

DESCRIPTION

WASHING MACHINE

5 TECHNICAL FIELD

The present invention relates to a washing machine that is capable of washing using hot water.

BACKGROUND ART

10 A conventional washing machine that is disclosed structurally lets steam out of the washing machine from an inner tub. This washing machine includes the inner tub rotatably disposed in an outer tub, a housing that supports the outer tub in a vibro-isolating manner, an upper frame body provided at a top of the housing, and a lid body that covers a clothing loading
15 port provided in the upper frame body. A reverse face of the lid body is provided with, about its outer part, a plurality of downwardly projecting ribs spaced at predetermined intervals. Steam generated in the inner tub is let out of the washing machine through a gap that is formed by the ribs between the upper frame body and the lid body (refer to, for example, PTL 1).

20 Citation List

Patent Literature

PTL 1: Unexamined Japanese Patent Publication No. 2004-337203

SUMMARY

25 In the conventional structure, however, steam that is let out of the inner tub condenses on the reverse face of the lid body into condensed water, so that there is a possibility that this condensed water might drip out of the

washing machine to cause discomfort to a user.

The present disclosure provides a washing machine that does not cause discomfort to a user by inhibiting condensed water from dripping out of the washing machine even when steam that is let out of an inner tub condenses on
5 a reverse side of a lid body.

In one aspect, the present disclosure refers to a washing machine capable of washing using hot water, the washing machine comprising: a housing; a water tub supported to be isolated from vibration inside the housing; a washing and spin-drying tub rotatably included in the water tub; an
10 upper frame body mounted at a top of the housing, the upper frame body including, in its substantially central part of the upper frame body, a clothing loading port where laundry is loaded and unloaded; and a lid body rotatably mounted to the upper frame body to openably cover the clothing loading port, wherein the lid body includes an upper lid frame that forms an upper part of
15 the lid body, and a lower lid frame that is disposed under the upper lid frame along a periphery of the upper lid frame and is formed to substantially include a recess in vertical section, the upper frame body includes a top face that slopes down toward the clothing loading port, while the lower lid frame includes a bottom face that slopes down inward at a left and a right side of the
20 lower lid frame, and with the lid body being closed, a bottom face of the lid body forms a predetermined gap with the top face of the upper frame body.

This structure can inhibit condensed water from dripping out of the washing machine even when steam that is let out of the washing and spin-drying tub condenses on a reverse side of the lid body.

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BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a vertical section of a washing machine according to a first

exemplary embodiment of the present invention.

FIG. 2 is a vertical section along a front-back line, illustrating respective main parts of an upper frame body and a lid body of the washing machine according to the first exemplary embodiment of the present invention.

5 FIG. 3 is a vertical section along a left-right line, illustrating respective main parts of the upper frame body and the lid body of the washing machine according to the first exemplary embodiment of the present invention.

FIG. 4 is an enlarged view of a main part of FIG. 3.

FIG. 5 is a top view illustrating the upper frame body and the lid body
10 of the washing machine according to the first exemplary embodiment of the present invention.

FIG. 6 is a side view illustrating the upper frame body and the lid body of the washing machine according to the first exemplary embodiment of the present invention.

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DESCRIPTION OF EMBODIMENT

A washing machine according to an exemplary embodiment is hereinafter described in detail with reference to the drawings where appropriate. However, more detailed descriptions than necessary may be
20 omitted. For example, detailed descriptions of already well-known matters and repeated description of substantially the same structure may be omitted. This is for the purpose of preventing the following description from needlessly having redundancy, thereby facilitating understanding by those skilled in the art.

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It is to be noted that the accompanying drawings and the following description are provided in order for those skilled in the art to fully understand the present invention and thus are not intended to limit the subject matter as

described in the claims.

(First exemplary embodiment)

With reference to FIGS. 1 to 5, a description is hereinafter provided of a washing machine according to the first exemplary embodiment.

5 [1. Structure]

[1-1. Structure of washing machine]

FIG. 1 is a vertical section of the washing machine according to the first exemplary embodiment.

In FIG. 1, water tub 13 is suspended and supported by suspension 12
10 to be isolated from vibration inside main body 11 that is a housing of the washing machine. Washing and spin-drying tub 15 that serves both as a washing tub and a spin-drying tub is rotatably provided in water tub 13. Pulsator 19 is rotatably disposed at an inner bottom part of washing and spin-drying tub 15.

15 Transmission mechanism 20 is disposed at an outer bottom part of water tub 13. Transmission mechanism 20 internally includes a reduction gear (not illustrated) that is used during washing, a switching clutch (not illustrated) for washing and spin-drying shaft 14, and a brake (not illustrated) that stops washing and spin-drying tub 15.

20 Motor 21 is mounted at the outer bottom part of water tub 13 and is mounted with motor-end pulley 22. Mechanism-end pulley 23 is connected to washing and spin-drying shaft 14 and is connected to motor-end pulley 22 by belt 24. With this structure, power of motor 21 is transmitted to washing and spin-drying shaft 14 via belt 24. Rotation of pulsator 19 and simultaneous
25 rotation of pulsator 19 and washing and spin-drying tub 15 are achieved by means of motor 21 through control of the switching clutch.

Upper frame body 25 is disposed at a top of main body 11 of the

washing machine. Upper frame body 25 is formed with, in its substantially central part, laundry loading and unloading port 26 that provides, as a clothing loading port, outside communication for washing and spin-drying tub 15. Lid body 27 openably covers laundry loading and unloading port 26.

5 Control device 28 is disposed in a rear upper part of upper frame body 25 and is overlain by operation panel 29 where various settings are input and are displayed. Upper frame body 25 internally includes, at its rear part, water supply valve 30 that can be opened by electromagnetic force, water filling case 31, and others.

10 Control device 28 controls motor 21 and others and has a controller (not illustrated) that sequentially controls a series of processes including a washing process, a rinsing process, and a spin-drying process.

Heated-water generator 32 is mounted at the outer bottom part of water tub 13. Heated-water generator 32 is provided with, for example, a
15 heater (not illustrated) that heats up washing water. Water tub 13 and heated-water generator 32 communicate with each other via an inflow passage (not illustrated) and an outflow passage (not illustrated).

[1-2. Structure of lid body and structure of upper frame body]

FIG. 2 is a vertical section along a front-back line, illustrating
20 respective main parts of the upper frame body and the lid body of the washing machine according to the present exemplary embodiment. FIG. 3 is a vertical section along a left-right line, illustrating respective main parts of the upper frame body and the lid body of the washing machine according to the present exemplary embodiment, and FIG. 4 is an enlarged view of a main part of FIG.
25 3. FIG. 5 is a top view illustrating the upper frame body and the lid body of the washing machine according to the present exemplary embodiment. FIG. 6 is a side view illustrating the upper frame body and the lid body of the

washing machine according to the present exemplary embodiment.

As illustrated in FIG. 3, upper frame body 25 is formed to upwardly extend out from laundry loading and unloading port 26. Upper frame body 25 includes top face 25b that slopes down frontward as illustrated in FIG. 2. As
5 illustrated in FIGS. 2 and 3, top face 25b of upper frame body 25 is formed to also slope down inward at its front part and at its both sides. Upper frame body 25 also includes, as illustrated in FIG. 3, inclined face 25a that extends from inner edge 25c of top face 25b toward laundry loading and unloading port 26.

10 As shown in FIG. 2, lid body 27 is openably provided to cover laundry loading and unloading port 26. When closed to face upper frame body 25, lid body 27 slopes down frontward as illustrated in FIGS. 1, 2, and 6. Lid body 27 is formed of upper lid frame 27a that forms an upper part of lid body 27, lower lid frame 27b that is mounted to upper lid frame 27a from below at a front part,
15 a rear part, and a left and a right side of upper lid frame 27a and substantially includes a recess in vertical section, and glass plate 27c that is connected to upper lid frame 27a at its periphery.

With lid body 27 being closed, lower lid frame 27b is positioned over top face 25b of upper frame body 25. As illustrated in FIGS. 3 and 4, outer
20 peripheral surface 37 of lower lid frame 27b slopes inward extending from its position of contact with lower edge 27f of upper lid frame 27a to outer edge 27d. Bottom face 36 of lower lid frame 27b is formed to slope down inward at a left and a right side of lower lid frame 27b.

As illustrated in FIG. 6, top face 25b of upper frame body 25 is
25 provided with, at its front part, first spacer 35a. Top face 25b is provided with, at a rear spot of each of its sides, second spacer 35b. Each of first and second spacers 35a and 35b may be formed of a rubber body or may be formed of a

synthetic resin or the like.

With lid body 27 being closed, bottom face 36 of lower lid frame 27b is supported on first spacer 35a and second spacers 35b. As such, gap S is formed, as illustrated in FIG. 6, between top face 25b of upper frame body 25 and bottom face 36 of lower lid frame 27b. It is to be noted here that gap size gradually increases heading from forward gap S1 toward rearward gap S2.

As illustrated in FIG. 5, main body 11 is provided with water supply hole 41 and hot-water supply hole 42 in its back face.

[2. Operation of washing machine being operated]

In the present exemplary embodiment, a description is provided next of operation of the washing machine being operated.

A user opens lid body 27, loads clothes into washing and spin-drying tub 15 through laundry loading and unloading port 26, which is the clothing loading port, closes lid body 27, and operates operation panel 29 to start a hot-water washing course.

At beginning of a washing process, water supply valve 30 is opened, and water is poured into water tub 13 by way of water filling case 31. The water poured flows into heated-water generator 32 through the inflow passage provided in a bottom of water tub 13.

It is to be noted here that in the hot-water washing course, termination of the washing process using water heated by the heater is followed by the rinsing process and the spin-drying process.

In the hot-water washing course, when the water poured into water tub 13 reaches a predetermined level in water tub 13, the heater of heated-water generator 32 is turned ON. The washing water in water tub 13 flows into heated-water generator 32 through the inflow passage. The washing water that has flowed into heated-water generator 32 is heated up by the

heater. The washing water heated up by the heater is guided to the outflow passage to be released into water tub 13. In this way, the washing water in water tub 13 has a predetermined elevated temperature. While being rotated at regular time intervals, pulsator 19 can agitate the washing water in water tub 13, so that the water in water tub 13 can have a substantially uniform temperature.

The hot-water washing course ends after the washing process, the rinsing process, and the spin-drying process are carried out. In cases where the hot-water washing course is not selected, namely, in a conventional washing course, the washing process, the rinsing process, and the spin-drying process are carried out, although washing water is not heated up by the heater.

During the hot-water washing course, heated washing water gives off steam in washing and spin-drying tub 15, particularly in a low-temperature and high-humidity environment in wintertime. The steam given off by the washing water can be let out of main body 11 through gap S between top face 25b of upper frame body 25 and lower lid frame 27b of lid body 27. While being let out of main body 11 through gap S, the steam condenses on bottom face 36 of lower lid frame 27b.

[3. Flow of condensed water on bottom face of lower lid frame]

With lid body 27 being closed, bottom face 36 formed slopes down frontward and inward, so that condensed water on bottom face 36 of lower lid frame 27b runs down inward while running frontward and thus drips onto top face 25b and inclined face 25a of upper frame body 25. As illustrated in FIGS. 2 and 3, top face 25b slopes down inward at its front part and at its left and right sides, so that water droplets that have dripped from bottom face 36 of lid body 27 onto top face 25b of upper frame body 25 run down inward, namely, toward laundry loading and unloading port 26 while running frontward. In

this way, the water droplets that have dripped onto the top face 25b of upper frame body 25 can be prevented from dripping out of main body 11, whereby discomfort can be prevented from being caused to the user.

Moreover, lid body 27 can have substantially the same size as upper
5 frame body 25 while water droplets are inhibited from dripping out of main body 11. This enables such a lid body to have high design quality with no discomfort caused to the user.

Because the gap size gradually increases heading from forward gap S1 toward rearward gap S2 between upper frame body 25 and lid body 27, steam
10 given off by hot water is discharged out of the washing machine mainly through rearward gap S2. As such, the steam given off by the hot water is not discharged at a front of main body 11. The user can thus be prevented from being exposed to the steam, and discomfort can be prevented from being caused to the user.

15 It is to be noted that the structure of the present invention may be such that when lid body 27 is in its closed condition, gap size gradually increases rearward with bottom face 36 of lid body 27 abutting top face 25b of upper frame body 25 at its front part.

As illustrated in FIG. 4, inner edge 27e of bottom face 36 of lid body 27
20 is positioned inwardly of inner edge 25c of top face 25b of upper frame body 25, that is to say, closer to laundry loading and unloading port 26 than inner edge 25c is. With this structure, water droplets on bottom face 36 run inward along the slope and drip into laundry loading and unloading port 26 from inner edge 27e of bottom face 36. The water droplets on bottom face 36 can thus be
25 prevented from dripping out of main body 11.

As illustrated in FIG. 4, outer edge 27d of bottom face 36 of lid body 27 is positioned inwardly of outer edge 25d of top face 25b of upper frame body 25,

that is to say, closer to laundry loading and unloading port 26 than outer edge 25d is. With this structure, water droplets on bottom face 36 can be prevented from dripping out of main body 11. It is to be noted that even in cases where top face 25b of upper frame body 25 slopes down inward from its inwardly positioned midpoint and not between outer edge 25d and that midpoint, similar effects can be achieved provided that outer edge 27d of bottom face 36 of lid body 27 is positioned inwardly of a top of top face 25b.

As illustrated in FIG. 4, upper frame body 25 includes inclined face 25a that extends from inner edge 25c of top face 25b toward laundry loading and unloading port 26. With this structure, laundry loading and unloading port 26, which is the clothing loading port, can open widely, and water droplets that have dripped onto the top face 25b of upper frame body 25 can, with more certainty, drip into washing and spin-drying tub 15 by inwardly running down inclined face 25a.

Similar effects can be obtained even in cases where hot water is supplied, for use in washing, from hot-water supply hole 42 that is illustrated in FIG. 5.

While the description provided in the present exemplary embodiment has been of lid body 27 that slopes down frontward when closed, it is to be noted that the present invention is not limited to this. Lid body 27 may be substantially horizontal when closed.

As described above, a washing machine according to a first disclosure is capable of washing using hot water and includes a housing, a water tub supported to be isolated from vibration inside the housing, and a washing and spin-drying tub rotatably included in the water tub. This washing machine also includes an upper frame body that is mounted at a top of the housing and includes, in its substantially central part, a clothing loading port where

laundry is loaded and unloaded, and a lid body that is rotatably mounted to the upper frame body to openably cover the clothing loading port. The lid body includes an upper lid frame that forms an upper part of the lid body, and a lower lid frame that is disposed under the upper lid frame along a periphery of the upper lid frame and is formed to substantially include a recess in vertical section. The upper frame body also includes a top face that slopes down toward the clothing loading port, while the lower lid frame includes a bottom face that slopes down inward at a left and a right side of the lower lid frame. With the lid body being closed, the bottom face of the lid body forms a predetermined gap with the top face of the upper frame body.

This structure can inhibit condensed water from dripping out of the washing machine even when steam that is let out of the washing and spin-drying tub condenses on a reverse side of the lid body.

A washing machine according to a second disclosure is based on the first disclosure and is such that with the lid body being closed, an outer edge of the bottom face of the lower lid frame may be positioned closer to the clothing loading port than an outer edge of the top face of the upper frame body is.

This structure allows condensed water dripping from the outer edge of the lid body to fall onto the top face of the upper frame body and thus can inhibit the condensed water from being discharged out of the washing machine.

A washing machine according a third disclosure is based on the first disclosure and is such that the upper frame body may also include a downwardly inclined face extending from an inner edge of the top face toward the clothing loading port.

With this structure, the clothing loading port can open widely, and water droplets that have dripped onto the top face of the upper frame body can, with more certainty, drip into the washing and spin-drying tub by inwardly

running down the inclined face.

A washing machine according a fourth disclosure is based on the second disclosure and is such that the upper frame body may also include a downwardly inclined face extending from an inner edge of the top face toward
5 the clothing loading port.

With this structure, the clothing loading port can open widely, and water droplets that have dripped onto the top face of the upper frame body can, with more certainty, drip into the washing and spin-drying tub by inwardly running down the inclined face.

10 A washing machine according to a fifth disclosure is based on any one of the first through fourth disclosures and is such that with the lid body being closed, an inner edge of the bottom face of the lower lid frame may be positioned closer to the clothing loading port than an inner edge of the top face of the upper frame body is.

15 This structure can allow condensed water dripping from the inner edge of the lid body to fall into the clothing loading port.

A washing machine according to a sixth disclosure is based on any one of the first through fourth disclosures and is such that with the lid body being closed, the lid body may slope down frontward, while the gap may gradually
20 increase in size in a front-to-rear direction.

This structure can let steam coming from within the washing and spin-drying tub out of the washing machine through a rearward part of the gap where the gap size is larger and thus can inhibit water droplets from forming and flooding at a front part of the upper frame body.

25 A seventh disclosure is based on the sixth disclosure and is such that with the lid body being closed, the lower lid frame may abut the top face of the upper frame body.

This structure can let steam coming from within the washing and spin-drying tub out of the washing machine through the rearward part of the gap and thus can inhibit water droplets from forming and flooding at the front part of the upper frame body.

5 A washing machine according to an eighth disclosure is based on any one of the first through fourth disclosures and is such that a heating unit may be provided at a bottom of the water tub to heat up washing water from the water tub and the washing and spin-drying tub. This structure can inhibit condensed water from dripping out of the washing machine even when steam
10 given off by hot water that has been heated by the heating unit condenses on the reverse side of the lid body.

A ninth disclosure is based on any one of the first through fourth disclosures and is such that the water tub and the washing and spin-drying tub may be supplied with hot water.

15 This structure can inhibit condensed water from dripping out of the washing machine even when steam given off by hot water that has been supplied condenses on the reverse side of the lid body.

INDUSTRIAL APPLICABILITY

20 As described above, a washing machine according to the present invention can prevent condensation on an inner side of an upper frame body or on a reverse side of a lid body from dripping out of the washing machine and thus can prevent discomfort from being caused to a user. As such, the washing machine according to the present invention is useful, for example, as a
25 washing machine that has a hot-water washing function.

REFERENCE MARKS IN THE DRAWINGS

	11: main body (housing)
	12: suspension
	13: water tub
	14: washing and spin-drying shaft
5	15: washing and spin-drying tub
	19: pulsator
	20: transmission mechanism
	21: motor
	22: motor-end pulley
10	23: mechanism-end pulley
	24: belt
	25: upper frame body
	25a: inclined face
	25b: top face
15	25c, 27e: inner edge
	25d, 27d: outer edge
	26: laundry loading and unloading port (clothing loading port)
	27: lid body
	27a: upper lid frame
20	27b: lower lid frame
	27c: glass plate
	27f: lower edge
	28: control device
	29: operation panel
25	32: heated-water generator (heating unit)
	36: bottom face

CLAIMS

1. A washing machine capable of washing using hot water, the washing machine comprising:

- 5 a housing;
- a water tub supported to be isolated from vibration inside the housing;
- a washing and spin-drying tub rotatably included in the water tub;
- an upper frame body mounted at a top of the housing, the upper frame body including, in a substantially central part of the upper frame body, a
- 10 clothing loading port where laundry is loaded and unloaded; and
- a lid body rotatably mounted to the upper frame body to openably cover the clothing loading port,
- wherein the lid body includes an upper lid frame that forms an upper part of the lid body, and a lower lid frame that is disposed under the upper lid
- 15 frame along a periphery of the upper lid frame and is formed to substantially include a recess in vertical section,
- the upper frame body includes a top face that slopes down toward the clothing loading port, while the lower lid frame includes a bottom face that slopes down inward at a left and a right side of the lower lid frame, and
- 20 with the lid body being closed, a bottom face of the lid body forms a predetermined gap with the top face of the upper frame body.

2. The washing machine according to claim 1, wherein with the lid
- body being closed, an outer edge of the bottom face of the lower lid frame is
- 25 positioned closer to the clothing loading port than an outer edge of the top face of the upper frame body is.

3. The washing machine according to claim 1, wherein the upper frame body includes a downwardly inclined face extending from an inner edge of the top face toward the clothing loading port.

5 4. The washing machine according to claim 2, wherein the upper frame body includes a downwardly inclined face extending from an inner edge of the top face toward the clothing loading port.

10 5. The washing machine according to any one of claims 1 to 4, wherein with the lid body being closed, an inner edge of the bottom face of the lower lid frame is positioned closer to the clothing loading port than an inner edge of the top face of the upper frame body is.

15 6. The washing machine according to any one of claims 1 to 4, wherein with the lid body being closed, the lid body slopes down frontward, while the predetermined gap gradually increases in size in a front-to-rear direction.

20 7. The washing machine according to claim 6, wherein with the lid body being closed, the lower lid frame abuts the top face of the upper frame body.

25 8. The washing machine according to any one of claims 1 to 4, wherein a heating unit is provided at a bottom of the water tub to heat up washing water from the water tub and the washing and spin-drying tub.

 9. The washing machine according to any one of claims 1 to 4, wherein the water tub and the washing and spin-drying tub are supplied with hot

water.