CLAIMS

[Claim 1]

A refrigerator having a storage compartment including a rear wall, lateral walls and an opening at a front side, the refrigerator comprising:

convex portions formed over a substantially entire range in a vertical direction in the storage compartment at corner portions of an internal box corresponding to an inner surface of the lateral walls and an inner surface of the rear wall, the convex portions projecting toward the front side with respect to the inner surface of the rear wall;

a concave portion formed by lateral surfaces of the convex portions and the rear wall in a manner of being recessed to a rear side;

a vacuum heat insulating material having a flat plate shape, the vacuum heat insulating material being arranged between the internal box corresponding to the inner surface of the rear wall and an external box corresponding to an outer surface of the rear wall in a manner of being partially overlapped with the convex portions in a width direction;

a first intermediate member charged or sealed in the convex portions and between the vacuum heat insulating material at the convex portions and the internal box to bond, attach, or fix the internal box and the vacuum heat insulating material to each other;

a second intermediate member other than a foam heat insulating material, the second intermediate member bonding, attaching, or fixing the vacuum heat insulating material with the external box; and

a charging port formed at the rear wall, the charging port being injected with a liquid raw material of the first intermediate member,

wherein the charging port has an widthwise inside end portion that is provided in a range of the convex portions at a same height level with the concave portion, and

wherein the vacuum heat insulating material is arranged without closing at least a part of the charging port, and is integrally formed with the internal box and the external box at the convex portions.

[Claim 2]

A refrigerator having a storage compartment including a rear wall, lateral walls and an opening at a front side, and a door for closing the storage compartment, the refrigerator comprising:

convex portions formed over a substantially entire range in a vertical direction in the storage compartment at corner portions of an internal box corresponding to an inner surface of the lateral walls and an inner surface of the rear wall, the convex portions projecting toward the front side with respect to the inner surface of the rear wall;

a concave portion formed by lateral surfaces of the convex portions and the rear wall in a manner of being recessed to a rear side;

a vacuum heat insulating material having a flat plate shape and provided between the internal box corresponding to the inner surface of the rear wall and an external box

corresponding to an outer surface of the rear wall in a manner of being partially overlapped with the convex portions in a width direction;

a first intermediate member charged or sealed in the convex portions and between the vacuum heat insulating material at the convex portions and the internal box to bond, attach, or fix the internal box and the vacuum heat insulating material to each other;

a second intermediate member other than a foam heat insulating material, the second intermediate member bonding, attaching, or fixing the vacuum heat insulating material with the external box; and

a charging port formed at the rear wall, the charging port being injected with a liquid raw material of the first intermediate member,

wherein the convex portions and the vacuum heat insulating material overlap with each other for a width of 30 mm or more and less than or equal to one-third of a distance between a right inner wall and a left inner wall,

wherein the door includes a glass plate member at the front side,

wherein the charging port has an widthwise inside end portion that is provided in a range of the convex portions at a same height level with the concave portion, and

wherein the vacuum heat insulating material is integrally formed with the internal box and the external box at the convex portions.

[Claim 3]

The refrigerator of claim 1 or 2, further comprising:

a cover member for covering at least a part of a rear of the storage compartment; and

a first mount portion provided in the concave portion for mounting the cover member,

wherein the cover member includes a second mount portion that is mounted to the first mount portion.

[Claim 4]

The refrigerator of claim 3,

wherein the cover member, together with the concave portion, forms an air passage.

[Claim 5]

The refrigerator of claim 3,

wherein the cover member forms at least a part of an air passage or covers at least the part of the air passage.

[Claim 6]

The refrigerator of any one of claims 3 to 5,

wherein the first mount portion is a protruding portion projecting toward the front side, and

wherein the refrigerator further comprises a screw, a hooking structure, a fitting structure, or a concavo-convex fitting structure to fix or hold the cover member to the protruding portion.

[Claim 7]

The refrigerator of any one of claims 3 to 6,

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

[Claim 8]

The refrigerator of any one of claims 3 to 7,

wherein the first mount portion is formed separately from the internal box forming the concave portion.

[Claim 9]

The refrigerator of any one of claims 1 to 8,

wherein the first intermediate member charged or sealed between the vacuum heat insulating material and the internal box comprises a foam heat insulating material,

wherein the foam heat insulating material has a density of more than 60 kg/m^3 and 100 kg/m^3 or less after foaming.

[Claim 10]

The refrigerator of any one of claims 1 to 9,

wherein the convex portions each have a substantially triangular shape having an oblique side in a horizontal sectional view of the refrigerator, and

wherein the charging port has the widthwise inside end portion that is arranged at a position facing the oblique side within a range of a part where the oblique side and the rear wall are connected to each other.

[Claim 11]

The refrigerator of any one of claims 1 to 10,

wherein the charging port is provided in the range of the convex portions.

[Claim 12]

The refrigerator of any one of claims 1 to 11,

wherein a distance Y1 between one widthwise end of the rear wall and the widthwise inside end of the charging port satisfies:

$T01 + r1 \leq Y1 \leq T1 + A$

where T01 represents a distance by which the charging port is arranged apart from one widthwise end of the rear wall, r1 represents a widthwise length of the charging port, T1 represents a thickness of each of the lateral walls, and A represents a widthwise length of each of the convex portions.

[Claim 13]

The refrigerator of claim 12,

wherein the distance T01 corresponds to a distance that the charging port can be processed or to a distance that a flow of the first intermediate member is not blocked.

[Claim 14]

The refrigerator of any one of claims 1 to 13, further comprising:

a second vacuum heat insulating material arranged between the internal box corresponding to the inner surface of the lateral walls and the external box corresponding to the outer surface of the lateral walls; and

a foam heat insulating material charged between the second vacuum heat insulating material and the internal box corresponding to the inner surface of the lateral walls,

wherein the second vacuum heat insulating material is integrally formed with the internal box and the external box at the convex portions.

[Claim 15]

The refrigerator of any one of claims 1 to 14,

wherein the vacuum heat insulating material has a cutout or an opening, the cutout or the opening being formed at a part facing the charging port so that the vacuum heat insulating material is prevented from interfering with the charging port.

[Claim 16]

The refrigerator of any one of claims 1 to 15,

wherein the first intermediate member at a part facing the vacuum heat insulating material has a thickness of less than 10 mm.

[Claim 17]

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

a machine room provided to a rear,

wherein the charging port is arranged at four positions near four corners of the rear wall excluding the machine room.

[Claim 18]

The refrigerator of any one of claims 1 to 17,

wherein a ratio of a 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 19]

The refrigerator of any one of claims 1 to 18,

wherein the first intermediate member comprises rigid urethane foam, and

wherein the rigid urethane foam has a bending elastic modulus of 15 MPa or more and 150 MPa or less.

[Claim 20]

The refrigerator of claim 2,

wherein the door comprises

a door outer shell formed of a door frame portion and a door inner plate,

the glass plate member arranged to the door outer shell,

a vacuum heat insulating material arranged in a door internal space formed of the glass plate member and the door outer shell, and

a foam heat insulating material charged, applied, or sealed in the door internal space,

wherein the foam heat insulating material charged, applied, or sealed between the glass plate member and the vacuum heat insulating material has a density of more than 60 kg/m^3 and 100 kg/m^3 or less after foaming, and has a thickness of less than 10 mm after the foaming.

[Claim 21]

The refrigerator of claim 14,

wherein the lateral walls each have a thickness of 20 mm or more and 40 mm or less, and

wherein the foam heat insulating material has a thickness of less than 10 mm after foaming.

[Claim 22]

The refrigerator of any one of claims 1 to 21,

wherein the storage compartment comprises a refrigerator compartment and a freezer compartment,

wherein the refrigerator further comprises a refrigerator compartment cooler and a freezer compartment cooler, and

wherein the refrigerator compartment cooler is provided on a rear of the refrigerator

compartment.

[Claim 23]

The refrigerator of any one of claims 3 to 6,

wherein the cover member is mounted to the concave portion to form an air passage, and

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

[Claim 24]

The refrigerator of any one of claims 3 to 6,

wherein the cover member or an air passage component fixed or hold by the cover member forms an air passage assembly, and the air passage assembly is mounted to the concave portion to form an air passage, and

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

[Claim 25]

The refrigerator of claim 14,

wherein a ratio of arrangement areas of a first vacuum heat insulating material arranged at the rear wall and the second vacuum heat insulating material arranged at the lateral walls relative to outer surface areas of the rear wall and the lateral walls is 70% or more.

[Claim 26]

The refrigerator of claim 12 or 13, further comprising:

a second vacuum heat insulating material arranged between the internal box corresponding to the inner surface of the lateral walls and the external box corresponding to the outer surface of the lateral walls; and

a foam heat insulating material charged between the second vacuum heat insulating material and the internal box corresponding to the inner surface of the lateral walls,

wherein the distance T01 corresponds to a distance that a flow of the foam heat insulating material is not hindered by the second vacuum heat insulating material.