CLAIMS

[Claim 1]

A refrigerator, comprising:

a box body formed of an external box and an internal box, the box body including:

a rear wall; and

lateral walls;

a storage compartment formed by partitioning an inside of the box body with a partition wall to have an opening portion formed on a front side of the box body;

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

a vacuum heat insulating material formed of a fibrous core material made of an inorganic fiber or an organic fiber, and arranged between a part of the internal box and a part of the external box corresponding to each of the lateral walls on which the rail members are arranged; and

a heat insulating material charged between the internal box and the vacuum heat insulating material at a position of facing each of the rail members,

wherein a thickness of the heat insulating material is set to less than 10 mm at the position of facing the each of the rail members, and

wherein a density of the heat insulating material charged between the internal box and the vacuum heat insulating material is set to more than 60 kg/m^3 .

[Claim 2]

The refrigerator of claim 1, further comprising a reinforcing member arranged on the internal box side between the internal box and the vacuum heat insulating material at the position of facing the each of the rail members, for supporting or holding the each of the rail members,

wherein the heat insulating material is charged between the reinforcing member and the vacuum heat insulating material at the position of facing the each of the rail members.

[Claim 3]

A refrigerator, comprising:

a box body formed of an external box and an internal box, the box body including:

a top wall;

a rear wall;

lateral walls; and

a bottom wall;

a storage compartment formed by partitioning an inside of the box body with a partition wall to have an opening portion formed on a front side of the box body;

a pull-out case housed in the storage compartment and pulled out through intermediation of rail members each arranged on the partition wall corresponding to a bottom surface or an upper surface of the storage compartment;

a vacuum heat insulating material formed of a fibrous core material made of an inorganic fiber or an organic fiber, and arranged in the partition wall on which the rail members are arranged; and

a heat insulating material charged, applied, or arranged between an outer shell member forming the partition wall and the vacuum heat insulating material in the partition wall at a position of facing each of the rail members,

wherein a thickness of the heat insulating material is set to less than 10 mm at the position of facing the each of the rail members, and

wherein a density of the heat insulating material is set to more than 60 kg/m^3.

[Claim 4]

The refrigerator of any one of claims 1 to 3, wherein a ratio of the thickness of the heat insulating material relative to a sum of the thickness of the heat insulating material and a thickness of the vacuum heat insulating material is 0.3 or less.

[Claim 5]

The refrigerator of any one of claims 1 to 4,

wherein the heat insulating material comprises rigid urethane foam, and

wherein a bending elastic modulus of the rigid urethane foam is 15 MPa or more.

[Claim 6]

The refrigerator of any one of claims 1 to 5, wherein the rail members each comprise a two-step rail capable of being pulled out in two steps, or a three-step rail capable of being pulled out in three steps.

[Claim 7]

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

a concave portion formed at a central portion in a width direction of the rear wall of the storage compartment;

the vacuum heat insulating material arranged between the internal box and the external box at a position of facing the concave portion, the vacuum heat insulating material having a flat plate shape larger in width than the concave portion at least in the width direction; and

a foam heat insulating material as the heat insulating material charged between the internal box and the vacuum heat insulating material at the position of facing the concave portion,

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

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

[Claim 8]

The refrigerator of any one of claims 1 to 7,

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

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

[Claim 9]

The refrigerator of claim 8,

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

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

[Claim 10]

The refrigerator of any one of claims 1 to 9, 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.

[Claim 11]

The refrigerator of any one of claims 7 to 10, further comprising a cooler for generating cooling air for cooling the storage compartment,

wherein the concave portion is formed over a vertical direction, and is used as a cooling air passage through which the cooling air generated by the cooler is caused to flow.

[Claim 12]

The refrigerator of any one of claims 7 to 10, further comprising:

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

protruding portions formed to project to the front side in at least two positions in the width direction of the concave portion; and

a second concave portion formed between the protruding portions formed in the at least two positions,

wherein the second concave portion is used as a cooling air passage through which the cooling air generated by the cooler is caused to flow.

[Claim 13]

The refrigerator of any one of claims 7 to 11, further comprising a misting device for supplying mist into the storage compartment,

wherein the concave portion is used as a mist passage through which the mist generated by the misting device is caused to flow.

[Claim 14]

The refrigerator of claim 12, further comprising a misting device for supplying mist into the storage compartment,

wherein the second concave portion is used as a mist passage through which the mist generated by the misting device is caused to flow.

[Claim 15]

The refrigerator of claim 12, further comprising control lead wires and a refrigerant pipe forming a refrigeration cycle, the control lead wires or the refrigerant pipe being arranged through each of the protruding portions.

[Claim 16]

The refrigerator of any one of claims 1 to 15, wherein the vacuum heat insulating material and the external box are bonded directly to each other with an adhesive agent.

[Claim 17]

The refrigerator of any one of claims 7 to 16, further comprising convex portions formed respectively at one corner portion between the concave portion and one of the lateral walls arranged on one lateral side with respect to the concave portion, and at an other corner portion between the concave portion and an other of the lateral walls arranged on an other lateral side with respect to the concave portion, the convex portions each being projected to the opening portion side with respect to the concave portion,

wherein the convex portions are each formed to overlap with the vacuum heat insulating material by a predetermined length in the width direction.

[Claim 18]

The refrigerator of claim 17, wherein the foam heat insulating material is charged between the vacuum heat insulating material and the internal box corresponding to each of the convex portions.

[Claim 19]

The refrigerator of claim 18, wherein the foam heat insulating material comprises rigid urethane foam.

[Claim 20]

The refrigerator of any one of claims 1 to 19, further comprising charging ports for the foam heat insulating material, the charging ports being formed in the external box,

wherein the vacuum heat insulating material is arranged without closing the charging ports.

[Claim 21]

The refrigerator of any one of claims 1 to 20, wherein the pull-out case comprises:

case lateral walls forming the pull-out case; and

step portions formed on the case lateral walls so that the pull-out case is supported by the rail members,

wherein the step portions are each arranged at a position of 1/3 or less in a height direction of the pull-out case.

[Claim 22]

The refrigerator of any one of claims 1 to 21, wherein a wall thickness of the rear wall or the each of the lateral walls is 20 mm or more and 40 mm or less.

[Claim 23]

A refrigerator, comprising:

a box body formed of an external box and an internal box, the box body including:

a rear wall; and

lateral walls;

a storage compartment formed in an inside of the box body to have an opening portion formed on a front side of the box body; and

a door for closing the opening portion formed on the front side of the box body in a freely openable and closable manner,

wherein the door comprises:

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

a glass plate member arranged in 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 a density of the foam heat insulating material charged, applied, or sealed between the glass plate member and the vacuum heat insulating material is more than 60 kg/m^3 after foaming, and

wherein a thickness of the foam heat insulating material charged, applied, or sealed between the glass plate member and the vacuum heat insulating material is less than 10 mm after the foaming.

[Claim 24]

The refrigerator of claim 23,

wherein the thickness of the foam heat insulating material is less than 10 mm at a position of facing the glass plate member, and

wherein a ratio of the thickness of the foam heat insulating material at the position of facing the glass plate member relative to a sum of the thickness of the foam heat insulating material at the position of facing the glass plate member and a thickness of the vacuum heat insulating material is 0.3 or less.

[Claim 25]

The refrigerator of claim 23 or 24,

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

wherein a bending elastic modulus of the foam heat insulating material is 15 MPa or more.

[Claim 26]

The refrigerator of any one of claims 23 to 25, wherein a thickness of the door is 20 mm or more and 40 mm or less.

[Claim 27]

The refrigerator of any one of claims 23 to 26, wherein a proportion of a volume of the vacuum heat insulating material relative to a volume of the door internal space is 40% or more.

[Claim 28]

A heat insulating box body formed of an external box and an internal box with a rear wall and lateral walls, the heat insulating box body comprising:

a storage compartment formed in an inside of the heat insulating box body to have an opening portion formed on a front side of the heat insulating box body;

a vacuum heat insulating material arranged on the external box side in the rear wall; and

injection ports formed at end portions in a width direction of the rear wall or end portions in a vertical direction of the rear wall, for injecting a liquid raw material of a foam heat insulating material into the rear wall,

wherein the vacuum heat insulating material comprises cutout portions comprising cutouts or openings, the cutout portions being formed at parts to face the injection ports so that the vacuum heat insulating material is prevented from interfering with the injection ports, and

wherein a thickness of the foam heat insulating material is set to less than 10 mm after injection.

[Claim 29]

The heat insulating box body of claim 28, wherein a density of the foam heat insulating material is more than 60 kg/m^3.

[Claim 30]

The heat insulating box body of claim 28 or 29, wherein a ratio of the thickness of the foam heat insulating material relative to a sum of the thickness of the foam heat insulating material and a thickness of the vacuum heat insulating material is 0.3 or less.

[Claim 31]

The heat insulating box body of any one of claims 28 to 30,

wherein the foam heat insulating material comprises rigid urethane foam, and

wherein a bending elastic modulus of the rigid urethane foam is 15 MPa or more.

[Claim 32]

The heat insulating box body of any one of claims 28 to 31,

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

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

[Claim 33]

The heat insulating box body of any one of claims 28 to 32, 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 heat insulating box body is 40% or more.

[Claim 34]

The heat insulating box body of any one of claims 28 to 33,

wherein the vacuum heat insulating material has a substantially quadrangular plate shape, and

wherein the cutout portions are formed at parts to face the injection ports corresponding to corner portions of the substantially quadrangular plate shape so that the vacuum heat insulating material is prevented from interfering with the injection ports.

[Claim 35]

A refrigerator using the heat insulating box body of any one of claims 28 to 34, the refrigerator comprising a door for closing the opening portion formed on the front side of the storage compartment,

wherein the door comprises:

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

a glass plate member arranged in 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 a density of the foam heat insulating material charged, applied, or sealed between the glass plate member and the vacuum heat insulating material is more than 60 kg/m^3 after foaming, and

wherein a thickness of the foam heat insulating material charged, applied, or sealed between the glass plate member and the vacuum heat insulating material is less than 10 mm after the foaming.

CLAIMS

[Claim 1]

A refrigerator, comprising:

a box body formed of an external box and an internal box, the box body including:

a rear wall; and

lateral walls;

a storage compartment formed by partitioning an inside of the box body with a partition wall and having an opening portion formed on a front side of the box body;

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

a vacuum heat insulating material arranged at a position facing each of the rail members between a part of the internal box and a part of the external box corresponding to each of the lateral walls on which the rail members are arranged; and

an intermediate member charged between the internal box and the vacuum heat insulating material at a position facing each of the rail members,

wherein the lateral walls have a thickness in a range of 20 mm to 40 mm,

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

wherein the intermediate member between the internal box and the vacuum heat insulating material at the position facing the each of the rail members is a foam heat insulating material that foams after being charged between the internal box and the vacuum heat insulating material,

wherein a thickness of the intermediate member is set to less than 10 mm, and

wherein a density of the intermediate member is set to more than 60 kg/m^3 and 100 kg/m^3 or less.

[Claim 2]

A refrigerator, comprising:

a box body formed of an external box and an internal box, the box body including:

a top wall;

a rear wall;

lateral walls; and

a bottom wall;

a storage compartment formed by partitioning an inside of the box body with a partition wall and having an opening portion formed on a front side of the box body;

a pull-out case housed in the storage compartment and pulled out through intermediation of rail members each arranged on the partition wall corresponding to a bottom surface or an upper surface of the storage compartment;

a vacuum heat insulating material arranged in the partition wall on which the rail members are arranged; and

a intermediate member charged, applied, or sealed between an outer shell member forming the partition wall and the vacuum heat insulating material,

wherein the partition wall has a thickness in a range of 20 mm to 40 mm,

wherein the intermediate member between the outer shell member and the vacuum heat insulating material at the position facing the each of the rail members is a foam heat insulating material that foams after being charged between the outer shell member and the vacuum heat insulating material,

wherein, in the partition wall, the vacuum heat insulating material is not arranged at a position where a rail fixing member for fixing the rail members is set,

wherein a thickness of the intermediate member charged between the outer shell member and the vacuum heat insulating material is set to less than 10 mm, and

wherein a density of the intermediate member is set to more than 60 kg/m^3 and 100 kg/m^3 or less.

[Claim 3]

A refrigerator, comprising

a box body formed of an external box and an internal box, the box body including:

a rear wall; and

lateral walls;

a storage compartment formed by partitioning an inside of the box body with a partition wall and having an opening portion formed on a front side of the box body;

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

a vacuum heat insulating material formed of a fibrous core material made of an inorganic fiber or an organic fiber, and arranged between a part of the internal box and a part of the external box forming the lateral walls on which the rail members are arranged; and

a heat insulating material charged between the internal box and the vacuum heat insulating material at a position facing each of the rail members,

wherein the lateral walls have a thickness in a range of 20 mm to 40 mm,

wherein the heat insulating material between the internal box and the vacuum heat insulating material at the position facing the each of the rail members is a foam heat insulating material that foams after being charged between the internal box and the vacuum heat insulating material,

wherein a thickness of the heat insulating material after foaming is set to less than 10 mm, and

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

[Claim 4]

The refrigerator of any one of claims 1 to 3, further comprising a reinforcing member arranged on the internal box side between the internal box and the vacuum heat insulating material at the position facing the each of the rail members, for supporting or holding the each of the rail members,

wherein the intermediate member is charged between the reinforcing member and the vacuum heat insulating material at the position facing the each of the rail members.

[Claim 5]

The refrigerator of any one of claims 1 to 4,

wherein the intermediate member comprises rigid urethane foam, and

wherein a bending elastic modulus of the rigid urethane foam is 15 MPa or more.

[Claim 6]

The refrigerator of any one of claims 1 to 5, wherein the rail members each comprise a two-step rail capable of being pulled out in two steps, or a three-step rail capable of being pulled out in three steps.

[Claim 7]

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

a concave portion formed at a central portion in a width direction of the rear wall of the storage compartment; and

the vacuum heat insulating material arranged between the internal box and the external box at a position facing the concave portion, the vacuum heat insulating material having a flat plate shape larger in width than the concave portion at least in the width direction;

wherein the intermediate member is charged in a part or entirety of a range between the internal box and the vacuum heat insulating material at the position facing the concave portion.

[Claim 8]

The refrigerator of any one of claims 1 to 7,

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

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

[Claim 9]

The refrigerator of claim 7,

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

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

[Claim 10]

The refrigerator of any one of claim 7 or 9, further comprising a cooler for generating cooling air for cooling the storage compartment,

wherein the storage compartment is a refrigerator compartment,

wherein the cooler is formed by two coolers, a refrigerator compartment cooler and a freezer compartment cooler, and

wherein the refrigerator compartment cooler is provided on the rear of the lower portion of the refrigerator compartment.

[Claim 11]

The refrigerator of claim 7 or 9, further comprising a cooler for generating cooling air for cooling the storage compartment,

wherein the concave portion is formed over a vertical direction, and is used as a cooling air passage through which the cooling air generated by the cooler is caused to flow.

[Claim 12]

The refrigerator of claim 7 or 9, further comprising:

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

protruding portions formed to project to the front side in at least two positions in the width direction of the concave portion; and

a second concave portion formed between the protruding portions formed in the at least two positions,

wherein the second concave portion is used as a cooling air passage through which the cooling air generated by the cooler is caused to flow.

[Claim 13]

The refrigerator of any one of claims 7, 9 and 11, further comprising a misting device for supplying mist into the storage compartment,

wherein the concave portion is used as a mist passage through which the mist generated by the misting device is caused to flow.

[Claim 14]

The refrigerator of claim 12, further comprising a misting device for supplying mist into the storage compartment,

wherein the second concave portion is used as a mist passage through which the mist generated by the misting device is caused to flow.

[Claim 15]

The refrigerator of claim 12, further comprising control lead wires and a refrigerant pipe forming a refrigeration cycle, the control lead wires or the refrigerant pipe being arranged through each of the protruding portions.

[Claim 16]

The refrigerator of any one of claims 1 to 15, wherein the vacuum heat insulating material and the external box are bonded directly to each other with an adhesive agent other than the foam insulating material.

[Claim 17]

The refrigerator of any one of claims 7 to 16, further comprising convex portions formed respectively at one corner portion between the concave portion and one of the lateral walls arranged on one lateral side with respect to the concave portion, and at an other corner portion between the concave portion and an other of the lateral walls arranged on an other lateral side with respect to the concave portion, the convex portions each being projected to the opening portion side with respect to the concave portion,

wherein the convex portions are each formed to overlap with the vacuum heat insulating material by a predetermined length in the width direction.

[Claim 18]

The refrigerator of claim 17, wherein the foam heat insulating material is charged between the vacuum heat insulating material and the internal box corresponding to each of the convex portions.

[Claim 19]

The refrigerator of claim 18, wherein the foam heat insulating material comprises rigid urethane foam.

[Claim 20]

The refrigerator of any one of claims 1 to 19, further comprising charging ports for the foam heat insulating material, the charging ports being formed in the external box,

wherein the vacuum heat insulating material is arranged without closing the charging ports.

[Claim 21]

The refrigerator of any one of claims 1 to 20, wherein the pull-out case comprises:

case lateral walls forming the pull-out case; and

step portions formed on the case lateral walls so that the pull-out case is supported by the rail members,

wherein the step portions are each arranged at a position of 1/3 or less in a height direction of the pull-out case.

[Claim 22]

The refrigerator of any one of claims 1 to 21, wherein a wall thickness of the rear wall or the each of the lateral walls is 20 mm or more and 40 mm or less.

[Claim 23]

A refrigerator, comprising:

a box body formed of an external box and an internal box, the box body including:

a rear wall; and

lateral walls;

a storage compartment formed in an inside of the box body and having an opening portion formed on a front side of the box body; and

a door for closing the opening portion formed on the front side of the box body in a freely openable and closable manner,

wherein the door comprises:

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

a glass plate member arranged in 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 a density of the foam heat insulating material charged, applied, or sealed between the glass plate member and the vacuum heat insulating material is more than 60 kg/m^3 and 100 kg/m^3 or less after foaming, and

wherein a thickness of the foam heat insulating material charged, applied, or sealed between the glass plate member and the vacuum heat insulating material is less than 10 mm after the foaming.

[Claim 24]

The refrigerator of claim 23,

wherein the thickness of the foam heat insulating material is less than 10 mm at a position facing the glass plate member, and

wherein a ratio of the thickness of the foam heat insulating material at the position facing the glass plate member relative to a sum of the thickness of the foam heat insulating material at the position facing the glass plate member and a thickness of the vacuum heat insulating material is 0.3 or less.

[Claim 25]

The refrigerator of claim 23 or 24,

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

wherein a bending elastic modulus of the foam heat insulating material is 15 MPa or more.

[Claim 26]

The refrigerator of any one of claims 23 to 25, wherein a thickness of the door is 20 mm or more and 40 mm or less.

[Claim 27]

The refrigerator of any one of claims 23 to 26, wherein a proportion of a volume of the vacuum heat insulating material relative to a volume of the door internal space is 40% or more.

[Claim 28]

A heat insulating box body formed of an external box and an internal box with a rear wall and lateral walls, the heat insulating box body comprising:

a storage compartment formed in an inside of the heat insulating box body having an opening portion formed on a front side of the heat insulating box body;

a vacuum heat insulating material arranged on the external box side in the rear wall; and

injection ports formed at end portions in a width direction of the rear wall or end portions in a vertical direction of the rear wall, for injecting a liquid raw material of a foam heat insulating material into the rear wall,

wherein the vacuum heat insulating material comprises cutout portions comprising cutouts or openings, the cutout portions being formed at parts facing the injection ports so that the vacuum heat insulating material is prevented from interfering with the injection ports, and

wherein a thickness of the foam heat insulating material injected into a part facing the vacuum heat insulating material is set to less than 10 mm after foaming.

[Claim 29]

The heat insulating box body of claim 28, wherein a density of the foam heat insulating material is more than 60 kg/m^3 and 100 kg/m^3 or less.

[Claim 30]

The heat insulating box body of claim 28 or 29, wherein a ratio of the thickness of the foam heat insulating material relative to a sum of the thickness of the foam heat insulating material and a thickness of the vacuum heat insulating material is 0.3 or less.

[Claim 31]

The heat insulating box body of any one of claims 28 to 30,

wherein the foam heat insulating material comprises rigid urethane foam, and

wherein a bending elastic modulus of the rigid urethane foam is 15 MPa or more.

[Claim 32]

The heat insulating box body of any one of claims 28 to 31,

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

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

[Claim 33]

The heat insulating box body of any one of claims 28 to 32, 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 heat insulating box body is 40% or more.

[Claim 34]

The heat insulating box body of any one of claims 28 to 33,

wherein the vacuum heat insulating material has a substantially quadrangular plate shape, and

wherein the cutout portions are formed at parts to face the injection ports corresponding to corner portions of the substantially quadrangular plate shape so that the vacuum heat insulating material is prevented from interfering with the injection ports.

[Claim 35]

A refrigerator using the heat insulating box body of any one of claims 28 to 34, the refrigerator comprising a door for closing the opening portion formed on the front side of the storage compartment,

wherein the door comprises:

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

a glass plate member arranged in 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 a density of the foam heat insulating material charged, applied, or sealed between the glass plate member and the vacuum heat insulating material is more than 60 kg/m^3 after foaming, and

wherein a thickness of the foam heat insulating material charged, applied, or sealed between the glass plate member and the vacuum heat insulating material is less than 10 mm after the foaming.