

DESCRIPTION

Title of Invention

REFRIGERATOR

Technical Field

5 [0001]

The present disclosure relates to a refrigerator having a heat insulating partition structure including a vacuum heat insulating material.

Background Art

[0002]

10 In recent years, in order to achieve energy saving, such a kind of refrigerator as described above has been made to have a configuration in which a vacuum heat insulating material is provided instead of an existing hard urethane foam, for example, between an outer box and an inner box that form a heat insulating box and between an inner plate and an outer plate of a door provided to open and close a front opening of
15 the heat insulating box. Because of provision of this configuration, a heat insulating performance is improved. In general, in refrigerators, an outer box of a heat insulating box and an outer plate of a door includes components made of steel plates, and an inner box and an inner plate of the door include components made of resin.

[0003]

20 In a refrigerator including a plurality of compartments that are different in temperature zones, the compartments need to be partitioned off by a heat insulating partition or partitions in order that the compartments be kept at respective temperatures. To achieve high heat insulating properties, it is important to use, as a heat insulating partition, a vacuum heat insulating material whose heat insulating performance is, for
25 example, six times or more higher than the heat insulating performance of an existing hard urethane foam.

[0004]

30 Such a vacuum heat insulating material is formed, for example, by adhering outer peripheries of two outer cover materials having gas barrier properties to each other, with the outer cover materials located to face each other, and by filling a core material such

as glass wool or glass fiber into space provided in the outer cover materials, while evacuating the space. The outer cover materials are each formed by adhering, for example, aluminum foil to a base material such as a nylon film. A fin portion formed by adhering the outer peripheries of the outer cover materials to each other is folded back to be flush with the vacuum heat insulating material, and is fixed by a tape or adhesive. [0005]

In addition, in refrigerators, in order to achieve space savings or increase the internal volume thereof, it is required to reduce a space provided between an outer box and an inner box of a heat insulating box, that is, reduce the wall thickness of the heat insulating box. For example, Patent Literature 1 describes a refrigerator whose internal volume is increased by directly attaching, to an outer box and an inner box, a vacuum heat insulating material to be provided between the outer box and the inner box, and thus reducing the wall thickness of a heat insulating box. [0006]

However, an existing heat insulating box is manufactured according to a technical concept in which a hard urethane foam primarily bears a function of heat insulation and a vacuum heat insulating material assists the function of heat insulation of the hard urethane foam. The strength of such an existing heat insulating box is ensured by filling a hard urethane foam into a space between an inner box and an outer box in a predetermined density. However, in the case where the wall thickness is reduced by reducing the thickness of the urethane foam, the density of the urethane foam is increased due to reduction of the thickness of the urethane foam, thus reducing the heat insulating performance. It is therefore hard to ensure a required box strength while achieving a satisfactory heat insulating performance.

[0007]

That is, in an existing refrigerator including a vacuum heat insulating material, the heat insulating performance and strength of wall surfaces and a heat insulating box are ensured using a hard urethane foam. Thus, if the thickness of the hard urethane foam is reduced by reducing the wall thickness of the heat insulating box, a sufficient heat

insulating performance or a sufficient strength of the heat insulating box cannot be obtained. Accordingly, it is hard to reduce the wall thickness.

[0008]

In view of the above, a technique in which a vacuum heat insulating material is surrounded by a frame body including covering components made of resin is applied as a measure to ensure the strength of a heat insulating box including a vacuum heat insulating material. In this structure, the periphery of a vacuum heat insulating material is covered with a plurality of covering components, and the vacuum heat insulating material is held by the frame body including the covering components, whereby the vacuum heat insulating material is fixed to the inside of the frame body. In this case, the covering components forming the frame are formed into a desired shape, for example, by processing a plastic material with a technique such as vacuum forming or pressure forming.

Citation List

Patent Literature

[0009]

Patent Literature 1: Japanese Unexamined Patent Application Publication No. 11-159950

Summary of Invention

Technical Problem

[0010]

However, in an existing technique using a frame, since surfaces of covering components that hold a vacuum heat insulating material are flat, the flat surfaces of the covering components are easily deformed, for example, warped, and a problem arises in insertion and fixation of a vacuum heat insulating material.

[0011]

The present disclosure is applied to solve the above problem, and relates to a refrigerator having a heat insulating partition structure in which deformation of covering components can be reduced by increasing the stiffness of the covering components,

and a vacuum heat insulating material can be stably fixed, while improving the workability of insertion of the vacuum heat insulating material.

Solution to Problem

[0012]

5 A refrigerator according to an embodiment of the present disclosure includes: an outer box forming an exterior of the refrigerator; an inner box provided in the outer box, and forming a storage; a first vacuum heat insulating material provided in a space provided between the outer box and the inner box; a foam heat insulating material filled into the space; and a heat insulating partition portion provided in the
10 inner box, and partitioning the inner box into storage compartments that are different in temperature zone from each other. The heat insulating partition portion includes a second vacuum heat insulating material provided along a surface that partitions the inner box, and a covering portion that covers the second vacuum heat insulating material, and that includes a first covering portion covering one surface of the
15 second vacuum heat insulating material, and a second covering portion joined to the first covering portion, and covering an other surface of the second vacuum heat insulating material. At a covering surface of at least one of the first and second covering portions, a projecting portion, a recessed portion, and a flat portion are formed. The covering faces the second vacuum heat insulating material. The
20 projecting portion is in contact with the second vacuum heat insulating material. The recessed portion is recessed toward the opposite side of a side on which the second vacuum heat insulating material is located. The flat portion projects toward the second vacuum heat insulating material. At a surface of the recessed portion, resin injection gates are provided. At the flat portion, an adhesive member is provided to
25 join the first covering portion or the second covering portion and the second vacuum heat insulating material.

Advantageous Effects of Invention

[0013]

30 In the refrigerator according to the embodiment of the present disclosure, the surface stiffness of the first covering portion and the second covering portion may be increased by providing recess-and-projection portions at the first covering portion and the second covering portion that form the heat insulating partition portion. Therefore, it

is possible to reduce deformations of the first covering portion and the second covering portion. Thus, it is possible to stably fix the second vacuum heat insulating material, while improving the workability of insertion of the second vacuum heat insulating material.

Brief Description of Drawings

[0014]

[Fig. 1] Fig. 1 is a perspective view illustrating a refrigerator according to Embodiment 1 of the present disclosure.

[Fig. 2] Fig. 2 is a sectional view illustrating the inside of the refrigerator as illustrated in Fig. 1 as viewed from the right side.

[Fig. 3] Fig. 3 is a perspective view illustrating a heat insulating partition portion of the refrigerator in Fig. 1.

[Fig. 4] Fig. 4 is an exploded perspective view illustrating the heat insulating partition portion in Fig. 3.

[Fig. 5] Fig. 5 is a sectional view of part of the heat insulating partition portion that is indicated by arrows Z in Fig. 3.

[Fig. 6] Fig. 6 is an enlarged view illustrating a related part of the heat insulating partition portion in Fig. 5.

[Fig. 7] Fig. 7 is a perspective view illustrating a refrigerator according to Embodiment 2 of the present disclosure.

[Fig. 8] Fig. 8 is a sectional view illustrating the inside of the refrigerator in Fig. 7 as viewed from the right side.

[Fig. 9] Fig. 9 is a perspective view illustrating a heat insulating partition portion of the refrigerator as illustrated in Fig. 7.

[Fig. 10] Fig. 10 is an exploded perspective view illustrating the heat insulating partition portion as illustrated in Fig. 9.

[Fig. 11] Fig. 11 is a sectional view of part of the heat insulating partition portion that is indicated by arrows Y in Fig. 9.

Description of Embodiments

[0015]

Embodiments of the present disclosure will be described with reference to the drawings. The configurations of the components described in the entire text of the specification are merely examples, that is, the configurations of the components are not limited to those described in the text. That is, the configurations can be modified as appropriate without departing from subject matter or concept that can be read from the claims and the entire text of the specification. A refrigerator obtained by applying such modifications is also covered by the present disclosure regarding the technical concept as described in the present disclosure. In addition, in each of the figures, components that are the same as or equivalent to those in a previous figure or figures are denoted by the same reference signs. The same is true of the entire text of the present specification. In the following descriptions, the upper part of each of the figures is defined as "upper side", and the lower part of each figure is defined as "lower side". In addition, in order that descriptions be easily understood, for example, terms indicating directions ("right", "left", "front", "rear", or other terms) are used as appropriate. However, these terms are used for the descriptions and are not limiting. In addition, it is assumed that as a refrigerator is viewed from a front side, the upward/downward direction of the refrigerator is defined as a height direction, and the leftward/rightward direction of the refrigerator is defined as a width direction. The relationships in size between the components in the figures may be different from those between actual ones.

[0016]

Embodiment 1

<Configuration of Refrigerator 1>

A refrigerator 1 according to Embodiment 1 of the present disclosure will be described with reference to Figs. 1 and 2. Fig. 1 is a perspective view illustrating the refrigerator 1 according to Embodiment 1 of the present disclosure. Fig. 2 is a sectional view illustrating the inside of the refrigerator 1 as illustrated in Fig. 1, as viewed from the right side. As illustrated in Figs. 1 and 2, the refrigerator 1 includes an outer box 2 and an inner box 9. The outer box 2 is made of a metal such as a steel plate, and forms the exterior of the refrigerator. The inner box 9 is made of a synthetic

resin such as acrylonitrile butadiene styrene resin (ABS), is provided in the outer box 2, and forms a storage. Between the outer box 2 and the inner box 9, an internal space is provided. First vacuum heat insulating materials 40, 41, 42, etc. are provided in internal spaces between the outer box 2 and the inner box 9 at the top, the back, the bottom, etc. of the refrigerator 1, respectively. Gaps around the first vacuum heat insulating materials 40, 41, and 42 are filled with hard-urethane-foam heat insulating materials 11 that are foam heat insulating materials.

[0017]

The refrigerator 1 includes a first heat insulating partition portion 29, a second heat insulating partition portion 30, a third heat insulating partition portion 31, and a fourth heat insulating partition portion 32, which are disposed in the inner box 9 and partition the inner box 9 into storage compartments that are different in temperature zone from each other. In the refrigerator 1, the space in the inner box 9 is partitioned into a refrigerator compartment 10, an ice-making compartment and a versatile compartment 12, a vegetable compartment 13, and a freezer compartment 14, which are storage compartments, by the first heat insulating partition portion 29, the second heat insulating partition portion 30, the third heat insulating partition portion 31, and the fourth heat insulating partition portion 32. In addition, the refrigerator 1 includes doors 3, 4, 5, 6, 7, and 8 each of which is provided at an associated one of the storage compartments to open and close a front opening of an associated part of the inner box 9.

[0018]

In the refrigerator 1, the storage compartments are provided such that the refrigerator compartment 10 is located at an uppermost portion of the refrigerator 1, and subsequently, the ice-making compartment and versatile compartment 12, the vegetable compartment 13, and the freezer compartment 14 are provided in this order from top, and the freezer compartment 14 is thus provided in a lowermost portion of the refrigerator 1. Specifically, the refrigerator compartment 10 is located in an upper region partitioned off by the first heat insulating partition portion 29 and is kept at a refrigeration temperature (approximately 5 degrees C). The ice-making compartment

and versatile compartment 12 are located in a space defined by a lower portion of the first heat insulating partition portion 29, an upper portion of the second heat insulating partition portion 30, and a front portion of the fourth heat insulating partition portion 32. The ice-making compartment is kept at a freezing temperature (approximately -20 degrees C). The versatile compartment 12 is kept at a subcooling temperature (-7 degrees C to 0 degrees C).

[0019]

The vegetable compartment 13 is located in a space defined by a lower portion of the second heat insulating partition portion 30, an upper portion of the third heat insulating partition portion 31, and a front portion of the fourth heat insulating partition portion 32. The vegetable compartment 13 is kept at a refrigeration temperature (approximately 5 degrees C). The freezer compartment 14 is located in a lower region partitioned off by the third heat insulating partition portion 31, and is kept at a freezing temperature (approximately -20 degrees C).

[0020]

The storage compartments (the refrigerator compartment 10, the ice-making compartment and versatile compartment 12, the vegetable compartment 13, and the freezer compartment 14) have respective front openings. The doors 3, 4, 5, 6, 7, and 8 cover the respective openings such that the doors 3, 4, 5, 6, 7, and 8 can open and close the respective openings. The doors 3 and 4 are refrigerator compartment doors 3 and 4, and double-leaf doors, i.e., left and right leaf doors that cover the refrigerator compartment 10. The door to open and close the refrigerator compartment 10 may be a single-leaf door. The doors 5 and 6 are an ice-making compartment door 5 and a versatile compartment door 6, respectively, that are provided as drawer-type doors to cover the ice-making compartment and versatile compartment 12, respectively. The door 7 is a vegetable compartment door 7 that is provided as a drawer-type door to cover the vegetable compartment 13. The door 8 is a freezer compartment door 8 that is provided as a drawer-type door to cover the freezer compartment 14. Each of the above drawer-type doors is drawn together with an associated storage case that stores an object to be stored. First vacuum heat insulating materials 46, 47, and 48 are

provided in the refrigerator compartment doors 3 and 4, the vegetable compartment door 7, and the freezer compartment door 8, respectively. The gaps around the first vacuum heat insulating materials 46, 47, and 48 are filled with hard-urethane-foam heat insulating material 11.

5 [0021]

The refrigerator 1 in Embodiment 1 includes a refrigerant circuit (refrigeration cycle circuit) for cooling the inside of each storage compartment. In the refrigerant circuit, a compressor 20, a cooler 21, a condenser (not illustrated), a capillary tube (not illustrated), and other components are connected by pipes. As illustrated in Fig. 2, at the inner box 9, a machine compartment 15, which is formed in the shape of a step, is located behind the freezer compartment 14. The compressor 20 and the condenser (not illustrated) are provided in the machine compartment 15. The cooler 21 is provided behind the vegetable compartment 13 and in a space partitioned off by the fourth heat insulating partition portion 32. The cooler 21 is configured to cool each of the storage compartments that are the refrigerator compartment 10, the ice-making compartment and versatile compartment 12, the vegetable compartment 13, and the freezer compartment 14, in such a manner as to cause the temperature of each storage compartment to fall within an associated predetermined temperature zone. The compressor 20 sucks refrigerant, compresses the refrigerant into high-temperature and high-pressure refrigerant, and discharges the high-temperature and high-pressure refrigerant. The condenser transfers heat from refrigerant and condenses and liquefies the refrigerant. The capillary tube, which serves as an expansion device, reduces the pressure of refrigerant that passes through the capillary tube, thereby expanding the refrigerant. The cooler 21 causes heat exchange to be performed between refrigerant and air, and evaporates and gasifies the refrigerant. Air cooled by the cooler 21 is sent into each storage compartment by a fan (not illustrated). The amount of cool air (amount of air) sent into each storage compartment is controlled by an electric opening and closing damper (not illustrated) provided in an air passage between the cooler 21 and each storage compartment.

30 [0022]

It should be noted that preferably, Isobutane (R600a) should be used as refrigerant that circulates in the refrigeration cycle circuit. Although other refrigerants can be used, Isobutane has advantages over the other refrigerants. For example, Isobutane does not destroy ozone layer even if being disposed of, and has a low global warming potential, for example.

[0023]

The first vacuum heat insulating materials 40 and 42, which are disposed at the top and the bottom of the inner box 9 of the refrigerator 1, respectively, are L-shaped. In the refrigerator 1, an electronic control board (not illustrated) that is a self-heating component for operation control is provided at a back surface of the ceiling of the refrigerator 1. Therefore, preferably, the first vacuum heat insulating material 40, which has a more heat insulation effect than that of a urethane foam, should be provided between the inner box 9 and the electronic control board. In addition, since a radiating pipe (not illustrated) is provided at the ceiling of the refrigerator 1, preferably, the first vacuum heat insulating material 40 should also be provided between the radiating pipe and the inner box 9. The first vacuum heat insulating material 40 provided at the top of the refrigerator 1 is obtained by bending a first vacuum heat insulating material 40 having a plate-like shape into an L shape. The first vacuum heat insulating material 40 is coated with styrene rubber-based hot melt, thereby adhered to the outer box 2, and simultaneously covers the ceiling of the refrigerator 1 and the electronic control board. That is, since the first vacuum heat insulating material 40 is L-shaped, the manufacturing cost can be reduced. It should be noted that although it is described that the first vacuum heat insulating material 40 is bent, it is not limiting. For example, the first vacuum heat insulating material 40 may be curved.

[0024]

The refrigerator 1 generates heat during operation of the compressor 20 and the condenser provided in the machine compartment 15. It is therefore necessary to prevent heat from entering the inside of the refrigerator 1 from the bottom of the refrigerator 1. Thus, preferably, the first vacuum heat insulating material 42 should be provided between the inner box 9 and the machine compartment 15 for the same

reason as for the electronic control board. In order to cover the bottom of the refrigerator 1 and the machine compartment 15, the first vacuum heat insulating material 42 provided at the bottom of the refrigerator 1 is L-shaped, to be more specific, a first vacuum heat insulating material 42 having a plate-like shape is L-shaped, and the first vacuum heat insulating material 42 is coated with styrene rubber-based hot melt and thereby adhered to the inner box 9. It should be noted that although it is described that the first vacuum heat insulating material 42 is bent into an L-shape, it is not limiting, and for example, the first vacuum heat insulating material 42 may be curved. In addition, the first vacuum heat insulating material 41 provided on the back side of the refrigerator 1 is coated with styrene rubber-based hot melt, whereby the first vacuum heat insulating material 41 is adhered to a back metal component 22. It should be noted that although it is described that in order to adhere the first vacuum heat insulating materials 40, 41, and 42, styrene rubber-based hot melt is used, it is not limiting, and for example, a double-coated tape may be used.

[0025]

<Configuration of Second Heat Insulating Partition Portion 30>

In the refrigerator 1 in Embodiment 1, the second heat insulating partition portion 30, which partitions off the vegetable compartment 13, includes a second vacuum heat insulating material 49. It should be noted that in the refrigerator 1 in Embodiment 1, the third heat insulating partition portion 31 and the fourth heat insulating partition portion 32 may also include respective second vacuum heating insulating materials, that is, second vacuum heat insulating materials 50 and 51, respectively, in such a manner as to have the same configuration as the second heat insulating partition portion 30. The heat insulating partition structure of the refrigerator 1 in Embodiment 1 will be described with reference to Figs. 3 to 6, referring to, as a representative example, the second heat insulating partition portion 30. As a matter of convenience, the second heat insulating partition portion 30 will be hereinafter simply referred to as "heat insulating partition portion 30".

[0026]

Fig. 3 is a perspective view illustrating the heat insulating partition portion 30 of the refrigerator 1 in Fig. 1. Fig. 4 is an exploded perspective view illustrating the heat insulating partition portion 30 as illustrated in Fig. 3. Fig. 5 is a sectional view illustrating part of the heat insulating partition portion 30 that is indicated by arrows Z in Fig. 3. Fig. 6 is an enlarged view illustrating a related part of the heat insulating partition portion 30 as illustrated in Fig. 5. The related part of the heat insulating partition portion 30 as illustrated in Fig. 6 corresponds to the part surrounded by circle A in Fig. 5.

[0027]

As illustrated in Figs. 3 and 4, the heat insulating partition portion 30 includes the second vacuum heat insulating material 49 and a covering portion. The second vacuum heat insulating material 49 is provided to extend along a surface that partitions the inner box 9, and the covering portion covers the second vacuum heat insulating material 49. The covering portion includes a first covering portion 62 that covers one surface of the second vacuum heat insulating material 49, and a second covering portion 63 that is combined with the first covering portion 62 and cover another surface of the second vacuum heat insulating material 49. The first covering portion 62 and the second covering portion 63 are each formed in the shape of a box having an opening provided on one side of the box. The first covering portion 62 includes claws 62a that are configured to fix the first covering portion 62 and the second covering portion 63 to each other, and that are disposed at peripheral side portions of the first covering portion 62. The first covering portion 62 also has a partition fixing portion 62b configured to fix a partition portion (not illustrated) that partitions off the ice-making compartment and versatile compartment 12 (see Fig. 2). The partition fixing portion 62b is located at an outer surface of the first covering portion 62 that is located on the opposite side of the covering surface thereof. Furthermore, the first covering portion 62 also has attachment portions 62c that are used to fix the heat insulating partition portion 30 to the inner box 9 with screws, and that are located on peripheral part of the first covering portion 62 that adjoins the doors 5 and 6.

[0028]

Specifically, as illustrated in Fig. 4, projecting portions 65 are formed at covering surfaces of the first covering portion 62 and second covering portion 63 that face the second vacuum heat insulating material 49, such that the projecting portions 65 is in contact with the second vacuum heat insulating material 49. Also, recessed portions 66 are formed in the covering surfaces of the first covering portion 62 and second covering portion 63 that face the second vacuum heat insulating material 49, such that the recessed portions 66 are recessed toward the respective opposite sides of the side on which the second vacuum heat insulating material 49 is located. In Embodiment 1, the projecting portions 65 each have a triangular shape. To be more specific, at each of the covering surfaces, projecting portions 65 are formed. The shape of each projecting portion 65 is not limited to a triangle and may be any shape as long as the shape is a polygon. In this case, the projecting portion 65 has an embossed shape. The recessed portions 66 are formed in the covering surfaces such that the recessed portions 66 cross each other as illustrated. As a result, on the opposite sides of the covering surfaces of the first covering portion 62 and the second covering portion 63, recesses are formed and shaped in accordance with the shapes of the respective projecting portions 65. That is, at an outer surface of the first covering portion 62, which corresponds to the bottom of the ice-making compartment and versatile compartment 12, and an outer surface of the second covering portion 63, which corresponds to the top of the vegetable compartment 13, the recesses are formed in such a manner as to be shaped in accordance with the shapes of the respective projecting portions 65. In this case, at the above outer surfaces of the first covering portion 62 and the second covering portion 63, recesses are formed to be X-shaped and projections are formed to be X-shaped as illustrated.

[0029]

In addition to the projecting portions 65 and the recessed portions 66, flat portions 63b that faces the second vacuum heat insulating material 49 are formed at the respective covering surfaces of the first covering portion 62 and second covering portion 63. At the flat portions 63b, respective adhesive members 64 are provided to join the second covering portion 63 and the second vacuum heat insulating material 49. In

addition, soft tapes 60 and 61 are provided at peripheral side portions of the second vacuum heat insulating material 49 to join peripheral side portions of the second vacuum heat insulating material 49 to inner surfaces of the first covering portion 62, into which the second vacuum heat insulating material 49 is fitted.

5 [0030]

Regarding the locations of the projecting portions 65, the recessed portions 66, and the flat portion 63b, it suffices that the projecting portions 65, the recessed portions 66, and the flat portion 63b are each provided at at least one of the covering surfaces of the first covering portion 62 and the second covering portion 63 that face the second vacuum heat insulating material. In particular, it should be noted that in the case where the projecting portions 65 and the recessed portions 66 are provided at both the covering surfaces of the first covering portion 62 and the second covering portion 63, it is possible to improve the stiffness of the first covering portion 62 and the second covering portion 63, and thus greatly improve the stiffness of the entire covering portion that is a combination of the first covering portion 62 and the second covering portion 63. It should be noted that as the adhesive member 64, in general, preferably, a double-coated tape should be used, since it can be easily handled. However, in the case where equipment of applying styrene rubber-based hot melt is present, styrene rubber-based hot melt may be used.

20 [0031]

In peripheral side portions of the second covering portion 63, holes 63a are formed as holes with which the claws 62a of the first covering portion 62 are engaged when the second covering portion 63 and the first covering portion 62 are joined to each other. It should be noted that the claws 62a may be provided at the peripheral side portions of the second covering portion 63, and the holes 63a with which the claws 62a are engaged may be provided at the peripheral side portions of the first covering portion 62. Furthermore, although it is described that the holes 63a as illustrated in Fig. 4 are formed as through-holes, the holes 63a may be recesses. At both side portions of the second covering portion 63, claws 63d are provided as claws for use in fixation of the heat insulating partition portion 30 to the inner box 9. At peripheral part of the second

covering portion 63 that adjoins the doors 5 and 6, attachment portions 63c are provided and used to fix the heat insulating partition portion 30 to the inner box 9 with screws. It should be noted that recess-and-projection portions of the first covering portion 62 and second covering portion 63 as illustrated in Figs. 3 and 4 are X-shaped, but may be formed, for example, in a lattice pattern. For example, regarding the recess-and-projection portions, the projecting portions 65 may be formed rectangularly and arranged at regular intervals at the covering surface, and recessed portions 66 may be formed in such a manner as to cross the projecting portions 65. In this case, the recessed portions and the projecting portions are arranged in a lattice pattern.

[0032]

As illustrated in Fig. 5, some parts of the upper surface and the periphery of the first covering portion 62 are shaped to project from the outer surface due to, for example, the X-shaped recess-and-projection portions and the partition fixing portion 62b. Thus, some parts of the inner surface of the first covering portion 62 have a certain clearance from a surface of the second vacuum heat insulating material 49. The other parts of the inner surface of the first covering portion 62 are recessed to be in contact with the surface of the second vacuum heat insulating material 49. Similarly, some parts of the lower surface and the periphery of the second covering portion 63 are shaped to project from the outer surface due to, for example, the X-shaped recess-and-projection portions and the flat portion 63b. Thus, some parts of the inner surface of the second covering portion 63 have a certain clearance from another surface of the second vacuum heat insulating material 49. The other parts of the inner surface of the second covering portion 63 are recessed to be in contact with the surface of the second vacuum heat insulating material 49. Referring to Fig. 5, the X-shaped portions are formed in such a manner as to project, and the vicinities of the X-shaped portions are formed in the shape of a triangular recess; however, the X-shaped portions may be formed in such a manner as to be recessed, and the vicinities of the X-shaped portions may be formed in the shape of a triangular projection.

[0033]

In addition, as illustrated in Fig. 6, ribs 63e are provided throughout the outer surface of the second covering portion 63 that includes the X-shaped recess-and-projection portions, and that is located opposite to the covering surface.

[0034]

5 Regarding the refrigerator 1 according to Embodiment 1, the above description is made with respect to the case where the heat insulating partition portion 30 serves as a partition between the vegetable compartment 13 and the ice-making compartment and versatile compartment 12. However, this is an example. The heat insulating partition portion 30 according to the present disclosure can be used as a heat insulating partition
10 portion that includes the second vacuum heat insulating material and that can serve as a partition between any adjacent compartments in the inner box 9.

[0035]

 In Embodiment 1, regarding the configuration of the covering portion of the heat insulating partition portion 30, it is described above that the second vacuum heat
15 insulating material 49 is inserted into the first covering portion 62, and the second covering portion 63 is joined as a lid to the first covering portion 62. However, this is an example. The configuration of the covering portion of the heat insulating partition portion 30 may be a configuration in which the second vacuum heat insulating material 49 is inserted into the second covering portion 63, and the first covering portion 62 is
20 joined as a lid to the second covering portion 63.

[0036]

 That is, regarding the configuration of the heat insulating partition portion 30 in the refrigerator 1 according to Embodiment 1, it suffices that at least all the six surfaces of the second vacuum heat insulating material 49 are covered with two or more covering
25 components having surfaces that face each other and having recess-and-projection portions.

[0037]

 The first covering portion 62 and the second covering portion 63 that form the heat insulating partition portion 30 are made of a hard plastic such as polypropylene
30 (PP) or ABS, and are each formed to have a thickness of approximately 1.5 mm.

When the temperature at the manufacturing time is approximately 70 degrees C, material such as PP or ABS, which is inexpensive, can be used as material for the first covering portion 62 and the second covering portion 63. When the temperature at the manufacturing time is higher than 100 degrees C due to, for example, heat generated by foaming of polyurethane foam, a material such as heat-resistant ABS, polycarbonate (PC), or polyamide (PA) can be used. Since the first covering portion 62 and the second covering portion 63 are resin molded products, it is preferable that a resin injection gate be provided at an inner surface thereof in terms of design that is hidden away from view.

[0038]

<Assembly Procedure of Second Heat Insulating Partition Portion 30>

The assembly procedure of the heat insulating partition portion 30 according to Embodiment 1 will be described. First, the soft taps 60 and 61 are adhered to the peripheral side portions of the second vacuum heat insulating material 49, and the adhesive member 64 is adhered to a lower surface of the second vacuum heat insulating material 49 that faces the flat portion 63b of the second covering portion 63. Next, the second vacuum heat insulating material 49 is inserted into the inside of the first covering portion 62. Subsequently, the second covering portion 63 is placed as a lid from an opening side of the first covering portion 62, and the holes 63a provided in the peripheral side portions of the second covering portion 63 and the claws 62a provided at the peripheral side portions of the first covering portion 62 are joined to each other. Then, the second vacuum heat insulating material 49 and the flat portion 63b are joined and fixed to each other by the adhesive member 64. It should be noted that the above procedure is merely an example, and for example, after adhering the adhesive member 64 to the flat portion 63b, the flat portion 63b may be joined to the lower surface of the second vacuum heat insulating material 49.

[0039]

<Advantages of Embodiment 1>

As described above, in the refrigerator 1 according to Embodiment 1, the surface stiffness of the first covering portion 62 and the second covering portion 63 is increased

because of provision of the recess-and-projection portions at the first covering portion 62 and the second covering portion 63, which form the heat insulating partition portion 30. Therefore, in the refrigerator 1 according to Embodiment 1, it is possible to reduce deformation of the first covering portion 62 and the second covering portion 63. Thus, it is possible to prevent deterioration of the workability at the time of inserting the second vacuum heat insulating material 49 into the first covering portion 62 or at the time of joining the second covering portion 63 and the first covering portion 62 to each other. In addition, it is possible to prevent deformation of the heat insulating partition portion 30 and thus avoid occurrence of floating between the second vacuum heat insulating material 49 and the projecting portions 65 of the heat insulating partition portion 30. As a result, the heat insulating partition portion 30 can reliably support and hold the second vacuum heat insulating material 49, for example, with the projecting portions 65 or the flat portion 63b.

[0040]

In addition, preferably, the recessed portions 66 should be provided to cross each other at each of the covering surfaces of the first covering portion 62 and the second covering portion 63. In this case, it is possible to improve the stiffness of each of the first covering portion 62 and the second covering portion 63.

[0041]

Furthermore, preferably, the projecting portions 65 should be each formed to have a polygonal shape such as a triangular shape or a quadrangular shape, and should be provided at each of the covering surfaces of the first covering portion 62 and the second covering portion 63. In this configuration, the recessed portions 66 formed between adjacent projecting portions 65 are disposed to cross each other at each of the covering surfaces of the first covering portion 62 and the second covering portion 63. It is therefore possible to increase the stiffness of the first covering portion 62 and the second covering portion 63.

[0042]

In addition, in the refrigerator 1 according to Embodiment 1, since the X-shaped recess-and-projection portions are provided at the first covering portion 62 and the

second covering portion 63, which form the heat insulating partition portion 30, the recessed portions 66 having a certain clearance from the surfaces of the second vacuum heat insulating material 49 can be provided. In this case, resin injection gates are provided at surfaces of the recessed portions 66 at the inner surfaces of the first and second covering portions 62 and 63, thereby obtaining a structure that prevents the surfaces of the second vacuum heat insulating material 49 and projections of the resin injection gates from coming into contact with each other without using an auxiliary member such as styrene foam. It should be noted that at the resin injection gates, when projections are generated, preferably, the recessed portions 66 should be recessed relative to the projecting portions 65 by approximately 3 mm toward the opposite side of a side where the second vacuum heat insulating material 49 in order to prevent the surface of the second vacuum heat insulating material 49 from contacting the projections of the resin injection gates. Thus, it is possible to prevent the surface of the second vacuum heat insulating material 49 from being torn and defective, since the surfaces of the second vacuum heat insulating material 49 do not contact the projections of the resin injection gates.

[0043]

In addition, each of the recess-and-projection portions of the first covering portion 62 and the second covering portion 63 is formed to have a thickness of approximately 1.5 mm, and recess-and-projection portions having an embossed shape are also provided at the outer sides of the first covering portion 62 and the second covering portion 63 in addition to the inner sides of the first covering portion 62 and the second covering portion 63 that face the second vacuum heat insulating material 49. In this case, compared with the case where the outer side of each of the first covering portion 62 and the second covering portion 63 has a flat shape, it is possible to increase the capacity of each of the compartments by sizes of the spaces in the recesses at the outer side of each of the first covering portion 62 and the second covering portion 63.

[0044]

In addition, because of attachment of the soft tapes 60 and 61 to the peripheral side portions of the second vacuum heat insulating material 49, it is possible to prevent

a problem from occurring when the second vacuum heat insulating material 49 is inserted into the first covering portion 62 or when the first covering portion 62 and the second covering portion 63 are joined to each other. That is, it is possible to prevent an outer cover material of part of the second vacuum heat insulating material 49 that
5 adjoins the periphery thereof from coming into contact with ribs provided close to inner side portions of the first covering portion 62 and the second covering portion 63, and thus prevent the outer cover from being torn and becoming defective.

[0045]

Furthermore, it is preferable that a certain clearance be provided in advance
10 between the side portions of the second vacuum heat insulating material 49 and the inner side portions of the first covering portion 62, to thereby facilitate assembly. Because of provision of the soft tapes 60 and 61 between the side portions of the second vacuum heat insulating material 49 and the inner side portions of the first covering portion 62, the clearance is filled with the soft tapes. Thus, it is possible to
15 prevent displacement or movement of the second vacuum heat insulating material 49. Accordingly, it is possible to reduce the risk in which the outer cover material of the second vacuum heat insulating material 49 be damaged.

[0046]

Because of provision of the flat portion 63b for attachment of the adhesive
20 member 64 thereto at the inner lower surface of the second covering portion 63, the second vacuum heat insulating material 49 and the second covering portion 63 are reliably fixed to each other by the adhesive member 64. Thus, the second vacuum heat insulating material 49 is prevented from being displaced or moved within the heat insulating partition portion 30 when the heat insulating partition portion 30 is set in the
25 inner box 9. Accordingly, it is possible to reduce a risk that the outer cover material of the second vacuum heat insulating material 49 will be damaged. It should be noted that preferably, the level of the flat portion 63b from the recessed portions 66 be located at a lower position by the thickness of the adhesive member 64 than the projecting portions 65 in order to prevent the projecting portions 65 of the second covering portion

63 from being floated from the surface of the second vacuum heat insulating material 49.

[0047]

In a method of joining the first covering portion 62 and the second covering portion 63 to each other, the first covering portion 62 and the second covering portion 63 are jointed together using the claws 62a provided at the periphery of the first covering portion 62 and the holes 63a provided in the periphery of the second covering portion 63. By applying this method, the above two components can be easily joined to each other without using an auxiliary member such as a screw or tape, and the workability can thus be improved. Even if a problem should arise in the second vacuum heat insulating material 49, the first covering portion 62 and the second covering portion 63 can be easily disjoined by disconnecting the claws 62a and the holes 63a.

[0048]

In addition, since the claws 63d are provided at both the side portions of the second covering portion 63, the heat insulating partition portion 30 can be fixed to the inner box 9 without an auxiliary member such as a screw, and it is therefore possible to improve the workability at the time of attaching the heat insulating partition portion 30 to the inner box 9. Even if a problem should arise in the heat insulating partition portion 30, the heat insulating partition portion 30 can be easily detached from the inner box 9.

[0049]

In addition, since the ribs 63e are provided at the entire outer surface including the recess-and-projection portions of the second covering portion 63, it is possible to increase the surface area of the outer surface of the second covering portion 63, which corresponds to the top of the vegetable compartment 13. Therefore, it is possible to cause water adhering to the outer surface of the second covering portion 63 to easily evaporate, and to prevent dew from forming on the outer surface of the second covering portion 63, which corresponds to the top of the vegetable compartment 13.

[0050]

Embodiment 2

Next, the refrigerator 1 according to Embodiment 2 of the present disclosure will be described with reference to Figs. 7 and 8. Fig. 7 is a perspective view illustrating the refrigerator 1 according to Embodiment 2 of the present disclosure. Fig. 8 is a sectional view illustrating the inside of the refrigerator 1 as illustrated in Fig. 7 as viewed from the right side.

[0051]

In the refrigerator 1 according to Embodiment 1, the refrigerator compartment 10, the ice-making compartment and versatile compartment 12, the vegetable compartment 13, and the freezer compartment 14 are arranged as storage compartments in this order from top. The second vacuum heat insulating materials 49, 50, and 51 are provided between the vegetable compartment 13 and the ice-making compartment and versatile compartment 12, between the vegetable compartment 13 and the freezer compartment 14, and between the vegetable compartment 13 and the cooler 21, respectively.

[0052]

In the refrigerator 1 according to Embodiment 2, the vegetable compartment 13 and the freezer compartment 14 are interchanged in order to improve the efficiency in terms of energy saving and thermal efficiency, as compared with the refrigerator 1 according to Embodiment 1. Regarding the refrigerator 1 according to Embodiment 2, the components that are the same as those in the refrigerator 1 according to Embodiment 1 will be denoted by the same reference signs, and their detailed descriptions will thus be omitted.

[0053]

As illustrated in Figs. 7 and 8, the refrigerator 1 according to Embodiment 2 includes the first heat insulating partition portion 29, a second heat insulating partition portion 33, the third heat insulating partition portion 31, and the fourth heat insulating partition portion 32, which are disposed in the inner box 9 and partition the inner box 9 into storage compartments that are different in temperature zone from each other. In the refrigerator 1, the space in the inner box 9 is partitioned into the refrigerator compartment 10, the ice-making compartment and versatile compartment 12, the vegetable compartment 13, and the freezer compartment 14, which are the storage

compartments, by the first heat insulating partition portion 29, the second heat insulating partition portion 33, the third heat insulating partition portion 31, and the fourth heat insulating partition portion 32. In addition, the refrigerator 1 includes the doors 3, 4, 5, 6, 7, and 8, each of which is provided at an associated one of the storage compartments and open and close the front opening of an associated part of the inner box 9.

[0054]

The storage compartments are formed in the refrigerator 1 such that the refrigerator compartment 10 is provided in the uppermost portion of the refrigerator 1, and subsequently, the ice-making compartment and versatile compartment 12, the freezer compartment 14, and the vegetable compartment 13 in this order from top. The vegetable compartment 13 is provided in the lowermost portion of the refrigerator 1. Specifically, the refrigerator compartment 10 is provided above the first heat insulating partition portion 29, and is kept at a refrigeration temperature (approximately 5 degrees C). The ice-making compartment and versatile compartment 12 are provided in a space defined by the lower portion of the first heat insulating partition portion 29, the upper portion of the second heat insulating partition portion 33, and the front portion of the fourth heat insulating partition portion 32. The ice-making compartment is kept at a freezing temperature (approximately -20 degrees C). The versatile compartment 12 is kept at a subcooling temperature (-7 degrees C to 0 degrees C).

[0055]

The freezer compartment 14 is provided in a space defined by the lower portion of the second heat insulating partition portion 33, the upper portion of the third heat insulating partition portion 31, and the front portion of the fourth heat insulating partition portion 32. The freezer compartment 14 is kept at a freezing temperature (approximately -20 degrees C). The vegetable compartment 13 is provided under the third heat insulating partition portion 31, and is kept at a refrigeration temperature (approximately 5 degrees C).

[0056]

<Configuration of Second Heat Insulating Partition Portion 33>

In the refrigerator 1 according to Embodiment 2, the second heat insulating partition portion 33, which partitions off the freezer compartment 14, includes the second vacuum heat insulating material 49. In the refrigerator 1 according to Embodiment 2, the third heat insulating partition portion 31 and the fourth heat insulating partition portion 32 may include the second vacuum heat insulating materials 50 and 51, respectively, in such a manner as to have a similar configuration to that of the second heat insulating partition portion 33. The heat insulating partition structure of the refrigerator 1 according to Embodiment 2 will be described with reference to Figs. 9 to 11, referring to, as a representative example, the second heat insulating partition portion 33. As a matter of convenience, the second heat insulating partition portion 33 will be hereinafter simply referred to as "heat insulating partition portion 33".

[0057]

Fig. 9 is a perspective view illustrating the heat insulating partition portion 33 of the refrigerator 1 as illustrated in Fig. 7. Fig. 10 is an exploded perspective view illustrating the heat insulating partition portion 33 as illustrated in Fig. 9. Fig. 11 is a sectional view of part of the heat insulating partition portion 33 that is indicated by arrows Y in Fig. 9.

[0058]

As illustrated in Figs. 9 to 11 in which components that correspond to those in Figs. 3 to 5 are denoted by the same reference signs, the heat insulating partition portion 33 includes the second vacuum heat insulating material 49, which is provided along a surface that partitions the inner box 9, and a covering portion that covers the second vacuum heat insulating material 49. That is, the covering portion includes the first covering portion 62, which covers one surface of the second vacuum heat insulating material 49, and the second covering portion 63, which is joined to the first covering portion 62 and covers another surface of the second vacuum heat insulating material 49, as well as the covering portion in Embodiment 1. Thus, the heat insulating partition portion 33 has a similar configuration to that of the heat insulating partition portion 30 except that the heat insulating partition portion 33 partitions off the freezer compartment 14 in place of the heat insulating partition portion 30 partitioning off the

vegetable compartment 13, and that the ribs 63e are not provided at the outer surface of the second covering portion 63.

[0059]

<Assembly Procedure of Second Heat Insulating Partition Portion 33>

5 The assembly procedure of the heat insulating partition portion 33 according to Embodiment 2 will be described. First, the soft taps 60 and 61 are adhered to the peripheral side portions of the second vacuum heat insulating material 49, and the adhesive member 64 is adhered to the lower surface of the second vacuum heat insulating material 49 that faces the flat portion 63b of the second covering portion 63.

10 Next, the second vacuum heat insulating material 49 is inserted into the inside of the first covering portion 62. Subsequently, the second covering portion 63 is placed as a lid from the opening side of the first covering portion 62, and the holes 63a provided in the peripheral side portions of the second covering portion 63 and the claws 62a provided at the peripheral side portions of the first covering portion 62 are joined to each other. Then, the second vacuum heat insulating material 49 and the flat portion 63b are joined and fixed to each other by the adhesive member 64. It should be noted that the above procedure is merely an example, and for example, after adhering the adhesive member 64 to the flat portion 63b, the flat portion 63b may be joined to the lower surface of the second vacuum heat insulating material 49.

20 [0060]

<Advantages of Embodiment 2>

25 As described above, in the refrigerator 1 according to Embodiment 2, because of provision of the recess-and-projection portions at the first covering portion 62 and the second covering portion 63, which form the heat insulating partition portion 33, the surface stiffness of the first covering portion 62 and the second covering portion 63 is improved. Therefore, in the refrigerator 1 according to Embodiment 2, it is possible to reduce deformation of the first covering portion 62 and the second covering portion 63, and thus prevent deterioration of the workability at the time of inserting the second vacuum heat insulating material 49 into the first covering portion 62 or at the time of joining the second covering portion 63 and the first covering portion 62. Furthermore, it

30

is possible to prevent deformation of the heat insulating partition portion 33 and thus avoid occurrence of floating between the second vacuum heat insulating material 49 and the projecting portions 65 of the heat insulating partition portion 33. As a result, the heat insulating partition portion 33 can reliably support and hold the second vacuum heat insulating material 49, for example, with the projecting portions 65 or the flat portion 63b.

[0061]

In the refrigerator 1 according to Embodiment 2, the storage medium are formed such that the refrigerator compartment 10 is located in the uppermost portion of the refrigerator 1, and subsequently, the ice-making compartment and versatile compartment 12, the freezer compartment 14, and the vegetable compartment 13 in this order from top, and the freezer compartment 14 is located in the lowermost portion of the refrigerator 1. That is, in the refrigerator 1 according to Embodiment 2, the vegetable compartment 13 is not interposed between the freezer compartment 14 and the ice-making compartment and versatile compartment 12, that is, the vegetable compartment 13 is provided in the lowermost portion, and the freezer compartment 14 and the ice-making compartment and versatile compartment 12 are disposed adjacent to each other in the vertical direction. Because of this configuration, it is possible to improve the efficiency in terms of energy saving and thermal efficiency, as compared with the refrigerator 1 in Embodiment 1.

[0062]

In addition, in the refrigerator 1 in Embodiment 2, since the X-shaped recess-and-projection portions are provided at the first covering portion 62 and the second covering portion 63, which form the heat insulating partition portion 33, the recessed portions 66 having a certain clearance from the surfaces of the second vacuum heat insulating material 49 can be provided. In this case, by providing resin injection gates at the surfaces of the recessed portions 66 at the inner surfaces of the first and second covering portions 62 and 63, it is possible to prevent the surfaces of the second vacuum heat insulating material 49 and the projections of the resin injection gates from coming into contact with each other without using an auxiliary member such as styrene foam.

It should be noted that at the resin injection gates, when projections are generated, preferably, the recessed portions 66 should be recessed relative to the projecting portions 65 by approximately 3 mm toward the opposite side of the side where the second vacuum heat insulating material 49 in order to prevent the surface of the second vacuum heat insulating material 49 from contacting the projections of the resin injection gates. Thus, in the refrigerator 1 according to Embodiment 2, since the surfaces of the second vacuum heat insulating material 49 do not contact the projections of the resin injection gates, it is possible to prevent the outer cover material of the second vacuum heat insulating material 49 from being torn and defective.

[0063]

In addition, the recess-and-projection portions of the first covering portion 62 and the second covering portion 63 are each made to have a thickness of approximately 1.5 mm, and also have an embossed shape not only at the inner side that faces the second vacuum heat insulating material 49, but also at the outer side. In this case, compared with the case where the outer side of each of the first covering portion 62 and the second covering portion 63 are flat, it is possible to increase the capacity of each compartment by the sizes of the spaces in the recesses at the outer side of each of the first covering portion 62 and the second covering portion 63.

[0064]

In addition, the soft tapes 60 and 61 are attached to the peripheral side portions of the second vacuum heat insulating material 49, thereby preventing a problem from occurring when the second vacuum heat insulating material 49 is inserted into the first covering portion 62 or when the first covering portion 62 and the second covering portion 63 are joined to each other. That is, part of the outer cover material of the second vacuum heat insulating material 49 that is located close to the periphery thereof can be prevented from coming into contact with ribs disposed close to inner side portions of the first covering portion 62 and the second covering portion 63, and thus prevented from being torn and becoming defective.

[0065]

In addition, it is preferable that a certain clearance be provided between the side portions of the second vacuum heat insulating material 49 and the inner side portions of the first covering portion 62 in order to facilitate assembly. By providing the soft tapes 60 and 61 between the side portions of the second vacuum heat insulating material 49 and the inner side portions of the first covering portion 62, the clearance is filled with the soft tapes, and it is thus possible to prevent displacement or movement of the second vacuum heat insulating material 49. Therefore, it is possible to reduce the risk that the outer cover material of the second vacuum heat insulating material 49 will be damaged. [0066]

The flat portion 63b for attachment of the adhesive member 64 thereto is provided at the inner lower surface of the second covering portion 63, and the second vacuum heat insulating material 49 and the second covering portion 63 are the reliably fixed to each other by the adhesive member 64. Thus, the second vacuum heat insulating material 49 is prevented from shifting or moving within the heat insulating partition portion 33 when the heat insulating partition portion 33 is mounted in the inner box 9. It is therefore possible to reduce the risk that the outer cover material of the second vacuum heat insulating material 49 will be damaged. It should be noted that preferably, the level of the flat portion 63b from the recessed portions 66 be located at a lower position by the thickness of the adhesive member 64 than the projecting portions 65 in order to prevent the projecting portions 65 of the second covering portion 63 from being floated from the surface of the second vacuum heat insulating material 49. [0067]

In a method of joining the first covering portion 62 and the second covering portion 63 together, the claws 62a provided at the periphery of the first covering portion 62 and the holes 63a provided at the periphery of the second covering portion 63 are used. It is therefore possible to easily join the two components to each other without an auxiliary member such as a screw or tape, and thus improve the workability. Even if a problem occurs in the second vacuum heat insulating material 49, the first covering portion 62 and the second covering portion 63 can be easily disjoined by disconnecting the claws 62a and the holes 63a.

[0068]

In addition, because of provision of the claws 63d at both the side portions of the second covering portion 63, it is possible to fix the heat insulating partition portion 33 to the inner box 9 without an auxiliary member such as a screw, and improve the workability at the time of attaching the heat insulating partition portion 33 to the inner box 9. Even if a problem should occur at the heat insulating partition portion 33, the heat insulating partition portion 33 can be easily detached from the inner box 9.

[0069]

Although the above descriptions are made regarding Embodiments 1 and 2, they are not limiting. For example, the arrangement sequence or the configuration of the refrigerator compartment 10, the ice-making compartment and versatile compartment 12, the vegetable compartment 13, and the freezer compartment 14 in the refrigerator 1 is not limited to that according to each of Embodiment 1 and Embodiment 2 as described above, and may be variously modified.

Reference Signs List

[0070]

1 refrigerator, 2 outer box, 3, 4, 5, 6, 7, 8 door, 9 inner box, 10 refrigerator compartment, 11 hard-urethane-foam heat insulating material, 12 versatile compartment, 13 vegetable compartment, 14 freezer compartment, 15 machine compartment, 20 compressor, 21 cooler, 22 back metal component, 29 first heat insulating partition portion, 30, 33 second heat insulating partition portion, 31 third heat insulating partition portion, 32 fourth heat insulating partition portion, 40, 41, 42, 46, 47, 48 first vacuum heat insulating material, 49, 50, 51 second vacuum heat insulating material, 60, 61 soft tape, 62 first covering portion, 62a claw, 62b partition fixing portion, 62c attachment portion, 63 second covering portion, 63a hole, 63b flat portion, 63c attachment portion, 63d claw, 63e rib, 64 adhesive member, 65 projecting portion, 66 recessed portion

CLAIMS

[Claim 1]

A refrigerator comprising:

an outer box forming an exterior of the refrigerator;

an inner box provided in the outer box, and forming a storage;

a first vacuum heat insulating material provided in a space provided between the outer box and the inner box;

a foam heat insulating material filled into the space; and

a heat insulating partition portion provided in the inner box, and partitioning the inner box into storage compartments that are different in temperature zone from each other,

wherein the heat insulating partition portion includes

a second vacuum heat insulating material provided along a surface that partitions the inner box, and

a covering portion covering the second vacuum heat insulating material, and including

a first covering portion covering one surface of the second vacuum heat insulating material, and

a second covering portion joined to the first covering portion, and covering an other surface of the second vacuum heat insulating material,

wherein at a covering surface of at least one of the first covering portion and the second covering portion, a projecting portion, a recessed portion, and a flat portion are formed, the covering surface facing the second vacuum heat insulating material, the projecting portion being contact with the second vacuum heat insulating material, the recessed portion recessed toward an opposite side of a side on which the second vacuum heat insulating material is located, the flat portion projecting toward the second vacuum heat insulating material,

wherein at a surface of the recessed portion, resin injection gates are provided, and

wherein at the flat portion, an adhesive member is provided to join the first covering portion or the second covering portion and the second vacuum heat insulating material.

[Claim 2]

5 The refrigerator of claim 1, wherein at the covering surface, the recessed portion is formed in a cross shape.

[Claim 3]

 The refrigerator of claim 1 or 2, wherein
 the projecting portion has a polygonal shape, and

10 a plurality of projecting portions including the projecting portion are provided at the covering surface.

[Claim 4]

 The refrigerator of any one of claims 1 to 3, wherein ribs are provided throughout an outer surface of the second covering portion that is located opposite to the covering surface of the second covering portion.

15

[Claim 5]

 The refrigerator of any one of claims 1 to 4, further comprising
 a partition portion partitioning one of the storage compartments partitioned off by the heat insulating partition portion in the inner box into storage compartments in which
20 temperature zones differ from each other,

 wherein the heat insulating partition portion further includes a partition fixing portion that is configured to fix the partition portion, and is provided at an outer surface of the first covering portion that is located opposite to the covering surface of the first covering portion.