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

(11) **EP 3 940 327 A1**

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

(43) Date of publication:
19.01.2022 Bulletin 2022/03

(21) Application number: **19918981.2**

(22) Date of filing: **10.09.2019**

(51) International Patent Classification (IPC):
F25D 29/00 *(2006.01)* ***F25D 23/00*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F25D 23/00; F25D 23/02; F25D 29/00; G09F 9/00

(86) International application number:
PCT/CN2019/105080

(87) International publication number:
WO 2020/181750 (17.09.2020 Gazette 2020/38)

(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:
KH MA MD TN

(30) Priority: **13.03.2019 CN 201910187402**

(71) Applicants:
- **Qingdao Haier Refrigerator Co., Ltd**
  Qingdao, Shandong 266101 (CN)
- **Haier Smart Home Co., Ltd.**
  Qingdao, Shandong 266101 (CN)

(72) Inventors:
- **LIU, Mingyong**
  Qingdao, Shandong 266101 (CN)
- **WANG, Ning**
  Qingdao, Shandong 266101 (CN)
- **ZHANG, Heng**
  Qingdao, Shandong 266101 (CN)
- **FU, Weijian**
  Qingdao, Shandong 266101 (CN)
- **WANG, Yuan**
  Qingdao, Shandong 266101 (CN)
- **WANG, Weiqing**
  Qingdao, Shandong 266101 (CN)

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

(54) DISPLAY ASSEMBLY FOR USE IN REFRIGERATOR DOOR, REFRIGERATOR DOOR, AND REFRIGERATOR

(57) The present invention discloses a display assembly for a refrigerator door, a refrigerator door and a refrigerator. The display assembly comprises a transparent cover plate, a display device with a display screen, and a touch film disposed between the transparent cover plate and the display screen, wherein the transparent cover plate extends along a curved line, and an extension path of the touch film is parallel to the extension path of the transparent cover plate. The present invention greatly improves the sensitivity and reliability of the touch.

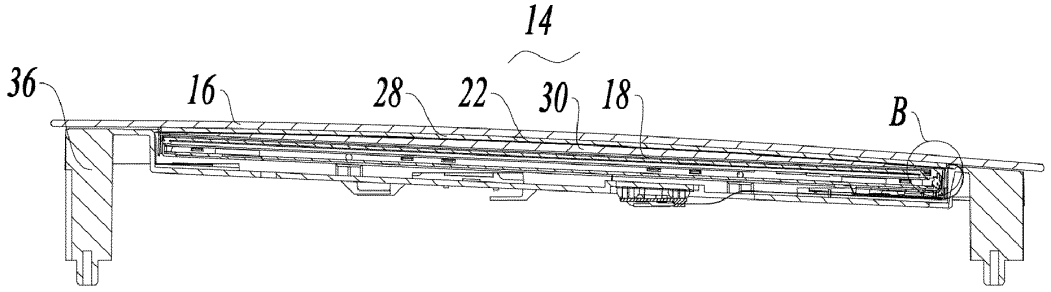

FIG. 2

EP 3 940 327 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to the field of household appliance and in particular to a display assembly for a refrigerator door, a refrigerator door and a refrigerator.

BACKGROUND

[0002] Conventional display on a door body generally employs LED display. Such display is relatively single and can only be regulated simply, and there is little human-machine interaction. To improve the intelligence of the refrigerator, technicians usually assemble a display screen at a middle position of the refrigerating door body, and dispose a touch film between the display screen and the door panel. Currently, a cover plate on a front surface of the door body having the display screen is a planar glass pane, and usually mounted in a way that a display device with the display screen is inserted in the door body, or the display screen is directly bonded to the planar glass pane. However, when the planar glass pane as the cover plate is set to a curved surface, since different positions of the cover plate are at different distances from the display screen and from the touch film, the touch sensitivity is very low and the use is very unreliable.

SUMMARY

[0003] An object of the present invention is to provide a display assembly for a refrigerator door, a refrigerator door and a refrigerator, which greatly improve the sensitivity and reliability of the touch.

[0004] To achieve one of the above objects of the present invention, an embodiment of the present invention provides a display assembly for a refrigerator door. The display assembly comprises a transparent cover plate, a display device with a display screen, and a touch film disposed between the transparent cover plate and the display screen, wherein
the transparent cover plate extends along a curved line, and an extension path of the touch film is parallel to the extension path of the transparent cover plate.

[0005] As a further improvement of an embodiment of the present invention, both the transparent cover plate and the touch film extend along a circular arc and share an arc center, and the arc center and the display screen are located on the same side of the transparent cover plate.

[0006] As a further improvement of an embodiment of the present invention, the transparent cover plate has an inner surface closer to the touch film and an outer surface opposite to the inner surface, and a radius of a circular arc of the inner surface is 5080mm.

[0007] As a further improvement of an embodiment of the present invention, a radian of the transparent cover plate is set to be greater than two degrees and less than three degrees.

[0008] As a further improvement of an embodiment of the present invention, the transparent cover plate is a glass pane and 3.2mm thick.

[0009] As a further improvement of an embodiment of the present invention, the transparent cover plate and the touch film are bonded by a first optical adhesive, and the touch film and the display screen are bonded by a second optical adhesive.

[0010] As a further improvement of an embodiment of the present invention, a first reinforcing adhesive that does not transmit light is disposed between the transparent cover plate and the touch film and adjacent to an outer periphery of the touch film, and the first reinforcing adhesive surrounds the first optical adhesive.

[0011] As a further improvement of an embodiment of the present invention, a second reinforcing adhesive that does not transmit light is provided between the touch film and the display screen and adjacent to the outer periphery of the touch film, and the second reinforcing adhesive surrounds the second optical adhesive.

[0012] To achieve one of the above objects of the present invention, another embodiment of the present invention provides a refrigerator door, wherein the refrigerator door comprises a main body and a display assembly disposed on the main body, and the display assembly is set as the display assembly as stated in any of the above technical solutions.

[0013] To achieve one of the above objects of the present invention, a further embodiment of the present invention provides a refrigerator, wherein the refrigerator comprises a cabinet and a refrigerator door for opening or closing the cabinet, and the refrigerator door is set as the refrigerator door as stated in any of the above technical solutions.

[0014] As compared with the prior art, the present invention has the following advantageous effects: in the technical solution provided the present invention, since the transparent cover plate extends along the curved line and the extension path of the touch film is parallel to the extension path of the transparent cover plate, distances between any positions of the transparent cover plate and the touch film are all equal. The present invention greatly improves the sensitivity and reliability of the touch.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

FIG. 1 is a front view of a refrigerator door of a refrigerator according to a specific embodiment of the present invention.

FIG. 2 is an enlarged cross-sectional view taken along line A-A of FIG. 1, and only illustrates a cross-sectional view at the position of a display assembly.

FIG. 3 is a partially enlarged view of the position B of FIG. 2.

DETAILED DESCRIPTION

[0016] The present invention will be described in detail below in conjunction with specific embodiments shown in the figures. However, these embodiments are not intended to limit the present invention. Variations in structures, methods or functions made by those having ordinary skill in the art according to these embodiments all are included in the extent of protection of the present invention.

[0017] In the depictions of the specific embodiments of the present invention, directional or positional relationship as indicted by terms such as "up", "down", "front", "rear", "left", "right", "vertical", "horizontal", "bottom", "in" and "out" is based on the directional or positional relationship shown in the figures usually with reference to the normal in-use state of the refrigerator, and does not indicate that the designated position or element must be in a specific direction.

[0018] Moreover, it should be appreciated that although the terms such as "first" and "second" may be used to describe various elements or structures herein, the described objects should not be limited by the above terms. The above terms are only used to distinguish the described objects from each other. For example, a first optical adhesive may be referred to as a second optical adhesive, and also the second optical adhesive may be referred to as the first optical adhesive, which does not depart from the extent of protection of the present invention.

[0019] As shown in FIG. 1 through FIG. 3, an embodiment according to the present invention provides a refrigerator comprising a cabinet (not shown) and a refrigerator door 10 for opening or closing the cabinet. The cabinet defines storage chambers whose number and structural forms may be configured according to different demands. The storage chambers usually comprise a refrigerating chamber and a freezing chamber. Usually, the refrigerator door 10 is provided with a storage region (not shown) for storing items, thereby improving the user's convenience in accessing the items.

[0020] The refrigerator door 10 comprises a main body 12 and a display assembly 14 disposed on the main body 12. The display assembly 14 comprises a transparent cover plate 16, a display device with a display screen 18, and a touch film 22 disposed between the transparent cover plate 16 and the display screen 18. Furthermore, the transparent cover plate 16 extends along a curved line, and an extension path of the touch film 22 is parallel to the extension path of the transparent cover plate 16.

[0021] In the present preferred embodiment, since the transparent cover plate 16 extends along the curved line and the extension path of the touch film 22 is parallel to the extension path of the transparent cover plate 16, distances between any positions of the transparent cover plate 16 and the touch film 22 are all equal. Touch at any positions of the transparent cover plate 16 may operate the display device well and greatly improve the sensitivity and reliability of the touch.

[0022] In the present embodiment, specifically, both the transparent cover plate 16 and the touch film 22 extend along a circular arc and share an arc center, and the arc center and the display screen 18 are located on the same side of the transparent cover plate 16, thereby ensuring that the vertical distances between any positions of the transparent cover plate 16 and corresponding positions of the touch film 22 are all equal and ensuring the sensitivity and reliability of the touch film. Certainly, in addition to extending along the circular arc, the transparent cover plate 16 and the touch film 22 may also set to extend other parallel curved lines so long as it may be ensured that the vertical distances between any positions of the transparent cover plate 16 and corresponding positions of the touch film 22 are all equal. Furthermore, light transmits between the transparent cover plate 16 and the touch film 22, and light also transmits between the touch film 22 and the display screen 18.

[0023] Usually, the display device further comprises various electrical modules 28 connected to the display screen 18. In the present preferred embodiment, the display screen 18 is set as a planar screen, a plane passing through an arc center line of the transparent cover plate 16 and equally dividing the touch film 22 is defined as a first plane, and the display screen 18 is perpendicular to the first plane. Furthermore, both ends of the transparent cover plate 16 protrude out of both ends of the display screen 18. Certainly, the display screen 18 may also set as a curved screen. Specifically, the curved screen and the transparent cover plate 16 share an arc center, and a radian of the curved screen is smaller than the radian of the transparent cover plate 16, to ensure that both ends of the transparent cover plate 16 protrude out of both ends of the curved screen.

[0024] In the present preferred embodiments, the transparent cover plate 16 is a glass pane and 3.2mm thick. Certainly, the transparent cover plate 16 may also employ other transparent materials in addition to glass, and the thickness of the transparent cover plate 16 may also set to other values.

[0025] The transparent cover plate 16 has an inner surface 24 closer to the touch film 22 and an outer surface 26 opposite to the inner surface 24. The inner surface 24 and the outer surface 26 are concentric circular arc surfaces. In the present preferred embodiment, a radius of the circular arc of the inner surface 24 is 5080 mm. Certainly, the radius of the circular arc of the inner surface 24 may also be set to other values. Preferably, the radius is set to a value that facilitates bending and forming. The radian of the transparent cover plate 16 is set to be greater than two degrees and less than three degrees. Specifically, the radian of the transparent cover plate 16 is set to 2.53 degrees.

[0026] The transparent cover plate 16 and the touch film 22 are bonded by a first optical adhesive 28, and the touch film 22 and the display screen 18 are bonded by a second optical adhesive 30. In actual manufacturing, a

dedicated device may be used to bond the touch film 22 to the transparent cover plate 16 according to the extension arc of the transparent cover plate 16 by the first optical adhesive 28 to ensure that the thickness of the first optical adhesive 28 is consistent, thereby ensuring the extension path of the touch film 22 is parallel to the extension path of the transparent cover plate 16. Then, the display screen 18 is bonded to the touch film 22 by the second optical adhesive 30. The first optical adhesive 28 ensures the light transmission between the transparent cover plate 16 and the touch film 22, the second optical adhesive 30 ensures the light transmission between the touch film 22 and the display screen 18, and the first optical adhesive 28 and the second optical adhesive 30 enables firmer and more reliable fixation between the transparent cover plate 16, the touch film 22 and the display screen 18.

[0027] Furthermore, a first reinforcing adhesive 32 that does not transmit light is disposed between the transparent cover plate 16 and the touch film 22 and adjacent to the outer periphery of the touch film 22, and the first reinforcing adhesive 32 surrounds the first optical adhesive 28, thereby shielding light and providing reinforcement between the transparent cover plate 16 and the touch film 22, so that the touch is more sensitive and the structure is firmer.

[0028] A second reinforcing adhesive 34 that does not transmit light is provided between the touch film 22 and the display screen 18 and adjacent to the outer periphery of the touch film 22, and the second reinforcing adhesive 34 surrounds the second optical adhesive 30. The second reinforcing adhesive 34 shields light and provides reinforcement between the touch film 22 and the display screen 18, so that the touch is more sensitive and the structure is firmer.

[0029] The display assembly 14 further comprises a mounting bracket 36 for mounting the display assembly 14 on the main body 12 of the refrigerator door 10, the mounting bracket 36 is fixedly connected to the display device, and the mounting bracket 36 is further fixed on the transparent cover plate 16 by an adhesive tape or other reinforcing adhesive, so that the adhesion between the mounting bracket 36 and the transparent cover plate 16 is firmer and more reliable. Further, the mounting bracket 36 is locked to the foamed main body 12 by a screw structure. Certainly, other connection structures may also be employed between the mounting bracket 36 and the main body 12.

[0030] It should be understood that although the description is described according to the embodiments, not every embodiment only includes one independent technical solution, that such a description manner is only for the sake of clarity, that those skilled in the art should take the description as an integral part, and that the technical solutions in the embodiments may be suitably combined to form other embodiments understandable by those skilled in the art.

[0031] The detailed descriptions set forth above are merely specific illustrations of feasible embodiments of the present invention, and are not intended to limit the scope of protection of the present invention. All equivalent embodiments or modifications that do not depart from the art spirit of the present invention should fall within the scope of protection of the present invention.

Claims

1. A display assembly for a refrigerator door, the display assembly comprising a transparent cover plate, a display device with a display screen, and a touch film disposed between the transparent cover plate and the display screen, wherein
the transparent cover plate extends along a curved line, and an extension path of the touch film is parallel to the extension path of the transparent cover plate.

2. The display assembly according to claim 1, wherein both the transparent cover plate and the touch film extend along a circular arc and share an arc center, and the arc center and the display screen are located on the same side of the transparent cover plate.

3. The display assembly according to claim 2, wherein the transparent cover plate has an inner surface closer to the touch film and an outer surface opposite to the inner surface, and a radius of a circular arc of the inner surface is 5080mm.

4. The display assembly according to claim 3, wherein a radian of the transparent cover plate is set to be greater than two degrees and less than three degrees.

5. The display assembly according to claim 1, wherein the transparent cover plate is a glass pane and 3.2mm thick.

6. The display assembly according to claim 1, wherein the transparent cover plate and the touch film are bonded by a first optical adhesive, and the touch film and the display screen are bonded by a second optical adhesive.

7. The display assembly according to claim 6, wherein a first reinforcing adhesive that does not transmit light is disposed between the transparent cover plate and the touch film and adjacent to an outer periphery of the touch film, and the first reinforcing adhesive surrounds the first optical adhesive.

8. The display assembly according to claim 7, wherein a second reinforcing adhesive that does not transmit light is provided between the touch film and the display screen and adjacent to the outer periphery of the touch film, and the second reinforcing adhesive

surrounds the second optical adhesive.

9. A refrigerator door, wherein the refrigerator door comprises a main body and a display assembly disposed on the main body, the display assembly being set as the display assembly according to any of claims 1-8.

10. A refrigerator, wherein the refrigerator comprises a cabinet and a refrigerator door for opening or closing the cabinet, the refrigerator door being set as the refrigerator door according to claim 9.

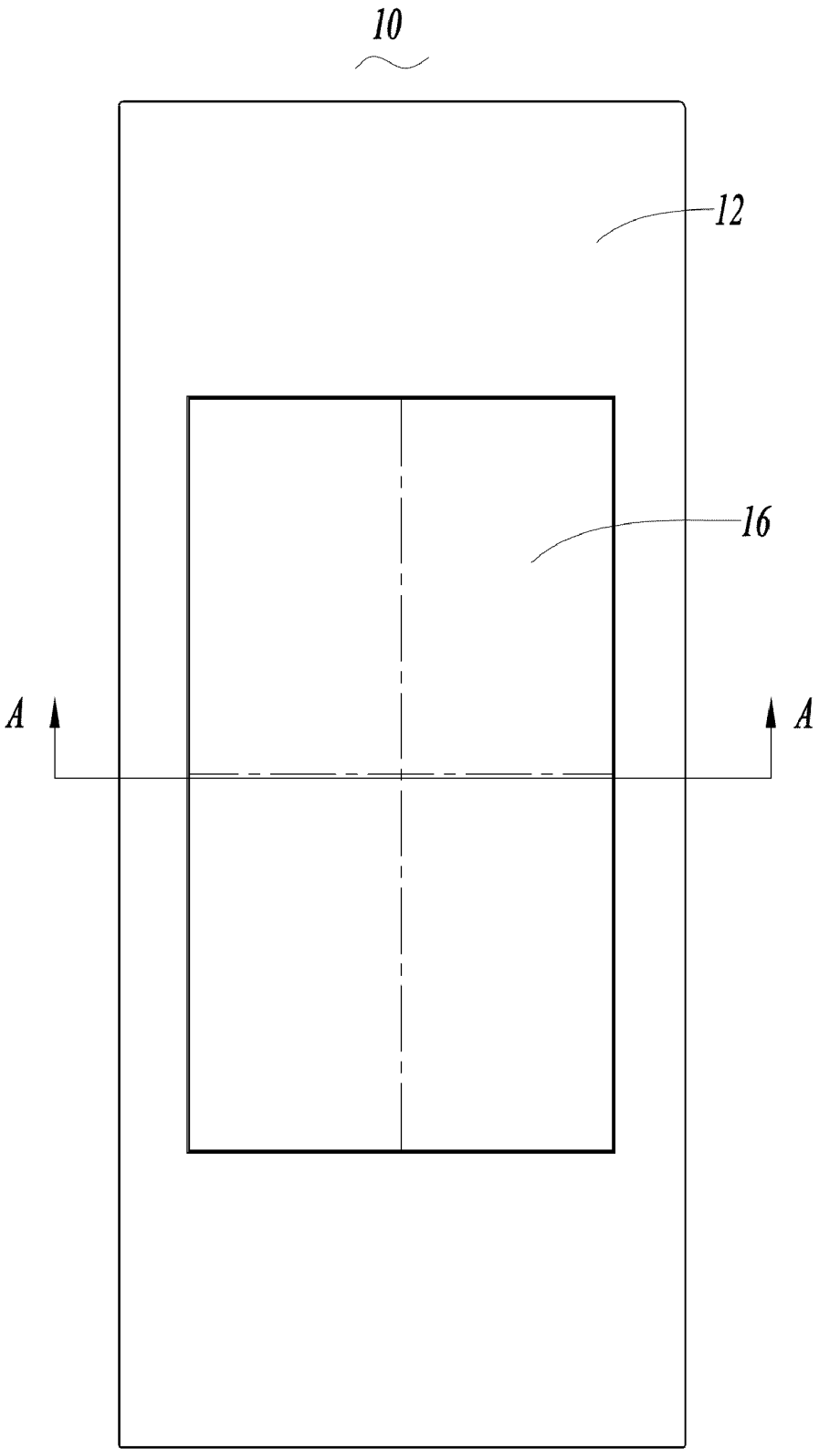

FIG. 1

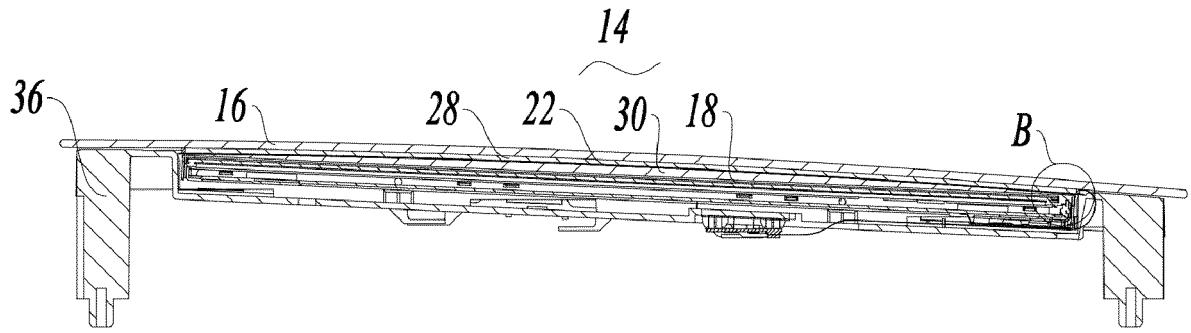

FIG. 2

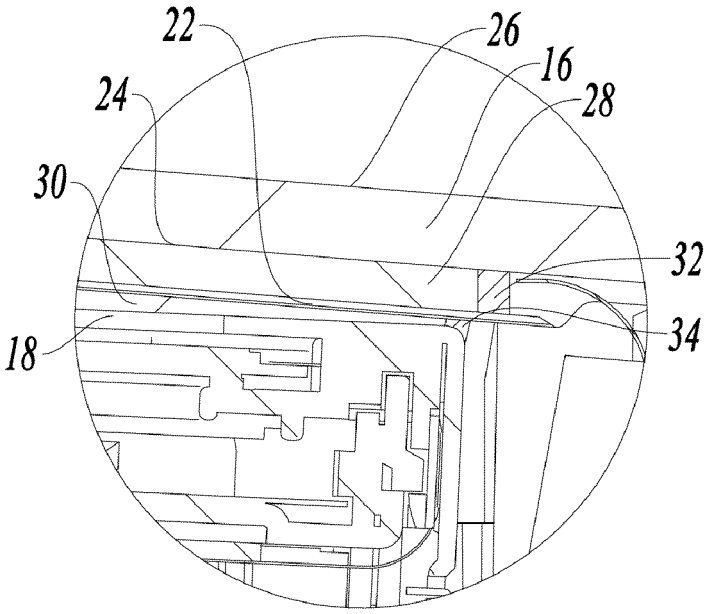

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2019/105080

A. CLASSIFICATION OF SUBJECT MATTER

F25D 29/00(2006.01)i; F25D 23/00(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)

F25D23, F25D29, 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)

CNTXT, CNABS, CNKI, SIPOABS, VEN: 曲线, 曲面, 凸, 弧, 弯, 显示, 屏, 液晶, 触摸, 灵敏, 胶, sensitiv+, quick w response, nimble, quick w act+, sharp, curve, convex, arc+, bend+, display+, screen, touch+, lcd, led, glue

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 203100333 U (HAIER GROUP CORPORATION et al.) 31 July 2013 (2013-07-31) description, paragraphs [0002]-[0035], and figures 1-7	1-5, 7-10
Y	CN 203100333 U (HAIER GROUP CORPORATION et al.) 31 July 2013 (2013-07-31) description, paragraphs [0002]-[0035], and figures 1-7	6
Y	CN 206073559 U (HEFEI MEILING COMPANY LIMITED) 05 April 2017 (2017-04-05) description, paragraphs [0030]-[0033], and figure 3	6
A	CN 108759269 A (QINGDAO HAIER CO., LTD.) 06 November 2018 (2018-11-06) entire document	1-10
A	JP 2018035954 A (TOSHIBA LIFESTYLE PRODUCTS & SERVICES CORP.) 08 March 2018 (2018-03-08) entire document	1-10
A	CN 206583203 U (FOSHAN XIAOXIAN INTERCONNECTION ELECTRICAL APPLIANCE TECHNOLOGY CO., LTD. et al.) 24 October 2017 (2017-10-24) entire document	1-10
A	CN 106403445 A (TOSHIBA LIFESTYLE PRODUCTS & SERVICES CORPORATION) 15 February 2017 (2017-02-15) entire document	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
"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
19 November 2019	**04 December 2019**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration** **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/CN2019/105080

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 106642895 A (HEFEI HUALING CO., LTD. et al.) 10 May 2017 (2017-05-10) entire document	1-10

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2019/105080

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 203100333 U	31 July 2013	None	
CN 206073559 U	05 April 2017	None	
CN 108759269 A	06 November 2018	None	
JP 2018035954 A	08 March 2018	CN 107782050 A	09 March 2018
CN 206583203 U	24 October 2017	None	
CN 106403445 A	15 February 2017	CN 106403445 B	16 August 2019
		JP 2017032160 A	09 February 2017
CN 106642895 A	10 May 2017	None	

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