

DESCRIPTION

WASHING MACHINE

5 TECHNICAL FIELD

The present invention relates to a washing machine having a lidded fabric softener loading port in a rotating drum that rotates.

BACKGROUND ART

10 In a conventional washing machine, fabric softener is automatically introduced in a final rinse cycle by making use of centrifugal force generated by rotation of a wash tank in an intermediate spin-dry cycle.

The conventional washing machine is described below. FIG. 4 is a cross-sectional view of a conventional washing machine. Lint-removal
15 water-circulation channel 10 and water spray nozzle water-circulation channel 11 are provided from pump chamber 12, located at an outer periphery of underside blades 6 of pulsator 5 which serves as an impeller, up to a top portion of rotating drum 4, and have top portions provided with a removable lint filter 13 and water spray nozzle 14, respectively. Drain
20 valve 15 drains wash water from an inside of water tank 3, and water supply valve 16 supplies water to the inside of water tank 3. Lid 18 is openably provided to upper frame member 17 which makes up a top portion of washing machine outer frame 1. Furthermore, fluid balancer 20 is provided in the top portion of rotating drum 4 in order to reduce vibration during
25 spin-drying, and automatic fabric softener dispenser 21 is provided to fluid balancer 20.

Since rotating drum 4 stops at an arbitrary position when the

preceding round of operations ends, it is not possible to determine the stopping position of automatic fabric softener dispenser 21 and fabric softener case 22, which are provided on an inner face-side of fluid balancer 20. As such, a phenomenon described below can occur when operation is
5 started in a state where fabric softener case 22 stops in the vicinity of feed-water inlet 16a and dry wash items 24 are loaded inside rotating tub 4 up to the vicinity of opening 20a of fluid balancer 20. In other words, when tap water is supplied from feed-water inlet 16a, there are cases where, depending on the state of loading of wash items 24, wash items 24 cause part
10 of the tap water to splash onto automatic fabric softener dispenser 21 and enter fabric softener case 22 via fabric softener loading port 23 of fluid balancer 20. When this happens, the water and the fabric softener that is inside fabric softener case 22 mix during the supplying of water, the concentration of the fabric softener deteriorates, and thus causing a problem
15 of not being able to obtain a certain performance from the fabric softener in the final rinse cycle.

In view of this, the conventional washing machine includes a fabric softener loading port provided to fluid balancer 20 and connected with automatic fabric softener dispenser 21, and a fabric softener loading port lid
20 that covers the opening of the fabric softener loading port; and axle sockets that allow the fabric softener loading port lid to rotate are provided in the vicinity of a top portion of the opening of the fabric softener loading port.

FIG. 5 is a cross-sectional view of a fabric softener loader in a conventional washing machine; FIG. 6A is a perspective view of a loading
25 port lid of the fabric softener loader in the conventional washing machine; FIG. 6B is a perspective view of the fabric softener loader in the conventional washing machine; and FIG. 6C is a perspective view of a top portion of a fluid

balancer in the conventional washing machine.

Loading port lid 33 and axles 35 run in an approximate straight line from an axle center in the cross-sectional direction. Axle sockets 34 accept axles of loading port lid 33 that are rotatably provided in the top face of fluid
5 balancer 31, and are formed at two locations as shown in FIG. 6C. Axles 35 are formed at 2 locations, that is, at left and at right of loading port lid 3, so as to sandwich loading port lid 33 and interfit with corresponding axle sockets 34,. The interfitting of axle sockets 34 and axles 35 allows attached loading port lid 33 to rotate freely and thus allows opening and closing of
10 fabric softener loading port 32.

With this, an effect described below can be obtained even in a state where the fabric softener loading port stops in the vicinity of a feed-water inlet and dry wash items are loaded inside the rotating drum up to the vicinity of an opening of fluid balancer 31, in a water supply or wash cycle
15 after the start of operation.. Specifically, even if the wash items cause part of the water to splash onto the fabric softener loading port, entry of water into fabric softener loading port 32 can be prevented by loading port lid 33. As such, mixing of the water and the fabric softener that is inside automatic fabric softener dispenser 36 and deterioration of the concentration of the
20 fabric softener can be suppressed.

However, in the case of a configuration in which loading port lid 33 rotates about axels 35, there are instances where lint, fabric softener, and so on, adhere to axle sockets 34 and axles 35, and thus loading port lid 33 cannot fully close. If a user does not close loading port lid 33 and starts
25 washing with loading port lid 33 left open at a perpendicular angle, loading port lid 33 spins in a vertically open state together with the rotating drum. In particular, loading port lid 33 is provided in the top portion of fluid

balancer 31 which rotates at high speed. As such, there is a possibility of contact with a water tank (illustrated as water tank 3 in FIG. 4) or an upper frame member provided above fluid balancer 31 due to vibration during high-speed rotation. In particular, when loading port lid 33 has a planar shape, there is a problem that loading port lid 33 tends to remain vertically open, and axles 35, and so on, break easily when force is applied from the vertical direction.

Citation List

10 Patent Literature

PTL 1: Japanese Unexamined Patent Application Publication No. 07-328277

PTL 2: Japanese Unexamined Patent Application Publication No. 2012-81042

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SUMMARY OF THE INVENTION

A washing machine according to the present invention includes a main body; a water tank supported inside the main body; a rotating drum supported rotatably inside the water tank; a balancer provided at a top portion of the rotating drum, and to which a fabric softener loader is provided; and a drive device that rotates the rotating drum. Furthermore, the fabric softener loader includes: a fabric softener loading port provided in the balancer; a loading port lid that covers the fabric softener loading port; and an axle that openably supports the loading port lid. In addition, the loading port lid has a first face and a second face, the first face having the axle at one end, the second face being located on a different plane from the first face.

Accordingly, with the positional relationship between the loading port lid and the axles, the center of the axles and weight and balance of the loading port lid when the cross-sectional direction is taken as reference, act to generate a moment of force when the loading port lid is opened, and thus
5 vertical standing of the loading port lid can be prevented.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a lateral cross-sectional view of a washing machine according to an embodiment of the present invention.

10 FIG. 2 is a lateral cross-sectional view of a fluid balancer and a loading port lid of a washing machine according to an embodiment of the present invention.

FIG. 3A is a perspective view of an external appearance of a loading port lid of a washing machine according to an embodiment of the present
15 invention.

FIG. 3B is a perspective view of an external appearance of a fluid balancer and a loading port lid of a washing machine according to an embodiment of the present invention.

FIG. 4 is a cross-sectional view of a conventional washing machine.

20 FIG. 5 is a lateral cross-sectional view of a fluid balancer and a loading port lid of the conventional washing machine.

FIG. 6A is a perspective view of an external appearance of a loading port lid of a conventional washing machine.

FIG. 6B is a perspective view of an external appearance of a loading
25 port of a conventional washing machine.

FIG. 6C is a perspective view of an external appearance of a fluid balancer and a loading port lid of a conventional washing machine.

DESCRIPTION OF EMBODIMENT

Hereinafter, a washing machine according to an embodiment of the present invention will be described with reference to drawings. It should be
5 noted that the present invention is not limited by this embodiment.

EMBODIMENT

FIG. 1 is a lateral cross-sectional view of a washing machine according to an embodiment of the present invention; FIG. 2 is a lateral cross-sectional view of a fluid balancer and a loading port lid of a washing
10 machine according to an embodiment of the present invention; FIG. 3A is a perspective view of a fabric softener loading port lid of a washing machine according to an embodiment of the present invention; and FIG. 3B is a perspective view of a top portion of a fluid balancer of a washing machine according to an embodiment of the present invention.

15 Hereinafter, this embodiment will be described with reference to the drawings.

Main body 41 of a fully automatic washing machine internally supports water tank 43, in a suspended and vibration-preventing manner, by a using suspension 42. A vertically disposed rotating drum 44 is rotatably
20 contained inside water tank 43. A sidewall of rotating drum 44 is provided with through-holes 45 through which water from laundry exits to outside of rotating drum 44 during spin-drying. Fluid balancer 46, which reduces vibration during spin-drying, is provided in a top portion of rotating drum 44. Pulsator 47, which serves as an agitator that agitates the laundry through
25 rotational force, is disposed in a central bottom portion of rotating drum 44. Gear unit device 48 and motor 49, which is a drive device, are attached to a bottom portion of water tank 43, and each transmits motive power to

wash/spin-dry axle 51 via belt 50.

Gear unit device 48 transmits the motive power of motor 49 to wash/spin-dry axle 51 and pulsator 47 via belt 50, thereby generating a current in wash water inside rotating drum 44 and thus moving the laundry.

5 Washing is executed as described above. Likewise, during spin-drying, the motive power of motor 49 is transmitted as rotation via wash/spin-dry axle 51 thereby causing rotating drum 44 to rotate, and spin-drying is executed through moisture separation from laundry caused by centrifugal force.

Furthermore, automatic fabric softener dispenser 61 is provided on
10 the center-side of fluid balancer 46 at the top portion of rotating drum 44.

FIG. 3A illustrates loading port lid 53, FIG. 3B illustrates fluid balancer 46 and loading port lid 53, and configurations therein will be described. Axle sockets 54a and 54b of loading port lid 53 are provided in a top portion of fluid balancer 46. Axles 55 provided to loading port lid 53
15 interfit with corresponding axle sockets 54. Axles 55 are formed at two locations, at left and right, to sandwich first face 56a which serves as an axle face portion of loading port lid 53. The interfitting of axle sockets 54 and axles 55 allows loading port lid 53 thus attached to rotate freely in the radial direction of fluid balancer 46, and thus allows opening and closing of fabric
20 softener loading port 52 illustrated in FIG. 2.

When the user holds end portion 53a, which is disposed on the side of loading port lid 53 opposite axles 55, and turns loading port lid 53 toward the center of rotating drum 44, fabric softener loading port 52 of loading port lid 53 opens. When the user turns loading port lid 53 in a direction opposite
25 the center of rotating drum 44, fabric softener loading port 52 of loading port lid 53 closes. Furthermore, loading port lid 53 interfits with axle sockets 54 by being inserted from above axle sockets 54. As such, loading port lid 53 is

removable.

Loading port lid 53 has two bend portions, first face 56a which is the axle face portion, and second face 56b which is a closing portion. Furthermore, loading port lid 53 has a center of gravity that is not on a straight line connecting axles 55 and end portion 53a. First face 56a has, at an end portion, axles 55. Second face 56b has, on one side, end portion 53a, and is located on a different plane from first face 56a. In this manner, the center of gravity of loading port lid 53 can be offset to second face 56b which is the closing portion, through a simple configuration.

Drain valve 71 drains wash water that is inside water tank 43, and water supply valve 70 supplies water to the inside of water tank 43. Lid 58 is openably provided to an upper frame member making up a top portion of main body 41, and controller 59 is provided at the front of the upper frame member.

Operation of the fully automatic washing machine configured as described above will be described.

The user opens lid 58 to load wash items such as clothes into rotating drum 44. When power supply to the washing machine is turned ON and a start button (not illustrated) is pushed, motor 49 causes rotating drum 44 to rotate forwardly and reversely, and an amount of the wash items (not illustrated) is detected. Subsequently, the required amount of detergent is displayed on an operation unit (not illustrated), and the user puts in detergent at a predetermined location (inside rotating drum 44 is also acceptable). Loading port lid 53 is opened, and a certain amount of fabric softener is inserted from fabric softener loading port 52. Subsequently, loading port lid 53 is closed, and, in addition, closing of lid 58 causes a predetermined amount of tap water to be supplied to the inside of rotating

drum 44 from a feed-water inlet via water supply valve 70.

When the predetermined amount of tap water is supplied, pulsator 47 rotates forwardly and reversely, thereby performing a wash cycle for washing the wash items.

5 When the wash cycle of a predetermined duration ends, a rinse cycle for extracting the detergent and dirt from the wash items is started. First, in the rinse cycle, the wash water inside the water tank 43 is drained out of the washing machine through drain valve 71. Then, when the wash water is drained, rotating drum 44 rotates at high speed (for example, 300 rpm),
10 thereby performing a first spin-dry cycle (intermediate spin-dry cycle).

 When the first spin-dry cycle ends, tap water is again supplied via water supply valve 70, and pulsator 47 rotates forwardly and reversely, thereby performing a first agitation cycle that rinses the wash items. When the first agitation cycle of a predetermined duration is performed, a first
15 rinse cycle ends, and operation transitions to a second rinse cycle. In the second rinse cycle, when the wash water inside water tank 43 is drained out of the washing machine, a second spin-dry cycle (intermediate spin-dry cycle) is performed. At this time, rotation speed of rotating drum 44 is, for example, 300 rpm. Then, tap water is supplied and a second agitation cycle
20 is performed. When the second agitation cycle of a predetermined duration is performed, the second rinse cycle ends.

 Subsequently, the operation transitions to a third spin-dry cycle, and the wash water inside water tank 43 is drained. In the third spin-dry cycle (final spin-dry cycle), for example, the rotation speed of rotating drum 44 is
25 800 rpm, and rotating drum 44 rotates at high speed.

When the third spin-dry cycle is performed, the operation ends.

Hereinafter, automatic fabric softener dispenser 61 will be described.

As described below, the fabric softener that is inserted from fabric softener loading port 52 is supplied to the wash water during the rinse cycle by making use of the centrifugal force generated by the rotation of rotating drum 44, and is used when agitated. Therefore, by making use of the centrifugal force in the intermediate spin-dry cycles performed up to the time of the rinse cycle, it is structurally possible to automatically introduce the fabric softener.

Automatic fabric softener dispenser 61 has plural partition walls and, because the rotation speed of rotating drum 44 during normal agitation is low and the centrifugal force generated as a result is weak, the partition walls causes the fabric softener to be held in partitioned chambers. With the centrifugal force generated by the high-speed rotation of rotating drum 44 during the spin-dry cycle, the fabric softener goes over the partition wall of a chamber where it is currently held and migrates to another chamber.

Likewise, in the next cycle, the fabric softener that has migrated to another chamber cannot go over the partition wall with the normal agitation, but with the centrifugal force generated by the high-speed rotation of rotating drum 44 during the next spin-dry cycle, the fabric softener goes over the partition wall of the chamber where it is currently held and migrates to yet another chamber. Although the chamber into which the fabric softener has migrated is directly connected to rotating drum 44 beyond a passage of a predetermined length, the fabric softener clings to a wall face of the chamber due to the centrifugal force generated during the spin-dry cycle, and remains in the chamber. Then, at the time of the second rinse cycle, the fabric softener goes from the chamber at which it has remained and drops into rotating drum 44 via the passage, thereby being supplied automatically to the wash water.

In this manner, dispersal of the fabric softener into the wash water is delayed for a period from after loading up to the rinse cycle. Because of this configuration, loading port lid 53 is provided in order to prevent events that would hinder the above-described action, such as water entering fabric
5 softener loading port 52 when water is supplied, and so on.

From the perspective of user convenience, the location at which loading port lid 53 is provided is the top portion of rotating drum 44 which performs high-speed rotation during a spin-drying operation, and loading port lid 53 has a rotation configuration which allows for opening and closing
10 by upward and downward manipulation of second face 56b which is the closing portion which directly blocks fabric softener loading port 52. Since fabric softener loading port 52 is provided in such a location, dust, lint, detergent residue, fabric softener, and so on, easily accumulate in axles 55, and thus there are cases where rotation of axles 55 of loading port lid 53 is
15 hindered. Furthermore, there are cases where the user starts the washing without fully closing loading port lid 53.

When the spin-dry cycle is started in such a state, the high-speed rotation of rotating drum 44 causes loading port lid 53 to spin together with fluid balancer 46. At this time, when loading port lid 53 is in the shape of a
20 flat plate, and end portion 53a, the center of gravity, and axles 55 of loading port lid 53 are on the same plane as is conventional, loading port lid 53 spins while standing vertically from axles 55. At this time, rotating drum 44 vibrates and sways significantly due to resonance, and may come into contact with a component located above fluid balancer 46. The component
25 located above is, for example, upper frame member 41a, a water supplying unit, water tank 43, and so on. If, at this time, the vertically standing loading port lid 53 should vertically contact the component located above,

loading port lid 53, which is a plate-like component made of resin, may be damaged.

In view of this, the present invention adopts a configuration that prevents vertical standing of loading port lid 53, and causes loading port lid 53 to normally lean toward the top portion of fluid balancer 46. Specifically, the location of the center of gravity of loading port lid 53 is offset to a location that is not on the plane connecting end portion 53a and axles 55 of loading port lid 53. Accordingly, loading port lid 53 becomes unstable in a vertically standing state, and thus a state in which loading port lid 53 projects vertically upward is eliminated, and component damage due to contact, tearing of laundry due to damaged components, and so on, can be reduced.

Even if loading port lid 53 and the component located above comes into contact, a force from above would act on the loading port lid in a direction that causes the loading port lid to fall open or fall shut because end portion 53a of loading port lid 53 is not in the vertical direction with reference to axles 55 due to the offsetting of the center of gravity of loading port lid 53. Therefore, damage to loading port lid 53 can be prevented.

More specifically, loading port lid 53 has step 57 formed between axles 55 and second face 56b which is the closing portion. Step 57 has first face 56a which is the axle face portion, second face 56b which is the closing portion, and connecting portion 56c (third face). Taking the cross-sectional direction as reference, step 57 causes the center of gravity of loading port lid 53 to be located further toward the center of rotating drum 4 than a plane connecting the axle center of axles 55 and end portion 53a is. In other words, end portion 53a is located further outward than a plane connecting axles 55 and the center of gravity is, and thus loading port lid 53 tends to fall shut. Therefore, damage to loading port lid 53 can be prevented, and

entrance of water into fabric softener loading port 52 can be further prevented.

In addition, when second face 56b stands vertically, the center of gravity of loading port lid 53 is located further toward the center-side of fluid balancer 46 than axles 55 are, thus creating an open state. In this embodiment, a component for opening and closing loading port lid 53 in the horizontal direction is not provided, and thus loading port lid 53 opens until second face 56b comes in to contact with the center-side face of fluid balancer 46. In such a state, it is unlikely that an external force will be applied to loading port lid 53 from above. Furthermore, in the case of an external force from below, such as when coming into contact with wash items such as clothes, axles 55 are dislodged from sockets 54, and thus damage to loading port lid 53 can be prevented.

As described above, according to this embodiment, with the positional relationship between the loading port lid and the axles, the center of the axles and the weight and balance of the loading port lid when the cross-sectional direction is taken as reference, act to generate a moment of force when the loading port lid is moved upward, and thus vertical standing can be prevented. Therefore, even if the loading port lid and the water tank come into contact, only a force in a direction that closes or opens the loading port lid acts on the loading port lid, and thus damage to the loading port lid can be prevented.

In addition, the center of gravity of the loading port lid can be offset by merely changing the shape of the loading port lid, and thus the possibility of damage to the loading port lid can be reduced through a simpler configuration.

It should be noted that the configuration of loading port lid 53 is not

limited to this embodiment. Specifically, step 57 need not be formed, and it is sufficient that the center of gravity of the loading port lid is offset to a degree in which the loading port lid falls over during spin-drying. For example, the thickness of the loading port lid may be changed or the loading port lid 53 may have a curved configuration.

Furthermore, if only prevention of damage to loading port lid 53 is aimed at, the location of the center of gravity may be designed such that end portion 53a of loading port lid 53 falls over toward the center of rotating drum 44.

As described above, the washing machine according to the present invention includes a main body; a water tank supported inside the main body; a rotating drum supported rotatably inside the water tank; a balancer provided at a top portion of the rotating drum, and to which a fabric softener loader is provided; and a drive device that rotates the rotating drum. Furthermore, the fabric softener loader includes: a fabric softener loading port provided in the balancer; a loading port lid that covers the fabric softener loading port; and an axle that openably supports the loading port lid. In addition, the loading port lid has a first face and a second face. Here, the first face has the axle at one end, and the second face is located on a different plane from the first face.

Accordingly, with the positional relationship between the loading port lid and the axles, the center of the axles and weight and balance of the loading port lid when the cross-sectional direction is taken as reference, act to generate a moment of force when the loading port lid is moved upward during high-speed rotation of the rotating drum, and thus vertical standing can be prevented. Therefore, even if the loading port lid and the water tank come into contact, only a force in a direction that closes or opens the loading

port lid acts on the loading port lid, and thus damage to the loading port lid can be prevented.

Furthermore, the present invention is configured so that the loading port lid has a center of gravity located outside a plane connecting the axle and an end portion of the second face. Accordingly, the center of gravity of the loading port lid can be offset by merely changing the shape of the loading port lid, and thus the possibility of damage to the loading port lid can be suppressed through a simpler configuration.

Furthermore, the present invention is configured so that the center of gravity of the loading port lid is located further toward a center-side of the balancer than the plane connecting the axle and the end portion of the second face is. Accordingly, the end portion of the loading port lid falls shut, thus inhibiting the entrance of water to the fabric softener loading port.

15 INDUSTRIAL APPLICABILITY

As described above, the washing machine according to the present invention prevents the vertical standing of the loading port lid, and is thus useful as a washing machine that includes a high-speed rotating mechanism.

20 REFERENCE MARKS IN THE DRAWINGS

3, 43 water tank

4, 44 rotating drum

5, 47 pulsator

6 underside blades

25 10 lint-removal water-circulation channel

11 water spray nozzle water-circulation channel

12 pump chamber

	13	lint filter
	14	water spray nozzle
	15, 71	drain valve
	16, 70	water supply valve
5	16a	feed-water inlet
	17, 41a	upper frame member
	18	lid
	20, 31, 46	fluid balancer
	20a	opening
10	21, 36, 61	automatic fabric softener dispenser
	22	fabric softener case
	23, 32, 52	fabric softener loading port
	24	wash items
	33	loading port lid
15	34	axle sockets
	35	axles
	41	main body
	42	suspension
	45	through-holes
20	48	gear unit device
	49	motor
	50	belt
	51	wash/spin-dry axle
	53	loading port lid
25	53a	end portion
	54, 54a, 54b	axle sockets
	55	axles

- 56a first face
- 56b second face
- 57 step
- 58 lid

CLAIMS

1. A washing machine comprising: a main body; a water tank supported inside the main body; a rotating drum supported rotatably inside the water tank; a balancer provided at a top portion of the rotating drum,
5 and to which a fabric softener loader is provided; and a drive device that rotates the rotating drum,

wherein the fabric softener loader includes: a fabric softener loading port provided in the balancer; a loading port lid that covers the fabric
10 softener loading port; and an axle that openably supports the loading port lid, and

the loading port lid has a first face and a second face, the first face having the axle at one end, the second face being located on a different plane from the first face.

2. The washing machine according to claim 1,
wherein a center of gravity of the loading port lid is located outside a plane connecting the axle and an end portion of the second face.

3. The washing machine according to claim 2,
wherein the center of gravity of the loading port lid is located further toward a center-side of the balancer than the plane connecting the axle and the end portion of the second face.