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

(11) **EP 4 517 230 A1**

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

(43) Date of publication:
05.03.2025 Bulletin 2025/10

(21) Application number: **23795594.3**

(22) Date of filing: **28.04.2023**

(51) International Patent Classification (IPC):
F25D 23/02 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F25D 23/02

(86) International application number:
PCT/CN2023/091428

(87) International publication number:
WO 2023/208162 (02.11.2023 Gazette 2023/44)

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **29.04.2022 CN 202221068740 U**

(71) Applicant: **Ningbo Handian Electric Appliance Co., Ltd.**
Ningbo, Zhejiang 315000 (CN)

(72) Inventors:
- **FEI, Xudan**
  Ningbo, Zhejiang 315000 (CN)
- **HU, Zheming**
  Ningbo, Zhejiang 315000 (CN)
- **YU, Ruchen**
  Ningbo, Zhejiang 315000 (CN)
- **ZHANG, Pengtao**
  Ningbo, Zhejiang 315000 (CN)

(74) Representative: **Zaboliene, Reda**
Metida
Business center Vertas
Gyneju str. 16
01109 Vilnius (LT)

(54) REFRIGERATOR DOOR HAVING SEE-THROUGH WINDOW

(57) A refrigerator door having a see-through window, comprising a door and a see-through window. A through mounting opening is formed in the middle of the door; the door is provided with a cavity used for being filled with a foaming filler; the door is provided with a door liner located in the mounting opening; the door liner is arranged on the inner side of the see-through window; a sealant layer is arranged between the door liner and the see-through window; and the see-through window is fixed together with the door liner by means of the sealant layer. By means of the door liner arranged at the mounting opening, the see-through window can be fixed and limited, and by filling the cavity of the door with the foaming filler, the sealing performance and thermal insulation performance of the door are improved, thereby improving the thermal insulation capability of the refrigerator.

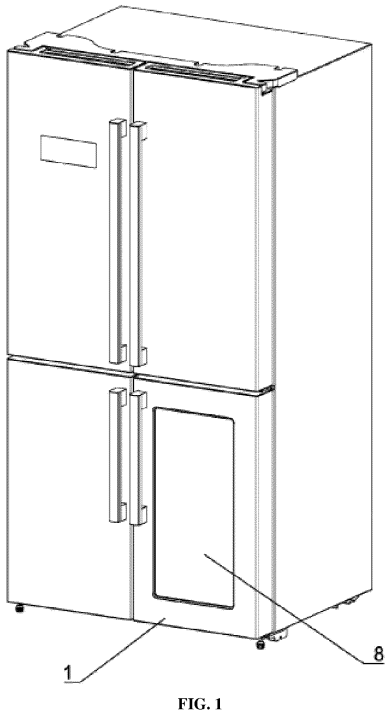

FIG. 1

EP 4 517 230 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to the field of refrigerator doors, and specifically relates to a refrigerator door having a see-through window.

BACKGROUND

[0002] A refrigerator is a refrigeration apparatus that maintains a constant low temperature. It reduces the temperature inside the refrigerator by discharging cold air generated by a compressor, a condenser, an expansion valve and an evaporator in refrigeration cycles, so that food stored in the refrigerator is in a frozen or refrigerated state. The refrigerator is divided into a freezer compartment and a refrigerator compartment according to a freezing function and a refrigerating function. In the structure of both the freezer compartment and the refrigerator compartment, a refrigerator door is included. The refrigerator door serves as an insulating wall to ensures that the freezer compartment and the refrigerator compartment are isolated from the external environment.

[0003] Generally, the refrigerator doors for opening or closing the freezer compartments and the refrigerator compartments are opaque. To take the food in the freezer compartment or the refrigerator compartment, a user needs to first open the door of the freezer compartment or the refrigerator compartment, and then looks around the freezer compartment and the refrigerator compartment in the open state to find the specific desired food, which takes a certain time.

[0004] Especially for refrigerators with wine cabinets, in order to ensure the quality of the wine in the wine cabinets, the temperature inside the refrigerators needs to be strictly controlled to keep constant. However, when it is necessary to access the wine cabinet, such as opening the door for search, the temperature inside the wine cabinet will change, and such change may even lead to imbalance in serious cases.

[0005] In order to solve the above-mentioned problems, existing refrigerators are provided with see-through windows on the doors. Users can observe articles inside the refrigerators through the see-through windows. However, due to the split design of the see-through window and the door, that is, a mounting opening is provided on the door, and then the see-through window is embedded in the door, it is urgent to solve the problem of undesirable fixing reliability of the see-through window and unsatisfactory sealing performance at the connection point. The existing refrigerator door having the see-through window has poor sealing performance between the door and the see-through window, resulting in obvious heat exchange between the inside of the refrigerator and the outside world, that is, resulting in poor insulation effect and increased energy consumption.

SUMMARY

[0006] The technical problem to be solved by the present invention is to provide a refrigerator door having a see-through window that is structurally simple, easy to assemble, convenient for users to observe the inside of the refrigerator, and has good performance.

[0007] In order to solve the above technical problem, the present invention is achieved by the following technical solution: a refrigerator door having a see-through window, includes a door and a see-through window, where a through mounting opening is formed in the middle of the door, the see-through window is arranged at the mounting opening, the door is provided with a cavity used for being filled with a foaming filler, the door is provided with a door liner located in the mounting opening, the door liner is arranged on the inner side of the see-through window, a sealant layer is arranged between the door liner and the see-through window, and the see-through window is fixed together with the door liner by means of the sealant layer.

[0008] Further, the door is provided with a door panel, the door panel is provided with a hollow portion corresponding to the mounting opening, a mounting groove is formed between the door panel and the door liner, the see-through window is arranged in the mounting groove, the mounting groove is communicated with the cavity, and a periphery of the see-through window is exposed in the cavity of the door, which have the advantages that the mounting groove is arranged so that the door liner can firmly clamp the see-through window, and side edges of the see-through window are exposed in the cavity; after the foaming filler is filled in the cavity of the door, the see-through window can be further fixed by means of the foaming filler to improve the stability of the see-through window; and a gap between the see-through window and the door can be filled to further insulate the transmission of heat and improve the thermal insulation effect.

[0009] Further, the door panel on a front end face of the door is provided with an inward folded edge, a decorative ring is provided between the folded edge and the see-through window, the decorative ring is provided with a clamping groove corresponding to the folded edge, and the decorative ring is further provided with a limiting frame sheathed on side edges of the see-through window, which have the advantages that pressing ability of the door panel against the see-through window can be improved by means of the decorative ring, and the decorative ring can prevent the metal door liner from causing scratches on the see-through window; and the limiting frame can also stabilize the see-through window to prevent the multi-layer see-through window from running off when the door vibrates or shakes.

[0010] Further, the door liner on a rear end face of the door is provided with a limiting portion and a fitting portion, the limiting portion is clamped on the side edges of the see-through window, and the fitting portion is fitted to the see-through window.

[0011] Further, the limiting portion and the fitting portion are integrally formed with the door liner, and the limiting portion is fixed together with the door with a smooth transition.

[0012] Further, the see-through window comprises a plurality of see-through layers provided at intervals, a holder is provided between two adjacent see-through layers, and the holder is arranged at an edge portion of the see-through layer.

[0013] Further, a laminated adhesive layer is provided on the side edges of the see-through window, and the plurality of see-through layers are adhesively fixed together with the corresponding holders by means of the laminated adhesive layer, which have the advantage that the see-through window can be sealed and adhesively fixed by means of the laminated adhesive layers to ensure cleanliness of the inner side of the see-through layers and prevent dust from falling into the see-through window to affect light transmittance.

[0014] Further, three see-through layers are provided, and the see-through layers are Low-Emissivity Glass (LOWE Glass), which have the advantages that the three see-through layers can realize double-interlayer thermal insulation while enabling users to observe, improving the thermal insulation performance of the door; and the use of the low-emissivity glass enables to effectively reduce heat radiation diffusion and has good light transmittance.

[0015] Further, a filling port is provided at the bottom of the door, and the filling port is provided with a sealing elastic piece.

[0016] Compared with the prior art, the present invention has the following beneficial effects: by means of the door liner arranged at the mounting opening, the see-through window can be fixed and limited, and by filling the cavity of the door with the foaming filler, the sealing performance and thermal insulation performance of the door are improved, thereby improving the thermal insulation capability of the refrigerator. Users can observe articles in the refrigerator through the see-through window, and the sealant layer can further improve the sealing reliability between the see-through window and the door, and improve firmness of the see-through window.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] In order to illustrate the technical solutions of the embodiments of the present invention more clearly, the accompanying drawings that need to be used in the embodiments will be briefly introduced below. Apparently, the accompanying drawings in the following description are merely some rather than all embodiments of the present invention, and a person of ordinary skill in the art may still derive other drawings from these accompanying drawings without creative efforts.

FIG. 1 is a schematic diagram of mounting and use of a refrigerator door of the present invention;

FIG. 2 is a first structural schematic diagram of the door of the present invention;

FIG. 3 is a second structural schematic diagram of the door of the present invention;

FIG. 4 is a front view of the door of the present invention;

FIG. 5 is a cross-sectional view of FIG. 4 taken along A-A;

FIG. 6 is a cross-sectional view of FIG. 4 taken along B-B; and

FIG. 7 is a structural schematic diagram of a see-through window of the present invention.

DESCRIPTION OF THE EMBODIMENTS

[0018] The present invention will be further described in detail with reference to the accompanying drawings.

[0019] The following description is presented to disclose the present invention to enable those skilled in the art to practice the present invention. The preferred embodiments in the following description are by way of example only, and other obvious variations will occur to those skilled in the art. The basic principles of the present invention as defined in the following description may be applied to other embodiments, modifications, improvements, equivalents, and other technical solutions without departing from the spirit and scope of the present invention.

[0020] It should be understood by those skilled in the art that in the disclosure of the present invention, the orientation or positional relationship indicated by the terms "longitudinal", "transverse", "upper", "lower", "left", "right", "front", "back", "vertical", "horizontal", "top", "bottom", "inside", "outside", etc. is based on the orientation or positional relationship shown in the accompanying drawings, which is merely for the convenience of describing the present invention and simplifying the description, and does not indicate or imply that the referred apparatus or element must have a particular orientation and be constructed and operated in the particular orientation. Therefore, the above terms cannot be construed as limiting the present invention.

[0021] A refrigerator door 1 having a see-through window 8, includes a door 1 and a see-through window 8. A through mounting opening 2 is formed in the middle of the door 1, the door 1 is further provided with a cavity 3 used for being filled with a foaming filler, the see-through window 8 is arranged at the mounting opening 2, a door liner 4 is provided on the inner side of the see-through window 8, and the door liner 4 and the door 1 can be fixed together by means of integral molding or other means such as welding. The door is provided with a door panel, the door panel is provided with a hollow portion corresponding to the mounting opening, a mounting groove 5 is formed between the door panel and the door liner 4, the see-through window 8 is arranged in the mounting groove 5, the mounting groove 5 is communicated with the cavity 3, a periphery of the see-through window 8 is exposed in the cavity 3 of the door 1, and a sealant layer 6

is arranged between the door liner 4 and the see-through window 8. The sealant layer 6 is VHB tape, and the see-through window 8 is fixed together with the door liner 4 by means of the sealant layer 6. The mounting groove 5 is arranged so that the door liner 4 and the door panel cooperate to firmly clamp the see-through window 8, and side edges of the see-through window 8 are exposed in the cavity 3; after the foaming filler is filled in the cavity 3 of the door 1, the see-through window 8 can be further fixed by means of the foaming filler to improve the stability of the see-through window 8; and a gap between the see-through window 8 and the door 1 can be filled to further insulate the transmission of heat and improve the thermal insulation effect.

[0022] In order to further improve mounting reliability of the see-through window 8 and sealing performance of the fit between the see-through window and the door 1, the door liner 4 on a front end face of the door 1 is provided with an inward folded edge 1.1, a decorative ring 7 is provided between the folded edge 1.1 and the see-through window 8, the decorative ring 7 is provided with a clamping groove corresponding to the folded edge 1.1, and the decorative ring 7 is further provided with a limiting frame 7.1 sheathed on side edges of the see-through window 8; pressing ability of the door liner 4 against the see-through window 8 can be improved by means of the decorative ring 7, and the decorative ring 7 can prevent the metal door liner 4 from causing scratches on the see-through window; and the limiting frame can also stabilize the see-through window 8 to prevent the multi-layer see-through window 8 from running off when the door 1 vibrates or shakes. The door liner 4 on a rear end face of the door is provided with a limiting portion 4.2 and an fitting portion 4.3, the limiting portion 4.2 is clamped on the side edges of the see-through window 8, and the fitting portion 4.3 is in tight sealing fit with the see-through window 8; and the limiting portion 4.2 and the fitting portion 4.3 can be integrally formed with the door liner 4, and the limiting portion 4.2 is fixed together with the door 1 with a smooth transition.

[0023] The see-through window 8 which facilitates observation of the inside of a refrigerator or a wine cabinet is arranged at the mounting opening 2. In order to improve the thermal insulation performance of the see-through window 8, the see-through window 8 can be formed by a plurality of see-through layers 9 provided at intervals. Preferably, three see-through layers 9 are provided, and a holder 10 is provided between two adjacent see-through layers 9, the holder 10 is arranged at an edge portion of the see-through layer 9, a laminated adhesive layer 11 is provided on the side edges of the see-through window 8, the laminated adhesive layer 11 is glass adhesive, and the plurality of see-through layers 9 are adhesively fixed together with the corresponding holder 10 by means of the glass adhesive; the see-through layer 9 is preferably Low-Emissivity Glass (LOWE Glass); the three see-through layers 9 can realize double-interlayer thermal insulation while enabling users to observe, improving the thermal insulation performance of the door 1; and the use of the low-emissivity glass enables to effectively reduce heat radiation diffusion and has good light transmittance.

[0024] In order to facilitate the filling of the foaming filler, a filling port 13 is provided at the bottom of the door 1, and the filling port 13 is provided with a sealing elastic piece, and the filling port 13 is sealed by the sealing elastic piece. In the process of filling the foaming filler, a monomeric foaming mold with a 90 ° inclination is used, thus ensuring the filling degree of the foaming filler in the cavity 3 of the door 1, and ensuring the structural strength and thermal insulation performance of the door 1. The door 1 is foamed using a closed mold to ensure overall appearance of the door 1; the foaming filler is filled through the filling port 13 at the bottom, the filling port is designed with an elastic piece, and the mold is placed flat in a normal state (to facilitate placement of a door shell and removal of the door 1). A rolling disc is used for remote sensing of ends, a bevel angle of the mold can be adjusted according to different process requirements, and the mold is provided with four positioning suction cups at the see-through window 8 to prevent the mold from shifting during tilting.

[0025] It will be appreciated by persons skilled in the art that the embodiments of the present invention described above and shown in the accompanying drawings are illustrative only and do not limit the present invention. The objects of the present invention have been fully and effectively achieved. The functional and structural principles of the present invention have been shown and described in the embodiments, and any variations or modifications may be made to the embodiments of the present invention without departing from the principles described.

Claims

1. A refrigerator door having a see-through window, comprising a door (1) and a see-through window (8), a through mounting opening (2) being formed in the middle of the door (1), and the see-through window (8) being arranged at the mounting opening (2), wherein the door (1) is provided with a cavity (3) used for being filled with a foaming filler, the door (1) is provided with a door liner (4) located in the mounting opening (2), the door liner (4) is arranged on the inner side of the see-through window (8), a sealant layer (6) is arranged between the door liner (4) and the see-through window (8), and the see-through window (8) is fixed together with the door liner (4) by means of the sealant layer (6).

2. The refrigerator door having the see-through window according to claim 1, wherein the door (1) is provided with a door panel, the door panel is provided with a hollow portion corresponding to the mounting open-

ing (2), a mounting groove (5) is formed between the door panel and the door liner (4), the see-through window (8) is arranged in the mounting groove (5), the mounting groove (5) is communicated with the cavity (3), and a periphery of the see-through window (8) is exposed in the cavity (3) of the door (1).

3. The refrigerator door having the see-through window according to claim 1, wherein the door panel on a front end face of the door (1) is provided with an inward folded edge (1.1), a decorative ring (7) is provided between the folded edge (1.1) and the see-through window (8), the decorative ring (7) is provided with a clamping groove corresponding to the folded edge (1.1), and the decorative ring (7) is further provided with a limiting frame (7.1) sheathed on side edges of the see-through window (8).

4. The refrigerator door having the see-through window according to claim 1, wherein the door liner (4) on a rear end face of the door (1) is provided with a limiting portion (4.2) and a fitting portion (4.3), the limiting portion (4.2) is clamped on the side edges of the see-through window (8), and the fitting portion (4.3) is fitted to the see-through window (8).

5. The refrigerator door having the see-through window according to claim 4, wherein the limiting portion (4.2) and the fitting portion (4.3) are integrally formed with the door liner (4), and the limiting portion (4.2) is fixed together with the door (1) with a smooth transition.

6. The refrigerator door having the see-through window according to claim 1, wherein the see-through window (8) comprises a plurality of see-through layers (9) provided at intervals, a holder (10) is provided between two adjacent see-through layers (9), and the holder (10) is arranged at an edge portion of the see-through layer (9).

7. The refrigerator door having the see-through window according to claim 6, wherein a laminated adhesive layer (11) is provided on the side edges of the see-through window (8), and the plurality of see-through layers (9) are adhesively fixed together with the corresponding holders (10) by means of the laminated adhesive layer (11).

8. The refrigerator door having the see-through window according to claim 6, wherein three see-through layers (9) are provided, and the see-through layers (9) are low-emissivity glass.

9. The refrigerator door having the see-through window according to claim 1, wherein a filling port (13) is provided at the bottom of the door (1), and the filling port (13) is provided with a sealing elastic piece.

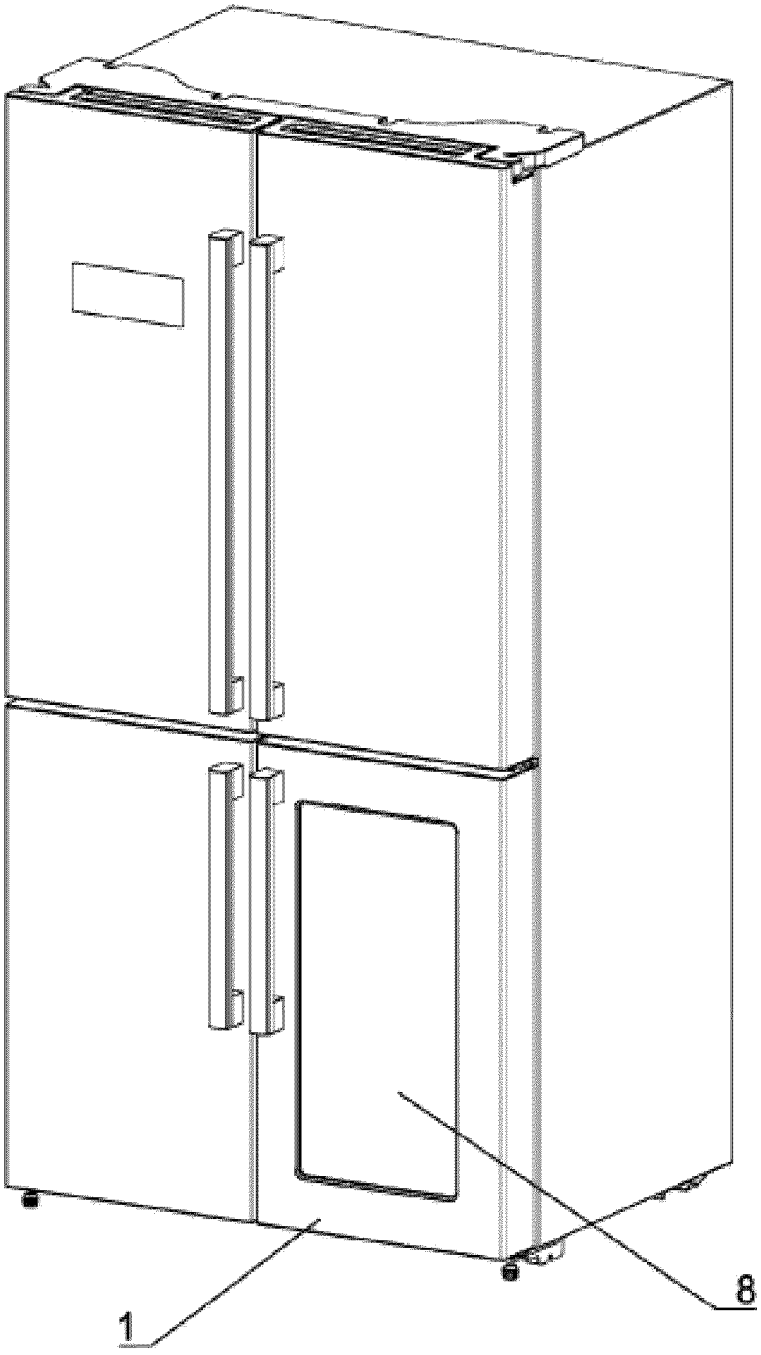

FIG. 1

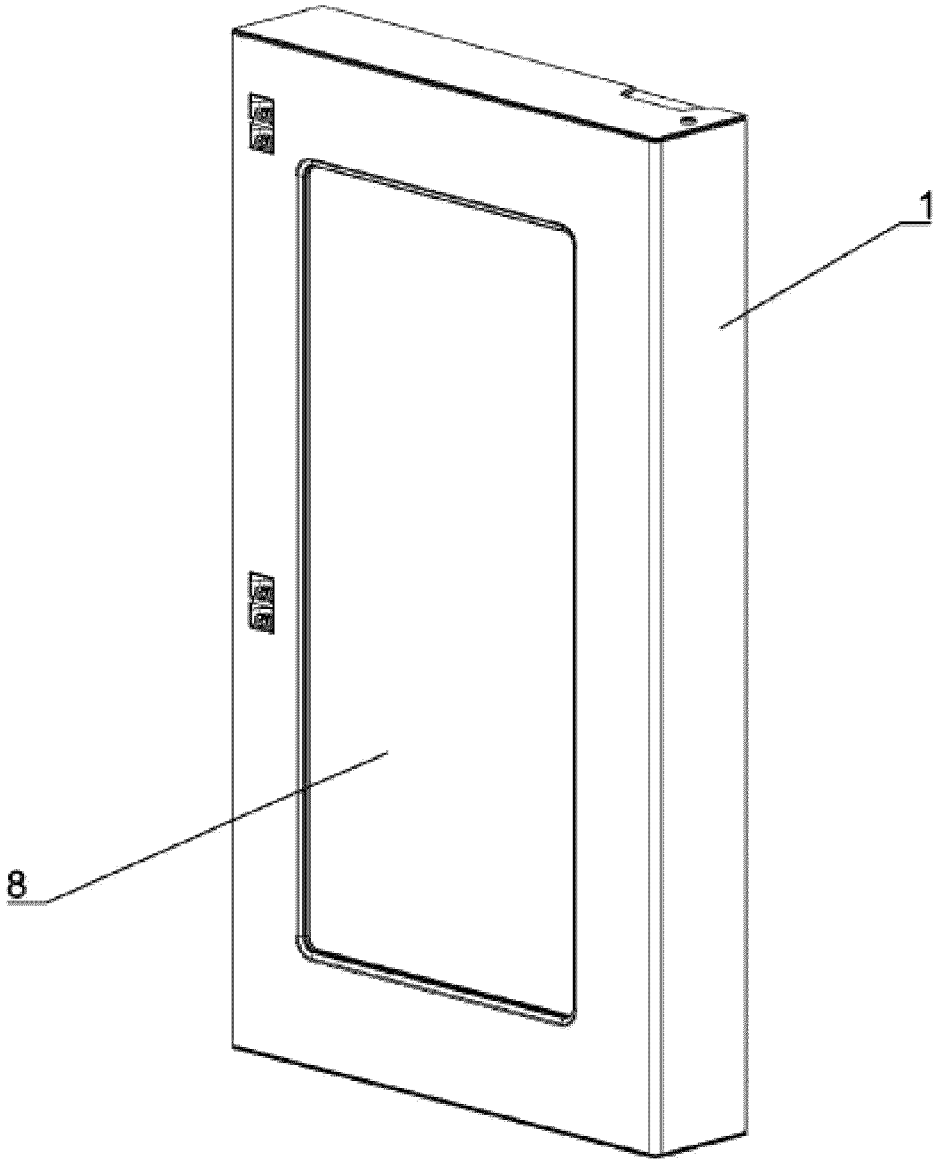

FIG. 2

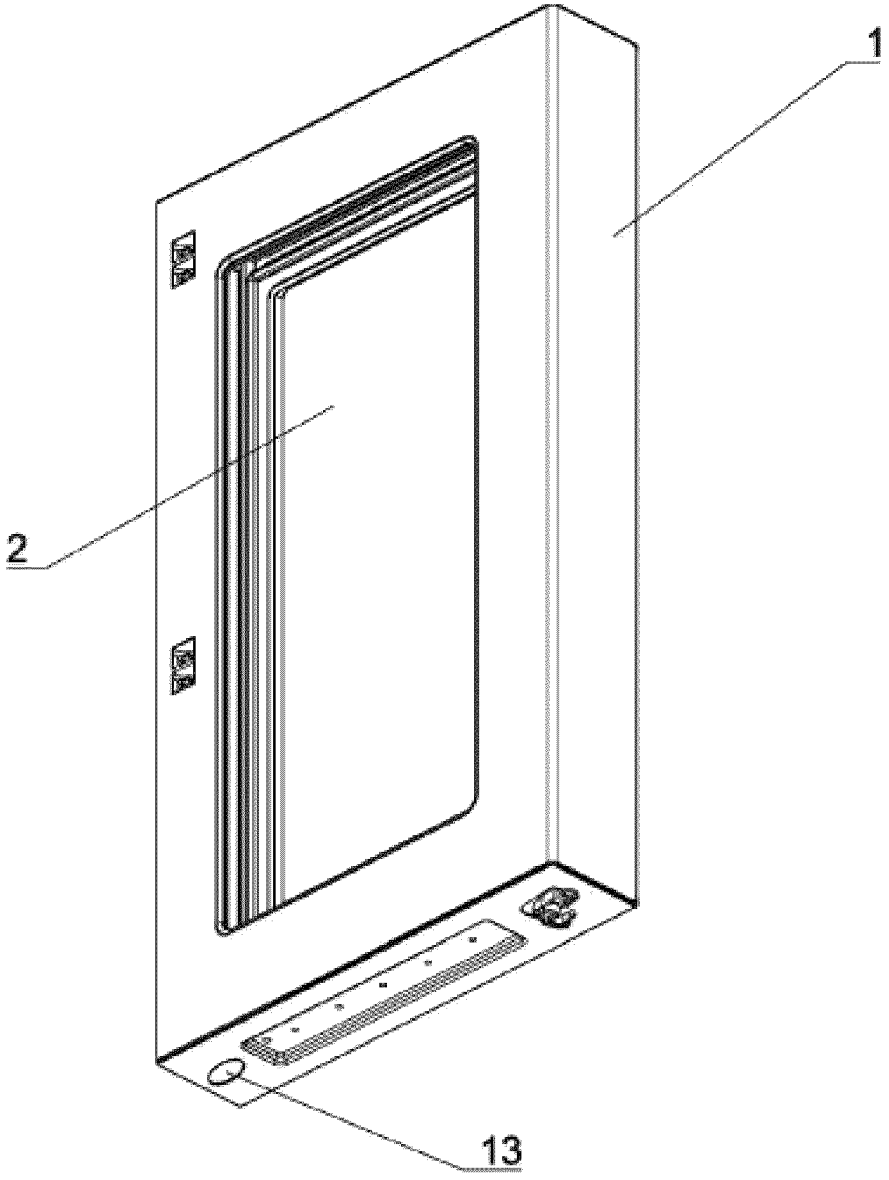

FIG. 3

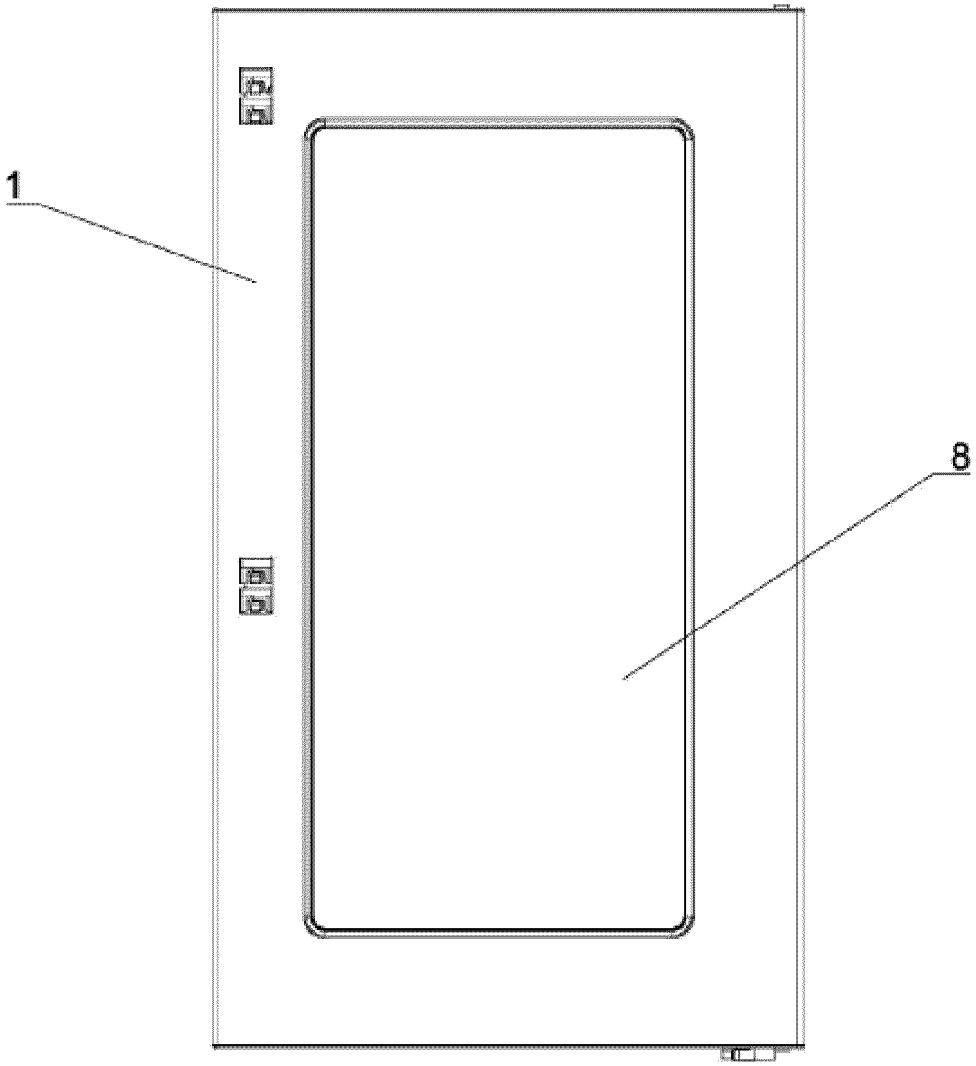

FIG. 4

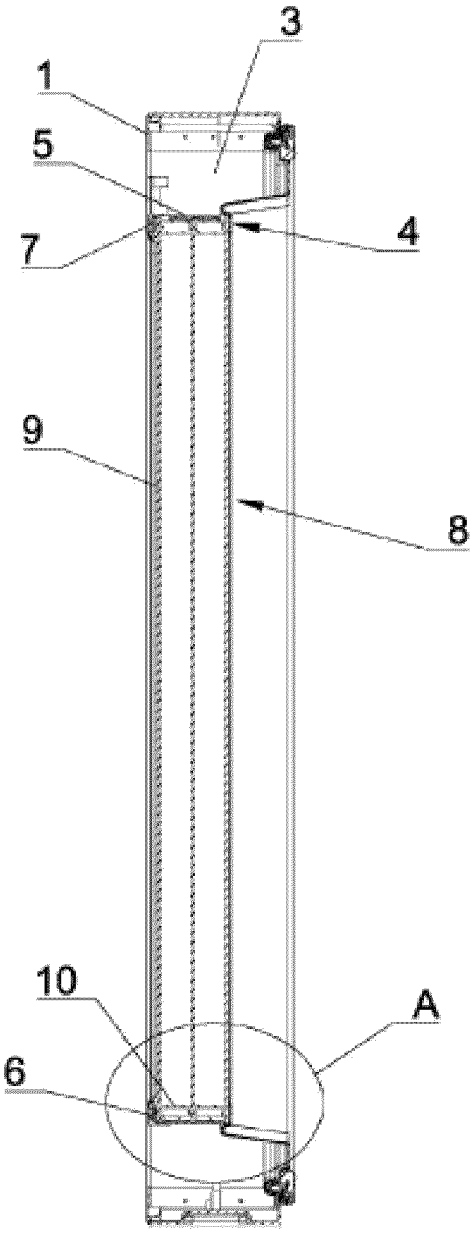

FIG. 5

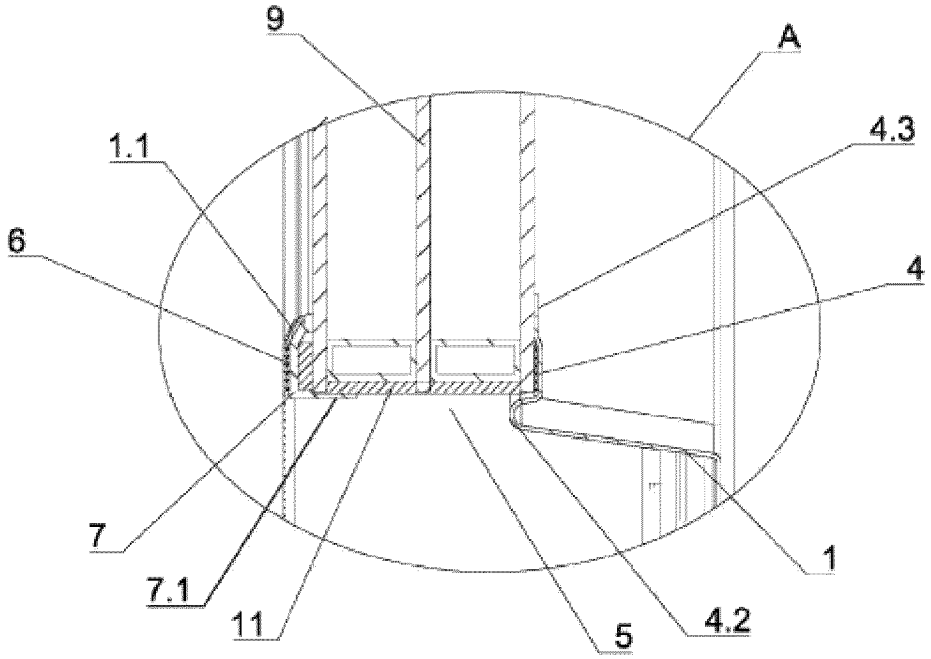

FIG. 6

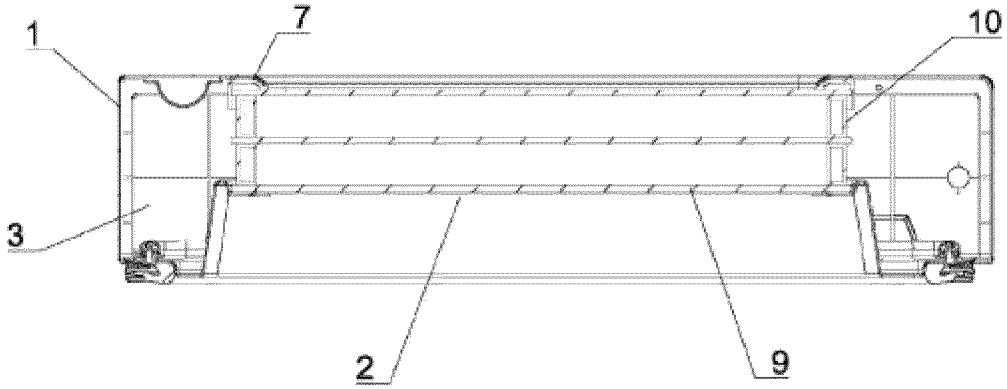

FIG. 7

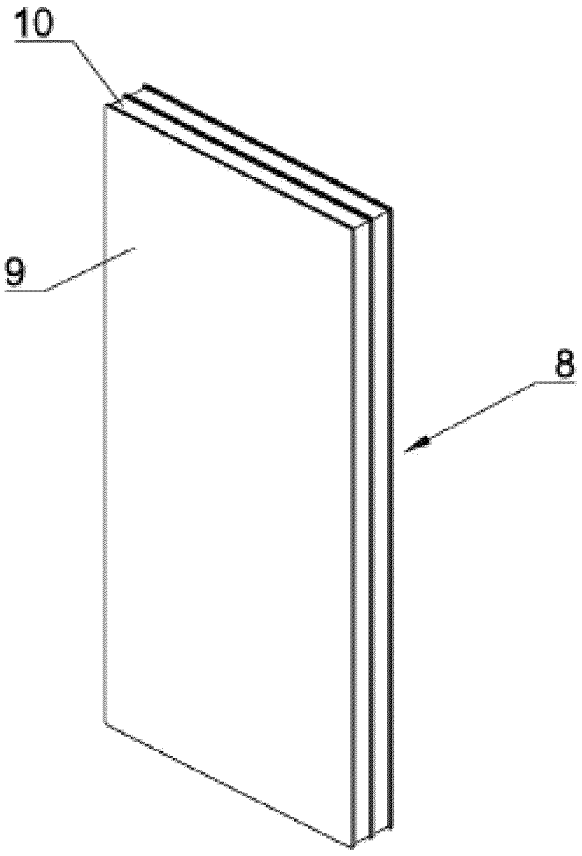

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/091428

A. CLASSIFICATION OF SUBJECT MATTER

F25D23/02(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)

IPC: F25D23

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 , ENTXT, ENTXTC, DWPI, WPABS, WPABSC: 宁波韩电电器有限公司, 费旭丹, 胡哲明, 郁如晨, 张鹏涛, 透视, 窗, 透明, 玻璃, 冰箱, 门, 发泡, 注料口, 弹片, 限位, 胶, 粘, 槽, refrigerator, door, glass, transparen+, window, foaming, filling, elastic sheet, glue, paste, groove, limit+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 217764086 U (NINGBO HANDIAN ELECTRIC APPLIANCE CO., LTD.) 08 November 2022 (2022-11-08) description, paragraphs 29-32, and figures 1-8	1-9
Y	JP H0452487 A (MATSUSHITA REFRIGERATION CO., LTD.) 20 February 1992 (1992-02-20) description, pp. 1-2, and figure 2	1-9
Y	JP 2007132637 A (NIPPON ITAGARASU SPACIA KK.) 31 May 2007 (2007-05-31) description, pp. 3 and 7, and figures 5 and 10	1-9
Y	JP 2000346541 A (SANYO ELECTRIC CO., LTD.) 15 December 2000 (2000-12-15) description, p. 2, and figures 1-3	3-5
Y	CN 107076504 A (LG ELECTRONICS INC.) 18 August 2017 (2017-08-18) description, paragraphs 80-138, and figures 1-3	1-9
Y	CN 201607083 U (ZHEJIANG XINGXING HOME APPLIANCE CO., LTD.) 13 October 2010 (2010-10-13) description, paragraphs 19-23, and figures 1-2	1-9

☑ 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
"D" document cited by the applicant in the international application
"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
21 July 2023	**27 July 2023**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **China No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2023/091428

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 210688897 U (SHUANGCHENG SENYING WINDOW INDUSTRY CO., LTD.) 05 June 2020 (2020-06-05) description, embodiment 1, and figures 1-5	1-9
Y	US 2022003482 A1 (LG ELECTRONICS INC.) 06 January 2022 (2022-01-06) description, paragraphs 116-156 and 283-296, and figures 4 and 15	1-9
A	CN 103827582 A (SAINT-GOBAIN GLASS FRANCE S.A.) 28 May 2014 (2014-05-28) entire document	1-9
A	CN 202264350 U (HAIER GROUP CORP. et al.) 06 June 2012 (2012-06-06) entire document	1-9
A	CN 216204635 U (GUANGDONG GALANZ GROUP CO., LTD. et al.) 05 April 2022 (2022-04-05) entire document	1-10
A	JP H06265262 A (SANYO ELECTRIC CO., LTD.) 20 September 1994 (1994-09-20) entire document	1-9

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2023/091428

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	217764086	U	08 November 2022	None			
JP	H0452487	A	20 February 1992	JP	2892781	B2	17 May 1999
JP	2007132637	A	31 May 2007	None			
JP	2000346541	A	15 December 2000	None			
CN	107076504	A	18 August 2017	US	2018112906	A1	26 April 2018
				US	11029075	B2	08 June 2021
				TW	201708776	A	01 March 2017
				TWI	637135	B	01 October 2018
				EP	3159636	A1	26 April 2017
				AU	2022203939	A1	23 June 2022
				AU	2020200727	A1	20 February 2020
				AU	2020200727	B2	10 March 2022
				WO	2017010828	A1	19 January 2017
				AU	2016294298	A1	17 August 2017
				AU	2016294298	B2	31 October 2019
CN	201607083	U	13 October 2010	None			
CN	210688897	U	05 June 2020	None			
US	2022003482	A1	06 January 2022	EP	3936799	A1	12 January 2022
				AU	2021204714	A1	20 January 2022
				AU	2021204714	B2	06 July 2023
CN	103827582	A	28 May 2014	WO	2013017792	A1	07 February 2013
				HUE	044407	T2	28 October 2019
				ES	2739835	T3	04 February 2020
				US	2014369063	A1	18 December 2014
				US	9664835	B2	30 May 2017
				EP	2737247	A1	04 June 2014
				EP	2737247	B1	03 July 2019
				DK	2737247	T3	05 August 2019
				DE	202012012888	U1	05 June 2014
				FR	2978525	A1	01 February 2013
				FR	2978525	B1	18 May 2018
				PL	2737247	T3	31 October 2019
				TR	201910334	T4	22 July 2019
CN	202264350	U	06 June 2012	None			
CN	216204635	U	05 April 2022	None			
JP	H06265262	A	20 September 1994	JP	3043200	B2	22 May 2000

Form PCT/ISA/210 (patent family annex) (July 2022)