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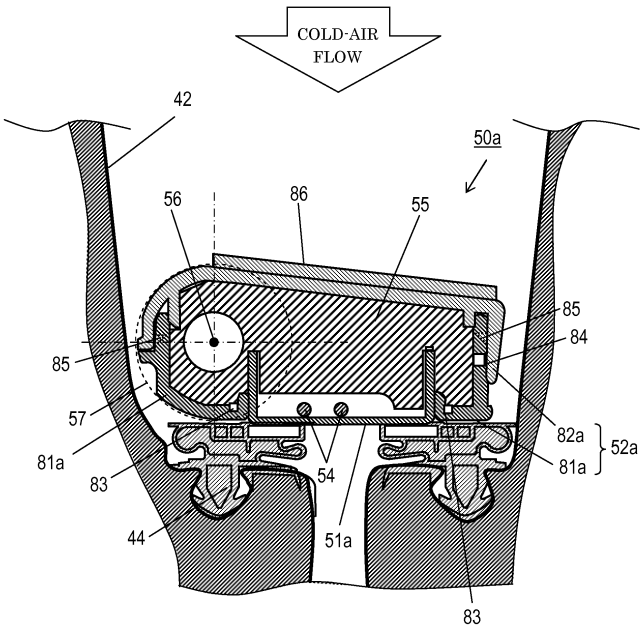
# (54) REFRIGERATOR

(57) A refrigerator of the present invention comprises a double-leafed type door configured to close a front opening of a storage compartment, a gasket disposed along a perimeter on a back face of the door, and coming into contact with a peripheral edge of the opening of a refrigerator main body, and a rotatable baffle body disposed to an inner face at a non-pivoted side of the doors. The baffle body comprises a contact plate having a high thermal conductivity and magnetic property, and an outer casing member that configures an outer casing of the baffle body in combination with the contact plate and a resin material of a low thermal conductivity.

FIG. 4

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## Description

### TECHNICAL FIELD

**[0001]** The present invention relates to a double-leafed door refrigerator equipped with a rotatable baffle body.

### BACKGROUND ART

**[0002]** Fig. 13 is an exploded perspective view of a rotatable baffle body of a conventional refrigerator described in Patent Literature 1, and Fig. 14 is a general cross-sectional view of the rotatable baffle body of the conventional refrigerator.

**[0003]** As shown in Fig. 13, baffle body 101 comprises main body 102, cap 103, contact plate 104, insulation material 105 and hinge member 106. Main body 102 is formed of a resin having a cross-sectional shape of generally the letter U. Cap 103 is mounted to each of top and bottom ends of this main body 101. Contact plate 104 is formed of a metal having a cross-sectional shape of generally the letter U, and attached to main body 102 and caps 103 with a space provided between it and main body 102. Insulation material 105 is formed of styrene foam or the like material, and placed in the space provided between contact plate 104 and main body 102. Hinge member 106 serves as a shaft when baffle body 101 rotates.

**[0004]** Baffle body 101 is joined to refrigerator door 107 by hinge member 106, as shown in Fig. 14. Baffle body 101 closes a front opening of a storage compartment, and secures its airtightness with gasket 108 disposed along a perimeter on a back face of refrigerator door 107 and in contact with a peripheral edge of the opening the refrigerator main body and contact plate 104. Baffle body 101 rotates on center 109 of a shaft of hinge member 106 with opening and closing motions of refrigerator door 107, to provide access to food. In addition, heating plate 110 is provided between contact plate 104 and insulation material 105 for preventing dew condensation on the surface of contact plate104.

**[0005]** Accordingly, it is possible in the double-leafed door refrigerator to secure airtightness of the interior of the refrigerator by having contact plate 104 form a contact face with the gasket only when the door having baffle body 101 is closed, improve the accessibility to food, while also improving thermal insulation in a baffle portion with insulation material 105 placed inside baffle body 101.

**[0006]** In the conventional structure described above, however, side portions of contact plate 104 having the cross-sectional shape of generally the letter U are so configured that they are subject to being cooled by the cold air inside the refrigerator. In addition, metal contact plate 104 having a high thermal conductivity causes a large amount of heat to leak outside of the refrigerator because it occupies nearly the entire surface of baffle body 101 exposed to the outside of the refrigerator, which gives rise to a problem of increasing electric power consumption.

Citation List:

Patent Literature

**[0007]** PTL 1: Japanese Patent Unexamined Publication No. 1994-42859

### SUMMARY OF THE INVENTION

**[0008]** A refrigerator of the present invention comprises a double-leafed type door configured to close a front opening of a storage compartment, a gasket disposed along a perimeter on a back face of the door and in contact with a peripheral edge of the opening of a refrigerator main body, and a rotatable baffle body disposed to an inner face at a non-pivoted side of the door. The baffle body comprises a contact plate having a high thermal conductivity and magnetic property, and an outer casing member that configures an outer casing of the baffle body in combination with the contact plate and a resin material of a low thermal conductivity.

**[0009]** As a result, the structure can decrease an amount of heat leakage from the contact plate and reduce an electric power consumption of the refrigerator.

### BRIEF DESCRIPTION OF DRAWINGS

**[0010]**

Fig. 1 is a longitudinal sectional view of a refrigerator according to first exemplary embodiment of the present invention.

Fig. 2 is a schematic top view of a double-leafed door refrigerator according to the first exemplary embodiment of the invention.

Fig. 3A is a sectional view of a main part of doors of the double-leafed door refrigerator according to the first exemplary embodiment of the invention.

Fig. 3B is a perspective view of a left door of the double-leafed door refrigerator according to the first exemplary embodiment of the invention.

Fig. 4 is a general sectional view of a rotatable baffle body according to the first exemplary embodiment of the invention.

Fig. 5A is a sectional view of the rotatable baffle body and the vicinity thereof when the door is in closed position according to the first exemplary embodiment of the invention.

Fig. 5B is a cross sectional view of the rotatable baffle body and the vicinity thereof when the door is being opened according to the first exemplary embodiment of the invention.

Fig. 6 is a sectional view of a flat joint piece of an exterior-side resin member according to the first exemplary embodiment of the invention.

Fig. 7 is a lateral sectional view of a rotatable baffle body according to second exemplary embodiment of the invention.

Fig. 8A is a lateral sectional view of a rotatable baffle body according to third exemplary embodiment of the invention.

Fig. 8B is a lateral sectional view of a rotatable baffle body according to fourth exemplary embodiment of the invention.

Fig. 8C is a lateral sectional view of a rotatable baffle body according to fifth exemplary embodiment of the invention.

Fig. 9 is a lateral sectional view of a rotatable baffle body according to sixth exemplary embodiment of the invention.

Fig. 10A is a lateral sectional view of a rotatable baffle body according to seventh exemplary embodiment of the invention.

Fig. 10B is a lateral sectional view of a rotatable baffle body according to eighth exemplary embodiment of the invention.

Fig. 10C is a lateral sectional view of a rotatable baffle body according to ninth exemplary embodiment of the invention.

Fig. 11 is a lateral sectional view of a rotatable baffle body according to tenth exemplary embodiment of the invention.

Fig. 12A is a lateral sectional view of a rotatable baffle body according to eleventh exemplary embodiment of the invention.

Fig. 12B is a lateral sectional view of a rotatable baffle body according to twelfth exemplary embodiment of the invention.

Fig. 13 is an exploded perspective view of a rotatable baffle body of a conventional refrigerator.

Fig. 14 is a general sectional view of the rotatable baffle body of the conventional refrigerator.

## DESCRIPTION OF EMBODIMENTS

**[0011]** Description will be provided hereinafter of exemplary embodiments of the present invention by referring to the accompanying drawings. In the following exemplary embodiments, same reference marks are used to denote components identical and/or similar to those of preceding embodiments, and their detailed descriptions will be omitted. Note that the following exemplary embodiments should not be construed as limiting the scope of the present invention.

## FIRST EXEMPLARY EMBODIMENT

**[0012]** Fig. 1 is a longitudinal sectional view of a refrigerator according to the first exemplary embodiment of the present invention, Fig. 2 is a schematic top view of a double-leafed door refrigerator according to the first embodiment, Fig. 3A is a sectional view of a main part of doors of the double-leafed door refrigerator according to the first embodiment, Fig. 3B is a perspective view of a left door of the double-leafed door refrigerator according to the first embodiment, Fig. 4 is a general sectional view of a rotatable baffle body (i.e., mullion bar) according to the first embodiment, Fig. 5A is a sectional view of the rotatable baffle body and the vicinity thereof when the door is in closed position according to the first embodiment, Fig. 5B is a sectional view of the rotatable baffle body and the vicinity thereof when the door is being opened according to the first embodiment, and Fig. 6 is a cross sectional view of a flat joint piece of an exterior-side resin member according to the first embodiment. Note that the structures of the refrigerator shown in Fig. 1 to Fig. 3B are common to all of the following second through twelfth exemplary embodiments.

**[0013]** In Fig. 1, insulated cabinet 31 of refrigerator 30 comprises outer box 32 made mainly from a steel sheet, and inner box 33 formed of a resin such as ABS. An inner space of insulated cabinet 31 is filled with foam insulation 34 such as a rigid foam urethane to insulate thermally from the surrounding environment, and the interior is divided into a plurality of storage compartments. The structure is such that refrigerator compartment 35 is disposed to an uppermost section, convertible compartment 36 is disposed under refrigerator compartment 35, and freezer compartment 37 is disposed to a lowermost section.

**[0014]** Refrigerator compartment door 38, convertible compartment door 39 and freezer compartment door 40 are pivotally supported at their respective locations in front of refrigerator compartment 35, convertible compartment 36 and freezer compartment 37 so that their front openings are freely openable.

**[0015]** Refrigerator compartment 35 is normally set to a temperature between 1°C and 5°C with a lower limit not to freeze food for chilled storage. Convertible compartment 36 has a temperature setting selectable from a freezing temperature range to a refrigeration temperature range such that the temperature can be set from -18°C to 4°C in one degree intervals. Freezer compartment 37 is normally set to keep a temperature within a freezing temperature range of -22°C to -15°C for frozen storage, but the temperature of freezer compartment 37 may be set to a lower temperature of -30°C or -25°C in certain instances to improve the frozen storage condition.

**[0016]** In Fig. 2, the storage compartment of refrigerator 30 is opened and closed with a pair of double-leafed doors. Refrigerator compartment door-left 38a and refrigerator compartment door-right 38b that compose this pair of doors are pivotally supported at their outer confronting sides with hinges mounted to refrigerator 30.

**[0017]** As shown in Fig. 3A and Fig. 3B, a main body of each of refrigerator compartment door-left 38a and refrigerator compartment door-right 38b is constructed from exterior side member 41, interior side member 42 and upper and lower caps to form a closed space, which is filled with insulation material 43. Baffle body 50a is mounted to interior side member 42 at a free-end side of refrigerator compartment door-left 38a, such that it is ro-

tatable in a manner to swing forward and backward from refrigerator compartment door-right 38b.

**[0018]** Each of mounting fixtures 45 provided with a shaft is attached to refrigerator compartment door-left 38a at both top and bottom ends of baffle body 50a to make it rotatable. There is a spring mounted to a compartment side of baffle body 50a so that a mechanism using a force of the spring makes baffle body 50a rotate in a linked motion with opening and closing of refrigerator compartment door-left 38a.

**[0019]** Gasket 44 is disposed to each of interior side members 42 of refrigerator compartment door-left 38a and refrigerator compartment door-right 38b to seal the front opening of refrigerator compartment 35.

**[0020]** In Fig. 4, Fig. 5A and Fig. 5B, baffle body 50a closes the front opening of the compartment and secures its airtightness with gasket 44, which is disposed along a perimeter on the back face of the refrigerator door and comes into contact with a peripheral edge of the opening the refrigerator main body and contact plate 51a. Baffle body 50a provided with metal contact plate 51a having magnetic property configures outer casing member 52a that serves a basic outer casing consisting of two resin members at an exterior side and an interior side. Outer casing member 52a comprises exterior-side resin member 81a that forms an exterior side face and compartment-side resin member 82a that forms an interior side face. Exterior-side resin member 81a has a shape configured to house contact plate 51a so that exterior-side resin member 81a and contact plate 51a form the exterior side of the outer casing.

**[0021]** Contact plate 51a has a cross-sectional shape of generally the letter U, and it is fixed to exterior-side resin member 81a with tabs formed on both sides thereof, or by using a fixing screw. Heating plate 54 is attached to substantially an entire back surface of contact plate 51a to prevent dew condensation on the surface of contact plate 51a. Insulation material 55 is provided in a space inside the baffle body configured with exterior-side resin member 81a, compartment-side resin member 82a and contact plate 51a, and it is so formed as to enfold especially the side portions of contact plate 51a.

**[0022]** Exterior-side resin member 81a and contact plate 51a form a contact face with gasket 44 to seal the cold air.

**[0023]** Mounting fixture 45 of baffle body 50a has a shaft, and it is so configured that center 56 of the shaft is located inside of exterior-side resin member 81a and compartment-side resin member 82a. Besides, center 56 of the shaft is located outside of the side face portion of contact plate 51a. Moreover, one of side face portions of baffle body 50a closer to the shaft lies outside of a side edge of gasket 44 in the lateral direction. These configurations can reduce a gap between baffle body 50a and the door where the cold air in the compartment can pass through, thereby suppressing the cold air in the compartment from exchanging heat with the outside air through gasket 44, and improving the efficiency of power consumed of the refrigerator.

**[0024]** Exterior-side resin member 81a and compartment-side resin member 82a form an outer casing of a curved shape of which rotational trajectory 57 lies along a largest area that does not interfere with interior side member 42 during rotation of baffle body 50a. This rotational trajectory 57 lies in a concentric circle of center 56 of the shaft. In other words, outer casing member 52a has a curved surface portion having substantially a circular shape concentric with the shaft of baffle body 50a, from a flat portion through a side portion that configure the outer casing of baffle body 50a.

**[0025]** Exterior-side resin member 81a is provided with grooves 83 having a thickness of about a half a basic plate thickness formed near areas in contact with contact plate 51a, and these grooves are cut from the inside of baffle body 50a that is not visible from the exterior side.

**[0026]** Exterior-side resin member 81a is also provided with hole 84 in the side face thereof. Hole 84 is formed in a location covered by the side face of compartment-side resin member 82a, such that it is not visible from the exterior side of baffle body 50a.

**[0027]** The side faces of exterior-side resin member 81a are formed to be inside of the side faces of compartment-side resin member 82a. Pawl-fitting portions 85 provided in exterior-side resin member 81a are engaged and fixed to fixing portions of compartment-side resin member 82a.

**[0028]** Insulation material 86 having a width larger than a width of contact plate 51a is fixed to an entire compartment-side surface of compartment-side resin member 82a in a direction of the full length of baffle body 50a except for areas in the proximity of mounting fixtures 45.

**[0029]** In Fig. 6, exterior-side resin member 81a has flat joint piece 87 that connects right and left flat portions of it. Flat joint piece 87 connects the right and left flat portions of exterior-side resin member 81a at a number of places, although the general cross section is just that illustrated in Fig. 4. Flat joint piece 87 has a shape formed parallel to a shape of side faces of contact plate 51a. Insulation material 55 disposed between exterior-side resin member 81a and compartment-side resin member 82a is so formed that it fills the space corresponding to the shape of flat joint piece 87.

**[0030]** Description is provided hereinafter of operation and functions of the refrigerator constructed as illustrated above.

**[0031]** Because contact plate 51a is made of a metal in the cross sectional shape of generally the letter U, it can increase strength of baffle body 50a to prevent leakage of the cold air from the compartment through a gap in the gasket contact face attributed to deformation of baffle body 50a. Contact plate 51a can further prevent leakage of the cold air from the compartment through the gap in the gasket contact face since it promotes attraction of a magnet contained in gasket 44 even when a condition of the contact is impaired due to the deformation mentioned above. In addition, contact plate 51a can efficiently

absorb an amount of the heat from heating plate 54, which helps suppress an excessive amount of the heat generated by heating plate 54, and reduce an amount of the electric power consumption of the refrigerator.

**[0032]** A periphery of contact plate 51a is surrounded by exterior-side resin member 81a made of a resin having a thermal conductivity lower than metal, and insulation material 55 such as a foam insulation is disposed on the compartment side, in order to increase a thermal insulation property around the side face portions of contact plate 51a which is susceptible to the heat transferred from the cold air in the compartment. This structure reduces an area occupied by contact plate 51a in the gasket contact face, and increases the thermal insulation property around contact plate 51a as compared to the conventional structure. It can thus suppress an amount of the heat leaked from contact plate 51a, and reduce an amount of the electric power consumption of the refrigerator.

**[0033]** The main baffle body of generally a box form becomes a pouch-like shape when the periphery of contact plate 51a is surrounded with the main baffle body. Although this structure makes a molding die difficult to produce, it provides an advantage that a surface constituting the gasket contact face of a low heat conductive material having the box-shaped can be formed easily by making the main baffle body a two-component structure consisting of exterior-side resin member 81a at the gasket contact face side and compartment-side resin member 82a at the compartment side of the refrigerator. Since consideration is also given to preparation of the molding-die of the low heat conductive material for baffle body 50a, it facilitates fabrication of the components efficiently and reduces the production cost of the refrigerator.

**[0034]** Here, center 56 of the shaft of baffle body 50a is located inside of exterior-side resin member 81a and compartment-side resin member 82a that form the outer casing of baffle body 50a, and this configuration can increase a thickness of insulation material 55 from contact plate 51a to the compartment. As a result, this configuration can further increase the thermal insulation property around contact plate 51a.

**[0035]** In addition, center 56 of the shaft is located outside of the side face portion of contact plate 51a to ensure rotational movement of baffle body 50a, while also securing the sufficient thickness of insulation material 55 from the side face portion of contact plate 51a to the compartment. This configuration can further improve the effect of reducing an amount of heat leakage.

**[0036]** The outer casing formed with exterior-side resin member 81a and compartment-side resin member 82a has a curved shape along rotational trajectory 57, which lies in a concentric circle of center 56 of the shaft. Baffle body 50a can thus rotate in a linked motion with opening and closing of refrigerator compartment door-left 38a without interfering with interior side member 42. While baffle body 50a is designed to rotate on center 56 of the shaft and to stop the rotation at a predetermined position when refrigerator compartment door-left 38a is opened, as described above, there may be a case however, that baffle body 50a hits against interior side member 42 due to a momentum of the rotation. In such a case, insulation material 86 fixed to the flat surface of compartment-side resin member 82a suppresses impact sound by absorbing the shock.

**[0037]** Exterior-side resin member 81a is provided with grooves 83 having a thickness of about a half the basic plate thickness, formed near areas in contact with contact plate 51a. Exterior-side resin member 81a is also provided with hole 84 in the side face thereof. Because of this structure, the heat of the outside air and heating plate 54 is transferred first to contact plate 51a, and then to exterior-side resin member 81a, where the heat transferred in exterior-side resin member 81a is hampered from dispersing throughout the material by thermal conduction. It becomes possible, as a result, to decrease an amount of the heat being exchanged with the compartment space, and reduce an amount of the power consumption.

**[0038]** Insulation material 86 fixed to the flat surface of compartment-side resin member 82a is a material having a thermal conductivity lower than that of compartment-side resin member 82a and a width larger than that of contact plate 51a, and it is fixed to the entire surface in the direction of the full length of baffle body 50a except for the areas in the vicinity of mounting fixtures 45. This structure can reduce the effect of the cold air delivered from the compartment upon baffle body 50a.

**[0039]** The side faces of exterior-side resin member 81a are formed to be inside of the side faces of compartment-side resin member 82a, which makes exterior-side resin member 81a unlikely to be influenced by compartment-side resin member 82a that is cooled by the delivered cold air, and suppresses the cold air from hitting directly on exterior-side resin member 81a.

**[0040]** In addition, strength of exterior-side resin member 81a is secured in its entirety by disposing flat joint piece 87 to connect the right and left flat portions of exterior-side resin member 81a at a number of places with contact plate 51a held in it. Flat joint piece 87 is also used for locating a gate position in the molding process, thereby helping the resin material to flow efficiently throughout exterior-side resin member 81a. Furthermore, this flat joint piece 87 has a shape formed parallel to the shape of side faces of contact plate 51a, and insulation material 55 disposed between exterior-side resin member 81a and compartment-side resin member 82a is so formed that it fills the space corresponding to the shape of flat joint piece 87, thereby reducing an amount of heat leakage from contact plate 51a.

## SECOND EXEMPLARY EMBODIMENT

**[0041]** Fig. 7 is a lateral sectional view of a rotatable baffle body according to the second exemplary embodiment of the present invention. In Fig. 7, baffle body 50b provided with metallic contact plate 51b having magnetic

property forms a shape of an outer casing in combination with outer casing member 52b of a resin material.

**[0042]** Contact plate 51b has a cross sectional shape of generally the letter U, and it is fixed to outer casing member 52b with tabs formed on both sides thereof or by using a fixing screw. Heating plate 54 is attached to substantially an entire back surface of contact plate 51b to prevent dew condensation on the surface of contact plate 51b. Insulation material 55 is formed in a space inside the baffle body configured with contact plate 51b and outer casing member 52b.

**[0043]** Mounting fixture 45 of baffle body 50b has a shaft, and it is so configured that center 56 of the shaft is located outside of a basic form of an outer casing constructed of contact plate 51b and outer casing member 52b. Heating plate 54 is attached to the entire back surface of contact plate 51b.

**[0044]** Heat-exchange suppressing space 59 provided in one of side faces of baffle body 50b at the pivoted side is configured with the side face of outer casing member 52b and space-forming member 60. Outer casing member 52b is provided with heat-conduction impeding section 61 on the side face thereof inside heat-exchange suppressing space 59. Heat-conduction impeding section 61 is formed of a cut hole or a thinned wall. Heat-conduction impeding section 61 is provided at a location closer to the storage compartment side than a front edge of the side face of contact plate 51b.

**[0045]** Heat-exchange suppressing space 59 is so located as to cover the side face of contact plate 51b. In addition, heat-exchange suppressing space 59 is so configured that it lies inside a rotational trajectory of an outermost part of outer casing member 52b at the pivoted side when baffle body 50b rotates during opening and closing of refrigerator compartment door-left 38a.

**[0046]** Description is provided hereinafter of operation and functions of the refrigerator constructed as illustrated above. However, description of such operation and functions similar to those of the first exemplary embodiment will be omitted.

**[0047]** Because contact plate 51b is made of a metal in the cross sectional shape of generally the letter U, it can increase strength of baffle body 50b to prevent leakage of the cold air from the compartment through a gap in a gasket contact face attributed to deformation of baffle body 50b. Contact plate 51b can further prevent leakage of the cold air of the compartment through the gap in the gasket contact face, since it promotes attraction of a magnet contained in gasket 44 even when a condition of the contact is impaired due to the deformation mentioned above. In addition, contact plate 51b can efficiently absorb amount of the heat from heating plate 54, which helps suppress an excessive amount of the heat of heating plate 54, and reduce an amount of the electric power consumption of the refrigerator.

**[0048]** The periphery of contact plate 51b is surrounded with outer casing member 52b made of a resin having a thermal conductivity lower than metal, and insulation material 55 such as a foam insulation is disposed on the compartment side, in order to increase a thermal insulation property around the side face portions of contact plate 51b which is susceptible to heat transferred from the cold air in the compartment.

**[0049]** In addition, heat-exchange suppressing space 59 configured by the side face of outer casing member 52b and space-forming member 60 provided on the side face of outer casing member 52b can secure a large distance between the side face of contact plate 51b and the storage compartment, and this convection-free space can improve the thermal insulation capability in the side face portion of contact plate 51b.

**[0050]** Center 56 of the shaft of baffle body 50b is located inside of space-forming member 60 that configures heat-exchange suppressing space 59 when viewed in a general cross section. This structure can increase the distance between contact plate 51b and the storage compartment, and further improve the thermal insulation around contact plate 51b.

**[0051]** Center 56 of the shaft of baffle body 50b is also located outside of the side face portion of contact plate 51b to ensure rotational movement of baffle body 50b, while also securing a sufficient distance from the side face portion of contact plate 51b to the compartment. This structure can further improve the effect of reducing an amount of heat leakage.

**[0052]** Space-forming member 60 has a curved shape along a rotational trajectory which is a line connecting from one point to another that does not come into contact with refrigerator compartment door-left 38a in a rotational operation of baffle body 50b. Baffle body 50b can thus rotate in a linked motion with opening and closing of refrigerator compartment door-left 38a without interfering with interior side member 42. As described previously, baffle body 50b rotates on center 56 of the shaft and stops the rotation at a predetermined position when refrigerator compartment door-left 38a is opened. If baffle body 50b hits against interior side member 42 due to a momentum of the rotation, a cushioning material fixed to outer casing member 52b suppresses impact sound by absorbing the shock.

**[0053]** Heat-conduction impeding section 61 formed by thinning a basic wall thickness or cutting a hole in outer casing member 52b is located in the vicinity of a contacting portion with contact plate 51b. Because of this structure, the heat of the outside air and heating plate 54 is transferred first to contact plate 51b, and then to outer casing member 52b, where the heat transferred in outer casing member 52b is hampered from dispersing throughout the material by thermal conduction. It becomes possible, as a result, to decrease an amount of the heat being exchanged with the storage compartment space, and reduce an amount of the power consumption. Since heat-conduction impeding section 61 is provided in the location closer to the compartment side than the front edge of the side face of contact plate 51b, it also prevents the heat transferred through contact plate 51b

from entering the storage compartment. This structure can thus improve the effect of suppressing thermal conduction of both outer casing member 52b and contact plate 51b.

THIRD EXEMPLARY EMBODIMENT

**[0054]** Fig. 8A is a lateral sectional view of a rotatable baffle body according to the third exemplary embodiment of the present invention.

**[0055]** In Fig. 8A, heat-exchange suppressing space 59 configured with a side face of outer casing member 52c and space-forming member 60, and provided on a side face of baffle body 50c has inner-space insulation material 62 contained therein.

**[0056]** Heat-conduction impeding section 61 formed of a cut hole or a thinned wall is provided in the side face of outer casing member 52c inside heat-exchange suppressing space 59. Heat-conduction impeding section 61 is provided in a location closer to a compartment side than a front edge of the side face of contact plate 51c.

**[0057]** Here, heat-exchange suppressing space 59 is provided in each of both side faces of baffle body 50c, and inner-space insulation material 62 and heat-conduction impeding section 61 are provided in each heat-exchange suppressing space 59, as described above.

**[0058]** Heat-exchange suppressing space 59 is so located as to cover the side face of contact plate 51c. In addition, heat-exchange suppressing space 59 is so configured that it lies inside of a rotational trajectory where it does not interfere with other components when baffle body 50c rotates during opening and closing refrigerator compartment door-left 38a and also during opening and closing refrigerator compartment door-right 38b.

**[0059]** Description is provided hereinafter of operation and functions of the refrigerator constructed as illustrated above. However, description of such operation and functions similar to those of the first exemplary embodiment will be omitted.

**[0060]** Since heat-exchange suppressing space 59 configured with the side face of outer casing member 52c and space-forming member 60 is provided on the side face portion of outer casing member 52c, it can secure a large distance between the side face portion of contact plate 51c and the storage compartment, and improve the thermal insulation capability. In addition, inner-space insulation material 62 provided inside heat-exchange suppressing space 59 can further improve the insulating effect of the side face portion of contact plate 51c, reduce an amount of heat being exchanged with the space in the storage compartment, and reduce an amount of power consumption.

**[0061]** Heat-conduction impeding section 61 formed by thinning a basic wall thickness or cutting a hole in outer casing member 52c is located in the vicinity of contacting portion with contact plate 51c. Because of this structure, the heat of the outside air and heating plate 54 is transferred first to contact plate 51c, and then to outer casing member 52c, where the heat transferred in outer casing member 52c is hampered from dispersing throughout the material by thermal conduction. It hence becomes possible to decrease an amount of the heat being exchanged with the compartment space, and reduce an amount of the power consumption. Since heat-conduction impeding section 61 is provided in the location closer to the storage compartment side than the front edge of the side face of contact plate 51c, it can prevent the heat transferred through contact plate 51c from entering the storage compartment, and improve the effect of suppressing thermal conduction of both outer casing member 52c and contact plate 51c.

**[0062]** Because heat-exchange suppressing space 59 configured with the side face of outer casing member 52c and space-forming member 60 is provided on both side faces of outer casing member 52c, they can further improve the effect of thermal insulation of the side face portions of contact plate 51c. Moreover, this effect can be improved even further by forming heat-conduction impeding section 61 in both side faces of outer casing member 52c in the like manner.

FOURTH EXEMPLARY EMBODIMENT

**[0063]** Fig. 8B is a lateral sectional view of a rotatable baffle body according to the fourth exemplary embodiment of the present invention.

**[0064]** In Fig. 8B, heat-exchange suppressing space 59 configured with a side face of outer casing member 52d and space-forming member 60, and provided on a side face of baffle body 50d has inner-space insulation material 62 contained therein. Heat-conduction impeding section 61 formed of a cut hole is provided in the side face of outer casing member 52d inside heat-exchange suppressing space 59. Heat-conduction impeding section 61 is provided in a location closer to a storage compartment side than a front edge of a side face of contact plate 51d. Inner-space insulation material 62 provided within heat-exchange suppressing space 59 is disposed in a state of being inserted into outer casing member 52d from heat-conduction impeding section 61 made of the cut hole.

**[0065]** Space-forming member 60 is fixed to outer casing member 52d by fastening them with space-forming member clamp 66. Pivoted-side circulation block member 63 formed of a flexible material is fixed detachably to an outer part of outer casing member 52d by fastening them with circulation block member clamp 88. Pivoted-side circulation block member 63 blocks circulation of the cold air by keeping in contact with a part of refrigerator compartment door-left 38a.

**[0066]** Non-pivoted-side circulation block member 64 formed of a flexible material similar to that of pivoted-side circulation block member 63 is fixed to refrigerator compartment door-right 38b with fixing member 65. Non-pivoted-side circulation block member 64 blocks circulation of the cold air by keeping in contact with a part of outer

casing member 52d.

**[0067]** Heat-exchange suppressing space 59 is so located as to cover a side face of contact plate 51d. In addition, heat-exchange suppressing space 59 is so configured that it lies inside of a rotational trajectory where it does not interfere with other components when baffle body 50d rotates during opening and closing refrigerator compartment door-left 38a and also during opening and closing refrigerator compartment door-right 38b.

**[0068]** Description is provided hereinafter of operation and functions of the refrigerator constructed as illustrated above. However, description of such operation and functions similar to those of the first exemplary embodiment will be omitted.

**[0069]** Heat-exchange suppressing space 59 configured with the side face of outer casing member 52d and space-forming member 60 is provided on the side face portion of outer casing member 52d. This structure can provide a large distance between the side face portion of contact plate 51d and the storage compartment, and improve the thermal insulation capability. In addition, inner-space insulation material 62 disposed inside heat-exchange suppressing space 59 can further improve the insulating effect of the side face portion of contact plate 51d, reduce an amount of heat being exchanged with the compartment space, and reduce an amount of power consumption.

**[0070]** Heat-conduction impeding section 61 formed of a cut hole is provided in the vicinity of contacting portion of outer casing member 52d with contact plate 51d. Because of this structure, the heat of the outside air and heating plate 54 is transferred first to contact plate 51d, and then to outer casing member 52d, where the heat transferred in outer casing member 52d is hampered from dispersing throughout the material by thermal conduction. It hence becomes possible to decrease an amount of the heat being exchanged with the compartment space, and reduce an amount of the power consumption. Heat-conduction impeding section 61 is provided in the location closer to the storage compartment side than the front edge of the side face of contact plate 51d. This can prevent the heat transferred through contact plate 51d from entering the storage compartment, and improve the effect of suppressing thermal conduction in both outer casing member 52d and contact plate 51d.

**[0071]** Inner-space insulation material 62 provided within heat-exchange suppressing space 59 is disposed in a manner to occupy or penetrate through heat-conduction impeding section 61 made of the cut hole. This structure improves thermal insulation in a passage of the heat that enters the storage compartment space by thermal conduction from outer casing member 52d, and reduces an amount of the heat being exchanged with the storage compartment space.

**[0072]** Heat-exchange suppressing space 59 is so configured that it lies inside of the rotational trajectory where it does not interfere with other components when baffle body 50d rotates during opening and closing refrigerator compartment door-left 38a and also during opening and closing refrigerator compartment door-right 38b. This structure requires a space between baffle body 50d and refrigerator compartment door-left 38a, as well as another between baffle body 50d and refrigerator compartment door-right 38b. The heat being exchanged between cold air and outside air through gasket 44 can be reduced by blocking the cold air that circulates the space between baffle body 50d and refrigerator compartment door-left 38a with pivoted-side circulation block member 63. Likewise, the heat being exchanged between the cold air and the outside air through gasket 44 can be reduced by blocking the cold air that circulates the space between baffle body 50d and refrigerator compartment door-right 38b with non-pivoted-side circulation block member 64.

**[0073]** Since space-forming member 60 is fixed to outer casing member 52d by fastening them with space-forming member clamp 66, the assembling work becomes easier, and a number of component parts can be reduced because no other fixing member is required.

**[0074]** Pivoted-side circulation block member 63 is fixed by circulation block member clamp 88 disposed to space-forming member 60, which eases the assembling work. In addition, it becomes possible to form pivoted-side circulation block member 63 by a process of extrusion molding using a flexible material, when it is shaped to extend along a vertical direction of baffle body 50d, which can also reduce the cost of material.

## FIFTH EXEMPLARY EMBODIMENT

**[0075]** Fig. 8C is a lateral sectional view of a rotatable baffle body according to the fifth exemplary embodiment of the present invention.

**[0076]** In Fig. 8C, heat-exchange suppressing space 59 configured with a side face of outer casing member 52e and space-forming member 60, and provided on a side face of baffle body 50e has inner-space insulation material 62 contained therein. Heat-conduction impeding section 61 formed of a cut hole is provided in the side face of outer casing member 52e inside heat-exchange suppressing space 59. Heat-conduction impeding section 61 is provided in a location closer to a storage compartment side than a front edge of a side face of contact plate 51e. Inner-space insulation material 62 provided within heat-exchange suppressing space 59 is disposed in a state of being inserted into outer casing member 52e from heat-conduction impeding section 61 made of the cut hole.

**[0077]** Space-forming member 60 is fixed to outer casing member 52e with space-forming member clamp 66, and pivoted-side circulation block member 63 made of a flexible material is formed integrally with it on outside of outer casing member 52e. Pivoted-side circulation block member 63 blocks circulation of cold air by keeping in contact with a part of refrigerator compartment door-left 38a.

**[0078]** Non-pivoted-side circulation block member 64

made of a flexible material similar to that of pivoted-side circulation block member 63 is fixed to refrigerator compartment door-right 38b with fixing member 65. Non-pivoted-side circulation block member 64 blocks circulation of the cold air by keeping in contact with a part of outer casing member 52e.

**[0079]** Heat-exchange suppressing space 59 is so located as to cover a side face of contact plate 51e. In addition, heat-exchange suppressing space 59 is so configured that it lies inside of a rotational trajectory where it does not interfere with other components when baffle body 50e rotates during opening and closing refrigerator compartment door-left 38a and also during opening and closing refrigerator compartment door-right 38b.

**[0080]** Refrigerator compartment door-right 38b includes humidity sensor 68. Humidity sensor 68 is disposed between refrigerator compartment door-left 38a and refrigerator compartment door-right 38b at a location in the vicinity of a front side of contact plate 51e of baffle body 50e between the left and right doors.

**[0081]** Description is provided hereinafter of operation and functions of the refrigerator constructed as illustrated above. However, description of such operation and functions similar to those of the first exemplary embodiment will be omitted.

**[0082]** Since heat-exchange suppressing space 59 configured with the side face of outer casing member 52e and space-forming member 60 is provided on the side face portion of outer casing member 52e, it can secure a large distance between the side face portion of contact plate 51e and the storage compartment, and improve the thermal insulation capability. In addition, inner-space insulation material 62 provided inside heat-exchange suppressing space 59 can further improve the insulating effect of the side face portion of contact plate 51e, reduce an amount of heat being exchanged with the compartment space, and reduce an amount of power consumption.

**[0083]** Heat-conduction impeding section 61 formed of a cut hole is provided near the contacting portion of outer casing member 52e with contact plate 51e. Because of this structure, the heat of the outside air and heating plate 54 is transferred first to contact plate 51e, and then to outer casing member 52e, where the heat transferred in outer casing member 52e is hampered from dispersing throughout the material by thermal conduction. It hence becomes possible to decrease an amount of the heat being exchanged with the compartment space, and reduce an amount of the power consumption. Heat-conduction impeding section 61 is provided in a location closer to the storage compartment side than a front edge of the side face of contact plate 51e. This can prevent the heat transferred through contact plate 51e from entering the storage compartment, and improve the effect of suppressing thermal conduction in both outer casing member 52e and contact plate 51e.

**[0084]** Inner-space insulation material 62 provided inside heat-exchange suppressing space 59 is disposed in a manner to occupy or penetrate through heat-conduction impeding section 61 made of the cut hole. This structure improves thermal insulation in a passage of the heat that enters the storage compartment by thermal conduction from outer casing member 52e, and reduces an amount of the heat being exchanged with the storage compartment space.

**[0085]** Heat-exchange suppressing space 59 is so configured that it lies inside of a rotational trajectory where it does not interfere with other components when baffle body 50e rotates during opening and closing refrigerator compartment door-left 38a and also during opening and closing refrigerator compartment door-right 38b, so that there requires a space between baffle body 50e and refrigerator compartment door-left 38a, as well as another between baffle body 50e and refrigerator compartment door-right 38b. The heat being exchanged between cold air and outside air through gasket 44 can be reduced by blocking the cold air that circulates the space between baffle body 50e and refrigerator compartment door-left 38a with pivoted-side circulation block member 63. Likewise, the heat being exchanged between the cold air and the outside air through gasket 44 can be reduced by blocking the cold air that circulates the space between baffle body 50e and refrigerator compartment door-right 38b with non-pivoted-side circulation block member 64.

**[0086]** Since space-forming member 60 is fixed to outer casing member 52e by fastening them with space-forming member clamp 66, the assembling work becomes easier, and a number of component parts can be reduced because no other fixing member is required.

**[0087]** Pivoted-side circulation block member 63 formed integrally with space-forming member 60 makes the assembling work unnecessary, thereby reducing a number of man-hours needed for assembling. Since pivoted-side circulation block member 63 does not require any extra portion of its shape for fixation, it helps increase a shape of heat-exchange suppressing space 59 to a maximum extent possible and raise the effect of heat-exchange suppressing space 59 to suppress an amount of heat exchange.

**[0088]** In addition, humidity sensor 68 disposed on refrigerator compartment door-right 38b detects humidity in the area in front of contact plate 51e of baffle body 50e. This can provide an advantage of controlling an amount of heat generated by heating plate 54 attached to contact plate 51e to obtain an optimum condition for contact plate 51e to avoid dew condensation, and reduce an amount of the power consumption.

## SIXTH EXEMPLARY EMBODIMENT

**[0089]** Fig. 9 is a lateral sectional view of a rotatable baffle body according to the sixth exemplary embodiment of the present invention. In Fig. 9, baffle body 50f provided with metal contact plate 51f having magnetic property configures a shape of outer casing in combination with outer casing member 52f made of a resin material.

**[0090]** Contact plate 51f has a cross-sectional shape of generally the letter U, and it is fixed to outer casing member 52f with tabs formed on both sides thereof, or by using a fixing screw. At an inner side of contact plate 51f, heating plate 54 is attached to substantially an entire back surface of contact plate 51f to prevent dew condensation on the surface of contact plate 51f. Insulation material 55 is provided in a space inside the baffle body configured with contact plate 51f and outer casing member 52f.

**[0091]** Mounting fixture 45 of baffle body 50f has a shaft, and it is so configured that center 56 of the shaft is located outside of a basic form of the outer casing configured with contact plate 51f and outer casing member 52f. Heating plate 54 is attached to the entire back surface of contact plate 51f.

**[0092]** Outer casing member 52f has heat-conduction impeding section 61 formed of a cut hole or a thinned wall in a side face thereof. Heat-conduction impeding section 61 is provided in a location closer to a storage compartment side than a front edge of the side face of contact plate 51f. Protective member 58 is disposed to an outside of outer casing member 52f near heat-conduction impeding section 61.

**[0093]** Protective member 58 is so configured that it lies inside of a rotational trajectory where it does not interfere with other components when baffle body 50f rotates during opening and closing refrigerator compartment door-left 38a, and during opening and closing refrigerator compartment door-right 38b.

**[0094]** Description is provided hereinafter of operation and functions of the refrigerator constructed as illustrated above. However, description of such operation and functions similar to those of the first exemplary embodiment will be omitted.

**[0095]** Because contact plate 51f is made of a metal in the cross-sectional shape of generally the letter U, it can increase strength of baffle body 50f to prevent leakage of the cold air from the compartment through a gap in a gasket contact face attributed to deformation of baffle body 50f. Contact plate 51f can further prevent leakage of the cold air from the compartment through the gap in the gasket contact face since it promotes attraction of the magnet contained in gasket 44 even when a condition of the contact is impaired due to the deformation mentioned above. In addition, contact plate 51f can efficiently absorb amount of the heat from heating plate 54, which helps suppress an excessive amount of heat by heating plate 54, and reduce an amount of electric power consumption of the refrigerator.

**[0096]** The periphery of contact plate 51f is surrounded with outer casing member 52f made of a resin having a thermal conductivity lower than metal, and insulation material 55 such as a foam insulation is disposed on the compartment side, in order to increase a thermal insulation property around the side face portions of contact plate 51f which is susceptible to heat transferred from the cold air in the compartment.

**[0097]** Center 56 of the shaft is located outside of the side face portion of contact plate 51f to ensure rotational movement of baffle body 50f, while also securing a sufficient distance from the side face portion of contact plate 51f to the compartment. This configuration can further improve the effect of reducing an amount of heat leakage.

**[0098]** Heat-conduction impeding section 61 formed by thinning a basic wall thickness or cutting a hole in outer casing member 52f is located in the vicinity of contacting portion with contact plate 51f. Because of this structure, the heat of the outside air and heating plate 54 is transferred first to contact plate 51f, and then to outer casing member 52f, where the heat transferred in outer casing member 52f is hampered from dispersing throughout the material by thermal conduction. It becomes possible, as a result, to decrease an amount of the heat being exchanged with the storage compartment space, and reduce an amount of electric power consumption. Since heat-conduction impeding section 61 is provided in the location closer to the compartment side than the front edge of the side face of contact plate 51f, it also prevents the heat transferred through contact plate 51f from entering the storage compartment, and improves the effect of suppressing thermal conduction in both outer casing member 52f and contact plate 51f.

**[0099]** Protective member 58 is formed inside of a rotational trajectory which is a line connecting from one point to another that does not come into contact with refrigerator compartment door-left 38a in a rotational operation of baffle body 50f. Baffle body 50f configured to rotate in a linked motion with opening and closing of refrigerator compartment door-left 38a can thus function without interfering with interior side member 42. As described previously, baffle body 50f rotates on center 56 of the shaft and stops the rotation at a predetermined position when refrigerator compartment door-left 38a is opened. If baffle body 50f hits against interior side member 42 due to a momentum of the rotation, a cushioning material fixed to outer casing member 52f suppresses impact sound by absorbing the shock.

**[0100]** When heat-conduction impeding section 61 is composed of a hole-like form or a cut-out form, protective member 58 protects heat-conduction impeding section 61 in a manner to cover from the outside of baffle body 50f. It is hence possible to improve the effect of thermal insulation by preventing the cold air from entering, and to increase the efficiency of power consumed in the refrigerator by reducing an amount of heat leakage. On the other hand, when heat-conduction impeding section 61 is composed of a thin wall form, a deficiency in the strength due to the reduced thickness of the material can be supplemented with protective member 58. Moreover, protective member 58 disposed to a side face portion of outer casing member 52f can reduce convection around refrigerator compartment door-left 38a and side face portion of contact plate 51f, and increase thermal insulation performance in the side face portion of contact plate 51f.

SEVENTH EXEMPLARY EMBODIMENT

**[0101]** Fig. 10A is a lateral sectional view of a rotatable baffle body according to the seventh exemplary embodiment of the present invention.

**[0102]** In Fig. 10A, heat-conduction impeding section 61 formed by cutting a hole or thinning a wall thickness is provided in a side face of outer casing member 52g. Heat-conduction impeding section 61 is formed in a location closer to a storage compartment side than a front edge of the side face of contact plate 51g. Protective member 58 is mounted to an outside of outer casing member 52g near heat-conduction impeding section 61.

**[0103]** Protective member 58 provided with pivoted-side circulation block member 63 formed of a flexible material is fixed detachably to the outside of outer casing member 52g by fastening it with protective member clamp 67. Pivoted-side circulation block member 63 blocks circulation of cold air by keeping in contact with a part of refrigerator compartment door-left 38a.

**[0104]** Non-pivoted-side circulation block member 64 formed of a flexible material similar to that of pivoted-side circulation block member 63 is fixed to refrigerator compartment door-right 38b by fastening it with fixing member 65. Non-pivoted-side circulation block member 64 blocks circulation of the cold air by keeping in contact with a part of outer casing member 52g.

**[0105]** Refrigerator compartment door-right 38b includes humidity sensor 68. Humidity sensor 68 is disposed between refrigerator compartment door-left 38a and refrigerator compartment door-right 38b at a location in the vicinity of a front side of contact plate 51g of baffle body 50g between the left and right doors.

**[0106]** Cold-air convection block section 70 has a rib shape formed on the side face of outer casing member 52g between refrigerator compartment door-left 38a and baffle body 50g.

**[0107]** Protective member 58 and cold-air convection block section 70 are so configured that they lie inside of a rotational trajectory where they do not interfere with other components when baffle body 50g rotates during opening and closing refrigerator compartment door-left 38a and also during opening and closing refrigerator compartment door-right 38b.

**[0108]** Description is provided hereinafter of operation and functions of the refrigerator constructed as illustrated above. However, description of such operation and functions similar to those of the first exemplary embodiment will be omitted.

**[0109]** Heat-conduction impeding section 61 is formed in the proximity of contacting portion of outer casing member 52g with contact plate 51g. Because of this structure, the heat of the outside air and heating plate 54 is transferred first to contact plate 51g, and then to outer casing member 52g, where the heat transferred in outer casing member 52g is hampered from dispersing throughout the material by thermal conduction. It becomes possible, as a result, to decrease an amount of the heat being exchanged with the compartment space, and reduce an amount of electric power consumption. Since heat-conduction impeding section 61 is provided in the location closer to the storage compartment side than a front edge of the side face of contact plate 51g, it also prevents the heat transferred through contact plate 51g from entering the storage compartment, and improves the effect of suppressing thermal conduction in both outer casing member 52g and contact plate 51g.

**[0110]** When heat-conduction impeding section 61 is composed of a hole-like form or a cut-out form, protective member 58 protects heat-conduction impeding section 61 in a manner to cover from the outside of baffle body 50g. It is hence possible to improve the effect of thermal insulation by preventing the cold air from entering, and to increase the efficiency of power consumed in the refrigerator by reducing an amount of heat leakage. When heat-conduction impeding section 61 is composed of a thin wall form, on the other hand, a deficiency in the strength due to the reduced thickness of the material can be supplemented with protective member 58. Moreover, protective member 58 disposed to a side face portion of outer casing member 52g can reduce convection around refrigerator compartment door-left 38a and a side face portion of contact plate 51g, and increase thermal insulation performance in the side face portion of contact plate 51g.

**[0111]** Baffle body 50g is so configured that it lies inside of a rotational trajectory where it does not interfere with other components when baffle body 50g rotates during opening and closing refrigerator compartment door-left 38a and also during opening and closing refrigerator compartment door-right 38b, so that there requires a space between baffle body 50g and refrigerator compartment door-left 38a, as well as another between baffle body 50g and refrigerator compartment door-right 38b. The heat being exchanged between cold air and outside air through gasket 44 can be reduced by blocking the cold air that circulates the space between baffle body 50g and refrigerator compartment door-left 38a with pivoted-side circulation block member 63. Likewise, the heat being exchanged between the cold air and the outside air through gasket 44 can be reduced by blocking the cold air that circulates the space between baffle body 50g and refrigerator compartment door-right 38b with non-pivoted-side circulation block member 64.

**[0112]** Protective member 58 is fixed to outer casing member 52g by fastening it with protective member clamp 67. This can make the assembling work easier and reduce a number of component parts since no other fixing member is necessary.

**[0113]** Cold-air convection block section 70 is formed of a rib shape on the side face of outer casing member 52g between refrigerator compartment door-left 38a and baffle body 50g. This structure suppresses a phenomenon of heat dissipation from the side face portion of contact plate 51g attributed to convection in the space between refrigerator compartment door-left 38a and baffle

body 50g, thereby reducing the heat being exchanged between warm air and cold air through pivoted-side circulation block member 63.

**[0114]** Protective member 58 provided with pivoted-side circulation block member 63 may be configured to extend along a vertical direction of baffle body 50g, which allows use of a process of two-color extrusion molding to form pivoted-side circulation block member 63 and the other parts with a flexible material and a rigid material respectively, which can also reduce the cost of materials.

**[0115]** Humidity sensor 68 disposed on refrigerator compartment door-right 38b detects humidity in the area in front of contact plate 51g of baffle body 50g. This can provide an advantage of controlling an amount of the heat generated by heating plate 54 attached to contact plate 51g to obtain an optimum condition for contact plate 51g to avoid dew condensation, and reduce an amount of power consumption.

## EIGHTH EXEMPLARY EMBODIMENT

**[0116]** Fig. 10B is a lateral sectional view of a rotatable baffle body according to the eighth exemplary embodiment of the present invention.

**[0117]** In Fig. 10B, heat-conduction impeding section 61 formed by cutting a hole or thinning a wall thickness is provided in a side face of outer casing member 52h. Heat-conduction impeding section 61 is formed in a location closer to a storage compartment side than a front edge of a side face of contact plate 51h. Protective member 58 is mounted to an outside of outer casing member 52h near heat-conduction impeding section 61.

**[0118]** Protective member 58 provided with pivoted-side circulation block member 63 formed of a flexible material is fixed detachably to the outside of outer casing member 52h by fastening them with protective member clamp 67. Pivoted-side circulation block member 63 blocks circulation of cold air by keeping in contact with a part of refrigerator compartment door-left 38a.

**[0119]** Cold-air convection block section 70 is formed of a protruding shape on the side face of outer casing member 52h between refrigerator compartment door-left 38a and baffle body 50h. Heat-conduction impeding section 61 is provided as a part of this shape of cold-air convection block section 70.

**[0120]** Pivoted-side circulation block member 63 of protective member 58 prevents the cold air from getting into heat-conduction impeding section 61 by keeping in contact with a part of refrigerator compartment door-left 38a.

**[0121]** Protective member 58 and cold-air convection block section 70 are so configured that they lie inside of a rotational trajectory where they do not interfere with other components when baffle body 50h rotates during opening and closing refrigerator compartment door-left 38a and also during opening and closing refrigerator compartment door-right 38b.

**[0122]** Another protective member 58 is also fixed to a non-pivoted side of baffle body 50h by fastening it with protective member clamp 67. Non-pivoted-side circulation block section 72, which is a part of protective member 58 at a pivoted side of baffle body 50h, and formed of a flexible material similar to that of pivoted-side circulation block member 63 prevents circulation of the cold air by keeping in contact with door-side cold-air circulation block member 71 fixed to refrigerator compartment door-left 38a.

**[0123]** Description is provided hereinafter of operation and functions of the refrigerator constructed as illustrated above. However, description of such operation and functions similar to those of the first exemplary embodiment will be omitted.

**[0124]** Heat-conduction impeding section 61 is provided in the proximity of contacting portion of outer casing member 52h with contact plate 51h. Because of this structure, the heat of the outside air and heating plate 54 is transferred first to contact plate 51h, and then to outer casing member 52h, where the heat transferred in outer casing member 52h is hampered from dispersing throughout the material by thermal conduction. It becomes possible, as a result, to decrease an amount of the heat being exchanged with the compartment space, and reduce an amount of electric power consumption. Since heat-conduction impeding section 61 is provided in the location closer to the storage compartment side than a front edge of the side face of contact plate 51h, it also prevents the heat transferred through contact plate 51h from entering the storage compartment, and improves the effect of suppressing thermal conduction in both outer casing member 52h and contact plate 51h.

**[0125]** Baffle body 50h is so configured that it lies inside of the rotational trajectory where it does not interfere with other components when baffle body 50h rotates during opening and closing refrigerator compartment door-left 38a and also during opening and closing refrigerator compartment door-right 38b, so that there requires a space between baffle body 50h and refrigerator compartment door-left 38a, as well as another between baffle body 50h and refrigerator compartment door-right 38b. The heat being exchanged between the cold air and outside air through gasket 44 can be reduced by blocking the cold air that circulates through the space between baffle body 50h and refrigerator compartment door-left 38a with pivoted-side circulation block member 63. In addition, non-pivoted-side circulation block section 72 formed of a flexible material similar to that of pivoted-side circulation block member 63 comes into contact with door-side cold-air circulation block member 71 fixed to refrigerator compartment door-right 38b, and prevents circulation of the cold air. This structure can thus suppress exchange of the heat between the cold air and the outside air through gasket 44.

**[0126]** Cold-air convection block section 70 suppresses a phenomenon of heat dissipation from the side face portion of contact plate 51h attributed to convection in the space between baffle body 50h and refrigerator com-

partment door-left 38a by means of the protruding shape formed of a rib or the like on the side face of outer casing member 52h between refrigerator compartment door-left 38a and baffle body 50h. It is by this structure that can reduce the heat being exchanged between warm air and the cold air through pivoted-side circulation block member 63.

**[0127]** Heat-conduction impeding section 61 prevents entry of the cold air from the storage compartment because it is located between pivoted-side circulation block member 63 provided with protective member 58 and gasket 44 in contact with contact plate 51h. In addition, heat-conduction impeding section 61 protects its weakness from deficiency in the strength due to the thinned wall thickness, entry of fluid through the cut hole and the like because it is located in the position not likely to become exposed during the actual use.

**[0128]** Since protective member 58 is fixed to outer casing member 52h by fastening it with protective member clamp 67, their assembling work is made easier and a number of component parts is reduced because no other fixing member is necessary.

**[0129]** Protective member 58 provided with pivoted-side circulation block member 63 may be configured to extend along a vertical direction of baffle body 50h, which allows use of a process of two-color extrusion molding to form pivoted-side circulation block member 63 and the other parts with a flexible material and a rigid material respectively, which can also reduce the cost of materials.

**[0130]** Pivoted-side circulation block member 63 and non-pivoted-side circulation block section 72 disposed to their corresponding side faces of outer casing member 52h can further improve the effect of suppressing heat exchange in the side face portions of contact plate 51h.

**[0131]** Humidity sensor 68 disposed to refrigerator compartment door-right 38b detects humidity in the area in front of contact plate 51h of baffle body 50h. This can provide an advantage of controlling an amount of heat generated by heating plate 54 attached to contact plate 51h to obtain an optimum condition for contact plate 51h to avoid dew condensation, and reduce an amount of the power consumption.

## NINTH EXEMPLARY EMBODIMENT

**[0132]** Fig. 10C is a lateral sectional view of a rotatable baffle body according to the ninth exemplary embodiment of the present invention.

**[0133]** In Fig. 10C, heat-conduction impeding section 61 formed of a cut hole is provided in each of two side faces and a back face of outer casing member 52i. Heat-conduction impeding sections 61 in both side faces are formed in locations closer to a storage compartment side than front edges of the side faces of contact plate 51i. Protective member 58 is mounted to an outside of outer casing member 52i near heat-conduction impeding sections 61.

**[0134]** Protective member 58 provided with pivoted-side circulation block member 63 and non-pivoted-side circulation block section 72 formed of a flexible material is fixed detachably to the outside of outer casing member 52i by fastening them with protective member clamps 67.

**[0135]** Pivoted-side circulation block member 63 blocks circulation of cold air by keeping in contact with a part of refrigerator compartment door-left 38a. In addition, non-pivoted-side circulation block section 72 formed of a flexible material similar to that of pivoted-side circulation block member 63 and located at an non-pivoted side of baffle body 50i comes into contact with door-side cold-air circulation block member 71 fixed to refrigerator compartment door-right 38b to prevent circulation of the cold air.

**[0136]** Protective member clamps 67 are engaged and fixed by using the cut holes serving as heat-conduction impeding sections 61 formed in both side faces of outer casing member 52i. Backside insulation material 73 is disposed between a back face of outer casing member 52i and protective member 58, where it is attached to the back face of outer casing member 52i.

**[0137]** Cold-air convection block section 70 is formed of a rib shape on the side face of outer casing member 52i between refrigerator compartment door-left 38a and baffle body 50i. This structure suppresses a phenomenon of heat dissipation from the side face portion of contact plate 51i attributable to convection in the space between baffle body 50i and refrigerator compartment door-left 38a, thereby reducing the heat being exchanged between warm air and the cold air through pivoted-side circulation block member 63.

**[0138]** Protective member 58 and cold-air convection block section 70 are so configured that they lie inside of a rotational trajectory where they do not interfere with other components when baffle body 50i rotates during opening and closing refrigerator compartment door-left 38a and also during opening and closing refrigerator compartment door-right 38b.

**[0139]** Refrigerator compartment door-right 38b includes humidity sensor 68. Humidity sensor 68 is disposed between refrigerator compartment door-left 38a and refrigerator compartment door-right 38b at a location in the vicinity of a front side of contact plate 51i of baffle body 50i between the left and right doors.

**[0140]** Description is provided hereinafter of operation and functions of the refrigerator constructed as illustrated above. However, description of such operation and functions similar to those of the first exemplary embodiment will be omitted.

**[0141]** Outer casing member 52i is provided with heat-conduction impeding sections 61 near its contact portions with contact plate 51i. Because of this structure, the heat of the outside air and heating plate 54 is transferred first to contact plate 51i, and then to outer casing member 52i, where the heat transferred in outer casing member 52i is hampered from dispersing throughout the material by thermal conduction. It becomes possible, as a result, to decrease an amount of the heat being exchanged with

the compartment space, and contribute to a reduction in an amount of electric power consumption. Since heat-conduction impeding sections 61 are provided in the locations closer to the storage compartment side than the front edges of the side faces of contact plate 51i, thy also prevent the heat transferred through contact plate 51i from entering the storage compartment, and improve the effect of suppressing thermal conduction in both outer casing member 52i and contact plate 51i.

**[0142]** Baffle body 50i is so configured that it lies inside of the rotational trajectory where it does not interfere with other components when baffle body 50i rotates during opening and closing refrigerator compartment door-left 38a and during opening and closing refrigerator compartment door-right 38b. Because of this configuration, there requires a space between baffle body 50i and refrigerator compartment door-left 38a, as well as another between baffle body 50i and refrigerator compartment door-right 38b. The heat being exchanged between the cold air and outside air through gasket 44 can be reduced by blocking the cold air that circulates through the space between baffle body 50i and refrigerator compartment door-left 38a with pivoted-side circulation block member 63. In addition, non-pivoted-side circulation block section 72 formed of a flexible material similar to that of pivoted-side circulation block member 63 comes into contact with door-side cold-air circulation block member 71 fixed to refrigerator compartment door-right 38b, and prevents circulation of the cold air, to hence suppress exchange of the heat between the cold air and the outside air through gasket 44.

**[0143]** Cold-air convection block section 70 is formed of a rib shape on the side face of outer casing member 52i between refrigerator compartment door-left 38a and baffle body 50i. Cold-air convection block section 70 can reduce the heat being exchanged between warm air and the cold air through pivoted-side circulation block member 63 by suppressing the phenomenon of heat dissipation from the side face portion of contact plate 51i attributable to convection in the space between baffle body 50i and refrigerator compartment door-left 38a.

**[0144]** Since protective member 58 is fixed to outer casing member 52i by fastening it with protective member clamps 67, their assembling work becomes easier and a number of component parts can be reduced because no other fixing member is necessary. Protective member clamps 67 for protective member 58 are engaged and fixed by using the cut holes, i.e., heat-conduction impeding sections 61, formed in the sides of outer casing member 52i. Since this structure does not require a shape specially configured to fix protective member 58 to outer casing member 52i, it simplifies the shape of protective member 58, and helps ease the assembling work.

**[0145]** Because of the structure having pivoted-side circulation block member 63 and non-pivoted-side circulation block section 72 formed at both side faces of outer casing member 52i, the effect of suppressing exchange of heat around the side face portions of contact plate 51i can be further improved.

**[0146]** Protective member 58 provided with pivoted-side circulation block member 63 and non-pivoted-side circulation block section 72 may be configured to extend along a vertical direction of baffle body 50i. This structure can make use of a process of two-color extrusion molding to form pivoted-side circulation block member 63 and the other parts with a flexible material and a rigid material respectively, which can reduce the cost of materials.

**[0147]** There is backside insulation material 73 formed of a foam material attached to the back face of outer casing member 52i between the back face of outer casing member 52i and protective member 58. The effect of thermal insulation provided by this backside insulation material 73 can suppress exchange of heat between protective member 58 and outer casing member 52i, and reduce an amount of power consumption.

**[0148]** Humidity sensor 68 disposed to refrigerator compartment door-right 38b detects humidity in the area in front of contact plate 51i of baffle body 50i. This can provide an advantage of controlling an amount of heat generated by heating plate 54 attached to contact plate 51i to obtain an optimum condition for contact plate 51i to avoid dew condensation, and reduce an amount of the power consumption.

## TENTH EXEMPLARY EMBODIMENT

**[0149]** Fig. 11 is a lateral sectional view of a rotatable baffle body according to the tenth exemplary embodiment of the present invention.

**[0150]** In Fig. 11, baffle body 50j configures a basic outer casing comprised of exterior-side outer casing member 90j including metal contact plate 51j having magnetic property and compartment-side resin member 82j of a plastic material.

**[0151]** Contact plate 51j has a cross-sectional shape of generally the letter U, and heating plate 54 is attached to substantially an entire back surface of contact plate 51j to prevent dew condensation on a surface of contact plate 51j.

**[0152]** Insulation material 55 of a foamed PS resin is disposed in a space inside the baffle body. Alternatively, insulation material 55 may be made of a foamed urethane.

**[0153]** Exterior-side outer casing member 90j comprises metal contact plate 51j and exterior-side resin member 81j of a resin having a thermal conductivity lower than the metal, and is formed integrally by insert molding. Exterior-side resin member 81j and compartment-side resin member 82j make up outer casing member 52j.

**[0154]** Mounting fixture 45 of baffle body 50j has a shaft, and it is so configured that center 56 of the shaft is located outside of a basic form of outer casing connfigured with exterior-side outer casing member 90j and compartment-side resin member 82j.

**[0155]** Description is provided hereinafter of operation and functions of the refrigerator constructed as illustrated

above. However, description of such operation and functions similar to those of the first exemplary embodiment will be omitted.

**[0156]** Because contact plate 51j is made of a metal in the cross sectional shape of generally the letter U, it can increase strength of baffle body 50j to prevent leakage of the cold air from the compartment through a gap in a gasket contact face attributed to deformation of baffle body 50j.

**[0157]** Contact plate 51j can further prevent leakage of the cold air of the compartment through the gap in the gasket contact face, since it promotes attraction of a magnet contained in gasket 44 even when a condition of the contact is impaired due to the deformation mentioned above. In addition, contact plate 51j can efficiently absorb amount of the heat from heating plate 54, which helps suppress an excessive amount of the heat generated by heating plate 54, and reduce an amount of electric power consumption of the refrigerator.

**[0158]** Center 56 of the shaft is located outside of the side face portion of contact plate 51j to ensure rotational movement of baffle body 50j, while also securing a sufficient distance from the side face portion of contact plate 51j to the compartment. This configuration can further improve the effect of reducing an amount of heat leakage.

**[0159]** Baffle body 50j configures the basic outer casing comprised of exterior-side outer casing member 90j and compartment-side resin member 82j, and the inside filled with insulation material 55 such as a foamed PS resin to increase the thermal insulation property.

**[0160]** Exterior-side outer casing member 90j is configured by surrounding a periphery of metal contact plate 51j with exterior-side resin member 81j made of a resin having a thermal conductivity lower than the metal, and integrally formed by inset molding. This structure can reduce a number of man-hours for assembling contact plate 51j and exterior-side resin member 81j, and make any special structure unnecessary for fitting and fixing these two components. As a result, it becomes possible to maximize an area of insulation material 55 disposed in it, and to increase the thermal insulation property.

**[0161]** In addition, this structure makes it unnecessary to provide a space between component parts for the work of fitting and assembling contact plate 51j and exterior-side resin member 81j, and elimination of this space can contribute to reduction in the amount of heat leakage as well as the amount of electric power consumption.

**[0162]** In this exemplary embodiment, although foamed PS resin is selected by giving priority to the workability, the thermal insulation property can be improved by filling the inner space of baffle body 50j with urethane foam.

**[0163]** By having contact plate 51j and exterior-side resin member's 81j formed integrally, the structure can be fabricated without a gap between the two component parts, thereby improving seepage of urethane through such a gap that has hitherto been a problem in the process of urethane foaming. It can also reduce an addition material such as a tape to close the gap, and achieve a cost reduction.

## ELEVENTH EXEMPLARY EMBODIMENT

**[0164]** Fig. 12A is a lateral sectional view of a rotatable baffle body according to the eleventh exemplary embodiment of the present invention.

**[0165]** In Fig. 12A, baffle body 50k configures a basic outer casing comprised of exterior-side outer casing member 90k including metal contact plate 51k having magnetic property, and compartment-side resin member 82k.

**[0166]** Contact plate 51k has a cross-sectional shape of generally the letter U, and heating plate 54 is attached to substantially an entire back surface of contact plate 51k to prevent dew condensation on a surface of contact plate 51k.

**[0167]** Insulation material 55 is disposed in a space inside the baffle body. Exterior-side outer casing member 90k comprises metal contact plate 51k and exterior-side resin member 81k of a resin having a thermal conductivity lower than the metal, and is formed integrally by insert molding. Exterior-side resin member 81k and compartment-side resin member 82k make up outer casing member 52k. Contact plate 51k is provided with front slit 93 formed in a surface exposed to the outside air at the front side except for a gasket contact face, wherein front slit 93 extends along a longitudinal direction of contact plate 51k.

**[0168]** Contact plate 51k is also provided with side slit 94 in each of both side faces placed inside of the baffle body, where it extends along the longitudinal direction of contact plate 51k.

**[0169]** Exterior-side resin member 81k formed by insert molding extends its presence in front slit 93 and side slits 94 provided in metal contact plate 51k. Exterior-side resin member 81k also extends its presence on a front side of the surface of contact plate 51k in contact with the gasket.

**[0170]** Description is provided hereinafter of operation and functions of the refrigerator constructed as illustrated above. However, description of such operation and functions similar to those of the first exemplary embodiment will be omitted.

**[0171]** Because contact plate 51k is made of a metal having a cross sectional shape of generally the letter U, it can increase strength of baffle body 50k to prevent leakage of the cold air from the compartment through a gap in a gasket contact face attributable to deformation of baffle body 50k. Contact plate 51k can further prevent leakage of the cold air of the compartment through the gap in the gasket contact face, since it promotes attraction of a magnet contained in gasket 44 even when a condition of the contact is impaired due to the deformation mentioned above. In addition, contact plate 51k can efficiently absorb an amount of the heat from heating plate 54, which helps suppress an excessive amount of the

heat generated by heating plate 54, and reduce an amount of electric power consumption of the refrigerator.

**[0172]** Baffle body 50k configures the basic outer casing comprised of exterior-side outer casing member 90k and compartment-side resin member 82k, and the inside filled with insulation material 55 such as a foam insulation to increase the thermal insulation property.

**[0173]** Exterior-side outer casing member 90k is configured by surrounding a periphery of metal contact plate 51k having magnetic property with exterior-side resin member 81k made of a resin having a thermal conductivity lower than the metal, and integrally formed by inset molding. This structure can reduce a number of manhours necessary for assembling contact plate 51k and exterior-side resin member 81k, and make any special structure unnecessary for fitting and fixing these two components. As a result, it becomes possible to maximize an area of insulation material 55 disposed in it, and to increase the thermal insulation property. In addition, this structure makes it unnecessary to provide a space between the components for the work of fitting and assembling contact plate 51k and exterior-side resin member 81k. Elimination of this space can also help reduce the amount of heat leakage as well as the amount of electric power consumption.

**[0174]** Contact plate 51k is provided with front slit 93 formed in a surface exposed to the outside air at the front side, except for the gasket contact face, in a manner to extend along a longitudinal direction of contact plate 51k, and exterior-side resin member 81k of the resin material is formed to cover the cut out area of front slit 93. Exterior-side resin member 81k is also formed to cover the front side of the gasket contact face of contact plate 51k. Contact plate 51k is thus embedded in exterior-side resin member 81k and integrally molded to improve strength of the components. Since the front side of the gasket contact face of contact plate 51k is covered with the resin material, the cost can be reduced by eliminating a coating process for protection of contact plate 51k against corrosion. A thickness of exterior-side resin member 81k in a front side portion corresponding to the gasket contact face of contact plate 51k is thinner than a general thickness by about a half that of other portions, thereby making the magnet of gasket 44 easily attractable.

**[0175]** Exterior-side resin member 81k is formed around the side face portions of contact plate 51k through side slits 94, and this shape of exterior-side resin member 81k can reinforce a deficiency in the strength of contact plate 51k resulting from the addition of side slits 94.

**[0176]** It becomes possible to reduce an amount of the heat of heating plate 54 necessary to maintain contact plate 51k at the temperature not to cause dew condensation, since a volume of the metallic material can be decreased by virtue of front slit 93 in contact plate 51k. In addition, side slits 94 reduce leakage of heat attributed to conduction of the heat of heating plate 54 and the outside air toward the side face portions of contact plate 51k embedded in insulation material 55 behind contact plate 51k, thereby reducing the amount of power consumption.

## TWELFTH EXEMPLARY EMBODIMENT

**[0177]** Fig. 12B is a lateral sectional view of a rotatable baffle body according to the twelfth exemplary embodiment of the present invention.

**[0178]** In Fig. 12B, baffle body 501 configures a basic outer casing comprised of exterior-side outer casing member 901 including metal contact plate 511 having magnetic property, and compartment-side resin member 821. Contact plate 511 has a cross-sectional shape of generally the letter U. Insulation material 55 is disposed in a space inside the baffle body.

**[0179]** Exterior-side outer casing member 901 comprises metal contact plate 511 and exterior-side resin member 811 of a resin having a thermal conductivity lower than the metal, and is formed integrally by insert molding. Exterior-side resin member 811 and compartment-side resin member 821 make up outer casing member 521.

**[0180]** Contact plate 511 is provided with front slit 93 formed in a surface exposed to the outside air at the front side except for a gasket contact face, wherein front slit 93 extends along a longitudinal direction of contact plate 511.

**[0181]** Contact plate 511 is also provided with side slit 94 in each of both side faces placed inside of the baffle body, where it extends along the longitudinal direction of contact plate 51l.

**[0182]** Exterior-side resin member 811 extends its presence in front slit 93 and side slits 94 provided in metal contact plate 511 formed together by insert molding.

**[0183]** Exterior-side resin member 81k also extends its presence on a front side of the gasket contact face of contact plate 511 such that contact plate 511 is embedded in exterior-side resin member 811.

**[0184]** In addition, exterior-side resin member 811 is provided with front protruding portion 95 of a shape that protrudes outward in a part of an outwardly exposed surface other than a gasket contact face. With this structure, heating plate 54 is attached to inside of a recessed portion on a backside of front protruding portion 95 for preventing dew condensation on the surface of contact plate 511.

**[0185]** Refrigerator compartment door-right 38b includes humidity sensor 68. Humidity sensor 68 is disposed between refrigerator compartment door-left 38a and refrigerator compartment door-right 38b at a location in the proximity of a front side of contact plate 511 of baffle body 501 between the left and right doors.

**[0186]** Description is provided hereinafter of operation and functions of the refrigerator constructed as illustrated above. However, description of such operation and functions similar to those of the first exemplary embodiment will be omitted.

**[0187]** Because contact plate 511 is made of a metal

having a cross sectional shape of generally the letter U, it can increase strength of baffle body 501 to prevent leakage of the cold air from the compartment through a gap in the gasket contact face attributable to deformation of baffle body 501. Contact plate 511 can further prevent leakage of the cold air of the compartment through the gap in the gasket contact face, since it promotes attraction of a magnet contained in gasket 44 even when a condition of the contact is impaired due to the deformation mentioned above. In addition, contact plate 511 can efficiently absorb an amount of the heat from heating plate 54, which helps suppress an excessive amount of the heat generated by heating plate 54, and reduce an amount of the power consumption of the refrigerator.

**[0188]** Baffle body 501 configures the basic outer casing comprised of exterior-side outer casing member 901 and compartment-side resin member 82l, and the inside filled with insulation material 55 such as a foam insulation to increase the thermal insulation property.

**[0189]** Exterior-side outer casing member 901 is configured by surrounding a periphery of metal contact plate 511 having magnetic property with exterior-side resin member 811 made of a resin having a thermal conductivity lower than the metal, and integrally formed by inset molding. This structure can reduce a number of manhours necessary for assembling contact plate 511 and exterior-side resin member 811, and make any special structure unnecessary for fitting and fixing these two components. As a result, it becomes possible to maximize an area of insulation material 55 disposed in it, and to increase the thermal insulation property. In addition, this structure makes it unnecessary to provide a space between the components for the work of fitting and assembling contact plate 511 and exterior-side resin member 811. Elimination of this space can also help reduce the amount of heat leakage as well as the amount of the electric power consumption.

**[0190]** Contact plate 511 is provided with front slit 93 in the surface exposed to the outside air at the front side other than the gasket contact face, in a manner to extend along the longitudinal direction of contact plate 511, and front protruding portion 95 is formed on exterior-side resin member 811 that protruded outward in the position corresponding to the cut out area of front slit 93a. Heating plate 54 is attached to inside of the recessed portion on the backside of front protruding portion 95 in order to prevent dew condensation on the surface of contact plate 511. Accordingly, this structure can maximize the area of insulation material 55 in baffle body 501, and increase the thermal insulation property of baffle body 501.

**[0191]** Exterior-side resin member 811 is so formed as to cover the front side of the gasket contact face of contact plate 511 so that contact plate 511 is embedded in exterior-side resin member 811, and integrally molded to improve the strength of the components. Furthermore, since the front side of the gasket contact face of contact plate 51l is covered with the resin material, the cost can be reduced by eliminating the coating process for protection of contact plate 511 against corrosion.

**[0192]** It becomes possible to reduce an amount of the heat of heating plate 54 necessary to maintain contact plate 511 at the temperature not to cause dew condensation, since a volume of the metallic material can be decreased by virtue of front slit 93 formed in contact plate 511. In addition, side slits 94 reduce leakage of heat attributable to conduction of the heat of heating plate 54 and the outside air toward the side face portions of contact plate 51k embedded in insulation material 55 behind contact plate 51k, thereby reducing the amount of power consumption.

**[0193]** Furthermore, humidity sensor 68 disposed to refrigerator compartment door-right 38b provides an advantage of reducing an amount of the power consumption by detecting humidity in the area in front of contact plate 511 of baffle body 501 and controlling an amount of heat generated by heating plate 54 attached to contact plate 511 to obtain an optimum condition for avoiding dew condensation on contact plate 511.

## INDUSTRIAL APPLICABILITY

**[0194]** A refrigerator according to the present invention is applicable to a cooling apparatus of any type equipped with a double-leafed type door unit having a baffle member since it has an advantage of suppressing an amount of heat leakage from a contact plate and improving electric power consumption capability of the refrigerator, as discussed above.

## REFERENCE MARKS IN THE DRAWINGS

**[0195]**

38a refrigerator compartment door-left
38b refrigerator compartment door-right
41 exterior side member
42 interior side member
43 insulation material
44 gasket
45 mounting fixture
50a, 50b, 50c, 50d, 50e, 50f, 50g, 50h, 50i, 50j, 50k, 501 baffle body
51a, 51b, 51c, 51d, 51e, 51f, 51g, 51h, 51i, 51j, 51k, 511 contact plate
52a, 52b, 52c, 52d, 52e, 52f, 52g, 52h, 52i, 52j, 52k, 521 outer casing member
54 heating plate
55 insulation material
56 center of shaft
57 rotational trajectory
58 protective member
59 heat-exchange suppressing space
60 space-forming member
61 heat-conduction impeding section
62 inner-space insulation material
63 pivoted-side circulation block member

64 non-pivoted-side circulation block member
65 fixing member
66 space-forming member clamp
67 protective member clamp
68 humidity sensor
70 cold-air convection block section
71 door-side cold-air circulation block member
72 non-pivoted-side circulation block section
73 backside insulation material
81a, 81j, 81k, 811 exterior-side resin member
82a, 82j, 82k, 821 compartment-side resin member
83 groove
84 hole
85 pawl-fitting portion
86 insulation material
87 flat joint piece
88 circulation block member clamp
90j, 90k, 901 exterior-side outer casing member
93 front slit
94 side slit
95 front protruding portion

## Claims

**1.** A refrigerator comprising:

a double-leafed type door configured to close a front opening of a storage compartment;
a gasket disposed along a perimeter on a back face of the door, and coming into contact with a peripheral edge of the opening of a refrigerator main body; and
a rotatable baffle body disposed to an inner face at a non-pivoted side of the door,
wherein the baffle body comprises
a contact plate having a high thermal conductivity and magnetic property, and
an outer casing member of a resin material having a thermal conductivity lower than the contact plate, and configuring an outer casing of the baffle body.

**2.** The refrigerator of claim 1, wherein a center of a shaft for rotating the baffle body is located inside of the outer casing of the outer casing member.

**3.** The refrigerator of claim 2, wherein the outer casing member has a curved surface portion having substantially a circular shape concentric with the shaft of the baffle body, from a flat portion through a side portion that configure the outer casing of the baffle body.

**4.** The refrigerator of claim 2, wherein one of side face portions of the baffle body closer to the shaft lies outside of a side edge of the gasket in the lateral direction.

**5.** The refrigerator of claim 2, wherein an insulation material is disposed in the baffle body.

**6.** The refrigerator of claim 2, wherein an insulation material having a width larger than that of the contact plate is fixed to a compartment-side flat surface of the baffle body.

**7.** The refrigerator of claim 2, wherein the outer casing member comprises an exterior-side resin member in contact with the contact plate and a compartment-side resin member that forms an interior side face, wherein a side face of the exterior-side resin member is fixed to a side face of the compartment-side resin member with a pawl-fitting portion.

**8.** The refrigerator of claim 7, wherein the side face of the exterior-side resin member is located inside of the side face of the compartment-side resin member.

**9.** The refrigerator of claim 7, wherein the flat portion or the side face of the exterior-side resin member is provided with a cut hole or a through hole.

**10.** The refrigerator of claim 7, wherein a flat joint piece of the exterior-side resin member has a shape formed parallel to the shape of side faces of the contact plate.

**11.** The refrigerator of claim 1, wherein a side face of the outer casing member and a space-forming member form a heat-exchange suppressing space.

**12.** The refrigerator of claim 11, wherein an insulation material is disposed in the heat-exchange suppressing space.

**13.** The refrigerator of claim 11, wherein the space-forming member is provided at a pivoted side of the baffle body.

**14.** The refrigerator of claim 11, wherein the outer casing member is provided with a heat-conduction impeding section inside the heat-exchange suppressing space.

**15.** The refrigerator of claim 11, wherein the space-forming member is fixed to the outer casing member with an engaging structure having a pawl-like form or a hole-like form.

**16.** The refrigerator of claim 11, wherein a humidity sensor is provided inside of the baffle body or in the vicinity of the baffle body of the door.

**17.** The refrigerator of claim 11, wherein a cold-air circulation block member is provided between the door and the non-pivoted side of the baffle body.

**18.** The refrigerator of claim 11, wherein the space-forming member is provided with a cold-air circulation block member between the door and the pivoted side of the baffle body.

**19.** The refrigerator of claim 17, wherein the space-forming member is integrally formed with the cold-air circulation block member.

**20.** The refrigerator of claim 1 further comprising a heat-conduction impeding section formed on any one of faces of the outer casing member, and a protective member, wherein the protective member is configured to protect the heat-conduction impeding section.

**21.** The refrigerator of claim 20, wherein the protective member includes a cold-air circulation block member.

**22.** The refrigerator of claim 20, wherein the protective member is fixed to the outer casing member with an engaging structure having a pawl-like form or a hole-like form.

**23.** The refrigerator of claim 20, wherein the outer casing member is provided with a cold-air convection block section.

**24.** The refrigerator of claim 20, wherein the outer casing member is provided with a heat-conduction impeding section on two or more side faces thereof.

**25.** The refrigerator of claim 20, wherein a humidity sensor is provided inside of the baffle body or in the vicinity of the baffle body of the door.

**26.** The refrigerator of claim 20, wherein a cold-air circulation block member is provided between the door and the non-pivoted side of the baffle body.

**27.** The refrigerator of claim 20, wherein the protective member integrally prevents a plurality of the heat-conduction impeding sections from being exposed.

**28.** The refrigerator of claim 20, wherein an insulation material is provided between the protective member and the outer casing member.

**29.** The refrigerator of claim 1, wherein the outer casing member comprises an exterior-side resin member and a compartment-side resin member, and the contact plate and the exterior-side resin member are integrally molded to form an exterior-side outer casing member.

**30.** The refrigerator of claim 29, wherein the exterior-side outer casing member is fixed to the compartment-side resin member with an engaging structure having a pawl-like form or a hole-like form.

**31.** The refrigerator of claim 29, wherein the exterior-side outer casing member has the contact plate embedded in the exterior-side resin member.

**32.** The refrigerator of claim 29, wherein the contact plate is provided with a front slit formed on the front side surface in contact with the gasket.

**33.** The refrigerator of claim 29, wherein the baffle body is provided with an insulation material therein.

**34.** The refrigerator of claim 29, wherein the contact plate has a cross-sectional shape of generally the letter U.

**35.** The refrigerator of claim 29, wherein the contact plate is provided with a side slit formed on the side portion thereof.

**36.** The refrigerator of claim 29, wherein the exterior-side outer casing member is provided with a protruding portion that protrudes outward in a part of an outwardly exposed surface.

**37.** The refrigerator of claim 29, wherein the inner space of the baffle body is filled with urethane foam.

**38.** The refrigerator of claim 29, wherein a humidity sensor is provided inside of the baffle body or in the vicinity of the baffle body of the door.

FIG. 1

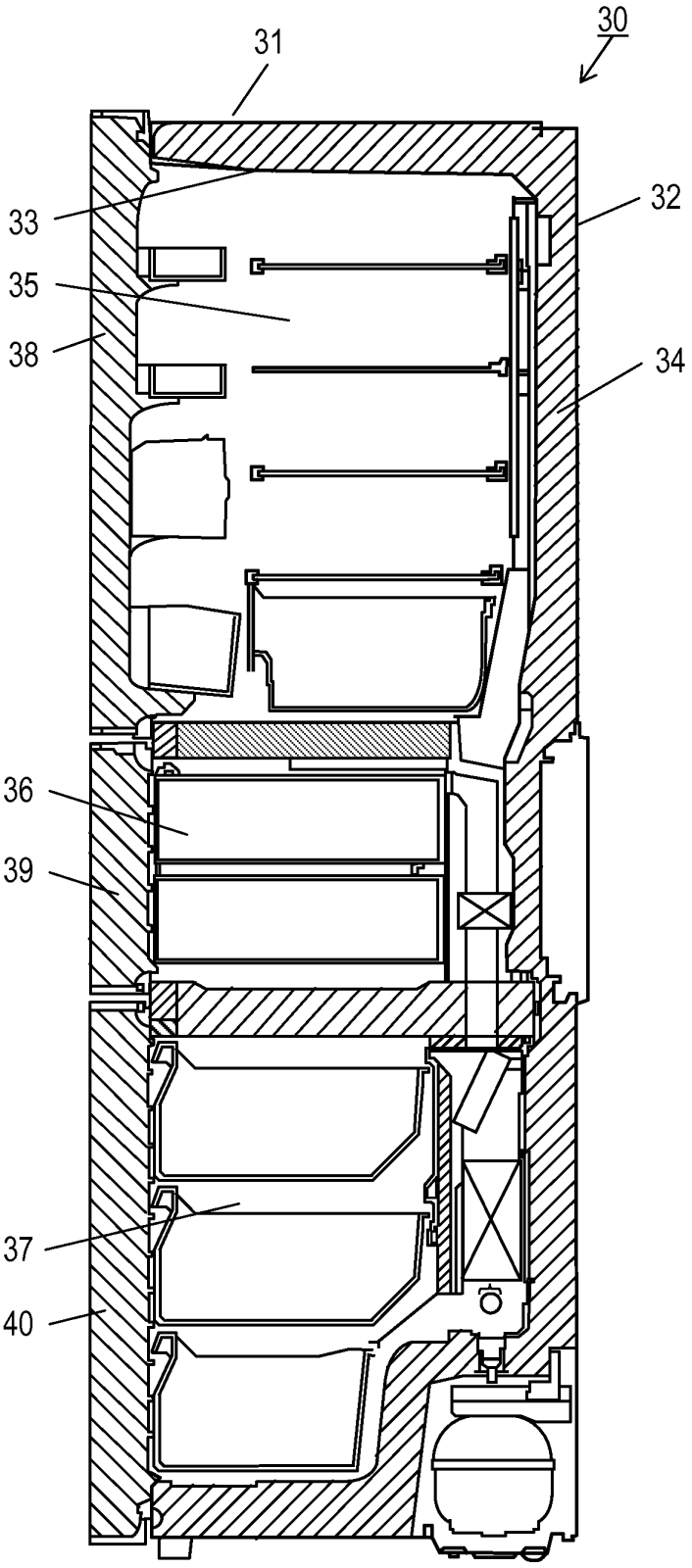


FIG. 2

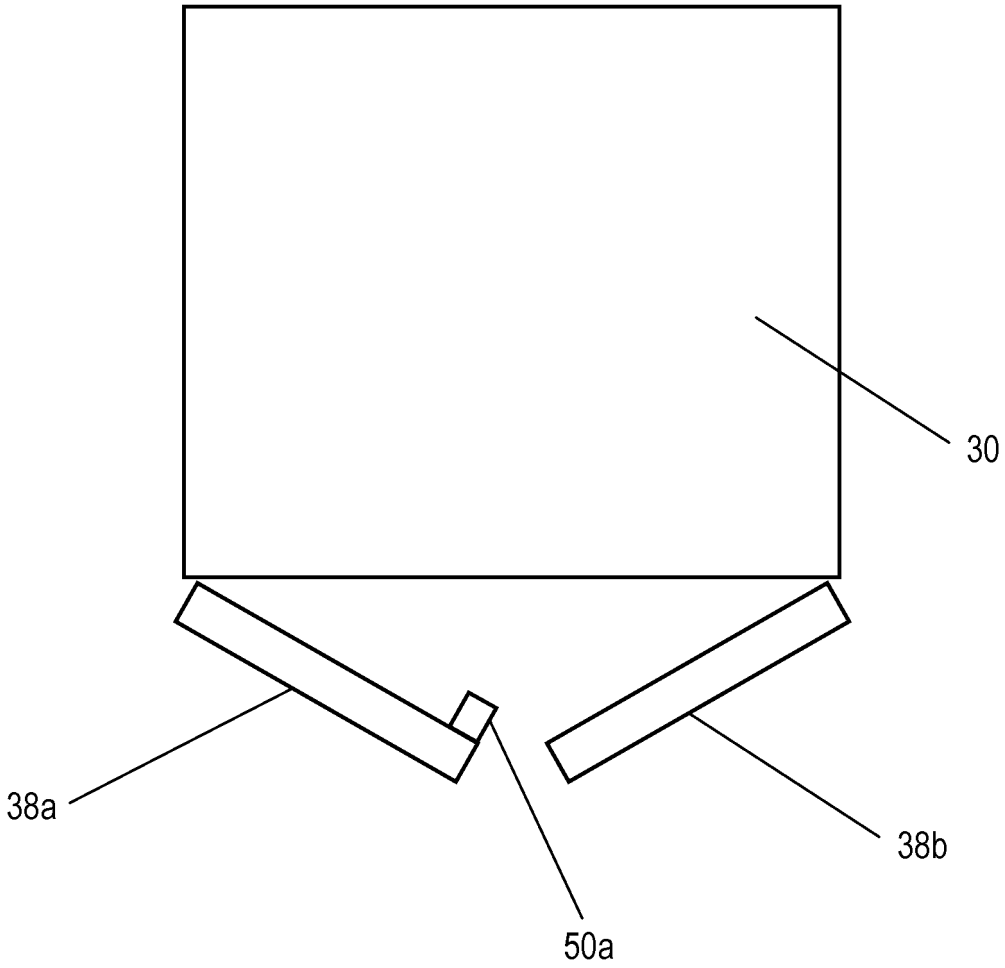


FIG. 3A

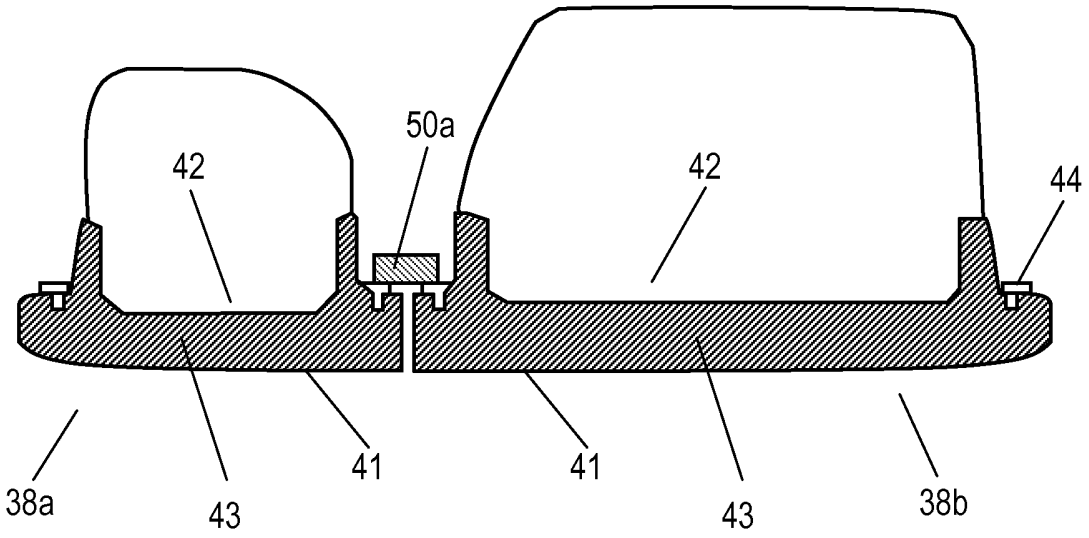


FIG. 3B

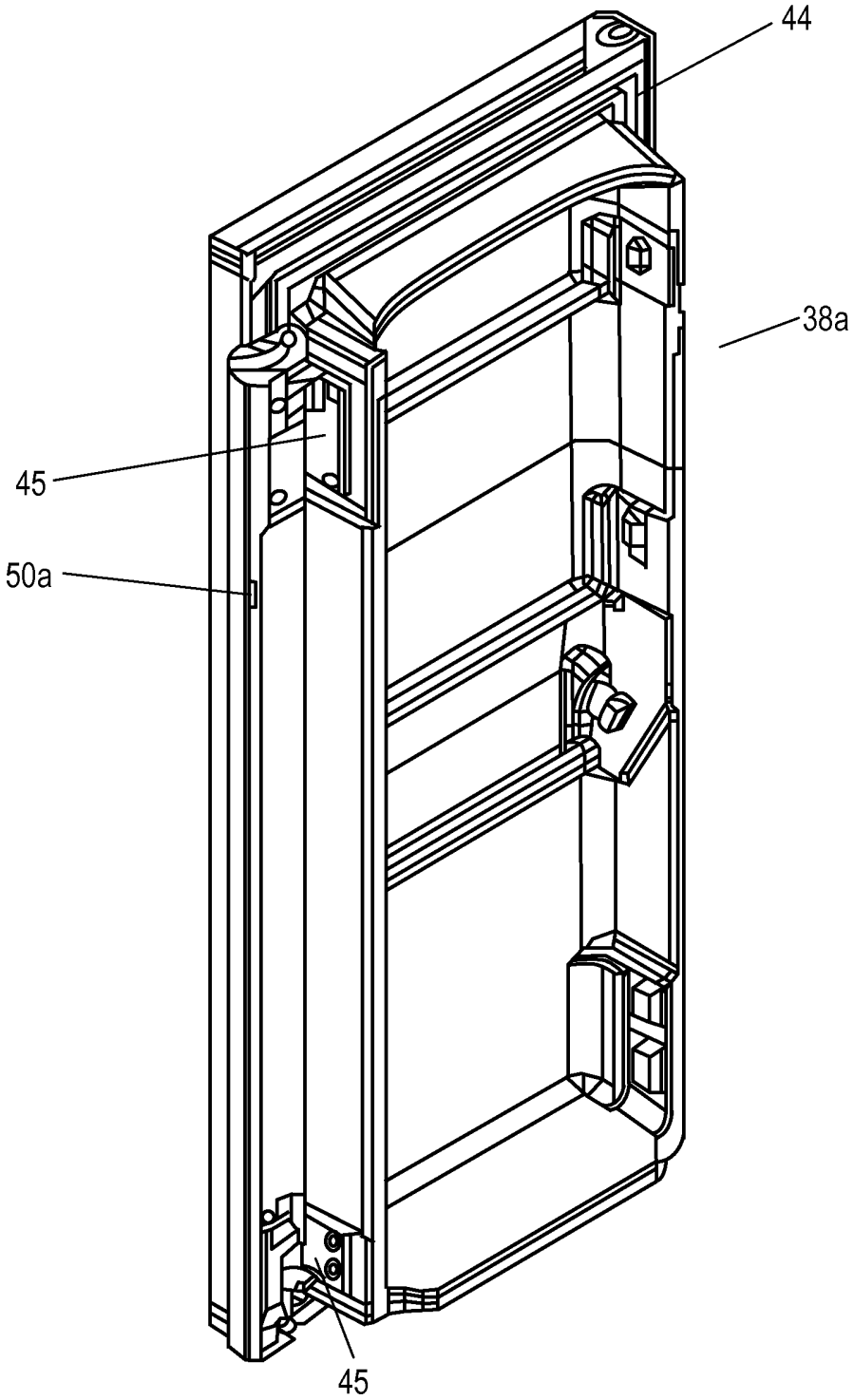


FIG. 4

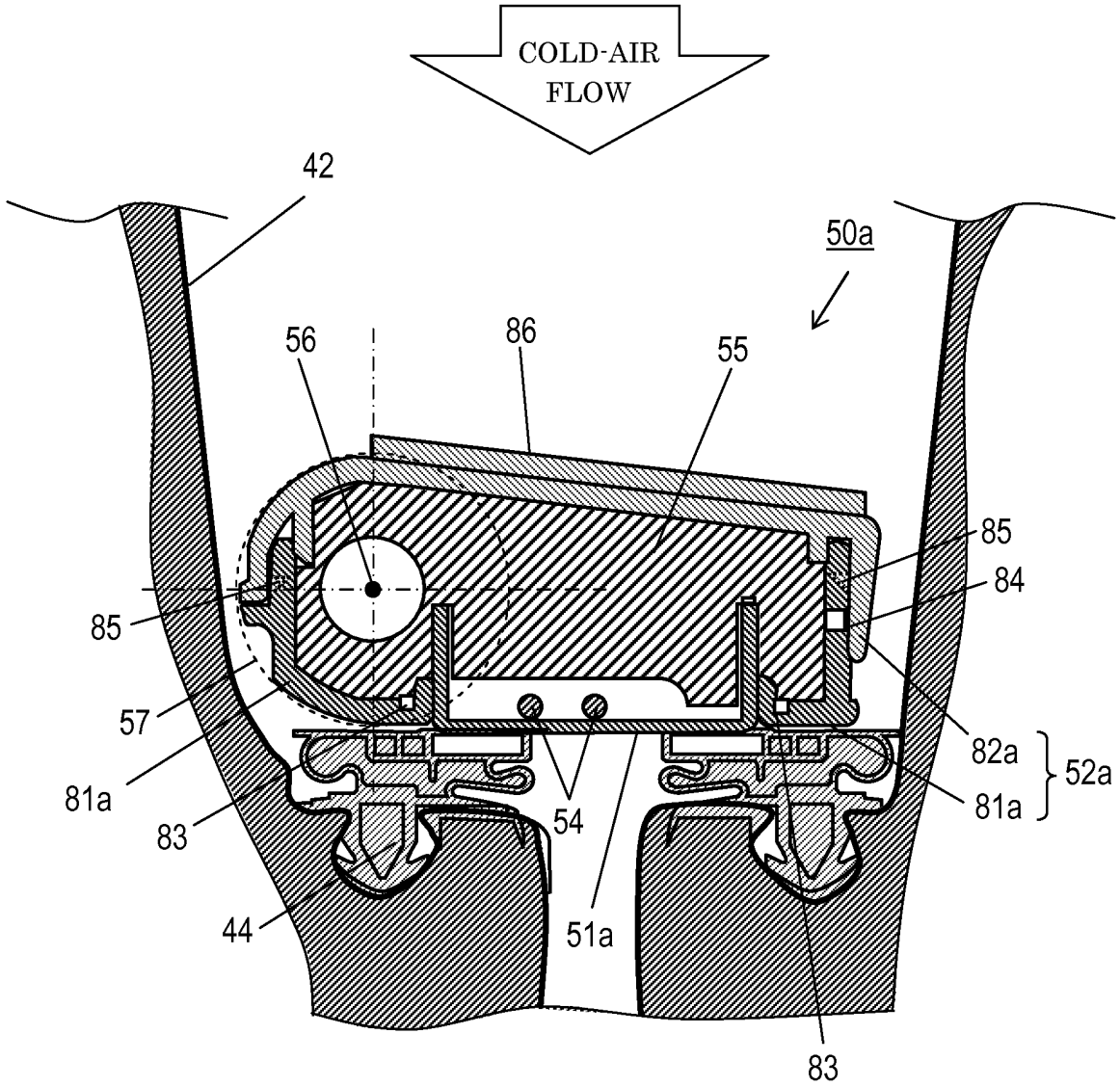

COLD-AIR
FLOW
42
50a
56
86
55
85
84
85
57
82a
52a
81a
81a
83
54
44
51a
83

FIG. 5A

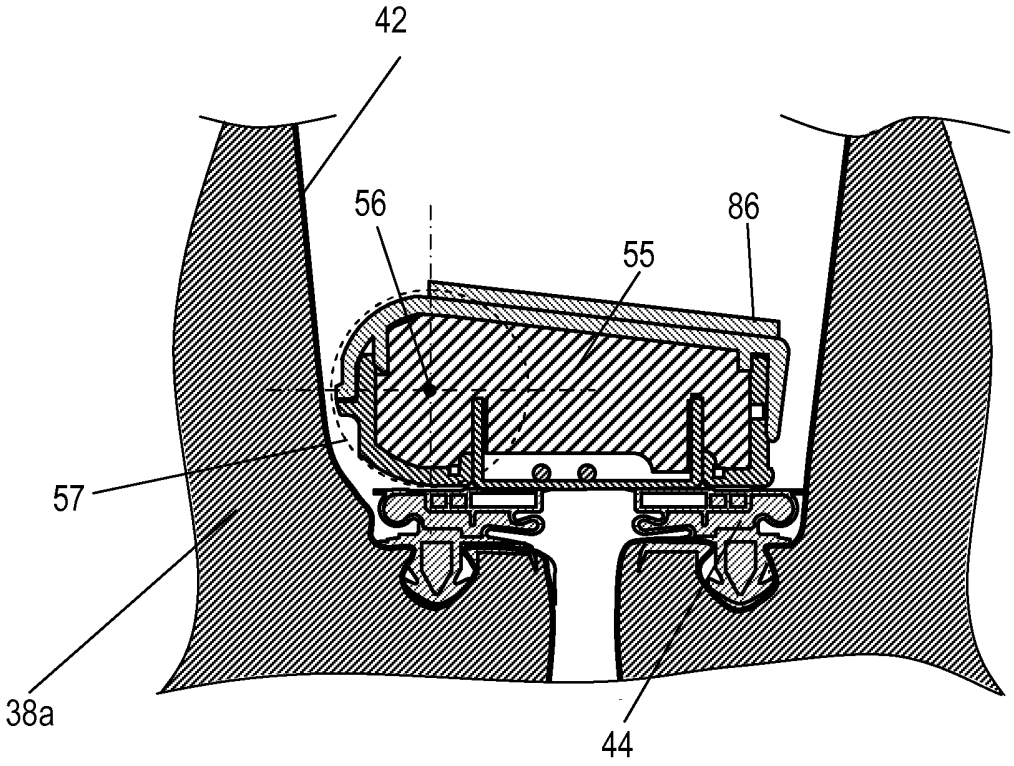


FIG. 5B

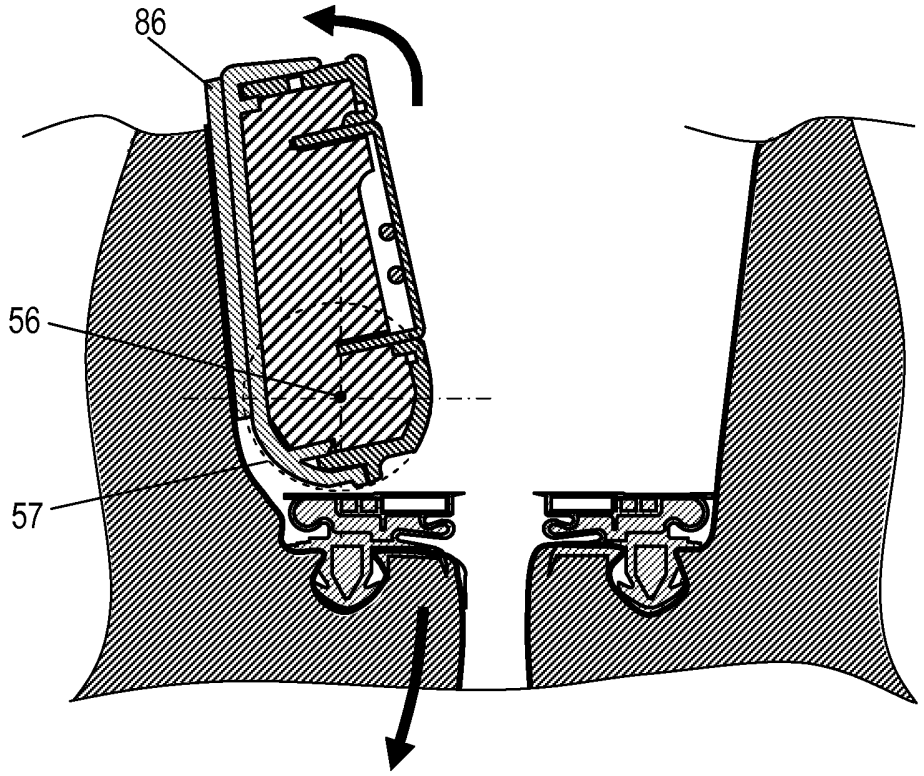


FIG. 6

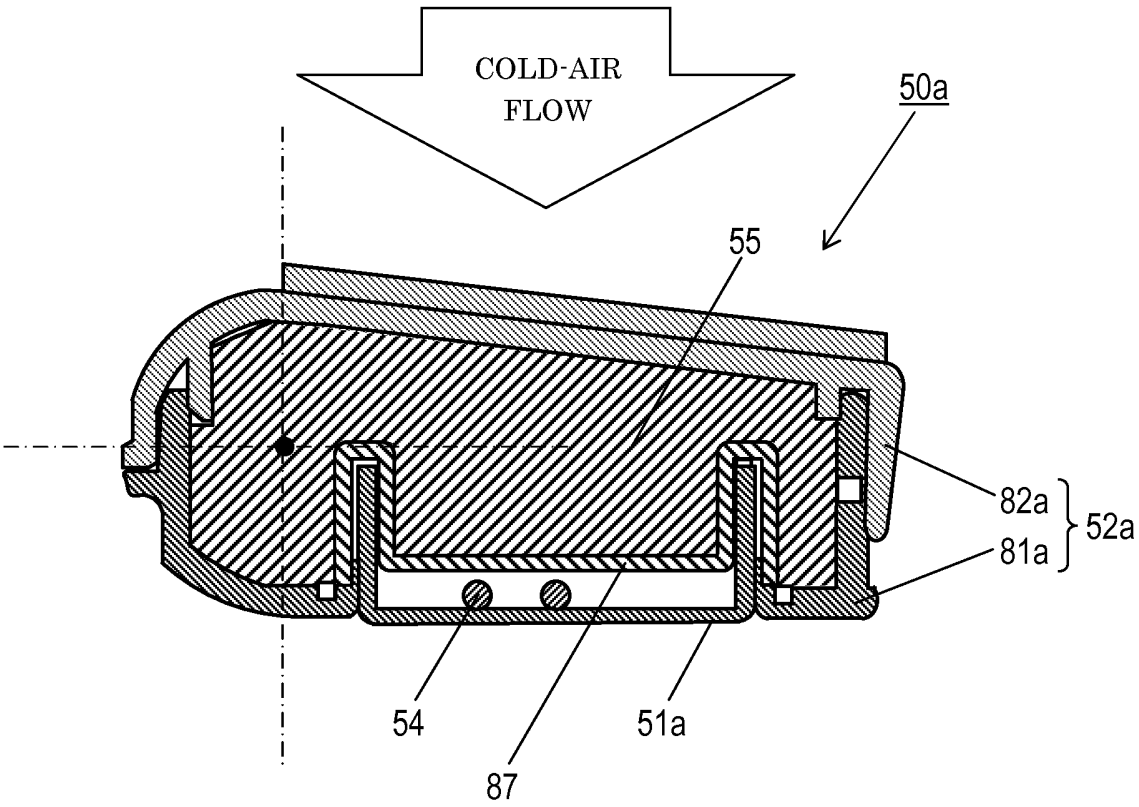


FIG. 7

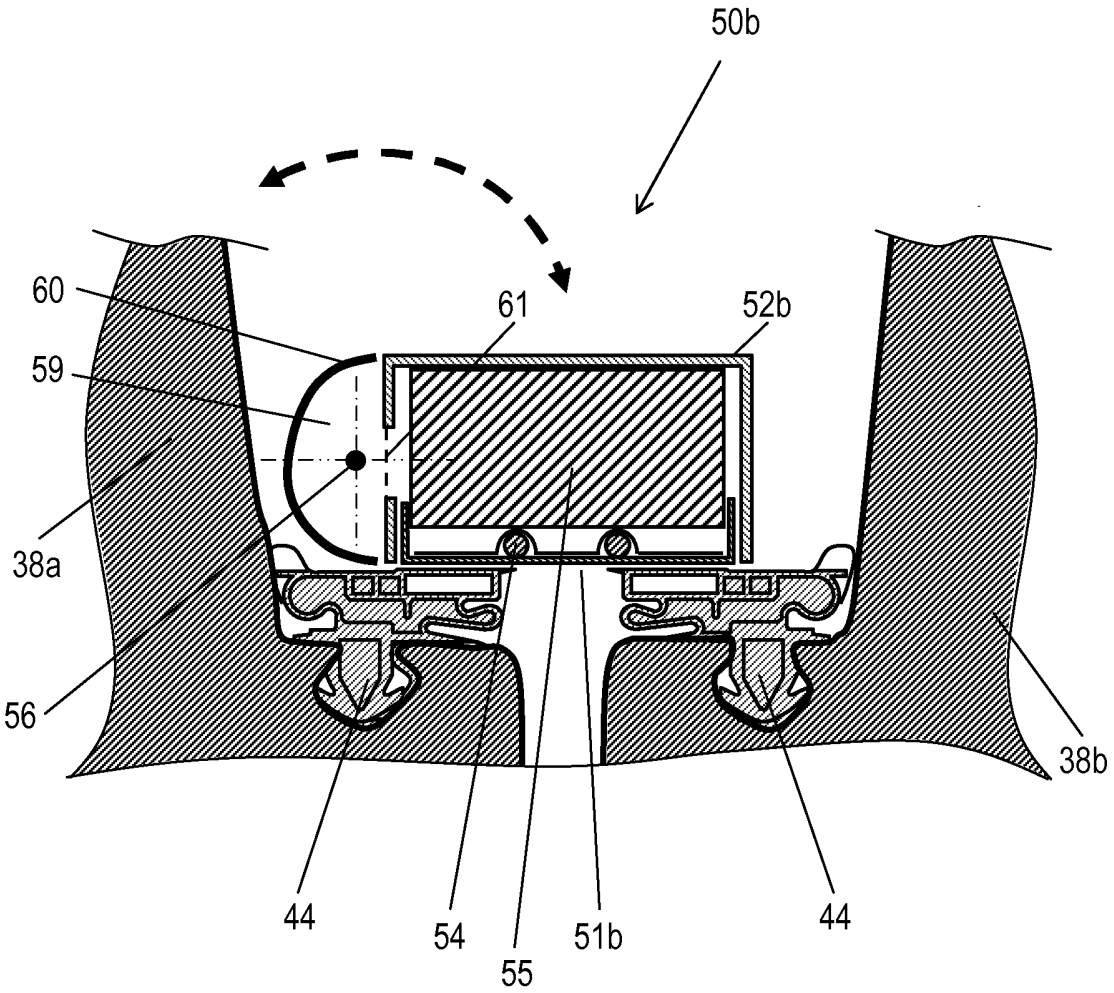


FIG. 8A

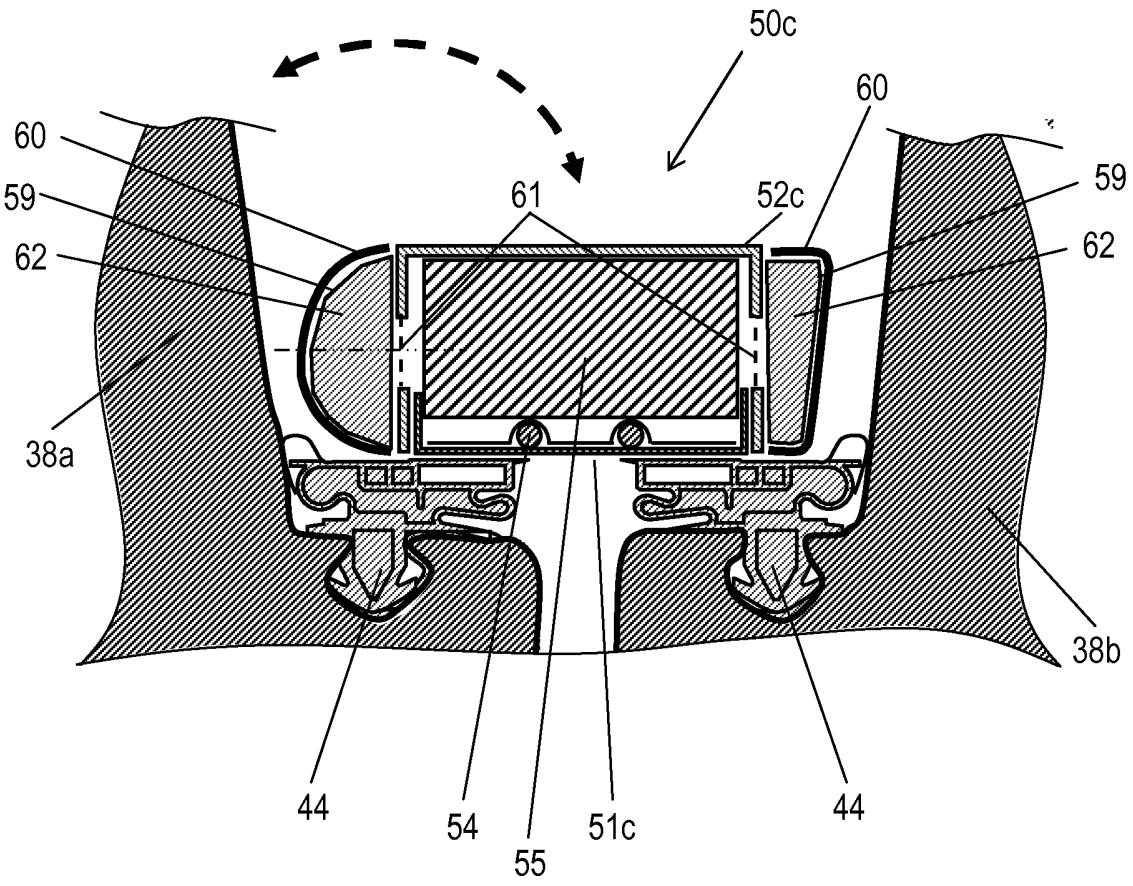


FIG. 8B

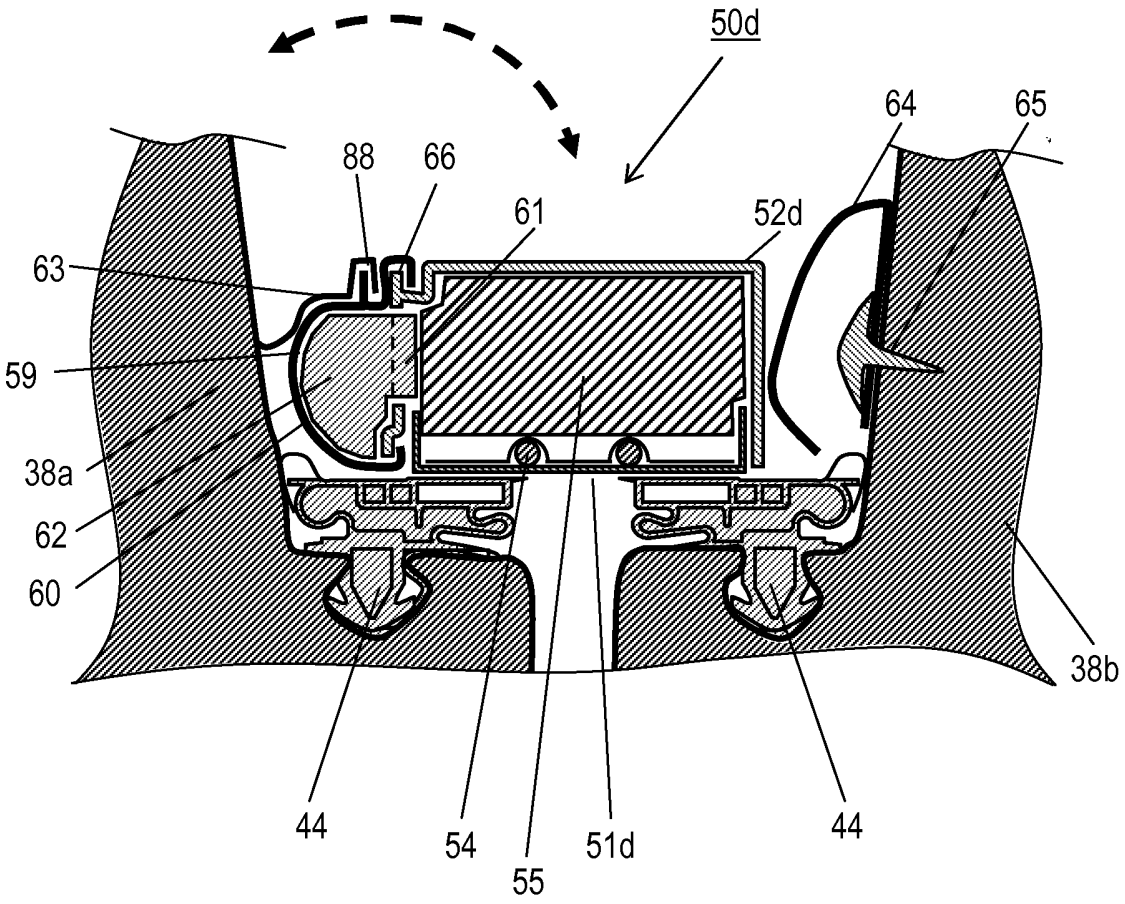


FIG. 8C

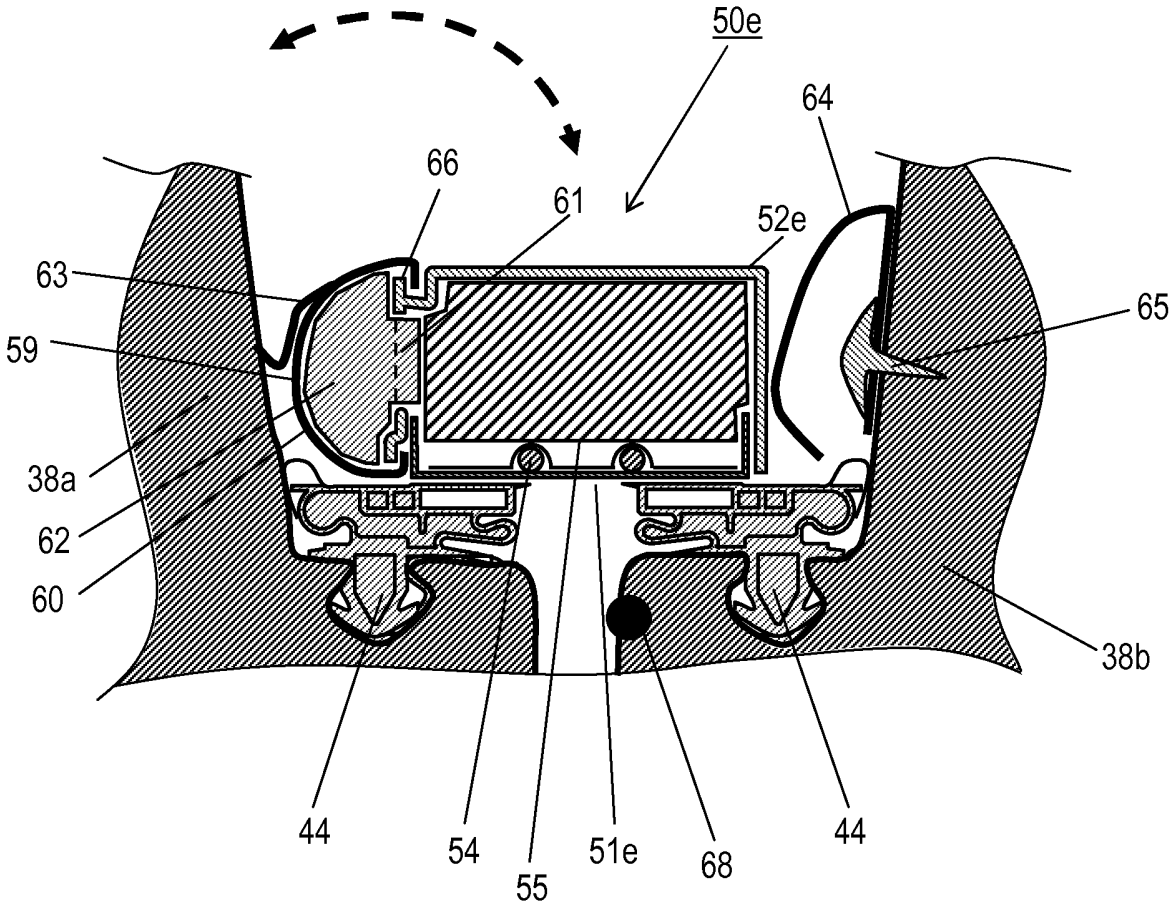


FIG. 9

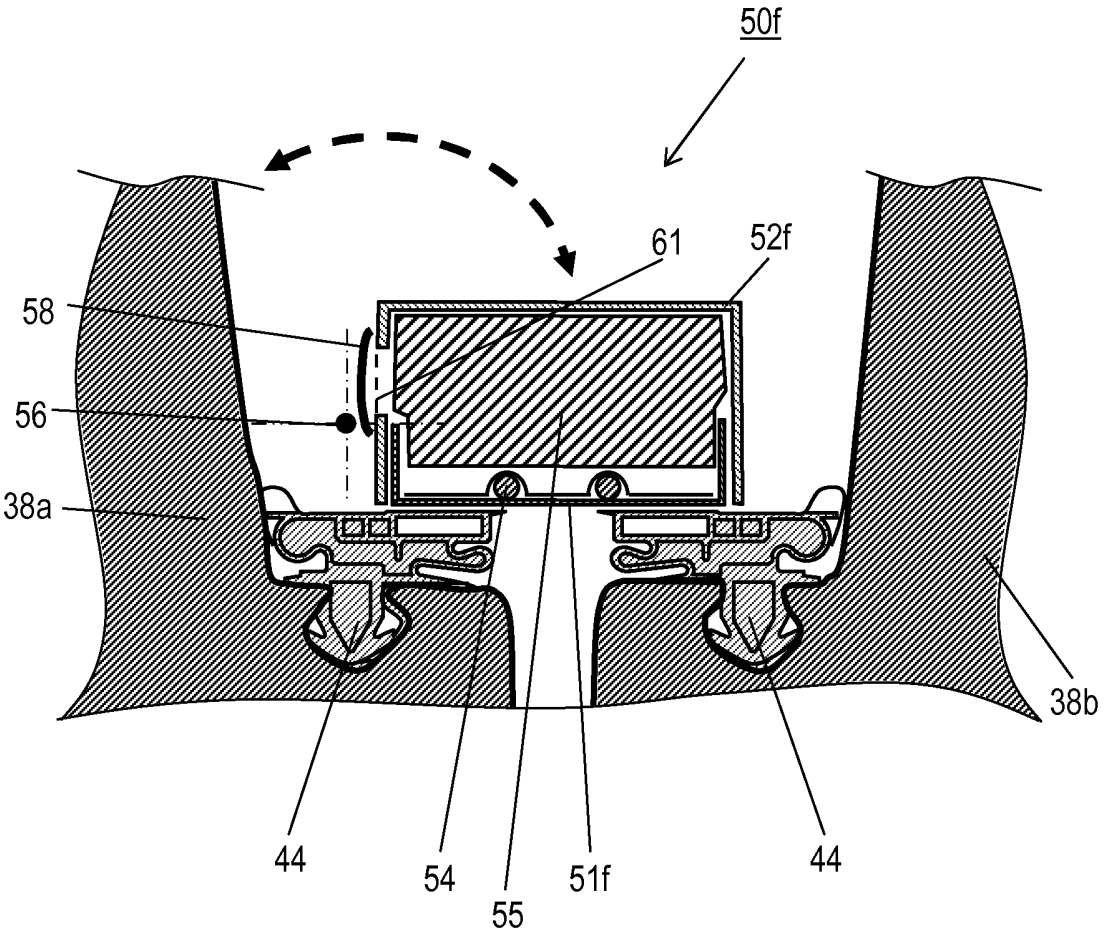


FIG. 10A

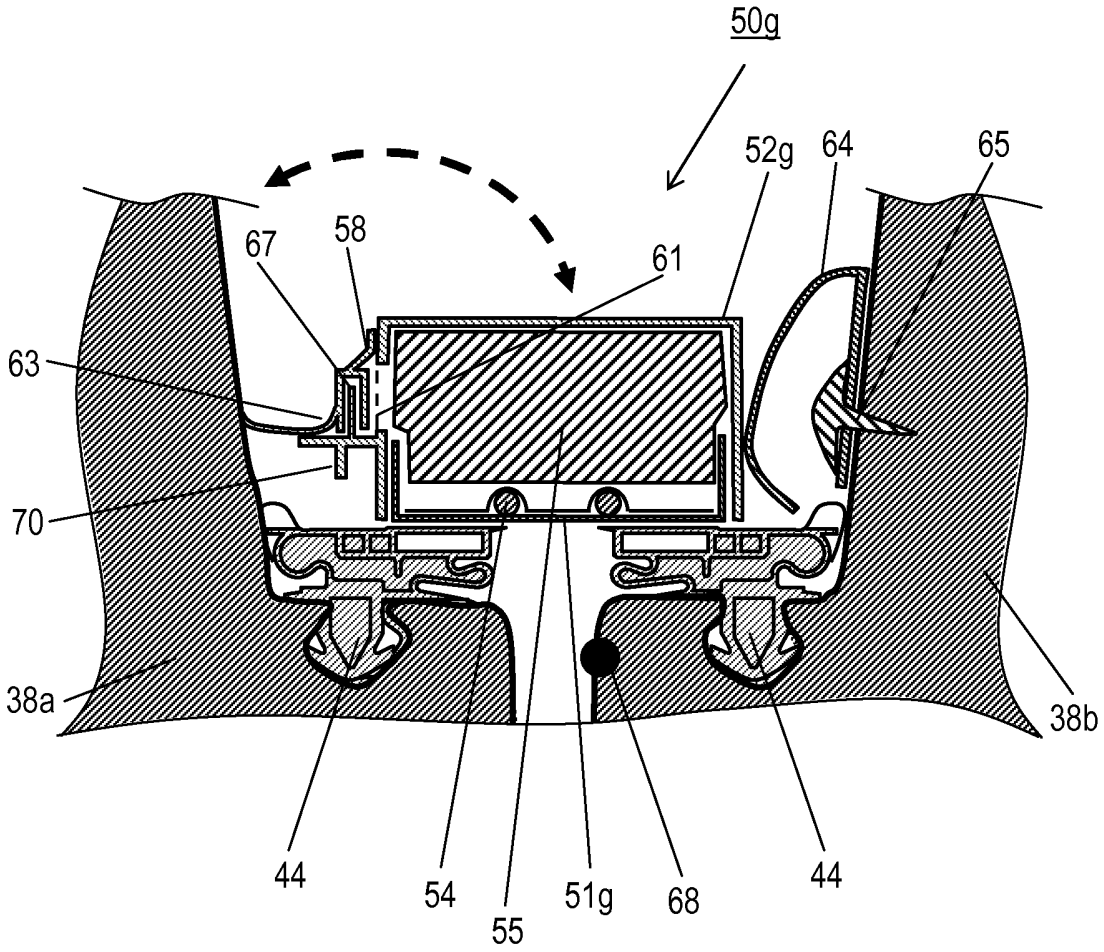


FIG. 10B

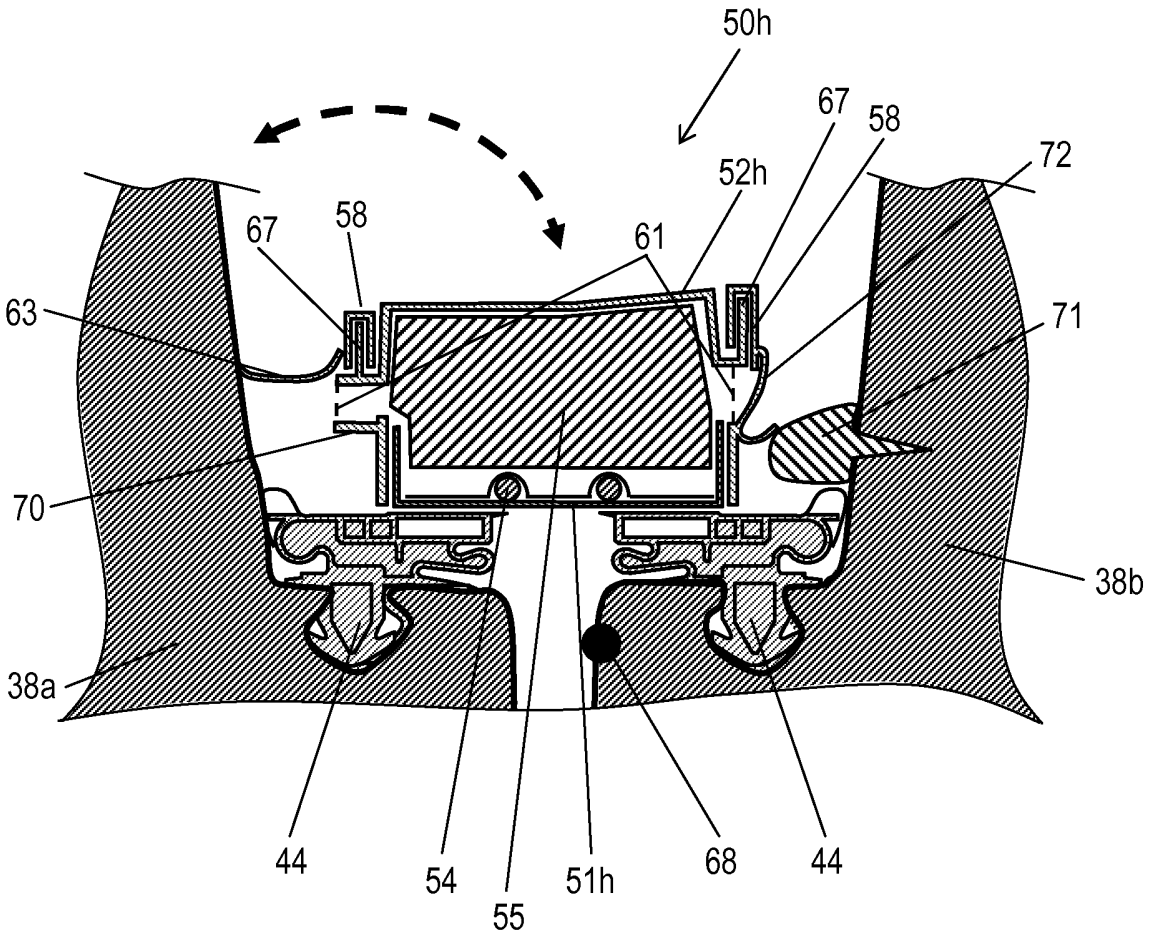


FIG. 10C

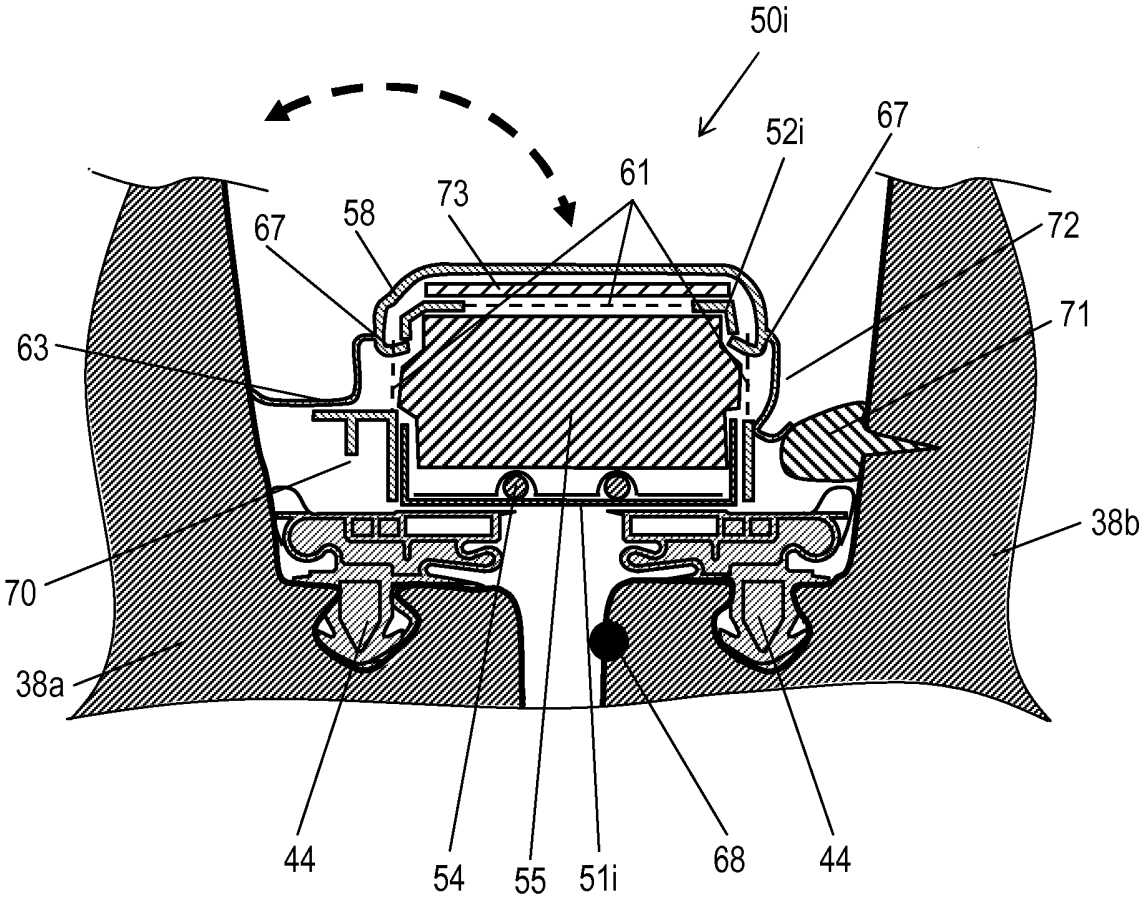


FIG. 11

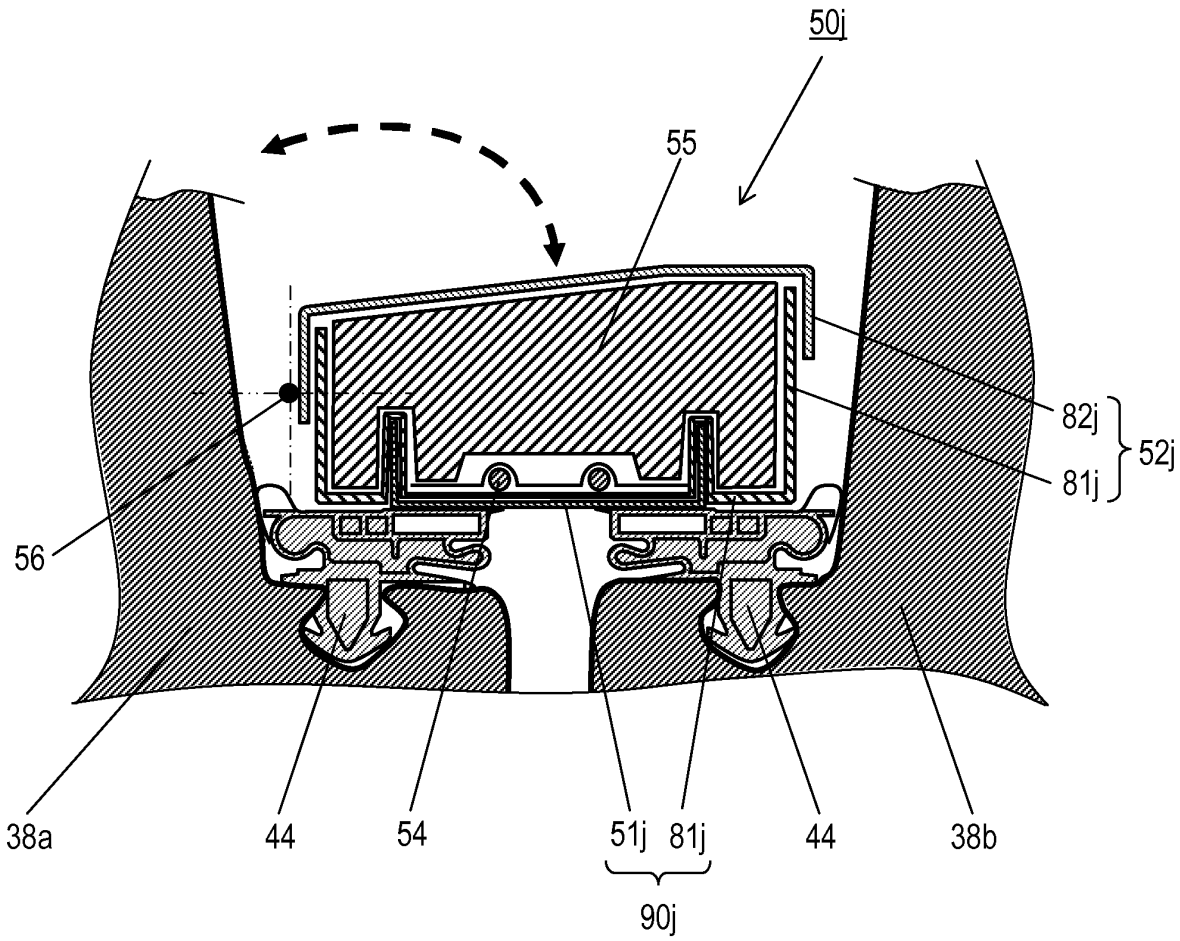


FIG. 12A

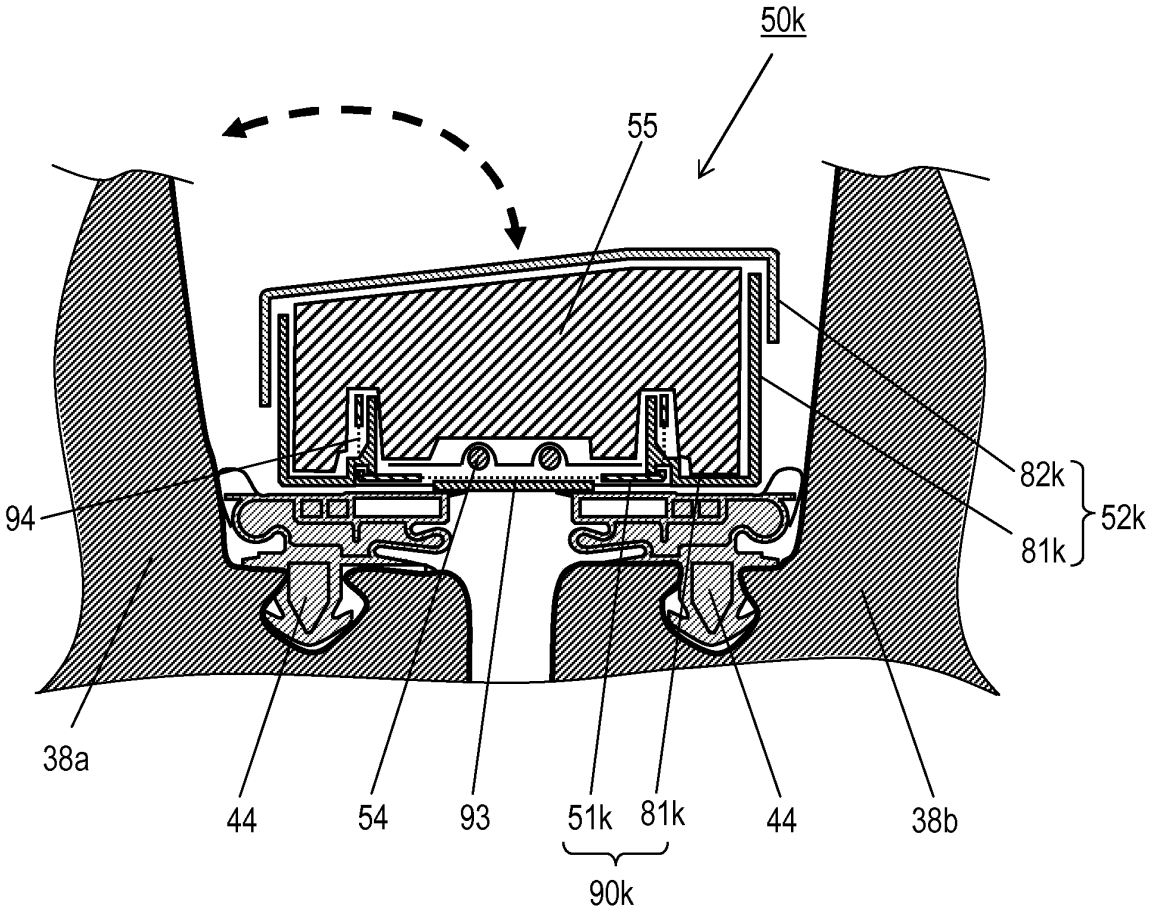


FIG. 12B

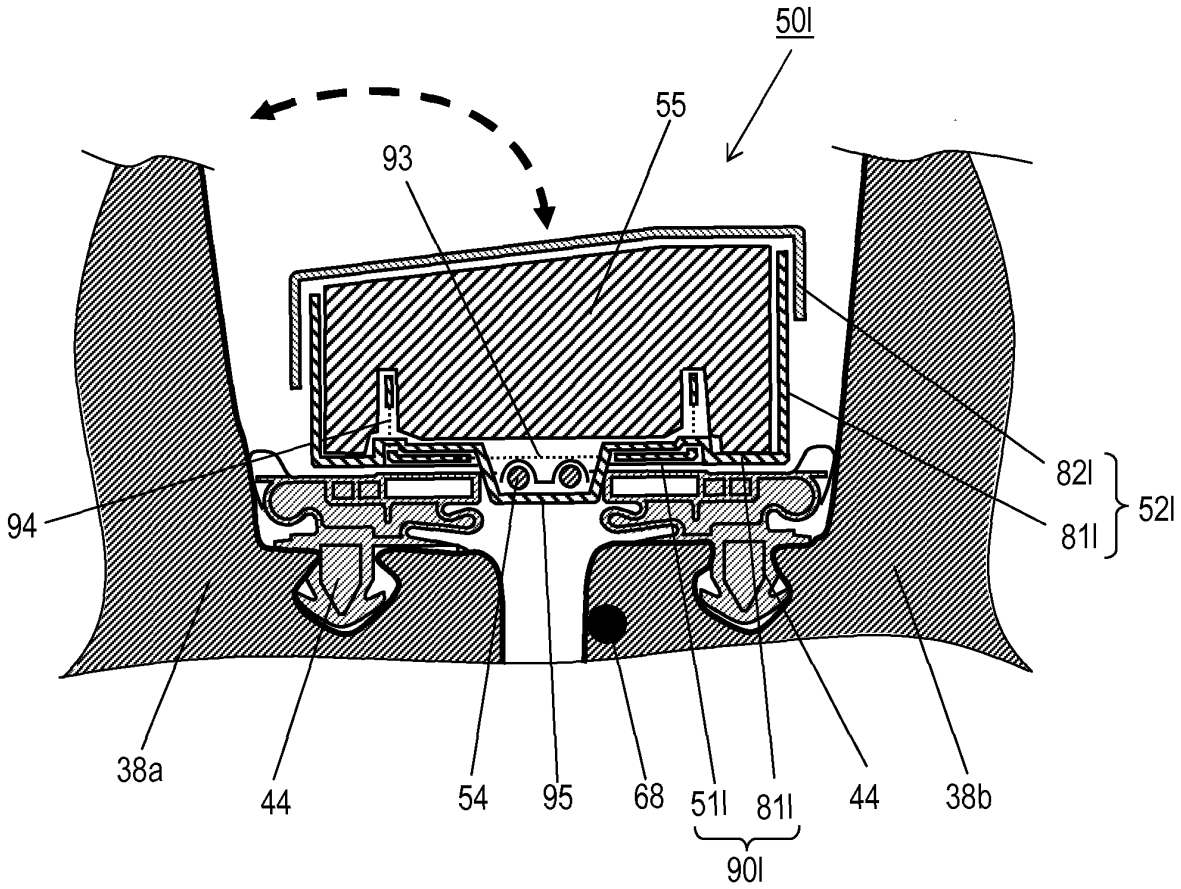


FIG. 13

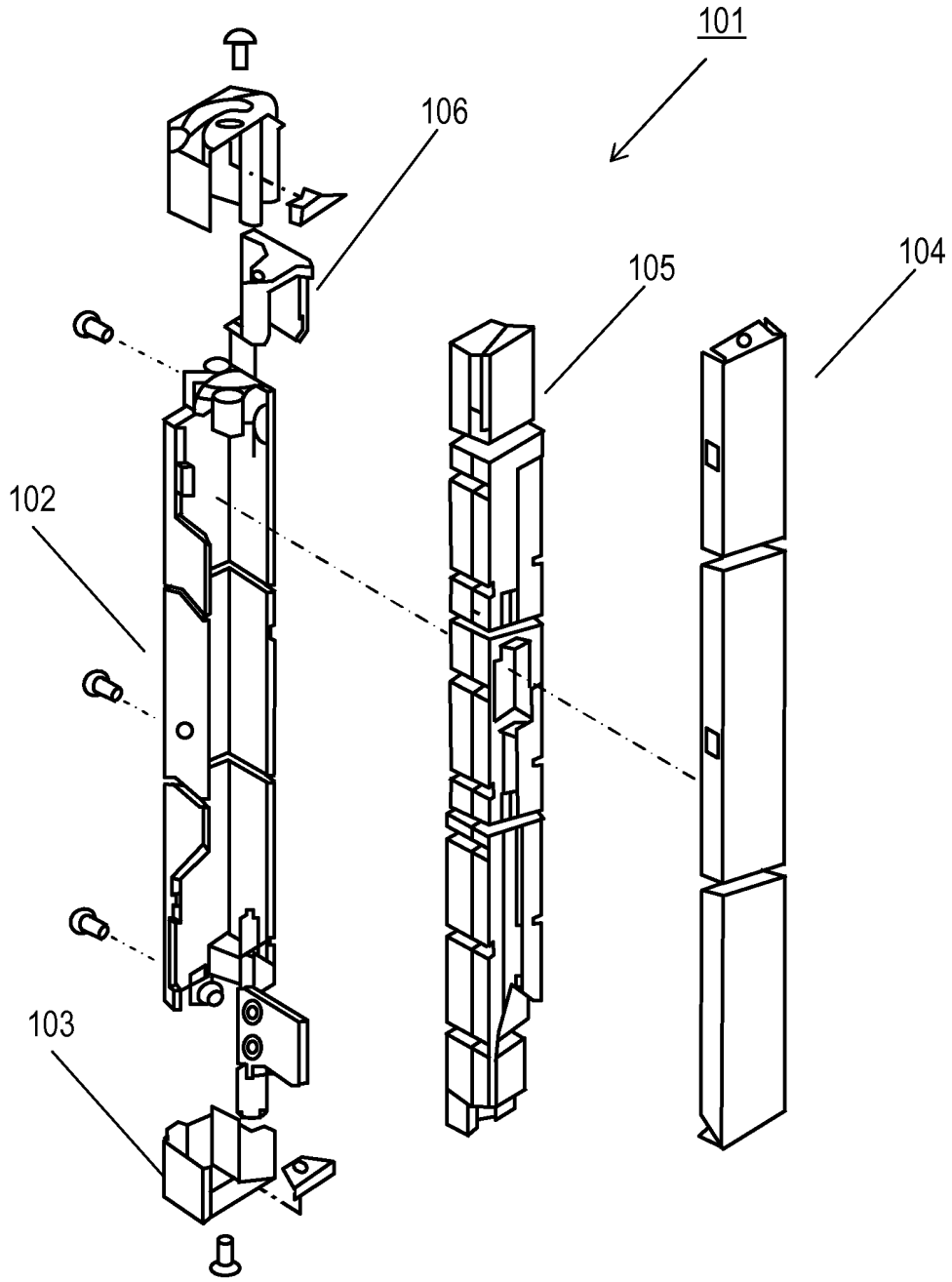
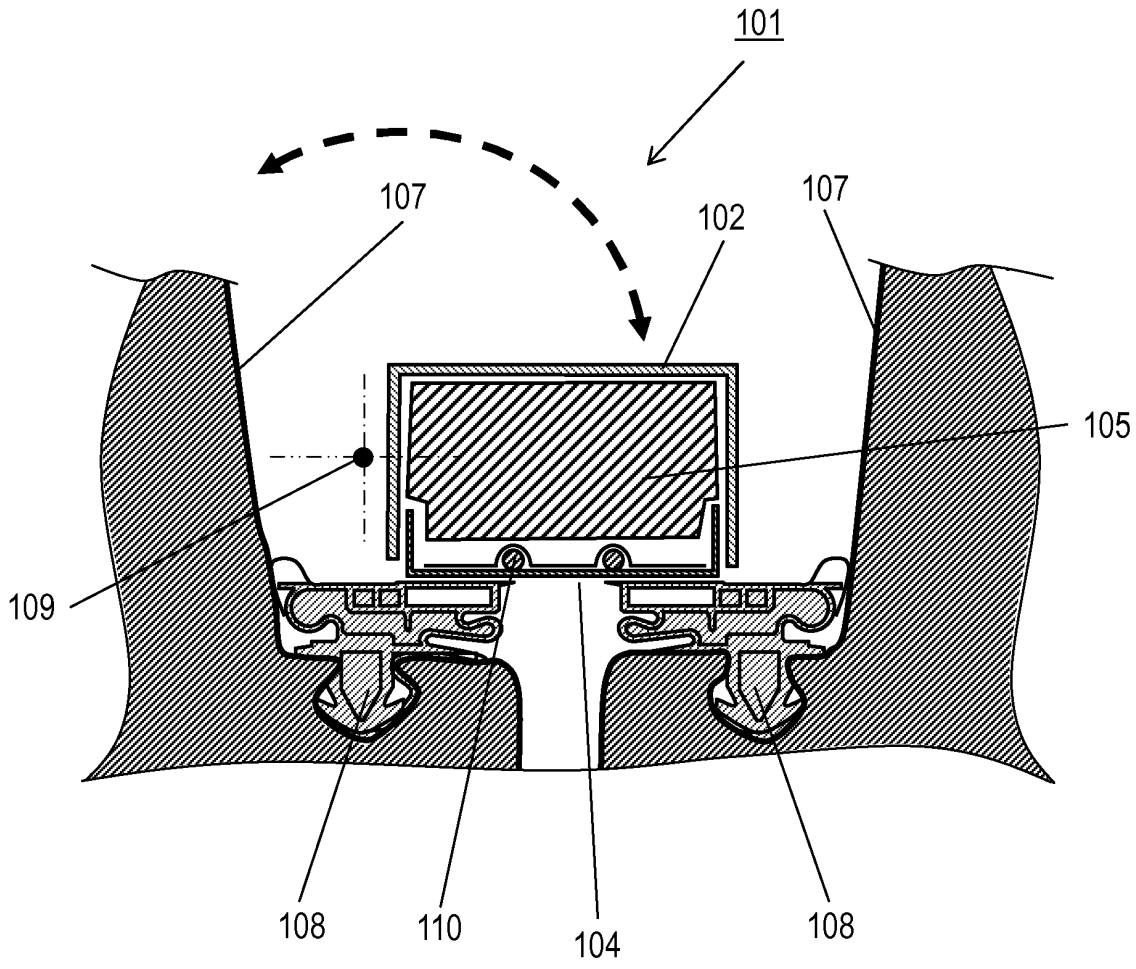


FIG. 14



**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2012/005832

A. CLASSIFICATION OF SUBJECT MATTER
*F25D23/02*(2006.01)i

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

B. FIELDS SEARCHED

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

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 | 1996-2012 |
| Kokai Jitsuyo Shinan Koho | 1971-2012 | Toroku Jitsuyo Shinan Koho | 1994-2012 |

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. |
|---|---|---|
| X<br>Y | JP 11-63800 A (Sanyo Electric Co., Ltd.),<br>05 March 1999 (05.03.1999),<br>entire text; all drawings (particularly,<br>paragraphs [0007] to [0010], [0029] to [0031];<br>fig. 2 to 4, 6)<br>(Family: none) | 1,2<br>3 |
| X<br>Y | JP 2011-174625 A (Panasonic Corp.),<br>08 September 2011 (08.09.2011),<br>entire text; all drawings (particularly,<br>paragraphs [0006], [0020] to [0034]; fig. 4, 5,<br>8)<br>(Family: none) | 1,2<br>3 |

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 25 December, 2012 (25.12.12) | 08 January, 2013 (08.01.13) |
| Name and mailing address of the ISA/<br>Japanese Patent Office<br><br>Facsimile No. | Authorized officer<br><br>Telephone No. |

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

**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2012/005832

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X<br>Y | JP 2007-147090 A (Hitachi Appliances, Inc.),<br>14 June 2007 (14.06.2007),<br>entire text; all drawings (particularly,<br>paragraphs [0042] to [0045], [0049] to [0050];<br>fig. 3 to 8)<br>(Family: none) | 1,2<br>3 |
| X<br>Y | JP 4-225774 A (Sanyo Electric Co., Ltd.),<br>14 August 1992 (14.08.1992),<br>entire text; all drawings (particularly,<br>paragraphs [0011], [0012], [0016]; fig. 4, 5)<br>(Family: none) | 1,2<br>3 |
| Y | JP 2010-65865 A (Hitachi Appliances, Inc.),<br>25 March 2010 (25.03.2010),<br>entire text; all drawings (particularly,<br>paragraph [0025]; fig. 3, 4)<br>(Family: none) | 3 |
| Y | JP 3199390 B2 (Matsushita Refrigeration Co.),<br>15 June 2001 (15.06.2001),<br>entire text; all drawings (particularly,<br>paragraph [0011]; fig. 15, 16)<br>& JP 4-244579 A | 3 |

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**INTERNATIONAL SEARCH REPORT**

International application No.
PCT/JP2012/005832

**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.:
1-3

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the 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)) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/005832

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

Disclosed in any of Document 1 (JP 11-63800 A (Sanyo Electric Co., Ltd.), 05 March 1999 (05.03.1999), entire text; all drawings (particularly, paragraphs [0007] to [0010], [0029] to [0031]; fig. 2 to 4, 6)), Document 2 (JP 2011-174625 A (Panasonic Corp.), 08 September 2011 (08.09.2011), entire text; all drawings (particularly, paragraphs [0006], [0020] to [0034]; fig. 4, 5, 8)), Document 3 (JP 2007-147090 A (Hitachi Appliances, Inc.), 14 June 2007 (14.06.2007), entire text; all drawings (particularly, paragraphs [0042] to [0045], [0049] to [0050]; fig. 3, 4, 5 to 8)), and Document 4 (JP 4-225774 A (Sanyo Electric Co., Ltd.), 14 August 1992 (14.08.1992), entire text; all drawings (particularly, paragraphs [0011], [0012], [0016]; fig. 4, 5)) is "a refrigerator which is provided with double swing doors so as to close the front opening of a storage chamber, the doors being provided, on the rear circumferential edge thereof, with a gasket in contact with the opening edge of the main body of the refrigerator, the doors being also provided, on the inner surface on the non-pivot side of the doors, with a rotary partition member." The refrigerator has a feature ([claim 1]) that "the partition member includes a magnetizable wear plate having a high thermal conductivity and an outer frame constituent member with the wear plate and a resin material of a low thermal conductivity constituting an outer frame of the partition member", and a feature ([claim 2]) that "the center of a rotating shaft for rotating the partition member is disposed inwardly of the outer frame portion of the outer frame constituent member."

Therefore, the inventions of claims 1 and 2 cannot be considered to be novel in the light of the inventions disclosed in the documents 1-4 respectively, and have no special technical feature.

Consequently, a group of inventions of claims (claims 1-38) have no technical relationship involving a same or corresponding special technical feature, and therefore cannot be considered to be so linked as to form a single general inventive concept.

As a result of judging special technical features, it is considered that the following eight inventions are involved.

Meanwhile, the parts concerning main invention (the invention firstly set forth in claims) are relevant to claims 1-3.

(Invention 1): the inventions of claims 1-3

A refrigerator "which is provided with double swing doors so as to close the front opening of a storage chamber, the doors being provided, on the rear circumferential edge thereof, with a gasket in contact with the opening edge of the main body of the refrigerator, the doors being also provided, on the inner surface on the non-pivot side of the doors, with a rotary partition member, the refrigerator being adapted such that the partition member includes a magnetizable wear plate having a high thermal conductivity and an outer frame constituent member with the wear plate and a resin material of a low thermal conductivity constituting an outer frame of the partition member; and the center of a rotating shaft for rotating the partition member is disposed inwardly of the outer frame portion of the outer frame constituent member."

(Continued to next extra sheet)

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/005832

(Invention 2): the invention of claim 4

A refrigerator "which is provided with double swing doors so as to close the front opening of a storage chamber, the doors being provided, on the rear circumferential edge thereof, with a gasket in contact with the opening edge of the main body of the refrigerator, the doors being also provided, on the inner surface on the non-pivot side of the doors, with a rotary partition member, the refrigerator being adapted such that the partition member includes a magnetizable wear plate having a high thermal conductivity and an outer frame constituent member with the wear plate and a resin material of a low thermal conductivity constituting an outer frame of the partition member; the center of a rotating shaft for rotating the partition member is disposed inwardly of the outer frame portion of the outer frame constituent member; and the side face of the partition member on the rotating shaft side is disposed outwardly of the end face of the gasket in the width direction."

(Invention 3): the invention of claim 5

A refrigerator "which is provided with double swing doors so as to close the front opening of a storage chamber, the doors being provided, on the rear circumferential edge thereof, with a gasket in contact with the opening edge of the main body of the refrigerator, the doors being also provided, on the inner surface on the non-pivot side of the doors, with a rotary partition member, the refrigerator being adapted such that the partition member includes a magnetizable wear plate having a high thermal conductivity and an outer frame constituent member with the wear plate and a resin material of a low thermal conductivity constituting an outer frame of the partition member; the center of a rotating shaft for rotating the partition member is disposed inwardly of the outer frame portion of the outer frame constituent member; and the partition member includes therein a heat insulating member."

(Invention 4): the invention of claim 6

A refrigerator "which is provided with double swing doors so as to close the front opening of a storage chamber, the doors being provided, on the rear circumferential edge thereof, with a gasket in contact with the opening edge of the main body of the refrigerator, the doors being also provided, on the inner surface on the non-pivot side of the doors, with a rotary partition member, the refrigerator being adapted such that the partition member includes a magnetizable wear plate having a high thermal conductivity and an outer frame constituent member with the wear plate and a resin material of a low thermal conductivity constituting an outer frame of the partition member; the center of a rotating shaft for rotating the partition member is disposed inwardly of the outer frame portion of the outer frame constituent member; and the partition member includes, on a flat portion thereof on the inner side of the refrigerator, a heat insulating member having a width greater than the width of the wear plate."

(Continued to next extra sheet)

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/005832

(Invention 5): the inventions of claims 7-10

A refrigerator "which is provided with double swing doors so as to close the front opening of a storage chamber, the doors being provided, on the rear circumferential edge thereof, with a gasket in contact with the opening edge of the main body of the refrigerator, the doors being also provided, on the inner surface on the non-pivot side of the doors, with a rotary partition member, the refrigerator being adapted such that the partition member includes a magnetizable wear plate having a high thermal conductivity and an outer frame constituent member with the wear plate and a resin material of a low thermal conductivity constituting an outer frame of the partition member; the center of a rotating shaft for rotating the partition member is disposed inwardly of the outer frame portion of the outer frame constituent member; the outer frame constituent member includes an outside-air-side resin member in contact with the wear plate and a storage-chamber-side resin member constituting the outer frame constituent member inside the refrigerator; and the side face of the outside-air-side resin member and the side face of the storage-chamber-side resin member are securely snap-fitted to each other."

(Invention 6): the inventions of claims 11-19

A refrigerator "which is provided with double swing doors so as to close the front opening of a storage chamber, the doors being provided, on the rear circumferential edge thereof, with a gasket in contact with the opening edge of the main body of the refrigerator, the doors being also provided, on the inner surface on the non-pivot side of the doors, with a rotary partition member, the refrigerator being adapted such that the partition member includes a magnetizable wear plate having a high thermal conductivity and an outer frame constituent member with the wear plate and a resin material of a low thermal conductivity constituting an outer frame of the partition member; and the side face of the outer frame constituent member and a space defining member define a heat exchange retarding space."

(Invention 7): the inventions of claims 20-28

A refrigerator "which is provided with double swing doors so as to close the front opening of a storage chamber, the doors being provided, on the rear circumferential edge thereof, with a gasket in contact with the opening edge of the main body of the refrigerator, the doors being also provided, on the inner surface on the non-pivot side of the doors, with a rotary partition member, the refrigerator being adapted such that the partition member includes a magnetizable wear plate having a high thermal conductivity and an outer frame constituent member with the wear plate and a resin material of a low thermal conductivity constituting an outer frame of the partition member; the refrigerator includes a heat conduction retarding portion provided on a constituent surface of the outer frame constituent member and a protective member; and the protective member is constructed to protect the heat conduction retarding portion."

(Continued to next extra sheet)

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2012/005832

(Invention 8): the inventions of claims 29-38

A refrigerator "which is provided with double swing doors so as to close the front opening of a storage chamber, the doors being provided, on the rear circumferential edge thereof, with a gasket in contact with the opening edge of the main body of the refrigerator, the doors being also provided, on the inner surface on the non-pivot side of the doors, with a rotary partition member, the refrigerator being adapted such that the partition member includes a magnetizable wear plate having a high thermal conductivity and an outer frame constituent member with the wear plate and a resin material of a low thermal conductivity constituting an outer frame of the partition member; and the outer frame constituent member is made up of an outside-air-side resin member and a storage-chamber-side resin member, the wear plate and the outside-air-side resin member being integrally molded into an outside-air-side outer frame member."

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## REFERENCES CITED IN THE DESCRIPTION

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

### Patent documents cited in the description


- JP 6042859 A **[0007]**