

DESCRIPTION

WASHING MACHINE

5 TECHNICAL FIELD

The present invention relates to a washing machine that has a lid body openably covering a laundry loading port, for example, in an upper face of the washing machine.

10 BACKGROUND ART

In a conventionally proposed configuration of such a type of washing machine, a damper mechanism is provided to prevent occurrence of a large impact noise at the time of closing the lid body (see Patent Literature 1, Patent Literature 2, for example).

15 FIG. 24 is a partially broken-out longitudinal section of a conventional washing machine described in PTL 1. FIG. 25 is a partial cutaway section of a main part of the conventional washing machine described in PTL 1. FIG. 26 is a partial cutaway section of a lid body portion of the conventional washing machine described in PTL 1.

20 In FIGS. 24, 25, and 26, water tub 242 is accommodated inside main body 241 while being hung and supported by elastic supporting mechanism 243, and washing and spin-drying tub 244 in which agitator wing 245 for agitation is rotatably disposed in a center bottom part of water tub 242 is placed so as to be capable of spin-drying by rotation. Agitator wing 245 and
25 washing and spin-drying tub 244 are rotated by motor 247 fixed to an outer bottom part of water tub 242.

Additionally, top cover 255 is attached to an uppermost part of casing

241, laundry loading and unloading port 256 that continues into washing and spin-drying tub 244 is provided in a center part of top cover 255, and flat lid body 257 is axially supported above laundry loading and unloading port 256 in an openable manner. Lid body 257 is configured of front lid 259 opened and closed by a user, and rear lid 258 rotatably connecting front lid 259. In FIG. 24, lid body 257a indicates an open state of lid body 257, where front lid 259a is bent in parallel with rear lid 258a. Additionally, as indicated by lid body 257a, lid body 257 rotates to a substantially vertical state when the lid body 257 is opened.

As shown in FIG. 25, lateral shaft hole 260 open to the right and left is formed in a rear end part of rear lid 258, while shaft support portion 262 provided to allow shaft 261 to project laterally in a slidable manner from shaft hole 260 projects from top cover 255. Shaft hole 260 of rear lid 258 is loosely fitted into shaft 261 to axially support lid body 257 in a rotatable manner.

Lever body 264 having fan-shaped gear portion 269 is integrally formed with a part behind and below shaft hole 260 of rear lid 258. Fan-shaped gear portion 269 formed in the lower end of lever body 264 meshes with spur gear 271 of rack 265 configured to be longitudinally movable in a rear part of top cover 255. Rack 265 works in synchronization with damper main body 267 that connects piston rod 266, is fixed below a rear part of top cover 255, and has a resistance force in the horizontal axis direction.

Additionally, toggle spring 270 in which arms of a helical torsion coil part are extended outward to apply an energizing force in an opening or closing direction of lid body 257 is fastened to lever body 264. When lid body 257 is flat, toggle spring 270 energizes lever body 264 in an anticlockwise (arrow F) direction around shaft hole 260, so as to close lid body 257.

Additionally, damper main body 267 has a single-sided structure that

applies resistance only to rearward (arrow G direction) movement of piston rod 266, and does not apply resistance to frontward movement of the piston indicated by arrow C in the opposite direction.

Accordingly, when lid body 257 is opened in arrow A direction, lever
5 body 264 is rotated in B direction around shaft 261, and rack 265 meshing with fan-shaped gear portion 269 moves in C direction but does not receive resistance of damper main body 267. On the other hand, when lid body 257 is closed (E direction) from the open state, rack 265 meshing with fan-shaped gear portion 269 moves rearward (G direction), and receives resistance of
10 damper main body 267, so that rotation of lid body 257 is attenuated.

Additionally, a conventional washing machine is provided with a lid body that openably closes a laundry loading and unloading port, and the lid body is rotatably supported by a hinge structure. To improve operability of the lid body, a spring hinge for suppressing the opening force of the lid body is
15 provided. The spring hinge applies a rotational force to the lid body by fixing one end to a hinge portion formed in the lid body, and attaching the other end to an upper frame body of the washing machine (see PTL 3, for example).

FIGS. 27 and 28 are exploded perspective views of a lid body of a conventional washing machine.

20 When lid body 302 and upper frame body 301 are attached, hinge shaft 305 formed in upper frame body 301 is inserted into hinge hole 304a formed in an end part of lid body 302. A protruding part is formed in hinge portion 304 of lid body 302 and a locking portion 303a on one end of spring hinge 303 is inserted and locked onto attachment hole 304b formed in the protruding part,
25 while locking portion 303b on the other end of spring hinge 303 is inserted and locked onto locking hole 307a formed in upper frame body 301. Additionally, insertion hole 306 into which hinge portion 304 is inserted is formed in upper

frame body 301, and recess 307 for supporting spring hinge 303 is formed so as to be continuous with insertion hole 306.

Citation List

Patent Literature

- 5 PTL 1: Unexamined Japanese Patent Publication No. 2000-167290
- PTL 2: Unexamined Japanese Patent Publication No. 2009-207651
- PTL 3: Unexamined Japanese Patent Publication No. H06-315597

SUMMARY

However, in the conventional configuration shown in FIGS. 24 to 26,
10 although a sudden impact noise or the like at the time of closing the lid body 257 from an open state is cancelled to a certain extent, when lid body 257 is opened from a closed state, a user is required to open a heavy lid body, since not only resistance of the springs, but also resistance to the rotational force due to meshing between gear portion 269 and rack 265 occur simultaneously.
15 Moreover, there is a problem that since there is no resistance of damper main body 267 when rear lid 258 is opened and stops substantially vertical to top cover 255, a large collision noise occurs between rear lid 258 and a stopper portion of top cover 255.

Additionally, although the conventional example shows a configuration
20 in which lid body 257 is divided into front lid 259 and rear lid 258, as a recent design trend, a large and single-structure lid is commonly used. In this case, there is a problem that when the lid body is raised to open from a closed state, the inertial force of the entire lid body is added to the opening energizing force of toggle spring 270, whereby the lid body is opened sharply to cause a
25 stronger impact noise and discomfort in use.

The present disclosure provides a washing machine in which collision

noise at the time of opening a lid body is suppressed and opening and closing can be done smoothly, while deformation of the periphery of a damper holding body is prevented by secure fixing of the damper holding body and the lid body, so that stabilized work may lead to improvement in productivity.

5 The washing machine of the present disclosure includes: a top cover placed on an upper part of a washing machine body; a laundry loading port formed in the top cover; a lid body openably covering the laundry loading port; a rotational impact damper that damps rotation of the lid body axially supported to the top cover , and a spring hinge that is attached to the lid body
10 and energizes the lid body in an opening direction. Additionally, the impact damper is held by a damper holding body. The lid body is attached to the top cover in a state that, one end of the spring hinge which projects downward substantially vertically is inserted into a spring insertion hole formed in the top cover, and the lid body has a space in each of right and left sides. The top
15 cover has lid hinge bearings installed therein, and the lid hinge bearings have damper shaft receiving holes on the right and left positions corresponding to the spaces. And, a hooking protrusion of the damper holding body holding the impact damper is engaged with an engaging part of the lid body and slid in the spaces, in a state that the lid body is provided on the top cover at a
20 substantially vertical angle, to engage a damper shaft of the impact damper with the damper shaft receiving holes. An end part of the damper holding body opposite to the engaging protrusion is fixed by a screw, and then, a lid hinge cover which covers the spaces is attached.

With this configuration, the lid body can be closed smoothly while suppressing collision noise. Additionally, when the lid body is opened, the resistance force of the impact damper is reduced by the energizing force of the spring hinge. Hence, the lid body can similarly be opened smoothly while
5 suppressing collision noise.

Moreover, since the damper holding body can be fixed temporarily at the time of assembly, productivity can be improved. In addition, since the damper holding body is reliably fixed to the lid body, deformation and breakage by impact force from rotary motion of the damper can be suppressed, and
10 reliability can be improved.

Additionally, in a lid structure of another conventional washing machine, attachment of a damper holding body that accommodates a damper is an open side type. Hence, a large load is applied on the attachment part, and a heavier lid may deform or break the lid or the damper holding body.

The present invention provides a washing machine that can prevent deformation and breakage of a lid or a damper even with a heavier lid.

The washing machine of the present invention includes: a top cover placed on an upper part of a washing machine body; a lid body axially supported above the top cover in an openable manner by a lid hinge shaft; a lid spring that energizes the lid body to an opening direction; a spring shaft that supports the lid spring; a rotational impact damper that damps rotation of the lid body; and a damper holding body that accommodates the impact damper. Additionally, the damper holding body includes an attachment rib for fixing with the lid body by a screw or the like and a positioning rib in a direction substantially opposite to the attachment rib, and the lid body has an attachment part attached with the attachment rib by a screw or the like, and a groove into which the positioning rib is inserted.

With this configuration, since the force acting on the impact damper at the time of closing the lid can be received on the attachment rib and the positioning rib, deformation and breakage of the lid or the damper can be prevented.

Additionally, in the conventional configuration shown in FIGS. 27 and 28, in order to fix spring hinge 303, during assembly, spring hinge 303 needs to be attached to attachment hole 304b of lid body 302 and locking hole 307a of upper frame body 301 while flexing spring hinge 303 from the free length to the attached state. This leads to poor workability.

The present invention provides a washing machine that facilitates assembly of a lid body and an upper frame body.

The present invention includes: a casing; an upper frame body that is attached to an upper part of the casing and has, in a substantially center part of the casing, a laundry loading port for loading and unloading laundry; and a

lid body that is rotationally provided in the upper frame body and openably covers the laundry loading port. Additionally, a lid hinge shaft is provided behind the lid body, a hinge part that supports rotation of the lid body is formed in a rear part of the upper frame body, a bearing that receives the lid
5 hinge shaft is provided in the hinge part, a sheet metal is fixed by a fixing member behind the lid body, and the sheet metal includes a bent portion bent substantially vertically by a bending process. Moreover, a through hole is formed in the bent portion, a spring shaft that axially supports a spring hinge energizing the lid body in an opening direction is inserted into the through
10 hole, and the fixing member is positioned on both axial ends of the spring shaft.

With this configuration, the spring shaft can be kept from falling off the spring hinge by a simple configuration, and assembly of the lid body and the upper frame body can be facilitated.

15 BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is an external view of a washing machine of a first exemplary embodiment of the present invention when a lid body is closed.

FIG. 2 is an external view of the washing machine of the first exemplary embodiment of the present invention when the lid body is open.

20 FIG. 3 is a side view of the washing machine of the first exemplary embodiment of the present invention showing open and closed states of the lid body.

FIG. 4 is an exploded perspective view showing a structure of the lid body of the washing machine of the first exemplary embodiment of the present
25 invention.

FIG. 5 is an exploded perspective view showing structures of the lid body and a top cover unit of the washing machine of the first exemplary

embodiment of the present invention.

FIG. 6 is an exploded perspective view showing a structure of an impact damper of the lid body of the washing machine of the first exemplary embodiment of the present invention.

5 FIG. 7A is a cross-sectional view of a main part of the lid body of the washing machine of the first exemplary embodiment of the present invention.

FIG. 7B is an enlarged view of part H of FIG. 7A.

FIG. 8 is a longitudinal section of a main part of the lid body of the washing machine of the first exemplary embodiment of the present invention.

10 FIG. 9 is an external perspective view of a washing machine of a second exemplary embodiment of the present invention.

FIG. 10 is a partial cutaway side view showing opening and closing of a lid body of the washing machine of the second exemplary embodiment of the present invention.

15 FIG. 11A is a sectional view of a main part showing a structure of a lid body portion of the washing machine of the second exemplary embodiment of the present invention.

FIG. 11B is a sectional view of a main part of the washing machine of the second exemplary embodiment of the present invention when the lid body
20 is open.

FIG. 12 is an exploded perspective view showing attachment of an upper frame body and the lid body of the washing machine of the second exemplary embodiment of the present invention.

FIG. 13 is an exploded perspective view of the lid body of the washing
25 machine of the second exemplary embodiment of the present invention.

FIG. 14 is an exploded perspective view showing a structure of an impact damper of the lid body of the washing machine of the second exemplary

embodiment of the present invention.

FIG. 15 is a sectional view taken along 15-15 of FIG. 12.

FIG. 16 is a sectional view taken along 16-16 of FIG. 15.

FIG. 17 is a longitudinal section of a washing machine of a third
5 exemplary embodiment of the present invention.

FIG. 18 is a longitudinal section of a main part of an upper frame body
and a lid body of the washing machine of the third exemplary embodiment of
the present invention.

FIG. 19 is a top view of the upper frame body and the lid body of the
10 washing machine of the third exemplary embodiment of the present invention.

FIG. 20 is a back view of a lower lid frame body of the washing
machine of the third exemplary embodiment of the present invention.

FIG. 21 is an enlarged view of a main part of FIG. 20.

FIG. 22 is an enlarged sectional view taken along 22-22 of FIG. 21.

FIG. 23 is a side cross section of the washing machine of the third
15 exemplary embodiment of the present invention when the upper frame body
and the lower lid frame body are attached.

FIG. 24 is a partial cutaway longitudinal section of a conventional
washing machine.

FIG. 25 is a partial cutaway section of a main part of the conventional
20 washing machine.

FIG. 26 is a partial cutaway section of a lid body portion of the
conventional washing machine.

FIG. 27 is an exploded perspective view of a lid body of a conventional
25 washing machine.

FIG. 28 is an exploded perspective view of the lid body of the
conventional washing machine.

DESCRIPTION OF EMBODIMENTS

Hereinafter, exemplary embodiments of the present invention will be described with reference to the drawings. Note that the present invention is not limited to the exemplary embodiments.

(First exemplary embodiment)

FIG. 1 is an external view of a washing machine of a first exemplary embodiment of the present invention when a lid body is closed. FIG. 2 is an external view of the washing machine of the first exemplary embodiment of the present invention when the lid body is open. FIG. 3 is a side view of the washing machine of the first exemplary embodiment of the present invention showing open and closed states of the lid body. FIG. 4 is an exploded perspective view showing a structure of the lid body of the washing machine of the first exemplary embodiment of the present invention. FIG. 5 is an exploded perspective view showing structures of the lid body and a top cover unit of the washing machine of the first exemplary embodiment of the present invention. FIG. 6 is an exploded perspective view showing a structure of an impact damper of the lid body of the washing machine of the first exemplary embodiment of the present invention. FIG. 7A is a cross-sectional view of a main part of the lid body of the washing machine of the first exemplary embodiment of the present invention. FIG. 7B is an enlarged view of part H of FIG. 7A. FIG. 8 is a longitudinal section of a main part of the lid body of the washing machine of the first exemplary embodiment of the present invention.

In FIGS. 1, 2, and 3, top cover 2 is placed on an upper part of washing machine body 1, laundry loading port 30 is formed in a substantial center part of top cover 2, and lid body 3 axially supported to top cover 2 so as to cover laundry loading port 30 is arranged in an upwardly openable manner.

Top cover 2 has, in a position behind lid body 3, operation display unit 4 in which various input settings are made and which displays the set contents. A controller (not shown) that controls operation of the washing machine is accommodated in operation display unit 4.

5 Lid body 3 is divided into upper and lower parts which are lid upper body 5 and lid lower body 6, and lid window 7 is attached to the upside of lid upper body 5. Additionally, lid hinge portions 31 are formed on the right and left of lid lower body 6, and lid hinge cover 9 is placed on lid hinge portion 31 to cover the inner structure and match the external design shape with lid lower
10 body 6.

Lid body 3 is axially supported to top cover 2 by lid hinge shaft 10, and is configured to rotate from closed state LO position to open state LH position at a substantially vertical full-open angle, around lid hinge shaft 10 as the rotation center. When lid body 3 is closed from open state LH, after lid body 3
15 passes tilted state L1 position, a later-mentioned damper structure included in lid hinge shaft 10 damps the rotary motion, so that lid body 3 may arrive at closed state LO position without receiving a sudden impact.

As shown in FIG. 4, lid window 7 is fixed on top of lid upper body 5 by double-faced adhesive tape 11, and lid decoration board 8 is held and fixed so
20 as to sandwich lid window 7 with a front part of lid upper body 5.

Hinge attachment plate 14 for suppressing the opening force of lid body 3 to improve operability is arranged between pair of lid hinge portions 31. Two spring hinges 12 having an energizing force in the opening direction and two lid hinge shafts 13 are attached symmetrically on hinge attachment plate 14.

25 Hinge attachment plate 14 is configured of a steel plate or the like. Shaft holes 15 are provided on both side faces of hinge attachment plate 14 that are formed by bending to support lid hinge shafts 13. Lid hinge shaft 13

supports and penetrates both sides of shaft hole 15 of hinge attachment plate 14, while holding and penetrating the coil center of spring hinge 12. Hinge attachment plate 14 to which lid hinge shafts 13 and spring hinges 12 are attached, is attached by fastening and fixing self-tapping screws 16 into threaded bosses 17 formed integrally with lid lower body 6. Lid body 3 is configured of the above parts and unitized.

In FIGS. 5, 6, 7A, and 7B, damper holding body 18 that holds impact damper 19 is included in space 6a formed in each of right and left lid hinge portions 31 of lid body 3. Damper holding body 18 is attached by engaging hooking protrusions 18a of damper holding body 18 with groove parts 22 of lid lower body 6 by claw fitting.

Additionally, lid hinge bearing 24 is fixed by fastening multiple attachment self-tapping screws 25 into threaded bosses 26 formed integrally with top cover 2.

Impact damper 19 applies a resistance force in the rotation direction of arrow M shown in FIG. 6. The resistance force of a viscous oil enclosed inside impact damper 19 acts on a rotary motion relative to damper shaft 19a, and has an attenuation effect of damping the rotational motion of lid body 3 in the closing direction. Thus, lid body 3 can be closed smoothly with no collision noise. Additionally, when lid body 3 is opened, since the resistance force of impact damper 19 is reduced by the energizing force of spring hinge 12, the lid body 3 can be opened smoothly with no collision noise.

A flat portion 19b is formed in impact damper, and flat portion 19b is loosely fitted into opening 18b of damper holding body 18 formed in the same shape, to position impact damper 19 in the rotation direction.

Additionally, damper shaft flat portion 19c is formed in damper shaft 19a, too, and damper shaft flat portion 19c is loosely fitted into damper shaft

receiving hole 24a of lid hinge bearing 24, to position rotation of damper shaft 19a in the rotation direction.

When unitized lid body 3 is attached to top cover 2, first, to insert and engage end parts of spring hinges 12 with spring insertion holes 23 of top cover 2, lid body 3 is placed and installed on top cover 2 from above, at a substantially vertical angle. At this time, spring hinges 12 can be inserted easily into spring insertion holes 23 in a free state with no repulsive force. Next, after inserting hooking protrusions 18a of damper holding bodies 18 holding impact dampers 19 into groove parts 22 of lid lower body 6, impact dampers 19 are slid outward to engage damper shafts 19a of impact dampers 19 with damper shaft receiving holes 24a of lid hinge bearings 24 installed in top cover 2. In this state, damper holding bodies 18 are fixedly attached by fastening multiple self-tapping screws 20 into threaded bosses 21 formed integrally with lid lower body 6. Finally, lid hinge covers 9 are attached.

In FIG. 8, when lid body 3 is closed, although the resistance force of impact damper 19 is large, and a torque in arrow M2 direction which is the direction of opening lid body 3 is applied on lid body 3, the lid body 3 is stably closed by the balance of center of gravity of lid body 3.

At this time, the resistance force of impact damper 19 applies torque in arrow M3 direction which is a direction of pulling damper holding body 18 off lid lower body 6. However, since one end of damper holding body 18 is fixed by screwing self-tapping screws 20, and hooking protrusion 18a on the other end of damper holding body 18 is inserted into groove part 22 of lid lower body 6, so that both ends of damper holding body 18 are fixed to lid body 3, deformation and breakage by impact force from rotary motion of the damper can be suppressed. Thus, reliability of the lid motion can be improved. Additionally, at the time of assembly, since the parts can be fixed temporarily by claw fitting

before screw fixing, productivity can be improved.

As has been described, the present exemplary embodiment includes damper holding body 18 provided in space 6a formed in lid hinge portion 31 of lid body 3, and rotational impact damper 19 having one end loosely fitted into
5 damper holding body 18 and the other end axially supported by lid hinge bearing 24, and damping rotation of lid body 3. Additionally, damper holding body 18 is configured such that the front end is fixed by being screwed to lid body by self-tapping screws 20, and hooking protrusions 18a formed in the rear end are inserted and fixed to groove parts 22 formed in lid body 3. With this
10 configuration, lid body 3 can be closed smoothly with no collision noise. Additionally, when lid body 3 is opened, since the resistance force of impact damper 19 is reduced by the energizing force of spring hinge 12, lid body 3 can similarly be opened smoothly with no collision noise.

Moreover, since damper holding body 18 can be fixed temporarily at
15 the time of assembly, productivity can be improved. In addition, since damper holding body 18 is firmly fixed to lid body 3, deformation and breakage by impact force from rotary motion of the damper can be suppressed, and reliability can be improved.

(Second exemplary embodiment)

20 FIG. 9 is an external perspective view of a washing machine of a second exemplary embodiment of the present invention. FIG. 10 is a partial cutaway side view showing opening and closing of a lid body of the washing machine of the second exemplary embodiment of the present invention. FIG. 11A is a sectional view of a main part showing a structure of a lid body portion
25 of the washing machine of the second exemplary embodiment of the present invention. FIG. 11B is a sectional view of a main part of the washing machine of the second exemplary embodiment of the present invention when the lid

body is open.

As shown in the external view of FIG. 9, top cover 52 is placed on an upper part of washing machine body 51, lid body 53 is arranged in an openable manner in a substantial center part of an upper face of top cover 52, and
5 control plate 55 that controls operation of the washing machine is disposed at the front of top cover 52.

Lid body 53 forms a substantially circular planar shape that is excellent in design, and is configured to have, in a center part, substantially circular transparent window 54 to view the inside. To open lid body 53, the
10 user needs to raise lid body 53 from recess 56 formed at the front of top cover 52.

As in the diagram showing opening and closing of lid body 53 in FIG. 10, lid body 53 is configured to open to open state LH position at a substantially vertical full-open angle from closed state L0 position, around
15 shaft hole 57 as the rotation center.

The user can open lid body 53 by raising lid body 53 from closed state L0 to open state LH with light force, due to an additional force of later-mentioned lid spring 69.

When lid body 53 is closed from open state LH, if the user lets go after
20 closing lid body 53 slightly, lid body 53 closes by its own weight. However, the additional force of lid spring 69 and later-mentioned impact damper 72 damps the closing rotary motion, so that lid body 53 does not apply a sudden impact on top cover 52, and closes in closed state L0 position.

Impact damper 72 does not work when lid body 53 is opened, and
25 works when lid body 53 is closed. Hence, when lid body 53 is opened, only a light force is required for raising, and when lid body 53 is closed, the rotary motion is damped and lid body 53 closes slowly.

As shown in FIGS. 11A and 11B, lid body 53 is configured by layering lid main body 58 that has a substantially circular planar shape and a protruding spherical section, lid lower frame body 59 that supports an outer peripheral part of lid main body 58 from below and has a substantially doughnut-shaped planar shape, and lid upper frame body 60 that covers the outer peripheral part of lid main body 58 from the upper side and has a substantially horseshoe-shaped planar shape. In particular, lid main body 58 is formed of a transparent resin member, for example, so that the user can view the state of laundry inside the washing machine.

Stepped portion 61 is formed behind lid main body 58, and flat plate-like lid cover 62 formed of a nontransparent material is attached from above to serve as a connecting component of horseshoe-shaped lid upper frame body 60. The configuration also gives consideration to design, so that a later-mentioned inner structure is not visible through lid main body 58 formed of the transparent resin member.

Hinge portion 63 is formed integrally with a rear part of lid lower frame body 59, and forms parts such as shaft hole 57 which is the center of rotary motion of opening and closing of lid body 53.

Lid springs 69, spring shafts 80 that support lid springs 69, and lid reinforcement plate 79 formed of parts such as a steel plate on which one end of each of lid springs 69 apply pressure and fixed to lid lower frame body 59, for example, are incorporated inside space 90 formed behind lid main body 58 when lid lower frame body 59 is attached.

Other end 91 of each of lid springs 69 is directed downward, and is inserted and fastened from above, to top cover reinforcement plate 76 attached to top cover 52.

In FIG. 11A showing a closed state of lid body 53, lid spring 69 is bent

substantially 90 degrees and applies a repulsive force for opening lid body 53 through lid reinforcement plate 79, in a clockwise direction around the rotation center of spring shaft 80 (i.e., lid hinge shaft 77 of rotation center of lid body 53). At this time, since the repulsive force of lid spring 69 for opening the lid is
5 set smaller than the weight applied by the weight of lid body 53, lid body 53 maintains the closed state.

In an open state where lid body 53 is raised substantially vertically and opened as in FIG. 11B, lid spring 69 is stretched substantially vertically to an almost free shape, and a little energizing force keeps the lid from collapsing.

10 As has been described with reference to FIGS. 11A and 11B, lid body 53 in recent years is configured to be relatively robust and heavy due to coupling of lid main body 58 formed of the transparent resin member and lid lower frame body 59 and lid upper frame body 60, for example. In order to reduce the load of work for opening lid body 53, lid body 53 is configured such that the
15 spring force of lid spring 69 is maximized in the closed state of lid body 53. As has been described, to support a relatively strong spring force, lid reinforcement plate 79 is formed of a horizontally long steel plate or the like, one end of lid spring 69 does not to apply the spring force directly on lid lower frame body 59, and a rear part of lid lower frame body 59 is reinforced to stand
20 the opening and closing of the lid.

Although the spring force of lid spring 69 is configured to act strongly relative to the weight of lid body 53 as described above, no large force acts on lid spring 69 when the lid is open. Hence, in the course of closing the lid, a large force acts on damper holding body 81.

25 FIG. 12 is an exploded perspective view showing attachment of the upper frame body and the lid body of the washing machine of the second exemplary embodiment of the present invention. FIG. 13 is an exploded

perspective view of the lid body of the washing machine of the second exemplary embodiment of the present invention. FIG. 14 is an exploded perspective view showing a structure of the impact damper of the lid body of the washing machine of the second exemplary embodiment of the present invention. FIG. 15 is a sectional view taken along 15-15 of FIG. 12. FIG. 16 is a sectional view taken along 16-16 of FIG. 15.

In the exploded perspective view of FIG. 12, lid body 53 integrally configured such that lid main body 58 is sandwiched from upper and lower sides by lid lower frame body 59 and lid upper frame body 60 is attached to lid installation portion 70 from above top cover 52, while directing operation parts such as hinge portions 63, other ends 91 of lid spring 69, and impact damper 72 (configuration to be described later) downward.

In top cover 52 behind lid installation portion 70, provided are parts such as top cover-side shaft support holes 71 corresponding to shaft holes 57 of lid lower frame body 59, top cover reinforcement plate 76 formed of a steel plate or the like having lid spring insertion holes 75 into which lid springs 69 are inserted and held, and impact damper receiving structure 73 having substantially Y-shaped receiving portion 74 to which impact damper 72 is attached.

As described with reference to FIG. 11B, before lid body 53 is assembled onto top cover 52, other ends 91 of lid springs 69 are directed downward in a free state with almost no repulsive force of the spring. In this state, other ends 91 are inserted and fastened to top cover reinforcement plate 76 arranged in top cover 52.

By attaching lid body 53 to top cover 52 from above and horizontally inserting and holding lid hinge shafts 77 in shaft holes 57 and top cover-side shaft support holes 71, lid body 53 is openably assembled to top cover 52.

In the exploded view of the lid body in FIG. 13, horseshoe-shaped stepped portion 78 is formed around lid main body 58 having a substantially circular planar shape, stepped portion 61 is formed behind lid main body 58, and lid upper frame body 60 having a substantially horseshoe-shaped planar shape and flat plate-like lid cover 62 are each fixed to lid main body 58 by fitting or welding, adhering or the like.

Additionally, substantially doughnut-shaped lid lower frame body 59 is attached from below lid main body 58, by fastening and fixing multiple attachment screws 82 into bosses 83 formed integrally with a rear face of horseshoe-shaped stepped portion 78.

Lid springs 69, spring shafts 80 that support lid springs 69, lid reinforcement plate 79 of lid springs 69, damper holding body 81 in which impact damper 72 is rotatably inserted and held, for example, are incorporated in space 90 (see FIG. 11A) behind lid main body 58 and below stepped portion 61, where lid lower frame body 59 is attached.

Spring shaft 80, the shaft center of lid hinge shaft 77 which is the rotation center of lid body 53 shown in FIG. 12, and the rotating shaft of impact damper 72 are configured to be on substantially the same axis of rotation.

The configuration gives consideration to design by forming lid cover 62, so that the inner structure such as lid springs 69 and lid reinforcement plate 79 which does not need to be viewed by the user in actual use is not visible through lid main body 58 formed of the transparent resin member. In addition, lid body 53 into which members are assembled is prepared as an integral unit member as shown in FIG. 12, and is configured to be attached to top cover 52 from above.

The spring structure and impact damper 72 structure having complex

design including curved faces and high strength are assembled into lid body 53 and unitized. Since the lid body 53 can be previously configured in a preparation step or the like, and can be assembled onto top cover 52 easily, a more flexible production process can be ensured, and productivity of the lid structure can be improved.

In the exploded view of the impact damper in FIG. 14, impact damper 72 that applies a resistance force in the rotation direction of closing the lid is configured of bottomed cylindrical damper main body 84, damper shaft 85, and protrusion 86 integrally formed with the outer bottom of the bottom of damper main body 84. Impact damper 72 has an attenuation effect of damping relative rotary motion between damper shaft 85 and damper main body 84 indicated by arrow M.

Damper main body 84 portion is inserted into cylindrical damper holding body 81, and protrusion 86 protruding from the bottom of damper main body 84 fits into opening 87 formed in an end part of damper holding body 81, so as to restrict rotation. Damper holding body 81 into which damper main body 84 is inserted has attachment rib 88 formed integrally with damper holding body 81, and positioning rib 89 in substantially the opposite direction. Positioning rib 89 is inserted into groove 66 formed in a rear part of lid lower frame body 59, and attachment rib 88 is fixed to lid lower frame body 59 by a screw. Hence, when damper shaft 85 is fixed and prevented from rotating in the rotation direction by damper receiving structure 73 of top cover 52, and damper holding body 81 rotates with opening or closing of lid body 53, the attenuation effect acts on the rotary motion in the rotation-restricted angle part.

At this time, although a force acts on damper holding body 81, the screw part, and groove 66, since the force is received on two points which are

attachment rib 88 and positioning rib 89 of damper holding body 81, deformation and breakage of damper holding body 81 can be prevented.

Additionally, the configuration of attaching damper shaft 85 of impact damper 72 to damper receiving structure 73 on the top cover side so as to prevent rotation is a configuration for attaching and locking flat portion 95 on the tip end part of damper shaft 85 to substantially Y-shaped receiving portion 74. Hence, as has been described with reference to FIG. 4, assembly is completed merely by attaching lid body 53 to top cover 52 from above, and productivity can be improved.

In the cross-sectional view around the rotating shaft of lid body 53 of FIG. 15, impact damper 72 rotatably inserted in cylindrical damper holding body 81 is arranged in a substantial center (indicated by 16-16) of lid main body 58 and lid cover 62 inside space 90 configured by assembly of lid main body 58 and lid lower frame body 59. Moreover, lid spring 69 and spring shaft 80 are arranged on left and right sides of impact damper 72 on the same axis line (indicated by J-J).

On right and left outer sides of lid spring 69, lid hinge shaft 77 that axially supports lid body 53 so as to be openable from top cover 52 is inserted and held in shaft hole 57 of frame hinge portion 63 of lid lower frame body 59 and top cover-side shaft support hole 71, on the same axis line as spring shaft 80.

Additionally, lid spring 69 is supported by allowing spring shaft 80 to penetrate the coil center of the spring, and spring shaft 80 is axially supported to small holes 93 of multiple cut-over pieces 92 of lid reinforcement plate 79 configured of a steel plate or the like.

Attachment of impact damper 72 will be described with reference to FIG. 16 showing a 16-16 section passing through impact damper 72. After

inserting positioning rib 89 extending 3 mm to 10 mm from damper holding body 81 into groove 66 provided in the rear part of lid lower frame body 59, attachment rib 88 is sandwiched and fixed by one of multiple bosses 95 formed integrally with lid lower frame body 59 and self-tapping screw 94.

5 At this time, the length of positioning rib 89 is set to range from 3 mm to 10 mm, so that the tip end of positioning rib 89 does not protrude to the outside of lid lower frame body 59. Additionally, since groove 66 is arranged in the rear part of lid lower frame body when the lid is closed, groove 66 is positioned behind the lid when the lid is closed, and below the lid when the lid
10 is opened, and therefore is not visible from the user.

As described above, lid reinforcement plate 79 is formed horizontally long so as to cover lid springs 69 arranged on the right and left of impact damper 72, is fixed to lid lower frame body 59 by multiple self-tapping screws 94, and serves as a reinforcement member of lid body 53 that receives a load
15 from impact damper 72, lid springs 69, lid hinge shafts 77, and the like configured inside space 90 formed behind lid body 53.

Additionally, the axis line of lid hinge shaft 77 of lid body 53, damper shaft 85 of impact damper 72, and spring shaft 80 of lid spring 69 are set on substantially the same line indicated by line J-J as in FIG. 15, so that opening
20 and closing of lid body 53 around lid hinge shaft 77 and the rotary motion of impact damper 72 and the rotary motion of lid spring 69 are on the same axis. With this configuration, motion can be simplified, whereby no structure other than rotational transmission is required for addition of spring load of lid spring 69 to lid body 53, or transmission of attenuation to the rotary motion of
25 lid body 53.

As has been described, according to the present exemplary embodiment, the force applied at the time of closing of the lid is supported at two points

which are attachment rib 88 and positioning rib 89 formed in damper holding body 81. Hence, force applied to one point in damper holding body 81 and lid body 53 can be reduced, whereby deformation and breakage of the attachment part can be prevented.

5 Additionally, since the length of positioning rib 89 ranges from 3 mm to 10 mm to be inserted into groove 66, the damper holding structure can be reduced in size, and excellent design can be maintained.

(Third exemplary embodiment)

FIG. 17 is a longitudinal section of a washing machine of a third
10 exemplary embodiment of the present invention.

In FIG. 17, water tub 113 is hung and flexibly mounted by suspension 112, inside body 111 (casing) of a washing machine. Inside water tub 113, washing and spin-drying tub 115 serving as both a washing tub and a spin-drying tub is provided in a rotatable manner. Pulsator 119 is rotatably
15 disposed in an inner bottom part of washing and spin-drying tub 115.

Transmission mechanism unit 120 is disposed in an outer bottom part of water tub 113. Transmission mechanism unit 120 incorporates a gear (not shown) to reduce speed during washing, a changeover clutch (not shown) of washing and spin-drying shaft 114, and a brake (not shown) to stop washing
20 and spin-drying tub 115.

Motor 121 is attached to an outer bottom part of water tub 113, and motor-side pulley 122 is attached to motor 121. Washing and spin-drying shaft 114 is coupled to mechanism-side pulley 123, and motor-side pulley 122 and mechanism-side pulley 123 are coupled to each other by belt 124. With this
25 configuration, power of motor 121 is transmitted to washing and spin-drying shaft 114 through belt 124. Additionally, by controlling the changeover clutch, rotation of pulsator 119 alone and simultaneous rotation of pulsator 119 and

washing and spin-drying tub 115 can be achieved by use of motor 121.

Upper frame body 125 is arranged in an upper part of washing machine body 111. Laundry loading and unloading port 126 (laundry loading port) for connecting washing and spin-drying tub 115 and the outside is formed
5 in a substantial center part of upper frame body 125, and laundry loading and unloading port 126 is openably covered by lid body 127. Controller 128 is disposed in an upper part on the rear side of upper frame body 125, and operation panel 129 in which various input settings are made and which displays the set contents covers an upper part of controller 128. Water supply
10 valve 130 that can be opened by electromagnetic force and water pouring case 131 are accommodated inside the rear side of upper frame body 125.

Control device 128 controls motor 121 and other parts and has control means (not shown) that sequentially controls a series of operations made up of washing, rinsing, and spin-drying.

15 Heated water generator 132 is attached to an outer bottom part of water tub 113. A heater (not shown) or the like for heating washing water is provided in heated water generator 132. Water tub 113 and heated water generator 132 are connected through an inflow path (not shown) and an outflow path (not shown).

20 FIG. 18 is a longitudinal section of a main part of the upper frame body and a lid body of the washing machine of the present exemplary embodiment. FIG. 19 is a top view of the upper frame body and the lid body of the washing machine of the present exemplary embodiment. FIG. 20 is a back view of a lower lid frame body of the washing machine of the present exemplary
25 embodiment. FIG. 21 is an enlarged view of a main part of FIG. 20. FIG. 22 is an enlarged sectional view taken along 22-22 of FIG. 21. FIG. 23 is a side cross section of the washing machine of the present exemplary embodiment

when the upper frame body and the lower lid frame body are attached.

As shown in FIG. 18, lid body 127 is provided in an openable manner so as to cover laundry loading and unloading port 126, and is tilted downward toward the front. As shown in FIGS. 18 and 19, lid body 127 is configured of
5 upper lid frame body 127a forming an upper part, lower lid frame body 127b attached to a front part, rear part, and both side parts of upper lid frame body 127a from below and has a substantially recessed longitudinal section, and glass plate 127c.

As shown in FIG. 20, lid hinge shaft 135 is provided in rear both sides
10 of lower lid frame body 127b. A hinge portion (not shown) that supports rotation of lid body 127 is provided behind upper frame body 125. A bearing portion (not shown) that receives lid hinge shaft 135 is formed in the hinge portion. Lid body 127 can rotatably open and close relative to upper frame body 125 by inserting and supporting lid hinge shaft 135 in the bearing portion.

As shown in FIGS. 20 to 23, lower lid frame body 127b and sheet metal
15 138 are fastened and fixed by screw 139 (fastening member) on the back side at the rear of lower lid frame body 127b. Multiple bent portions 140 bent substantially vertically by a bending process are formed in sheet metal 138. A through hole (not shown) is formed in bent portion 140, and spring shaft 137
20 that axially supports spring hinge 136 is inserted into the through hole. Spring hinge 136 energizes lid body 127 in an opening direction. Screw 139 is disposed on both axial ends of spring shaft 137.

With this configuration, spring shaft 137 is inserted and supported in the through hole, while screw head 139b of screw 139 suppresses axial
25 movement of spring shaft 137. Hence, spring shaft 137 can be kept from falling off the through hole and the spring hinge 136. In the conventional configuration, a groove is formed in a spring shaft and an E type retaining ring

needs to be fitted in, for example. However, this is unnecessary in the present exemplary embodiment, and movement of spring shaft 137 can be suppressed in less processes.

When lid body 127 and upper frame body 125 are assembled, lid hinge
5 shaft 315 is connected to the bearing portion of upper frame body 125, and one end of spring hinge 136 is inserted into a spring insertion hole (not shown) behind upper frame body 125. The other end of spring hinge 136 is fixed to lower lid frame body 127b. Hence, the unstable work of attaching the spring hinge to a locking hole of the upper frame body and an attachment hole of the
10 lid body while flexing the spring hinge from the free length to the attached state as in the conventional configuration is unnecessary, and assembly can be facilitated. Additionally, the risk of damaging the upper frame body from friction between the spring hinge and the upper frame body in the middle of assembly can be reduced.

15 Note that although the present exemplary embodiment describes a configuration in which lid body 127 and sheet metal 138 are fixed by screw-fastening, the present invention is not limited to this, and other fixing methods may be adopted.

Additionally, although the present exemplary embodiment describes a
20 configuration in which two each of spring hinge 136 and spring shaft 137 are provided, the present invention is not limited to this. The same effect can be achieved by providing one each of spring hinge 136 and spring shaft 137, and disposing screw 139 on both ends of spring shaft 137.

Additionally, the present invention may be configured of a double tub
25 washing machine.

As has been described, the present invention includes: a top cover placed on an upper part of a washing machine body; a laundry loading port

placed on an upper part of a washing machine body; a laundry loading port formed in the top cover; a lid body openably covering the laundry loading port; a rotational impact damper that damps rotation of the lid body axially supported to the top cover, and a spring hinge that is attached to the lid body
5 and energizes the lid body in an opening direction. Additionally, the impact damper is held by a damper holding body. The lid body is attached to the top cover in a state that, one end of the spring hinge which projects downward substantially vertically is inserted into a spring insertion hole formed in the top cover, and the lid body has a space in each of right and left sides. The top
10 cover has lid hinge bearings installed therein, and the lid hinge bearings have damper shaft receiving holes on the right and left positions corresponding to the spaces. And, a hooking protrusion of the damper holding body holding the impact damper is engaged with an engaging part of the lid body and slid in the spaces, in a state that the lid body is provided on the top cover at a
15 substantially vertical angle, to engage a damper shaft of the impact damper with the damper shaft receiving holes. An end part of the damper holding body opposite to the engaging protrusion is fixed by a screw, and then, a lid hinge cover which covers the spaces is attached.

Thus, the lid body can be closed smoothly while suppressing collision
20 noise. Additionally, when the lid body is opened, the resistance force of the impact damper is reduced by the energizing force of the spring hinge. Hence, the lid body can similarly be opened smoothly while suppressing collision noise.

Moreover, since the damper holding body can be fixed temporarily at

the time of assembly, productivity can be improved. In addition, since damper holding body is firmly fixed to the lid body, deformation and breakage by impact force from rotary motion of the damper can be suppressed, and reliability can be improved.

5 Additionally, the present invention includes: a top cover placed on an upper part of a washing machine body; a lid body axially supported above the top cover in an openable manner by a lid hinge shaft; a lid spring that energizes the lid body to the opening direction; a spring shaft that supports the lid spring; a rotational impact damper that damps rotation of the lid body; and
10 a damper holding body that accommodates the impact damper. Additionally, the damper holding body includes an attachment rib for fixing with the lid body by a screw or the like, and a positioning rib in substantially the opposite direction of the attachment rib, and the lid body has an attachment part attached with the attachment rib by the screw or the like, and a groove into

With this configuration, since the force acting on the impact damper at the time of closing the lid can be received on the attachment rib and the positioning rib, deformation and breakage of the lid or the damper can be prevented.

5 Additionally, the present invention includes: a casing; an upper frame body that is attached to an upper part of the casing and has, in a substantially center part of the casing, a laundry loading port for loading and unloading laundry; and a lid body that is rotationally provided in the upper frame body and openably covers the laundry loading port. Additionally, a lid hinge shaft is
10 provided behind the lid body, a hinge part that supports rotation of the lid body is formed in a rear part of the upper frame body, a bearing that receives the lid hinge shaft is provided in the hinge part, a sheet metal is fixed by a fixing member behind the lid body, and the sheet metal includes a bent portion bent substantially vertically by a bending process. Moreover, a through hole is
15 formed in the bent portion, a spring shaft that axially supports a spring hinge energizing the lid body in an opening direction is inserted into the through hole, and the fixing member is positioned on both axial ends of the spring shaft.

With this configuration, the spring shaft can be kept from falling off the spring hinge by a simple configuration, and assembly of the lid body and
20 the upper frame body can be facilitated.

INDUSTRIAL APPLICABILITY

As has been described, the washing machine of the present invention can suppress occurrence of collision noise when a lid body is opened, enables
25 smooth opening and closing, can improve reliability of the lid body structure, and can improve productivity. Hence, the invention is applicable to other electronic equipment having a lid body.

REFERENCE MARKS IN THE DRAWINGS

	1: washing machine body
	2: top cover
5	3: lid body
	5: lid upper body
	6: lid lower body
	6a, 90: space
	12: spring hinge
10	13, 77, 135: lid hinge shaft
	18: damper holding body
	18a: hooking protrusion
	19: impact damper
	19a, 85: damper shaft
15	20, 94: self-tapping screw
	22: groove part
	24: lid hinge bearing
	30: laundry loading port
	31: lid hinge portion
20	51: washing machine body
	52: top cover
	53: lid body
	58: lid main body
	59: lid lower frame body
25	66: groove
	69: lid spring
	72: impact damper

	73: damper receiving structure
	74: substantially Y-shaped receiving portion
	76: top cover reinforcement plate
	79: lid reinforcement plate
5	80: spring shaft
	81: damper holding body
	86: protrusion
	87: opening
	88: attachment rib
10	89: positioning rib
	111: body (casing)
	125: upper frame body
	126: laundry loading and unloading port (laundry loading port)
	127: lid body
15	136: spring hinge
	137: spring shaft
	138: sheet metal
	139: screw (fixing member)
	140: bent portion
20	

CLAIMS

1. A washing machine comprising:

a top cover placed on an upper part of a washing machine body;

a laundry loading port formed in the top cover;

5 a lid body openably covering the laundry loading port;

a rotational impact damper that damps rotation of the lid body axially supported to the top cover, and

a spring hinge that is attached to the lid body and energizes the lid body in an opening direction, wherein

10 the impact damper is held by a damper holding body,

the lid body is attached to the top cover in a state that, one end of the spring hinge which projects downward substantially vertically is inserted into a spring insertion hole formed in the top cover, and the lid body has a space in each of right and left sides,

15 the top cover has lid hinge bearings installed therein, and the lid hinge bearings have damper shaft receiving holes on the right and left positions corresponding to the spaces, and

a hooking protrusion of the damper holding body holding the impact damper is engaged with an engaging part of the lid body and slid in the spaces
20 in a state that the lid body is provided on the top cover at a substantially vertical angle, to engage a damper shaft of the impact damper with the damper shaft receiving holes, and an end part of the damper holding body opposite to the engaging protrusion is fixed by a screw, and then, a lid hinge cover which covers the spaces is attached.

25

2. The washing machine according to claim 1, wherein the engaging part is a groove part.