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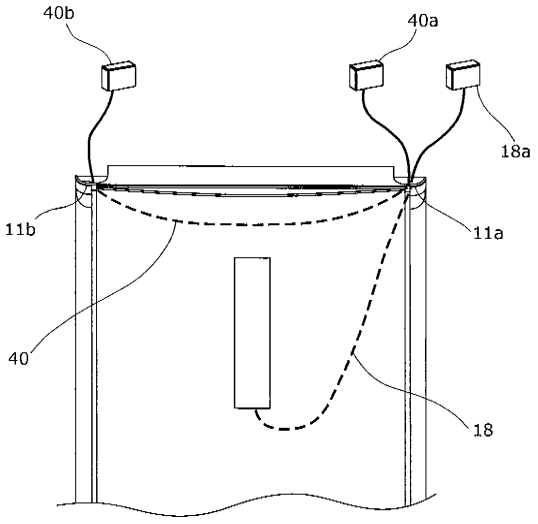
(54) REFRIGERATOR

(57) To provide a refrigerator which includes a door changeable between left-opening and right-opening, and facilitates internal wiring modification required in such changing.

The refrigerator includes: a heat-insulating main body (70); a storage compartment (10); a first door (11) changeable between left-opening and right-opening; a display terminal (17) provided on a front surface of the first door (11); a control board (80) provided on the heat-insulating main body (70); a left-side harness (60a) running from the control board (80) to the upper-left portion of the heat-insulating main body; a right-side harness (60b) running from the control board (80) to the upper-right portion of the heat-insulating main body (70); and a door-side harness (18) having one end connected to the display terminal (17) and the other end being exposed from the upper portion of the first door (11) and connected to a relay harness (40), and thus changing the door can be changed from left-opening to right-opening.

FIG. 4



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Description

[Technical Field]

[0001] The present invention relates to refrigerators, and particularly to a refrigerator including a door capable of being changed from one of left-opening and right-opening to the other, by way of transferring a hinge member.

[Background Art]

[0002] Conventionally, refrigerators include a storage compartment such as a refrigerator compartment, and the opening of such compartment is openably closed by an insulated door.

[0003] Furthermore, there are also refrigerators having an information terminal provided on a front surface of a door. For example, there are refrigerators which include, as an information terminal, a display device that displays the temperature setting of the refrigerator, and so on.

[0004] In a refrigerator which includes such an information terminal, a control board which controls the information terminal is provided in a heat-insulating main body making up the main body of the refrigerator.

[0005] Furthermore, the door in which the information terminal is placed swings by way of a hinge member provided in a left end portion or a right end portion. As such, a door-side harness, which is the bundle of wires connected the information terminal, is typically connected to a harness leading to the control board, by passing through the portion at which the hinge member is placed.

[0006] FIG. 13 is a perspective view showing the arrangement of a door-side harness in a conventional refrigerator 200.

[0007] In the conventional refrigerator 200 shown in FIG. 13, a display unit 250, which is a type of information terminal, is provided on the front surface of a door 211. Furthermore, a hinge member 260 is attached to the upper-right portion of a heat-insulating main body 201, and the door 211 is included in the refrigerator 200 as a right-opening, hinged door.

[0008] For example, a harness 270 connected to the display unit 250 passes through the insulating material of the door 211, and is passed through the inside of a hinge pin 261 for example.

[0009] A connection terminal 270a is provided at an end of the harness 270, and the connection terminal 270a is connected to a control board-side harness (not illustrated) which runs up to the vicinity of the hinge member 260.

[0010] Techniques regarding such a structure for enabling an information terminal-side harness to reach the heat-insulating main body-side is also disclosed (for example, see PTL 1).

[0011] FIG. 14 is an exploded perspective view showing the structure of a conventional hinge member.

[0012] A conventional hinge member 110 shown in FIG. 14 includes: an anchor part 112 for anchoring onto a roof part of the heat-insulating main body of the refrigerator; a swing shaft attachment part 114 running from the anchor part 112, for attaching the door; a through-hole 116 provided in the swing shaft attachment part 114; a notch part 118 provided in the through-hole 116; a swing shaft 120 that is cylindrical in shape and protrudes to the bottom, from the edge of the through-hole 116; and a cord insertion part 122 which is notched continuously along the axis direction from the notch part 118.

[0013] A bush 138 having a cylindrical shape is attached to the swing shaft 120 of the hinge member 110 having the above-described structure, so as to be covered by the swing shaft 120.

[0014] A harness 146, which is connected to an operating switch provided in the door and which passes through the insulating material in the inside of the door, is passed through the inside of the bush 138.

[0015] The harness 146 is inserted within the through-hole 116, from the cord insertion part 122 and the notch part 118, so as to be attached inside the swing shaft 120. Subsequently, the harness 146 is connected to a control board-side harness arranged in the heat-insulating main body. Furthermore, the harness 146 is covered by a hinge cover 134.

[0016] In this manner, since the hinge member 110 includes the code insertion part 122 and the notch part 118, attaching the harness 146 to the hinge member 110 is easy and the harness 146 does not get damaged.

[Citation List]

[Patent Literature]

[0017] [PTL 1]
Japanese Unexamined Patent Application Publication No. 8-296952

[Summary of Invention]

[Technical Problem]

[0018] Here, conventionally, there are also refrigerators that allow the refrigerator door to be changed from left-opening to right-opening or vice versa, depending on the intent of the user of the refrigerator. With such a refrigerator, the opening direction of the door can be changed by transferring the hinge member for example.

[0019] However, with the conventional refrigerator 200 shown in FIG. 13, even when the attachment position of the hinge member 260 to the heat-insulation main body 201 can be changed from the upper-right portion to the upper-left portion, the position at which the harness 270 is exposed to the outside from the door 211 is fixed to the upper-right portion.

[0020] Therefore, connecting the connection terminal 270a and the control board-side harness is practically impossible. Furthermore, the connection terminal 270a

that is exposed to the outside from the upper-right portion of the door 211 becomes an obstruction to the opening and closing of the door 211 and becomes an detracting factor to the outward appearance of the refrigerator 200.

[0021] Furthermore, although the task involved in passing the harness 146 through the hinge member 110 is simplified, and so on, in the conventional hinge member 110 shown in FIG. 14, this is premised on the fact that the harness 146 runs up to the bottom of the hinge member 110.

[0022] Consequently, for example, during the transferring the hinge member 110, it is also possible to consider changing the running direction of the harness 146 embedded in the insulating material inside the door, to the direction of the transferred hinge member 110. However, in actuality, such a task is extremely difficult and thus impractical.

[0023] The present invention is conceived in view of the above-described conventional problem and has as an object to provide a refrigerator which includes a hinged door capable of being changed from one of left-opening and right-opening to the other, and facilitates the task of modifying internal wiring required in such changing.

[Solution to Problem]

[0024] In order to solve the above-described conventional problem, the refrigerator in an aspect of the present invention is a refrigerator including: a heat-insulating main body; a storage compartment which is located inside the heat-insulating main body and has an opening in a front surface; a door of a hinged-type, which openably closes the opening and is capable of being changed from one of left-opening and right-opening to the other, by transferring a hinge member from one of an upper-left portion and an upper-right portion of the heat-insulating main body to the other; an information terminal which is provided on a front surface of the door and is for inputting or outputting information; a control board which is provided in the heat-insulating main body and controls the information terminal; a left-side wire which runs from the control board to the upper-left portion of the heat-insulating main body; a right-side wire which runs from the control board to the upper-right portion of the heat-insulating main body; a door-side wire which has one of ends connected to the information terminal and the other of the ends exposed from an upper portion of the door; a first connection terminal which is provided at the other of the ends of the door-side wire and capable of being connected to one of the left-side wire and the right-side wire; and a relay wire which includes two second connection terminals, one of which is exposed from an upper-left portion of the door and the other of which is exposed from an upper-right portion of the door, wherein: when the first connection terminal is directly connected to the right-side wire, the two of the second connection terminals are placed without being connected; and when the first connection terminal is directly connected to one of the second connection terminals, the other of the second connection terminals is placed connected to the left-side wire.

[0025] With this configuration, in the refrigerator in an aspect of the present invention, the connection terminals on both ends of the relay wire that can be connected to the first connection terminal of the door-side wire are pulled out from the upper portion of the door whose opening direction can be changed. In addition, when exposed from the right side of the door, the first connection terminal of the door-side wire can be directly connected to the right-side wire. When connecting to the left-side wire, the first connection terminal is connected to the left-side wire by being connected via the relay wire.

[0026] Therefore, for example, when the user of the refrigerator changes the opening direction of the door, from right to left, by having the user disconnect the first connection terminal which is directly connected to the right-side wire, then connect the first connection terminal to one terminal-side of the relay wire and connecting the other terminal-side to the left-side wire, it becomes possible to change the opening direction of the door while controlling the information terminal provided on the front surface of the door.

[0027] Specifically, by using the relay wire, which is embedded in the insulating material inside the door, depending on the opening direction of the door, the user can easily change the opening direction from left to right and from light to left.

[0028] In this manner, the refrigerator in an aspect of the present invention, is a refrigerator that includes a door which is of the hinged-type and capable of being changed from one of left-opening and right-opening to the other, and is a refrigerator that facilitates the task of changing internal wiring necessary in such changing.

[0029] Furthermore, in order to solve the above-described conventional problem, the refrigerator in an aspect of the present invention is a refrigerator including: a heat-insulating main body; a storage compartment which is located inside the heat-insulating main body and has an opening; a door of a hinged-type, which openably closes the opening and is capable of being changed from one of left-opening and right-opening to the other, by transferring a hinge member from one of an upper-left portion and an upper-right portion of the heat-insulating main body to the other; an information terminal which is provided on a front surface of the door and is for inputting or outputting information; a control board which is provided in the heat-insulating main body and controls the information terminal; a left-side wire which runs from the control board to the upper-left portion of the heat-insulating main body; a right-side wire which runs from the control board to the upper-right portion of the heat-insulating main body; a door-side wire which has one of ends connected to the information terminal and the other of the ends exposed from an upper portion of the door so that a part that is exposed from the upper portion of the door is capable of being bent to either left or right; and a

connection terminal which is provided at the other of the ends of the door-side wire and capable of being connected to one of the left-side wire and the right-side wire, wherein a length of the part that is exposed from the upper portion of the door is a length which allows the connection terminal and the left-side wire to be connected when the part that is exposed is bent to the left, and allows the connection terminal and the right-side wire to be connected when the part that is exposed is bent to the right.

[0030] With this configuration, in the refrigerator in an aspect of the present invention, the end of the door-side wire having the connection terminal is pulled out from the upper portion of the door whose opening direction can be changed. Furthermore, the door-side wire can be bent either to the left or to the right at the upper portion of the door, and the connection terminal can be connected to one of the left-side wire and the right-side wire at the heat-insulating main body-side.

[0031] Therefore, for example, when the user of the refrigerator changes the opening direction of the door from the right to the left or vice versa, the user can connect the door-side wire and the wire at the control board-side by bending, in the direction of the hinge member after changing, the part of the door-side wire that is exposed from the upper portion of the door, that is, the free end whose running direction can be flexibly changed.

[0032] Specifically, the user can easily change the running direction of the door-side wire from left to right and from light to left, without involving the part of the door-side wire that is embedded in the insulating material inside the door.

[0033] In this manner, the refrigerator in an aspect of the present invention, is a refrigerator that includes a door which is of the hinged-type and capable of being changed from one of left-opening and right-opening to the other, and is a refrigerator that facilitates the task of changing internal wiring necessary in such changing.

[0034] Furthermore, the refrigerator according to an aspect of the present invention, may further include: a wiring trench in which the door-side wire is buried, the wiring trench running in a left-and-right direction in the upper portion of the door; and a wire opening through which the door-side wire passes, and which is provided in a plane forming the wiring trench, at a central portion in the left-and-right direction of the wiring trench.

[0035] With this, the door-side wire is arranged so as to be embedded in the door. Therefore, for example, the door-side wire can be arranged in the door without having to substantively increase the height of the door.

[0036] Furthermore, since the door-side wire is exposed from the central portion of the trench, the necessary length of the exposed part becomes approximately the same for the case where the connection terminal is connected to the left-side wire and the case where the connection terminal is connected to the right-side wire. Therefore, there is no need to provide the door-side wire with unnecessary length.

[Advantageous Effects of Invention]

[0037] The present invention can provide a refrigerator which includes a hinged door capable of being changed from one of left-opening and right-opening to the other, and which facilitates the task of modifying internal wiring required in such changing.

[Brief Description of Drawings]

[0038]

[FIG. 1] FIG. 1 is an elevational view of a refrigerator in a first embodiment of the present invention.

[FIG. 2] FIG. 2 is a cross-sectional view of the refrigerator in the first embodiment.

[FIG. 3] FIG. 3 is a perspective view showing the arrangement of a door-side harness in the refrigerator in the first embodiment.

[FIG. 4] FIG. 4 is an elevational view showing the arrangement of the door-side harness in the refrigerator in the first embodiment.

[FIG. 5] FIG. 5 is a plan view showing the arrangement of the door-side harness and the harness at the control board-side in the refrigerator in the first embodiment.

[FIG. 6] FIG. 6 is a cross-sectional view along line A-A in FIG. 5.

[FIG. 7] FIG. 7 is an outline view showing a refrigerator in which a first door in the refrigerator in the first embodiment is attached as a right-opening door.

[FIG. 8] FIG. 8 is an outline view showing a refrigerator in which the first door in the refrigerator in the first embodiment is attached as a left-opening door.

[FIG. 9] FIG. 9 is a perspective view showing the arrangement of a door-side harness in a refrigerator in a second embodiment of the present invention.

[FIG. 10] FIG. 10 is a perspective view showing the arrangement of the door-side harness and a harness on a control board-side in the refrigerator in the second embodiment.

[FIG. 11] FIG. 11 is a partial cross-sectional view showing the arrangement of the door-side harness in the refrigerator in the second embodiment.

[FIG. 12A] FIG. 12A is an outline view showing a refrigerator in which a first door in the second embodiment is attached as a right-opening door.

[FIG. 12B] FIG. 12B is an outline view showing a refrigerator in which the first door in the second embodiment is attached as a left-opening door.

[FIG. 13] FIG. 13 is a perspective view showing the arrangement of a door-side harness in a conventional refrigerator.

[FIG. 14] FIG. 14 is an exploded perspective view showing the structure of a conventional hinge member.

[Description of Embodiments]

[0039] Hereinafter, embodiments of a refrigerator according to the present invention shall be described with reference to the Drawings. It should be noted that the present invention is not limited to such embodiments.

[First Embodiment]

[0040] FIG. 1 is an elevational view of a refrigerator 100 in a first embodiment of the present invention.

[0041] As shown in FIG. 1, the refrigerator 100 is a refrigerator including two doors, and includes, in a heat-insulating main body 70, a storage compartment partitioned into three storage compartments.

[0042] Furthermore, the heat-insulating main body 70 is configured of a heat-insulating wall in which a foam heat-insulating material 73 is injected into a space formed between an inner casing 71 that is a vacuum-formed resin body made from ABS, or the like, and an outer casing 72 using a metal material such as pre-coated steel plate.

[0043] The above-mentioned three storage compartments are included within the heat-insulating main body 70. Specifically, the refrigerator 100 includes a refrigerator compartment 10, a variable-temperature compartment 55 whose inside temperature can be varied, and a freezer compartment 30. It should be noted that the rectangular dotted lines in the diagram represent the respective openings of the storage compartments.

[0044] The opening of each storage compartment is provided with a heat-insulating door filled with a foam heat-insulating material such as urethane.

[0045] Specifically, a first door 11, which is hinged and openably closes the opening of the refrigerator compartment 10 and the variable-temperature compartment 20, is provided.

[0046] Furthermore, the first door 11 is an example of the door, which is of a hinged-type, in a refrigerator according to the present invention, and is a door capable of being changed from one of left-opening and right-opening to the other, by way of transferring a hinge member.

[0047] A display device 17 is provided on a front surface of the first door 11. The display device 17 is an example of the information terminal in a refrigerator according to the present invention.

[0048] It should be noted that the information terminal is a device through which input or output of information is performed. A display device for notifying the temperature setting, and so on, of a storage compartment to the user, a switch button unit by which a user sets the temperature, and so on, of a storage compartment, input-output device including both, a sensor which detects the temperature, and so on, are given as examples of such an information terminal.

[0049] The display device 17 in the first embodiment displays, for example, information indicating the temperature zone that is set for the variable-temperature compartment 20.

[0050] Furthermore, a second door of the drawer-type is provided to the freezer compartment 30.

[0051] In the refrigerator 100 in first embodiment, having the above-described basic configuration, the refrigerator compartment 10 is cooled by way of a direct cooling method, and the variable-temperature compartment 20 and the freezer compartment 30 are cooled by way of an indirect cooling method.

[0052] FIG. 2 is a vertical cross-sectional view of the refrigerator 100 in the first embodiment.

[0053] As shown in FIG. 2, inside the heat-insulating main body 70, the refrigerator compartment 10 and the variable-temperature compartment 20 are partitioned by a partition 15. Furthermore, the variable-temperature compartment 20 and the freezer compartment 30 are partitioned by a partition 25.

[0054] Furthermore, the refrigerator 100 includes two coolers. Specifically, a first cooler 12 is provided at the backside of a deep-end plane l0a of the refrigerator compartment 10. The deep-end plane l0a of the refrigerator compartment 10 is cooled by thermal conduction from the first cooler 12. The air within the refrigerator compartment 10 is cooled by the deep-end plane l0a that has been cooled.

[0055] The first cooler 12 includes a cooling pipe 12a and a metal plate 12b. The deep-end plane 10a of the refrigerator compartment 10 is directly cooled by the metal plate 12 which is fitted so as to be in contact with the backside of the deep-end plane 10a.

[0056] Furthermore, the refrigerator 100 includes a second cooler 32 at the backside of the deep-end plane of the freezer compartment 30. The inside of the freezer compartment 30 is cooled by the circulation of the cool air discharged from the second cooler 32.

[0057] The cool air discharged from the second cooler 32 is also supplied to the variable-temperature compartment 20 where it is maintained, for example, at a temperature zone between the temperature zone for the refrigerator compartment 10 and the temperature zone for the freezer compartment 30 by controlling the opening and closing of a damper.

[0058] Furthermore, as shown in FIG. 2, a door-side harness 18 is connected to the display device 17. The door-side harness 18 is an example of the door-side wire in a refrigerator according to the present invention.

[0059] Furthermore, a control board 80 is provided at a back plane portion of the heat-insulating main body 70. The control board 80 and the display device 17 are electrically connected, and the display device 17 is controlled by the control board 80.

[0060] FIG. 3 is a perspective view showing the arrangement of the door-side harness 18 in the refrigerator 100 in the first embodiment.

[0061] As shown in FIG. 3, a right hinge-hole 11a is provided in the upper-right portion of the first door 11 and a left hinge-hole 11b is provided in the upper-left portion.

[0062] As shown in FIG. 3, for example, the door-side

harness 18 passes within the first door 11 and is exposed to the outside from the right hinge-hole 11a. A first connection terminal 18a is connected to the exposed part. Although exposed from the right hinge-hole 11a, the door-side harness 18 may be exposed to the outside from the left hinge-hole 11b.

[0063] Furthermore, a relay wire 40 (hereafter denoted as relay harness 40) is arranged within an insulating material 73a of the first door 11. The ends of the relay harness 40 are respectively led to the outside from the right hinge-hole 11a and the left hinge-hole 11b, and respectively include a second connection right terminal 40a exposed from the right hinge-hole 11a and a second connection left terminal 40b exposed from the left hinge-hole 11b. It should be noted that the second connection right terminal 40a and the second connection left terminal 40b correspond to the "second connection terminals" described in the Claims. Details of the second connection right terminal 40a and the second connection left terminal 40b shall be described later.

[0064] Furthermore, a left hinge part 52 is provided at the upper-left portion of the heat-insulating main box 70 and a right hinge part 51 is provided at the upper-right portion.

[0065] The left hinge part 52 and the right hinge part 51 are parts to which a hinge member can be attached. FIG. 3 shows the state in which a hinge member 53 for right-opening is attached to the right hinge part 51.

[0066] Furthermore, FIG. 3 shows the state in which a hinge member for left-opening (not illustrated) is not attached to the left hinge part 52, and a hinge cover 52a is fitted.

[0067] Specifically, in FIG. 3, the first door 11 is a door which swings with the right end as an axis (left side opens), and is included in the refrigerator 100 as a right-opening door.

[0068] It should be noted that a hinge member for left-opening and the hinge member 53 for right-opening need not be separate pieces, and may be a singe hinge member that is used for both right-opening and left-opening.

[0069] FIG. 4 is an outline view of the door-side harness 18 and the relay harness 40 that are arranged in the first door 11. The broken line portion of each harness represents a part buried within the insulating material 73a of the first door 11. After passing through the right hinge-hole 11a, the leading ends of the door-side harness 18 and the relay harness 40 are connected to the first connection terminal 18a and the second connection right terminal 40a, respectively. Furthermore, after passing through the left hinge-hole 11b, the lead end of the relay harness 40 is connected to the second connection left terminal 40b.

[0070] FIG. 5 is a plan view showing the arrangement of the door-side harness 18 and the harness at the control board 80-side in the refrigerator 100 in the first embodiment.

[0071] As shown in FIG. 5, the a left-side harness 60a, which is connected to the control board 80, and a right-side harness 60b, which is likewise connected to the control board 80, are arranged in the heat-insulating main body 70.

[0072] The left-side harness 60a is an example of the left-side wire in a refrigerator according to the present invention, and runs from the control board 80 towards the upper-left portion of the heat-insulating main body 70.

[0073] The right-side harness 60b is an example of the right-side wire in a refrigerator according to the present invention, and runs from the control board 80 towards the upper-right portion of the heat-insulating main body 70.

[0074] As shown in FIG. 5, the door-side harness 18 is connected to the right-side harness 60b by passing through the inside of the hinge pin 53a and passing over the hinge member 53.

[0075] Specifically, the end of the right-side harness 60b is placed in the vicinity of the hinge member 53, and such end is directly connected to the first connection terminal 18a of the door-side harness 18.

[0076] Furthermore, in FIG. 5, a hinge cover 52a and a hinge pin cover 52b are fitted to the left hinge part 52 to which a hinge member is not attached. The hinge pin cover 52b is a first cover member that covers the second connection left terminal 40b which is not connectively wired with other wires.

[0077] It should be noted that, although not illustrated in FIG. 3 and FIG. 5 for the description of the structure of the right hinge part 51, a hinge cover and a hinge pin cover are also fitted to the right hinge part 51. The hinge cover and hinge pin may be separate pieces, and may also be of a single-piece construction.

[0078] In this manner, the door-side harness 18 passes through the inside of the hinge pin 53a and is connected to the right-side harness 60b. As such, the application of tension to the door-side harness 18 during the opening and closing of the first door 11 is prevented. Furthermore, unnecessary slackening of the door-side harness 18 during the opening and closing of the first door 11 is prevented.

[0079] Furthermore, FIG 6 is a cross-sectional view of principal parts along line A-A in FIG. 5. The second connection right terminal 40a is exposed to the outside from the inside of a wiring trench 19, and protrusions 41 are provided at intervals within the wiring trench 19. In addition, the second connection right terminal 40a is placed on the protrusions 41 and is either connected to the first connection terminal 18a or just placed on the protrusions 41 even when the when the second connection right terminal 40a is not to be used. Therefore, even when water enters from gaps in a cover member 19a covering the upper portion of the wiring trench 19, the protrusions 41 can prevent water from entering the inside of the connection terminal, and reduce faulty connection of the terminal, since the second connection right terminal 40a is located on top of the protrusions 41.

[0080] It should be noted that, although the second connection right terminal 40a and the cover member 19a

are constructed as different components, the second connection right terminal 40a may be constructed as a single-piece with the cover member 19a, so that the second connection right terminal 40a also functions as a cover member.

[0081] Although description has been made regarding the second connection right terminal 40a-side, the protrusions 41 are also formed for the wire parts of the second connection left terminal 40b and the first connection terminal 18a, and thus proving effective in preventing the entrance of water.

[0082] Using FIG. 3 to FIG. 6, description has been made thus far regarding the form, and so on, of the connection between the door-side harness 18 and the right-side harness 60b when the hinge member 53 is attached to the right hinge part 51, that is, when the first door 11 is fitted to the refrigerator 100 as a right-opening door.

[0083] FIG. 7 is an outline view showing the refrigerator 100 in which the first door 11 is attached as a right-opening door, and FIG. 8 is an outline view showing the refrigerator 100 in which the first door 11 is attached as a left-opening door.

[0084] In this case, as shown in FIG. 7, the second connection right terminal 40a and the second connection left terminal 40b of the relay harness 40 are not connected to the other terminals, and the second connection left terminal 40b that is not in use is stored within the hinge pin cover 52b, and the second connection right terminal 40a is stored within the hinge cover.

[0085] Furthermore, even when the hinge member is attached to the left hinge part 52 and the first door 11 is attached to the refrigerator 100 as a left-opening door, the door-side harness 18 and the left-side harness 60a can be connected easily.

[0086] As shown in FIG. 8, when the hinge member is attached to the left hinge part 52 and the first door 11 is changed from right-opening to left-opening, the first connection terminal 18a of the door-side harness 18 is disconnected from the right-side harness 60b, the first connection terminal 18a and the second connection right terminal 40a of the relay harness 40 are then connected and, in addition, the second connection left terminal 40b and the left-side harness 60a are connected.

[0087] At this time, the second connection left terminal 40b is connected by being passed through the inside left hinge-hole 11b and exposed from the inside of the hinge member.

[0088] Therefore, by having the user transfer the hinge member from the right side to the left side, it is possible to enable the easy changing between right-opening and left-opening of the first door 11.

[0089] Furthermore, providing the relay harness 40 can reduce the risk of disconnection of the door-side harness 18 since the door-side harness 18 is not connected to the left-side harness or right-side harness at the cabinet-side by being laid-out in a manner where it is bent in one of the left and right directions depending on the opening and closing direction of the door.

[0090] Furthermore, the hinge pin cover 52b can be made to be left-right convertible and thus cost reduction is possible. Furthermore, since the connection terminal part of the relay harness 40 and the connection terminal part of the door-side harness 18 are arranged by being placed on the protrusions, it is possible to prevent the water from going along the wires and entering the inside of the terminals.

[0091] As described above, the refrigerator 100 in the first embodiment includes the first door 11 which is capable of being changed from one of left-opening and right-opening to the other, and the display device 17 is provided on the front surface of the first door 11.

[0092] By exposing the end, including the first connection terminal 18a, of the door-side harness 18 connected to the display device 17, and connecting the exposed end to the right-side harness 60b, the first door 11 becomes capable of right-opening, and by connecting the first connection terminal 18a and the second connection right terminal 40a of the relay harness and connecting the second connection left terminal 40b and the left-side harness 60a when setting the first door 11 to left-opening, the changing between left and right opening and closing directions can be performed easily.

[0093] Specifically, the opening direction of the first door 11 can be easily changed after the shipment of the refrigerator 100, for example, when the refrigerator 100 is set up at a buyer's home. At this time, the task of modifying the internal wiring becomes necessary.

[0094] Specifically, it is necessary to modify the connection-destination of the door-side harness 18 in order to maintain the electrical connection between the display device 17 and the control board 80. With the refrigerator 100 in the first embodiment, such modification can be performed easily, as described above.

[0095] In this manner, the refrigerator 100 in the first embodiment is a refrigerator 100 that includes the first door 11 which is of the hinged-type and capable of being changed from one of left-opening and right-opening to the other, and is a refrigerator 100 that facilitates the task of changing internal wiring necessary in such changing.

[0096] It should be noted that, although the first embodiment assumes the adoption of a direct cooling method and an indirect cooling method as cooling methods for the three storage compartments, the cooling method for each storage compartment shall not be limited to a particular method in the implementation of the present invention.

[0097] For example, in the refrigerator 100 in the first embodiment, the refrigerator compartment 10, the variable-temperature compartment 20, and the freezer compartment 30 may all be cooled using an indirect cooling method.

[0098] Furthermore, the type of each storage compartment is not limited to the types described in the first embodiment. For example, the variable-temperature compartment 20 may be a storage compartment referred to as a vegetable compartment which is dedicated to the

storage of vegetables.

[0099] Furthermore, the first door 11 in the first embodiment is included in the refrigerator 100 as a door for the refrigerator compartment 10 and the variable-temperature compartment 20. However, the first door may be a door which openably closes only the opening of the refrigerator compartment 10. In other words, the variable-temperature compartment 20 may be provided with a door that is separate from the first door 11.

[0100] In other words, an advantageous effect of the present invention which is the advantageous effect of facilitating the task of modifying internal wiring following the changing of the opening direction of the first door 11 is exerted without dependency on the number of openings of the storage compartments openably closed by the first door 11.

[Second Embodiment]

[0101] The elevational view and vertical cross-sectional view of the refrigerator 100 in a second embodiment of the present invention are the same as the elevational view and the vertical cross-sectional view of the refrigerator 100 in the first embodiment, shown in FIG. 1 and FIG. 2, and thus their description shall be omitted.

[0102] It should be noted that, as shown in FIG. 2, the wiring trench 19 which runs in the left-and-right direction is present at the upper portion of the first door 11. A part of the door-side harness 18, which is exposed from the upper portion of the first door 11, that is, the free end part whose running direction can be freely changed, is buried in the wiring trench 19. The wiring trench 19 is covered by a cover member 19a.

[0103] FIG. 9 is a perspective view showing the arrangement of the door-side harness 18 in the refrigerator 100 in the second embodiment.

[0104] As shown in FIG. 9, the door-side harness 18 penetrates through the central portion (the portion including the center of the left-and-right direction of the first door 11 and the vicinity thereof) of the wiring trench 19 which extends in the left-and-right direction of the first door 11, and the part that is exposed from the first door 11 is buried in the wiring trench 19.

[0105] Furthermore, a left hinge part 52 is provided at the upper-left portion of the heat-insulating main box 70 and a right hinge part 51 is provided at the upper-right portion.

[0106] The left hinge part 52 and the right hinge part 51 are parts to which a hinge member can be attached. FIG. 9 shows the state in which the hinge member 53 for right-opening is attached to the right hinge part 51.

[0107] Furthermore, FIG. 9 shows the state in which a hinge member for left-opening (not illustrated) is not attached to the left hinge part 52, and the hinge cover 52a is fitted.

[0108] Specifically, in FIG. 9, the first door 11 is a door which swings with the right end as an axis (left side opens), and is included in the refrigerator 100 as a right-opening door.

[0109] It should be noted that the hinge member for left-opening and the hinge member 53 for right-opening need not be separate pieces, and may be a singe hinge member that is used for both right-opening and left-opening.

[0110] In this manner, when the hinge member 53 is attached to the right side, the part of the door-side harness 18 which is exposed from the upper portion of the first door 11 is bent towards the side at which the hinge member 53 is attached, that is, rightward, and the first connection terminal 18 and the harness on the board-side are connected. It should be noted that first connection terminal 18a corresponds to the "connection terminal" described in the Claims.

[0111] Furthermore, the part of the door-side harness 18 that is bent rightward is buried in the wiring trench 19 and covered by the cover member 19a.

[0112] FIG. 10 is a plan view showing the arrangement of the door-side harness 18 and the harness at the control board 80-side in the refrigerator 100 in the second embodiment.

[0113] As shown in FIG. 10, the a left-side harness 60a, which is connected to the control board 80, and the right-side harness 60b, which is likewise connected to the control board 80, are arranged in the heat-insulating main body 70.

[0114] The left-side harness 60a is an example of the left-side wire in a refrigerator according to the present invention, and runs from the control board 80 towards the upper-left portion of the heat-insulating main body 70.

[0115] The right-side harness 60b is an example of the right-side wire in a refrigerator according to the present invention, and runs from the control board 80 towards the upper-right portion of the heat-insulating main body 70.

[0116] As shown in FIG. 10, the door-side harness 18 passes through a wire opening 19b provided in a plane forming the wiring trench 19, at the central portion of the left-and-right direction of the wiring trench 19.

[0117] The door-side harness 18 which passes through the wire opening 19b in such manner is connected to the right-side harness 60b by passing through the vicinity of the hinge pin 53a and passing over the hinge member 53.

[0118] Specifically, the end of the right-side harness 60b is placed in the vicinity of the hinge member 53, and such end is connected to the first connection terminal 18a of the door-side harness 18.

[0119] Furthermore, in FIG. 10, the hinge cover 52a and the hinge pin cover 52b are fitted to the left hinge part 52 to which a hinge member is not attached.

[0120] It should be noted that, although not illustrated in FIG. 9 and FIG. 10 for the description of the structure of the right hinge part 51, a hinge cover and a hinge pin cover are also fitted to the right hinge part 51. The hinge cover and hinge pin may be separate pieces, and may also be of a single-piece construction.

[0121] In such manner, the door-side harness 18 passes through the vicinity of the hinge pin 53a and is connected to the right-side harness 60b. As such, the application of tension to the door-side harness 18 during the opening and closing of the first door 11 is prevented. Furthermore, unnecessary slackening of the door-side harness 18 during the opening and closing of the first door 11 is prevented.

[0122] Furthermore, the wire opening 19b is provided at the central portion of the left-and-right direction of the wiring trench 19. With this, the necessary length of the exposed part of the door-side harness 18 becomes approximately the same for the case where the first connection terminal 18a is connected to the left-side harness 60a and the case where the first connection terminal 18a is connected to the right-side harness 60b. Therefore, there is no need to provide the door-side harness 18 with unnecessary length.

[0123] It should be noted that, although the wire opening 19b is provided in a bottom plane which is one of the planes forming the wiring trench 19, the wire opening 19b may be provided on a side plane.

[0124] FIG. 11 is a partial cross-sectional view showing the arrangement of the door-side harness 18 in the refrigerator 100 in the second embodiment. Specifically, the cross-section along A-A shown in FIG. 9 is shown.

[0125] As shown in FIG. 11, a part of the door-side harness 18 of the first door 11, which is exposed from the upper portion of the first door 11, is buried in the wiring trench 19.

[0126] Specifically, such part of the door-side harness 18 is a part that is not buried in the insulating material 73a of the first door 11, and the running direction thereof can be changed freely. Specifically, it can be easily buried in the wiring trench 19.

[0127] Furthermore, the cover member 19a is attached to the wiring trench 19, and the wiring trench 19 and the door-side harness 18 are hidden from the outside by the cover element 19a. This prevents dirt, and the like, from accumulating in the wiring trench 19 and, appearance-wise, does not detract from the aesthetics of the first door 11.

[0128] Using FIG. 9 to FIG. 11, description has been made thus far regarding the form, and so on, of the connection between the door-side harness 18 and the right-side harness 60b when the hinge member 53 is attached to the right hinge part 51, that is, when the first door 11 is fitted to the refrigerator 100 as a right-opening door.

[0129] However, even when the hinge member is attached to the left hinge part 52 and the first door 11 is attached to the refrigerator 100 as a left-opening door, the door-side harness 18 and the left-side harness 60a can be connected easily.

[0130] Specifically, the part of the door-side harness 18, which is exposed from the upper portion of the first door 11, is bent toward the side at which the hinge member is attached, that is, leftward, and buried in the wiring trench 19. In addition, the door-side harness 18 is passed through the vicinity of the hinge pin of the hinge member, and the first connection terminal 18a and the left-side harness 60a are connected.

[0131] Furthermore, the cover member 19a is attached to the wiring trench 19 after the door-side harness 18 is buried in the wiring trench 19. With this, the part of the door-side harness 18 that is bent leftward is hidden by the cover member 19a.

[0132] FIG. 12A is an outline view showing the refrigerator 100 in which the first door 11 is attached as a right-opening door, and FIG. 12B is an outline view showing the refrigerator 100 in which the first door 11 is attached as a left-opening door.

[0133] It should be noted that illustration of shelves disposed inside the refrigerator compartment 10 and drawers, and the like, arranged on the inner surface of the first door 11 are omitted for the sake of simplifying the Drawings.

[0134] As shown in FIG. 12A, a case is assumed where, for example, the user of the refrigerator 100 attaches the first door 11 to the refrigerator 100 as a right-opening door.

[0135] In this case, the user bends the part of the door-side harness 18 that is exposed from the wire opening 19b, in the direction of the right hinge part 51, buries the exposed part in the wiring trench 19, and attaches the cover member 19a.

[0136] Furthermore, the user connects the first connection terminal 18a to the end of the right-side harness 60b which is placed in the vicinity of the hinge member 53.

[0137] In such manner, even when the first door 11 is attached to the refrigerator 100 as a right-opening door, the door-side harness 18 and the right-side harness 60b, which is a harness at the control board 80-side, can be connected through a simple operation.

[0138] Furthermore, as shown in FIG. 12B, a case is assumed where, for example, the user of the refrigerator 100 attaches the first door 11 to the refrigerator 100 as a left-opening door.

[0139] In this case, the user bends the part of the door-side harness 18 that is exposed from the wire opening 19b, in the direction of the left hinge part 52, buries the exposed part in the wiring trench 19, and attaches the cover member 19a.

[0140] Furthermore, the user connects the first connection terminal 18a to the end of the left-side harness 60a which is placed in the vicinity of the hinge member of the left hinge part 52.

[0141] In such manner, even when the first door 11 is attached to the refrigerator 100 as a left-opening door, the door-side harness 18 and the left-side harness 60a, which is a harness at the control board 80-side, can be connected through a simple operation.

[0142] As described above, the refrigerator 100 in the second embodiment includes the first door 11 which is capable of being changed from one of left-opening and right-opening to the other, and the display device 17 is provided on the front surface of the first door 11.

[0143] For the door-side harness 18 connected to the display device 17, the end including the first connection terminal 18a is exposed from the upper portion of the first door 11, and the exposed part can be bent either leftward or rightward.

[0144] Furthermore, the length of the part exposed from the upper part of the first door 11 is a length which allows the first connection terminal 18a and the left-side harness 60a to be connected when the exposed part is bent leftward, and allows the first connection terminal 18a and the right-side harness 60b to be connected when the exposed part is bent rightward.

[0145] This allows the first connection terminal 18a and the left-side harness 60a to be connected easily when the first door 11 is set up to be left-opening. Furthermore, the first connection terminal 18a and the left-side harness 60a can be connected easily when the first door 11 is set up to be right-opening.

[0146] Specifically, the opening direction of the first door 11 can be changed after the shipment of the refrigerator 100, for example, when the refrigerator 100 is set up at a buyer's home. At this time, the task of modifying the internal wiring becomes necessary.

[0147] Specifically, it is necessary to modify the connection-destination of the door-side harness 18 in order to maintain the electrical connection between the display device 17 and the control board 80. With the refrigerator 100 in the second embodiment, such modification can be performed easily, as described above.

[0148] It should be noted that, in order to handle the changing of the opening direction of the door, it is also possible to pre-embed a door-side harness running both leftward and rightward of the door at the time the door is fabricated. However, when comparing a refrigerator having such a structure and the refrigerator 100 in the second embodiment, the refrigerator 100 in the second embodiment is economically advantageous because the amount of work required in fabricating the door is less and the total extension of the door-side harness is shorter.

[0149] In this manner, the refrigerator 100 in the second embodiment is a refrigerator 100 that includes the first door 11 which is of the hinged-type and capable of being changed from one of left-opening and right-opening to the other, and is a refrigerator 100 that facilitates the task of changing internal wiring necessary in such changing.

[0150] It should be noted that, although the second embodiment assumes the adoption of a direct cooling method and an indirect cooling method as cooling methods for the three storage compartments, the cooling method for each storage compartment shall not be limited to a particular method in the implementation of the present invention.

[0151] For example, in the refrigerator 100 in the second embodiment, the refrigerator compartment 10, the variable-temperature compartment 20, and the freezer compartment 30 may all be cooled using an indirect cooling method.

[0152] Furthermore, the type of each storage compartment is not limited to the types described in the second embodiment. For example, the variable-temperature compartment 20 may be a storage compartment referred to as a vegetable compartment which is dedicated to the storage of vegetables.

[0153] Furthermore, the first door 11 in the second embodiment is included in the refrigerator 100 as a door for the refrigerator compartment 10 and the variable-temperature compartment 20. However, the first door may be a door which openably closes only the opening of the refrigerator compartment 10. In other words, the variable-temperature compartment 20 may be provided with a door that is separate from the first door 11.

[0154] In other words, an advantageous effect of the present invention which is the advantageous effect of facilitating the task of modifying internal wiring following the changing of the opening direction of the first door 11 is exerted without dependency on the number of openings of the storage compartments openably closed by the first door 11.

[0155] Although the refrigerator according to an implementation of the present invention has been described thus far using the above-mentioned embodiments, the present invention is not limited to such embodiments.

[0156] Specifically, the embodiments currently disclosed should be considered, in all points, as being examples, and are not restricting. The scope of the present invention is indicted, not by the previous description, but by the Claims, and all modifications having equivalent meaning and falling within the scope of the Claims are intended to be included.

[0157] Furthermore, the respective constituent elements in the above-described embodiments may be combined within a scope that does not depart from the essence of the invention.

[Industrial Applicability]

[0158] The present invention can provide a refrigerator which includes a hinged door capable of being changed from one of left-opening and right-opening to the other, and which facilitates the task of modifying internal wiring required in such changing. Therefore, the present invention is useful as refrigerators of various types and sizes, such as refrigerators for household use and commercial use.

[Reference Signs List]

[0159]

10	Refrigerator compartment
10a	Deep-end plane
11	First door
11a	Right hinge-hole
11b	Left hinge-hole

12	First cooler
12a	Cooling pipe
12b	Metal plate
15	Partition
17	Display device
18	Door-side harness
18a	First connection terminal
19	Wiring trench
19a	Cover member
19b	Wire opening
20	Variable-temperature compartment
25	Partition
30	Freezer compartment
31	Second door
32	Second cooler
40	Relay harness
40a	Second connection right terminal
40b	Second connection left terminal
41	Protrusions
51	Right hinge part
52	Left hinge part
52a	Hinge cover
52b	Hinge pin cover
53	Hinge member
53a	Hinge pin
60a	Left-side harness
60b	Right-side harness
70	Heat-insulating main body
71	Inner casing
72	Outer casing
73	Foam heat-insulating material
73a	Insulating material
80	Control board
100	Refrigerator

Claims

1. A refrigerator comprising:

a heat-insulating main body;
a storage compartment which is located inside said heat-insulating main body and has an opening in a front surface;
a door of a hinged-type, which openably closes the opening and is capable of being changed from one of left-opening and right-opening to the other, by transferring a hinge member from one of an upper-left portion and an upper-right portion of said heat-insulating main body to the other;
an information terminal which is provided on a front surface of said door and is for inputting or outputting information;
a control board which is provided in said heat-insulating main body and controls said information terminal;
a left-side wire which runs from said control board to the upper-left portion of said heat-insulating main body;
a right-side wire which runs from said control board to the upper-right portion of said heat-insulating main body;
a door-side wire which has one of ends connected to said information terminal and the other of the ends exposed from an upper portion of said door;
a first connection terminal which is provided at the other of the ends of said door-side wire and capable of being connected to one of said left-side wire and said right-side wire; and
a relay wire which includes two second connection terminals, one of which is exposed from an upper-left portion of said door and the other of which is exposed from an upper-right portion of said door,
wherein:

when said first connection terminal is directly connected to said right-side wire, the two of said second connection terminals are placed without being connected; and
when said first connection terminal is directly connected to one of said second connection terminals, the other of said second connection terminals is placed connected to said left-side wire.

2. The refrigerator according to Claim 1,
wherein protrusions are formed in a wiring trench in which said second connection terminals of said relay wire are housed, and said second connection terminals are placed on said protrusions.

3. The refrigerator according to one of Claim 1 and Claim 2, wherein a wire part of said relay wire is arranged within an insulating part of said door.

4. The refrigerator according to any one of Claim 1 to Claim 3, wherein each of said second connection terminals includes a cover member which covers said wiring trench in which said second connection terminals are housed.

5. A refrigerator comprising:

a heat-insulating main body;
a storage compartment which is located inside said heat-insulating main body and has an opening;
a door of a hinged-type, which openably closes the opening and is capable of being changed from one of left-opening and right-opening to the other, by transferring a hinge member from one of an upper-left portion and an upper-right portion of said heat-insulating main body to the other;

an information terminal which is provided on a front surface of said door and is for inputting or outputting information;
a control board which is provided in said heat-insulating main body and controls said information terminal;
a left-side wire which runs from said control board to the upper-left portion of said heat-insulating main body;
a right-side wire which runs from said control board to the upper-right portion of said heat-insulating main body;
a door-side wire which has one of ends connected to said information terminal and the other of the ends exposed from an upper portion of said door so that a part that is exposed from the upper portion of said door is capable of being bent to either left or right; and
a connection terminal which is provided at the other of the ends of said door-side wire and capable of being connected to one of said left-side wire and said right-side wire,
wherein a length of the part that is exposed from the upper portion of said door is a length which allows said connection terminal and said left-side wire to be connected when the part that is exposed is bent to the left, and allows said connection terminal and said right-side wire to be connected when the part that is exposed is bent to the right.

6. The refrigerator according to Claim 5, further comprising:

a wiring trench in which said door-side wire is buried, said wiring trench running in a left-and-right direction in the upper portion of said door; and
a wire opening through which said door-side wire passes, and which is provided in a plane forming said wiring trench, at a central portion in the left-and-right direction of said wiring trench.

FIG. 1

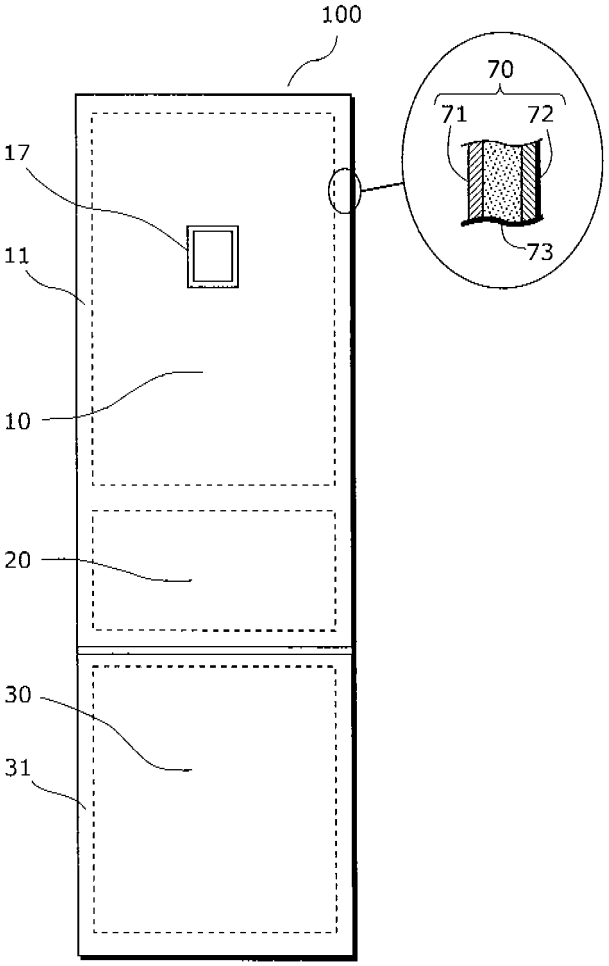


FIG. 2

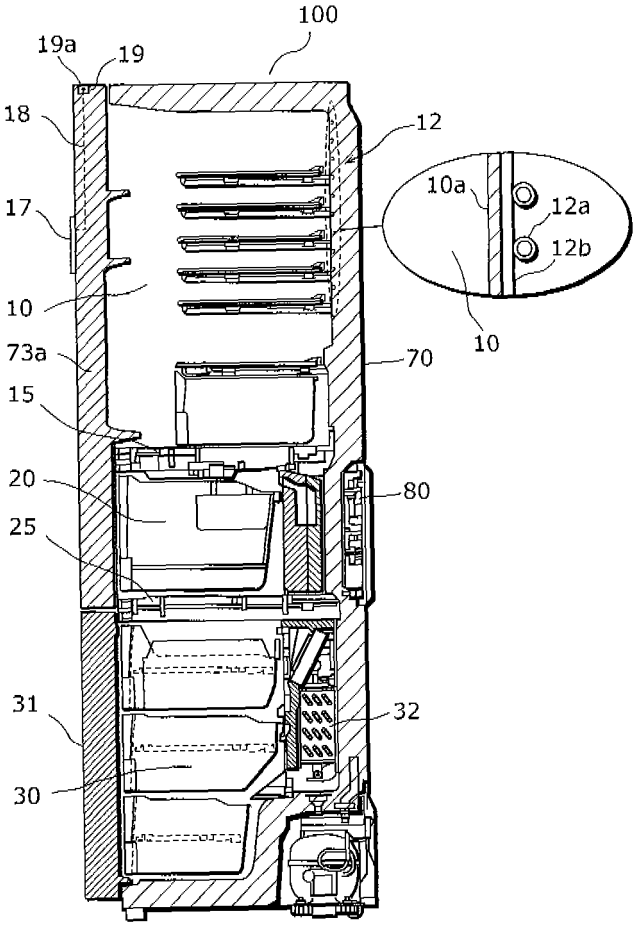


FIG. 3

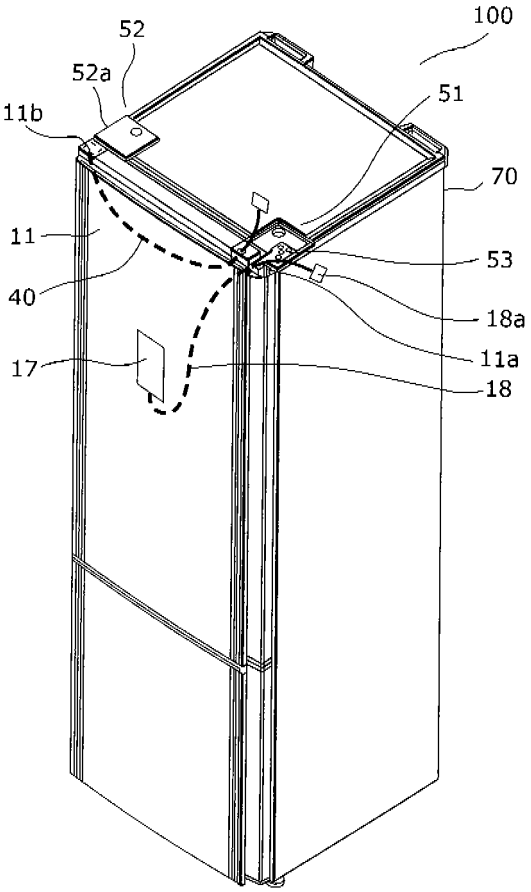


FIG. 4

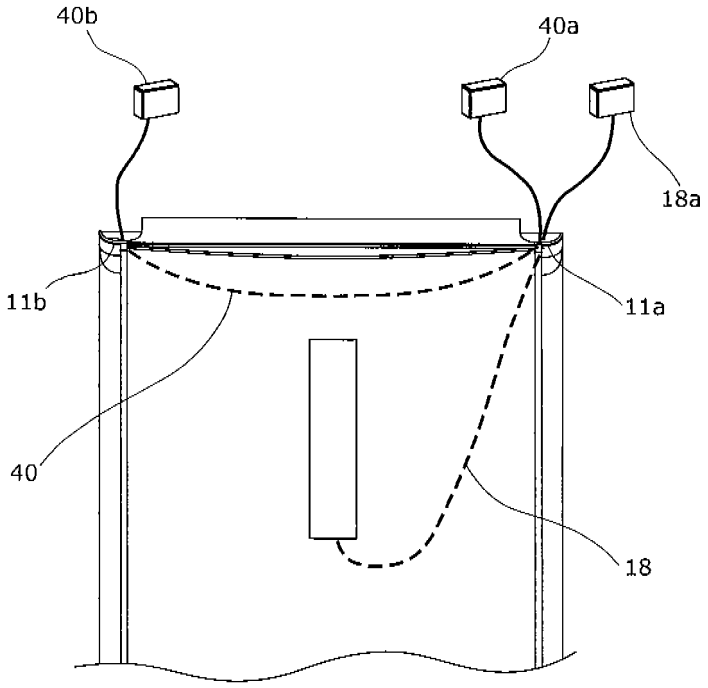


FIG. 5

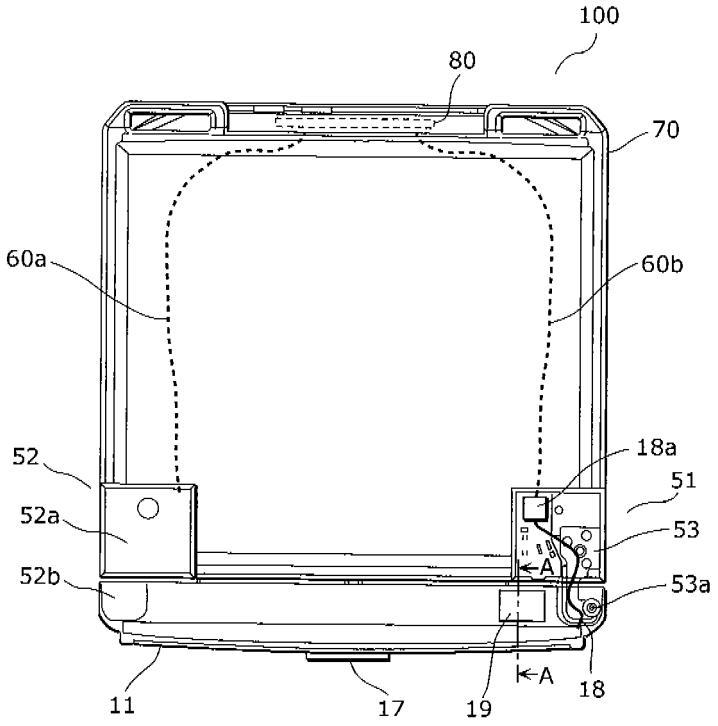


FIG. 6

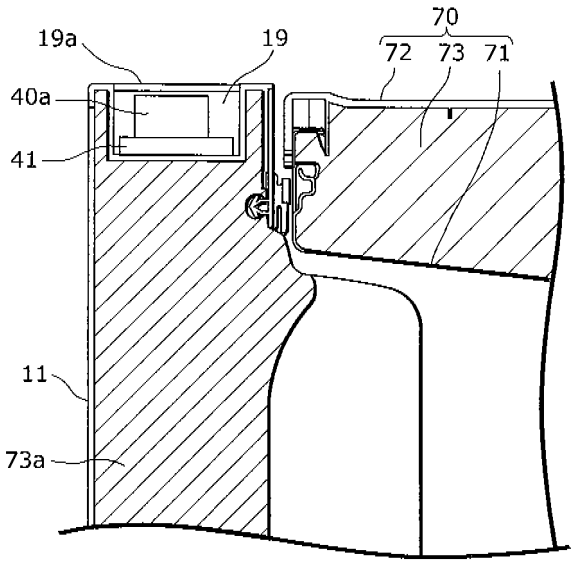


FIG. 7

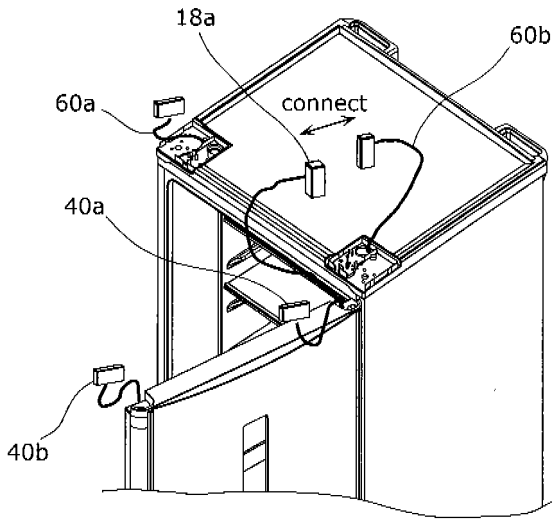


FIG. 8

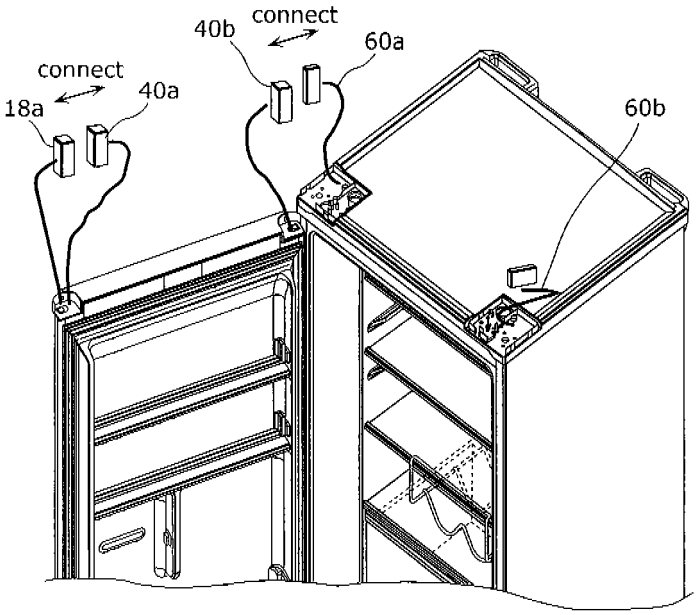


FIG. 9

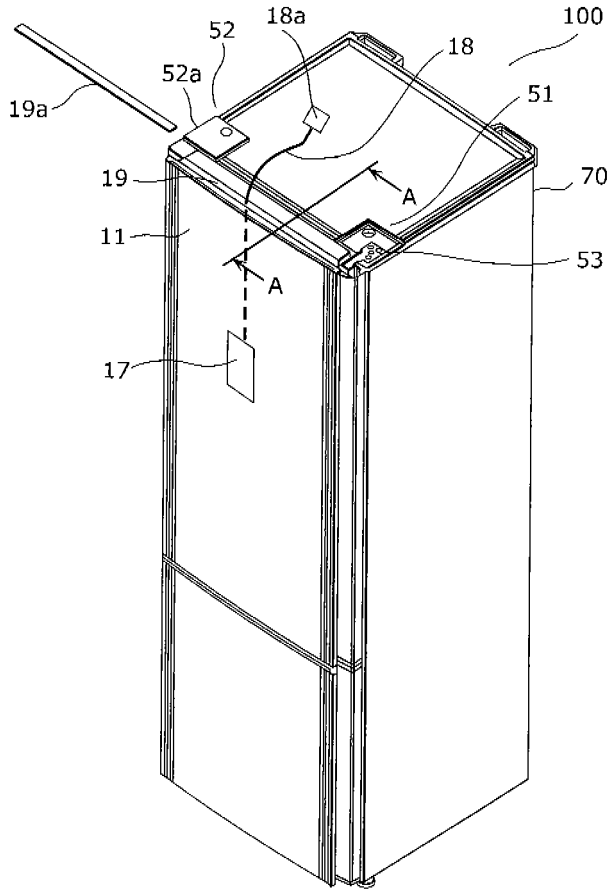


FIG. 10

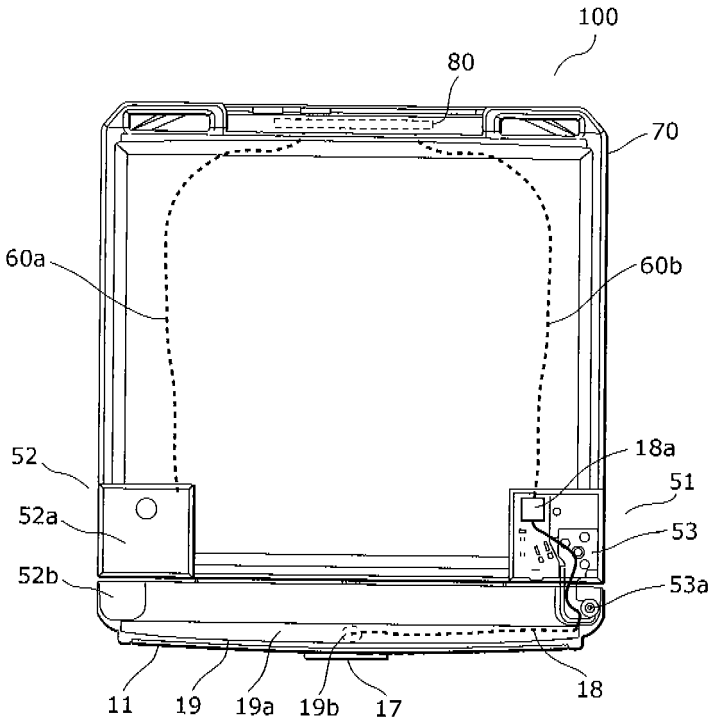


FIG. 11

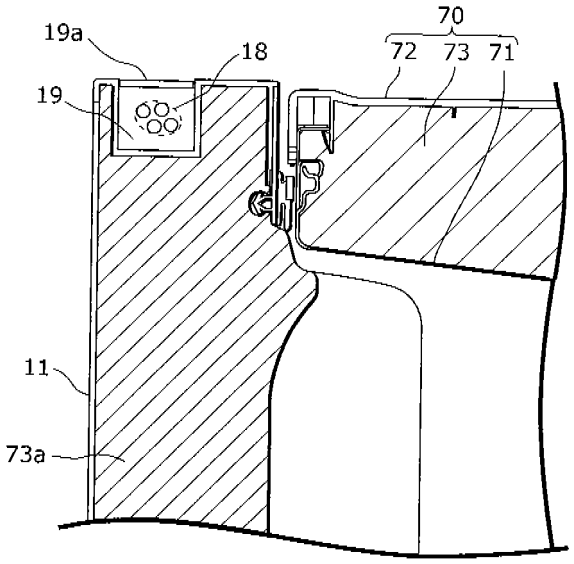


FIG. 12B

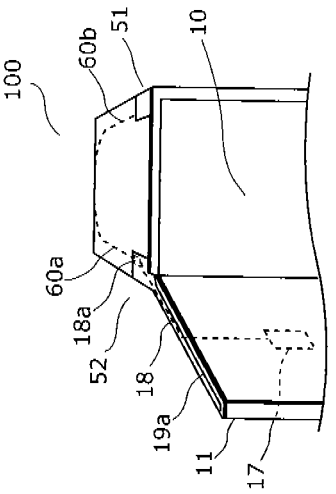


FIG. 12A

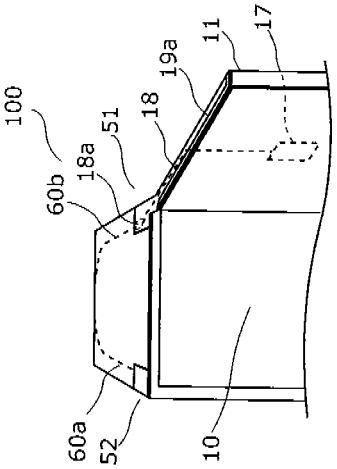


FIG. 13

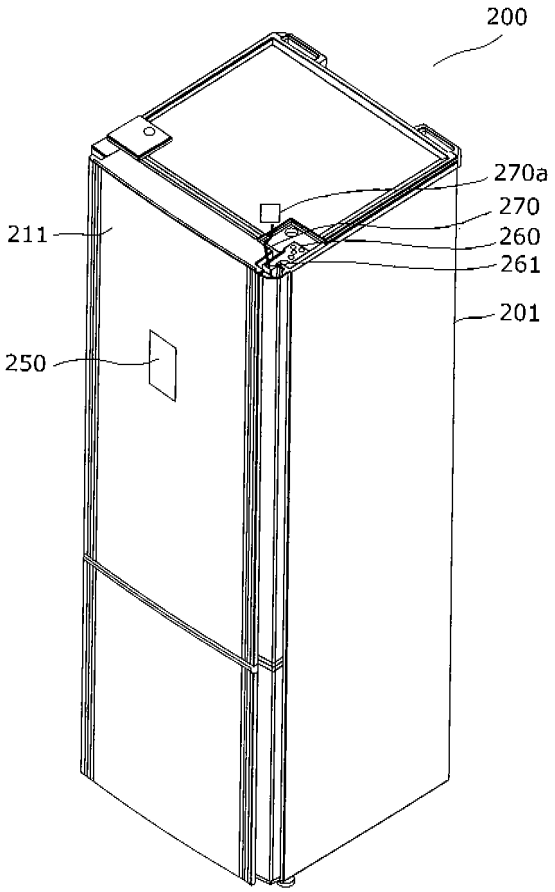
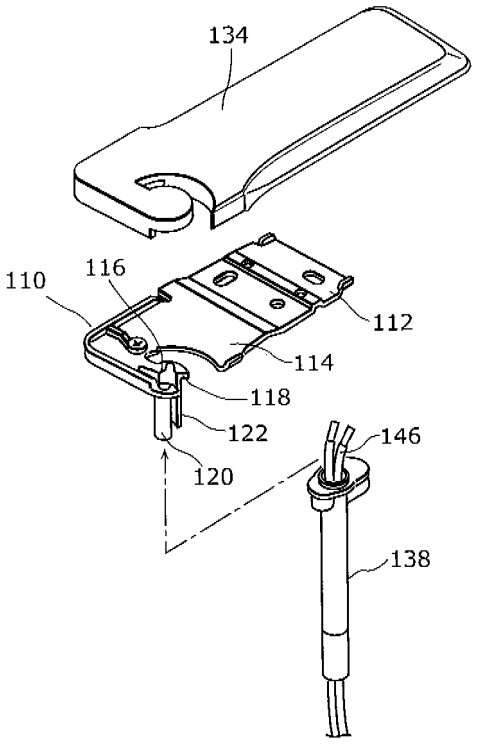


FIG. 14



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/003617

A. CLASSIFICATION OF SUBJECT MATTER
F25D23/02(2006.01)i, F25D23/00(2006.01)i, F25D29/00(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F25D23/02, F25D23/00, F25D29/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2009
Kokai Jitsuyo Shinan Koho 1971-2009 Toroku Jitsuyo Shinan Koho 1994-2009

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2007-85639 A (Sharp Corp.), 05 April 2007 (05.04.2007), entire text; all drawings (Family: none)	1-4
A	JP 60-261878 A (Hitachi, Ltd.), 25 December 1985 (25.12.1985), entire text; all drawings (Family: none)	1-4
A	JP 2006-64288 A (Hoshizaki Electric Co., Ltd.), 09 March 2006 (09.03.2006), entire text; all drawings (Family: none)	1-4

☒ 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
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"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
27 November, 2009 (27.11.09)	08 December, 2009 (08.12.09)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/003617

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005-221184 A (Hoshizaki Electric Co., Ltd.), 18 August 2005 (18.08.2005), entire text; all drawings (Family: none)	1-4
A	JP 8-296952 A (Toshiba Corp.), 12 November 1996 (12.11.1996), entire text; all drawings (Family: none)	1-4

Form PCT/ISA/210 (continuation of second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/003617

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See extra sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-4

Remark on Protest

the

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/003617

Continuation of Box No.III of continuation of first sheet(2)

Document 1: JP 2007-85639 A (Sharp Corp.), 5 April 2007 (05.04.2007), entire text, all drawings
Document 2: JP 60-261878 A (Hitachi, Ltd.), 25 December 1985 (25.12.1985), entire text, all drawings

The technical feature common to the invention (hereinafter referred to as the "specified invention") of claim 1 and the inventions of independent claim 5 and of claim 6 citing claim 5 is a technical matter that "a refrigerator provided with a heat insulated box, a storage compartment provided on the inner side of the heat insulated box and having an opening in the front face of the storage compartment, and a hinged door for openably closing the opening, the hinged door being configured such that the opening configuration thereof can be changed from one of a left-hand opening configuration or a right-hand opening configuration to the other by changing the position of mounting of a hinge member from one of the upper left part or the upper right part of the heat insulated box to the other." However, the technical matter is a publicly known technique because the technical matter is disclosed in document 1 or document 2.

As a consequence, the technical feature common to the specified invention and the inventions of claim 5 and claim 6 is not a special technical feature within the meaning of PCT Rule 13.2, second sentence. Also, since there are no other technical matters which are the same or corresponding to each other and which can be considered as special technical features within the same meaning as above, no technical relationship within the meaning of PCT Rule 13.2, first sentence, can be seen.

Accordingly, the inventions of claim 1 and of claims 2 to 4 which cite claim 1 are classified into the first invention group, and the inventions of claim 5 and claim 6 are classified into the invention group 2.

As described above, the first invention group and the second invention group which are presented in the note below are not so linked as to form a single general inventive concept, and therefore the inventions of claims 1-6 do not satisfy the requirement of unity of invention.

Note:
First invention group: the inventions of claim 1 to claim 4
Second invention: the inventions of claim 5 and claim 6

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 8296952 A **[0017]**