

DESCRIPTION

[Title of Invention] HANDLE STRUCTURE OF REFRIGERATOR

[Technical Field]

[0001]

5 The present invention relates to a handle structure of a refrigerator.

[Background Art]

[0002]

 Hitherto some door handles having a handle structure of a refrigerator include a handle grip formed by fixing an inner handle member made of a synthetic resin to a door body with screws and fitting an outer handle member, which also serves as a decorative cover, to the front side of the inner handle member. Vertically and horizontally extending ribs protrude from the surface of the inner handle member to improve reinforcement. Both the inner handle member and the outer handle member have a substantially arc-shaped outer shape. The inner handle member and the outer handle member are combined to form a handle grip. Thus, the handle grip is substantially oval-shaped in an orthogonal cross section taken in the longitudinal direction (see Patent Literature 1, for example).

10

15

[Citation List]

20 [Patent Literature]

[0003]

 [Patent Literature 1] Japanese Examined Patent Application Publication No. 7-37873 (page 3 and Fig. 1)

[Summary of Invention]

25 [Technical Problem]

[0004]

However, the door handle of the refrigerator described in Patent Literature 1 is disadvantageous in that the handle grip is more likely to have an uneven portion and thus may be awkward to grasp so that the handle grip is constituted of two components, that is, the inner handle member fixed to the door and the outer handle member serving as a surface cover as described above.

[0005]

Moreover, the door handle has another disadvantage. When the weight of a door increases due to a large amount of food, drinking water, or the like being stored in a door storage pocket, the handle grip including the handle member made of a synthetic resin sags when the door is opened and closed. Consequently, a user feels that the door is heavy and cannot smoothly open and close the door.

[0006]

The present invention has been made to solve the above problems. A first object of the present invention is to provide a firm handle structure of a refrigerator including a door handle (handle) that does not sag even when the weight of the door increases due to a large amount of food, drinking water, or the like being stored in the door.

A second object of the present invention is to provide a handle structure of a refrigerator including a door handle (handle) that has no uneven portions, that has a smoothly graspable texture, and that is easily graspable.

[Solution to Problem]

[0007]

A handle structure of a refrigerator according to the present invention includes a handle made of a metal and having a hollow pipe shape for opening and closing a door of a storage chamber of the refrigerator; at least two mounting members fixed to a decorative surface of the door and supporting the handle;

and fixing members having substantially a same diameter as a hollow portion of the handle having the hollow pipe shape, the fixing members being provided in a same number as the at least two mounting members inserted into the handle, wherein the handle has holes into which the respective mounting members are inserted, wherein an outer surface of each mounting member inserted into the handle through the corresponding one of the holes is in contact with an inner periphery of the hole, wherein each mounting member is fixed to the door at an end opposite to an end of the mounting member inserted into the handle, and wherein each fixing member inserted into the handle is fixed to a portion of the outer surface of the corresponding one of the mounting members inserted into the handle through the corresponding hole.

[Advantageous Effects of Invention]

[0008]

According to the present invention, the handle is made of a metal and has a hollow pipe shape. Thus, the door can be smoothly opened and closed without the handle sagging when the door is opened and closed. The handle has an easily graspable structure without any uneven portion throughout the entirety of the handle.

In addition, the mounting member is inserted into the handle and the outer periphery of the mounting member is brought into contact with the inner circumference of a hole of the handle, so that the handle is fixed with respect to the mounting member in the up-down and left-right directions. Further, a fixing member having substantially the same diameter as a hollow portion is fixed to a portion of the mounting member inserted into the handle, so that the handle is fixed with respect to the mounting member in the front-rear direction. Thus, it is possible to provide a firm handle structure in which a mounting member supports a handle without being deformed by a load being applied to the handle.

[Brief Description of Drawings]

[0009]

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

5 [Fig. 2] Fig. 2 is an exploded view of a portion of a handle structure of the refrigerator according to Embodiment 1 of the present invention.

[Fig. 3] Fig. 3 is a cross section of the refrigerator taken in the line Z-Z of Fig. 1.

10 [Fig. 4] Fig. 4 is a vertical cross section of a main portion of a handle 4 and a mounting member 9 of a refrigerator according to Embodiment 2 of the present invention.

[Fig. 5] Fig. 5 is a horizontal cross section of a main portion of the handle 4 and the mounting member 9 of the refrigerator according to Embodiment 2 of the present invention, in which a fixing plate 13 is fixed to the mounting member 9 inserted into the handle 4.

15 [Fig. 6] Fig. 6 is an exploded view of a handle structure of a refrigerator according to Embodiment 3 of the present invention in which a handle cap 15 is attached to an open end of a handle 4.

[Description of Embodiments]

[0010]

20 Embodiment 1

(Whole Structure of Refrigerator)

25 Fig. 1 is a perspective view of the exterior of a refrigerator according to Embodiment 1 of the present invention. The following description will be given on the basis of the up-down direction, the left-right direction, and the front-rear direction of Fig. 1.

As illustrated in Fig. 1, doors that are opened and closed to make storage chambers accessible or inaccessible are disposed on a front side of a main body

1 of a refrigerator according to Embodiment 1, the storage chambers being formed inside the main body 1. The doors include a refrigerator-compartment door 2 and a freezer-compartment door 3. The refrigerator-compartment door 2 is opened and closed to make a refrigerator compartment, which is an upper storage chamber of the main body 1, accessible or inaccessible. The freezer-compartment door 3 is opened and closed to make a freezer compartment, which is a lower storage chamber of the main body 1, accessible or inaccessible. Aluminum handles 4 having a hollow pipe shape are individually attached to the refrigerator-compartment door 2 and the freezer-compartment door 3, the handles 4 being used to make the storage chambers accessible or inaccessible. A door panel 5 made of a steel plate is disposed on a decorative surface side of the refrigerator-compartment door 2. The outer covering of the refrigerator-compartment door 2 is constituted of the door panel 5, upper and lower caps 6 and 7 which respectively cover the upper portion and the lower portion of the door panel 5, and an inner plate (not illustrated) made of a synthetic resin and positioned on the storage-chamber side of the refrigerator-compartment door 2. The inside of the refrigerator-compartment door 2 defined by the outer covering of the refrigerator-compartment door 2 is filled with a heat insulator 8 (see Fig. 3 described below) made of an agent such as a cyclopentane blowing agent.

[0011]

The handles 4 are formed into a hollow cylindrical pipe shape by extruding aluminum. The handles 4 are grasped when the refrigerator-compartment door 2 and the freezer-compartment door 3 are opened and closed. Since the handles 4 are manufactured by extruding aluminum as described above, the handles 4 do not sag while the doors are opened and closed. Thus, the doors can be smoothly opened and closed. In addition, the handles 4 are formed in a cylindrical shape and thus are easily graspable.

The surfaces of the handles 4 may be subjected to sandblasting or the like so that the handles 4 become less slippery when grasped. Instead, the surfaces of the handles 4 may be coated or buffed so that the handles 4 have a high quality appearance.

5 [0012]

(Handle Structure of Refrigerator)

Fig. 2 is an exploded view of a portion of a handle structure of the refrigerator according to Embodiment 1 of the present invention. Fig. 3 is a cross section of the refrigerator taken in the line Z-Z of Fig. 1.

10 As illustrated in Fig. 2, a cubical mounting member 9 and a mounting member cover 10 are fixed to the door panel 5 from the decorative surface side of the door panel 5 with a screw 12. The mounting member 9 supports the handle 4 (described in detail below) and the mounting member cover 10 is a synthetic resin decorative trim that covers the mounting member 9. A reinforcing
15 plate 11 made of a steel plate is fixed to the door panel 5 from a rear surface side opposite the decorative surface side with the screw 12. A fixing plate 13 is inserted into the hollow-pipe-shaped handle 4 from the end of the handle 4 and fixed, using a screw 14, to the mounting member 9 inserted into the handle 4 from a circular hole 4a, which will be described later. Highly decorative handle
20 caps 15 made of a synthetic resin are pressure-inserted into ends of the handle 4 having a hollow pipe shape.

[0013]

As illustrated in Fig. 2, the mounting member 9 is formed by bending a steel plate into a cube. The mounting member 9 has a screw hole 9a in a portion
25 inserted into the handle 4 through the circular hole 4a and on a side that faces an end of the hollow-pipe-shaped handle 4 (upper end in Fig. 2). The screw hole 9a is one in which the screw 14 is tightened to fasten the fixing plate 13. A plate

portion extends from one of four sides of a substantially square open end of the mounting member 9 that is on a side opposite the end of the mounting member 9 inserted into the cubical handle 4. As illustrated in Fig. 3, the plate portion is bent so as to cover the opening of the end of the mounting member 9 and serves as a bent portion 9b. Here, the bent portion 9b does not have to completely cover the opening of the end of the mounting member 9. In addition, a screw hole 9c is formed in the bent portion 9b. The screw 12 is inserted into the screw hole 9c to fix the mounting member 9 to the door panel 5 from the decorative surface side of the door panel 5, as described above.

[0014]

The mounting member cover 10 is a synthetic resin decorative trim that covers the cubical mounting member 9. As illustrated in Fig. 3, the end of the mounting member cover 10 that is on the side opposite the open end from which the mounting member 9 is inserted is closed. A boss 10a protrudes outward from the closed end. A boss hole 5c is formed in the door panel 5. When the mounting member cover 10 is fixed to the door panel 5 from the decorative surface side of the door panel 5 using the screw 12, as described above, the boss 10a is inserted into the boss hole 5c. Ribs 10b are formed on the inner side of the mounting member cover 10. When the mounting member 9 is inserted into the mounting member cover 10 from the open end of the mounting member cover 10 and, as will be described below, the mounting member 9 and the mounting member cover 10 are fixed to the door panel 5 using the screw 12, the ribs 10b prevent the mounting member 9 from rotating due to the screw 12 being rotated and fix the position of the mounting member 9 inside the mounting member cover 10. The ribs 10b are formed on the closed end side of the mounting member cover 10. In addition, a screw hole 10c is formed in the closed end of the mounting member cover 10. The screw 12 is inserted into the screw

hole 10c to fix the mounting member cover 10 to the door panel 5 from the decorative surface side of the door panel 5, as described above.

[0015]

As illustrated in Fig. 3, the ribs 10b are formed on the closed end side of the mounting member cover 10 and on the inner side of the mounting member cover 10, but the present invention is not limited to this. In other words, the ribs 10b may be formed at any position on the inner side of the mounting member cover 10 as long as the ribs 10b prevent the mounting member 9 from rotating due to the screw 12 being rotated and fix the position of the mounting member 9 inside the mounting member cover 10 when the mounting member 9 is inserted into the mounting member cover 10.

[0016]

The ribs 10b are examples of "position fixing means" of the invention.

[0017]

As described above, the reinforcing plate 11 is fixed to the door panel 5 using the screw 12 from the rear surface of the door panel 5 that is opposite the decorative surface of the door panel 5. As illustrated in Fig. 2, the reinforcing plate 11 has protrusions 11a (three protrusions in Fig. 2) formed by a device such as a halfway punch. The door panel 5 has holes 5a into which the protrusions 11a are inserted when the reinforcing plate 11 is fixed to the door panel using the screw 12 from the rear surface of the door panel 5 that is opposite the decorative surface. In this manner, the reinforcing plate 11 is positioned by inserting the protrusions 11a into the respective holes 5a. The reinforcing plate 11 also has a screw hole 11b in which the screw 12 is tightened so that the mounting member 9 and the mounting member cover 10 are fixed to the door panel 5 from the decorative surface of the door panel 5 and so that the reinforcing plate 11 is fixed to the door panel 5 from the rear side of the door panel 5 that is opposite the

decorative surface. The reinforcing plate 11 also has a boss hole 11c into which the boss 10a is inserted, the boss 10a penetrating through the boss hole 5c beyond the rear surface of the door panel 5, which is opposite the decorative surface, when the mounting member cover 10 is fixed to the door panel 5. As illustrated in Fig. 3, left and right end portions of the reinforcing plate 11 are obliquely bent in directions away from the rear surface of the door panel 5, which is opposite the decorative surface, and form wobble prevention portions 11d. By forming the wobble prevention portions 11d, the handle 4 is prevented from wobbling due to the door panel 5 being deformed by leftward and rightward loads being applied to the handle 4 when the refrigerator-compartment door 2 or the freezer-compartment door 3 is opened or closed.

[0018]

The fixing plate 13 is a disc-shaped steel plate having substantially the same diameter as a hollow portion 4b, which is an inner portion of the hollow-pipe-shaped handle 4. The fixing plate 13 has a screw hole 13a into which a screw 14 is inserted when the fixing plate 13 is fixed to a portion of the mounting member 9 inserted into the handle 4 from the circular hole 4a using the screw 14.

[0019]

The screw 12 is an example of "fixing means" of the present invention.

[0020]

Referring now to Figs. 2 and 3, the configuration in which the mounting member 9, the mounting member cover 10, and the reinforcing plate 11 are supported by the door panel 5 will be described in detail.

Firstly, the mounting member 9 is inserted from the open end of the mounting member cover 10. Here, the ribs 10b formed on the inner side of the mounting member cover 10 fix the position of the mounting member 9 inside the mounting member cover 10 and the bent portion 9b of the mounting member 9

comes into contact with the inner side of the closed end of the mounting member cover 10. Then, the boss 10a of the mounting member cover 10 is inserted into the boss hole 5c of the door panel 5 and the closed end of the mounting member cover 10 is brought into contact with the decorative surface of the door panel 5.

5 [0021]

The protrusions 11a of the reinforcing plate 11 are inserted into the holes 5a of the door panel 5. Furthermore, the boss 10a, which penetrates beyond the rear surface of the door panel 5 opposite the decorative surface of the door panel 5, is inserted into the boss hole 11c of the reinforcing plate 11. Thus, the reinforcing plate 11 is brought into contact with the rear surface of the door panel 5 opposite the decorative surface.

[0022]

Here, the door panel 5 has a screw hole 5b into which the screw 12 is inserted so that the mounting member 9, the mounting member cover 10, and the reinforcing plate 11 are fixed to the door panel 5 with the screw 12. While the mounting member cover 10 and the reinforcing plate 11 are in contact with the door panel 5, the screw 12 is inserted into the mounting member 9 from the open end of the mounting member 9, is caused to penetrate through the screw hole 9c of the mounting member 9, the screw hole 10c of the mounting member cover 10, and the screw hole 5b of the door panel 5, and is finally tightened in the screw hole 11b of the reinforcing plate 11. Consequently, the mounting member 9, the mounting member cover 10, and the reinforcing plate 11 are fixed to the door panel 5.

[0023]

25 In the above-described supporting configuration, the insertion of the boss 10a into the boss hole 5c and the boss hole 11c prevents the mounting member

cover 10 from rotating and being displaced from an attachment position when the mounting member cover 10 is fixed to the door panel 5 by rotating the screw 12.

The ribs 10b fix the position of the mounting member 9 inside the mounting member cover 10. Thus, the ribs 10b prevent the mounting member 9 from rotating due to the screw 12 being rotated.

The mounting member 9 and the mounting member cover 10 are fixed to the door panel 5 with the bent portion 9b being in contact with the inner surface of the closed end of the mounting member cover 10. Thus, when the handle 4 is fixed to the mounting member 9 (how the handle 4 is fixed will be described later), the mounting member 9 and the mounting member cover 10 are prevented from being displaced from the fixed positions by a vertical load being applied to the handle 4.

The reinforcing plate 11 is positioned by inserting the protrusions 11a into the holes 5a, thereby preventing the reinforcing plate 11 from being rotated due to the screw 12 being rotated. Thus, the wobble prevention portions 11d, which prevent the handle 4 from wobbling when the door panel 5 is deformed by a leftward or rightward load applied to the handle 4 when the refrigerator-compartment door 2 or the freezer-compartment door 3 is opened and closed, can securely function.

After the reinforcing plate 11 is fixed to the door panel 5, the refrigerator-compartment door 2 or the freezer-compartment door 3 is filled with the heat insulator 8. Thus, the reinforcing plate 11 is attached to the heat insulator 8 after the refrigerator-compartment door 2 or the freezer-compartment door 3 is filled with the heat insulator 8, thereby more securely fixing the reinforcing plate 11 to the door panel 5.

[0024]

Referring now to Figs. 2 and 3, the configuration in which the handle 4 is supported by the mounting member 9 will be described.

The handle 4 has a circular hole 4a into which the mounting member 9 is inserted. The cubical mounting member 9 is inserted into the circular hole 4a from the open end of mounting member 9. Then, as illustrated in Fig. 3, the open end of the mounting member 9 is brought into contact with the inner surface of the handle 4 while outer peripheral corner portions of the cubical mounting member 9 are brought into contact with the inner circumference of the circular hole 4a. Consequently, the handle 4 is fixed with respect to the mounting member 9 in the up-down and left-right directions.

[0025]

As illustrated in Fig. 2, the handle 4 has the circular hole 4a that can be easily processed and manufactured at a low cost, into which the mounting member 9 can be inserted. The handle 4 is fixed to the mounting member 9 with the outer peripheral corner portions of the cubical mounting member 9 being brought into contact with the inner circumference of the circular hole 4a. Here, only the four corner portions are brought into contact with the inner circumference. In view of this circumstance, the shape of the circular hole 4a is not limited to the circular shape and may be an rectangle so that the entirety of the inner circumference of the hole can be in contact with the outer surface of the mounting member 9. With this shape, the handle 4 can be more securely fixed to the mounting member 9.

As described above, the mounting member 9 is formed by bending a steel plate into a cubical shape but is not limited to this. For example, if the handle 4 is small and a load applied to the handle 4 when the door is opened and closed is not large, the mounting member 9 may be formed by bending a steel plate into an angular C shape or an L shape.

[0026]

The fixing plate 13 is a disc-shaped steel plate having substantially the same diameter as the hollow portion 4b, which is an inner portion of the hollow-pipe-shaped handle 4. The fixing plate 13 is inserted from the open end (upper end in Fig. 2) of the handle 4 and is brought into contact with a handle-end-side side surface of the mounting member 9 inserted into the handle 4. In this state, the screw 14 is inserted into the handle 4 from the open end of the handle 4 (upper end in Fig. 2), is caused to penetrate through the screw hole 13a of the fixing plate 13, and is tightened in the screw hole 9a of the mounting member 9. Thus, the fixing plate 13 is fixed to the mounting member 9. Since the diameter of the fixing plate 13 is substantially the same as the diameter of the hollow portion 4b, the handle 4 can be fixed with respect to the mounting member 9 in the front-rear direction.

[0027]

Thereafter, the highly decorative handle cap 15 made of a synthetic resin is pressure-inserted into the open end of the handle 4. Here, the handle cap 15 can be made further decorative by being coated or plated.

[0028]

In the above-described supporting configuration, the fixing plate 13 whose diameter is substantially the same as the diameter of the hollow portion 4b is fixed to a portion of the mounting member 9 inserted into the handle 4. Thus, the handle 4 can be fixed with respect to the mounting member 9 in the front-rear direction.

[0029]

The configuration around the handle 4 is described based on the configuration of supporting the upper portion of the handle 4. However, the configuration of supporting the handle 4 is vertically symmetrical; the

configuration of supporting the lower portion of the handle 4 is the same as the configuration of supporting the upper portion of the handle 4. This vertically symmetrical configuration allows the use of the same components for supporting the upper and lower portions of the handle 4, thereby requiring fewer types of components.

[0030]

The description has been given mainly on the configuration in which the handle 4 is supported by the refrigerator-compartment door 2, but the configuration in which the handle 4 is supported by the freezer-compartment door 3 is similar to the above-described configuration.

[0031]

(Effects of Embodiment 1)

As described in the configuration of supporting the handle 4, the handle 4 is formed by extruding aluminum into a cylindrical shape. Thus, since the handle 4 does not sag when the door is opened and closed, the door can be opened and closed smoothly. Moreover, the handle 4 manufactured in the above manner has no uneven portions or other inconvenience throughout the entirety of the handle 4 and is easily graspable.

Here, the handle 4 is made of aluminum. However, the handle 4 made of other metals, not resins, can have the same effects.

[0032]

In addition, the following configuration points (1) to (6) constitute a strong handle structure with which the mounting member 9 that supports the handle 4 is not deformed by a load being applied to the handle 4:

(1) the ribs 10b fix the position of the mounting member 9 inside the mounting member cover 10;

(2) the boss 10a of the mounting member cover 10 is inserted into the boss hole 5c of the door panel 5 and the boss hole 11c of the reinforcing plate 11 in order to prevent the mounting member cover 10 from rotating and being displaced from the mounting position;

5 (3) the mounting member 9 and the mounting member cover 10 are fixed to the door panel 5 with the bent portion 9b being brought into contact with the inner surface of the closed end of the mounting member cover 10, so that the mounting member 9 and the mounting member cover 10 are prevented from being displaced from the fixed positions by a vertical load being applied to the
10 handle 4;

 (4) the protrusions 11a of the reinforcing plate 11 are inserted into the holes 5a of the door panel 5 to position the reinforcing plate 11;

 (5) the mounting member 9 is inserted into the handle 4, the end of the mounting member 9 is brought into contact with the inner surface of the handle 4,
15 and the outer surface of the mounting member 9 is brought into contact with the inner circumference of the circular hole 4a of the handle 4, so that the handle 4 is fixed with respect to the mounting member 9 in the up-down and left-right directions; and

 (6) the fixing plate 13 whose diameter is substantially the same as the
20 diameter of the hollow portion 4b is fixed to a portion of the mounting member 9 inserted into the handle 4, so that the handle 4 is fixed with respect to the mounting member 9 in the front-rear direction.

[0033]

 In addition, since the mounting member 9 is covered by the mounting
25 member cover 10 and the handle cap 15 is attached to the open end of the handle 4, the mounting member 9 is not exposed to the outside. Thus, a highly decorative handle structure can be provided.

[0034]

The shape of the handle 4 is not limited to the above-described cylindrical shape and may be an elliptic cylinder shape including the concept of a cylinder shape. In this case, the fixing plate 13 has to only have an elliptic shape in accordance with the elliptic cylinder shape of the handle 4. Also in this case, the same effects can be obtained. In addition, if the handle 4 has an elliptic cylinder shape instead of a cylindrical shape, the fixing plate 13 and the handle 4 are positioned with respect to each other, thereby preventing the handle 4 from rotating around the screw hole 13a.

[0035]

Fig. 1 illustrates the handle 4 that is a vertical handle whose longitudinal direction is the vertical direction, but the present invention is not limited to the vertical handle. The same effects as those described above can be obtained by applying the same handle structure to a horizontal handle whose longitudinal direction is the horizontal direction.

[0036]

Embodiment 2

Now, a handle structure of a refrigerator according to Embodiment 2 is described mainly with regard to points that differ from those in the handle structure of the refrigerator according to Embodiment 1.

[0037]

(Handle Structure of Refrigerator)

Fig. 4 is a vertical cross section of a main portion of a handle 4 and a mounting member 9 of a refrigerator according to Embodiment 2 of the present invention. Fig. 5 is a horizontal cross section of a main portion of the handle 4 and the mounting member 9 of the refrigerator, in which a fixing plate 13 is fixed to the mounting member 9 inserted into the handle 4.

[0038]

As illustrated in Figs. 4 and 5, two hollow portion ribs 4c extending in the longitudinal direction of the handle 4 stand erect from the inner surface of the hollow portion 4b of the handle 4 so as to face each other. The fixing plate 13 has cutouts 13b that fit on the hollow portion ribs 4c when the fixing plate 13 is inserted from the end of the handle 4.

[0039]

As illustrated in Fig. 4, the fixing plate 13 also has protrusions 13c (two protrusions in Fig. 4) on the surface that comes into contact with the mounting member 9. The protrusions 13c protrude toward the mounting member 9. The mounting member 9 has holes 9d into which the protrusions 13c are inserted when the fixing plate 13 is fixed to the mounting member 9 using the screw 14.

[0040]

Referring now to Figs. 4 and 5, a configuration in which the handle 4 is supported by the mounting member 9 will be described mainly with regard to points that differ from those according to Embodiment 1.

The fixing plate 13 is a perfect-disc-shaped steel plate having substantially the same diameter as a hollow portion 4b, which is an inner portion of the hollow-pipe-shaped handle 4. The fixing plate 13 is inserted into the handle 4 from the open end of the handle 4 and is brought into contact with the handle-end-side side surface of the mounting member 9 inserted into the handle 4. Here, the fixing plate 13 is inserted into the handle 4 such that the cutouts 13b of the fixing plate 13 fit on the hollow portion ribs 4c of the hollow portion 4b and such that the protrusions 13c of the fixing plate 13 are inserted into the holes 9d of the mounting member 9. In this state, the screw 14 is inserted into the handle 4 from the open end of the handle 4, is caused to penetrate through the screw hole 13a of the fixing plate 13, and is tightened in the screw hole 9a of the mounting

member 9, thereby fixing the fixing plate 13 to the mounting member 9. Since the diameter of the fixing plate 13 is substantially the same as the diameter of the hollow portion 4b, the handle 4 can be fixed with respect to the mounting member 9 in the front-rear direction. In addition, since the fixing plate 13 is fixed to the mounting member 9 by being inserted into the handle 4 such that the cutouts 13b of the fixing plate 13 fit on the hollow portion ribs 4c of the hollow portion 4b, the handle 4 and the fixing plate 13 are securely positioned with respect to each other. Further, since the fixing plate 13 is fixed to the mounting member 9 by being inserted into the handle 4 such that the protrusions 13c of the fixing plate 13 are inserted into the holes 9d of the mounting member 9, the mounting member 9 and the fixing plate 13 are securely positioned with respect to each other. As a result, the handle 4 and the mounting member 9 are securely positioned with respect to each other.

[0041]

The hollow portion 4b has been described as having two hollow portion ribs 4c, but the present invention is not limited to this. The hollow portion 4b may have one hollow portion rib 4c or three or more hollow portion ribs 4c. In this case, the fixing plate 13 is required to have only the same number of cutouts 13b at a position or positions corresponding to the hollow portion rib or ribs 4c.

[0042]

The fixing plate 13 has been described as having two protrusions 13c, but the present invention is not limited to this. The fixing plate 13 may have one protrusion 13c or three or more protrusions 13c. In this case, the mounting member 9 is required to have only the same number of holes 9d at a position or positions corresponding to the protrusion or protrusions 13c.

[0043]

The cutouts 13b are examples of "fit portions" according to the present invention.

[0044]

(Effects of Embodiment 2)

5 With the above supporting configuration, the handle 4 and the mounting member 9 are firmly and securely positioned with respect to each other. Thus, the handle 4 can be prevented from rotating about its longitudinal axis with respect to the mounting member 9.

[0045]

10 The fixing plate 13 has been described as having a perfect-disc shape. Here, if the fixing plate 13 did not have any cutout 13b and there were no hollow portion ribs 4c in the hollow portion 4b, the handle 4 and the fixing plate 13 would not be fixed with respect to each other at any point. Thus, the handle 4 may rotate about its longitudinal axis with respect to the mounting member 9. In the
15 above supporting configuration, on the other hand, the cutouts 13b of the fixing plate 13 fit on the hollow portion ribs 4c of the hollow portion 4b and thus the handle 4 and the fixing plate 13 are securely positioned with respect to each other. The handle 4 can thus be prevented from rotating about its longitudinal axis with respect to the mounting member 9.

20 [0046]

 In the above configuration in which the handle 4 is supported by the mounting member 9, in order to prevent the handle 4 from rotating about the longitudinal axis of the handle 4 with respect to the mounting member 9, the fixing plate 13 has been described as being fixed to the mounting member 9 by
25 the following way. The fixing plate 13 is inserted into the handle 4 such that the cutouts 13b of the fixing plate 13 fit on the hollow portion ribs 4c of the hollow portion 4b and such that the protrusions 13c of the fixing plate 13 are inserted

into the holes 9d of the mounting member 9. However, the present invention is not limited to this configuration. Specifically, simply fitting the cutouts 13b of the fixing plate 13 on the hollow portion ribs 4c of the hollow portion 4b without the presence of the holes 9d and protrusions 13c is effective to prevent the handle 4 from rotating about the longitudinal axis of the handle 4 with respect to the mounting member 9.

[0047]

Embodiment 3

Now, a handle structure of a refrigerator according to Embodiment 3 will be described mainly with regard to points that differ from those in the handle structures of the refrigerators according to Embodiment 1 and Embodiment 2.

[0048]

(Handle Structure of Refrigerator)

Fig. 6 is an exploded view of a handle structure of a refrigerator according to Embodiment 3 of the present invention in which a handle cap 15 is attached to an open end of a handle 4.

The refrigerator according to Embodiment 3 includes a cylindrical fixing member 16 illustrated in Fig. 6 instead of the fixing plate 13 according to Embodiment 1 and Embodiment 2. The fixing member 16 is a resin component having a cylindrical shape and is inserted into the handle 4 from the open end of the handle 4. The fixing member 16 has grooves 16b formed in its outer surface. The grooves 16b fit on the hollow portion ribs 4c formed in the hollow portion 4b when the fixing member 16 is inserted into the handle 4. The outer diameter of the cylindrical fixing member 16 is substantially the same as the diameter of the hollow portion 4b. The fixing member 16 has claws 16d on the upper end side. The lower end of the fixing member 16 is closed and a hole (not illustrated) that is equivalent to the screw hole 13a according to Embodiment 1 and Embodiment

2 is formed in the lower end. The handle cap 15 has claw holes 15a in the outer side surface.

[0049]

Referring now to Fig. 6, attachment of the fixing member 16 and the handle cap 15 to the handle 4 will be described.

Firstly, the fixing member 16 is inserted into the handle 4 such that the grooves 16b of the fixing member 16 fit on the hollow portion ribs 4c of the hollow portion 4b. Then, the screw 14 is inserted from the open upper end of the fixing member 16, is caused to penetrate through the hole formed in the lower end of the fixing member 16, and is tightened in the screw hole 9a of the mounting member 9. Consequently, the fixing member 16 is fixed to the mounting member 9. Here, the fixing member 16 that is equivalent to the fixing plate 13 according to Embodiment 1 and Embodiment 2 made of a steel plate is made of a resin as described above. Although the fixing member 16 is made of a resin, the handle 4 and the fixing member 16 are securely and firmly positioned with respect to each other by fitting the grooves 16b of the fixing member 16 on the hollow portion ribs 4c of the hollow portion 4b since the fixing member 16 has a cylindrical shape and a large area of the outer surface of the fixing member 16 comes into contact with the inner surface of the hollow portion 4b.

[0050]

In Embodiment 3, the handle cap 15 is attached to the handle 4 not by pressure-inserting the handle cap 15 into the open end of the handle 4 but by inserting the claws 16d of the fixing member 16 into the claw holes 15a of the handle cap 15.

[0051]

The grooves 16b are examples of "fitting portions" of the present invention.

[0052]

(Effects of Embodiment 3)

As described above, by using the cylindrical resin-made fixing member 16 instead of the fixing plate 13 made of a steel plate according to Embodiment 1 and Embodiment 2, a large area of the outer surface of the fixing member 16 comes into contact with the inner surface of the hollow portion 4b. In addition, although the fixing member 16 is made of a resin, the handle 4 and the fixing member 16 are securely and firmly positioned with respect to each other by fitting the grooves 16b of the fixing member 16 on the hollow portion ribs 4c of the hollow portion 4b. This configuration has an effect of preventing the handle 4 from rotating about the longitudinal axis of the handle 4 with respect to the mounting member 9.

[0053]

In addition, the handle cap 15 is attached to the handle 4 not by pressure-inserting the handle cap 15 into the handle 4 but by inserting the claws 16d of the fixing member 16 into the claw holes 15a of the handle cap 15. Thus, as compared with the pressure insertion, the handle cap 15 can be prevented from being detached from the handle 4 due to an insufficient supply of pressure for the pressure insertion, thereby preventing the handle cap 15 from being detached from the handle 4 due to causes such as a shock produced when the door is opened and closed.

[Reference Signs List]

[0054]

1: main body, 2: refrigerator-compartment door, 3: freezer-compartment door, 4: handle, 4a: circular hole, 4b: hollow portion, 4c: hollow portion rib, 5: door panel, 5a: hole, 5b: screw hole, 5c: boss hole, 6: upper cap, 7: lower cap, 8: heat insulator, 9: mounting member, 9a: screw hole, 9b: bent portion, 9c: screw hole, 9d: hole, 10: mounting member cover, 10a: boss,

10b: rib, 10c: screw hole, 11: reinforcing plate, 11a: protrusion, 11b: screw hole, 11c: boss hole, 11d: wobble prevention portion, 12: screw, 13: fixing plate, 13a: screw hole, 13b: cutout, 13c: protrusion, 14: screw, 15: handle cap, 15a: claw hole, 16: fixing member, 16b: groove, 16d: claw.

5

10

15

20

25

CLAIMS

[Claim 1]

A handle structure of a refrigerator comprising:

a handle made of a metal and having a hollow pipe shape for opening and closing a

5 door of a storage chamber of the refrigerator;

at least two mounting members fixed to a decorative surface of the door and supporting the handle;

a mounting member cover fixed to the decorative surface of the door for covering each mounting member, and

10 fixing members having substantially a same diameter as a hollow portion of the handle having the hollow pipe shape, the fixing members being provided in a same number as the at least two mounting members inserted into the handle,

wherein the handle has holes into which the respective mounting members are inserted,

15 wherein an outer surface of each mounting member inserted into the handle through the corresponding one of the holes is in contact with an inner periphery of the hole,

wherein each mounting member is fixed to the door at an end opposite to an end of the mounting member inserted into the handle,

20 wherein each fixing member inserted into the handle is fixed to a portion of the outer surface of the corresponding one of the mounting members inserted into the handle through the corresponding hole, and

wherein the mounting member cover comprises a boss which penetrates through a boss hole formed in the door panel and beyond the rear surface of the door panel, when the mounting member cover is fixed to the door panel.

25

[Claim 2]

The handle structure of claim 1, further comprising

a reinforcing plate fixed to a rear surface of a door panel of the door opposite to the decorative surface, and fixed at a portion countering with the portion at which the corresponding mounting member is fixed on the decorative surface with same type fixing means such that a plate surface of the reinforcing plate is parallel to the rear surface,

5 wherein the reinforcing plate further comprises an other boss hole into which the boss of the mounting member cover is inserted, when the mounting member cover is fixed to the door panel.

[Claim 3]

10 The handle structure of claim 1 or 2,

 wherein at least one hollow portion rib extending in a longitudinal direction of the handle stands erect from an inner surface of the hollow portion, and

 wherein, when each fixing member is inserted into the handle and fixed to the portion of the outer surface of the corresponding mounting member inserted into the handle
15 through the corresponding hole of the handle, the at least one hollow portion rib is inserted into at least one fitting portion of the fixing member formed at such a position as to correspond to a position of the at least one hollow portion rib.

[Claim 4]

20 The handle structure of claim 3,

 wherein each fixing member is a fixing plate that is a steel plate having substantially the same diameter as the hollow portion,

 wherein the at least one fitting portion is a cutout formed in the fixing plate, and

 wherein, when each fixing plate is fixed to the portion of the outer surface of the
25 corresponding mounting member inserted into the handle through the corresponding hole of the handle, the at least one hollow portion rib is inserted into the cutout in the fixing plate.

[Claim 5]

The handle structure of any one of claims 1 to 4,
wherein the handle has openings at both ends thereof in a longitudinal direction,
and

wherein the handle structure comprises handle caps that are attached to the
5 respective ends thereof by being pressure-inserted.

[Claim 6]

The handle structure of claim 3,
wherein each fixing member has a cylindrical shape having substantially the same
10 outer diameter as the hollow portion, and

wherein, when each fixing member is fixed to the portion of the outer surface of the
corresponding mounting member inserted into the handle through the corresponding hole of
the handle, the at least one hollow portion rib is inserted into at least one groove formed in
an outer surface of the fixing member at such a position as to correspond to the position of
15 the at least one hollow portion rib.

[Claim 7]

The handle structure of claim 6,
wherein the handle has openings at both ends thereof in a longitudinal direction,
20 wherein each fixing member has a claw on a side of the corresponding end of the
handle when having been inserted into from the corresponding end, and

wherein the handle structure further comprises handle caps each having a claw hole
on a side surface thereof, the handle caps being attached to the ends of the handle by
fitting the claw holes and the claws to one another.

25

[Claim 8]

The handle structure of any one of claims 3 to 7,

wherein each fixing member has a protrusion that protrudes from a surface that is to be fixed to the mounting member,

wherein each mounting member has a hole in a portion of the outer surface thereof which the fixing member is fixed, the portion corresponding to the protrusion,

5 wherein, when each fixing member is fixed to the portion of the outer surface of the corresponding mounting member inserted into the handle through the corresponding hole of the handle, the protrusion is inserted into the hole of the mounting member.

[Claim 9]

10 The handle structure of any one of claims 1 to 8, wherein the holes of the handle into which the mounting members are inserted are formed such a shape that, when the mounting members are inserted into the holes, the entirety of the inner peripheries of the holes are in contact with the outer surfaces of the mounting members.

15 [Claim 10]

 The handle structure of any one of claims 1 to 9,
wherein position fixing means is formed in an inner side of the mounting member cover to fix the position of the corresponding mounting member inside the mounting member cover.

20 [Claim 11]

 The handle structure of any one of claims 2 to 10,

25

wherein both end portions of the reinforcing plate in a direction perpendicular to a longitudinal direction of the handle are bent in directions away from the rear surface and form wobble prevention portions.