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

(11) **EP 2 868 851 A1**

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

(43) Date of publication:
06.05.2015 Bulletin 2015/19

(21) Application number: **13884951.8**

(22) Date of filing: **04.09.2013**

(51) Int Cl.:
E05F 1/12 *(2006.01)* ***F25D 23/02*** *(2006.01)*

(86) International application number:
PCT/CN2013/082929

(87) International publication number:
WO 2015/032041 (12.03.2015 Gazette 2015/10)

(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

(71) Applicant: **Hisense Ronshen Guangdong Refrigerator Co., Ltd.**
Foshan, Guangdong 528303 (CN)

(72) Inventors:
- **LI, Liyun**
  Foshan
  Guangdong 528303 (CN)
- **ZHU, Jiawei**
  Shunde
  Guangdong 528303 (CN)
- **TAN, Minwei**
  Shunde
  Guangdong 528303 (CN)
- **ZHI, Dongning**
  Shunde
  Guangdong 528303 (CN)
- **WANG, Meiyan**
  Shunde
  Guangdong 528303 (CN)

(74) Representative: **Petraz, Gilberto Luigi et al**
GLP S.r.l.
Viale Europa Unita, 171
33100 Udine (IT)

(54) DOOR STOPPER FOR REFRIGERATOR DOOR BODY

(57) The present invention relates to a suction assisting device for a refrigerator door, comprising: a door end cover, a cover plate, and a hinge, the hinge being separately coupled to a cabinet and a door of a refrigerator, and the door end cover being securely coupled to the door; wherein the suction assisting device further comprises: a rotating shaft and an elastic piece, the rotating shaft being coupled to the hinge, the elastic piece being coupled to the door end cover via a secure coupling structure, the elastic piece being provided with a first stopper structure, and the rotating shaft being provided with a protrusion structure. When the hinge shaft rotates, the protrusion structure on the rotating shaft falls within the first stopper structure such that the rotating shaft is locked with the elastic piece, thereby achieving locking of the door. In this way, the objective of tightly closing the refrigerator door is achieved, and the structure is simple, and high practicability is reached.

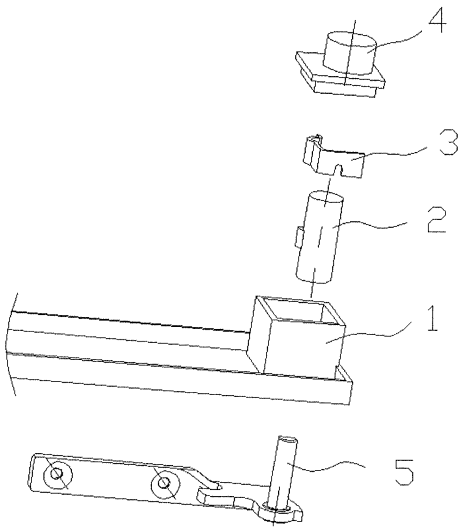

FIG. 1

EP 2 868 851 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to the field of refrigerator door technologies, and in particular, to a suction assisting device for a refrigerator door.

BACKGROUND

[0002] The door of a refrigerator may be not tightly closed due to a small applied force or due to rebound of the door due to a greater applied force. Once the refrigerator door is not tightly closed, waste of electricity may be caused and even cold air in the cabinet may be subjected to leakage. In this way, temperatures inside the cabinet may increase, such that food stored on the cabinet may decay and deteriorate.

[0003] Opening and closing of the refrigerator is implemented by means of a suction assisting device provided on the door. The suction assisting device is disposed at a hinge of the refrigerator. A traditional suction assisting device is made of a nylon material. A rebound force generated during opening of the refrigerator door is caused by deformation of the nylon material. However, the rebound force is small such that the force generated for closing the refrigerator door is small. Starting from the perspective of design, the rebound force of such suction assisting device generally needs to be calculated and verified for many times, and thus the required time and cost are both considerable. In addition, the traditional suction assisting device is designed at the lower part of the door, affecting appearance of the refrigerator.

SUMMARY

[0004] To overcome the at least one defect in the prior art, the present invention provides a suction assisting device for a refrigerator door. A rotation locking structure of the suction assisting device has a function of self-locking a refrigerator door when closing the door, and the door is securely closed.

[0005] To solve the above technical problem, the present invention employs the following technical solution:

[0006] A suction assisting device for a refrigerator door, comprises: a door end cover, a cover plate, and a hinge, the hinge being separately coupled to a cabinet and a door of a refrigerator, and the door end cover being securely coupled to the door; wherein the suction assisting device further comprises: a rotating shaft and an elastic piece, the rotating shaft being coupled to the hinge, the elastic piece being coupled to the door end cover via a secure coupling structure, the elastic piece being provided with a first stopper structure, and the rotating shaft being provided with a protrusion structure;

[0007] wherein when the door forms an angle with the cabinet, the rotating shaft is pressed against the elastic piece to cause the elastic piece to deform, and when the angle continuously decreases, the elastic piece rebounds and the protrusion structure of the rotating shaft falls within the first stopper structure such that the rotating shaft is locked with the elastic piece to achieve locking of the door.

[0008] When the door is being closed, the hinge shaft rotates to drive the rotating shaft to rotate, the elastic piece is coupled to the door end cover via the secure coupling structure such that the elastic piece is secured relative to the door. When the rotating shaft rotates such that the door forms an angle with the cabinet, the protrusion structure of the rotating shaft presses the elastic piece to cause it to deform. When the angle continuously decreases, the elastic piece rebounds and thus the protrusion structure of the rotating shaft falls within the first stopper structure such that the rotating shaft is locked with the elastic piece to achieve locking of the door, that is locking of the door with the cabinet.

[0009] Preferably, the protrusion structure provided on the rotating shaft is an elongated rounded protrusion and has a U-shaped cross section, the first stopper groove provided on the elastic piece is a U-shaped stopper groove, and the U-shaped protrusion is positioned in the U-shaped stopper groove to achieve the function of self-locking. When a force is applied to rotate the hinge shaft, the rotating shaft is driven to rotate, and when the angle formed by the door with the cabinet increases to a specific degree, the elastic piece is subjected to the force and deforms, and the U-shaped protrusion rotates to an outer side of the U-shaped stopper groove, thereby opening the refrigerator door. On the contrary, when a force is applied to rotate the hinge shaft such that the rotating shaft is driven to rotate, and when the angle formed by the door with the cabinet decreases to a specific degree, the elastic piece is subjected to the force and thus deforms, the U-shaped protrusion slides into the U-shaped stopper groove, and the door and the cabinet are closed, thereby implementing self-locking of the U-shaped groove.

[0010] Preferably, the hinge is provided with a hinge shaft, and the rotating shaft is provided with a first through hole, the hinge shaft being positioned in the first through hole.

[0011] Further, the hinge shaft has a D-shaped cross section, and the first through hole is a D-shaped hole. The hinge shaft is positioned in the first through hole, and when the D-shaped shaft is inserted into the D-shaped hole such that the hole is relatively and securely coupled to the shaft. In this way, the hinge shaft is relatively secured to the rotating shaft, and by rotating the hinge, the secure coupling structure drives the rotating shaft to rotate.

[0012] Preferably, the secure coupling structure comprises a second stopper groove disposed on the elastic piece and a clip groove disposed on the door end cover, the clip groove being provided with a stopper rib and a reinforcing rib, and one side of the elastic piece is posi-

tioned in the clip groove, the stopper rib being positioned in the second stopper groove, and the reinforcing rib being positioned on an outer side of the second stopper groove; the second stopper groove is a U-shaped stopper groove, the stopper rib is a ball-shaped stopper rib, and the reinforcing rib is a hollow reinforcing rib; the clip groove structure, as well as the stopper rib and the reinforcing rid, causes the elastic piece to be in a tightly-clipping state, such that the elastic piece is relatively secured to the door end cover, and the second stopper groove achieves a function of limiting and clipping.

[0013] Preferably, the door end cover and the refrigerator door are in a unibody structure. The door end cover is internally provided with a second through hole, an outer side of the second through hole being provided with a first cover edge; the cover plate is internally provided with a blind hole, the bind hole is externally provided with a second cover edge; and one end of the rotating shaft is positioned in the second through hole and the other end of the rotating shaft is positioned in the blind hole, an outer side of the second cover edge being clipped to an inner side of a first protrusion cover edge. The elastic piece is coupled to the protrusion structure on the rotating shaft, the elastic piece is positioned in the door end cover, the hinge structure couples the door to the cabinet, and the hinge shaft is securely coupled to the rotating shaft, such that the hinge shaft is securely coupled to the rotating shaft via the second through hole on the door end cover, and hence extends to the cover plate and mates with the blind hole in the cover plate. To be specific, the external structure of the entire suction assisting device is formed by the closed cover plate and the door end cover, the hinge shaft penetrates through the door end cover and is coupled to the internal structure of the suction assisting device, thereby making the suction assisting device of the refrigerator door simple and beautiful in terms of appearance.

[0014] Compared with the prior art, the beneficial effects of the present invention lie in that:

[0015] According to the present invention, the first secure coupling structure, the second secure coupling structure, and the rotation locking structure of the suction assisting device for a refrigerator door apply a force to the elastic piece via rotation of the hinge shaft when the refrigerator door is opened to cause the elastic piece to deform, such that the U-shaped protrusion on the rotating shaft rotates out of the U-shaped stopper groove, thereby implementing an open operation of the refrigerator; and apply a force to the elastic piece when the refrigerator door is closed, such that the U-shaped protrusion on the rotating shaft rotates into the U-shaped stopper groove to implement self-locking, thereby preventing disadvantages caused if the refrigerator is not tightly closed due to a small rebound force, and achieving a better self-locking capability. In addition, the external structure of the suction assisting device of the refrigerator door is implemented by mutual clipping of the door end cover and the cover plate, thereby achieving a function of shading the internal structure thereof. The suction assisting device is entirely positioned in the door, thereby making the entire structure simple and beautiful in terms of appearance.

BRIEF DESCRIPTION OF DRAWINGS

[0016]

FIG. 1 is a three-dimensional exploded view of a suction assisting device for a refrigerator door according to Embodiment 1 of the present invention;
FIG. 2 is a sectional view of the installed suction assisting device in FIG. 1;
FIG. 3 is an A-A sectional view of FIG. 2; and
FIG. 4 is a schematic view of a locking process of the suction assisting device in FIG. 1.

DETAILED DESCRIPTION

[0017] The present invention is further described with reference to a specific embodiment. The drawings are schematic views for illustration purpose only, but shall not be construed as limitations to the present invention. For better illustration of the following embodiment, some parts or components would be omitted, scaled up or scaled down in the drawings, which are not indicative of the practical sizes. For a person skilled in the art, it shall be understandable that some commonly known structures and description thereof are omitted for brevity.

[0018] Identical or like reference numerals in the drawings illustrating the embodiment of the present invention denote identical or similar parts or elements. In the description of the present invention it should be understood that terms "upper", "lower", "left", and "right" indicative of azimuth and position relationships based on the azimuth and position relationships as illustrated in the drawings are merely for briefly describing the present invention, rather than denoting or implying that the denoted apparatuses or elements need to be positioned at specific azimuths and constructed and operated with the specific azimuths. Therefore, the terms for denoting the position relationships in the drawings are merely for exemplary illustration, but shall not be construed as limitations to the present invention. Persons of ordinary skill in the art may understand denotations of the terms according to the actual circumstances.

Embodiment 1

[0019] FIG. 1 to FIG. 3 illustrate a suction assisting device for a refrigerator door according to a first embodiment of the present invention. As illustrated in FIG. 1, the suction assisting device comprises a door end cover 1, a rotating shaft 2, an elastic piece 3, a cover plate 4, and a hinge 5. The hinge 5 is separately coupled to a cabinet and a door of a refrigerator, and the door end cover 1 is securely coupled to the door. The installed

suction assisting device is as illustrated in FIG. 2 and FIG. 3. The elastic piece 3 is positioned in a clip groove 11 on the door end cover 1 and clipped to the clip groove structure; one end of the rotating shaft 2 is inserted into a second through hole of the door end cover 1; a protrusion structure 21 of the rotating shaft 2 is clipped to a first stopper groove 31 of the elastic piece 3 and then the cover plate 4 is installed; the other end of the rotating shaft 2 is inserted into a blind hole 41 of the cover plate 4; a second cover edge 42 of the cover plate 4 is installed inside a first cover edge 13 of the door end cover 1; and finally a hinge shaft 51 of the hinge 5 is inserted from a side of the door end cover via the second through hole 12 of the door end cover, penetrates through a first through hole 21 of the rotating shaft 2 and is securely coupled to the rotating shaft 2, that is, forming the suction assisting device for a refrigerator door.

[0020] As illustrated in FIG. 3, the hinge shaft 51 of the hinge 5 is inserted into the first through hole 21. Since the hinge shaft 51 has a D-shaped cross-section, the first through hole 21 is a D-shaped hole, and this structure ensures relatively secure coupling of the hinge shaft 51 and the through hole 21. The secure coupling structure is implemented by positioning one end of the elastic piece 3 in the clip groove 11 on the door end cover 1, and is relatively clipped tightly by a stopper rib 111 and a reinforcing rib 112, wherein the reinforcing rib 111 is positioned on an inner side of a second stopper groove 32 on the elastic piece 3, and the reinforcing rib 112 is positioned on an outer side of the second stopper groove 32. The stopper rib 111 is a ball-shaped stopper rid, the reinforcing rib 112 is a hollow reinforcing rib, and the second stopper groove 32 is a U-shaped stopper groove. Tight clipping of the internal stopper rib 111 and the external reinforcing rib 112 of the stopper groove and tight clipping of the clip groove 11 enable the elastic piece 3 to be securely coupled to the door end cover. The protrusion structure 21 on the rotating shaft 2 is positioned in the first stopper groove on the elastic piece 3, and the protrusion structure 21 is a U-shaped structure, and the first stopper groove is a U-shaped stopper groove. The protrusion structure and the first stopper groove are rotatably locked.

[0021] As illustrated in FIG. 4, when a force is applied to close the refrigerator door, the door rotates relative to the cabinet, that is, the hinge shaft 51 rotates to drive the rotating shaft 2 to rotate; when the angle formed between the door and the cabinet is less than 55 degrees, the protrusion structure 21 on the rotating shaft 2 is pressed against the elastic piece 3 to cause it to deform; when the angle is less than 22 degrees, the elastic piece 3 rebounds to cause the protrusion structure 21 on the rotating shaft 2 to fall within the first stopper groove 31 on the elastic piece 3, thereby achieving self-locking. The elastic piece 3 is securely coupled to the door end cover 1 via the secure coupling structure, such that the refrigerator door is tightly locked with the cabinet.

[0022] Obviously, the above embodiment of the present invention is merely an exemplary one for clearly describing and illustrating the present invention, but is not intended to limit the implementation of the present invention. Persons of ordinary skills in the art may derive other modifications and variations based on the above embodiment. All embodiments of the present invention are not exhaustively listed herein. Any modification, equivalent replacement, or improvement made without departing from the spirit and principle of the present invention should fall within the protection scope of the present invention.

Claims

1. A suction assisting device for a refrigerator door, comprising: a door end cover (1), a cover plate (4), and a hinge (5), the hinge (5) being separately coupled to a cabinet and a door of a refrigerator, and the door end cover (1) being securely coupled to the door; wherein the suction assisting device further comprises: a rotating shaft (2) and an elastic piece (3), the rotating shaft (2) being coupled to the hinge (5), the elastic piece (3) being coupled to the door end cover (1) via a secure coupling structure, the elastic piece being provided with a first stopper structure (31), and the rotating shaft (2) being provided with a protrusion structure (21);
wherein when the door forms an angle with the cabinet, the rotating shaft (2) is pressed against the elastic piece (3) to cause the elastic piece (3) to deform, and when the angle continuously decreases, the elastic piece (3) rebounds and the protrusion structure (21) of the rotating shaft (2) falls within the first stopper structure (31) such that the rotating shaft (2) is locked with the elastic piece (3) to achieve locking of the door.

2. The suction assisting device for a refrigerator door according to claim 1, wherein the protrusion structure (21) is an elongated rounded protrusion and has a U-shaped cross section, and the first stopper groove (31) is a U-shaped stopper groove.

3. The suction assisting device for a refrigerator door according to claim 1, wherein the hinge (5) is provided with a hinge shaft (51), and the rotating shaft (2) is provided with a first through hole (22), the hinge shaft (51) being positioned in the first through hole (22).

4. The suction assisting device for a refrigerator door according to claim 3, wherein the hinge shaft (51) has a D-shaped cross section, and the first through hole (22) is a D-shaped hole.

5. The suction assisting device for a refrigerator door according to claim 1, wherein: the secure coupling

structure comprises a second stopper groove (32) disposed on the elastic piece (3) and a clip groove (11) disposed on the door end cover (1), the clip groove (11) being provided with a stopper rib (111) and a reinforcing rib (112); and one side of the elastic piece (3) is positioned in the clip groove (11), the stopper rib (111) being positioned in the second stopper groove (32), and the reinforcing rib (112) being positioned on an outer side of the second stopper groove (32).

6. The suction assisting device for a refrigerator door according to claim 5, wherein the second stopper groove (32) is a U-shaped stopper groove, the stopper rib (111) is a ball-shaped stopper rib, and the reinforcing rib (112) is a hollow reinforcing rib.

7. The suction assisting device for a refrigerator door according to claim 1, wherein: the door end cover (1) is internally provided with a second through hole (12), an outer side of the second through hole (12) being provided with a first cover edge (13); the cover plate (4) is internally provided with a blind hole (41), the bind hole (41) is externally provided with a second cover edge (42); and one end of the rotating shaft (2) is positioned in the second through hole (12) and the other end of the rotating shaft (2) is positioned in the blind hole (41), an outer side of the second cover edge (42) being clipped to an inner side of a first protrusion cover edge (41).

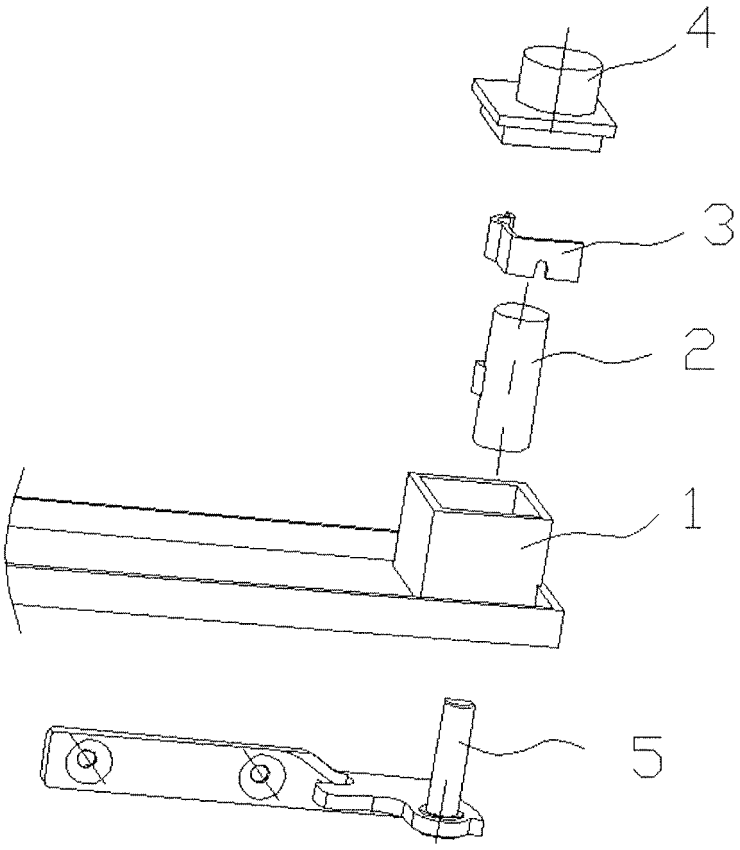

FIG. 1

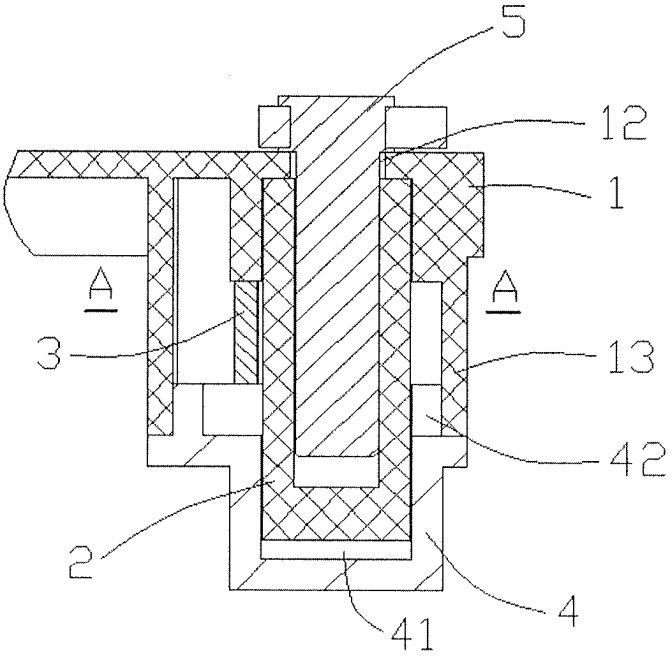

FIG. 2

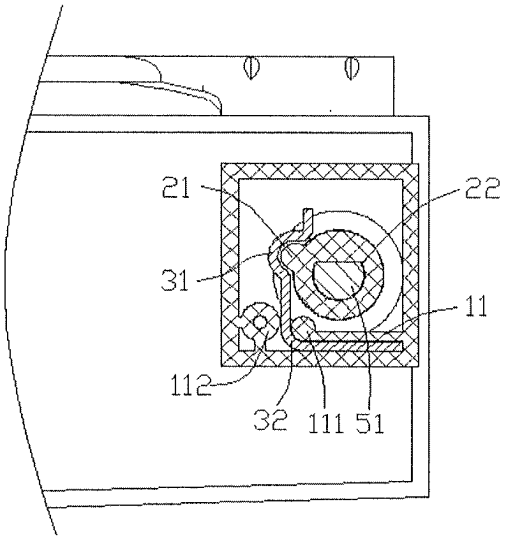

FIG. 3

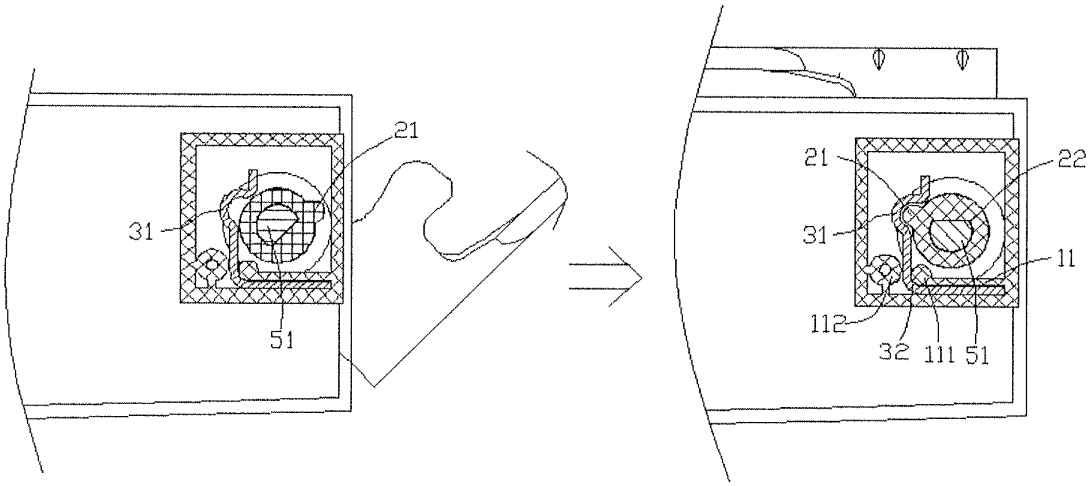

FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2013/082929

A. CLASSIFICATION OF SUBJECT MATTER

E05F 1/12 (2006.01) i; F25D 23/02 (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: E05B; E05C; E05D; E05F; 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)

CNABS, VEN, CNTXT, CNKI: refrigerator, freezer, door, assist, suction, attraction, close, open, distortion, elastic, spring, extrude, bump, concave, convex, protruding, angle, hinge, shaft, rotary, auto

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	CN 103452400 A (HISENSE RONGSHENG GUANGDONG REFRIGERATOR) 18 December 2013 (18.12.2013) the whole document	1-7
A	CN 101135218 A (HAIER GROUP CO et al.) 05 March 2008 (05.03.2008) description, page 3, line 15 to page 8, line 10 and figures 3-8	1-7
A	CN 2497250 Y (KELONG ELECTRIC APPLIANCE CO., LTD., GUANGDONG) 26 June 2002 (26.06.2002) the whole document	1-7
A	CN 1740715 A (SANKYO SEIKI SEISAKUSHO KK) 01 March 2006 (01.03.2006) the whole document	1-7

☒ 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
26 May 2014	09 June 2014
Name and mailing address of the ISA 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 SUN, Xiaolei Telephone No. (86-10) 62085810

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

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2013/082929

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2011129605 A2 (NIFCO KOREA INC.) 20 October 2011 (20.10.2011) the whole document	1-7
A	JP H07190609 A (SAM SUNG ELECTRONIC) 28 July 1995 (28.07.1995) the whole document	1-7

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2013/082929

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 103452400 A	18 December 2013	None	
CN 101135218 A	05 March 2008	CN 101135218 B	02 November 2011
CN 2497250 Y	26 June 2002	None	
CN 1740715 A	01 March 2006	JP 2006090115 A	06 April 2006
		CN 100363697 C	23 January 2008
		KR 100648343 B1	23 November 2006
		JP 4521293 B2	11 August 2010
		KR 20060053217 A	19 May 2006
		US 2006038412 A1	23 February 2006
WO 2011129605 A2	20 October 2011	KR 20110114336 A	19 October 2011
		WO 2011129605 A3	08 March 2012
		KR 101146047 B1	14 May 2012
JP H07190609 A	28 July 1995	US 5579606 A	03 December 1996
		JP 2670429 B2	29 October 1997
		KR 970007468 B1	09 May 1997

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