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

(72) Inventors:
- **JU, Baochun**
  Qingdao
  Shandong 266101 (CN)
- **ZHAO, Fa**
  Qingdao
  Shandong 266101 (CN)
- **YANG, Falin**
  Qingdao
  Shandong 266101 (CN)

(74) Representative: **Lavoix**
Bayerstrasse 83
80335 München (DE)

(54) **INTEGRATED AIR DUCT MODULE AND REFRIGERATOR HAVING INTEGRATED AIR DUCT MODULE**

(57) An integrated air duct module (100), wherein the distributed structure of traditional air ducts is changed and a modular structure is used so as to improve the precision in the assembly of a refrigerator, being applied to a two-door refrigerator and eliminating the traditional refrigerator structure by providing an air vent at a side of a refrigerator compartment (30), thereby preventing a convex structure that occupies the storage capacity of the refrigerator compartment (30) from forming at a top portion of the refrigerator compartment (30), increasing the storage space of the refrigerator compartment (30).

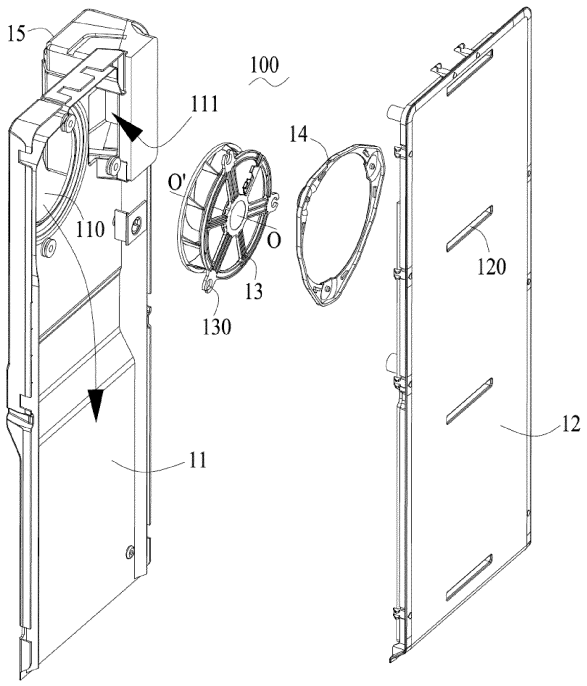

FIG. 2

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Description

[0001] The present application claims priority to Chinese Patent Application No. 201810195287.6, filed to the Chinese Patent Office on March 9, 2018 and titled "Integrated Air Duct Module And Refrigerator Having Integrated Air Duct Module", the content of which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present invention relates to the field of household appliances, and in particular, to an integrated air duct module and a refrigerator having the same.

BACKGROUND

[0003] A refrigeration link is a core of a refrigerator to achieve a basic function thereof, and in the refrigeration link, an air duct is essential in the refrigerator as a delivery passage of cold air. When the existing refrigerator is assembled, parts of the air duct are assembled separately, resulting in a complex assembly process; usually, connection and fixation of the parts constituting the air duct with one another and with other structures of the refrigerator have a problem of affecting a mounting quality due to a large error. Furthermore, for a single-system side-by-side refrigerator, based on the arrangement of the conventional air duct, a top of a refrigerator compartment tends to be required to be provided with a protruding structure which protrudes to an interior of the refrigerator compartment to accommodate an air vent of the refrigerator compartment, and the protruding structure occupies a partial space of the refrigerator compartment and may reduce a storage volume thereof.

[0004] In view of this, it is necessary to provide an improved air duct to solve the above-mentioned problems.

SUMMARY

[0005] The present invention seeks to solve one of the technical problems in a prior art to at least some extent. In order to achieve the above-mentioned inventive object, the present invention provides an integrated air duct module, a specific design of which is as follows.

[0006] An integrated air duct module for delivering cold air of a refrigerator, comprising an air duct housing with an air duct formed therein, the air duct housing being provided with an air inlet for the cold air to enter the air duct and a first air outlet for discharging the cold air in the air duct, wherein the air duct housing further has a second air outlet for discharging the cold air in the air duct, and an air vent for controlling the second air outlet to be opened and closed is fixed at the second air outlet.

[0007] Further, the integrated air duct module further comprises a fan fixed relative to the air duct housing to drive the cold air in the air duct to flow.

[0008] Further, the air duct housing comprises an air-duct rear plate provided with the air inlet and an air-duct front cover plate provided with the first air outlet, and the air-duct front cover plate is provided opposite to the air-duct rear plate to form the air duct therebetween, the fan is configured as a radial fan and fixed to a side of the air inlet close to the air-duct front cover plate, and a rotation axis of the fan is in the same direction as the first air outlet.

[0009] Further, the second air outlet is located at a radial air outgoing side of the fan.

[0010] Further, the integrated air duct module further comprises an air guide portion fixed at the second air outlet and provided therein with a flow guide cavity, the flow guide cavity being communicated with the second air outlet and defining a flow direction of the cold air of the second air outlet.

[0011] Further, the air guide portion is made of a heat insulating material.

[0012] Further, the air duct housing has a covering portion extending outwards and at least covering a part of an outer wall of the air guide portion.

[0013] Further, the air vent is provided in the flow guide cavity.

[0014] The present invention further provides a refrigerator comprising a refrigerator compartment and a freezing compartment, wherein the refrigerator further comprises the integrated air duct module according to any one of claims 1-8, the first air outlet of the integrated air duct module is communicated with the freezing compartment, and the second air outlet of the integrated air duct module is communicated with the refrigerator compartment.

[0015] Further, the refrigerator is configured as a side-by-side refrigerator, and the integrated air duct module is located at a rear side of the freezing compartment.

[0016] The present invention has the following beneficial effects. With the integrated air duct module according to the present invention, a dispersed structure of a traditional air duct is changed, and the air duct for delivering cold air is formed into a modular structure, which may improve an assembly accuracy of a refrigerator effectively; based on a specific design structure of the integrated air duct module, for example, when the integrated air duct module is applied to a side-by-side refrigerator, an air vent provided at one side of a refrigerator compartment of the traditional refrigerator may be omitted, thereby avoiding formation of a protruding structure occupying a storage volume of the refrigerator compartment at a top of the refrigerator compartment, and increasing a storage space of the refrigerator compartment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 shows a schematic diagram of an integrated air duct module at a first angle;

FIG. 2 shows a schematic exploded diagram of the integrated air duct module;

FIG. 3 shows a schematic mounting diagram of a fan of the integrated air duct module;
FIG. 4 shows a schematic diagram of the integrated air duct module at a second angle;
FIG. 5 shows a schematic split diagram of an air guide portion and an air duct housing;
FIG. 6 shows a schematic split diagram of the air guide portion and an air vent;
FIG. 7 shows a schematic diagram of a sectioned structure at position B-B' in FIG. 5;
FIG. 8 shows a schematic diagram in which the air vent in FIG. 7 is in a closed state;
FIG. 9 shows a schematic diagram of a sectioned structure at position A-A' in FIG. 1;
FIG. 10 shows a schematic enlarged diagram of portion a in FIG. 9;
FIG. 11 shows a schematic diagram of a layout of a refrigerator compartment and a freezing compartment of a refrigerator according to the present invention at a first angle;
FIG. 12 shows a schematic enlarged diagram of portion b in FIG. 11;
FIG. 13 shows a schematic diagram of the layout of the refrigerator compartment and the freezing compartment of the refrigerator according to the present invention at a second angle; and
FIG. 14 shows a schematic partial diagram of a sectioned structure at position C-C' in FIG. 13.

DETAILED DESCRIPTION

[0018] The present invention is below described in detail in combination with each embodiment illustrated in drawings. FIGS. 1-14 show some preferable embodiments of the present invention.

[0019] A refrigerator according to the present invention is configured as a side-by-side refrigerator. Referring to FIG. 11, the side-by-side refrigerator includes a refrigerator compartment 30 and a freezing compartment 20 provided adjacent to each other, and a mullion 4 separating the refrigerator compartment 30 from the freezing compartment 20. Specifically, in the present invention, the refrigerator compartment 30 is enclosed by a refrigerating liner 3, the freezing compartment 20 is enclosed by a freezing liner 2, and the mullion 4 includes two adjacent side walls of the freezing liner 2 and the refrigerating liner 3.

[0020] The side-by-side refrigerator further includes an integrated air duct module 100 located at a rear side of the freezing compartment 20, for delivering cold air. As shown in FIGS. 1 and 2, the integrated air duct module 100 includes an air duct housing with an air duct (not shown) formed therein, and the air duct housing is provided with an air inlet 110 for cold air to enter the air duct, and a first air outlet 120 and a second air outlet 111 for discharging the cold air in the air duct; as shown in FIGS. 11-14, the first air outlet 120 is communicated with the freezing compartment 20, and the mullion 4 is provided therein with a refrigerating air outlet duct 40 which is communicated with the second air outlet 111 and has an air supply outlet 400 communicated with the refrigerator compartment 30.

[0021] Specifically, in the present embodiment, the air duct housing includes an air-duct rear plate 11 provided with the air inlet 110 and an air-duct front cover plate 12 provided with the first air outlet 120, and the air-duct front cover plate 12 is provided opposite to the air-duct rear plate 11 to form the air duct therebetween. During implementation, the air-duct rear plate 11 may be in a snap-fit relationship with the air-duct front cover plate 12 to be fixed integrally.

[0022] In the present invention, the integrated air duct module 100 further includes an air vent 16 fixed at the second air outlet 111, for controlling the second air outlet 111 to be opened and closed.

[0023] The air vent 16 in the present invention serves as a part of the integrated air duct module 100 located at a rear side of the freezing compartment 20, and based on a specific design structure of the integrated air duct module, a protruding structure in a traditional design is not required to be formed in the refrigerator compartment 30; as shown in FIGS. 12 and 14, only the refrigerating air outlet duct 40 is required to be provided at one side of the refrigerator compartment 30, and connected with the integrated air duct module for delivering the cold air, such that the refrigerator compartment 30 has a simple internal structure and an enlarged storage space. In the present embodiment, a wall constituting the refrigerating air outlet duct 40 slightly protrudes from a wall surface of the mullion 4 at one side of the refrigerator compartment 30; in other embodiments of the present invention, the wall constituting the refrigerating air outlet duct 40 does not protrude from the wall surface of the mullion 4 at the side of the refrigerator compartment 30.

[0024] As shown in FIGS. 2-4, the integrated air duct module 100 according to the present invention further includes a fan 13 fixed relative to the air duct housing to drive the cold air in the air duct to flow. Specifically, in the present embodiment, the fan 13 is configured as a radial fan and fixed to a side of the air inlet 110 close to the air-duct front cover plate 12, and a rotation axis O-O' of the fan 13 is in the same direction as the first air outlet 110.

[0025] In the present embodiment, the integrated air duct module 100 further includes a fixing piece for fixing the fan 13 to the air-duct rear plate 11. The fixing piece is configured as a pressing plate 14 with the substantially same shape as the fan 13, a periphery of the fan 13 is provided with a fitting portion 130 matched with the pressing plate 14, and the air-duct rear plate 11 is provided with a fixing portion (not shown) where the pressing plate 14 is mounted to fix the fitting portion 130 at the peripheral of the fan 13. During implementation, the fitting portion 130 and the fixing portion are both of a screw hole structure, and a bolt passing through the pressing plate 14 is fitted with a screw hole to fix the fan 13.

[0026] An evaporator (not shown) of the refrigerator according to the present invention is provided at a rear side of the air-duct rear plate 11. Specifically, as shown in FIGS. 13 and 14, a cavity (not shown) where the evaporator is placed is formed between a rear plate 21 at the rear side of the freezing compartment 30 and the air-duct rear plate 11, and the air duct of the integrated air duct module 100 is communicated with the cavity through the air inlet 110. When the refrigerator operates, by the rotating fan 13, the cold air refrigerated by the evaporator in the cavity is sucked into the air duct of the integrated air duct module 100 through the air inlet 110, and driven to flow in the air duct.

[0027] In order to facilitate the air of the fan 13 to enter the second air outlet 111 smoothly and reduce an energy loss during the flow of the cold air, the second air outlet 111 is located at a radial air outgoing side of the fan 13. Referring to FIG. 2, the second air outlet 111 is provided close to one lateral side of the fan 13.

[0028] In the present embodiment, the integrated air duct module 100 further includes an air guide portion 15 fixed at the second air outlet 111 and provided therein with a flow guide cavity 150 communicated with the second air outlet 111 to guide the cold air into the refrigerating air outlet duct 40. More specifically, as shown in FIGS. 10 and 14, a switching passage (not shown) is further provided between the flow guide cavity 150 and the refrigerating air outlet duct 40, and formed in a switching portion 411 to enable the flow guide cavity 150 to be communicated with the refrigerating air outlet duct 40.

[0029] Referring to FIG. 6, the air guide portion 15 in the present embodiment is formed by assembling a first air guide member 151 and a second air guide member 152, and in other embodiments of the present invention, may also be integrally formed.

[0030] As a preferred embodiment of the present invention, both the air guide portion 15 and the switching portion 411 are made of a heat insulating material, thereby avoiding a loss of cold energy of the cold air.

[0031] During implementation of the present invention, as shown in FIGS. 6-8, the air vent 16 is provided in the flow guide cavity 150. Specifically, the air vent 16 in the present embodiment includes an air vent fixed portion 161 fixed in the flow guide cavity 150 directly and an air vent body 162 rotationally provided relative to the air vent fixed portion 161. When the air vent 16 is opened, referring to FIGS. 7 and 10, the air vent body 162 is rotated and approaches a side wall of the flow guide cavity 150, thereby achieving conduction of the flow guide cavity 150; when the air vent 16 is closed, referring to FIG. 8, the air vent body 162 is rotated and obstructs two ends of the flow guide cavity 150, and at this point, the cold air is unable to enter the refrigerator compartment through the second air outlet 111.

[0032] Based on the above-mentioned arrangement, referring to FIG. 14, in the present invention, when the air vent 16 is opened, the cold air enters the flow guide cavity 150 through the second air outlet 111, the refrigerating air outlet duct 40 through the switching passage, and the refrigerator compartment 30 through the air supply outlet 400, thereby achieving a refrigerating function of the refrigerator compartment 30. In other embodiments of the present invention, a specific structure of the air vent is not limited to the above-mentioned structure.

[0033] In order to facilitate integrated assembly of the air guide portion 15 and the air duct housing in the integrated air duct module 100, referring to FIG. 5, the air duct housing has a covering portion 17 extending outwards and at least covering a part of an outer wall of the air guide portion 15. Specifically, in the present embodiment, the covering portion 17 is formed at the air-duct rear plate 11, a mounting cavity where the air guide portion 15 is embedded and mounted is formed between the covering portion 17 and the air-duct front cover plate 12, and when the air guide portion 15 is embedded into the mounting cavity, a butt joint may be implemented between the flow guide cavity 150 the second air outlet 111.

[0034] Furthermore, with the integrated air duct module according to the present invention, a dispersed structure of a traditional air duct is changed, and the air duct for delivering the cold air is formed into a modular structure, which may improve an assembly accuracy of the refrigerator effectively.

[0035] It should be understood that although the present specification is described based on embodiments, not every embodiment contains only one independent technical solution. Such a narration way of the present specification is only for the sake of clarity. Those skilled in the art should take the present specification as an entirety. The technical solutions in the respective embodiments may be combined properly to form other embodiments which may be understood by those skilled in the art.

[0036] So far, a person skilled in the art shall know that although a plurality of exemplary embodiments of the present invention have been described above in detail, various variations and improvements can be directly determined or deducted from the content disclosed by the present invention without departing from the spirit and scope of the present invention. Therefore, all those variations and improvements shall be deemed to be covered by the scope of the present invention.

Claims

1. An integrated air duct module for delivering cold air of a refrigerator, comprising an air duct housing with an air duct formed therein, the air duct housing being provided with an air inlet for the cold air to enter the air duct and a first air outlet for discharging the cold air in the air duct, wherein the air duct housing further has a second air outlet for discharging the cold air in the air duct, and an air vent for controlling the second air outlet to be opened and closed is fixed at the second air outlet.

2. The integrated air duct module according to claim 1, wherein the integrated air duct module further comprises a fan fixed relative to the air duct housing to drive the cold air in the air duct to flow.

3. The integrated air duct module according to claim 2, wherein the air duct housing comprises an air-duct rear plate provided with the air inlet and an air-duct front cover plate provided with the first air outlet, and the air-duct front cover plate is provided opposite to the air-duct rear plate to form the air duct therebetween, the fan is configured as a radial fan and fixed to a side of the air inlet close to the air-duct front cover plate, and a rotation axis of the fan is in the same direction as the first air outlet.

4. The integrated air duct module according to claim 3, wherein the second air outlet is located at a radial air outgoing side of the fan.

5. The integrated air duct module according to claim 1, wherein the integrated air duct module further comprises an air guide portion fixed at the second air outlet and provided therein with a flow guide cavity, the flow guide cavity being communicated with the second air outlet and defining a flow direction of the cold air of the second air outlet.

6. The integrated air duct module according to claim 5, wherein the air guide portion is made of a heat insulating material.

7. The integrated air duct module according to claim 5, wherein the air duct housing has a covering portion extending outwards and at least covering a part of an outer wall of the air guide portion.

8. The integrated air duct module according to claim 5, wherein the air vent is provided in the flow guide cavity.

9. A refrigerator comprising a refrigerator compartment and a freezing compartment, wherein the refrigerator further comprises the integrated air duct module according to any one of claims 1-8, the first air outlet of the integrated air duct module is communicated with the freezing compartment, and the second air outlet of the integrated air duct module is communicated with the refrigerator compartment.

10. The refrigerator according to claim 9, wherein the refrigerator is configured as a side-by-side refrigerator, and the integrated air duct module is located at a rear side of the freezing compartment.

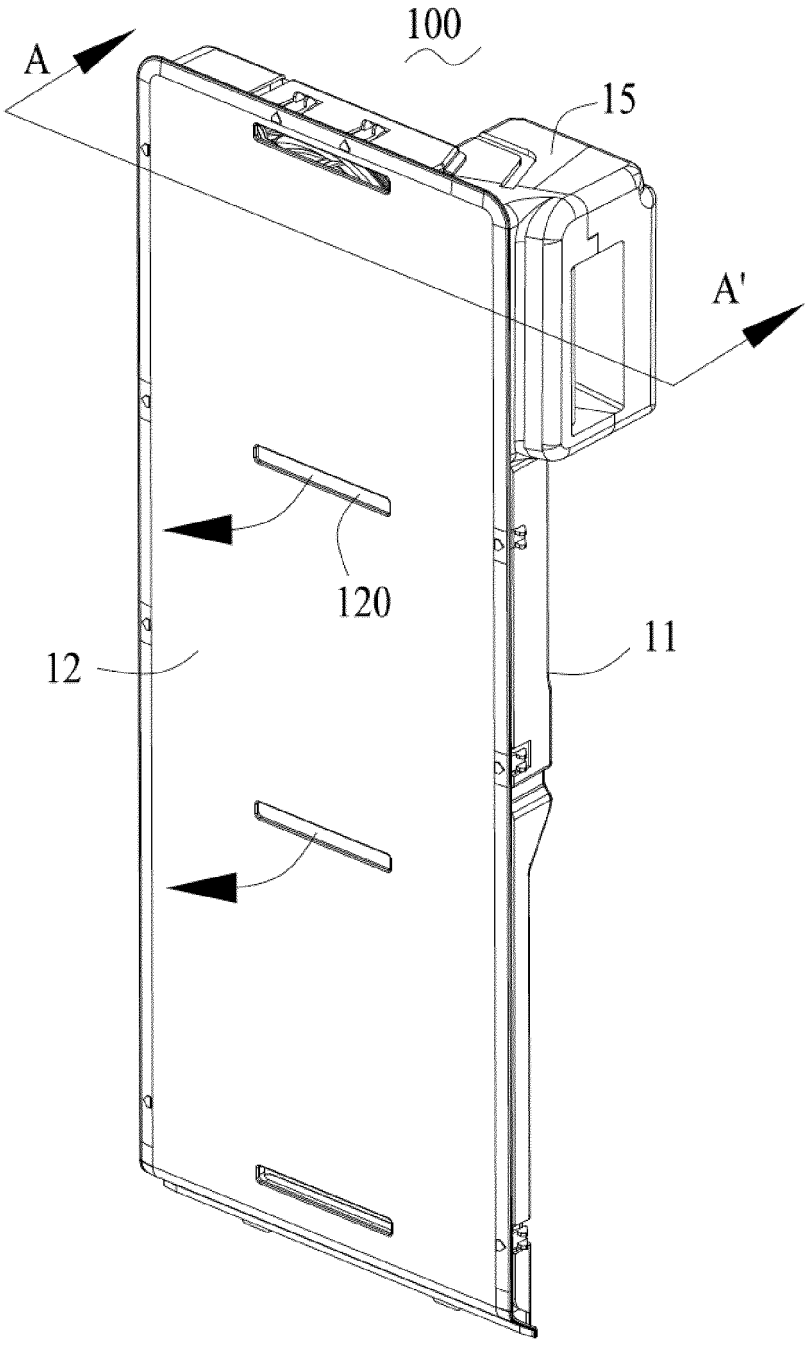

FIG. 1

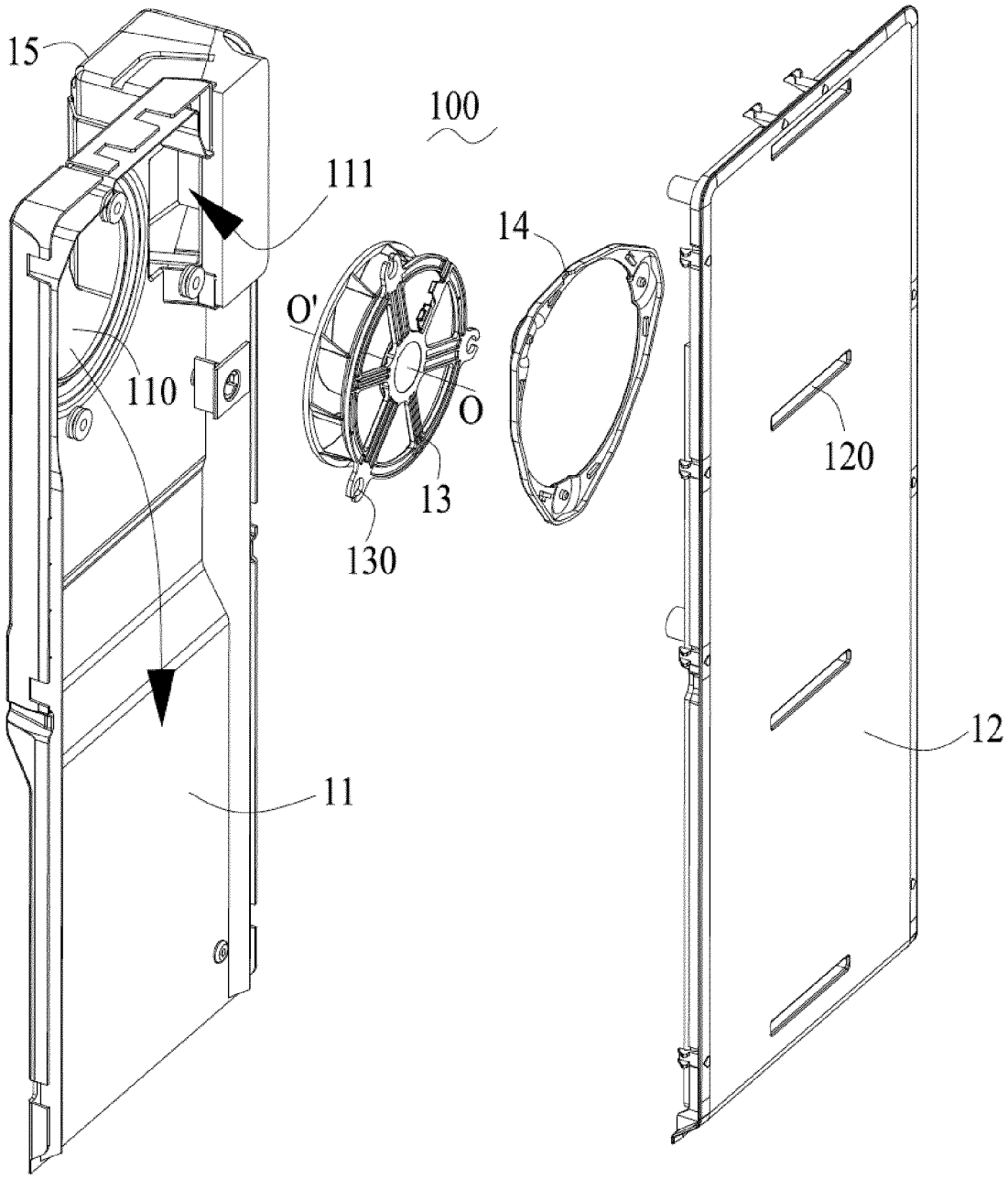

FIG. 2

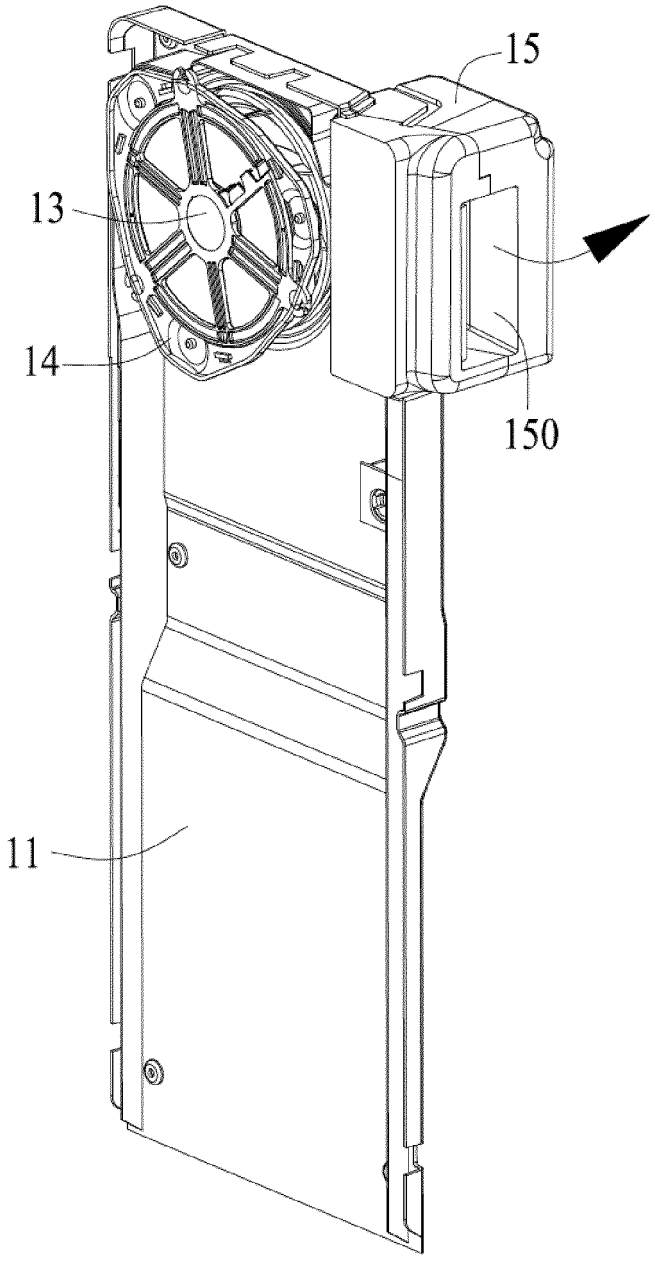

FIG. 3

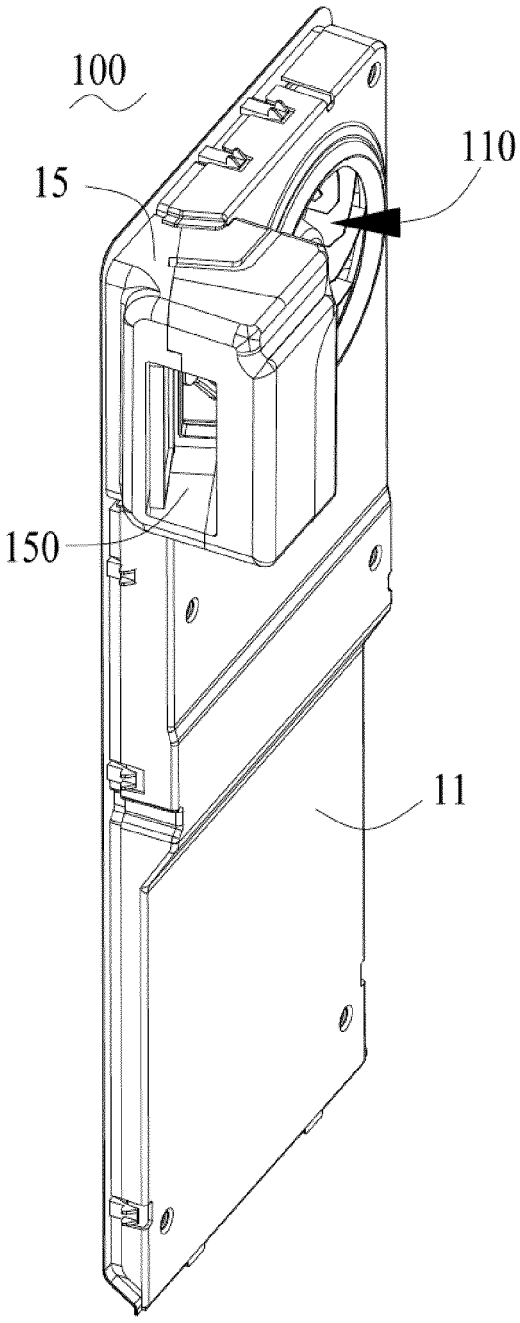

FIG. 4

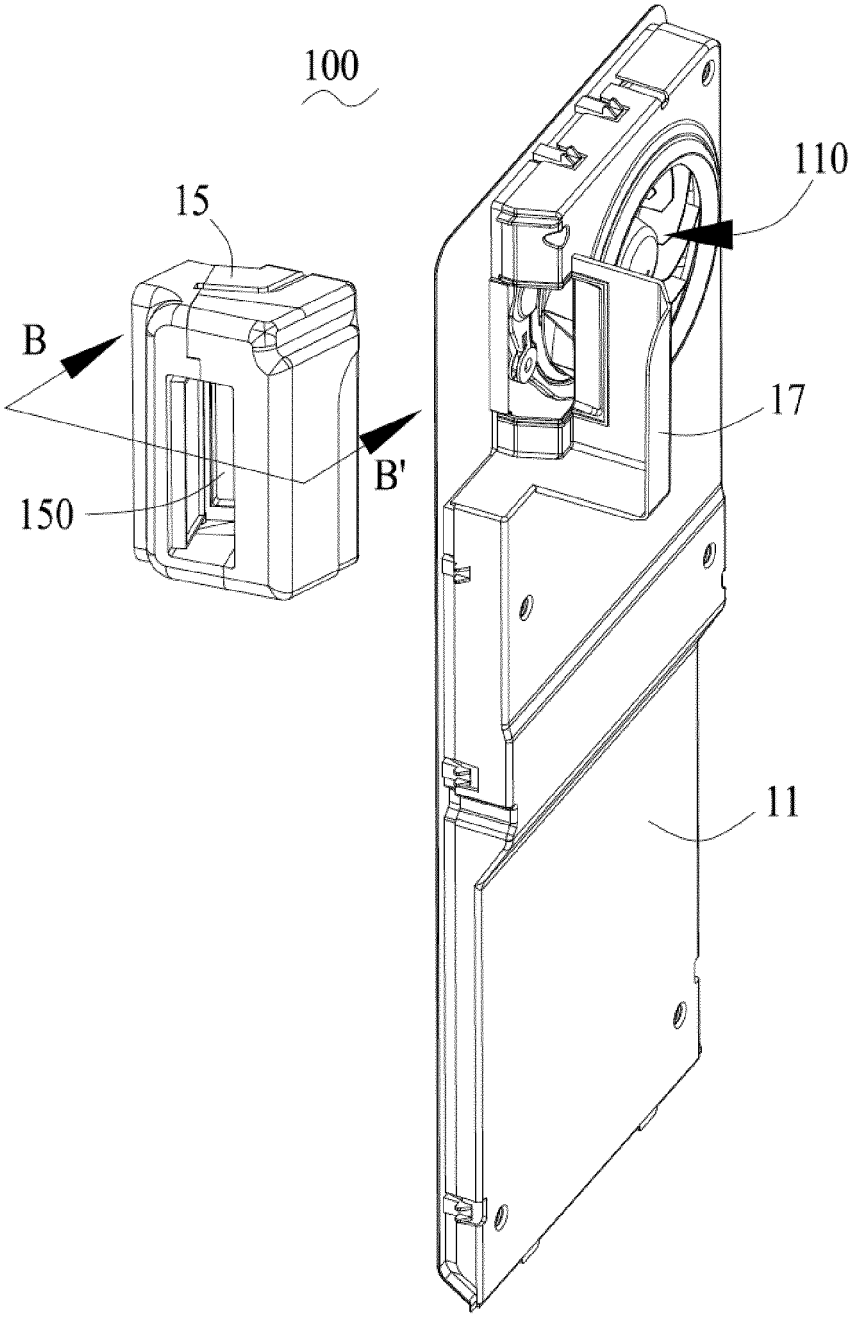

FIG. 5

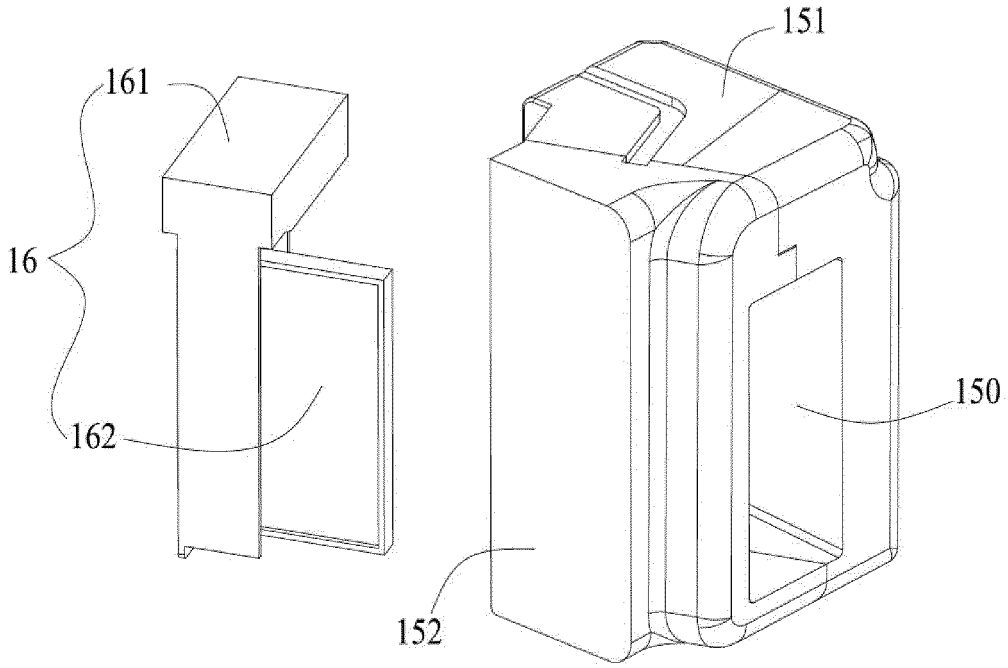

FIG. 6

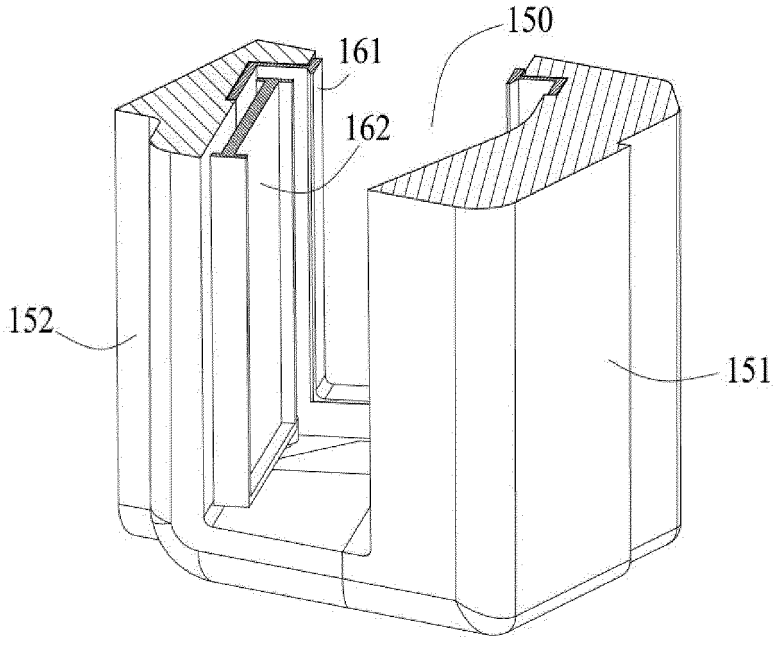

FIG. 7

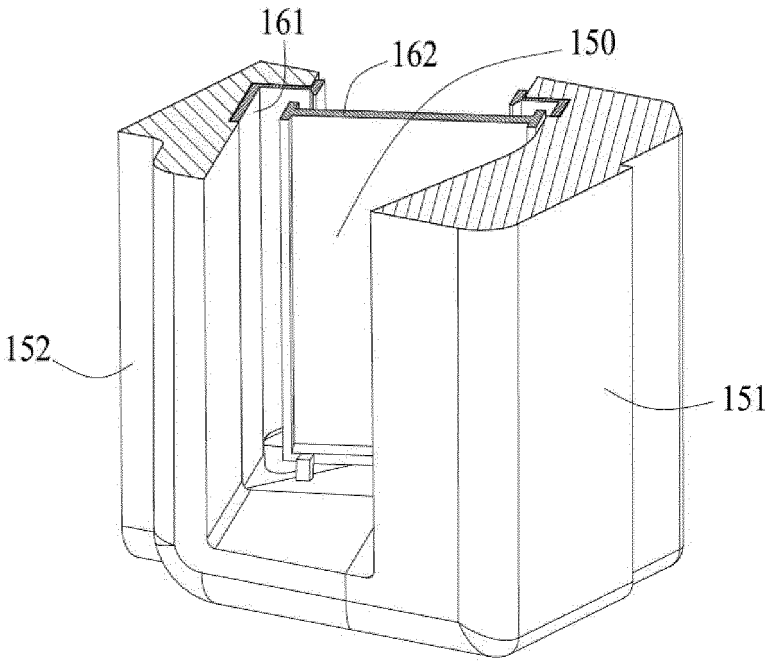

FIG. 8

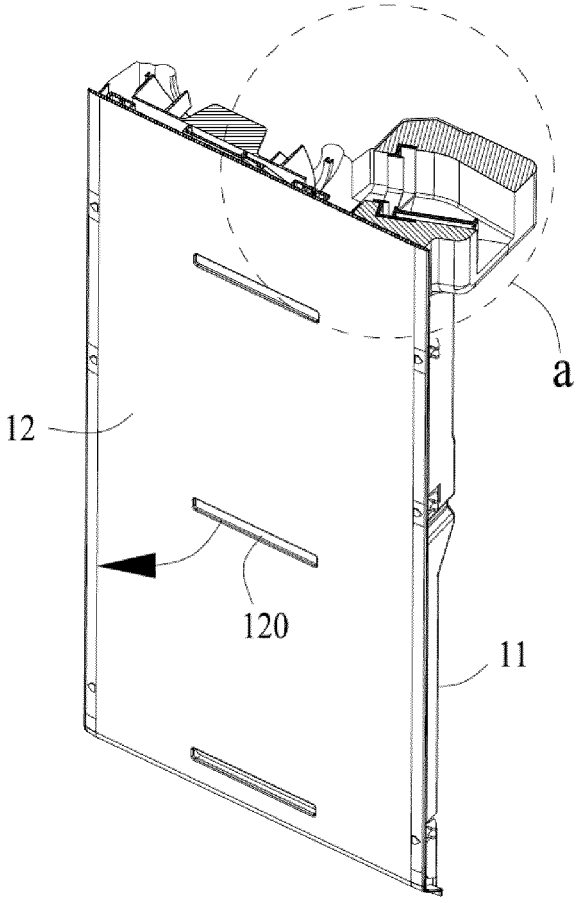

FIG. 9

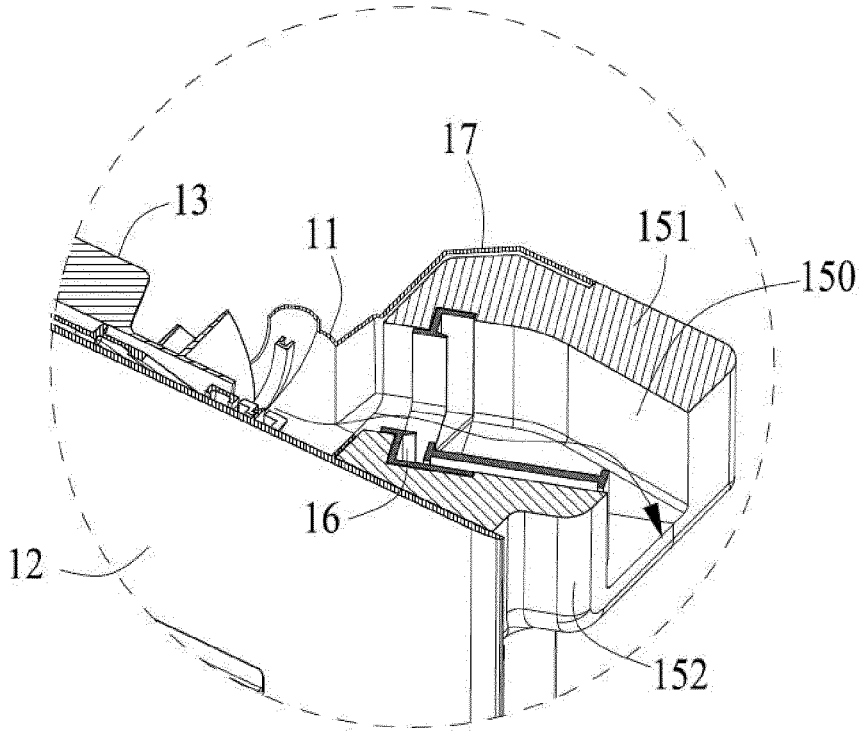

FIG. 10

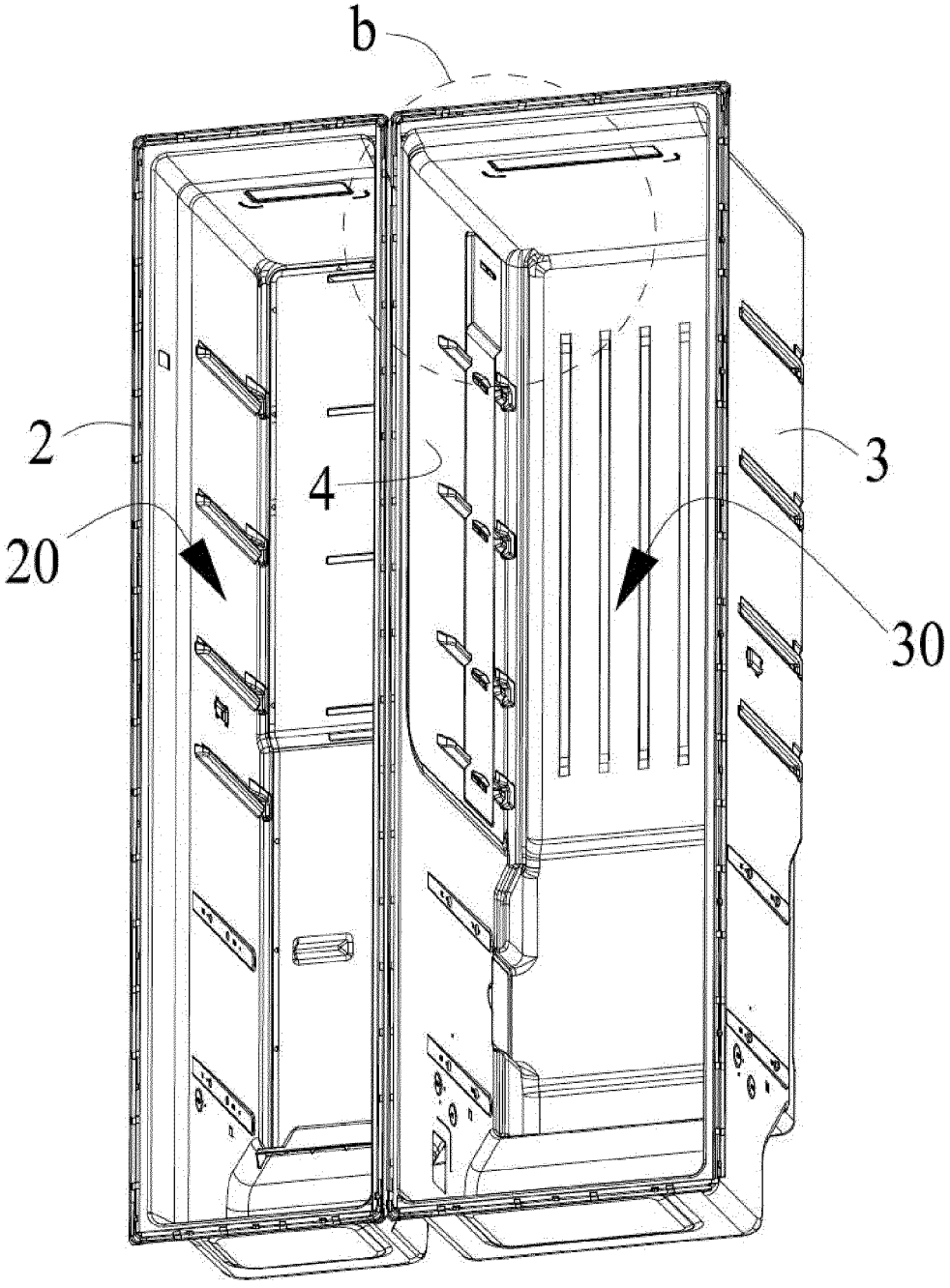

FIG. 11

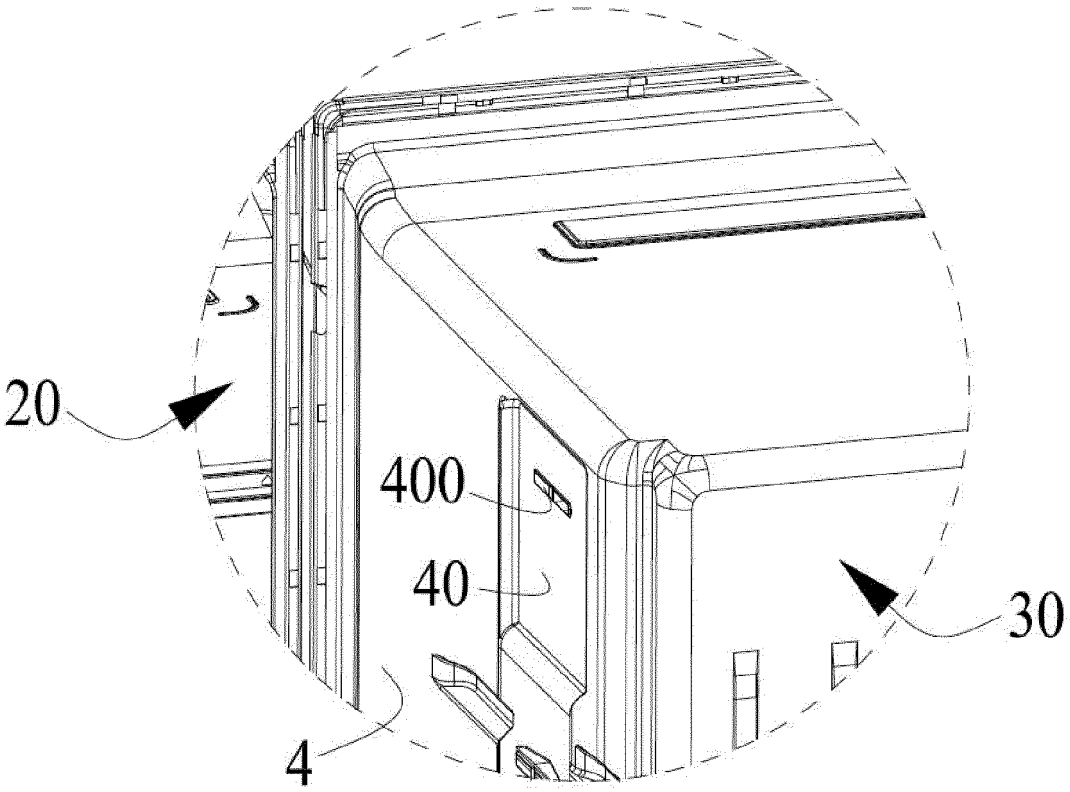

FIG. 12

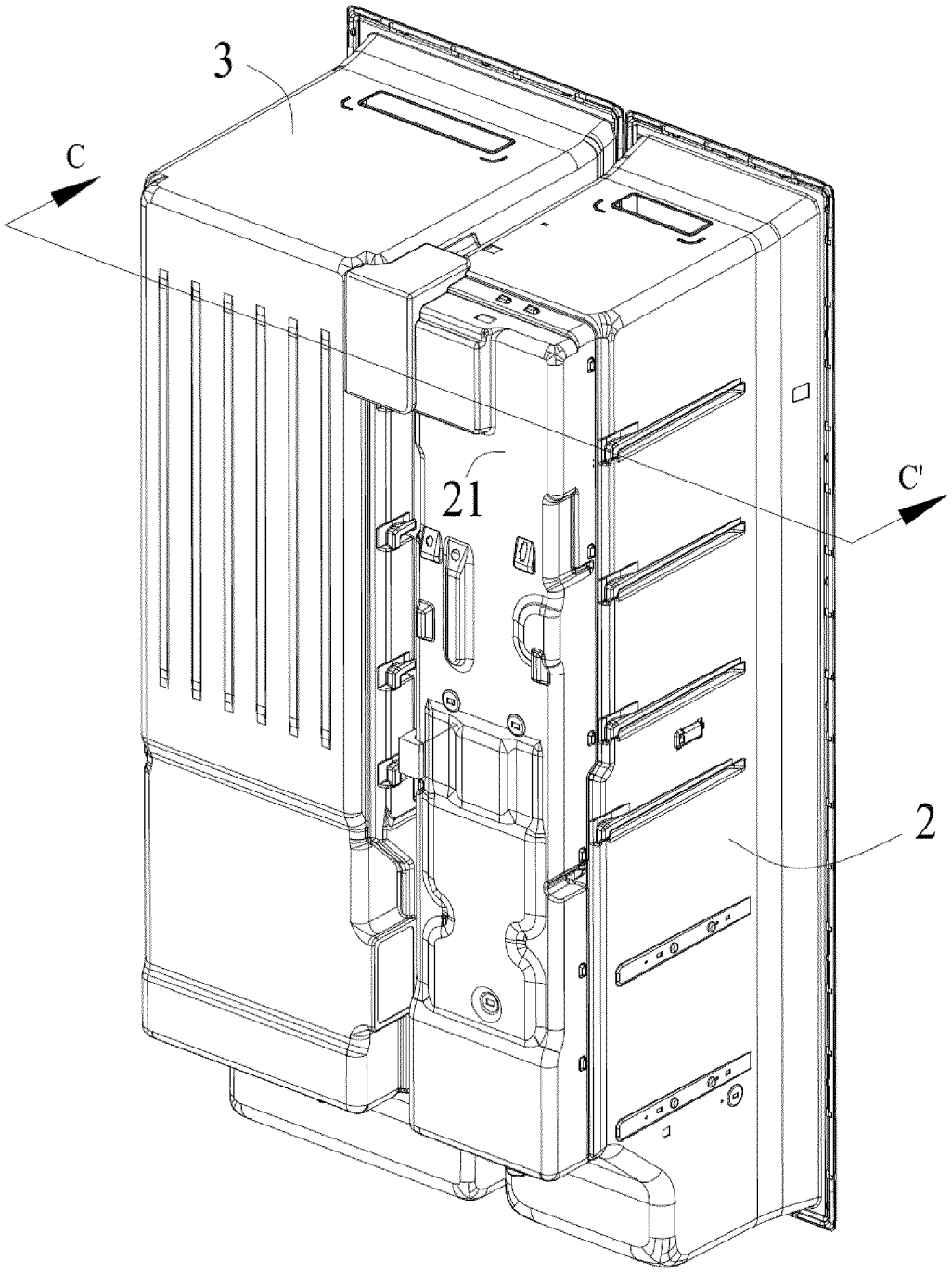

FIG. 13

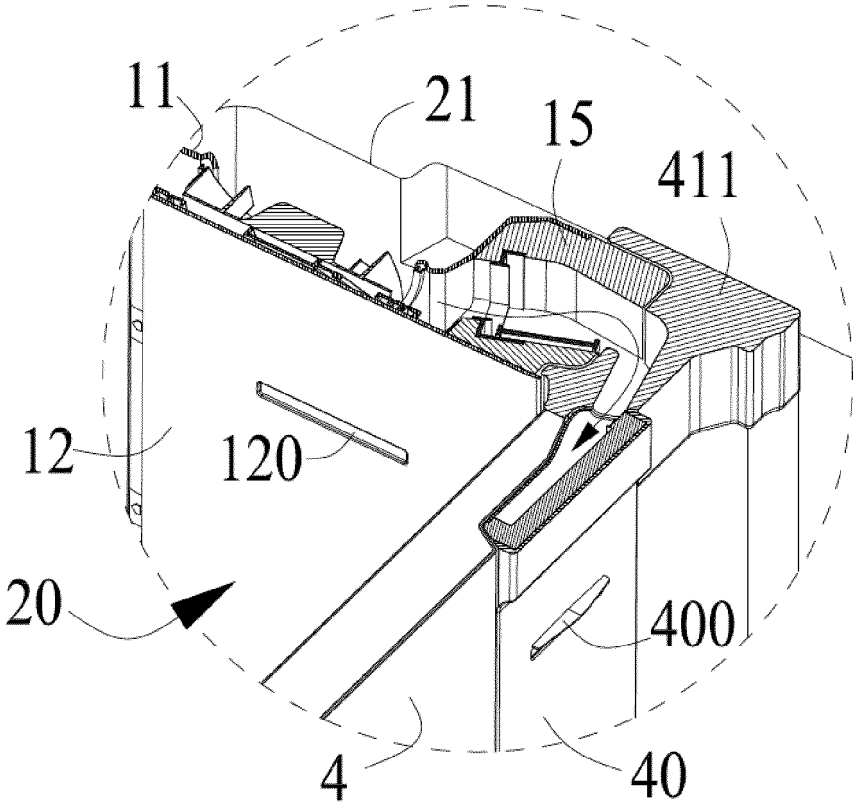

FIG. 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2018/123736

A. CLASSIFICATION OF SUBJECT MATTER

F25D 17/08(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)

F25D17 F25D11

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)

CNABS, CNTXT, CNKI, DWPI, SIPOABS: 冷冻室, 冷藏室, 空间, 容积, 风门, freezing, refrigerating, chamber, compartment, space, volume, damper

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 108548355 A (QINGDAO HAIER CO., LTD.) 18 September 2018 (2018-09-18) claims 1-10	1-10
PX	CN 108444175 A (QINGDAO HAIER CO., LTD.) 24 August 2018 (2018-08-24) description, paragraphs [0029]-[0047], and figures 1-14	1-10
X	CN 203464581 U (HISENSE (SHANDONG) REFRIGERATOR CO., LTD.) 05 March 2014 (2014-03-05) description, pages 2-3, and figures 1-6	1-10
X	CN 202153073 U (HEFEI MIDEA-ROYALSTAR REFRIGERATOR CO., LTD. ET AL.) 29 February 2012 (2012-02-29) description, paragraphs [0027]-[0043], and figures 1-5	1-10
X	CN 1746599 A (LG ELECTRONICS (TIANJIN) ELECTRICAL APPLIANCES CO., LTD.) 15 March 2006 (2006-03-15) description, pages 4-7, and figures 2-7	1-10
X	KR 20050114531 A (LG ELECTRONICS INC.) 06 December 2005 (2005-12-06) description, pages 4-5, and figures 1-6	1-10
X	US 2008000257 A1 (CHOI, B.J. ET AL.) 03 January 2008 (2008-01-03) description, paragraphs [0025]-[0066], and figures 1-9A	1-10

☑ 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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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 March 2019	**11 March 2019**
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 Telephone No.

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2018/123736

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0550984 A1 (GEN ELECTRIC) 14 July 1993 (1993-07-14) entire document	1-10

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2018/123736

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REFERENCES CITED IN THE DESCRIPTION

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