CLAIMS

[Claim 1]

A refrigerator having a storage compartment with an opening at a front side as a refrigerator compartment and a door for opening and closing the opening, the refrigerator comprising:

a convex portion formed on a rear wall at a corner portion between a lateral wall of the refrigerator compartment and the rear wall of the refrigerator compartment and projecting toward the front side;

a concave portion formed on the rear wall in a manner of being recessed to a rear side with respect to the convex portion;

a vacuum heat insulating material arranged between a part of an internal box corresponding to an inner surface of the rear wall and a part of an external box corresponding to an outer surface of the rear wall, or between another part of the internal box corresponding to an inner surface of the lateral wall and another part of the external box corresponding to an outer surface of the lateral wall;

a first intermediate member charged, sealed, or applied between the vacuum heat insulating material and the internal box corresponding to the inner surface of the rear wall, or between the vacuum heat insulating material and the internal box corresponding to the inner surface of the lateral wall to bond, attach, or fix the vacuum heat insulating material and the internal box to each other; and

a second intermediate member bonding the vacuum heat insulating material with the external box corresponding to the outer surface of the rear wall,

wherein the vacuum heat insulating material is arranged to at least partially overlap with the convex portion,

wherein the first intermediate member comprises a foam heat insulating material that is charged, sealed, or applied between the vacuum heat insulating material and the internal box corresponding to the inner surface of the rear wall, or between the vacuum heat insulating material and the internal box corresponding to the inner surface of the lateral wall,

wherein the first intermediate member has a thickness of less than 10 mm,

wherein the second intermediate member comprises an adhesive agent different from the foam heat insulating material,

wherein the vacuum heat insulating material is integrated with the internal box and the external box at the convex portion,

wherein the refrigerator further comprises

a cooler generating a cooling air to cool the storage compartment,

a cooling air passage formed of the concave portion that is formed in a vertical direction of the rear wall, the cooling air passage supplying the cooling air generated by the cooler into the storage compartment,

a cover member for covering a part of a rear surface of an inside of the storage compartment, and

a protruding portion formed in the concave portion,

wherein the cover member includes

an air passage cover portion that forms at least a part of the cooling air passage or covers at least the part of the cooling air passage, and

a mount portion for mounting to the protruding portion.

[Claim 2]

The refrigerator of claim 1,

wherein the first intermediate member between the vacuum heat insulating material and the internal box has a thickness of smaller than a thickness of the vacuum heat insulating material.

[Claim 3]

A refrigerator having a storage compartment with an opening at a front side as a refrigerator compartment and a door for opening and closing the opening, the refrigerator comprising:

a convex portion formed on a rear wall at a corner portion between a lateral wall of the refrigerator compartment and the rear wall of the refrigerator compartment and projecting toward the front side;

a concave portion formed on the rear wall in a manner of being recessed to a rear side with respect to the convex portion;

a vacuum heat insulating material arranged between an internal box corresponding to an inner surface of the rear wall and an external box corresponding to an outer surface of the rear wall, the vacuum heat insulating material having a width larger than a width of the concave portion and at least partially overlapping with the convex portion in a width direction;

a first intermediate member charged, sealed, or applied between the vacuum heat insulating material and the internal box corresponding to the inner surface of the rear wall to bond, attach, or fix the vacuum heat insulating material and the internal box to each other; and

a second intermediate member bonding the vacuum heat insulating material with the external box,

wherein the first intermediate member interposed between the internal box forming the concave portion and the vacuum heat insulating material comprises a foam heat insulating material that is charged, sealed, or applied between the vacuum heat insulating material and the internal box,

wherein the first intermediate member has a thickness of less than 10 mm,

wherein the second intermediate member comprises an adhesive agent different from the first intermediate member,

wherein the vacuum heat insulating material is directly bonded to the external box via the second intermediate member,

wherein the vacuum heat insulating material is integrated with the internal box and the external box at the convex portion,

wherein the refrigerator further comprises

a cooler generating a cooling air to cool the storage compartment,

a cooling air passage formed of the concave portion that is formed in a vertical direction of the rear wall, the cooling air passage supplying the cooling air generated by the cooler into the storage compartment,

a cover member for covering a part of a rear surface of an inside of the storage compartment, and

a protruding portion formed in the concave portion,

wherein the cover member includes

an air passage cover portion that forms at least a part of the cooling air passage or covers at least the part of the cooling air passage, and

a mount portion for mounting to the protruding portion.

[Claim 4]

The refrigerator of any one of claims 1 to 3,

wherein the foam heat insulating material is charged or sealed between the vacuum heat insulating material and the internal box forming the convex portion.

[Claim 5]

The refrigerator of any one of claims 1 to 4,

wherein the foam heat insulating material comprises a rigid urethane foam, and has a density of more than 60 kg/m^3 after foaming.

[Claim 6]

The refrigerator of any one of claims 1 to 5,

wherein the first intermediate member is charged or applied to a part of a range of a space between the internal box forming the concave portion and the vacuum heat insulating material in the concave portion.

[Claim 7]

The refrigerator of any one of claims 1 to 6, further comprising

injection ports provided at positions near widthwise end portions of the external box corresponding to the rear wall or at positions near four corners of the external box corresponding to the rear wall, the injection ports being charged or injected with the first intermediate member,

wherein the vacuum heat insulating material is arranged so as not to interfere with the injection ports.

[Claim 8]

The refrigerator of claim 7,

wherein the convex portion has a triangular shape having an oblique side in a horizontal cross section, and the injection ports are provided in the range of the oblique side.

[Claim 9]

The refrigerator of claim 7 or 8,

wherein the vacuum heat insulating material is a flat plate shape and has cutout portions at corner portions of the flat plate shape, and the cutout portions are arranged at positions corresponding to the injection ports.

[Claim 10]

The refrigerator of any one of claims 7 to 9,

wherein Y1 <= T1 + A, where A is a widthwise length of the convex portion, T1 is a thickness of the lateral wall, and Y1 is a length from an outer surface of the lateral wall to an outer edge of the injection ports added by a widthwise length of the injection ports.

[Claim 11]

The refrigerator of any one of claims 1 to 10,

wherein a proportion of a volume of the vacuum heat insulating material relative to a volume of a space formed between the external box and the internal box is 40% or more.

[Claim 12]

The refrigerator of any one of claims 1 to 11,

wherein a ratio of the thickness of the first intermediate member relative to a sum of the thickness of the first intermediate member and a thickness of the vacuum heat insulating material is 0.3 or less.

[Claim 13]

The refrigerator of any one of claims 1 to 12,

wherein the vacuum heat insulating material has a bending elastic modulus of 20 MPa or more.

[Claim 14]

The refrigerator of any one of claims 1 to 13,

wherein the vacuum heat insulating material is arranged such that a proportion of a sum of areas of projection of the vacuum heat insulating material arranged in each of the rear wall and the lateral wall onto the rear wall and the lateral wall relative to a total surface area of the rear wall and the lateral wall is 70% or more.

[Claim 15]

The refrigerator of any one of claims 1 to 14,

wherein the vacuum heat insulating material comprises, as a core material, a fibrous core material made of an organic fiber or an inorganic fiber.

[Claim 16]

The refrigerator of any one of claims 1 to 15, further comprising

at least one of a screw, a hooking structure, or a fitting structure to fix or hold the mount portion to the protruding portion.

[Claim 17]

The refrigerator of any one of claims 1 to 16,

wherein the concave portion is formed on the rear surface of the storage compartment, and

wherein the refrigerator further comprises an illumination device arranged in an upper surface, a lower surface, or a lateral surface of the storage compartment for illuminating the inside of the storage compartment.

[Claim 18]

The refrigerator of any one of claims 1 to 17, further comprising

a pipe forming a refrigeration cycle, the pipe being arranged between the vacuum heat insulating material and the internal box forming the convex portion.

[Claim 19]

The refrigerator of any one of claims 1 to 16, further comprising

a pipe forming a refrigeration cycle, the pipe being arranged in the protruding portion.

[Claim 20]

The refrigerator of any one of claims 1 to 19, further comprising

control lead wires arranged in the convex portion.

[Claim 21]

The refrigerator of any one of claims 1 to 16, further comprising

control lead wires arranged in the protruding portion.

[Claim 22]

The refrigerator of any one of claims 1 to 21, further comprising:

a pull-out case housed in the storage compartment and pulled out through rail members arranged on the lateral wall of the storage compartment;

a vacuum heat insulating material arranged between the internal box and the external box at a position facing the rail members; and

a foam heat insulating material charged between the internal box and the vacuum heat insulating material at positions facing the rail members,

wherein the foam heat insulating material has a thickness of less than 10 mm at the positions facing the rail members.

[Claim 23]

The refrigerator of claim 22, further comprising

a reinforcing member for fixing the rail members, the reinforcing member being provided between the vacuum heat insulating material and the internal box.

[Claim 24]

The refrigerator of any one of claims 1 to 16,

wherein the protruding portion is formed separately from the internal box corresponding to the rear wall.

[Claim 25]

The refrigerator of any one of claims 1 to 16,

wherein the cooling air passage comprises an air passage assembly that is formed of the cover member and an air passage component hold by the cover member.

[Claim 26]

The refrigerator of any one of claims 1 to 16,

wherein the cooling air passage has a cross-sectional shape that is formed in an elliptical shape elongated in a widthwise direction.

[Claim 27]

The refrigerator of any one of claims 1 to 26,

wherein the storage compartment comprises

the refrigerator compartment arranged in an upper stage,

a freezer compartment arranged in a lower stage,

a vegetable compartment arranged under the refrigerator compartment and above the freezer compartment.

[Claim 28]

The refrigerator of claim 27, further comprising

an ice making compartment and a switching compartment that are arranged parallel to each other under the refrigerator compartment,

wherein the vegetable compartment is arranged under the ice making compartment and the switching compartment that are arranged parallel to each other, and above the freezer compartment.

[Claim 29]

The refrigerator of claim 27 or 28,

wherein the storage compartment is partitioned by a partition plate, and

wherein a second vacuum heat insulating material is arranged in an internal space of the partition plate, and the internal space of the partition plate is charged with an urethane foam.

[Claim 30]

The refrigerator of claim 29,

wherein the urethane foam has a thickness of less than 10 mm, and

wherein a charging rate of the vacuum heat insulating material is 40% or more and 95% or less.