

[Name of Document] DESCRIPTION

[Title of Invention] REFRIGERATOR

[Technical Field]

[0001]

5 The present invention relates to a refrigerator with side-by-side doors, and more specifically, it relates to a door structure of a refrigerator.

[Background Art]

[0002]

10 A side-by-side door refrigerator includes, as countermeasure against leak of cold air through the gap between left and right doors, a partition member at one door for blocking a gap between the doors in a fully-closed door state. The partition member is rotated and folded so as not to collide with the door on the opposite side when the doors are opened and closed. This rotation is achieved by an operation in which a guide pin of a guide structure provided at a refrigerator box body side is
15 inserted into a guide groove provided on an upper end portion of the partition member, and the door at which the partition member is provided is closed whereby the guide pin slides within the guide groove.

20 As main related art, for example, Patent Literature 1 discloses a structure in which a partition member is configured to be moveable by link-connecting two support arms, thereby making it easy to open and close a door and achieving smooth rotation of the partition member without rattling the partition member. Patent Literature 2 discloses a structure in which a guide member having a guide groove is provided at a body side and a roller is provided at a partition member at a door side so as to be inserted into the guide groove. Furthermore, Patent Literature 3 discloses a structure
25 in which a guide pin having a narrow portion is provided at a body side, a groove is provided in an upper portion of a partition member such that the width at its opening is wide in a vertical direction and the width at its bottom is narrow, and a guide groove with a curved-surface shape into which the guide pin is inserted is provided on an upper portion of the groove.

30 [Citation List]

[Patent Literature]

[0003]

[Patent Literature 1] Japanese Unexamined Patent Application Publication No. 10-54648

5 [Patent Literature 2] Japanese Unexamined Utility Model Registration Application Publication No. 63-185087

[Patent Literature 3] Japanese Unexamined Patent Application Publication No. 7-305943

[Summary of Invention]

10 [Technical Problem]

[0004]

However, in the door structure in Patent Literature 1, links for the support arms need to be provided at upper and lower end portions of the partition member, and thus the structure is complicated and the cost is increased. Also, in the door structure in Patent Literature 2, guide members having guide grooves need to be provided at upper and lower portions of a body opening, and thus the structure is complicated and the cost is increased. In the door structure in Patent Literature 3, the guide pin is fixed, and thus a misalignment may occur between the guide pin and the guide groove. If a misalignment occurs, the door opening/closing force is deteriorated, and a problem arises that the door is half-opened.

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[0005]

Meanwhile, in a mechanism for countermeasure against cold air leak in current side-by-side doors, a guide pin is fixed as shown in Patent Literature 3. Thus, it is necessary to strictly set a positional relationship between a guide groove on an end portion of a partition member and a guide pin at a body side. If the position of the guide pin or the guide groove is largely shifted in the horizontal direction of the refrigerator, the guide pin does not deeply enter into the guide groove, and the guide pin does not engage (disengages) the guide groove at the worst. In addition, even if a shift in the position of the guide pin or the guide groove is small, the contact angle between the guide pin and the guide groove is changed, and thus an extra force is

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required for an operation of rotating the partition member. Furthermore, the positional relationship between the guide pin and the guide groove in a door closed state is also changed. Thus, the guide pin engages an inclined surface of the guide groove, and the partition member is not sufficiently rotated, which leads to a problem that the door is half-opened (half-opening of the door, cold air leak). Therefore, widening the opening of the guide groove (which means the maximum entrance width at which the guide pin can be inserted into the guide groove when inserting the guide pin into the guide groove) is conceivable. However, if the opening of the guide groove is merely widened, it is effective for countermeasure against disengagement, but is not a fundamental solution, since, due to a shift in the position of the guide pin, the partition member fails to rotate properly, the opening/closing operation of the door becomes non-smooth, or the door is half-opened.

[0006]

The present invention proposes a door structure with a movable guide pin different from Patent Literature 1 to 3, and it is an object of the present invention to obtain a refrigerator having a door structure that is able to eliminate problems such as deterioration of a door opening/closing force, improper rotation of a partition member, a non-smooth opening/closing operation of a door, half-opening of the door even when a positional relationship between a guide pin and a guide groove of the partition member is changed due to distortion of a refrigerator body, downward inclination of the door, initial variation, or the like.

[Solution to Problem]

[0007]

A refrigerator according to the present invention is a side-by-side door refrigerator including: a box-shaped body; two doors rotatably mounted at the body on an opening of the body and configured to open and close the opening in a side-by-side manner; a guide pin provided at an inner side of an upper side of the opening of the body; a partition member rotatably provided at an end portion of one of the doors that is opposite to a rotatably mounted portion thereof, so as to extend in a vertical direction; and a guide groove provided on an upper portion of the partition member,

into and from which the guide pin is inserted and pulled in accordance with an opening or closing operation of the one of the doors, the guide groove being a curved shape. A movement mechanism in which the guide pin moves in a horizontal direction is provided.

5 [Advantageous Effects of Invention]

[0008]

10 The refrigerator according to the present invention is a side-by-side door refrigerator including a movement mechanism in which a guide pin moves in a horizontal direction. Thus, the guide pin moves such that a contact surface area with the guide groove is reduced, namely, to a position where a force applied to the guide groove is reduced. Therefore, it is possible to eliminate problems such as deterioration of a door opening/closing force, improper rotation of the partition member, non-smooth opening/closing operation of a door, and half-opening of the door which are caused by changes in the positions of the partition member and the guide pin.

15 [Brief Description of Drawings]

[0009]

[Fig. 1] Fig. 1 is a schematic perspective view showing a state where one door of a refrigerator according to Embodiment 1 of the present invention is opened.

20 [Fig. 2] Fig. 2 is a schematic perspective view showing a state where the door of the refrigerator according to Embodiment 1 of the present invention is closed.

[Fig. 3] Fig. 3 is a plan view showing a positional relationship between a guide pin and a guide groove of a partition member when the doors are closed according to Embodiment 1 of the present invention.

25 [Fig. 4] Fig. 4 is a diagram showing a movement mechanism for the guide pin according to Embodiment 1 of the present invention.

[Fig. 5] Fig. 5 is a diagram showing shapes before and after widening an opening of the guide groove according to Embodiment 2 of the present invention.

[Fig. 6] Fig. 6 is a diagram showing a movement mechanism at an end portion of the guide groove of the partition member according to Embodiment 3 of the present invention.

[Description of Embodiments]

[0010]

Hereinafter, embodiments of a refrigerator according to the present invention will be described with reference to the drawings. It should be noted that the drawings described below including Fig. 1 are schematically shown, and a relationship in size between each component is sometimes different from actual one.

[0011]

Embodiment 1

Fig. 1 is a schematic perspective view showing a state where one door 1 of a refrigerator 100 according to Embodiment 1 of the present invention is opened, an enlarged view (a) of a guide pin mounted portion and an enlarged view (b) of a partition member upper portion are shown together. Fig. 2 is a schematic perspective view showing a state where the door 1 of the refrigerator 100 according to Embodiment 1 of the present invention is closed.

The refrigerator 100 according to Embodiment 1 includes the doors 1 and 2 which open and close side by side, and has a structure in which the door 1 is capable of independently opening and closing regardless of opening and closing of the other door 2.

[0012]

The side-by-side doors 1 and 2 are provided, for example, for opening and closing a front opening of a cold room of the refrigerator 100, and each of the doors 1 and 2 is rotatably mounted at one end side thereof to an opening 4 of a box-shaped body 3. A magnetic gasket, which is not shown, is attached to a peripheral portion of a back surface of each of the doors 1 and 2 so as to cover an opening edge of the body 3, thereby preventing leak of cold air when the doors 1 and 2 are closed.

[0013]

Here, a side-by-side door structure will be described.

As shown in Figs. 1 and 2, a partition member 5 is rotatably provided at a back surface of an end portion of the door 1 that is opposite to a rotatably mounted portion thereof, so as to extend in the vertical direction. On an upper portion of the partition member 5, a guide groove 7 is formed in a curved shape into and from which a guide pin 6 provided at an inner side of an upper side of the opening 4 of the body 3 is inserted and pulled.

[0014]

The partition member 5 is configured to rotate, for example, by an angle of 90 degrees. In a door-opened state, as shown in Fig. 1, the partition member 5 is rotated perpendicularly to the back surface of the door 1. When the door 1 is to be closed from this state, the guide pin 6 provided at the inner side of the upper side of the opening 4 of the body 3 is inserted obliquely into the curved-shape guide groove 7 provided on the upper portion of the partition member 5. When the guide pin 6 deeply enters into the guide groove 7, the partition member 5 rotates outwardly about a rotation center 5a, and in a case of a door-closed state, the partition member 5 becomes parallel to the back surface of the door 1 as shown in Fig. 2. A portion of the partition member 5 that is exposed to the outside (a gasket close-contact portion 5b) comes into close contact with the magnetic gasket (not shown) attached to the back surface of the other door 2. Since the magnetic gasket has magnetism, the doors 1 and 2 come into close contact with the gasket close-contact portion 5b of the partition member 5 and the opening edge portion of the body 3 via the magnetic gasket because of the magnetic force of the magnetic gasket. Thus, it is possible to independently open and close the door 1 regardless of an opening/closing operation of the other door 2, and cold air within the body 3 does not leak out in the door-closed state.

[0015]

Fig. 3 is a plan view showing a positional relationship between the guide pin 6 and the guide groove 7 when the doors are closed according to Embodiment 1 of the present invention. In addition, Fig. 4 is a diagram showing a movement mechanism for the guide pin 6 according to Embodiment 1 of the present invention, (a) is an

exploded view of a mounted portion of the guide pin 6, (b) is an assembly diagram of the mounted portion of the guide pin 6, and (c) is a cross-sectional view taken along the line A-A in (b).

As shown in Fig. 3, when the doors are closed, the guide pin 6 is in a state of being inserted obliquely in an end portion (innermost portion) of the guide groove 7, and the door 1 and the door 2 are in a state of hermitically sealing the body 3, unless the door 2 is opened.

[0016]

In Embodiment 1, a mechanism is provided which allows the guide pin 6 to move in a horizontal direction indicated by a dotted line arrow in Figs. 3 and 4. In the movement mechanism for the guide pin 6, for example, springs 8a and 8b are provided at both sides of the guide pin 6 as shown in Fig. 4.

[0017]

Fig. 4 will be described. The guide pin 6 is formed so as to be integral with a guide member 9 and forms a projection with an elongate shape. The guide member 9 of the guide pin 6 is slidably provided at a guide pin retaining member 10 such that the guide pin 6 formed of this projection projects through an opening 11 provided in the guide pin retaining member 10 and moves within the opening 11 in the horizontal direction (the dotted line arrow direction). The springs 8a and 8b are mounted between end portions of the guide member 9 and the guide pin retaining member 10. The guide pin retaining member 10 is provided at the inner side of the upper side of the opening 4 of the body 3. Thus, in opening or closing the door 1, the guide pin 6 moves to a position where its contact surface area with the guide groove 7 is decreased, by elastic forces being applied to the guide pin 6 from both sides thereof by the springs 8a and 8b. Thus, it is possible to absorb changes in the positions of the partition member 5 and the guide pin 6 which are caused by processing errors or mounting errors of the partition member 5 and the guide pin 6 or the like. In other words, in closing the door 1, the spring 8b at the right side or back side pushes back the guide pin 6 against the resistance force applied from the guide pin 6 to the guide groove 7, whereas in opening the door 1, the spring 8a at the left side or front side

pushes back the guide pin 6 against the resistance force applied from the guide pin 6 to the guide groove 7, whereby it is possible to absorb changes in the positions due to the above errors.

[0018]

5 As described above, according to Embodiment 1, it is configured that elastic forces are applied to the guide pin 6 from both sides thereof by the springs 8a and 8b. Thus, in opening or closing the door 1, it is possible to reduce the resistance force applied from the guide pin 6 to the guide groove 7, and it is possible to move the guide pin 6 to a position where a force is less likely to be applied to the groove shape of the guide groove 7. Therefore, it is possible to reduce an opening force and a closing force of the door 1. In addition, when the outer force to the guide pin 6 is released, the guide pin 6 automatically returns to the original position by the forces of the springs 8a and 8b. Here, the "position where a force is less likely to be applied" is a position where, in opening or closing the door 1, the guide pin 6 moves with a minimum contact surface area to the guide groove 7. The guide pin 6 automatically moves to the "position where a force is less likely to be applied", by the forces of the springs 8a and 8b. It should be noted that the moving amount of the guide pin 6 in each of the left and right directions is 15 mm at its maximum. In addition, the spring constant of each of the springs 8a and 8b is 5 N/mm.

[0019]

20 In Embodiment 1, the forces of the springs 8a and 8b assist in rotation of the partition member 5, thereby reducing the opening/closing force of the door 1. It should be noted that the springs 8a and 8b are shown as compression springs, but may be tension springs.

25 In addition, since a guide pin is fixed according to the specifications in the related art, even when a positional relationship in which rotation of the partition member is stopped in the middle of rotation is provided due to a positional shift between the guide pin and the guide groove of the partition member, the guide pin 6 moves to the position where a force is less likely to be applied, by the forces of the springs 8a and 8b in Embodiment 1. Thus, the partition member 5 is not locked, and

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reliable rotation thereof is achieved. Thus, it is possible to prevent a half-opened mode of the door 1, and it is possible to avoid problems such as cold air leak and a door alarm going off.

[0020]

Even when magnets (not shown) are used as another movement mechanism for the guide pin 6 instead of the above-described springs 8a and 8b, it is possible to obtain the same advantageous effect. In other words, a structure may be employed in which the guide pin 6 is moveable by magnetic forces (repulsion forces or attraction forces) of magnets from both sides thereof.

[0021]

Embodiment 2

Fig. 5 is a diagram showing shapes before and after widening the opening of the guide groove 7 according to Embodiment 2 of the present invention.

In Embodiment 2, the opening of the guide groove 7 is formed so as to be enlarged from (a) to (b) of Fig. 5. The guide pin 6 is moveable similarly to Embodiment 1.

Typically, the guide groove 7 has a groove shape including an inner curved portion (a curved portion located on an inner side when the doors are closed) 7a and an outer curved portion (a curved portion located on an outer side when the doors are closed) 7b which are connected to an end portion 7c, as shown in Fig. 5(a). In Embodiment 2, as shown in Fig. 5(b), the entrance portion of the outer curved portion 7b of the guide groove 7 is widened such that an opening distance d2 of the guide groove 7 is larger than an opening distance d1 of the guide groove 7 shown in Fig. 5(a). Here, the opening distance d1 is the distance from the gasket close-contact portion 5b of the partition member 5 to a top 7e of the convex shape of the outer curved portion 7b, while the opening distance d2 is the distance from the gasket close-contact portion 5b of the partition member 5 to the widened entrance end of the outer curved portion 7b when the top 7e is located at the same position. The top 7e of the convex shape of the outer curved portion 7b is a part of the outer curved portion 7b opposite to the top of the convex shape of the inner curved portion 7a.

The distance between the outer curved portion 7b and the gasket close-contact portion 5b is increased towards the entrance end side. Accordingly, the groove width of the guide groove 7 is increased towards the entrance end side.

[0022]

5 In the case where the guide pin 6 is fixed, with the groove shape of the guide groove 7 as shown in Fig. 5(a), the opening of the guide groove 7 is narrow, and thus deterioration of the door opening/closing force caused by changes in the positions of the partition member 5 and the guide pin 6 is increased. However, with the groove shape in which the opening of the guide groove 7 is widened as shown in Fig. 5(b) in
10 Embodiment 2, the guide pin 6 is easily inserted, and it is also possible to absorb errors caused by great variations in the positions of the partition member 5 and the guide pin 6, in cooperation with an error absorption effect by the moveable guide pin 6. Thus, it is possible to further improve reliability of the opening/closing operation of the door 1.

15 [0023]

Embodiment 3

Fig. 6 is a diagram showing a movement mechanism at the end portion of the guide groove 7 of the partition member 5 according to Embodiment 3 of the present invention. In Fig. 6, (a) and (b) are plan views showing a state where the guide pin 6
20 and the guide groove 7 of the partition member 5 are coupled with each other. In Fig. 6, (c) and (d) are plan views showing an internal configuration.

In Embodiment 3, as shown in Fig. 6, a second end portion 7d similar in shape to the end portion 7c of the guide groove 7 of the partition member 5 is provided at the end portion 7c, and is configured to be moveable by being pressed by the
25 moveable guide pin 6. The second end portion 7d is urged by a spring 12 toward a direction facing the guide pin 6. In other words, in Embodiment 3, the second end portion 7d and the guide pin 6 provided in the guide groove 7 are configured to be moveable. In addition, the left spring 8a shown in Fig. 4 may be omitted, and it suffices that only the right spring 8b is provided.

30 [0024]

In Embodiment 3, in closing the door 1, the guide pin 6 is pushed back by the force of the right spring 8b until the guide pin 6 comes into contact with the second end portion 7d. Then, when the guide pin 6 comes into contact with the second end portion 7d and pushes the second end portion 7d to a position where the second end portion 7d comes into contact with the end portion 7c, the guide pin 6 moves to a position where a force is less likely to be applied, because of the fact that the forces of the spring 12 and the spring 8b are balanced.

In opening the door 1, when the guide pin 6 is released from the forces of the spring 12 and the spring 8b, the guide pin 6 is smoothly extracted from the guide groove 7. Thus, it is possible to smoothly open the door 1.

[0025]

According to Embodiment 3, since the guide pin 6 and the second end portion 7d provided at the end portion 7c of the guide groove 7 are configured to be moveable, it is possible to move the guide pin 6 to the position where a force is less likely to be applied to the groove shape of the guide groove 7, in cooperation with the error absorption effect of the moveable guide pin 6. Therefore, it is possible to prevent deterioration of the opening/closing force of the door 1, and it is also possible to ensure reliable rotation of the partition member 5 without being locked. Accordingly, it is possible to avoid a problem that the door 1 is half-opened and cold air leaks or a door alarm goes off.

[Reference Signs List]

[0026]

1: door 2: door 3: body 4: opening 5: partition member 5a: rotation center of partition member 5b: gasket close-contact portion 6: guide pin 7: guide groove 7a: inner curved portion 7b: outer curved portion 7c: end portion 7d: second end portion 7e: top of inner curved portion 8a, 8b: spring 9: guide member 10: guide pin retaining member 11: opening 12: spring 100: refrigerator

[Name of Document] CLAIMS

[Claim 1]

A refrigerator having a side-by-side door, comprising:

a box-shaped body;

5 two doors rotatably mounted at the body on an opening of the body and configured to open and close the opening in a side-by-side manner;

a guide pin provided at an inner side of an upper side of the opening of the body;

10 a partition member rotatably provided at a back surface of an end portion of one of the doors that is opposite to a rotatably mounted portion of the one door, the partition member being extended in a vertical direction; and

15 a guide groove provided on an upper portion of the partition member, into and from which the guide pin is inserted and pulled in accordance with an opening or closing operation of the one of the doors, the guide groove being a curved shape, wherein

a movement mechanism in which the guide pin moves in a horizontal direction is provided.

[Claim 2]

20 The refrigerator of claim 1, wherein the movement mechanism for the guide pin includes springs which apply elastic forces to the guide pin from both sides thereof.

[Claim 3]

The refrigerator of claim 1, wherein the movement mechanism for the guide pin includes magnets which apply magnetic forces to the guide pin from both sides thereof.

25 [Claim 4]

The refrigerator of any one of claims 1 to 3, wherein

the guide groove has a groove shape including an end portion, an inner curved portion connected to the end portion and located on an inner side when the doors are closed, and an outer curved portion connected to the end portion and located on an
30 outer side when the doors are closed, and

a second end portion is provided at the end portion of the guide groove and configured to be moveable by being pressed by the guide pin.

[Claim 5]

The refrigerator of claim 1, wherein

5 the guide groove has a groove shape including an end portion, an inner curved portion connected to the end portion and located on an inner side when the doors are closed, and an outer curved portion connected to the end portion and located on an outer side when the doors are closed, and

10 the guide groove is formed in a shape in which an entrance portion of the outer curved portion is widened such that an opening distance from a gasket close-contact portion of the partition member to an entrance end of the outer curved portion is larger than an opening distance from the gasket close-contact portion of the partition member to a top of a convex shape of the outer curved portion.