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(54) **HINGE ASSEMBLY AND REFRIGERATION DEVICE PROVIDED WITH SAME**

(57) A hinge assembly (30) and a refrigeration device (100) having the same. The hinge assembly (30) includes a first hinge part (31) and a second hinge part (32) which are matched with each other, and further includes a first shaft (311) and a second shaft (312) which are located on the first hinge part (31), and a fitting part located on the second hinge part (32); the fitting part (40) includes a first fitting part (321) and a second fitting part (322) which are communicated with each other; when the hinge assembly (30) is in an opening process, the first shaft (311) moves at the first fitting part (321), and the second shaft body (312) moves at the second fitting part (322); and when the hinge assembly (30) is at a maximum opening angle, the first shaft (311) is located at a stop end (A1) of the first fitting part (321), and the stop end (A1) is located at the second fitting part (322). The hinge assembly (30) can change a movement trajectory of a door (20) so as to adapt to different application scenes.

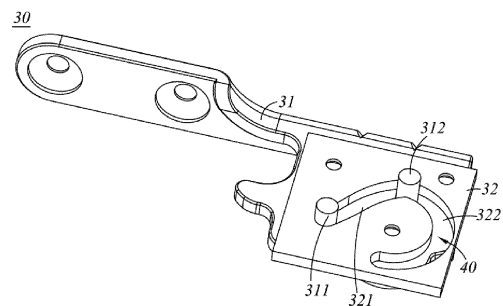


FIG.2

Description

[0001] The present application claims the priority of the Chinese patent application filed on September 9, 2021, with the application number 202122181198.6, and the invention titled "hinge assembly and refrigeration device having the same." The entire content of which is incorporated herein by reference.

TECHNICAL FIELD

[0002] The utility model relates to the technical field of home appliances, and in particular to a hinge assembly and refrigeration device having the same.

BACKGROUND

[0003] Currently, a refrigeration device uses a single-axis hinge assembly, where a door performs a circular motion around a fixed axis of the hinge assembly, allowing the door to open at a large angle. At the same time, when the door is opened, a lateral side of the door occupy a certain space.

[0004] For instance, in recent years, with a progress of society and an improvement of people's living standards, a placement location and method of a refrigerator in home has become increasingly important to ordinary users. In line with current home decoration styles, some families pursue an integrated style, necessitating the embedding of refrigerators into cupboards to form what is called an embedded refrigerator device, suitable for integrated homes, smart homes, etc. These refrigerators are referred to as embedded refrigerators, and current refrigerators struggle to adapt to this type of embedded application scenario.

[0005] In light of this, it is necessary to improve existing refrigerators to address the aforementioned issues.

SUMMARY

[0006] An objective of the utility model is to provide a hinge assembly and refrigeration device having the same which can reduce a size of the hinge assembly and change a motion trajectory of the door to adapt to different application scenarios.

[0007] To achieve one of the purposes of the utility model, an embodiment of the utility model provides a hinge assembly which includes a first hinge part and a second hinge part that cooperate with each other; the hinge assembly further includes a first shaft and a second shaft that are located on the first hinge part, and a fitting part located on the second hinge part, the fitting part includes a first fitting part and a second fitting part that are interconnected, when the hinge assembly is in an opening process, the first shaft moves at the first fitting part, and the second shaft moves at the second fitting part, when the hinge assembly is at a maximum opening angle, the first shaft is located at a stop end of the first fitting

part, the stop end is located at the second fitting part.

[0008] As a further improvement of an embodiment of the utility model, the fitting part is a slot, the slot includes a first slot and a second slot that are interconnected, when the hinge assembly is in the opening process, the first shaft moves within the first slot, and the second shaft moves within the second slot, when the hinge assembly is at the maximum opening angle, the first shaft is located at a stop end of the first slot, the stop end is located within the second slot.

[0009] As a further improvement of an embodiment of the utility model, a movement trajectory of the first shaft partially overlaps with a movement trajectory of the second shaft.

[0010] As a further improvement of an embodiment of the utility model, the slot includes a first section, a middle section, and a second section that are sequentially connected, the first section together with the middle section forms the first slot, and the middle section together with the second section forms the second slot.

[0011] As a further improvement of an embodiment of the utility model, the second hinge part rotates around a first rotational axis as a center axis relative to the first hinge part, the first rotational axis is a variable axis.

[0012] As a further improvement of an embodiment of the utility model, the second hinge part rotates around a first rotational axis as a center axis relative to the first hinge part, the first rotational axis is a virtual axis.

[0013] As a further improvement of an embodiment of the utility model, when the hinge assembly is opening from a closed state to a first opening angle, the second hinge part rotates around a first rotational axis as a center axis relative to the first hinge part, when the hinge assembly continues to be opened to the maximum opening angle from the first opening angle, the second hinge part rotates around a second rotational axis as a center axis relative to the first hinge part, the first rotational axis is different from the second rotational axis.

[0014] As a further improvement of an embodiment of the utility model, the first rotational axis is a variable axis, and the second rotational axis is a fixed axis.

[0015] As a further improvement of an embodiment of the utility model, both the first rotational axis and the second rotational axis are virtual axes.

[0016] As a further improvement of an embodiment of the utility model, the second slot is an arc slot with a central axis being a fixed axis.

[0017] As a further improvement of an embodiment of the utility model, one of the first hinge part and the second hinge part is connected to a cabinet, and the other is connected to a door, the first shaft and the second shaft slide simultaneously within the slot to drive the door relative to the cabinet to produce a translational movement.

[0018] As a further improvement of an embodiment of the utility model, the cabinet includes an accommodating chamber and a pivot side connected to the hinge assembly, when the hinge assembly is opened from a closed state to a first opening angle, the door moves from the

pivot side towards the accommodating chamber.

[0019] As a further improvement of an embodiment of the utility model, the second slot includes a beginning end and a final end, when the hinge assembly is in a closed state, the second shaft is located at the beginning end, and the first shaft is located at an end of the first slot far from the second slot, when the hinge assembly is opened from the closed state to the first opening angle, the first shaft moves within the first slot, driving the second shaft from the beginning end to the final end, and the door moves from the pivot side towards the accommodating chamber.

[0020] As a further improvement of an embodiment of the utility model, the door includes a front wall away from the accommodating chamber and a side wall that is always sandwiched between the front wall and the accommodating chamber, the second hinge part is connected to the door, the beginning end is farther away from the front wall and the side wall compared to the final end.

[0021] As a further improvement of an embodiment of the utility model, the second slot includes a beginning end and a final end, and the first slot includes a first part and a second part that are interconnected, when the hinge assembly is opened from the closed state to a first intermediate opening angle, the second shaft remains at the beginning end, and the first shaft moves within the first part around the second shaft as a central axis, when the hinge assembly is opened from the first intermediate opening angle to the first opening angle, the first shaft moves within the second part, driving the second shaft from the beginning end to the final end, and the door moves from the pivot side towards the accommodating chamber.

[0022] As a further improvement of an embodiment of the utility model, one of the first hinge part and the second hinge part is connected to a cabinet, and the other is connected to a door, when the hinge assembly is opened from a closed state to a first opening angle, the first shaft and the second shaft slide simultaneously within the slot to drive the door relative to the cabinet to produce a translational movement, when the hinge assembly continues to be opened to the maximum opening angle from the first opening angle, the first shaft and the second shaft slide simultaneously within the slot to drive the door to rotate in suit.

[0023] As a further improvement of an embodiment of the utility model, the cabinet includes an accommodating chamber and a pivot side connected to the hinge assembly, the second slot includes a beginning end, a middle position, and a final end that are sequentially arranged, when the hinge assembly is in the closed state, the second shaft is located at the beginning end, and the first shaft is located at the end of the first slot far from the second slot, when the hinge assembly is opening from the closed state to the first opening angle, the first shaft moves within the first slot, driving the second shaft from the beginning end to the middle position, and the door moves from the pivot side towards the accommodating

chamber, when the hinge assembly continues to be opened to the maximum opening angle from the first opening angle, the first shaft continues to move within the first slot, driving the second shaft from the middle position to the final end, and the door rotates in suit.

[0024] As a further improvement of an embodiment of the utility model, the beginning end is located within the first slot.

[0025] As a further improvement of an embodiment of the utility model, the fitting part is a protrusion, the protrusion includes a first protrusion and second protrusion that are interconnected, the first shaft includes a first notch that mates with the first protrusion, and the second shaft includes a second notch that mates with the second protrusion, when the hinge assembly is in the opening process, the first notch slides along the first protrusion and the second notch slides along the second protrusion, when the hinge assembly is at the maximum opening angle, the first notch is located at a stop end of the first protrusion, the stop end is located at the second protrusion.

[0026] As a further improvement of an embodiment of the utility model, both the first protrusion and the second protrusion are elongated, the first notch is fitted on an outside of the first protrusion and slides along an extension direction of the first protrusion, and the second notch is fitted on an outside of the second protrusion and slides along an extension direction of the second protrusion.

[0027] As a further improvement of an embodiment of the utility model, the first shaft includes two first protruding columns, the two first protruding columns together form the first notch, the second shaft includes two second protruding columns, the two second protruding columns together form the second notch.

[0028] As a further improvement of an embodiment of the utility model, the first shaft further includes a first shaft main part connected to the first hinge part, and the second shaft further includes a second shaft main part connected to the first hinge part, the two first protruding columns are located on a side of the first shaft main part away from the first hinge part, and the two second protruding columns are located on a side of the second shaft main part away from the first hinge part.

[0029] Compared with the existing technology, the beneficial effects of an embodiment of the utility model include: the first fitting part and the second fitting part of this embodiment are interconnected, which can reduce a space occupied by an entire fitting part of the second hinge part, and an integrated fitting part is easy to mold. Additionally, the hinge assembly includes two shafts, which, compared to a single-axle hinge assembly, can change a motion trajectory of the door to adapt to different application scenarios.

BRIEF DESCRIPTION OF DRAWINGS

[0030]

FIG. 1 is a perspective view of a refrigeration device in an embodiment of the utility model.

FIG. 2 is a perspective view of a hinge assembly in an embodiment of the utility model.

FIG. 3 is an exploded view of the hinge assembly in an embodiment of the utility model.

FIG. 4 is a cross-sectional view of a hinge assembly in another embodiment of the utility model.

FIG. 5 is a top view of the refrigeration device in a closed state in an embodiment of the utility model.

FIG. 6 is a schematic diagram of the hinge assembly in a closed state in an embodiment of the utility model.

FIG. 7 is a cross-sectional view of the hinge assembly in the closed state in an embodiment of the utility model.

FIG. 8 is a top view of the refrigeration device at a first opening angle in an embodiment of the utility model.

FIG. 9 is a schematic diagram of the hinge assembly at a first opening angle in an embodiment of the utility model.

FIG. 10 is a cross-sectional view of the hinge assembly at the first opening angle in an embodiment of the utility model.

FIG. 11 is a top view of the refrigeration device at a maximum opening angle in an embodiment of the utility model.

FIG. 12 is a schematic diagram of the hinge assembly at a maximum opening angle in an embodiment of the utility model.

FIG. 13 is a cross-sectional view of the hinge assembly at the maximum opening angle in an embodiment of the utility model.

FIG. 14 is a cross-sectional view of a hinge assembly in a closed state in a first specific example of the utility model.

FIG. 15 is a cross-sectional view of the hinge assembly at a first opening angle in the first specific example of the utility model.

FIG. 16 is a cross-sectional view of a hinge assembly in a closed state in a second specific example of the utility model.

FIG. 17 is a cross-sectional view of the hinge assembly at a first intermediate opening angle in the second specific example of the utility model.

FIG. 18 is a cross-sectional view of the hinge assembly at a first opening angle in the second specific example of the utility model.

FIG. 19 is a cross-sectional view of a hinge assembly in a closed state in a third specific example of the utility model.

FIG. 20 is a cross-sectional view of the hinge assembly at a first opening angle in the third specific example of the utility model.

FIG. 21 is a cross-sectional view of the hinge assembly at a maximum opening angle in the third specific example of the utility model.

FIG. 22 is an exploded view of a hinge assembly in a second embodiment of the utility model.

DETAILED DESCRIPTION OF EMBODIMENTS

[0031] The following will provide a detailed description of the utility model with reference to specific embodiments shown in drawings. However, the embodiments do not limit the utility model; a structural, methodological, or functional modifications made by those of ordinary skill in the art based on the embodiments are all included within a scope of protection of the utility model.

[0032] In various figures of the utility model, some dimensions of structures or parts are exaggerated relative to other structures or parts for a sake of illustration. Therefore, they are only used to illustrate a basic structure of a theme of the utility model.

[0033] Refer to FIG. 1 for a schematic diagram of a refrigeration device 100 according to an embodiment of the utility model.

[0034] The refrigeration device 100 includes a cabinet 10, a door 20, and a hinge assembly 30 connecting the cabinet 10 and the door 20.

[0035] It should be noted that the refrigeration device 100 can be a refrigerator, freezer, wine cooler, etc., with the refrigeration device 100 being exemplified as a refrigerator here.

[0036] Moreover, the hinge assembly 30 is not only applicable to the refrigeration device 100 but can also be applied to other scenarios, such as cupboards, wardrobes, etc. The utility model is exemplified by an application of the hinge assembly 30 to the refrigerator 100 but is not limited to this.

[0037] Combining FIG. 2 and FIG. 3, a schematic diagram of the hinge assembly 30 with slots according to an embodiment of the utility model is shown.

[0038] The hinge assembly 30 includes a first hinge part 31 and a second hinge part 32 that cooperate with each other.

[0039] Here, the first hinge part 31 connects to either the cabinet 10 or the door 20, and the second hinge part 32 connects to the other.

[0040] It should be noted that a connection of hinge parts to the cabinet 10 or the door 20 refers to the hinge parts being independent components installed on the cabinet 10 or the door 20, or the hinge parts being directly integrated into the cabinet 10 or the door 20.

[0041] The hinge assembly 30 also includes a first shaft 311 and a second shaft 312 located on the first hinge part 31, as well as a fitting part 40 located on the second hinge part 32.

[0042] Here, "the first shaft 311 and the second shaft 312 located on the first hinge part 31" means that the first shaft 311 and the second shaft 312 are set on the first hinge part 31. The first shaft 311 and the second shaft 312 can either be integrally formed with or assembled together with the first hinge part 31. The explanation of "located on" in other parts of the utility model can refer

to the above description, which will not be reiterated subsequently.

[0043] The fitting part 40 includes a first fitting part 321 and a second fitting part 322 which are interconnected. When the hinge assembly 30 is in a process of opening, the first shaft 311 moves at the first fitting part 321, and the second shaft 312 moves at the second fitting part 322. When the hinge assembly 30 is at a maximum opening angle, the first shaft 311 is located at a stop end A1 of the first fitting part 321, and the stop end A1 is located at the second fitting part 322.

[0044] In this embodiment, the first fitting part 321 and the second fitting part 322 are interconnected, which can reduce a space occupied by an entire fitting part of the second hinge part 32, and an integrated fitting part 40 is easy to mold. Additionally, the hinge assembly 30 includes two shafts. Compared to a single-axle hinge assembly, it can change a motion trajectory of the door 20 to adapt to different application scenarios.

[0045] In a first embodiment of the utility model, the fitting part 40 is exemplified as a slot 40 for explanation.

[0046] The slot 40 can penetrate the second hinge part 32 in a thickness direction of the second hinge part 32, meaning the slot 40 is a through hole, or, the slot 40 can have a closed area on a side away from the first hinge part 31, meaning the slot 40 is a groove.

[0047] The slot 40 includes a first slot 321 and a second slot 322 which are interconnected. When the hinge assembly 30 is in an opening process, the first shaft 311 moves within the first slot 321, and the second shaft 312 moves within the second slot 322.

[0048] Here, the first shaft 311 moves within the area defined by the first slot 321, and the second shaft 312 moves within the area defined by the second slot 322. "The slot 40 includes a first slot 321 and a second slot 322 which are interconnected" means that there is a direct connection between the first slot 321 and the second slot 322 without any gap, making the slot 40 a complete through structure.

[0049] Furthermore, "the hinge assembly 30 is in an opening process" refers to the second hinge part 32 is opened away from the first hinge part 31, that is, actuating the second hinge part 32 in one direction to move away from the first hinge part 31. When the hinge assembly 30 is installed on the refrigerator 100, the opening process of the hinge assembly 30 corresponds to a opening process of the door 20.

[0050] When the hinge assembly 30 is at a maximum opening angle, the first shaft 311 is located at a stop end A2 of the first slot 321, and the stop end A2 is located within the second slot 322.

[0051] Here, the hinge assembly 30 being at the maximum opening angle corresponds to the door 20 opening to a maximum opening angle, and "the stop end A2 is located within the second slot 32" means that the stop end A2 is at an end or a middle position of the second slot 322.

[0052] In this embodiment, the first slot 321 and the

second slot 322 are interconnected, which can reduce a space occupied by an entire slot 40 of the second hinge part 32, and an integrated slot 40 is easy to mold, significantly reducing a molding process of the hinge assembly 30.

[0053] Additionally, the hinge assembly 30 in this embodiment includes two shafts. Compared to a single-axle hinge assembly, this embodiment can change a motion trajectory of the door to adapt to different application scenarios.

[0054] In this embodiment, a movement trajectory of the first shaft 311 partially overlaps with that of the second shaft 312.

[0055] Here, the movement trajectory of the first shaft 311 refers to all the movement paths of the first shaft 311 during an entire opening process of the hinge assembly 30, and the movement trajectory of the second shaft 312 refers to all the movement paths of the second shaft 312 during the entire opening process of the hinge assembly 30. "Partially overlap" means that during the entire opening process of the hinge assembly 30, the first shaft 311 passes through some areas that the second shaft 312 has passed through.

[0056] Thus, the slot 40 has a section that is a shared area for both the first shaft 311 and the second shaft 312, effectively reducing an overall length of the slot 40 in an extension direction, thereby further reducing the space occupied by the entire slot 40 of the second hinge part 32.

[0057] Specifically, the slot 40 includes a first section L1, a middle section L2, and a second section L3 that are sequentially connected, with the first section L1 and the middle section L2 combined to form the first slot 321, and the middle section L2 and the second section L3 combined to form the second slot 322.

[0058] In other words, the slot 40 is divided into three sequentially connected sections, with the middle section L2 being an overlapping area between the first slot 321 and the second slot 322.

[0059] In this embodiment, the first slot 321 includes a starting end A1 and a stopping end A2 set oppositely, and the second slot 322 includes a beginning end B1 and a final end B2 set oppositely. When the hinge assembly 30 is at the maximum opening angle, the first shaft 311 is located at the stopping end A2, which is between the beginning end B1 and the final end B2 of the second slot 322, meaning the stopping end A2 is in a middle area of the second slot 322.

[0060] Of course, in other embodiments, the slot 40 could be of other structures.

[0061] Combining with FIG. 4, a slot 40' includes a first slot 321' and a second slot 322' that are interconnected without an overlapping area. The first slot 321' includes a starting end A1 and a stopping end A2 set oppositely, and the second slot 322' includes a beginning end B1 and a final end B2 set oppositely. When the hinge assembly 30' is at a maximum opening angle, the first shaft 311' is located at the stopping end A2, which is at a junction area of the first slot 321' and the second slot 322',

meaning the stopping end A2 is at an end of the second slot 322' and overlaps with the beginning end B1.

[0062] In this embodiment, combined with FIG. 5 to FIG. 13, when the hinge assembly 30 is opened from the closed state to a first opening angle α_1 , the second hinge part 32 rotates around a first rotational axis P1 relative to the first hinge part 31.

[0063] The first rotational axis P1 is a variable axis and also a virtual axis.

[0064] Here, "the first rotational axis P1 is a variable axis" means that the first rotational axis P1 is not a fixed axis.

[0065] That is, a position of the first rotational axis P1 is always changing, meaning the relative position between the first rotational axis P1 and the cabinet 10 or the door 20 is variable.

[0066] Additionally, "the first rotational axis P1 is a virtual axis" indicates that the first rotational axis P1 is not an actual shaft present within the hinge assembly 30.

[0067] When the hinge assembly 30 continues to be opened from the first opening angle α_1 to a maximum opening angle α_2 , the second hinge part 32 rotates around a second rotational axis P2 relative to the first hinge part 31, where the first rotational axis P1 and the second rotational axis P2 are different.

[0068] That is, during the entire opening process of the hinge assembly 30, the second hinge part 32 initially rotates relative to the first hinge part 31 around the first rotational axis P1 and then around the second rotational axis P2.

[0069] In this embodiment, the second rotational axis P2 is a fixed axis and also a virtual axis.

[0070] Here, "the second rotational axis P2 is a fixed axis" means that the position of the second rotational axis P2 is always fixed, meaning the relative position between the second rotational axis P2 and the cabinet 10 or the door 20 is fixed.

[0071] In other embodiments, the hinge assembly 30 may only include either the first rotational axis P1 or the second rotational axis P2. The forms of the first rotational axis P1 and the second rotational axis P2 are not limited to the description above; that is, the first rotational axis P1 and the second rotational axis P2 can be selected as a fixed axis, a non-fixed axis, a virtual axis, or a physical axis (the physical axis is defined as an actual component included in the hinge assembly 30) depending on the actual situation.

[0072] In this embodiment, continuing with FIG. 5 to FIG. 13, when the hinge assembly 30 is opening from the closed state to the first opening angle α_1 , the second hinge part 32 rotates around the first rotational axis P1 relative to the first hinge part 31, and both the first shaft 311 and the second shaft 312 slide within the slot 40, driving the door 20 to generate a translational movement relative to the cabinet 10.

[0073] That is, at this time, both the first shaft 311 and the second shaft 312 rotate around the first rotational axis P1.

[0074] Here, "the door 20 generates a translational movement relative to the cabinet 10" means that, when the door 20 rotates relative to the cabinet 10, the door 20 also moves horizontally relative to the cabinet 10, especially when applied to a refrigerator, the translational movement refers to a horizontal movement; that is, in addition to rotate relative to the cabinet 10, the door 20 also generates horizontal movement relative to the cabinet 10.

[0075] Below, various specific examples of the motion trajectory of the door 20 are introduced.

[0076] In a first specific example, combined with FIG. 14 and FIG. 15, the cabinet 10 includes an accommodating chamber D and a pivot side P connected to a hinge assembly 30a. When the hinge assembly 30a is opened from a closed state to a first opening angle α_1 , the door 20 moves from the pivot side P towards the accommodating chamber D.

[0077] Here, the accommodating chamber D refers to a compartment formed by an enclosure of the cabinet 10 for storing items, and the pivot side P refers to a side where the door 20 is hinged to the cabinet 10, with the movement towards the accommodating chamber D indicated as a left move in FIG. 14.

[0078] Specifically, a second slot 322a includes a beginning end B1 and a final end B2. When the hinge assembly 30a is in the closed state, a second shaft 312a is at the beginning end B1, and a first shaft 311a is at the end of the first slot 321a far from a second slot 322a. When the hinge assembly 30a is opened from the closed state to a first opening angle α_1 , the first shaft 311a moves within the first slot 321a, driving the second shaft 312 from the beginning end B1 to the final end B2, and the door 20 moves from the pivot side P towards the accommodating chamber D.

[0079] That is, when there is a cupboard next to the refrigerator, a movement of the door 20 from the pivot side P towards the accommodating chamber D means the door 20 moves a certain distance away from the cupboard to avoid interference with the cupboard during the initial opening process.

[0080] Here, the door 20 includes a front wall 21 away from the accommodating chamber D and a side wall 22 that is always sandwiched between the front wall 21 and the accommodating chamber D. When the second hinge part 32 is connected to the door 20, the beginning end B1 is farther away from the front wall 21 and the side wall 22 compared to the final end B2.

[0081] It should be noted that in this specific example, the first opening angle α_1 is a maximum opening angle. The first shaft 311a moves from the starting end A1 to the stopping end A2, driving the second shaft 312a from the beginning end B1 to the final end B2, with the stopping end A2 overlapping with the beginning end B1, and the door 20 moves from the pivot side P towards the accommodating chamber D.

[0082] In other examples, the stopping end A2 may not overlap with the beginning end B1, for example, the stop-

ping end A2 could be on a side of the beginning end B1 far from the final end B2.

[0083] In a second specific example, combined with FIG. 16 to FIG. 18, a second slot 322b includes a beginning end B1 and a final end B2. A first slot 321b includes a first part M1 and a second part M2 that are connected. When a hinge assembly 30b is opened from a closed state to a first intermediate opening angle α_{11} , a second shaft 312b remains at the beginning end B1, and a first shaft 311b moves within the first part M1 centered around the second shaft 312b. When the hinge assembly 30b continues to be opened from the first intermediate opening angle α_{11} to a first opening angle α_1 , the first shaft 311b moves within the second part M2, driving the second shaft 312b from the beginning end B1 to the final end B2, and the door 20b moves from the pivot side P towards the accommodating chamber D.

[0084] That is, the door 20 first rotates in suit to a certain degree and then moves a certain distance away from a cupboard 200 to prevent interference with the cupboard 200 during an initial opening process.

[0085] Here, in refrigerators with French doors or multi-door refrigerators that have a mullion, there are side-by-side left door and right door. Rotating the door 20 in suit to a certain degree first can prevent interference between the left door and right door.

[0086] It should be noted that, in this specific example, the first opening angle α_1 is a maximum opening angle. The first shaft 311b moves from the starting end A1 to the stopping end A2, driving the second shaft 312b from the beginning end B1 to the final end B2. The stopping end A2 overlaps with the beginning end B1, and the door 20 first rotates in suit, then moves from the pivot side P towards the accommodating chamber D.

[0087] In a third specific example, combined with FIG. 19 to FIG. 21, when a hinge assembly 30c is opened from a closed state to a first opening angle α_1 , a second hinge part 32c rotates around a first rotational axis P1 relative to a first hinge part 31c, and both a first shaft 311c and a second shaft 312c slide within a slot 40c, driving the door 20 to generate a translational movement relative to the cabinet 10. When the hinge assembly 30c continues to be opened from the first opening angle α_1 to a maximum opening angle α_2 , the second hinge part 32c rotates in suit around a second rotational axis P2 relative to the first hinge part 31c, and both the first shaft 311c and the second shaft 312c slide within the slot 40c, driving the door 20 to rotate in suit.

[0088] Specifically, a second slot 322c includes a beginning end B1, a middle position B3, and a final end B2 that are sequentially arranged. When the hinge assembly 30c is in a closed state, the second shaft 312c is at the beginning end B1, and the first shaft 311c is at the end of the first slot 321c far from the second slot 322c. When the hinge assembly 30c is opened from the closed state to the first opening angle α_1 , the first shaft 311c moves within the first slot 321c, driving the second shaft 312c from the beginning end B1 to the middle position B2, and

the door 20 moves from the pivot side P towards the accommodating chamber D. When the hinge assembly 30c continues to be opened from the first opening angle α_1 to the maximum opening angle α_2 , the first shaft 311c continues to move within the first slot 321c, driving the second shaft 312c from the middle position B3 to the final end B2, and the door 20 rotates in suit.

[0089] It should be noted that, in this specific example, the first shaft 311c moves from the starting end A1 to the stopping end A2, driving the second shaft 312c from the beginning end B1 to the final end B2. The beginning end B1 is located within the first slot 321c, or in other words, the stopping end A2 is located within the second slot 322c, meaning there is an overlapping area between the first slot 321c and the second slot 322c. The door 20c first moves from the pivot side P towards the accommodating chamber D, and then continues to rotate in suit.

[0090] In an example, when the second shaft 312c moves from the middle position B3 to the final end B2, the first shaft 311c is located within the second slot 322c. For instance, when the second shaft 312c is at the middle position B3, the first shaft 311c is precisely at the beginning end B1 of the second slot 322c. The second slot 322c is an arc slot with a central axis being a fixed axis, meaning at this time, both the first shaft 311c and the second shaft 312c move together within the second slot 322c around the second rotational axis P2, causing the door 20 to rotate in suit relative to the cabinet 10.

[0091] Of course, in other examples, when the second shaft 312c is at the middle position B3, the first shaft 311c could also be in different positions.

[0092] In a second embodiment of the utility model, combined with FIG. 22, the fitting part 40 is a protrusion located on the second hinge part 32d. The protrusion includes a first protrusion 321d and a second protrusion 322d that are interconnected. The first shaft 311d includes a first notch 313d that mates with the first protrusion 321d, and the second shaft 312d includes a second notch 314d that mates with the second protrusion 322d. When the hinge assembly 30d is in the opening process, the first notch 313d slides along the first protrusion 321d, and the second notch 314d slides along the second protrusion 322d. When the hinge assembly 30d is at a maximum opening angle, the first notch 313d is located at a stop end of the first protrusion 321d, which is located at the second protrusion 314d.

[0093] It should be noted that, similar to the first embodiment, the first protrusion 321d in this embodiment could also include a starting end, a stopping end, etc., and the second protrusion 322d could include a beginning end, a middle position, and a final end, etc. The specifics can refer to the description of the first embodiment and will not be reiterated here.

[0094] In this embodiment, both the first protrusion 321d and the second protrusion 322d are elongated. The first notch 313d is fitted on an outside of the first protrusion 321d and slides along an extension direction of the first protrusion 321d. Similarly, the second notch 314d is fitted

on an outside of the second protrusion 322d and slides along an extension direction of the second protrusion 322d.

[0095] Here, an opening width of the first notch 313d is roughly the same as a width of the first protrusion 321d, ensuring that when the first notch 313d slides at the first protrusion 321d, it can stably slide along the extension direction of the first protrusion 321d without wobbling or disengaging. Moreover, a length of the first notch 313d in the extension direction of the first protrusion 321d is minimized to prevent interference between the first notch 313d and the first protrusion 321d during the sliding process.

[0096] Similarly, an opening width of the second notch 314d is roughly the same as a width of the second protrusion 322d, ensuring that when the second notch 314d slides at the second protrusion 322d, it can stably slide along the extension direction of the second protrusion 322d without wobbling or disengaging. Furthermore, a length of the second notch 314d in the extension direction of the second protrusion 322d is minimized to prevent interference between the second notch 314d and the second protrusion 322d during the sliding process.

[0097] The ends of the first protrusion 321d and the second protrusion 322d are equipped with stoppers to prevent the first notch 313d and the second notch 314d from disengaging from the first protrusion 321d and the second protrusion 322d during the sliding process.

[0098] Here, the stoppers can be protrusions located at the ends of the first protrusion 321d and the second protrusion 322d or the ends of the first protrusion 321d and the second protrusion 322d could be bent to limit further sliding of the first notch 313d and the second notch 314d, but this is not limited to such configurations.

[0099] In this embodiment, the first shaft 311d includes two first protruding columns 3111d, which together form the first notch 313d. Similarly, the second shaft 312d includes two second protruding columns 3121d, which together form the second notch 314d.

[0100] Here, both the first protruding columns 3111d and the second protruding columns 3121d are cylindrical.

[0101] Thus, when the first notch 313d moves relative to the first protrusion 321d, it essentially means that the two first protruding columns 3111d slide on either side of the first protrusion 321d, reducing a friction between the first notch 313d and the first protrusion 321d and preventing the first notch 313d from getting stuck during the sliding process.

[0102] Similarly, when the second notch 314d moves relative to the second protrusion 322d, it essentially means that the two second protruding columns 3121d slide on either side of the second protrusion 322d, reducing a friction between the second notch 314d and the second protrusion 322d and preventing the second notch 314d from getting stuck during the sliding process.

[0103] In this embodiment, the first shaft 311d also includes a first shaft main part 3112d connected to the first hinge part 31d, and the second shaft 312d also includes

a second shaft main part 3122d connected to the first hinge part 31d. The two first protruding columns 3111d are located on a side of the first shaft main part 3112d away from the first hinge part 31d, and the two second protruding columns 3121d are located on a side of the second shaft main part 3122d away from the first hinge part 31d.

[0104] Of course, in other embodiments, the two first protruding columns 3111d and the two second protruding columns 3121d could directly connect to the first hinge part 31d.

[0105] Other explanations of this embodiment can refer to the first embodiment and will not be reiterated here.

[0106] The above embodiments are only intended to illustrate technical solutions of the utility model and not to limit it. Although the utility model has been described in detail with reference to preferable embodiments, for example, if technologies of different embodiments can be superimposed to achieve corresponding effects, such schemes are also within a protection scope of the utility model. Those skilled in the art should understand that modifications or equivalent substitutions can be made to the technical solutions of the utility model without departing from a spirit and scope of the technical solutions of the utility model.

Claims

1. A hinge assembly, **characterized in that** it comprises a first hinge part and a second hinge part that cooperate with each other; the hinge assembly further comprises a first shaft and a second shaft that are located on the first hinge part, and a fitting part located on the second hinge part, the fitting part comprises a first fitting part and a second fitting part that are interconnected, when the hinge assembly is in an opening process, the first shaft moves at the first fitting part, and the second shaft moves at the second fitting part, when the hinge assembly is at a maximum opening angle, the first shaft is located at a stop end of the first fitting part, the stop end is located at the second fitting part.
2. The hinge assembly according to claim 1, **characterized in that** the fitting part is a slot, the slot comprises a first slot and a second slot that are interconnected, when the hinge assembly is in the opening process, the first shaft moves within the first slot, and the second shaft moves within the second slot, when the hinge assembly is at the maximum opening angle, the first shaft is located at a stop end of the first slot, the stop end is located within the second slot.
3. The hinge assembly according to claim 2, **characterized in that** a movement trajectory of the first shaft partially overlaps with a movement trajectory of the second shaft.

4. The hinge assembly according to claim 2, **characterized in that** the slot comprises a first section, a middle section, and a second section that are sequentially connected, the first section together with the middle section forms the first slot, and the middle section together with the second section forms the second slot. 5
5. The hinge assembly according to claim 2, **characterized in that** the second hinge part rotates around a first rotational axis as a center axis relative to the first hinge part, the first rotational axis is a variable axis. 10
6. The hinge assembly according to claim 2, **characterized in that** the second hinge part rotates around a first rotational axis as a center axis relative to the first hinge part, the first rotational axis is a virtual axis. 15
7. The hinge assembly according to claim 2, **characterized in that**, when the hinge assembly is opening from a closed state to a first opening angle, the second hinge part rotates around a first rotational axis as a center axis relative to the first hinge part, when the hinge assembly continues to be opened to the maximum opening angle from the first opening angle, the second hinge part rotates around a second rotational axis as a center axis relative to the first hinge part, the first rotational axis is different from the second rotational axis. 20 25 30
8. The hinge assembly according to claim 7, **characterized in that** the first rotational axis is a variable axis, and the second rotational axis is a fixed axis. 35
9. The hinge assembly according to claim 7, **characterized in that** both the first rotational axis and the second rotational axis are virtual axes.
10. The hinge assembly according to claim 2, **characterized in that** the second slot is an arc slot with a central axis being a fixed axis. 40
11. The hinge assembly according to claim 2, **characterized in that** one of the first hinge part and the second hinge part is connected to a cabinet, and the other is connected to a door, the first shaft and the second shaft slide simultaneously within the slot to drive the door relative to the cabinet to produce a translational movement. 45 50
12. The hinge assembly according to claim 11, **characterized in that** the cabinet comprises an accommodating chamber and a pivot side connected to the hinge assembly, when the hinge assembly is opened from a closed state to a first opening angle, the door moves from the pivot side towards the accommodating chamber. 55
13. The hinge assembly according to claim 12, **characterized in that** the second slot comprises a beginning end and a final end, when the hinge assembly is in a closed state, the second shaft is located at the beginning end, and the first shaft is located at an end of the first slot far from the second slot, when the hinge assembly is opened from the closed state to the first opening angle, the first shaft moves within the first slot, driving the second shaft from the beginning end to the final end, and the door moves from the pivot side towards the accommodating chamber. 5
14. The hinge assembly according to claim 13, **characterized in that** the door comprises a front wall away from the accommodating chamber and a side wall that is always sandwiched between the front wall and the accommodating chamber, the second hinge part is connected to the door, the beginning end is farther away from the front wall and the side wall compared to the final end.
15. The hinge assembly according to claim 12, **characterized in that** the second slot comprises a beginning end and a final end, and the first slot comprises a first part and a second part that are interconnected, when the hinge assembly is opened from the closed state to a first intermediate opening angle, the second shaft remains at the beginning end, and the first shaft moves within the first part around the second shaft as a central axis, when the hinge assembly is opened from the first intermediate opening angle to the first opening angle, the first shaft moves within the second part, driving the second shaft from the beginning end to the final end, and the door moves from the pivot side towards the accommodating chamber.
16. The hinge assembly according to claim 2, **characterized in that** one of the first hinge part and the second hinge part is connected to a cabinet, and the other is connected to a door, when the hinge assembly is opened from a closed state to a first opening angle, the first shaft and the second shaft slide simultaneously within the slot to drive the door relative to the cabinet to produce a translational movement, when the hinge assembly continues to be opened to the maximum opening angle from the first opening angle, the first shaft and the second shaft slide simultaneously within the slot to drive the door to rotate in suit.
17. The hinge assembly according to claim 16, **characterized in that** the cabinet comprises an accommodating chamber and a pivot side connected to the hinge assembly, the second slot comprises a beginning end, a middle position, and a final end that are sequentially arranged, when the hinge assembly is in the closed state, the second shaft is located at the

beginning end, and the first shaft is located at the end of the first slot far from the second slot, when the hinge assembly is opening from the closed state to the first opening angle, the first shaft moves within the first slot, driving the second shaft from the beginning end to the middle position, and the door moves from the pivot side towards the accommodating chamber, when the hinge assembly continues to be opened to the maximum opening angle from the first opening angle, the first shaft continues to move within the first slot, driving the second shaft from the middle position to the final end, and the door rotates in suit.

18. The hinge assembly according to claim 17, **characterized in that** the beginning end is located within the first slot.
19. The hinge assembly according to claim 1, **characterized in that** the fitting part is a protrusion, the protrusion comprises a first protrusion and second protrusion that are interconnected, the first shaft comprises a first notch that mates with the first protrusion, and the second shaft comprises a second notch that mates with the second protrusion, when the hinge assembly is in the opening process, the first notch slides along the first protrusion and the second notch slides along the second protrusion, when the hinge assembly is at the maximum opening angle, the first notch is located at a stop end of the first protrusion, the stop end is located at the second protrusion.
20. The hinge assembly according to claim 19, **characterized in that** both the first protrusion and the second protrusion are elongated, the first notch is fitted on an outside of the first protrusion and slides along an extension direction of the first protrusion, and the second notch is fitted on an outside of the second protrusion and slides along an extension direction of the second protrusion.
21. The hinge assembly according to claim 19, **characterized in that** the first shaft comprises two first protruding columns, the two first protruding columns together form the first notch, the second shaft comprises two second protruding columns, the two second protruding columns together form the second notch.
22. The hinge assembly according to claim 21, **characterized in that** the first shaft further comprises a first shaft main part connected to the first hinge part, and the second shaft further comprises a second shaft main part connected to the first hinge part, the two first protruding columns are located on a side of the first shaft main part away from the first hinge part, and the two second protruding columns are located

on a side of the second shaft main part away from the first hinge part.

23. A refrigeration device, **characterized in that** it comprises a cabinet, a door, and a hinge assembly connecting the cabinet and the door, the hinge assembly is any one of the hinge assembly according to claims 1-22.

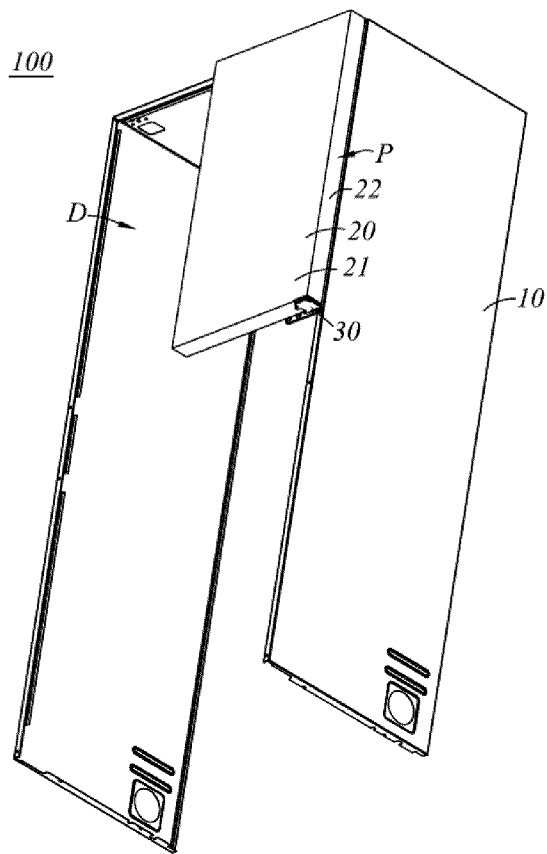


FIG.1

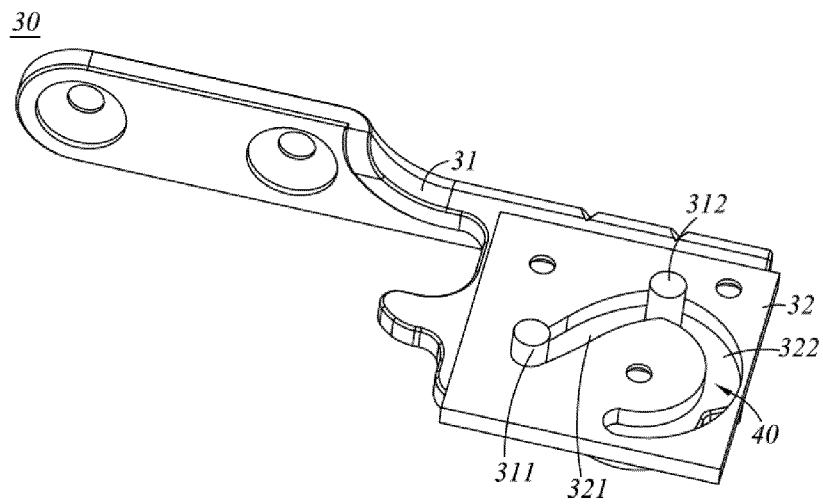


FIG.2

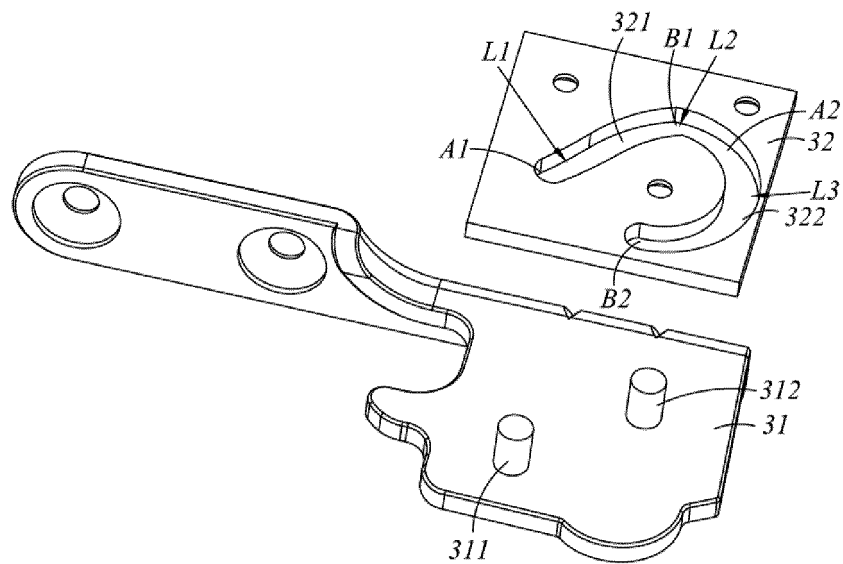


FIG.3

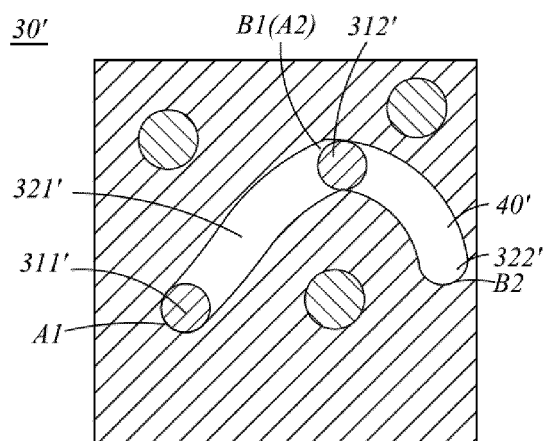


FIG.4

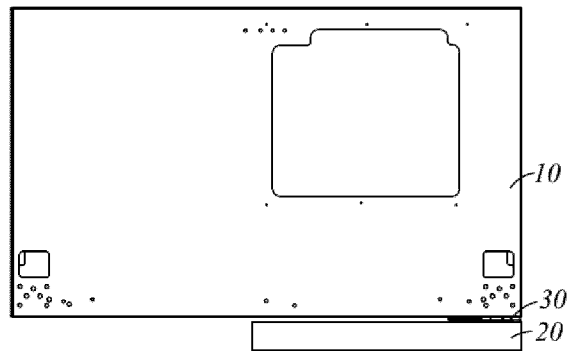


FIG. 5

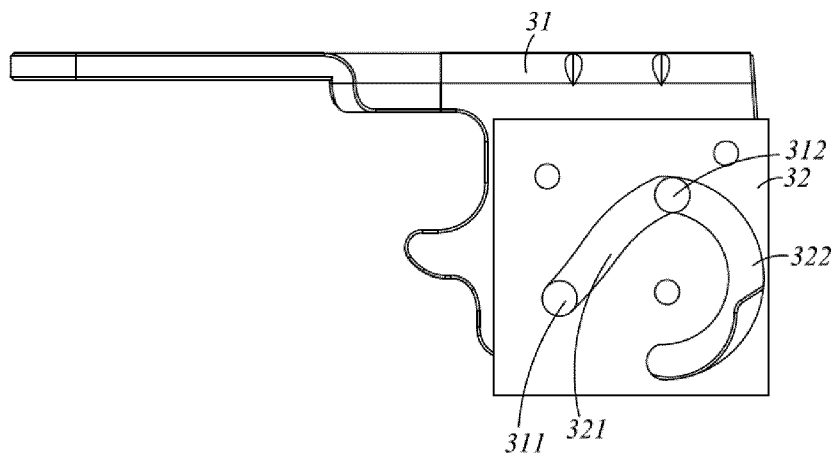


FIG. 6

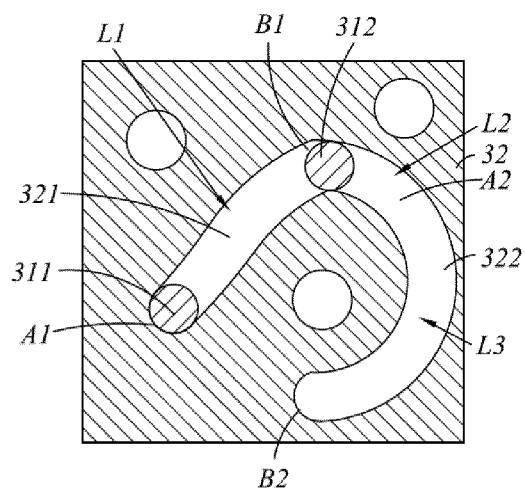


FIG. 7

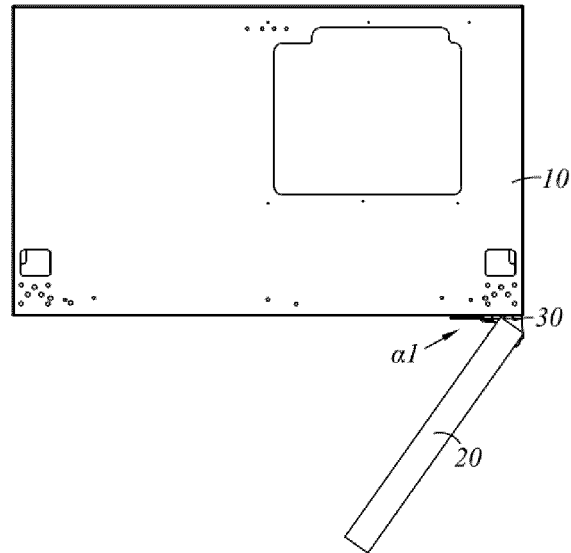


FIG. 8

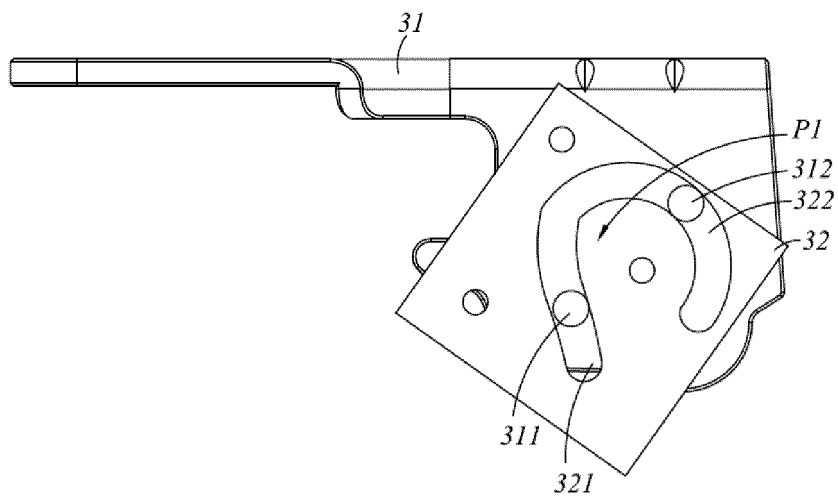


FIG. 9

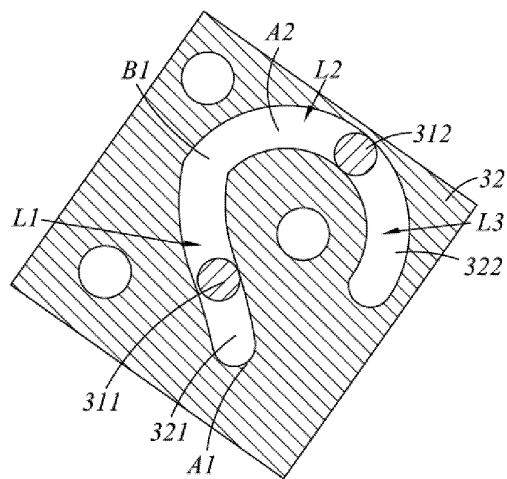


FIG. 10

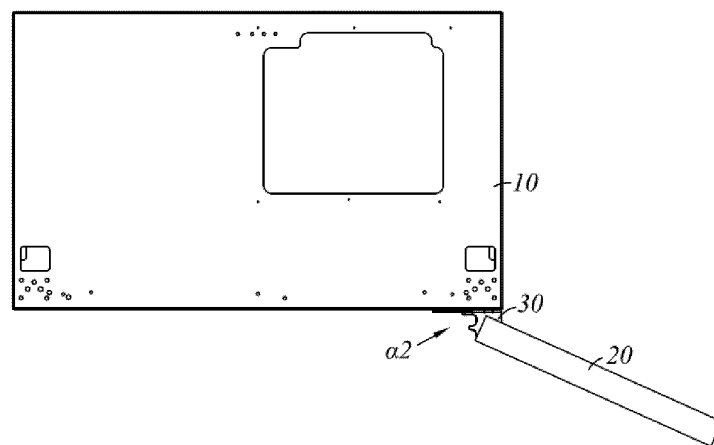


FIG. 11

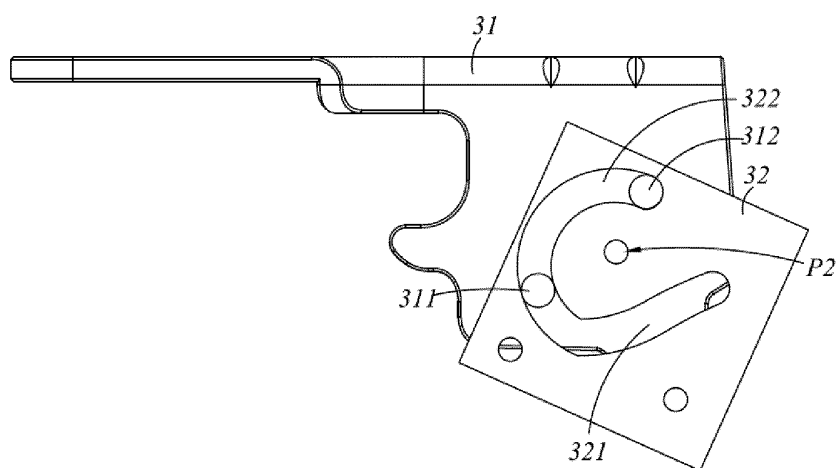


FIG. 12

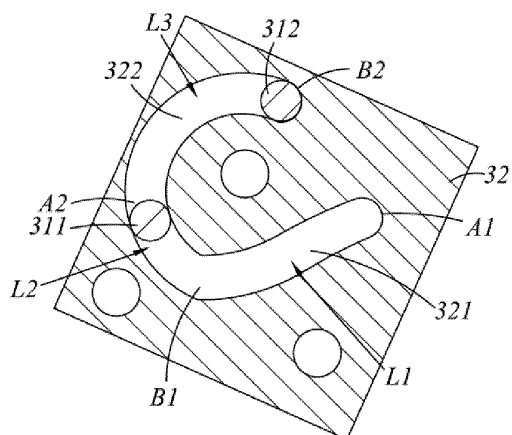


FIG. 13

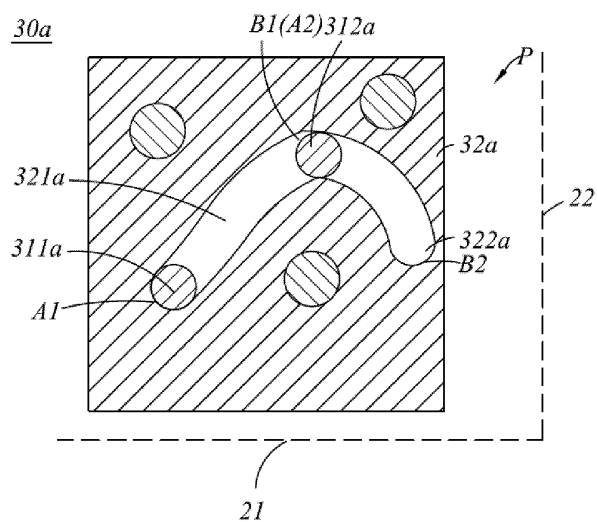


FIG. 14

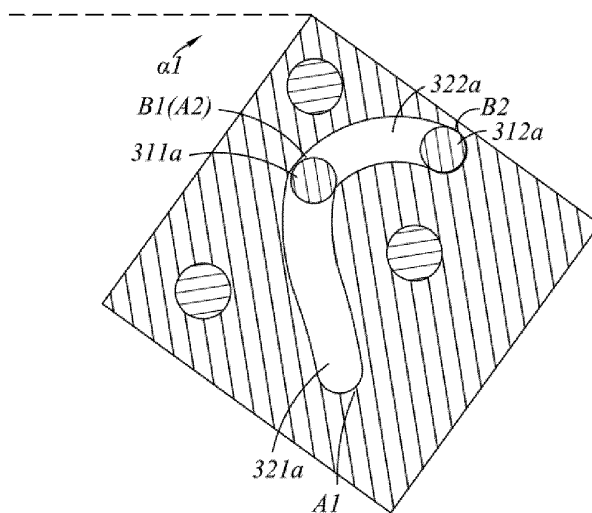


FIG. 15

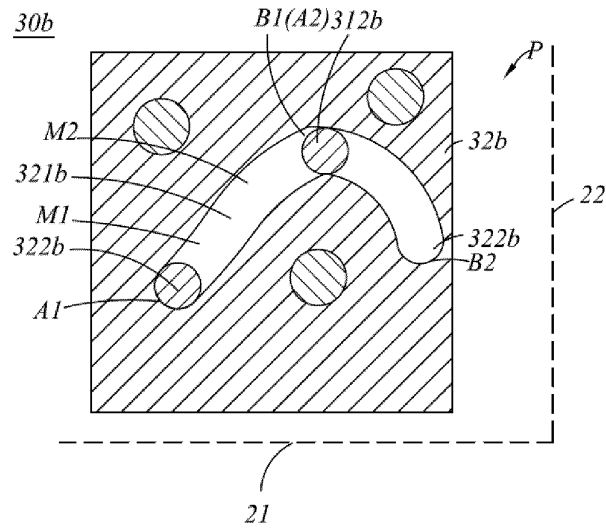


FIG. 16

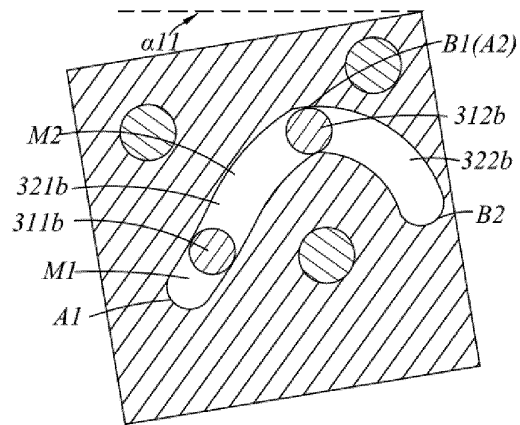


FIG. 17

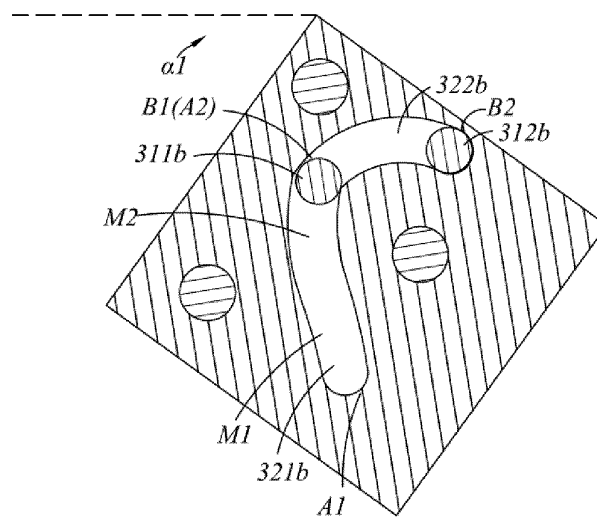


FIG. 18

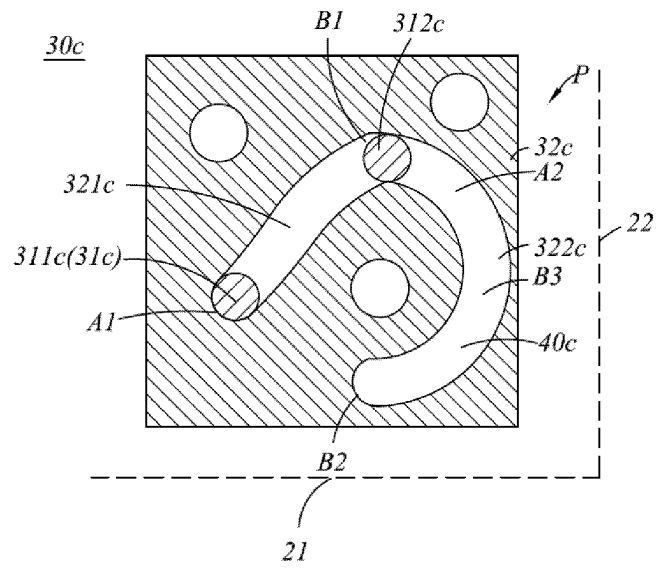


FIG.19

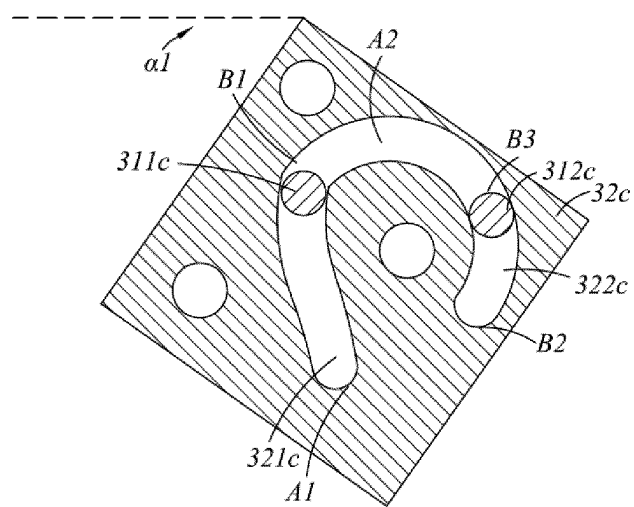


FIG.20

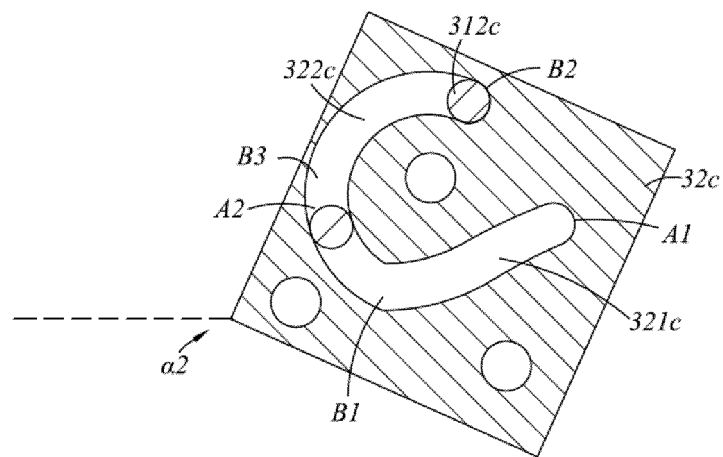


FIG. 21

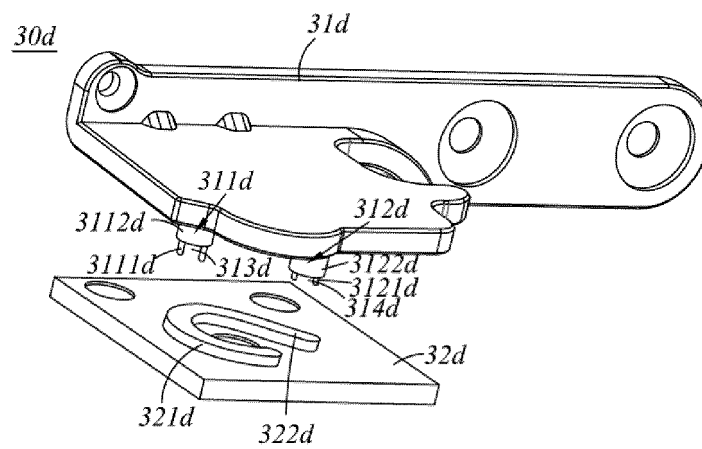


FIG. 22

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/117151

5	A. CLASSIFICATION OF SUBJECT MATTER E05D 5/02(2006.01)i; F25D 23/02(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC		
10	B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) E05D5/-;F25D23/- Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) CNTXT, CNABS, WPABSC, ENTXTC, DWPI, WPABS, ENTXT, OETXT, 中国期刊网全文数据库, Chinese Journal Network Full-Text Database: 海尔, 铰链, 轴, 销, 第一, 第二, 槽, 连通, 贯通, 停止, 配合, 滑; hinge?, shaft?, pin?, first, second, groove?, slot?, through, stop+, slid+		
20	C. DOCUMENTS CONSIDERED TO BE RELEVANT		
	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	PX	CN 216110239 U (QINGDAO HAIER REFRIGERATOR CO., LTD. et al.) 22 March 2022 (2022-03-22) claims	1-23
25	A	CN 112282542 A (QINGDAO HAIER REFRIGERATOR CO., LTD. et al.) 29 January 2021 (2021-01-29) description, specific embodiments, and figures 1-28	1-23
	A	CN 108286862 A (QINGDAO HAIER CO., LTD.) 17 July 2018 (2018-07-17) entire document	1-23
30	A	CN 112282540 A (QINGDAO HAIER REFRIGERATOR CO., LTD. et al.) 29 January 2021 (2021-01-29) entire document	1-23
	A	CN 213477969 U (HEFEI MIDEA REFRIGERATOR CO., LTD. et al.) 18 June 2021 (2021-06-18) entire document	1-23
35	A	US 2014232250 A1 (SAMSUNG ELECTRONICS CO., LTD.) 21 August 2014 (2014-08-21) entire document	1-23
40	☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
45	* 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		
50	Date of the actual completion of the international search 17 November 2022		Date of mailing of the international search report 08 December 2022
55	Name and mailing address of the ISA/CN China National Intellectual Property Administration (ISA/CN) 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/CN2022/117151

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2004301457 A (TOSHIBA CORP.) 28 October 2004 (2004-10-28) entire document	1-23

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2022/117151

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 216110239 U	22 March 2022	None	
CN 112282542 A	29 January 2021	CN 112282542 B	28 October 2022
CN 108286862 A	17 July 2018	CN 108286862 B	29 September 2020
CN 112282540 A	29 January 2021	CN 112282540 B	24 June 2022
CN 213477969 U	18 June 2021	None	
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JP 2004301457 A	28 October 2004	None	

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

REFERENCES CITED IN THE DESCRIPTION

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