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- **ZOU, Lei**
Qingdao
Shandong 266101 (CN)
- **ZHU, Yuntao**
Qingdao
Shandong 266101 (CN)
- **WANG, Dongmei**
Qingdao
Shandong 266101 (CN)
- **WANG, Weiqing**
Qingdao
Shandong 266101 (CN)
- **TANG, Songzhi**
Qingdao
Shandong 266101 (CN)

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

(72) Inventors:
• **DONG, Qin**
Qingdao
Shandong 266101 (CN)

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

(54) **SIDE-BY-SIDE REFRIGERATOR WITH CAMERA DEVICE**

(57) A side-by-side refrigerator with an imaging device (300) comprises a refrigerator body (100) in which a storage compartment is defined, an opening-closing component (200) provided with two oppositely disposed door bodies (210) and a vertical beam (220) on one of the door bodies (210) and configured to open or close the storage compartment, and at least one imaging device (300) mounted on the vertical beam (220).

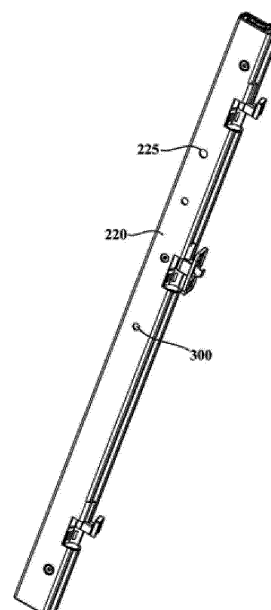


FIG. 3

Description

TECHNICAL FIELD

[0001] The present invention relates to a refrigerating and freezing storage device and in particular to a side-by-side refrigerator with an imaging device.

BACKGROUND

[0002] A refrigerator is a refrigeration device that maintains a constant low temperature, and is also a civil product that keeps food or other articles in a constant low-temperature cold state. With advancement of technologies and improvement of living standards, intellectualization is an inevitable development trend of home appliances. Intelligent food management is an important component of intellectualization of the refrigerator. In an implementation solution of intelligent food management, image recognition of the articles stored in the refrigerator is involved. A camera is usually utilized to recognize the articles stored in a storage compartment.

[0003] At present, most smart refrigerator viewfinder cameras are placed in positions visible to users. For example, a camera is usually installed on the front side of an upper wall of a refrigerator inner container. In this way, the camera can be easily damaged by the articles that are taken and placed, and is unaesthetic. The camera has an improper installation position and a small shooting wide angle. There also exists a shooting dead corner. In addition, the camera installed in a low-temperature and high-humidity environment in the refrigerator is unfavorably subject to dew formation. An effective camera dew removing device is unavailable. Consequently, the service life, the shooting effect, and the user experience of the camera are all affected.

SUMMARY

[0004] One objective of the present invention is to avoid at least one defect in image capturing of a conventional refrigerator and to provide a novel side-by-side refrigerator which may protect a camera against collision.

[0005] A further objective of the present invention is to ensure high shooting stability of the camera so as to guarantee the accuracy in recognizing food shot by the camera.

[0006] Another further objective of the present invention is to eliminate shooting dead corners in a storage compartment of a side-by-side refrigerator so as to improve the shooting effect.

[0007] To fulfill at least one of the above objectives, the present invention provides a side-by-side refrigerator, comprising:

a refrigerator body in which a storage compartment is defined;
an opening-closing component provided with two op-

positely disposed door bodies and a vertical beam on one of the door bodies and configured to open or close the storage compartment; and
at least one imaging device mounted on the vertical beam and configured to shoot an article in the storage compartment.

[0008] Alternatively, the side-by-side refrigerator further comprises a dew removal heating device disposed on the vertical beam to heat one or both of the vertical beam and the at least one imaging device.

[0009] Alternatively, the vertical beam comprises a front housing and a rear housing mounted on the front housing. At least one light hole is formed in the rear housing.

[0010] Each imaging device is mounted in an accommodating space, defined by the front housing and the rear housing, and penetrates one of the light holes to shoot the article in the storage compartment.

[0011] Alternatively, the front housing comprises a base body and a front cover. A groove that extends in a length direction of the vertical beam is formed in a front surface of the base body. The front cover is mounted in the groove. The dew removal heating device is disposed in the groove.

[0012] Alternatively, at least one mounting hole is formed in the base body. A rear end of each imaging device is located in one of the mounting holes. A rear side surface of each imaging device is connected to the dew removal heating device. Alternatively, the dew removal heating device comprises a heating element and a heat conducting plate. Two sides of the heat conducting plate are abutted against the front cover and the at least one imaging device respectively.

[0013] Alternatively, the front housing is clamped with the rear housing.

[0014] Alternatively, a plurality of imaging devices is provided on the vertical beam at intervals in a length direction of the vertical beam.

[0015] Alternatively, the side-by-side refrigerator further comprises at least one shelf device disposed in the storage compartment to divide the storage compartment into a plurality of storage spaces that are arranged in a vertical direction. Each imaging device is configured to shoot an article in one of the storage spaces.

[0016] Alternatively, an imaging lens of each imaging device is located in the middle of the storage compartment in a horizontally transverse direction after the opening-closing component closes the storage compartment.

[0017] Alternatively, the two door bodies are respectively rotatably disposed at two transverse ends of the front side of the storage compartment. The vertical beam is rotatably disposed on one of the door bodies.

[0018] According to the side-by-side refrigerator provided by the present invention, since the imaging device is mounted on the vertical beam, particularly in the vertical beam, not only may the vertical beam be reasonably utilized, the internal space of the side-by-side refrigerator

be saved and the volume of the refrigerator per se be improved, but also the imaging lens is prevented from collision during taking and placing of the article and thus may be protected. Besides, when a user opens the door, the vertical beam will rotate, and the imaging lens will rotate along with the vertical beam, such that the user may not visually see the imaging lens (the user feels to see a black hole when looking straight ahead). Thus, the aesthetic degree of the side-by-side refrigerator is improved.

[0019] Further, according to the side-by-side refrigerator provided by the present invention, the dew removal heating device mounted on the vertical beam may be utilized to heat one or both of the vertical beam and each imaging device, such that the imaging device and its periphery (including a mounting space of the imaging device) are prevented from dew and frost formation. In particular, dew or frost formation may not occur on a surface or in front of the imaging lens of the imaging device. Thus, the imaging device may shoot a clear photo. Recognition demands of other devices, such as a computer and a single chip microcomputer, are met. The electrical apparatus safety of the imaging device may be guaranteed.

[0020] Further, the imaging device is mounted on the vertical beam and may be centered with respect to the storage compartment. The vertical position of the imaging device may be determined according to the positions of the shelf devices (or the vertical position of the imaging device may be determined in accordance with the divided storage spaces). Thus, the shooting wide angle of the imaging lens may be expanded. The imaging lens may uniformly find a view by 360°, and realize no-dead-angle shooting, obtaining better photos.

[0021] Through detailed description of the specific embodiments of the present invention with reference to the drawings, those skilled in the art will understand the above and other objectives, advantages and features of the present invention more clearly.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The followings will describe some specific embodiments of the present invention in detail in an exemplary rather than restrictive manner with reference to the accompanying drawings. The same reference signs in the drawings represent the same or similar parts. Those skilled in the art shall understand that these drawings may not be necessarily drawn according to the scales. In the drawings,

FIG. 1 is a schematic partial view of a side-by-side refrigerator according to an embodiment of the present invention;

FIG. 2 is a schematic partial structural view of a side-by-side refrigerator according to an embodiment of the present invention;

FIG. 3 is a schematic structural view of a vertical beam and an imaging device in a side-by-side refrig-

erator according to an embodiment of the present invention; and

FIG. 4 is a schematic exploded view of a vertical beam and an imaging device in a side-by-side refrigerator shown in FIG. 3.

DETAILED DESCRIPTION

[0023] FIG. 1 and FIG. 2 are respectively a schematic structural view and a partial structural view of a side-by-side refrigerator according to an embodiment of the present invention. As shown in FIG. 1 and FIG. 2, the embodiment of the present invention provides a side-by-side refrigerator, which may comprise a refrigerator body 100, an opening-closing component 200, a refrigeration system and at least one imaging device 300. A storage compartment is defined in the refrigerator body 100. For example, the refrigerator body 100 may comprise an inner container in which the storage compartment is defined. The storage compartment is preferably a refrigerating chamber with a relatively higher temperature. Another storage compartment with a relatively lower temperature, namely a freezing chamber, is further defined in the refrigerator body 100 and is located below the refrigerating chamber. The opening-closing component 200 may be configured to open or close the storage compartment, and particularly, may be provided with two oppositely disposed door bodies 210 and a vertical beam 220 on one of the door bodies 210. The two door bodies 210 are respectively rotatably disposed at two transverse ends of a front side of the storage compartment. The vertical beam 220 is rotatably disposed on one of the door bodies 210 and configured for closing a gap between the two door bodies 210. The refrigeration system may be a semi-conductor refrigeration system or a compressor refrigeration system, and may directly supply refrigerating capacity for the interior of the storage compartment or supply cold air for the storage compartment through an air passage.

[0024] In the embodiment, the at least one imaging device 300 is configured to shoot an article in the storage compartment. In particular, the at least one imaging device 300 is mounted on the vertical beam 220, particularly in the vertical beam 220, to shoot the article in the storage compartment from an inner side of the vertical beam 220. In this way, not only may the vertical beam 220 be reasonably utilized and the internal space of the side-by-side refrigerator be saved, but also an imaging lens is prevented from collision during taking and placing of the article and thus may be protected. Besides, when a user opens the door, the vertical beam 220 will rotate, and the imaging lens will rotate along with the vertical beam 220, such that the user may not visually see the imaging lens (the user feels to see a black hole when looking straight ahead). Thus, the aesthetic degree of the side-by-side refrigerator is improved. In the embodiment of the present invention, each imaging device 300 may comprise a housing, as well as a camera and a control element that

are disposed in the housing. The housing may be square to facilitate installation of each imaging device 300.

[0025] In some embodiments of the present invention, as shown in FIG. 3 and FIG. 4, the side-by-side refrigerator may further comprise a dew removal heating device 400 disposed on the vertical beam 220. The dew removal heating device 400 disposed on the vertical beam 220 is mainly configured to prevent the vertical beam 220 from dew formation. In the embodiment, since the inventor specially mounts the at least one imaging device 300 on the vertical beam 220, the dew removal heating device 400 may heat the imaging device 300 while heating the vertical beam 220. The inventor skillfully utilizes the dew removal heating device 400 on the vertical beam 220 to heat the imaging device 300, so that the imaging device 300 and its periphery (including a mounting space of the imaging device 300) are prevented from dew and frost formation. In particular, dew or frost formation may not occur on a surface or in front of the imaging lens of the imaging device 300. Thus, the imaging device 300 may shoot a clear photo. Recognition demands of other devices, such as a computer and a single chip microcomputer, are met. The dew removal heating device 400 may heat the vertical beam 220 and the imaging device 300 simultaneously or alternatively.

[0026] In some embodiments of the present invention, the vertical beam 220 may comprise a front housing 221 and a rear housing 222 mounted on the front housing 221. The front housing 221 is preferably clamped with the rear housing 222. At least one light hole 225 is formed in the rear housing 222. Each imaging device 300 is mounted in an accommodating space defined by the front housing 221 and the rear housing 222, and penetrates one of the light holes 225 to shoot the article in the storage compartment. A transparent lens may be further disposed in each light hole 225. A heat insulating layer 224 is further disposed in the accommodating space defined by the front housing 221 and the rear housing 222, and may be made of a foam material. Further, the front housing 221 comprises a base body 2211 and a front cover 2212. A groove that extends in a length direction of the vertical beam 220 is formed in a front surface of the base body 2211. The front cover 2212 is mounted in the groove. The dew removal heating device 400 may comprise a heating element 410 and a heat conducting plate 420. The heating element 410 may be an electric heating tube, an electric heating wire, a refrigerant condensation tube of the refrigeration system, or the like, is disposed in the groove and is located on a front side of the heat conducting plate 420. The heat conducting plate 420 is disposed in the groove and transfers heat of the heating element 410 to a front surface of the front cover 2212.

[0027] Preferably, in the embodiment, at least one mounting hole is formed in the base body 2211. A rear end of each imaging device 300 is located in one of the mounting holes. A rear side surface of each imaging device 300 is connected to the dew removal heating device 400. For example, the heating element 410, such as the

electric heating tube, the electric heating wire, the refrigerant condensation tube of the refrigeration system, or the like, is in contact with and propped against the rear side surface of each imaging device 300. Alternatively, the heat conducting plate 420 is abutted against the rear side surface of each imaging device 300. Preferably, two sides of the heat conducting plate 420 are respectively abutted against the front cover 2211 and the at least one imaging device 300 to transfer heat to the vertical beam 220 and each imaging device 300. According to the side-by-side refrigerator provided by the present invention, such designs as the structural design and the electric control design are fully optimized and are effectively combined. Thus, not only is a technical bottleneck that the imaging lens of the imaging device 300 is subject to dew formation solved, but also miniaturization and improved aesthetic degree of the imaging device 300 are realized, and the user experience is improved.

[0028] In some embodiments of the present invention, there may be one imaging device 300. In other embodiments of the present invention, to better shoot the article in the storage compartment, there may be a plurality of imaging devices 300, preferably, three, four, five, six imaging devices or the like. The imaging devices 300 are disposed on the vertical beam 220 at intervals in a length direction of the vertical beam 220. In general, the side-by-side refrigerator may further comprise at least one shelf device disposed in the storage compartment to divide the storage compartment into a plurality of storage spaces that are arranged in a vertical direction. Each shelf device may be a shelf, a partition plate, a transparent drawer or the like. Each imaging device 300 is configured to shoot an article in one of the storage spaces. In particular, the imaging lens of each imaging device 300 is located in the middle of the storage compartment in a horizontally transverse direction after the opening-closing component 200 closes the storage compartment. In the embodiment, the number of the storage spaces may be equal to or larger than that of the imaging devices 300. In some alternative embodiments of the present invention, a shooting direction of the imaging lens of the imaging device 300 may be adjusted by an adjustment mechanism of the imaging device 300. For each storage space, a plurality of imaging devices 300 may be used for shooting.

[0029] In some alternative embodiments of the present invention, the opening-closing component 200 may further comprise another vertical beam 220 that is rotatably disposed on the other door body 210. After the opening-closing component 200 closes the storage compartment, the two vertical beams 220 face each other at the side surfaces of the two door bodies 210. Sealing strips may be disposed on the opposite side surfaces. The width of each of the two vertical beams 220 of the opening-closing component 200 when the opening-closing component 200 includes two vertical beams 220 may be about half of the width of the vertical beam 220 of the opening-closing component 200 when the opening-closing compo-

nent 200 includes only one vertical beam 220. In these alternative embodiments, one or more imaging devices 300 may be disposed on the other vertical beam 220.

[0030] Those skilled in the art should realize that although the present description illustrates and describes various exemplary embodiments of the present invention, many other modifications or amendments conforming to the principle of the present invention can be determined directly or derived based on the content disclosed by the present invention without departing from the spirit and scope of the present invention. Therefore, the scope of the present invention should be understood and considered to have covered all these modifications or amendments.

Claims

1. A side-by-side refrigerator with an imaging device, comprising:

a refrigerator body in which a storage compartment is defined;
an opening-closing component provided with two oppositely disposed door bodies and a vertical beam on one of the door bodies and configured to open or close the storage compartment; and
at least one imaging device mounted on the vertical beam and configured to shoot an article in the storage compartment.

2. The side-by-side refrigerator according to claim 1, further comprising a dew removal heating device disposed on the vertical beam to heat one or both of the vertical beam and the at least one imaging device.

3. The side-by-side refrigerator according to claim 2, wherein
the vertical beam comprises a front housing and a rear housing mounted on the front housing, and at least one light hole is formed in the rear housing; and
each imaging device is mounted in an accommodating space, defined by the front housing and the rear housing, and penetrates one of the light holes to shoot the article in the storage compartment.

4. The side-by-side refrigerator according to claim 3, wherein
the front housing comprises a base body and a front cover, a groove that extends in a length direction of the vertical beam is formed in a front surface of the base body, and the front cover is mounted in the groove; and
the dew removal heating device is disposed in the groove.

5. The side-by-side refrigerator according to claim 4, wherein
at least one mounting hole is formed in the base body, a rear end of each imaging device is located in one of the mounting holes, and a rear side surface of each imaging device is connected to the dew removal heating device.

6. The side-by-side refrigerator according to claim 5, wherein
the dew removal heating device comprises a heating element and a heat conducting plate, and two sides of the heat conducting plate are abutted against the front cover and the at least one imaging device respectively.

7. The side-by-side refrigerator according to claim 1, wherein
a plurality of imaging devices is provided on the vertical beam at intervals in a length direction of the vertical beam.

8. The side-by-side refrigerator according to claim 7, further comprising:

at least one shelf device disposed in the storage compartment to divide the storage compartment into a plurality of storage spaces that are arranged in a vertical direction; and
each imaging device is configured to shoot an article in one of the storage spaces.

9. The side-by-side refrigerator according to claim 7, wherein
an imaging lens of each imaging device is located in the middle of the storage compartment in a horizontally transverse direction after the opening-closing component closes the storage compartment.

10. The side-by-side refrigerator according to claim 1, wherein the two door bodies are respectively rotatably disposed at two transverse ends of a front side of the storage compartment; and the vertical beam is rotatably disposed on one of the door bodies.

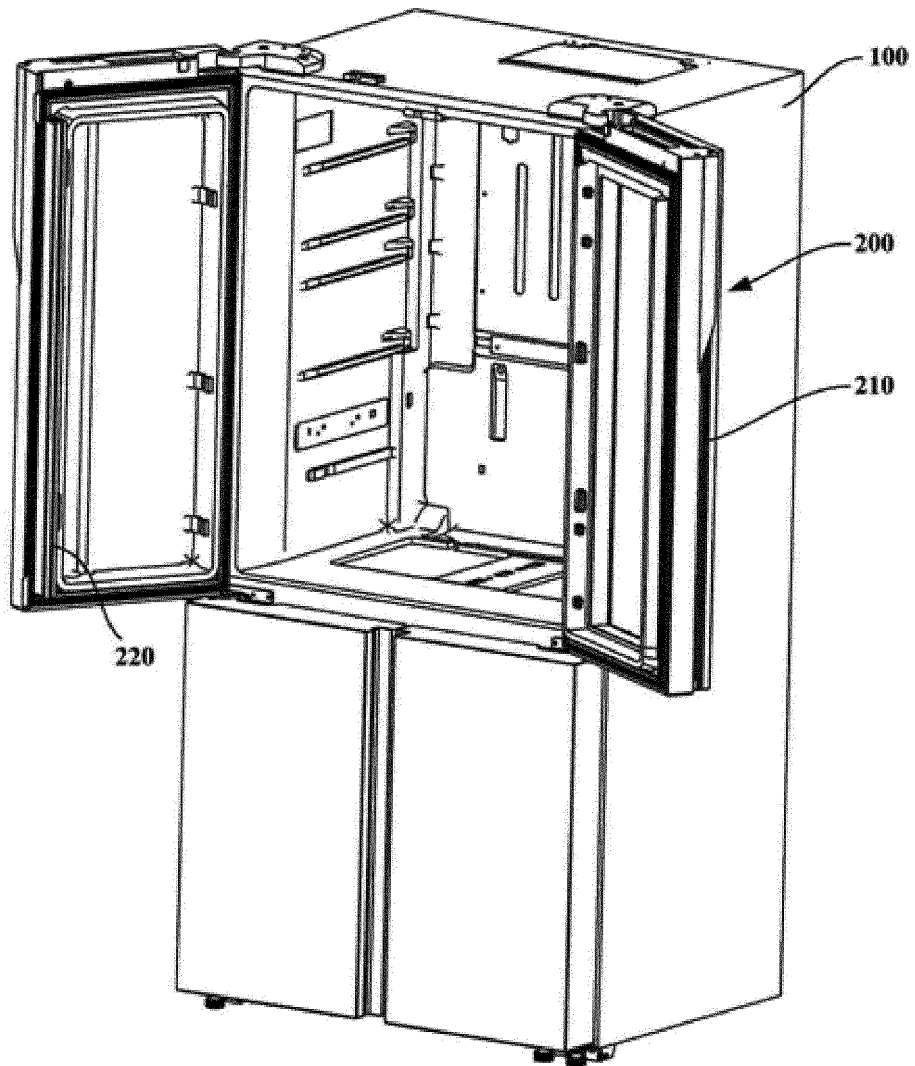


FIG. 1

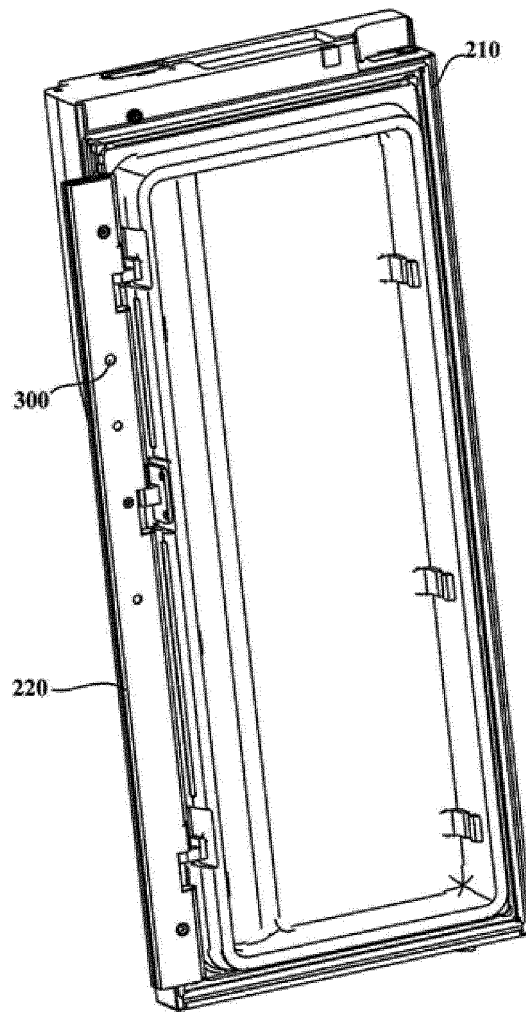


FIG. 2

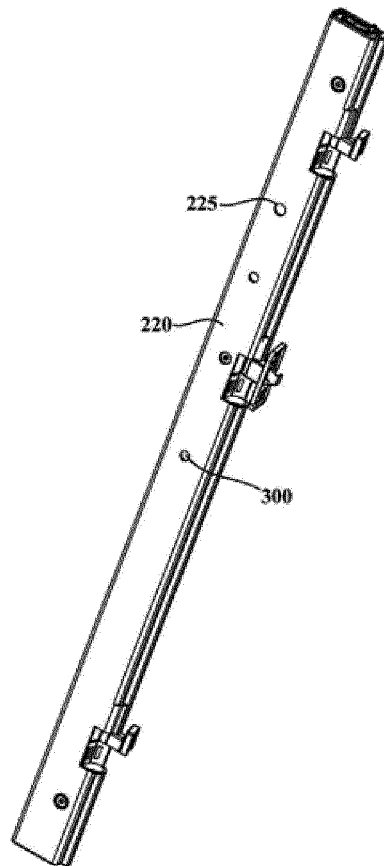


FIG. 3

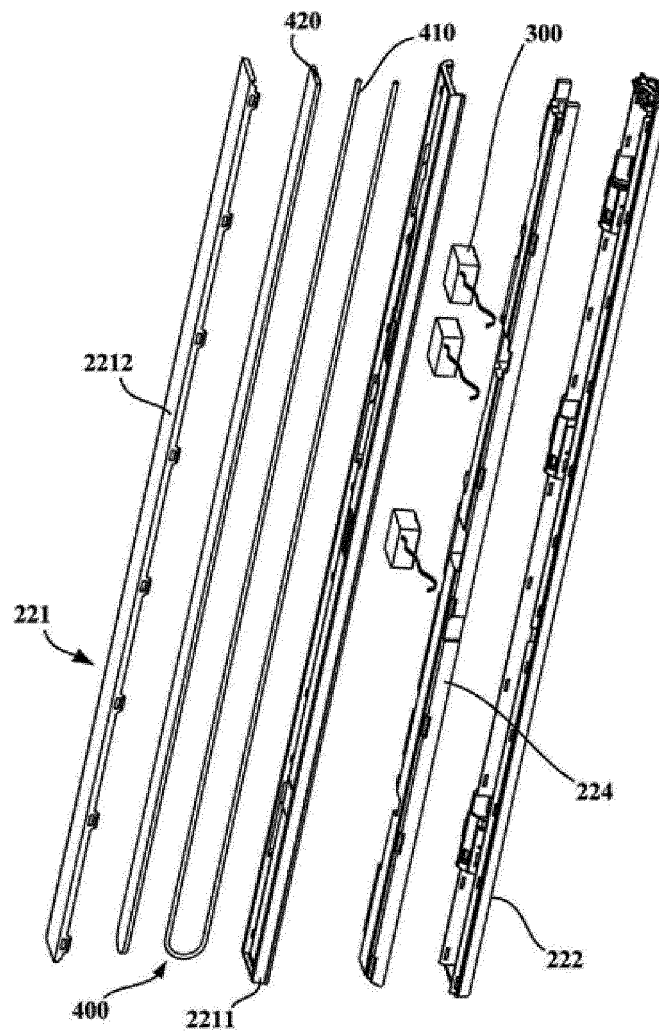


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2017/085775

A. CLASSIFICATION OF SUBJECT MATTER

F25D 23/10 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F25D 23, F25D 11, F25D 21, H04N 5, G03B 17

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, SIPOABS, DWPI, CNKI: camera shooting, video recording, image collecting, picture collecting, photographing; camera, picture, image, video, CCD, CMOS, heat+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2015148366 A (TOSHIBA CORP. et al.), 20 August 2015 (20.08.5015), description, paragraphs [0008]-[0033], and figures 1-16	1-10
X	CN 105074366 A (PANASONIC INTELLECTUAL PROPERTY MANAGEMENT CO., LTD.), 18 November 2015 (18.11.2015), description, paragraphs [0127]-[0158], and figures 1-9	1, 7-10
PX	CN 105972908 A (QINGDAO HAIER CO., LTD.), 28 September 2016 (28.09.2016), description, paragraphs [0033]-[0039], and figures 1-4	1-10
A	JP 2003207258 A (TOSHIBA CORP.), 25 July 2003 (25.07.2003), the whole document	1-10
A	CN 104359269 A (QINGDAO HAIER CO., LTD.), 18 February 2015 (18.02.2015), the whole document	1-10
A	JP 2002072341 A (MATSUSHITA ELECTRIC IND CO., LTD.), 12 March 2002 (12.03.2002), the whole document	1-10

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	
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"O" document referring to an oral disclosure, use, exhibition or other means	
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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

YAN, Lei

Telephone No.: (86-10) 62084872

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2015148366 A	20 August 2015	None	
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		JP 2014196851 A	16 October 2014
		DE 112014001738 T5	03 March 2016
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JP 2002072341 A	12 March 2002	None	

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