

DESCRIPTION

Title of Invention

REFRIGERATOR AND METHOD OF MANUFACTURING THE REFRIGERATOR

Technical Field

5 [0001]

The present disclosure relates to a refrigerator and a method of manufacturing the refrigerator.

Background Art

[0002]

10 A refrigerator usually includes a refrigerator body and a door unit. The refrigerator body has an open front face and at least one compartment. The door unit covers an opening of the compartment in such a manner as to allow the opening to be opened and closed. The door unit is of a rotational type or a drawer type. Door units of home-use refrigerators are components that are viewed most frequently by end
15 users. Therefore, excellent design is considered to be important particularly for door units. Accordingly, recent-year door units each have a surface made of a glass material for achieving a beautiful appearance as a whole.

[0003]

20 For example, a door body disclosed by Patent Literature 1 includes a cuboid frame body, a front panel made of glass and covering one of open faces of the frame body, and a rear panel covering the other open face of the frame body. The frame body includes a supporting plate extending inward. The front panel includes a decorative sheet provided on the rear face of the front panel. The outer periphery of the decorative sheet is pasted to the supporting plate with double-sided adhesive film.
25 A space surrounded by the frame body that is tightly closed by the front panel and the rear panel is filled with a heat insulator made of resin foam.

Citation List

Patent Literature

[0004]

Summary of Invention

Technical Problem

[0005]

The double-sided adhesive film used in the door body disclosed by Patent Literature 1 has a rectangular shape obtained by punching the film in conformity to the shape of the frame body or is in the form of tape. It is very difficult to accurately and orderly paste the rectangular-shaped double-sided adhesive film onto the supporting plate. Therefore, the double-sided adhesive film may be displaced, opening a gap between the supporting plate and the front panel. On the other hand, in the case of tape-type double-sided adhesive film, one end of the film needs to be laid over the other end. Therefore, a step is formed at one of the two ends. In such a case, a very small gap may be opened at the stepped part. In some other cases, the frame body may be obtained by molding four individual components that are to form the upper, lower, left, and right sides of the frame body and then assembling the four components. When the components are assembled, a small step may be formed between adjacent ones of the components. Such a step may not be completely adjusted by double-sided adhesive tape. Consequently, a gap may be opened between the supporting plate and the front panel. If, for example, a solution that turns into resin foam is fed into the frame body with such a gap that is opened between the supporting plate and the front panel, the solution may flow into the gap and foam in the gap. Consequently, the front panel may come off, or the resin foam may leak from the gap and be exposed to the outside, deteriorating the quality of appearance design.

[0006]

On the other hand, every time the door unit of the refrigerator is opened or closed, an impact is applied to the front panel. Under such circumstances, if the strength of bonding between the supporting plate and the front panel is low, because of the gap opened between the supporting plate and the front panel, the front panel may drop off when the door unit is opened or closed.

[0007]

The present disclosure seeks to provide a highly reliable refrigerator in which a frame part and a decorative plate may be closely bonded to each other with no gap in between to provide an appearance with excellent design and safe and secure use, and also provide a method of manufacturing the refrigerator.

Solution to Problem

[0008]

A refrigerator according to an embodiment of the present disclosure includes a refrigerator body having an open front face and including at least one compartment, and a door unit covering an opening of the at least one compartment in such a manner as to allow the opening to be opened and closed. The door unit includes a frame part shaped in a rectangular shape; an inner plate that closes an open face of the frame part, the open face being located close to the at least one compartment; a decorative plate that closes an open face of the frame part, the open face being located close to a front face of the refrigerator; a heat insulator provided in a space tightly closed by the frame part, the inner plate, and the decorative plate; and hot-melt adhesive that bonds the frame part and the decorative plate to each other, the hot-melt adhesive being solidified with moisture and not melting with heat once solidified. The hot-melt adhesive has a thickness of 0.2mm or greater and 0.3mm or smaller.

Advantageous Effects of Invention

[0009]

According to an embodiment of the present disclosure, the frame part and the decorative plate are closely bonded to each other with no gap in between by using the hot-melt adhesive, which exhibits high strength of bonding and becomes flexible when melted with heat. Therefore, the heat insulator fed into the tightly closed inner space may be prevented from leaking to the outside. Consequently, the refrigerator can have an appearance with excellent design. Furthermore, as the frame part and the decorative plate can be bonded to each other with increased strength of bonding, the refrigerator can be used safely and securely.

Brief Description of Drawings

[0010]

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

[Fig. 2] Fig. 2 is an exploded perspective view of a door unit of the refrigerator according to Embodiment of the present disclosure.

5 [Fig. 3] Fig. 3 is a sectional view of the door unit of the refrigerator according to Embodiment of the present disclosure.

[Fig. 4] Fig. 4 is an enlargement of part A encircled in Fig. 3.

[Fig. 5] Fig. 5 is a diagram illustrating a modification of the refrigerator according to Embodiment of the present disclosure.

10 [Fig. 6] Fig. 6 is a diagram illustrating another modification of the refrigerator according to Embodiment of the present disclosure.

[Fig. 7] Fig. 7 is a plan view of a frame part of the refrigerator according to Embodiment of the present disclosure, with hot-melt adhesive provided on the frame part.

15 [Fig. 8] Fig. 8 is an enlargement of part B encircled in Fig. 7.

[Fig. 9] Fig. 9 is a diagram of the refrigerator according to Embodiment of the present disclosure, illustrating how to attach a decorative plate to the frame part.

Description of Embodiments

[0011]

20 Embodiment of the present disclosure will be described below with reference to the drawings. In the drawings, the same or equivalent elements are denoted by the same reference signs and description of such elements is appropriately omitted or simplified. The shapes, the sizes, the arrangement, and other factors of the elements illustrated in the drawings may be appropriately changed within the scope of the present disclosure.

25 [0012]

Embodiment

30 An overall configuration of a refrigerator 100 according to Embodiment will first be described with reference to Fig. 1. Fig. 1 is a perspective view of a refrigerator according to Embodiment of the present disclosure. As illustrated in Fig. 1, the

refrigerator 100 includes a refrigerator body 1 and door units 3. The refrigerator body 1 has an open front face, and the inside of the refrigerator body 1 is sectioned into a plurality of compartments 2 by a plurality of partitions. The door units 3 are provided on the front face of the refrigerator body 1 and cover openings of the respective compartments in such a manner as to allow the openings to be opened and closed. The refrigerator body 1 includes an inner box made of hard resin and forming an inner part of the refrigerator 100, and an outer box made of steel sheet and forming an outer part of the refrigerator 100, with a tightly closed space provided in between. The tightly closed space between the inner box and the outer box is provided with a vacuum insulation material and is further filled with a foam insulation material such as urethane foam.

[0013]

The compartments 2 include the following in order from the top, for example: a refrigerator compartment 20, a set of a versatile compartment 21 and an ice-making compartment 22, a freezer compartment 23, and a vegetable compartment 24. The compartments are distinguished from one another by the range of settable temperature (the settable temperature range). For example, the refrigerator compartment 20 is settable to about 3 degrees C, the versatile compartment 21 is settable to 0 degrees C or -7 degrees C, the ice-making compartment 22 and the freezer compartment 23 are each settable to about -12 degrees C to -18 degrees C, and the vegetable compartment 24 is settable to about 5 degrees C. The compartments 2 are not limited to those illustrated in the drawing. Moreover, the temperature settings for the respective compartments are not limited to those given above. The temperature setting for each compartment may be changed to suit the place of installation and what is to be stored in the compartment.

[0014]

The refrigerator compartment 20 is of frequent use and is provided at the highest position, where the user can put or take out things into or from the compartments 2 without bending down. The refrigerator compartment 20 is provided with a refrigerator-compartment door 30 at the front opening of the refrigerator compartment 20. The

refrigerator-compartment door 30 is a double door including a refrigerator-compartment left door and a refrigerator-compartment right door. The refrigerator-compartment left door and the refrigerator-compartment right door are each supported by a hinge part that supports a door-rotating shaft in such a manner that the refrigerator-compartment left door and the refrigerator-compartment right door are rotatable.

[0015]

The temperature of the versatile compartment 21 is switchable between, for example, a chilling temperature of about 0 degrees C and a soft-freezing temperature of about -7 degrees C. The versatile compartment 21 is provided with a drawer-type versatile-compartment door 31 at the front opening of the versatile compartment 21. The ice-making compartment 22 is provided with a drawer-type ice-making-compartment door 32 at the front opening of the ice-making compartment 22. The freezer compartment 23 is provided with a drawer-type freezer-compartment door 33 at the front opening of the freezer compartment 23. The vegetable compartment 24 is provided with a drawer-type vegetable-compartment door 34 at the front opening of the vegetable compartment 24. The door units are each provided with a door gasket, not illustrated, along the inner periphery of the door unit. The door gasket prevents the leakage of cooling air from the compartment to the outside.

[0016]

A configuration of the door unit 3 of the refrigerator 100 will be described below with reference to Figs. 2 to 6. Fig. 2 is an exploded perspective view of the door unit of the refrigerator according to Embodiment of the present disclosure. Fig. 3 is a sectional view of the door unit of the refrigerator according to Embodiment of the present disclosure. Fig. 4 is an enlargement of part A encircled in Fig. 3. In Embodiment, the vegetable-compartment door 34 provided at the front opening of the vegetable compartment 24 will be described as an example of the door unit 3. However, the door unit 3 is not limited to this example. The door unit 3 of any other compartment 2 can be applied to the same configuration.

[0017]

As illustrated in Fig. 2, the vegetable-compartment door 34 includes a rectangular frame part 4, an inner plate 5 that closes an open face of the frame part 4 that is located close to the vegetable compartment, and a decorative plate 6 that closes an open face of the frame part 4 that is located close to a front face of the refrigerator. Furthermore, as illustrated in Figs. 3 and 4, the vegetable-compartment door 34 includes a heat insulator 7 provided in a space tightly closed by the frame part 4, the inner plate 5, and the decorative plate 6, and hot-melt adhesive 8 that bonds the frame part 4 and the decorative plate 6 to each other.

[0018]

As illustrated in Fig. 2, the frame part 4 is made of, for example, synthetic resin and has a substantially oblong rectangular shape in plan view. The frame part 4 is obtained by, for example, molding four individual components that are to form the upper, lower, left, and right sides of the frame part 4 and then assembling the four components. This is for reduction in the cost of molds to be used in molding relevant components and for ease of handling of the molded components.

[0019]

The frame part 4 includes an outer frame part 40 forming the peripheral sides of the frame part 4, and a bonding surface part 41 extending along the periphery of the outer frame part 40. As illustrated in Figs. 2 and 3, a portion of the bonding surface part 41 that extends along the upper side of the outer frame part 40 is provided by bending an edge of the outer frame part 40 outward. Other portions of the bonding surface part 41 that extend along the left, right, and lower sides of the outer frame part 40 are provided by bending respective edges of the outer frame part 40 inward. The bonding surface part 41 has a width L_1 of 10 mm or greater and 30 mm or smaller. If the width L_1 of the bonding surface part 41 is smaller than 10 mm, the area of bonding is too small to provide satisfactory strength of bonding. Consequently, the decorative plate 6 may come off the frame part 4. In some cases, the bonding surface part 41 may have a slight warp. In such a case, if the width L_1 of the bonding surface part 41 is greater than 30 mm, it may be difficult to straighten the bonding surface part 41 because of its rigidity when the decorative plate 6 is press-bonded to the bonding

surface part 41. Consequently, the surface contact between the bonding surface part 41 and the decorative plate 6 may be insufficient, and the strength of bonding may be reduced. Furthermore, as the amount of hot-melt adhesive 8 to be applied increases, the manufacturing cost may increase. That is, in the refrigerator 100 according to Embodiment, as the bonding surface part 41 has a width L_1 of 10 mm or greater and 30 mm or smaller, a satisfactory area of bonding is provided. Thus, the strength of bonding between the bonding surface part 41 and the decorative plate 6 can be increased. Consequently, the decorative plate 6 can be prevented from coming off the bonding surface part 41. It is more preferable that the width L_1 of the bonding surface part 41 be 15 mm or greater and 30 mm or smaller.

[0020]

As illustrated in Fig. 3, the edge of the bonding surface part 41 that extends along the upper side of the outer frame part 40 includes a hook part 42. The hook part 42 catches the decorative plate 6. Furthermore, as illustrated in Figs. 3 and 4, the outer frame part 40 includes a step part 43 between each of the left, right, and lower sides of the outer frame part 40 and the bonding surface part 41. When the decorative plate 6 is placed on the bonding surface part 41, corresponding ones of the outer edges of the decorative plate 6 are brought into contact with the respective step parts 43.

Alternatively, the portion of the bonding surface part 41 that extends along the left side, the right side, or the lower side of the outer frame part 40 may be provided by bending the edge of the outer frame part 40 outward, with the hook part 42 provided at the edge of this portion of the bonding surface part 41. Furthermore, the portion of the bonding surface part 41 that extends along the upper side of the outer frame part 40 may be provided by bending the edge of the outer frame part 40 inward, with the step part 43 provided between the upper side of the outer frame part 40 and this portion of the bonding surface part 41.

[0021]

The inner plate 5 is made of, for example, synthetic resin. As illustrated in Fig. 3, the inner plate 5 is positioned opposite to the decorative plate 6 with the heat insulator 7 in between. The inner plate 5 is provided with a frame structure, not

illustrated, on a face of the inner plate 5 that is located close to the vegetable compartment. The frame structure supports the vegetable-compartment door 34 in such a manner that the vegetable-compartment door 34 is movable from the refrigerator body 1.

[0022]

The decorative plate 6 forms the front face of the vegetable-compartment door 34. As illustrated in Fig. 2, the decorative plate 6 includes a transparent glass plate 60, and a design sheet 61 pasted to the back face of the glass plate 60. The glass plate 60 has a thickness of, for example, about 4 mm. The design sheet 61 has a thickness of, for example, about 0.1 mm to 0.5 mm. The design sheet 61 has various colors and patterns on the front face of the design sheet 61. Such colors and patterns are visible through the glass plate 60. Thus, the design quality of the door unit 3 is increased.

[0023]

As illustrated in Fig. 3, the heat insulator 7 includes a foam insulation material 70 made of urethane foam, and a vacuum insulation material 71. The foam insulation material 70 is obtained by feeding a urethane solution, which is a mixture of polyol, isocyanate, water, and a foaming agent such as cyclopentane, into the space tightly closed by the frame part 4, the inner plate 5, and the decorative plate 6 and then allowing the solution to foam. When the urethane solution is solidified, the urethane solution generates heat of reaction, with which the foaming agent is gasified, so that the urethane solution expands into a sponge body. Thus, the space surrounded by the frame part 4 is filled with the foam insulation material 70. The vacuum insulation material 71 is attached to the inner face of the inner plate 5 with, for example, rubber-based hot-melt adhesive.

[0024]

The hot-melt adhesive 8 is, for example, a kind of adhesive that is solidified with moisture, such as urethane-based hot-melt adhesive that does not melt with heat once solidified. The heat of reaction generated in foaming of the foam insulation material 70 may reach almost 140 degrees C at maximum. Therefore, a kind of hot-melt adhesive that melts with heat even once solidified, such as rubber-based hot-melt adhesive used

for fixing a vacuum insulation material, may melt while the foam insulation material 70 is foaming, and then may be extruded to the outside from the gap between the decorative plate 6 and the frame part 4 by the pressure produced when the foam insulation material 70 is foaming. Accordingly, urethane-based hot-melt adhesive is employed in Embodiment. However, the hot-melt adhesive 8 is not limited to the urethane-based adhesive and may be of another kind. Moreover, depending on the structure of the door unit 3 or other relevant factors, rubber-based hot-melt adhesive may be employed. [0025]

The hot-melt adhesive 8 is provided on the bonding surface part 41 along the periphery of the frame part 4. The hot-melt adhesive 8 has a thickness of 0.2 mm or greater and 0.3 mm or smaller. If the thickness of the hot-melt adhesive 8 is smaller than 0.2 mm, the bonding between the bonding surface part 41 and the decorative plate 6 may be insufficient. If the thickness of the hot-melt adhesive 8 is greater than 0.3 mm, some of the hot-melt adhesive 8 applied may leak to the outside from the gap between the bonding surface part 41 and the decorative plate 6. That is, in the refrigerator 100 according to Embodiment, as the hot-melt adhesive 8 has the above thickness, the bonding surface part 41 and the decorative plate 6 can be firmly bonded to each other. Simultaneously, the occurrence of a situation where some of the hot-melt adhesive 8 applied may leak to the outside from a gap between the bonding surface part 41 and the decorative plate 6 can be prevented. [0026]

As illustrated in Fig. 4, the hot-melt adhesive 8 is provided in such a manner that a gap S of about 2 mm to 3 mm is opened between the hot-melt adhesive 8 and the step part 43. If the hot-melt adhesive 8 is present closer to the step part 43, the hot-melt adhesive 8 may be exposed to the outside. In contrast, if the gap from the step part 43 is too large, some liquid such as water, food drips, and a cleansing solution may flow into the gap, causing the design sheet 61 to peel or discolor. That is, in the refrigerator 100, as the hot-melt adhesive 8 is provided with the gap S of about 2 mm to 3 mm from the step part 43, the hot-melt adhesive 8 is not visible from the outside. Furthermore, even if any liquid such as water, food drips, and a cleansing solution flows

into the small gap, such liquid does not spread to the surface of the design sheet 61.
Therefore, the quality of appearance design can be maintained for a long time.

[0027]

Figs. 5 and 6 are diagrams illustrating modifications of the refrigerator according to Embodiment of the present disclosure. As illustrated in Fig. 5, it is desirable that the hot-melt adhesive 8 include an extended part 81 projecting from a distal end of the bonding surface part 41. If there is a gap between a distal portion of the bonding surface part 41 and the decorative plate 6, the urethane solution fed into the space surrounded by the frame part 4 may flow into the gap. In such an event, the pressure of foaming of the urethane foam may reduce the strength of bonding between the decorative plate 6 and the bonding surface part 41. That is, when the hot-melt adhesive 8 has the extended part 81, the occurrence of a situation where the urethane solution may flow into a gap between the distal portion of the bonding surface part 41 and the decorative plate 6 can be prevented.

[0028]

On the other hand, as illustrated in Fig. 6, it is desirable that the hot-melt adhesive 8 include widened parts 82 at the respective corners of the frame part 4 and the widened parts 82 be each wider than other parts of the hot-melt adhesive 8 that extends along the sides of the frame part 4. When the hot-melt adhesive 8 is applied to the bonding surface part 41 in such a manner as to form a string of beads along the periphery of the outer frame part 40, the hot-melt adhesive 8 forms a round shape at each corner of the frame part 4. If the hot-melt adhesive 8 in such a state is pressed, the hot-melt adhesive 8 may fail to spread to the very end of the frame part 4. In such a case, the area of bonding between the decorative plate 6 and the bonding surface part 41 at each of the corners is reduced, and the strength of bonding is reduced. Accordingly, the hot-melt adhesive 8 includes the widened parts 82. Thus, the strength of bonding between the decorative plate 6 and the bonding surface part 41 at the corners of the frame part 4 can be increased.

[0029]

A method of manufacturing the refrigerator according to Embodiment will be described below with reference to Figs. 7 to 9, as well as Figs. 2 to 6. Fig. 7 is a plan view of the frame part of the refrigerator according to Embodiment of the present disclosure, with the hot-melt adhesive provided on the frame part. Fig. 8 is an enlargement of part B encircled in Fig. 7. Fig. 9 is a diagram of the refrigerator according to Embodiment of the present disclosure, illustrating how to attach the decorative plate to the frame part.

[0030]

As illustrated in Fig. 7, the hot-melt adhesive 8 is applied to the bonding surface part 41 in such a manner as to form a string of beads along the periphery of the outer frame part 40. Furthermore, at a middle part of any one of the sides, as illustrated in Fig. 8, a start point from which the hot-melt adhesive 8 is applied and an end point to which the hot-melt adhesive 8 is applied are overlapped each other, so that an overlapping part 80 is formed. The overlapping part 80 is formed in the middle part of any one of the sides, because it is considered to be easier for the worker to form the overlapping part 80 at a position on a side of the bonding surface part 41 than at a corner of the bonding surface part 41. As illustrated in Figs. 8 and 9, the hot-melt adhesive 8 is applied to a position at a distance of about 5 mm from the distal end of the bonding surface part 41.

[0031]

The overlapping part 80 is formed with a length L_2 that is half the width L_1 of the bonding surface part 41 or smaller. Specifically, if the width L_1 of the bonding surface part 41 is 20 mm, the overlapping part 80 is formed with a length L_2 of 10 mm or smaller. The amount of hot-melt adhesive 8 in the overlapping part 80 is twice the amount of hot-melt adhesive 8 in the other parts. Therefore, if the overlapping part 80 is formed with a length greater than half the width L_1 of the bonding surface part 41, an excessive portion of the hot-melt adhesive 8 may leak to the outside when the decorative plate 6 is press-bonded to the bonding surface part 41. Accordingly, in the method of manufacturing the refrigerator 100 according to Embodiment, the overlapping part 80 is formed with the length L_2 that is half the width L_1 of the bonding surface part

41 or smaller. Thus, the occurrence of a situation where an excessive portion of the hot-melt adhesive 8 may leak to the outside is prevented.

[0032]

Subsequently, as illustrated in Fig. 9, the outer edges of the decorative plate 6 are placed on and press-bonded to the bonding surface part 41 in such a manner that the hot-melt adhesive 8 is squashed as illustrated in Fig. 4. Thus, the bonding surface part 41 and the decorative plate 6 are bonded to each other. The hot-melt adhesive 8 can provide a large area of bonding with a small amount. Furthermore, the hot-melt adhesive 8 is easy to handle. Therefore, anyone can stably form a continuous string of beads of the hot-melt adhesive 8, regardless of the skill of the worker. In addition, after the inner plate 5 and the decorative plate 6 are attached to the frame part 4, the solution that turns into the foam insulation material 70 is fed into the thus closed space through a feed hole opened in the inner plate 5.

[0033]

As described above, the refrigerator 100 according to Embodiment includes the refrigerator body 1 having an open front face and including at least one compartment 2, and the door unit 3 covering the opening of the compartment 2 in such a manner as to allow the opening to be opened and closed. The door unit 3 includes the rectangular frame part 4, the inner plate 5 that closes the open face of the frame part 4 that is located close to the compartment, the decorative plate 6 that closes the open face of the frame part 4 that is located close to the front face of the refrigerator, the heat insulator 7 provided in the space tightly closed by the frame part 4, the inner plate 5, and the decorative plate 6, and the hot-melt adhesive 8 that bonds the frame part 4 and the decorative plate 6 to each other. Specifically, the frame part 4 includes the outer frame part 40 forming the peripheral sides of the frame part 4, and the bonding surface part 41 extending along the periphery of the outer frame part 40. The hot-melt adhesive 8 is provided on the bonding surface part 41 along the periphery of the frame part 4. The bonding surface part 41 and the decorative plate 6 are bonded to each other with the hot-melt adhesive 8. In the above refrigerator 100, the frame part 4 and the decorative plate 6 are closely bonded to each other with no gap in between by using

the hot-melt adhesive 8, which exhibits high strength of bonding and becomes flexible when melted with heat. Therefore, the heat insulator 7 fed into the tightly closed inner space is prevented from leaking to the outside. Consequently, the refrigerator 100 can have an appearance with excellent design. Furthermore, as the frame part 4 and the decorative plate 6 can be bonded to each other with increased strength of bonding, the refrigerator 100 can be used safely and securely.

[0034]

Furthermore, the hot-melt adhesive 8 has an indefinite shape. Therefore, even if the frame part 4 is an assembly formed by a plurality of different components and steps are formed at the joints between the components, the hot-melt adhesive 8 can conform to such steps. Therefore, the opening of gaps can be prevented assuredly.

[0035]

The bonding surface part 41 has a width L_1 of 10 mm or greater and 30 mm or smaller. Therefore, in the refrigerator 100 according to Embodiment, a satisfactory area of bonding can be provided between the decorative plate 6 and the bonding surface part 41. Furthermore, there is no need to straighten the bonding surface part 41. Such a configuration can increase the strength of bonding between the bonding surface part 41 and the decorative plate 6. Consequently, the decorative plate 6 can be prevented from coming off the bonding surface part 41.

[0036]

On the other hand, the hot-melt adhesive 8 includes the extended part 81 projecting from the distal end of the bonding surface part 41. Therefore, in the refrigerator 100 according to Embodiment, the occurrence of a situation where the urethane solution may flow into a gap between the distal portion of the bonding surface part 41 and the decorative plate 6 can be prevented. Consequently, the strength of bonding between the frame part 4 and the decorative plate 6 can be increased.

[0037]

Furthermore, the hot-melt adhesive 8 has a thickness of 0.2 mm or greater and 0.3 mm or smaller. That is, in the refrigerator 100 according to Embodiment, the bonding surface part 41 and the decorative plate 6 can be firmly bonded to each other.

Simultaneously, the occurrence of a situation where some of the hot-melt adhesive 8 applied may leak to the outside from a gap between the bonding surface part 41 and the decorative plate 6 can be prevented.

[0038]

5 In the method of manufacturing the refrigerator according to Embodiment, the hot-melt adhesive 8 is applied to the bonding surface part 41 in such a manner as to form a string of beads along the periphery of the outer frame part 40, and the overlapping part 80 is formed by overlapping the start point from which the hot-melt adhesive 8 is applied and the end point to which the hot-melt adhesive 8 is applied each
10 other at the middle part of any one of the sides. Subsequently, the bonding surface part 41 and the decorative plate 6 are bonded to each other by press-bonding the decorative plate 6 to the bonding surface part 41 in such a manner that the hot-melt adhesive 8 is squashed. In the refrigerator 100 manufactured by the above method, the hot-melt adhesive 8 is applied along the periphery of the outer frame part 40 with no
15 gaps. Therefore, the strength of bonding between the frame part 4 and the decorative plate 6 can be assuredly increased. Consequently, the refrigerator 100 can have an appearance with excellent design.

[0039]

20 The overlapping part 80 is formed with the length L_2 that is half the width L_1 of the bonding surface part 41 or smaller. Therefore, the occurrence of a situation where an excessive portion of the hot-melt adhesive 8 may leak to the outside when the decorative plate 6 is press-bonded to the bonding surface part 41 can be prevented.

[0040]

25 While the present disclosure has been described above with reference to Embodiment, the present disclosure is not limited to the configuration according to Embodiment described above. For example, the decorative plate 6 may be a steel plate or may be an acrylic plate with a design sheet pasted on the acrylic plate. Furthermore, the frame part 4 is not limited to the one illustrated in the drawings and may be in any other shape, as long as the frame part 4 includes an outer frame part 40
30 forming the peripheral sides of the frame part 4, and a bonding surface part 41

extending along the periphery of the outer frame part 40. In short, the present disclosure encompasses any design changes and applied variations that are normally made by those skilled in the art without departing from the technical scope of the present disclosure.

5 Reference Signs List

[0041]

1 refrigerator body 2 compartment 3 door unit 4 frame part 5 inner
plate 6 decorative plate 7 heat insulator 8 hot-melt adhesive 20 refrigerator
compartment 21 versatile compartment 22 ice-making compartment 23
10 freezer compartment 24 vegetable compartment 30 refrigerator-compartment
door 31 versatile-compartment door 32 ice-making-compartment door 33
freezer-compartment door 34 vegetable-compartment door 40 outer frame part
41 bonding surface part 42 hook part 43 step part 60 glass plate 61
design sheet 70 foam insulation material 71 vacuum insulation material 80
15 overlapping part 81 extended part 82 widened part 100 refrigerator

CLAIMS

[Claim 1]

A refrigerator, comprising:

a refrigerator body having an open front face and including at least one compartment; and

a door unit covering an opening of the at least one compartment in such a manner as to allow the opening to be opened and closed,

the door unit including

a frame part shaped in a rectangular shape,

an inner plate that closes an open face of the frame part, the open face being located close to the at least one compartment,

a decorative plate that closes an open face of the frame part, the open face being located close to a front face of the refrigerator,

a heat insulator provided in a space tightly closed by the frame part, the inner plate, and the decorative plate, and

hot-melt adhesive that bonds the frame part and the decorative plate to each other, the hot-melt adhesive being solidified with moisture and not melting with heat once solidified;

wherein the holt-melt adhesive has a thickness of 0.2mm or greater and 0.3mm or smaller.

[Claim 2]

The refrigerator of claim 1,

wherein the frame part includes an outer frame part forming peripheral sides of the frame part, and a bonding surface part extending along a periphery of the outer frame part,

wherein the hot-melt adhesive is provided on the bonding surface part along a periphery of the frame part, and

wherein the bonding surface part and the decorative plate are bonded to each other with the hot-melt adhesive.

[Claim 3]

The refrigerator of claim 2, wherein the bonding surface part has a width of 10 mm or greater and 30 mm or smaller.

[Claim 4]

The refrigerator of claim 2 or 3, wherein the hot-melt adhesive includes an extended part projecting from a distal end of the bonding surface part.

[Claim 5]

A method of manufacturing the refrigerator of claim 2, wherein the hot-melt adhesive is applied to the bonding surface part in such a manner as to form a string of beads along the periphery of the outer frame part, an overlapping part is formed by overlapping a start point from which the hot-melt adhesive is applied and an end point to which the hot-melt adhesive is applied each other at a middle part of any one of sides, and the bonding surface part and the decorative plate are bonded to each other by press-bonding the decorative plate to the bonding surface part in such a manner that the hot-melt adhesive is squashed.

[Claim 6]

The method of manufacturing the refrigerator of claim 5, wherein the overlapping part is formed with a length that is half a width of the bonding surface part or smaller.