CLAIMS

[Claim 1]

A refrigerator, comprising:

a heat insulating box body including

a rear wall,

a right lateral wall and a left lateral wall,

an upper wall, and

a lower wall;

a storage compartment arranged in the heat insulating box body for housing items to be stored; and

a cooler for generating a cooling air,

wherein the heat insulating box body includes

convex portions formed on the rear wall at corner portions between the lateral walls and the rear wall 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 portions,

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 walls and another part of the external box corresponding to an outer surface of the lateral walls, the vacuum heat insulating material being arranged to partially overlap with the convex portions,

a first intermediate member comprising 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 walls to bond, attach, or fix the vacuum heat insulating material and the internal box to each other,

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

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 concave portion is formed in a vertical direction of the rear wall, and is used as an air passage through which the cooling air generated by the cooler is supplied into the storage compartment, and

wherein the cover member includes

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

a mount portion for mounting to the protruding portion.

[Claim 2]

A refrigerator, comprising:

a heat insulating box body including

a rear wall,

a right lateral wall and a left lateral wall,

an upper wall, and

a lower wall;

a storage compartment arranged in the heat insulating box body for housing items to be stored; and

a cooler for generating a cooling air,

wherein the heat insulating box body includes

convex portions formed on the rear wall at corner portions between the lateral walls and the rear wall 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 portions,

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 walls and another part of the external box corresponding to an outer surface of the lateral walls, the vacuum heat insulating material being arranged to partially overlap with the convex portions,

a first intermediate member comprising 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 walls to bond, attach, or fix the vacuum heat insulating material and the internal box to each other,

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

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

wherein the concave portion is formed in a vertical direction of the rear

wall, and is used as an air passage through which the cooling air generated by the cooler is supplied into the storage compartment, and

wherein the cover member includes

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

a mount portion for mounting the air passage cover portion to the protruding portion.

[Claim 3]

The refrigerator of claim 1 or 2, further comprising

injection ports provided at left-and-right 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.

[Claim 4]

A refrigerator, comprising:

a heat insulating box body including

a rear wall,

a right lateral wall and a left lateral wall,

an upper wall, and

a lower wall;

a storage compartment arranged in the heat insulating box body for housing items to be stored; and

a cooler for generating a cooling air,

wherein the heat insulating box body includes

convex portions formed at corner portions between the lateral walls and the rear wall 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 portions,

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, the vacuum heat insulating material being larger than a width of the concave portion and arranged to overlap with the convex portions 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,

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

a cover member that covers a part of a rear surface of an inside of

the storage compartment, and

a protruding portion formed in the concave portion,

wherein the vacuum heat insulating material overlaps with the convex portions for a length of 30 mm or more and for a length of less than or equal to one-third of a distance between the right lateral wall and the left lateral wall,

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 concave portion is formed in a vertical direction of the rear wall, and is used as an air passage through which the cooling air generated by the cooler is supplied into the storage compartment, and

wherein the cover member includes

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

a mount portion for mounting to the protruding 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.

[Claim 7]

The refrigerator of claim 3,

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 each of the convex portions are 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 the 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 portions, T1 is a thickness of the lateral walls, and Y1 is the length from the outer surface of the lateral walls 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, the right lateral wall, and the left lateral wall onto the rear wall, the right lateral wall, and the left lateral wall relative to a total surface area of the rear wall, the right lateral wall, and the left 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,

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

[Claim 17]

The refrigerator of any one of claims 1 to 16,

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 18]

The refrigerator of any one of claims 1 to 4, further comprising

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

[Claim 19]

The refrigerator of any one of claims 1 to 4,

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 at least one of an upper surface, a lower surface, and a lateral surface of the storage compartment, for illuminating the inside of the storage compartment.

[Claim 20]

The refrigerator of any one of claims 1 to 4, 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 portions.

[Claim 21]

The refrigerator of any one of claims 1 to 4, further comprising

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

[Claim 22]

The refrigerator of any one of claims 1 to 4, further comprising

control lead wires arranged in the convex portions.

[Claim 23]

The refrigerator of any one of claims 1 to 4, further comprising

control lead wires arranged in the protruding portion.

[Claim 24]

The refrigerator of any one of claims 1 to 4,

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 4, further comprising:

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

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

a foam heat insulating material charged between the internal box and the vacuum heat insulating material at the position 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 26]

The refrigerator of claim 25, further comprising

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

[Claim 27]

The refrigerator of any one of claims 1 to 26,

wherein the vacuum heat insulating material overlaps with the convex portions for a length of 30 mm or more and for a length of less than or equal to one-third of a distance between the right lateral wall and the left lateral wall.

[Claim 28]

The refrigerator of any one of claims 1 to 4,

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