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(54) **REFRIGERATOR**

(57) The present invention provides a refrigerator, comprising: a freezing chamber (1205); a refrigerating chamber (1203) provided above the freezing chamber (1205); and a fan (305) provided on the back of the freezing chamber and above an evaporator (303) to at least enabling cold air to flow into the freezing chamber (1205) from an air outlet through an air duct (315). An intermediate separator plate (307) between the freezing chamber (1205) and the refrigerating chamber (1203) is provided on the back of the freezing chamber to bend the inside of the freezing chamber upwards to create a space for the freezing chamber, and at least part of the fan (305) is provided in the space (309).

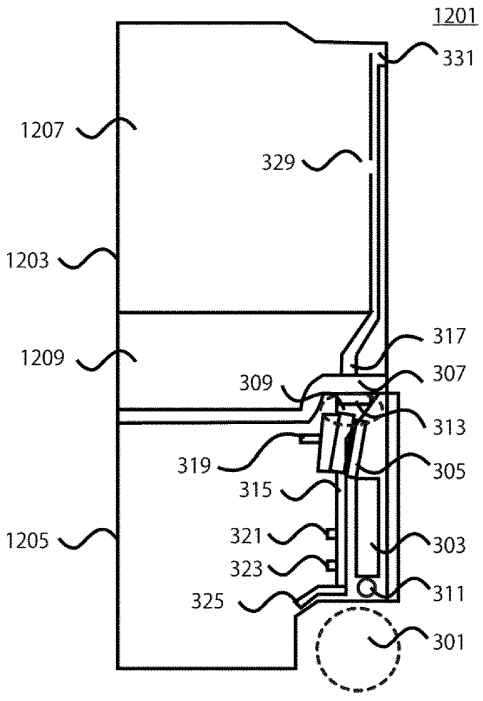

FIG.3

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Description

TECHNICAL FIELD

[0001] The present invention relates to a refrigerator having a freezing chamber and a refrigerating chamber.

BACKGROUND

[0002] A practice arises in recent years: cutting vegetable and then storing it in a freezing chamber, and taking the vegetable out of the freezing chamber upon cooking the vegetable. Therefore, there is a requirement for reducing the volume of vegetable compartment and increasing the volume of the freezing chamber.

[0003] In addition, patent document 1 discloses the following technique: adding a fan cover to a fan which feeds cold air to the freezing chamber and refrigerating chamber to save electrical power. The fan cover is closed and a heater is on during defrosting, so that warm air does not flow in the refrigerator.

(Prior art document)

(Patent document)

[0004] Patent document 1: Japanese patent No. 6254404

[0005] The fan and a fan shielding cover provided with a fan cover are disposed on a back side of the freezing chamber. Therefore, the size of the fan shielding device takes up the volume of the freezing chamber. In addition, on the back side of the freezing chamber are disposed an evaporator serving as a cooler and a heater for defrosting purpose. If the freezing chamber is disposed at the lowermost portion of the refrigerator, a machine room disposed in the lower portion of the refrigerator and provided with a compressor will takes up the space for disposing the evaporator and the heater, so that the volume of the freezing chamber becomes smaller.

[0006] In view of the above, it is necessary to improve the conventional refrigerators to solve the above problems.

SUMMARY

[0007] An object of the present invention is to provide a refrigerator which is provided with a fan shielding device and has an increased volume of the freezing chamber

[0008] Another object of the present invention is to provide a power-saving refrigerator by providing a fan shielding device. In addition, the refrigerator according to the present invention may also improve the cooling efficiency by disposing the vertically elongated evaporator on the back of the freezing chamber.

[0009] To achieve the above-mentioned objects, the present invention provides a refrigerator comprising: a freezing chamber; a refrigerating chamber disposed above the freezing chamber; and a fan disposed on a back side of the freezing chamber and above an evaporator, so that the fan can at least make cold air flow into the freezing chamber through an air duct and through an air outlet, an intermediate separator plate between the freezing chamber and the refrigerating chamber is on a back side of the freezing chamber so that an inner side of the freezing chamber bends upward to create a space for the freezing chamber, and at least a portion of the fan is disposed in the space.

[0010] As such, the refrigerator according to the present invention is provided with a fan in the space, which can increase the volume of the freezing chamber. In addition, the present invention can provide a power-saving refrigerator by providing a fan shielding device. Furthermore, in the refrigerator according to the present invention, the cooling efficiency can be enhanced and the volume of the freezing chamber can be increased by setting a vertically elongated site for disposing the evaporator which is on the back of the freezing chamber and disposed above the machine room.

[0011] As a further improvement of the present invention, an air outlet of the freezing chamber is disposed at a position parallel to the fan. As such, the cold air can be sent to the freezing chamber with a high air flow rate.

[0012] As a further improvement of the present invention, a fan cover and a fan shielding device are provided coaxial with a central shaft of the fan, the fan cover assumes a shape of a cover with an internal thread, the fan is mounted on the fan shielding device, the fan cover opens and closes by the rotation of a shaft portion, the shaft portion is disposed above the fan, is coaxial with the central shaft of the fan and is engaged with the internal thread, a cooling space cooled by the evaporator communicates with a space of the air duct by opening the fan cover, and the communication between the cooling space and the space of the air duct is blocked by closing the fan cover.

[0013] Thus, the fan cover can be opened and closed with a simple mechanism. The present invention can block the communication between the cooling space and the space of the air duct by providing the fan shielding device.

[0014] As a further improvement of the present invention, a heater is disposed below the evaporator; during a defrosting period, the fan cover closes and blocks the communication between the cooling space and the space of the air duct, and the heater is activated to melt frost.

[0015] Thus, in the refrigerator according to the present invention, the fan can be shielded during a defrosting period when the heater is turned on. With the fan being shielded, it will not occur that the warm air in the refrigerator flows around and the temperature rises. Thus, the present invention may achieve power saving.

[0016] As a further improvement of the present invention, a vegetable compartment is disposed below the refrigerating chamber and directly above the intermediate separator plate. As such, the volume of the vegetable

compartment can be reduced and the volume of the freezing chamber can be increased.

[0017] Advantageous effects of the present invention are as follows: the refrigerator according to the present invention is provided with the fan shielding device, which can increase the volume of the freezing chamber. In addition, the present invention can provide a power-saving refrigerator with the fan shielding device being provided. Furthermore, a refrigerator with a high cooling efficiency and an increased volume of the freezing chamber can be provided by disposing a vertically elongated evaporator on the back side of the freezing chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

FIG. 1 is a schematic diagram of a refrigerator according to the present invention.

FIG. 2 is a front view of the refrigerator whose door body is opened according to the present invention.

FIG. 3 is a cross-sectional view of the refrigerator shown in FIG. 2 taken along the line A-A.

FIG. 4 is a schematic diagram of a portion, namely, a fan and a fan cover, of a fan shielding device of the refrigerator according to the present invention.

FIG. 5 is a front view of the fan shielding device of the refrigerator according to the present invention.

Listing of parts designated by reference numerals:

[0019]

101	refrigerator
103	refrigerator main body
105	door body
107	door body
1201	refrigerator body
1203	refrigerating chamber
1205	freezing chamber
1207	refrigerating chamber for storing food to be refrigerated
1209	Vegetable compartment
211	air outlet
213	air outlet
215	air outlet
217	air outlet
219	air outlet
221	air return port
223	air return port
225	air return port
227	air outlet
229	air outlet
231	air outlet
301	machine room
303	evaporator
305	fan
307	intermediate separator plate
309	space
311	heater
313	air throttle
315	air duct
317	air duct
319	air outlet
321	air outlet
323	air outlet
325	air return port
329	air outlet
331	air outlet
401	a portion of the fan shielding device
403	fan
405	fan cover
407	internal thread
409	shaft portion
411	support pin
501	fan shielding device
503	position
505	air outlet
507	air outlet
509	air outlet
511	air outlet
513	air outlet
515	air return port.

DETAILED DESCRIPTION

[0020] To make the objectives, technical solutions and advantages of the present invention clearer, the present invention will be described in detail below with reference to the figures and specific embodiments.

(Regarding the overall structure of the refrigerator)

[0021] FIG. 1 is a schematic diagram of a refrigerator in a preferred embodiment of the present invention. The overall structure of the refrigerator of the present invention will be described below with reference to FIG. 1.

[0022] As shown in FIG. 1, the refrigerator 101 according to the present invention comprises a refrigerator main body 103 capable of storing food and the like therein. The refrigerator main body 103 comprises door bodies 105 and 107 for opening and closing an opening in the front thereof. The door body 105 opens and closes a refrigerating chamber, and the door body 107 opens and closes a freezing chamber 1205.

(Regarding the internal structure of the refrigerator)

[0023] FIG. 2 is a front view of the refrigerator whose door body is opened according to the present invention, the description of the door body being omitted here. FIG. 3 is a cross-sectional view of the refrigerator 101 of the present invention taken along the line A-A in FIG. 2. The internal structure of the refrigerator 101 will be described with reference to FIGS. 2 and 3.

[0024] As shown in FIG. 2, the refrigerator main body

1201 has: a refrigerating chamber 1203 into which cold air for refrigeration is sent, a refrigerating chamber 1207 for storing foods to be refrigerated, a vegetable compartment 1209, and a freezing chamber 1205 into which cold air is sent for freezing. In the refrigerator main body 1201, the freezing chamber 1205 is provided in the lowermost portion, the vegetable compartment 1209 is provided above the freezing chamber 1205, and the refrigerating chamber 1207 for storing foods to be refrigerated is provided above the vegetable compartment 1209.

[0025] As shown in FIG. 3, a machine room 301 is disposed on the back of the freezing chamber 1205, and a compressor is disposed in a lower portion of the machine room 301. A heater 311 is disposed above the machine room 301 on the back of the freezing chamber. An evaporator 303 serving as a cooler is disposed above the heater 311 on the back of the freezing chamber.

[0026] To lower the center of gravity of the refrigerator 101 to stabilize the installation of the refrigerator 101, the machine room 301 is disposed in a lower portion of the refrigerator 101. However, this portion takes up the volume of the storage chamber of the refrigerator 101. In the present embodiment, the freezing chamber 1205 is disposed in the lowest portion of the refrigerator 101, so the machine room 301 will take up the volume of the freezing chamber 1205.

[0027] The evaporator 303 generates cold air for cooling the freezing chamber 1205 and the refrigerating chamber 1203. In order to maintain the cooling capacity of the refrigerator 101 of the present invention, the evaporator 303 which is disposed on the back side of the freezing chamber and above the machine room 301 is set to be vertically elongated. The vertically elongated evaporator 303 can have a longer cooling area, so the cooling efficiency is high.

[0028] The heater 311 is disposed below the evaporator 303 to remove the frost adhered to the evaporator 303. The heater 311 will automatically start after a certain period of time has passed to warm the air and melt the frost. The melted frost becomes water and is discharged from the lower portion of the heater 311.

[0029] A fan 305 is disposed on the evaporator 303 on the back of the freezing chamber. The fan 305 can at least make cold air flow into the freezing chamber 1205. After passing through the fan 305, the cold air flows towards the freezing chamber 1205 through an air duct 315, through an air outlet 319 corresponding to air outlets 211, 213 in FIG. 2, an air outlet 321 corresponding to air outlets 215, 217 in FIG. 2, and an air outlet 323 corresponding to the air outlet 219 in FIG. 2.

[0030] The cold air, after circulating in the freezing chamber 1205, is sucked in through an air return port 325 corresponding to an air return port 221 in FIG. 2, and is cooled in the evaporator 303 again.

[0031] In addition, cold air flows into the refrigerating chamber 1203 through an air throttle 313, and the air throttle 313 switches the inflow into the refrigerating chamber 1203. After passing through the air throttle 313, the cold air enters the air duct 317, and flows towards the refrigerating chamber 1203 through an air outlet 227 in FIG. 2, an air outlet 329 corresponding to an air outlet 229 in FIG. 2, and an air outlet 331 corresponding to the air outlet 231 in FIG. 2.

[0032] The cold air, after circulating in the refrigerating chamber 1203, is sucked in from the air return ports 223 and 225, passes through a return air duct, returns to a lower side of the evaporator 303, and is cooled again in the evaporator 303.

[0033] The freezing chamber 1205 and the refrigerating chamber 1203 are partitioned by an intermediate separator plate 307. The intermediate separator plate 307 bends the inside of the freezing chamber 1205 upward on the back side of the freezing chamber 1205 to create a space 309 for the freezing chamber 1205. At least one portion of the fan 305 is disposed in the space 309.

[0034] Although the intermediate separator plate 307 may bend upward on the back side of the freezing chamber 1205 to form the space 309 as in the present embodiment, it is also possible to remove a portion of the intermediate separator plate 307 to form the space 309.

[0035] The space on the back side of the freezing chamber 1205 can be effectively used with the fan 305 being disposed in the space 309. Therefore, the volume of the freezing chamber 1205 can be made larger.

[0036] The vegetable compartment 1209 is disposed below the refrigerating chamber 1203 and directly above the intermediate separator plate 307. The space 309 can be a portion of the vegetable compartment 1209, or can make an unnecessary portion of the vegetable compartment 1209 become a portion of the freezing chamber 1205. In addition, a dead space of a portion of the air duct 315 can be set as a portion of the freezing chamber 1205.

[0037] As such, the refrigerator of the present invention increases the volume of the freezing chamber 1205 with the fan 305 not occupying the volume of the freezing chamber 1205. In addition, the present invention can reduce the volume of the vegetable compartment 1209 and increase the volume of the freezing chamber 1205. Furthermore, the volume of the air duct 315 is reduced, and the volume of the freezing chamber 1205 is increased.

[0038] In addition, in the refrigerator of the present invention, a site for disposing the evaporator 303 which is on the back of the freezing chamber and disposed above the machine room 301, can be set in an upper direction. Therefore, it is possible to arrange the evaporator 303 to be vertically elongated, enhance the cooling efficiency, and increase the volume of the back side of the freezing chamber.

(Depictions of a fan shielding device)

[0039] FIG. 4 is a schematic diagram of a portion, namely, a fan and a fan cover, of a fan shielding device according to the present invention. FIG. 5 is a front view of the fan shielding device according to the present in-

vention. The fan shielding device including the fan and the fan cover will be described with reference to FIG. 4 and FIG. 5.

[0040] FIG. 4 shows a portion 401 of the fan shielding device including the fan 403 and the fan cover 405. The fan cover 405 coaxial with a central shaft of the fan 403 shown by the dashed line in FIG. 4 and the fan shielding device are attached. The fan cover 405 assumes a shape of a cover with an internal thread 407, and the fan 403 is mounted on the fan shielding device.

[0041] The fan cover 405 moves up and down by the rotation of a shaft portion 409, and the shaft portion 409 is located above the fan 403, is coaxial with the central shaft of the fan 403 and is engaged with the internal thread 407. The support pin 411 runs through the fan cover 405 for guiding, so that the fan cover 405 moves in parallel.

[0042] The fan cover 405 opens when it acts upward, and the cooling space cooled by the evaporator 303 communicates with the space of the air duct 315, so that air flows in the direction indicated by the arrows. The fan cover 405 closes when it acts downward, and communication between the cooling space cooled by the evaporator 303 and the air duct 315 is blocked.

[0043] Therefore, the fan cover 405 can shield the fan 403 during the defrosting period when the heater 311 of the evaporator 303 is turned on. During the defrosting period, the heater 311 is activated to melt the frost. At the same time, the fan 403 is shielded by closing the fan cover 405, and then communication between the cooling space and the space of air duct 315 is blocked, so that it will not occur that the warm air in the refrigerator flows around and the temperature rises. Thus, the present invention may achieve the effect of power saving.

[0044] FIG. 5 is a front view of the fan shielding device 501. The fan shielding device 501 comprises a fan 403 corresponding to the fan 305 in FIG. 3 and a fan cover 405, the air duct 315 in FIG. 3, air outlets 505, 507 corresponding to the air outlets 211, 213 in FIG. 2 and corresponding to the air outlet 319 in FIG. 3, air outlets 509, 511 corresponding to the air outlets 215, 217 in FIG. 2 and corresponding to the air outlet 321 in FIG. 3, an air outlet 513 corresponding to the air outlet 219 in FIG. 2 and corresponding to the air outlet 323 in FIG. 3, and an air return port 515 corresponding to the air return port 221 in FIG. 2 and corresponding to the air return port 325 in FIG. 3.

[0045] As shown in FIG. 3, the space 309 is provided with a portion above than the line B-B of the fan shielding device 501. In addition, the portion 401 of the fan shielding device is disposed on the back of a position 503 of the fan shielding device 501. In this way, the portion of the fan shielding device 501 including the fan 403 and the fan cover 405 is disposed in the space 309.

[0046] Here, an important thing is that the air outlet 505 and the air outlet 507 are provided in parallel with the position 503 where the fan 403 is provided. The cold air needs to be sent from the vicinity of the ceiling of the freezing chamber 1205. In the prior art, an air outlet is disposed above the position of the fan.

[0047] However, in the present invention, the fan 403 can be disposed above the freezing chamber 1205, so the air outlet 505 for blowing air can be placed in parallel with the position 503 where the fan 403 is disposed. In this way, the cold air can be sent to the freezing chamber 1205 with a high air flow rate, and therefore, power can be saved.

[0048] According to the present invention, the volume of the freezing chamber 1205 can be increased in the refrigerator provided with the fan shielding device. In addition, the present invention can provide a power-saving refrigerator by providing the fan shielding device. Furthermore, the present invention can provide a refrigerator with a high cooling efficiency and increased volume of the freezing chamber 1205 by disposing the vertically elongated evaporator 303 on the back of the freezing chamber.

(Industrial applicability)

[0049] The present invention can be applied to a refrigerator with a fan disposed on the back of the freezing chamber. In addition, the present invention can be applied to a refrigerator provided with a fan shielding device for saving power.

[0050] The above embodiments are only intended to illustrate the technical solutions of the present invention and not to limit them. Although the present invention has been described in detail with reference to the preferred embodiments, those having ordinary skill in the art should understand that the technical solutions of the present invention may be modified or equivalently replaced, without departing from the spirit and scope of the technical solutions of the present invention.

Claims

1. A refrigerator, comprising: a freezing chamber and a refrigerating chamber disposed above the freezing chamber, wherein the refrigerator further comprises:

   a fan disposed on a back side of the freezing chamber and above an evaporator, so that the fan can at least make cold air flow into the freezing chamber through a air duct and through an air outlet,

   an intermediate separator plate between the freezing chamber and the refrigerating chamber is on a back side of the freezing chamber so that an inner side of the freezing chamber bends upward to create a space for the freezing chamber, and

   at least a portion of the fan is disposed in the space.

2. The refrigerator according to claim 1, wherein an air outlet of the freezing chamber is disposed at a position parallel to the fan.

3. The refrigerator according to claim 1 or 2, wherein a fan cover and a fan shielding device are provided coaxial with a central shaft of the fan, the fan cover assumes a shape of a cover with an internal thread, the fan is mounted on the fan shielding device, the fan cover opens and closes by the rotation of a shaft portion, the shaft portion is disposed above the fan, is coaxial with the central shaft of the fan and is engaged with the internal thread, a cooling space cooled by the evaporator communicates with a space of the air duct by opening the fan cover, and the communication between the cooling space and the space of the air duct is blocked by closing the fan cover.

4. The refrigerator according to claim 3, wherein a heater is disposed below the evaporator; during a defrosting period, the fan cover closes and blocks the communication between the cooling space and the space of the air duct, and the heater is activated to melt frost.

5. The refrigerator according to claim 4, wherein a vegetable compartment is disposed below the refrigerating chamber and directly above the intermediate separator plate.

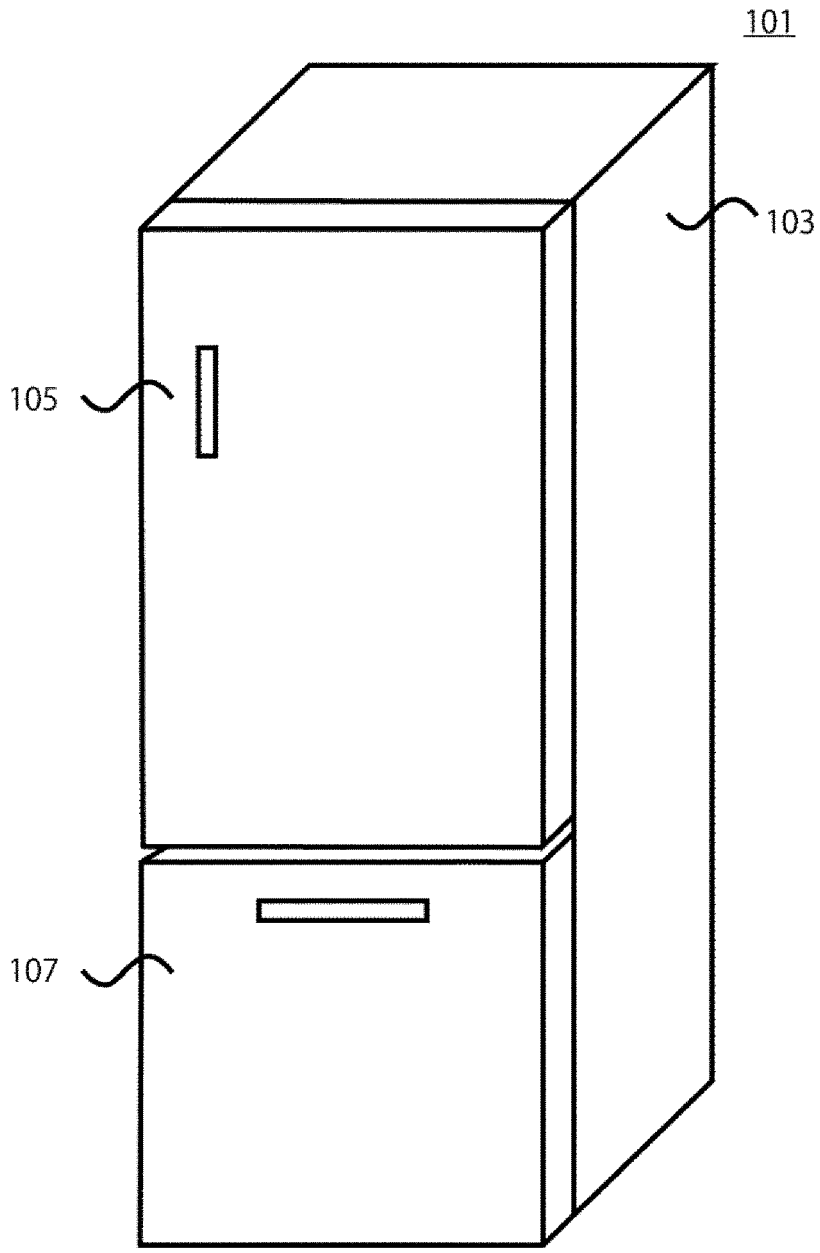

FIG.1

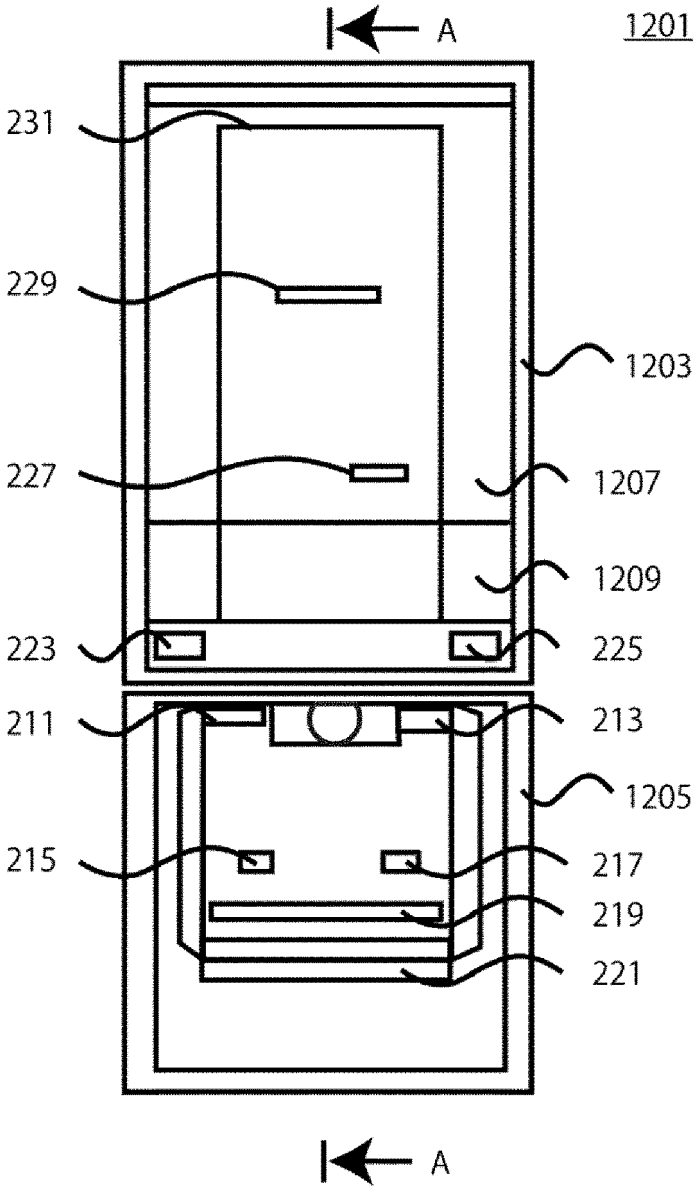
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FIG.2

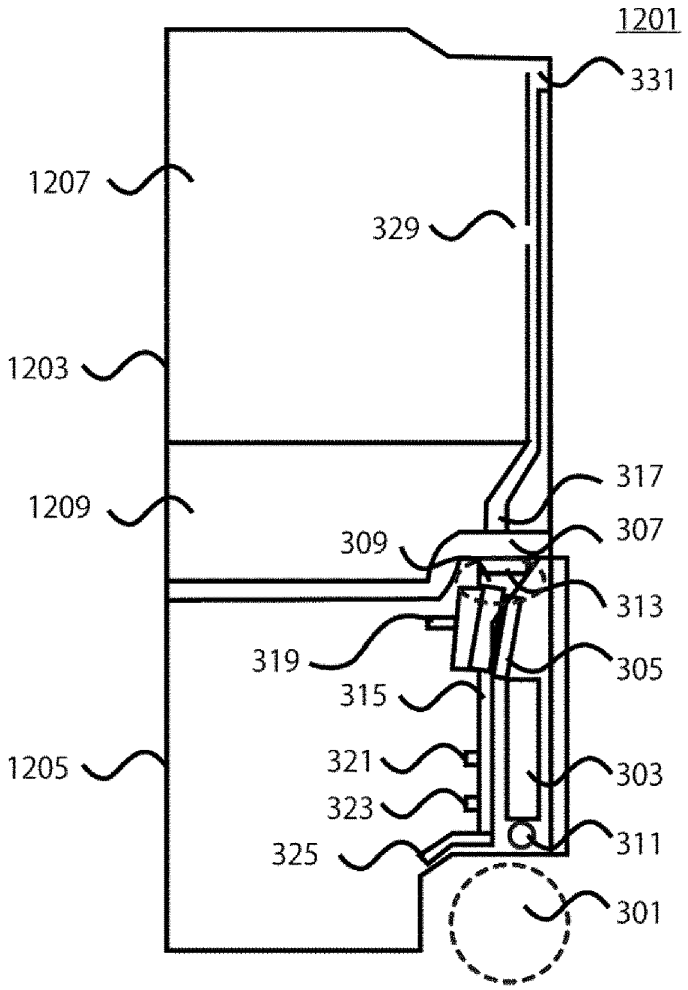
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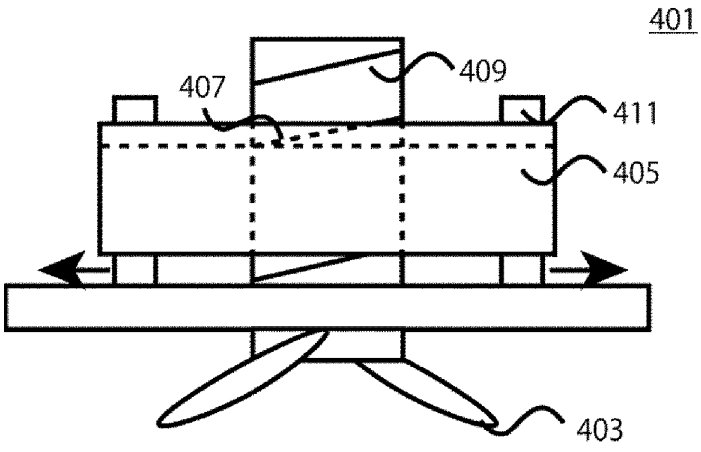
FIG.3


401
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411
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403

FIG.4

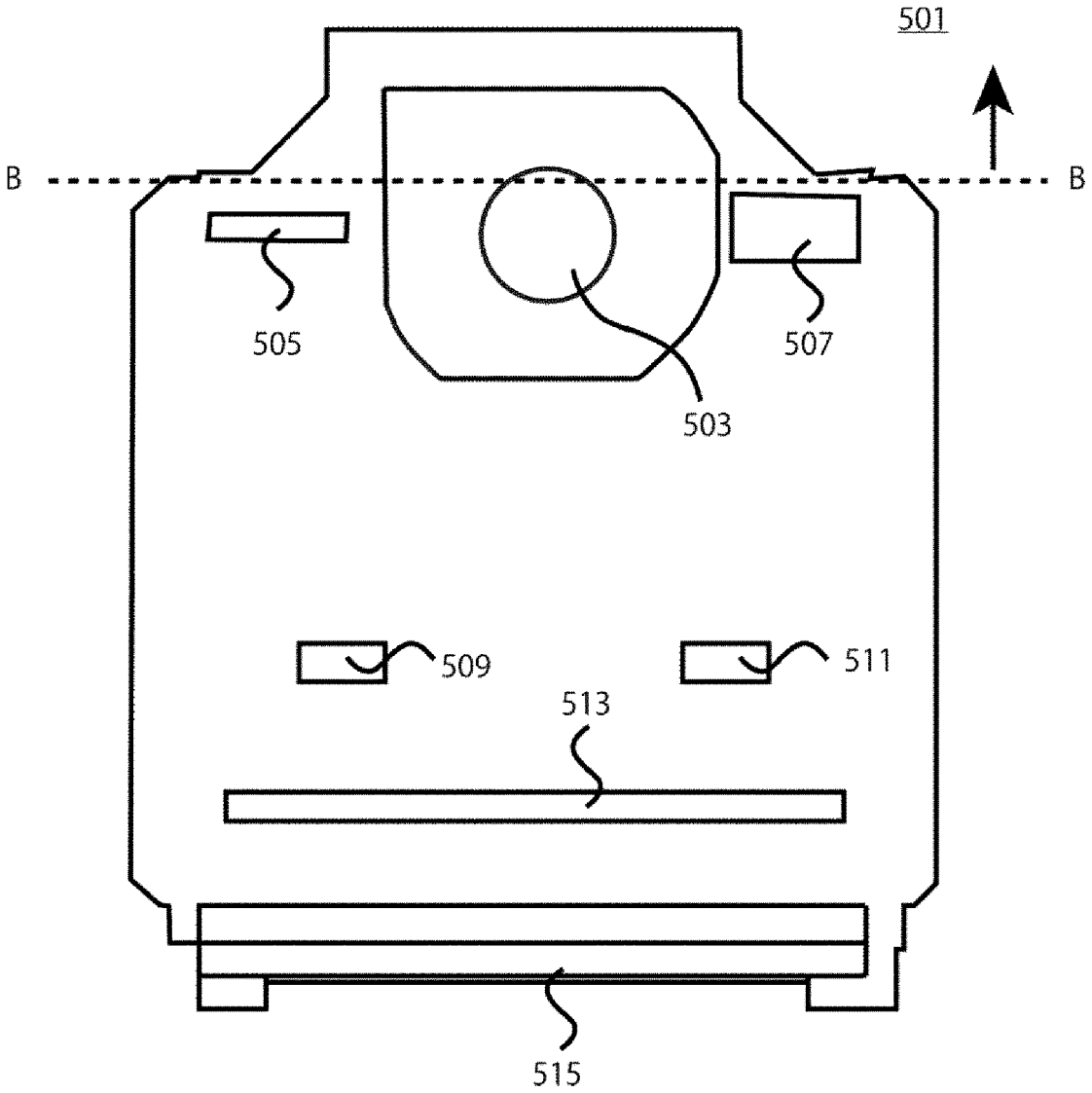

FIG.5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/123352

A. CLASSIFICATION OF SUBJECT MATTER

F25D 17/06(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

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, CNKI, SIPOABS, DWPI, 风扇, 隔板, 梁, 空间, 罩, 盖, 螺纹, 轴, 加热器, 除霜, fan, partition, beam, room, lid, cover, thread, shaft, heater, defrost

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 207361005 U (PANASONIC INTELLECTUAL PROPERTY MANAGEMENT CO., LTD.) 15 May 2018 (2018-05-15) description, paragraphs [0128]-[0208], and figures 16-19	1, 2
A	CN 204187907 U (BSH ELECTRICAL APPLIANCES (JIANGSU) CO., LTD. et al.) 04 March 2015 (2015-03-04) entire document	1-5
A	CN 104748484 A (HEFEI HUALING CO., LTD. et al.) 01 July 2015 (2015-07-01) entire document	1-5
A	CN 102331138 A (HISENSE RONSHEN (GUANGDONG) REFRIGERATORS CO., LTD.) 25 January 2012 (2012-01-25) entire document	1-5
A	CN 108050751 A (QINGDAO HAIER CO., LTD.) 18 May 2018 (2018-05-18) entire document	1-5
A	US 2004107724 A1 (LG ELECTRONICS INC.) 10 June 2004 (2004-06-10) entire document	1-5

☐ 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
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"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
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"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
21 February 2020	**02 March 2020**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China**	Authorized officer
Facsimile No. **(86-10)62019451**	Telephone No.

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/123352

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Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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- JP 6254404 B **[0004]**