CLAIMS

[Claim 1]

A refrigerator, comprising:

a box body including

a top wall,

a rear wall,

lateral walls, and

a bottom wall,

the top wall, the rear wall, the lateral walls, and the bottom wall being formed of an external box and an internal box,

the box body having a storage compartment with an opening formed on a front side of the box body;

reinforcing portions each formed at two corner positions between the internal box corresponding to the rear wall and the internal box corresponding to the lateral walls;

a vacuum heat insulating material arranged between a part of the internal box and a part of the external box corresponding to the rear wall, and between a part of the internal box and a part of the external box corresponding to each of the lateral walls; and

a foam heat insulating material charged between the internal box and the vacuum heat insulating material that is arranged in each of the lateral walls, the foam heat insulating material being foamed between the internal box and the vacuum heat insulating material,

wherein the foam heat insulating material is further charged between the internal box corresponding to the rear wall and the vacuum heat insulating material arranged between the reinforcing portions,

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

wherein the foam heat insulating material charged between the internal box

corresponding to the rear wall and the vacuum heat insulating material arranged between the reinforcing portions has a thickness of less than 10 mm, and

wherein the foam heat insulating material comprises rigid urethane foam having a density of more than 60 kg/m3.

[Claim 2]

A refrigerator, comprising:

a box body including

a top wall,

a rear wall,

lateral walls, and

a bottom wall,

the top wall, the rear wall, the lateral walls, and the bottom wall being formed of an external box and an internal box,

the box body having a storage compartment with an opening formed on a front side of the box body;

a vacuum heat insulating material arranged between a part of the internal box and a part of the external box corresponding to the rear wall, and between a part of the internal box and a part of the external box corresponding to each of the lateral walls;

a foam heat insulating material charged between the internal box and the vacuum heat insulating material that is arranged in each of the lateral walls, the foam heat insulating material being foamed between the internal box and the vacuum heat insulating material; and

a pull-out case housed in the storage compartment and pulled out through intermediation of a rail member arranged at a storage compartment side of one of the lateral walls,

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

wherein the vacuum heat insulating material is bonded to the external box with an adhesive agent other than foam heat insulating material,

wherein the vacuum heat insulating material has a bending elastic modulus of 20 MPa or more at a position facing the rail member,

wherein the foam heat insulating material between the internal box and the vacuum heat insulating material has a thickness of less than 10 mm at the position facing the rail member, and

wherein the foam heat insulating material comprises rigid urethane foam having a density of more than 60 kg/m3.

[Claim 3]

A refrigerator, comprising:

a box body including

a top wall,

a rear wall,

lateral walls, and

a bottom wall,

the top wall, the rear wall, the lateral walls, and the bottom wall being formed of an external box and an internal box,

the box body having a storage compartment with an opening formed on a front side of the box body;

a vacuum heat insulating material arranged between a part of the internal box and a part of the external box corresponding to the rear wall, and between a part of the internal box and a part of the external box corresponding to each of the lateral walls;

a foam heat insulating material charged between the internal box and the vacuum heat insulating material that is arranged in each of the lateral walls, the foam heat insulating material being foamed between the internal box and the vacuum heat insulating material;

a pull-out case housed in the storage compartment and pulled out through intermediation of a rail member arranged at a storage compartment side of one of the lateral walls; and

a reinforcing member arranged at an external box side of a position facing the rail member of the internal box,

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

wherein the vacuum heat insulating material is bonded to the external box with an adhesive agent other than foam heat insulating material,

wherein the vacuum heat insulating material has a bending elastic modulus of 20 MPa or more at the position facing the rail member,

wherein the foam heat insulating material between the reinforcing member and the vacuum heat insulating material has a thickness of less than 10 mm, and

wherein the foam heat insulating material comprises rigid urethane foam having a density of more than 60 kg/m3

.

[Claim 4]

The refrigerator of claim 1, further comprising:

a concave portion formed at a substantially central portion of the rear wall of the storage compartment in a width direction, the concave portion being formed between the reinforcing portions;

a cover member for covering at least a part of the concave portion; and

a mount portion provided separately from the internal box at the concave portion, the mount portion holding or fixing the cover member.

[Claim 5]

The refrigerator of claim 4,

wherein the vacuum heat insulating material arranged in the rear wall has a flat plate shape larger in width than the concave portion at least in the width direction of

the rear wall.

[Claim 6]

A refrigerator, comprising:

a box body including

a top wall,

a rear wall,

lateral walls, and

a bottom wall,

the top wall, the rear wall, the lateral walls, and the bottom wall being formed of an external box and an internal box,

the box body having a storage compartment with an opening formed on a front side of the box body;

reinforcing portions each formed at two corner positions between the internal box corresponding to the rear wall and the internal box corresponding to the lateral walls;

a concave portion formed between the convex portions, the concave portion being formed at a substantially central portion in a width direction of a rear of the storage compartment to extend over a vertical direction;

a vacuum heat insulating material arranged between a part of the internal box and a part of the external box corresponding to the rear wall, or between a part of the internal box and a part of the external box corresponding to each of the lateral walls;

a foam heat insulating material charged between the internal box and the vacuum heat insulating material that is arranged in the rear wall or in each of the lateral walls, the foam heat insulating material being foamed between the internal box and the vacuum heat insulating material;

a cover member for covering at least a part of the concave portion; and

a mount portion provided separately from the internal box at the concave portion, the mount portion holding or fixing the cover member,

wherein the foam heat insulating material is further charged between the internal box corresponding to the rear wall and the vacuum heat insulating material arranged between the reinforcing portions,

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

wherein the foam heat insulating material comprises rigid urethane foam having a density of more than 60 kg/m3.

[Claim 7]

The refrigerator of any one of claims 4 to 6,

wherein the foam heat insulating material is not charged into an entire range between the internal box corresponding to the rear wall and the vacuum heat insulating material arranged between the reinforcing portions, but is charged into a partial range therebetween.

[Claim 8]

The refrigerator of any one of claims 4 to 7, further comprising

a charging port arranged at the rear wall for charging or sealing the foam heat insulating material,

wherein $Y1 \leq T1 + A$ is satisfied, where T1 represents a thickness of one of the lateral walls, A represents a widthwise length of one of the reinforcing portions, and Y1 represents a distance between a widthwise end portion of a rear of the refrigerator and a widthwise inside end portion of the charging port.

[Claim 9]

The refrigerator of claim 8,

wherein the charging port is arranged within a range of the reinforcing portions.

[Claim 10]

The refrigerator of claim 8 or 9,

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

[Claim 11]

The refrigerator of claim 4 or 6, further comprising:

a cooler for generating cooling air for cooling the storage compartment; and

a cooling air passage through which the cooling air generated by the cooler is supplied into the storage compartment,

wherein the concave portion comprises the cooling air passage.

[Claim 12]

The refrigerator of claim 4 or 6, further comprising:

a cooler for generating cooling air for cooling the storage compartment; and

a cooling air passage through which the cooling air generated by the cooler is supplied into the storage compartment,

wherein a second member forming at least a part of the cooling air passage is arranged at a rear side of the cover member, and

wherein the second member abuts against the internal box.

[Claim 13]

The refrigerator of claim 4 or 6, further comprising:

a cooler for generating cooling air for cooling the storage compartment; and

a cooling air passage through which the cooling air generated by the cooler is supplied into the storage compartment,

wherein the cover member comprises

an air passage cover portion for forming at least a part of the cooling air passage or for covering at least the part of the cooling air passage, and

a second mount portion for being mounted to the mount portion.

[Claim 14]

The refrigerator of claim 4 or 6, further comprising:

a cooler for generating cooling air for cooling the storage compartment; and

a cooling air passage through which the cooling air generated by the cooler is supplied into the storage compartment,

wherein a second member forming an independent air passage by integrally assembling two or more members with each other at a rear side of the cover member, and

wherein the second member comprises the cooling air passage.

[Claim 15]

The refrigerator of claim 4 or 6, further comprising:

a cooler for generating cooling air for cooling the storage compartment; and

a cooling air passage through which the cooling air generated by the cooler is supplied into the storage compartment,

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

[Claim 16]

The refrigerator of any one of claims 1 to 15,

wherein the vacuum heat insulating material is arranged in at least the rear wall and the lateral walls,

wherein a proportion of a volume of the vacuum heat insulating material relative to a volume of a space between the external box and the internal box forming the box body is 40% or more and 90% or less, and

a ratio of an area of the vacuum heat insulating material relative to a surface area of the external box is 60% or more, and

wherein a proportion of a sum of areas of projection of the vacuum heat

insulating material arranged in the rear wall and the lateral walls relative to a total surface area of the rear wall and the lateral walls is 70% or more.

[Claim 17]

The refrigerator of claim 2 or 3,

wherein the pull-out case includes

case lateral walls forming the pull-out case, and

a step portion formed on the case lateral walls and configured to allow the pull-out case to be supported by the rail member, and

wherein the step portion is arranged at a position lower than or equal to 1/3 of the case in a height direction.

[Claim 18]

The refrigerator of any one of claims 1 to 17,

wherein the vacuum heat insulating material and the external box are bonded therebetween with a second adhesive agent other than foam heat insulating material.

[Claim 19]

The refrigerator of any one of claims 1 to 18,

wherein the foam heat insulating material comprises rigid urethane foam.

[Claim 20]

The refrigerator of any one of claims 1 to 19,

wherein a ratio of the thickness of the vacuum heat insulating material relative to a wall internal thickness of the rear wall or one of the lateral walls is 0.7 or more.