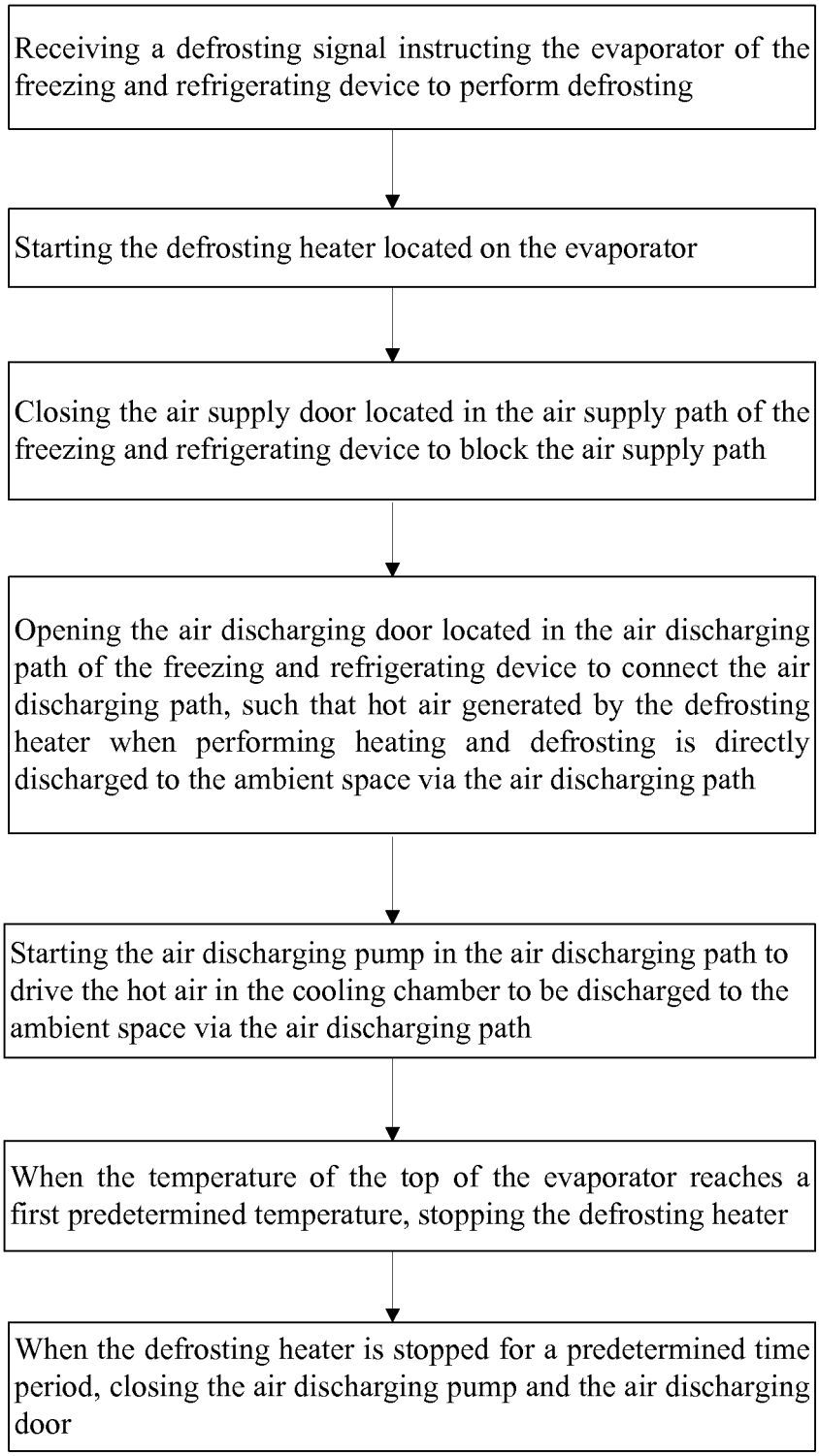
Receiving a defrosting signal instructing the evaporator of the freezing and refrigerating device to perform defrosting
Starting the defrosting heater located on the evaporator
Closing the air supply door located in the air supply path of the freezing and refrigerating device to block the air supply path
Opening the air discharging door located in the air discharging path of the freezing and refrigerating device to connect the air discharging path, such that hot air generated by the defrosting heater when performing heating and defrosting is directly discharged to the ambient space via the air discharging path
Starting the air discharging pump in the air discharging path to drive the hot air in the cooling chamber to be discharged to the ambient space via the air discharging path
When the temperature of the top of the evaporator reaches a first predetermined temperature, stopping the defrosting heater
When the defrosting heater is stopped for a predetermined time period, closing the air discharging pump and the air discharging door

Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/093402

A. CLASSIFICATION OF SUBJECT MATTER

F25D 21/06 (2006.01) 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)

F25D 21, F25D 11, F25D 17

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)

CNTXT; CNABS; SIPOABS; VEN; CNKI: air duct, return air, heat, defrost, refrigerator, fridge, freezer, door, damper, flap, discharge, heater

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 204678776 U (QINGDAO HAIER CO., LTD.), 30 September 2015 (30.09.2015), description, paragraphs [0036]-[0069], and figures 1-5	1-12
PX	CN 104807279 A (QINGDAO HAIER CO., LTD.), 29 July 2015 (29.07.2015), description, paragraphs [0047]-[0074], and figures 1-7	1-12
PX	CN 204678774 U (QINGDAO HAIER CO., LTD.), 30 September 2015 (30.09.2015), description, paragraphs [0035]-[0061], and figures 1-5	1-12
PX	CN 104792094 A (QINGDAO HAIER CO., LTD.), 22 July 2015 (22.07.2015), description, paragraphs [0051]-[0084], and figures 1-7	1-12
Y	CN 1204041 A (DAEWOO ELECTRONICS CORP.), 06 January 1999 (06.01.1999), description, page 4, line 24 to page 6, line 9, and figures 1-3	1-12
Y	DE 2841804 A1 (SACHS SYSTEMTECHNIK GMBH), 03 April 1980 (03.04.1980), description, page 4, line 24 to page 6, line 32, and figures 1-3	1-12

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 January 2016 (11.01.2016)	**04 February 2016 (04.02.2016)**
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer **WANG, Ying** Telephone No.: (86-10) **62084892**

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2015/093402

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 204678776 U	30 September 2015	None	
CN 104807279 A	29 July 2015	None	
CN 204678774 U	30 September 2015	None	
CN 104792094 A	22 July 2015	None	
CN 1204041 A	06 January 1999	US 5941085 A	24 August 1999
		JP H1123135 A	26 January 1999
		CN 1102232 C	26 February 2003
DE 2841804 A1	03 April 1980	SE 7907729 L	27 March 1980

Form PCT/ISA/210 (patent family annex) (July 2009)