

DESCRIPTION

WASHING MACHINE

5 TECHNICAL FIELD

[0001] The present disclosure relates to a washing machine including a lid.

BACKGROUND ART

[0002] Patent Literature 1 discloses a washing machine including a lid
10 disposed to cover the top of a clothes slot in an openable and closable manner.

[0003] The washing machine disclosed in Patent Literature 1 includes: a casing; a top cover disposed on the top of the casing; a clothes slot formed in the top cover; a lid disposed to cover the top of a clothes slot in the openable and closable manner; a lid hinge bearing configured to rotatably support the lid; and
15 a rotary damper for shock absorption, the damper being configured to attenuate the rotation of the lid having one end pivotally supported by the lid hinge bearing. The lid hinge bearing is fastened to the top cover with a screw.

Citation List

20 [0004] Patent Literature 1: Unexamined Japanese Patent Publication No. 2018-38467

SUMMARY OF INVENTION

[0005] However, in the above-mentioned conventional lid hinge bearing, a
25 stress concentrates around the screw fastening the lid hinge bearing during the rotation of the lid, and as a result, the risk of breakage of the top cover and the lid hinge bearing arises.

[0006] The present disclosure provides a washing machine with high durability to withstand a stress occurring during the rotation of a lid.

[0007] The washing machine according to the present disclosure includes:

a casing; a top cover disposed on the top of the casing; a slot in the top cover; a
5 lid disposed to cover the top of the slot in an openable and closable manner; and
a bearing configured to rotatably support the lid. The top cover includes a top
face having a space into which the bearing is to be inserted. The bottom face of
the bearing includes: a first face at a side of the bearing, the side being inserted
into the space; and a second face at a higher position than the first face. Each
10 of the first face and the second face is fixed to the top cover with a screw.

[0008] The washing machine according to the present disclosure has high durability to withstand a stress occurring during the rotation of the lid.

BRIEF DESCRIPTION OF DRAWINGS

15 [0009] FIG. 1 is a perspective view of the appearance of a washing machine of Embodiment 1 in a state in which a lid of the washing machine is closed.

FIG. 2 is a perspective view of the appearance of the washing machine in a state in which the lid of the washing machine is opened.

FIG. 3 is a side view illustrating states in which the lid of the washing
20 machine is opened and closed.

FIG. 4 is an exploded perspective view illustrating a structure around the lid of the washing machine.

FIG. 5 is a vertical cross-sectional view illustrating a structure around the bearing of the lid of the washing machine.

25 FIG. 6 is a horizontal cross-sectional view obtained when the structure around the bearing of the lid of the washing machine is viewed from below.

FIG. 7 is a schematic diagram illustrating a stress occurring around the

bearing of the lid of the washing machine.

DESCRIPTION OF EMBODIMENTS

[0010] Hereinafter, embodiments will be described with reference to the
5 drawings. The present invention is not limited by the embodiments.

[0011] (Embodiment 1)

FIG. 1 is a perspective view of the appearance of the washing machine
of Embodiment 1 in a state in which the lid of the washing machine is closed.
FIG. 2 is a perspective view of the appearance of the washing machine in a
10 state in which the lid of the washing machine is opened.

[0012] As illustrated in FIG. 1 and FIG. 2, top cover 2 is disposed on the top of
washing machine body 1. Clothes slot 5 is formed in the top face of top cover 2.
Clothes put from clothes slot 5 are accommodated in washing tub 6 disposed
inside washing machine body 1. Lid 3 is provided in an operable and closable
15 manner to cover the top of clothes slot 5. A structure around lid 3 will be
described in detail later.

[0013] Operation display 4 configured to make various input settings and
display details of the settings is disposed behind lid 3. A controller (not
illustrated) configured to control the operation of the washing machine is
20 disposed below operation display 4.

[0014] Next, the structure around lid 3 will be described in detail. FIG. 3 is a
side view illustrating states in which the lid of the washing machine of
Embodiment 1 is opened and closed.

[0015] As illustrated in FIG. 3, lid 3 is pivotally supported at the rear right end
25 and the rear left end of the washing machine. Lid 3 is configured to be
rotatable about a lid hinge shaft serving as a rotation center from closed-state
position L0 to open-state position LH at which lid 3 is vertically opened. When

lid 3 is closed from open-state position LH, a rotational motion of lid 3 is damped by the later-mentioned damper structure after lid 3 goes past position L1. With this configuration, lid 3 is closed at position LO without giving a rapid shock to lid 3.

5 [0016] FIG. 4 is an exploded perspective view illustrating the structure around the lid of the washing machine of Embodiment 1.

[0017] As illustrated in FIG. 4, rotating shaft 21 formed to extend rightward is disposed in a rear right portion of lid 3. The damper structure is disposed in a rear left portion of lid 3. Note that the right side of the washing machine at
10 the time when the washing machine is viewed from the front is defined as a right side, and the left side of the washing machine at the time when the washing machine is viewed from the front is defined as a left side. The damper structure includes: lid space 13 formed in lid 3; damper holder 10 configured to be accommodated in lid space 13; and damper 9 configured to be
15 held by damper holder 10. Damper 9 includes: damper shaft 9a having a quadrangular prism shape and formed to extend leftward; and an internal structure configured to damp a rotational motion. The front face of the damper structure is covered with cover 11 so that the internal structure of lid space 13 cannot be seen from the outside.

20 [0018] Top cover space 14a and top cover space 14b are formed as recesses on the right and the left of the rear upper face of top cover 2, respectively. Top cover space 14a is disposed on a rear left portion of top cover 2, while top cover space 14b is disposed on a rear right portion of top cover 2. Bearing 8a and bearing 8b are inserted into top cover space 14a and top cover space 14b,
25 respectively. Bearing 8a is engaged with damper 9 and bearing body 8b is loosely fitted to rotating shaft 21, so that lid 3 is rotatably supported.

[0019] FIG. 5 is a vertical cross-sectional view illustrating a structure around

the bearing of the lid of the washing machine according to Embodiment 1.

[0020] As illustrated in FIG. 5, the bottom of bearing 8 is formed so as to be loosely fitted into top cover space 14. Here, bearing 8a disposed closer to the damper structure will be described. Bearing hole 20a having a quadrangular shape is formed in an upper portion of bearing 8a. Damper shaft 9a is inserted into bearing hole 20a. Note that, instead of bearing hole 20a, bearing through-hole 20b (see FIG. 4) as a circular through hole is formed in bearing 8b disposed closer to rotating shaft 21. Rotating shaft 21 (see FIG. 4) is loosely fitted into bearing through-hole 20b.

[0021] The bottom face of bearing 8a is formed step-wise so that first face 22 as a rear face is positioned lower than second face 23 as a front face. Third face 24 indicating a difference in level between first face 22 and second face 23 is formed perpendicular to first face 22 and second face 23. Note that, in the same manner as in bearing 8a, the bottom face of bearing 8b is formed step-wise. In other words, the bottom face of bearing 8 is divided into second face 23 and first face 22, first face 22 being disposed inside top cover space 14 and positioned below second face 23. Furthermore, each of first face 22 and second face 23 is fixed to top cover 2 with screw 12.

[0022] Engaging recess 17 is formed in a lower portion at each edge of first face 22. In top cover space 14a, engaging hook 15 is formed at a position to be engaged with engaging recess 17. When bearing 8a is inserted into top cover space 14, engaging hook 15 is engaged with engaging recess 17. With this configuration, bearing 8a is temporarily fixed to top cover space 14a. Furthermore, screw hole 19 is formed in each of second face 23 and first face 22, and bearing 8a is fixed in screw holes 19 from below with screws. Note that, in the same manner as in bearing 8a, the bottom face of bearing 8b is temporarily fixed with engaging hooks 15, and fixed from below with screws in second face

23 and first face 22.

[0023] FIG. 6 is a horizontal cross-sectional view obtained when the structure around the bearing of the lid of the washing machine according to Embodiment 1 is viewed from below.

5 [0024] As illustrated in FIG. 6, rib 16 vertically extending is formed in a side face of each of top cover space 14a and top cover space 14b. Groove 18 is provided in each of bearing 8a and bearing 8b so that rib 16 can be inserted into groove 18. Rib 16 is formed in the right side face of top cover space 14a formed in the rear left portion of top cover 2, while rib 16 is formed in the left side face
10 of top cover space 14b formed in the rear right portion of top cover 2. Thus, even if bearing 8b to be disposed closer to rotating shaft 21 is tried to be inserted into top cover space 14a positioned closer to the damper structure, bearing 8b cannot be fitted into top cover space 14a. With this configuration, when bearing 8 is installed into top cover space 14, bearing 8a disposed closer to
15 the damper structure and bearing 8b disposed closer to rotating shaft 21 can be prevented from being mixed up. Thus, installation workability can be enhanced.

[0025] Furthermore, as illustrated in the present embodiment, second groove 25 may be provided in the right side face of bearing 8b. With this
20 configuration, when a model having no damper structure is manufactured, instead of bearing 8a, bearing 8b can be inserted into top cover space 14a, so that standardization of components can be realized. However, a configuration without second groove 25 can more effectively prevent bearing 8a to be disposed closer to the damper structure and bearing 8b to be disposed closer to rotating
25 shaft 21 from being mixed up.

[0026] Operations associated with the above-mentioned configurations will be described below.

[0027] FIG. 7 is a schematic diagram illustrating a stress occurring around the bearing of the lid of the washing machine according to Embodiment 1.

[0028] As illustrated in FIG. 7, when lid 3 is moved in the closing direction by gravity, a rotational moment is generated in the direction of arrow A. At this
5 time, since damper shaft 9a has a non-circular shape, a strong stress occurs on bearing 8a, centering on portions of fastening with screws 12 as fixed points.

[0029] However, bearing 8a according to the present embodiment is provided with the portions of fastening with screws 12 in first face 22 and second face 23, first face 22 and second face 23 being positioned at different heights, so that the
10 stress is distributed across the entirety of lid-falling-load action face 26 (illustrated with a broken line).

[0030] Furthermore, bearing 8a according to the present embodiment is formed of a component independent of top cover 2, and therefore, a material of bearing 8a can be freely selected. Thus, in the case where a rotational moment
15 due to the natural fall of the lid is large, a material with high rigidity can be selected, and, in the case where a rotating shaft having a columnar shape is employed, a material with low rigidity can be selected.

[0031] As described above, the washing machine of Embodiment 1 includes: washing machine body 1; top cover 2 disposed on the top of washing machine
20 body 1; clothes slot 5 formed in top cover 2; lid 3 configured to cover the top of clothes slot 5 in the openable and closable manner; and bearing 8 configured to rotatably support lid 3. Top cover space 14 into which bearing 8 is to be inserted is formed in the top face of top cover 2. The bottom of bearing 8 includes: first face 22 closer to a side of bearing 8, the side being inserted into
25 top cover space 14; and second face 23 formed at a higher position than first face 22. Each of first face 22 and second face 23 is fixed to top cover 2 with a screw.

[0032] With this configuration, bearing 8 has enhanced rigidity, and a surface area in which top cover space 14 and bearing 8 are in contact with each other is increased, so that a stress occurring during the rotation of lid 3 can be distributed. This configuration can prevent the breakage of top cover 2 and
5 bearing 8 due to stress concentration.

[0033] As illustrated in the present embodiment, lid 3 may include damper 9 configured to attenuate a rotational motion of lid 3, and damper shaft 9a provided in damper 9 may be fitted into bearing hole 20a formed in bearing 8a and having a non-circular shape.

10 [0034] With this configuration, when a rotational moment is generated due to the natural fall of lid 3, a stress occurring in the vicinity of the portions of fastening with screws in bearing 8a can be distributed. This can prevent the breakage of top cover 2 and bearing 8 due to stress concentration.

[0035] As illustrated in the present embodiment, lid 3 may be supported at
15 both the rear right portion and the rear left portion of lid 3, and damper 9 may be provided in one of the rear right portion and the rear left portion of lid 3, and rotating shaft 21 to be loosely fitted into bearing hole 20a may be provided in the other thereof.

[0036] As illustrated in the present embodiment, the position, in top cover
20 space 14a, of rib 16 closer to damper 9 and the position, in top cover space 14b, of rib 16 closer to rotating shaft 21 may be different, and grooves 18 may be respectively formed at a position corresponding to rib 16 in bearing 8a closer to damper 9 and a position corresponding to rib 16 in bearing 8b closer to rotating shaft 21.

25 [0037] With this configuration, bearing 8a disposed closer to damper 9 cannot be inserted into top cover space 14b, while bearing 8b disposed closer to rotating shaft 21 cannot be inserted into top cover space 14a. Thus, bearing 8a to be

engaged with damper 9 and bearing 8b to be loosely fitted to rotating shaft 21 can be prevented from being fixed, with being mixed up, and as a result, installation workability can be enhanced.

[0038] (Other Embodiments)

5 Embodiment 1 has been described above as just an example of the technique disclosed in the present application. However, the technique according to the present disclosure is not limited to Embodiment 1.

[0039] Therefore, other embodiments will be illustrated below.

[0040] In Embodiment 1, a top-loading washing machine has been described as
10 an example of a washing machine. Any type of washing machine is applicable as long as the washing machine includes a clothes slot opened upward, and therefore the washing machine is not limited to a top-loading washing machine, but may be a twin-tub washing machine. Furthermore, a casing and a top cover may be integrated into one piece.

15 [0041] In Embodiment 1, rotating shaft 21 integrated with lid 3 has been described as an example of rotating shaft 21. As long as rotating shaft 21 is loosely fitted into bearing through-hole 20b provided in bearing 8b, rotating shaft 21 may be integrated with lid 3 or may be a component independent of lid 3.

20 [0042] In Embodiment 1, as an example of arrangement of the damper structure, the damper structure disposed in the rear left portion of lid 3 has been described. As long as the damper structure is configured to attenuate a rotational motion of lid 3, the position of the damper structure is not limited to the rear left portion of lid 3. For example, the damper structure may be
25 provided in the rear right portion of lid 3 or may be provided in both the rear right portion and the rear left portion of lid 3.

[0043] In Embodiment 1, the configuration in which rib 16 is formed in each of

top cover space 14a and top cover space 14b while groove 18 is formed in each of bearing 8a and bearing 8b has been described. The position of rib 16 and the position of groove 18 may be reversed. In other words, groove 18 may be formed in each of top cover space 14a and top cover space 14b, while rib 16 may be formed in each of bearing 8a and bearing 8b. Note that the configuration in which rib 16 is formed in each of top cover space 14a and top cover space 14b can make thinner a wall of top cover space 14a and a wall of top cover space 14b.

[0044] The embodiments have been described above by using expressions such as "perpendicular", "quadrangular", and "circular". These expressions also include cases of being not strictly perpendicular, quadrangular, or circular. For example, "being perpendicular" not only means "being perfectly perpendicular" but also means "being substantially perpendicular".

[0045] The present disclosure is applicable to an apparatus including an openable and closable lid. Specifically, the present disclosure is applicable to, for example, a top-loading washing machine or a twin-tub washing machine.

REFERENCE MARKS IN THE DRAWINGS

[0046] 1...washing machine body
20 2...top cover
3...lid
4...operation display
5...clothes slot
6...washing machine tub
25 8...bearing
8a...bearing
8b...bearing

	9...damper
	9a...damper shaft
	10...damper holder
	12...screw
5	13...lid space
	14...top cover space
	14a...top cover space
	14b...top cover space
	15...engaging hook
10	16...rib
	17...engaging recess
	18...groove
	19...screw hole
	20a...bearing hole
15	20b...bearing through-hole
	21...rotating shaft
	22...first face
	23...second face
	24...third face
20	25...second groove
	26...lid-falling-load action face

CLAIMS

1. A washing machine, comprising:
 - a casing;
 - a top cover disposed on a top of the casing;
 - 5 a slot in the top cover;
 - a lid disposed to cover a top of the slot in an openable and closable manner; and
 - a bearing configured to rotatably support the lid,
 - wherein the top cover includes a top face having a space into which the
 - 10 bearing is to be inserted,
 - wherein a bottom of the bearing includes
 - a first face at a side of the bearing, the side being inserted into
 - the space, and
 - a second face at a higher position than the first face, and
 - 15 wherein each of the first face and the second face is fixed to the top cover with a screw.
2. The washing machine according to claim 1,
 - wherein the lid includes a damper configured to attenuate a rotational
 - 20 motion of the lid, and
 - wherein a shaft provided in the damper is fitted into a bearing hole formed in the bearing.
3. The washing machine according to claim 1 or 2,
 - 25 wherein the lid is supported at both a rear right portion and a rear left portion of the lid, and
 - wherein the damper is provided in one of the rear right portion and the

rear left portion of the lid, and a rotating shaft configured to pass through the bearing hole is provided in another one of the rear right portion and the rear left portion of the lid.

5 4. The washing machine according to claim 3,
 wherein the space includes a first portion closer to the damper and a second portion closer to the rotating shaft,

 a first rib is in the first portion closer to the damper,

 a second rib is in the second portion closer to the rotating shaft,

10 and

 the first rib and the second rib are different in position in the first portion and the second portion, respectively, and

 wherein the bearing includes a first bearing disposed closer to the damper and a second bearing disposed closer to the rotating shaft, and each of
15 the first bearing and the second bearing is provided with a groove at a position
 corresponding to a corresponding one of the first rib and the second rib.