[Name of Document] DESCRIPTION

[Title of Invention] REFRIGERATOR

[Technical Field]

[0001]

The present invention relates to a refrigerator in which an inner space of a heat-insulating cabinet is divided into a plurality of storage compartments by a partition.

[Background Art]

[0002]

An outer shell of a conventional refrigerator is formed by a heat-insulating cabinet. The heat-insulating cabinet includes an outer box, an inner box, and a foam insulator filled in a space between these boxes. The interior of the heat-insulating cabinet (a space on an inner peripheral side of the inner box) is divided by a partition into some storage compartments having different temperature zones (a refrigerating compartment, a freezing compartment, a vegetable compartment, and an ice-making compartment).

[0003]

There has been proposed a conventional refrigerator of such a type in which an inner box and a partition are joined when the inner box is vacuum-molded. For example, there has been proposed a refrigerator, in which "An inner box 2 is molded by vacuum molding. In Fig. 3, reference numeral 18 denotes a molding die for molding the inner box. Reference numeral 18a denotes a freezing-compartment side of the molding die 18, and reference numeral 18b denotes a refrigerating-compartment side thereof. Reference numeral 18c denotes a die groove portion in which a partition 3 for dividing the inner box 2 into a refrigerating compartment and a freezing compartment is to be inserted at the time of vacuum molding. Reference numeral 19 denotes an inner box sheet. The inner box 2 is molded by vacuum molding by covering the molding die 18 with the inner box sheet 19 after the insertion of the partition 3 with first reinforcing plates 12 into the die groove portion 18c. At this time, the inner box sheet 19 is brought into tight contact with side wall pieces 12b of

the first reinforcing plates 12 described with reference to Fig. 2, and is also brought into tight contact with first L-shaped biting ribs 12f and second L-shaped biting ribs 17. Hence, the inner box 2, the first reinforcing plates 12, and the partition 3 are fixed firmly and tightly" (see Patent Literature 1).

[Citation List]

[Patent Literature]

[0004]

[Patent Literature 1] Japanese Patent No. 4006901 (paragraphs [0017]-[0019], Figs. 2 and 3)

[Summary of Invention]

[Technical Problem]

[0005]

In recent years, there have been an increasing number of refrigerators in which a vacuum insulator having high insulation performance is provided together with a foam insulator between an inner box and an outer box in order to enhance energy-saving performance. In such refrigerators in which the vacuum insulator is provided between the inner box and the outer box, if the inner box is joined to a partition when the inner box is vacuum-molded by a conventional method, the following problem occurs.

[0006]

Fig. 5 is a perspective view illustrating an outer appearance of a partition in a conventional refrigerator.

As illustrated in Fig. 5, in a conventional partition 104, an insulator 143 formed of, for example, styrene foam is held between an upper outer wall 104a and a lower outer wall 104b formed of resin such as PP. The upper outer wall 104a and the lower outer wall 104b are fastened to each other, for example, by screws. The conventional partition 104 has, in an outer peripheral portion opposed to an inner box 102 of a below-described conventional heat-insulating cabinet 110, flanges 144 projecting inward and outward along the inner box 102. In the conventional partition 104, a

plurality of L-shaped biting ribs 150 project at intervals on surfaces of the flanges 144 opposed to the inner box 102.

[0007]

Fig. 6 is a cross-sectional view illustrating a section near the partition in the heat-insulating cabinet of the conventional refrigerator. Fig. 6 is a cross-sectional view taken along line A-A of Fig. 5.

The conventional heat-insulating cabinet 110 illustrated in Fig. 6 is obtained by joining the inner box 102 and the partition 104 when the inner box 102 is vacuum-molded, then combining the inner box 102 with an outer box 101 with a vacuum insulator 160 stuck to its inner peripheral side, and foam-filling a space between the inner box 102 and the outer box 101 combined with each other with a foam insulator 103. As illustrated in Fig. 6, when the inner box 102 is vacuum-molded, a resin sheet serving as the material of the inner box 102 firmly bites the biting ribs 150. Hence, it is possible to prevent the inner box 102 and the partition 104 from separating and to firmly join the inner box 102 and the partition 104.

[0008]

However, since the biting ribs 150 protrude outward (toward the outer box 101) from the flanges 144 in the conventional partition 104, they sometimes touch and break the vacuum insulator 160 stuck to the outer box 101. To solve the above problem, there is a need to partially thin the vacuum insulator 160 so that the vacuum insulator 160 and the biting ribs 150 do not interfere with each other. Hence, insulation performance of the heat-insulating cabinet 110 is reduced partially. Also, when the vacuum insulator 160 is partially thinned, the cost is increased by the addition of a working step, and the vacuum insulator is sometimes broken during the additional working step.

[0009]

The present invention has been made to solve the above-described problems, and an object of the invention is to provide a refrigerator using an inner box that is joined to a partition at the time of vacuum molding, which can prevent deterioration of

insulation performance of a heat-insulating cabinet, the increase in production cost, and breakage of a vacuum insulator.

[Solution to Problem]

[0010]

A refrigerator according to the present invention includes a heat-insulating cabinet having an inner box and an outer box, a space between the inner box and the outer box being filled with a vacuum insulator and a foam insulator, and a partition that divides an inner space of the heat-insulating cabinet on an inner peripheral side of the inner box into a plurality of storage compartments. The inner box and the partition are joined when the inner box is vacuum-molded. The partition has, in an outer peripheral portion opposed to the inner box, a flange projecting outward along the inner box and a recess receding away from the inner box. The recess has a rib projecting from a side face portion of the recess in a direction opposite from the flange.

[Advantageous Effects of Invention]

[0011]

In the refrigerator of the present invention, the inner box and the partition are joined by causing a sheet member serving as the material of the inner box to bite the rib of the partition when the inner box is vacuum-molded. At this time, since the rib in the refrigerator of the present invention does not protrude from the outer peripheral portion of the partition, it does not break the vacuum insulator when the heat-insulating cabinet is molded. For this reason, it is unnecessary to add a working step of partially thinning the vacuum insulator. Therefore, the present invention can prevent deterioration of insulation performance of the heat-insulating cabinet, the increase in production cost of the refrigerator, and breakage of the vacuum insulator.

[Brief Description of Drawings]

[0012]

[Fig. 1] Fig. 1 is a sectional side view of a refrigerator according to Embodiment of the present invention.

[Fig. 2] Fig. 2 is a perspective view illustrating a section near an outer peripheral portion of a partition in the refrigerator according to Embodiment of the present invention.

[Fig. 3] Fig. 3 is a cross-sectional view illustrating a section near the partition in the refrigerator according to Embodiment of the present invention.

[Fig. 4] Fig. 4 is an explanatory view illustrating a molding method for an inner box in the refrigerator according to Embodiment of the present invention.

[Fig. 5] Fig. 5 is a perspective view illustrating an outer appearance of a partition in a conventional refrigerator.

[Fig. 6] Fig. 6 is a cross-sectional view illustrating a section near the partition in a heat-insulating cabinet of the conventional refrigerator.

[Description of Embodiment]

[0013]

Fig. 1 is a sectional side view of a refrigerator according to Embodiment of the present invention. Fig. 2 is a perspective view illustrating a section near an outer peripheral portion of a partition in the refrigerator. Fig. 3 is a cross-sectional view illustrating a section near the partition in the refrigerator.

A refrigerator 90 according to Embodiment will be described below with reference to Figs. 1 to 3. A left side of Fig. 1 is a front side of the refrigerator 90. Fig. 3 is a cross-sectional view taken along line B-B of Fig. 2.

[0014]

The refrigerator 90 of Embodiment includes a heat-insulating cabinet 10 serving as an outer shell thereof. The heat-insulating cabinet 10 includes an outer box 1 that mainly forms an outer peripheral surface of the heat-insulating cabinet 10, an inner box 2 that mainly forms an inner peripheral surface of the heat-insulating cabinet 10, and a vacuum insulator 60 and a foam insulator 3 filled in a space between an inner peripheral side of the outer box 1 and an outer peripheral side of the inner box 2. The interior (that is, an inner peripheral side of the inner box 2) of the heat-insulating cabinet 10 having such a structure is divided by a partition 4 into some storage compartments (for example, a refrigerating compartment, a freezing

compartment, a vegetable compartment, and an ice-making compartment) having different temperature zones. These storage compartments are open on their front sides, and front openings of the storage compartments are openably closed by doors 5. On a rear side of the heat-insulating cabinet 10, a cooler 6 is provided. Cold air cooled by the cooler 6 is introduced into the storage chambers via ducts.

[0015]

The partition 4 has a structure in which an insulator 43 formed of, for example, styrene foam is held between an upper outer wall 4a and a lower outer wall 4b that are formed of resin such as PP. For example, the upper outer wall 4a and the lower outer wall 4b are fastened to each other by screws. The upper outer wall 4a and the lower outer wall 4b of the partition 4 have, on outer peripheral portions opposed to the inner box 2 of the heat-insulating cabinet 10, flanges 44 projecting outward along the inner box 2.

[0016]

In the outer peripheral portions of the upper outer wall 4a and the lower outer wall 4b opposed to the inner box 2, inner flanges 45 are provided closer to an inner side of the partition 4 than the flanges 44 to project in a direction opposite from the flanges 44. A gap is provided between the inner flange 45 of the upper outer wall 4a and the inner flange 45 of the lower outer wall 4b, and the insulator 43 projects from the gap toward an outer peripheral side. That is, in Embodiment, wall surfaces between the flanges 44 and the inner flanges 45 of the upper outer wall 4a and the lower outer wall 4b, the inner flanges 45 provided in the upper outer wall 4a and the lower outer wall 4b, and a portion of the insulator 43 projecting from between the inner flanges 45 define recesses 70 receding away from the inner box in the outer peripheral portion of the partition 4 opposed to the inner box 2. Further, the partition 4 of Embodiment has ribs 80 that project from side faces of the recesses 70, that is, the walls between the flanges 44 and the inner flanges 45 of the upper outer wall 4a and the lower outer wall 4b in the direction opposite from the flanges 44. While the ribs 80 are provided at positions opposed to the flanges 44 in Embodiment, they may be

provided closer to the inner flanges 45 than the flanges 44. Further, in Embodiment, a plurality of ribs 80 are arranged at predetermined intervals.

[0017]

The heat-insulating cabinet 10 of Embodiment is obtained by joining the inner box 2 and the partition 4 when the inner box 2 is vacuum-molded, then combining the inner box 2 with the outer box 1 having the vacuum insulator 60 stuck to its inner peripheral side, and foam-filling a space between the combined inner and outer boxes 2 and 1 with the foam insulator 3.

A production method for the inner box 2 will be described below.

[0018]

Fig. 4 is an explanatory view illustrating a molding method for the inner box in the refrigerator according to Embodiment of the present invention.

A molding die 20 used in vacuum molding of an inner box 2 has a plurality of projections (projections 20a and 20b) in conformity to the shapes of the storage compartments. Further, the molding die 20 has, between the projection 20a and the projection 20b, a die groove portion 20c in which a partition 4 for separating the storage compartments is to be inserted. In Fig. 4, reference numeral "30" denotes an inner box sheet that is the material of the inner box 2. The inner box sheet 30 is formed of resin such as ABS.

[0019]

After the partition 4 is inserted in the die groove portion 20c, the molding die 20 is covered with the inner box sheet 30 formed of heated thermoplastic resin such as ABS, and the inner box 2 is molded in a shape along the molding die 20 and an outer peripheral portion of the partition 4 by vacuum molding.

[0020]

At this time, as illustrated in Fig. 3, the inner box sheet 30 thermally contracts and enters the recesses 70. That is, the inner box sheet 30 is brought into tight contact with the flanges 44 of the partition 4, and is also brought into tight contact with the recesses 70. For this reason, the inner box sheet 30 bites the ribs 80. Therefore, even if it is attempted to separate the inner box sheet 30 from the recesses 70, the

inner box sheet 30 is caught by the biting ribs 80, so that the inner box 2 and the partition 4 can be joined firmly. Further, since the ribs 80 of Embodiment do not project from the flanges 44 of the partition 4 toward the outside of the refrigerator (toward the outer box 1), they do not break the vacuum insulator 60.

[0021]

As described above, in the refrigerator 90 having the structure of Embodiment, the ribs 80 of the partition 4 do not break the vacuum insulator 60. Hence, it is unnecessary to partially thin the vacuum insulator 60, and this facilitates production. Therefore, the refrigerator 90 of Embodiment can prevent degradation of insulation performance of the heat-insulating cabinet 10, the increase in production cost of the refrigerator 90, and breakage of the vacuum insulator 60.

[0022]

Further, since a plurality of ribs 80 are provided on the partition 4 in the refrigerator of Embodiment, the number of biting positions of the inner box sheet 30 increases, and this allows the inner box 2 and the partition 4 to be joined more firmly.

[0023]

While bottom portions of the recesses 70 are formed by the inner flanges 45 and the insulator 43 in Embodiment, the structure for forming the recesses 70 is not limited thereto. For example, the inner flanges 45 of the upper outer wall 4a and the lower outer wall 4b may serve as the bottom portions of the recesses 70 without forming a gap between the inner flange 45 of the upper outer wall 4a and the inner flange 45 of the lower outer wall 4b. Alternatively, for example, end face portions of the insulator 43 may serve as the bottom portions of the recesses 70 without forming the inner flanges 45.

[Reference Signs List]

[0024]

1: outer box, 2: inner box, 3: foam insulator, 4: partition, 4a: upper outer wall, 4b: lower outer wall, 5: door, 6: cooler, 10: heat-insulating cabinet, 20: molding die, 20a: projection, 20b: projection, 20c: die groove portion, 30: inner box sheet, 43: insulator, 44: flange, 45: inner flange, 60: vacuum insulator, 70: recess, 80: rib, 90:

refrigerator, 101: outer box (conventional), 102: inner box (conventional), 103: foam insulator, 104: partition (conventional), 104a: upper outer wall (conventional), 104b: lower outer wall (conventional), 110: heat-insulating cabinet (conventional), 143: insulator (conventional), 144: flange (conventional), 150: biting rib (conventional), 160: vacuum insulator (conventional).

[Name of Document] CLAIMS

[Claim 1]

A refrigerator comprising:

a heat-insulating cabinet having an inner box, an outer box, a vacuum insulator, and a foam insulator, the vacuum insulator and the foam insulator being filled in a space between the inner box and the outer box; and

a partition that divides an inner space of the heat-insulating cabinet on an inner peripheral side of the inner box into a plurality of storage compartments,

wherein the inner box and the partition are joined when the inner box is vacuum-molded,

wherein the partition has, in an outer peripheral portion opposed to the inner box, a flange projecting outward along the inner box and a recess receding away from the inner box, and

wherein the recess has a rib projecting from a side face portion of the recess in a direction opposite from the flange.

[Claim 2]

The refrigerator of Claim 1, wherein a plurality of the ribs are provided.