

DESCRIPTION

WASHING MACHINE

5 TECHNICAL FIELD

The present invention relates to a washing machine which includes a water injection device which supplies water to a washing tub and loads a washing aid agent such as a detergent or a softening agent on the washing tub.

10 BACKGROUND ART

A washing machine in the related art includes a water injection device which accommodates a detergent case into which a detergent is loaded before a user starts a washing operation and a water injection case which is connected to a water supply or the like so as to supply water (for example, refer to PTL 1).

15 Hereinafter, the water injection device of the washing machine of the related art will be described with reference to FIGS. 9 and 10.

First, the configuration of the washing machine of the related art will be described with reference to FIG. 9. FIG. 9 is a view showing a cross-section of a side surface of a main portion in the washing machine of the related art.

20 As shown in FIG. 9, the washing machine of the related art includes water tub 102 inside main body 101. Washing tub 103 is disposed inside water tub 102. Washing tub 103 includes multiple water passage holes 103b on the side wall thereof and pulsator 104 which stirs laundry on the bottom portion thereof. Washing tub 103 functions as a spin-drying tub which rotates
25 at a high speed in a spin-drying step.

Motor 105 is disposed on the lower portion of main body 101. Motor 105 rotationally drives washing tub 103 and pulsator 104 via transmission

mechanism 106.

Main body 101 includes upper frame 107 on the upper portion thereof. Upper frame 107 includes an opening at the center thereof, and includes lid 108 which opens and closes the opening. A user loads and unloads laundry
5 into/from washing tub 103 via the opening. Upper frame 107 includes control device 109 and operation display unit 109a on the front portion thereof, and includes water injection device 110 on the rear portion thereof. Control device 109 performs a series of washing operations such a washing step, a rinsing step, a spin-drying step, or the like while controlling the series of washing operations.
10 When a user sets the washing operations, the user operates operation display unit 109a to input the washing operations thereto. Water injection device 110 supplies a detergent, a washing water, or the like to washing tub 103.

Next, the configuration of the water injection device of the washing machine will be described with reference to FIG. 10. FIG. 10 is an exploded
15 perspective view showing the water injection device of the washing machine of the related art.

As shown in FIG. 10, water injection device 110 is formed on the center of lower surface cover 111 which covers the lower surface of the rear portion of upper frame 107 of main body 101. Electrical components such as vibration
20 detection devices (not shown) are disposed on both sides of water injection device 110 of lower surface cover 111.

Water injection device 110 includes detergent case 112, water supply valve 113, water injection case 114, or the like. The detergent loaded by a user is accommodated in detergent case 112 before the operation of the washing
25 machine starts. Water supply valve 113 includes connection port 113a, and connection port 113a is connected to a water supply pipe or the like via a hose or the like. Water injection case 114 holds detergent case 112, and an

injection water passage, through which water is injected into detergent case 112, is formed in water injection case 114. Water injection case 114 includes an opening on the front portion, and holds detergent case 112 so as to be freely taken in and out horizontally.

5 Water injection case 114 includes lower water injector 114a which configures the lower portion of water injection device 110, and upper water injector 114b which covers the upper portion thereof.

Lower water injector 114a includes bottom surface wall 114c which has a water injection port, upper water supply port 115a, lower water supply port 10 115b, or the like. Upper water supply port 115a supplies only tap water to washing tub 103. Lower water supply port 115b supplies tap water mixed with a detergent to washing tub 103.

Lower water injector 114a and upper water injector 114b are fixed to each other by welding, and form an injection water passage which 15 communicates with water supply valve 113.

In this way, water injection device 110 is configured.

Next, the operation and effects of water injection device 110 will be described.

First, control device 109 opens and closes water supply valve 113 based 20 on the washing operation set by a user. In this case, in the washing step, tap water is directly supplied from upper water supply port 115a into washing tub 103. Simultaneously, the tap water is supplied from lower water supply port 115b to washing tub 103 while being mixed with a detergent by flowing in detergent case 112. In the rinsing step, tap water is supplied from upper 25 water supply port 115a and lower water supply port 115b to washing tub 103. In this case, since the detergent in detergent case 112 has flowed out previously, only the tap water is supplied from lower water supply port 115b to washing

tub 103.

Next, a configuration and operation of a water injection device according to another example of the washing machine of the related art will be described with reference to FIG. 11 (for example, refer to PTL 2).

5 FIG. 11 is a perspective view showing the water injection device according to this another example of the washing machine of the related art.

As shown in FIG. 11, water injection device 121 according to this another example includes aid-agent case 124, flowing water port 125, water injection port 126, gap 127, or the like. Aid-agent case 124 includes aid-agent
10 loading portion 123 which loads washing aid agent 122 such as a liquid detergent, a rinse agent, or a finishing agent. Aid-agent case 124 is accommodated in water injection device 121 so as to be extractable from the inside thereof. Flowing water port 125 allows tap water to be injected into washing tub through aid-agent case 124. Water injection port 126 injects tap
15 water into aid-agent case 124. Gap 127 is provided on the extraction side of aid-agent case 124.

In water injection device 121 having the above-described configuration, in a case where an injection speed of the tap water supplied from water injection port 126 is fast, an aid-agent liquid (washing water) including
20 washing aid agent 122 overflowing from aid-agent loading portion 123 overflows from gap 127 to the front side of flowing water port 125. Accordingly, the aid-agent liquid is prevented from overflowing to the right side, the left side, or the rear side of aid-agent case 124. As a result, it is possible to supply washing aid agent 122 to the washing tub while preventing the vicinity of
25 water injection device 121 from being contaminated due to the aid-agent liquid.

However, in the configuration of water injection device 110 disclosed in PTL 1, lower water injector 114a and upper water injector 114b are fixed to

each other by welding. Accordingly, if there is a portion which is not completely bonded in the welded portions, water leaks out from a gap of a defectively welded portion when water is supplied from water supply valve 113. The overflowed water may come into contact with an electric terminal of an electrical component such as water supply valve 113 of water injection device 110, or enter the inside thereof. Accordingly, there is a problem that an operation failure or a breakdown of a washing machine may occur.

In the configuration of water injection device 121 disclosed in PTL 2, the aid-agent liquid overflowing from aid-agent case 124 irregularly falls from the front end to flowing water port 125. Accordingly, the falling water is scattered to the outside of the washing tub, and there is a problem that the quality of the appearance of the washing machine deteriorates due to attachment of washing aid agent 122 or the like.

Citation List

Patent Literature

PTL 1: Japanese Patent Unexamined Publication No. 2014-033837

PTL 2: Japanese Patent Unexamined Publication No. 11-042392

SUMMARY

Embodiments of present disclosure provide a washing machine in which a water injection case of a water injection device is integrally formed, water leakage from the water injection device is prevented, and occurrence of operation failures or the like is prevented.

That is, a washing machine of a first aspect of the present disclosure includes a washing tub which is provided inside a main body, a water injection device which supplies water to the washing tub, and a control

device which performs a

washing operation. The water injection device includes an accommodation case into which a washing aid agent is loaded, a water injection case which has an opening on a front portion of the water injection case, is integrally formed, and holds the accommodation case so as to be freely taken in and out, and a
5 flow regulator which is disposed inside the water injection case and forms an channel. The water injection device further includes a first water injector which communicates with the flow regulator, a first water supply valve which communicates with the first water injector, a second water injector which is provided in the water injection case and injects water into the accommodation
10 case; and a second water supply valve which communicates with the second water injector wherein the first water injector is provided on at least one of a right side or a left side of the accommodation case on a rear side of the accommodation case, and wherein the flow regulator is provided on the rear side of a bottom portion of the accommodation case, and includes an outlet
15 portion at substantially a center of the accommodation case.

According to another aspect, there is a washing machine comprising a washing tub which is provided inside a main body;
a water injection device which supplies water to the washing tub; and
20 a control device which performs a washing operation,
wherein the water injection device includes:
an accommodation case into which a washing aid agent is loaded;
a water injection case which has an opening on a front portion of the water injection case, is integrally formed, and holds the accommodation case so as to
25 be freely taken in and out;
a flow regulator which is disposed inside the water injection case and forms a channel;

a first water injector which communicates with the flow regulator;
a first water supply valve which communicates with the first water injector;
a second water injector which is provided in the water injection case and injects
water into the accommodation case; and
5 a second water supply valve which communicates with the second water
injector,
wherein the second water injector is provided to inject, into the accommodation
case, only a portion of water supplied via the second water supply valve.

10 According to this configuration, the water injection device includes the
water injection case which is integrally formed without using a fixing method
performed by bonding such as welding. Accordingly, occurrence of operation
failures or the like due to water leakage from the water injection device is
prevented, and it is possible to improve reliability of the washing machine.
15 Since a bonding step such as welding of the water injection case and a leakage
inspection step thereof are not required, it is possible to realize a reasonable
manufacturing operation having improved productivity.

BRIEF DESCRIPTION OF DRAWINGS

20 FIG. 1 is a view showing a cross-section of a side surface of a washing
machine according to an embodiment of the present invention.

FIG. 2 is a view showing a cross-section of a side surface of a main
portion of the washing machine according to the embodiment.

FIG. 3 is an exploded perspective view showing a water injection device
25 of the washing machine according to the embodiment.

FIG. 4A is a plan view of an accommodation case in a normal state of the washing machine according to the embodiment.

FIG. 4B is a plan view in a state where a cover is removed from the accommodation case of the washing machine according to the embodiment.

5 FIG. 5 is a sectional view taken along line 5-5 of FIG. 4A.

FIG. 6 is a sectional view taken along line 6-6 of FIG. 4A.

FIG. 7 is a view showing a cross-section when the water injection device of the washing machine in the embodiment is viewed from the front.

10 FIG. 8 is a perspective view when a flow regulator of the washing machine in the embodiment is viewed from the rear.

FIG. 9 is a view showing a cross-section of a side surface of a main portion of a washing machine in the related art.

FIG. 10 is an exploded perspective view showing the water injection device of the washing machine in the related art.

15 FIG. 11 is a perspective view of a water injection device according to another example of the washing machine in the related art.

DESCRIPTION OF EMBODIMENTS

Hereinafter, an embodiment of the present invention will be described with reference to the drawings. The present invention is not limited to the embodiment.

(Embodiment)

25 Hereinafter, a washing machine according to the embodiment of the present invention will be described with reference to FIG. 1.

FIG. 1 is a view showing a cross-section of a side surface of a washing machine according to the embodiment of the present invention.

As shown in FIG. 1, the washing machine of the present embodiment

includes main body 11 and water tub 13 inside main body 11. Water tub 13 is supported to be suspended by suspension 12 so as to prevent vibrations. Washing tub 15 is disposed inside water tub 13.

5 Washing tub 15 is shared with a spin-dry tub, and includes multiple water passage holes 16 on the side wall thereof. Fluid balancer 17 is disposed on the upper portion of washing tub 15, and pulsator (agitator) 18 is disposed on the bottom portion at the center.

Rotary shaft 14 has a hollow structure, is connected to transmission mechanism 19 having a biaxial structure, and rotates washing tub 15 or
10 pulsator 18. A reduction gear (not shown) and a switching clutch (not shown) of rotary shaft 14 operated when washing is performed, and a brake for stopping washing tub 15 when spin-drying is performed are built in transmission mechanism 19.

Motor 20 is attached to the bottom portion of water tub 13. Motor 20
15 includes motor-side pulley 21, and motor-side pulley 21 is connected to mechanism-side pulley 22 of transmission mechanism 19 via belt 23. Accordingly, power of motor 20 is transmitted to rotary shaft 14 to rotate washing tub 15 or pulsator 18.

Main body 11 includes upper frame 24 on the upper portion thereof.
20 Opening portion 25 through which laundry is load and unloaded by a user is provided on upper frame 24. Opening portion 25 is freely opened and closed by lid body 26.

Control device 36 is disposed on the rear portion of upper frame 24, controls electric components such as motor 20, and performs a series of washing
25 operations such as a washing step, a rinsing step, or a spin-drying step. Operation display unit 37 which displays setting conditions of a user or operation conditions of the washing machine is disposed on the upper portion of

control device 36.

As described above, the washing machine of the present embodiment is configured.

Hereinafter, the configuration of the water injection device of the washing machine according to the present embodiment will be described with reference to FIGS. 2 and 3.

FIG. 2 is a view showing a cross-section of a side surface of a main portion of the washing machine according to the embodiment. FIG. 3 is an exploded perspective view showing a water injection device of the washing machine according to the embodiment.

As shown in FIGS. 2 and 3, upper frame 24 of main body 11 includes lower surface cover 38 which covers the lower surface of the rear portion of upper frame 24. Lower surface cover 38 includes water injection case 31 which is formed on the center thereof and bosses which are provided on the right side and left side thereof. Water injection case 31 configures water injection device 39. Electric components (not shown) such as a vibration detection device for detecting unbalance of laundry are attached to the bosses. Lower surface cover 38 is attached to upper frame 24 from below.

Water injection device 39 is disposed to be positioned at the rear portion of opening portion 25, and is configured so as to be connected to an external water supply pipe via a hose, or the like. Water injection device 39 includes accommodation case 29 inside water injection case 31 formed in lower surface cover 38. Washing aid agent is loaded on accommodation case 29 by a user before the operation of the washing machine starts.

Water injection case 31 has an opening on the front portion thereof, and holds accommodation case 29 so as to be freely taken in and out horizontally via the opening. Flowing water surface 35 through which water or the like flows

is formed on the bottom surface of water injection case 31. Flowing water surface 35 is formed to be inclined downwardly from the rear side thereof to the front side, and is formed to be inclined downwardly from the right and left sides thereof to the center.

5 The above-described washing aid agent includes not only a detergent which is loaded in a washing step but also a softening agent, a finishing agent, or the like which is loaded in a rinsing step.

In the present embodiment, an example in which a washing aid agent for rinsing is used in the rinsing step is described.

10 Water injection device 39 of the present embodiment is configured as described above.

Hereinafter, the configuration of the accommodation case of the water injection device according to the present embodiment will be described with reference to FIGS. 4A to 6.

15 FIG. 4A is a plan view of the accommodation case in a normal state of the washing machine according to the embodiment. FIG. 4B is a plan view in a state where the cover is removed from the accommodation case. FIG. 5 is a sectional view taken along line 5-5 of FIG. 4A. FIG. 6 is a sectional view taken along line 6-6 of FIG. 4A.

20 Accommodation case 29 includes knob 29a provided on the front portion thereof, accommodation portion 29b, first boss 29c, cover 43, or the like. Accommodation portion 29b is formed to be recessed downwardly toward the center thereof, and holds the loaded washing aid agent. First boss 29c is formed in a tubular shape on the bottom portion of accommodation portion 29b,
25 and includes through port 29c1 in a vertical direction (direction perpendicular to a paper surface). First boss 29c has rib 29d which is vertically formed around first boss 29c.

Cover 43 covers accommodation portion 29b of accommodation case 29 and includes loading portion 43a which becomes a reference of the position at which a user loads the washing aid agent. Cover 43 further includes second boss 43b (refer to FIG. 5) which extends downwardly from the lower surface of the rear portion of loading portion 43a. Second boss 43b is disposed to be fitted to first boss 29c via rib 29d. In this case, in a state where gap S1 and gap S2 are provided on the upper end and the lower end inside second boss 43b, cover 43 is disposed to be supported by first boss 29c and peripheral wall 29e of accommodation portion 29b. Accordingly, siphon channel 44 through which water including the washing aid agent is discharged is formed by gap S1 and gap S2 between first boss 29c and second boss 43b, and through port 29c1 of first boss 29c.

Accommodation case 29 includes grooves 29f which communicate from the front portion of accommodation portion 29b to right and left outsides thereof. Through holes 29g which are opened to (communicate with) flowing water surface 35 are provided on right and left grooves 29f. In the case, preferably, through holes 29g are provided on rear wall 29h side of accommodation case 29 corresponding to the rear side into which accommodation case 29 is accommodated.

Accommodation case 29 has an inclination (refer to FIG. 5) which is formed in a smooth arc shape from rear wall 29h to the bottom surface of accommodation portion 29b. Accordingly, supplied water can smoothly flow.

As described above, accommodation case 29 of the present embodiment is configured.

Hereinafter, the detailed configuration of water injection device 39 of the present embodiment will be described using FIG. 7 with reference to FIG. 3.

FIG. 7 is a view showing a cross-section when the water injection device

of the washing machine in the embodiment is viewed from the front.

As shown in FIGS. 3 and 7, water injection case 31 of water injection device 39 includes three water injectors such as first water injector 31a, second water injector 31b, and third water injector 31c on the upper portion of the rear side of water injection case 31. First water injector 31a includes first water supply valve 28a. Second water injector 31b includes second water supply valve 28b. Third water injector 31c includes third water supply valve 28c.

For example, first water supply valve 28a and second water supply valve 28b are connected to an external water supply pipe (not shown) via a hose or the like, and supply a room-temperature (corresponding to a surrounding environment temperature) tap water to washing tub 15. For example, third water supply valve 28c is connected to a water heater (not shown), and supplies warm water or the like to washing tub 15.

In the present embodiment, for example, first water supply valve 28a and second water supply valve 28b are configured of a double water-supply valve which is integrally configured with respect to each other. In a case where the water heater is not present, the connection with respect to third water supply valve 28c is not required.

Water injection device 39 of the present embodiment is configured as described above.

Hereinafter, the configuration of flow regulator 42 of water injection device 39 in the present embodiment will be described using FIG. 8 with reference to FIGS. 2 and 7.

FIG. 8 is a perspective view when the flow regulator of the washing machine in the embodiment is viewed from the rear.

First, as shown in FIG. 7, first water injector 31a and third water injector 31c extends to the bottom portion inside water injection case 31, and

have opening 32a and opening 32b at positions at which openings 32a and 32b face each other in the vicinity of the bottom portion. Flow regulator 42 is disposed between opening 32a and opening 32b facing each other in the vicinity (refer to FIG. 2) of the innermost portion on the rear side of the bottom portion
5 of water injection case 31.

As shown in FIG. 8, flow regulator 42 includes inlet portions 42a which are provided on side walls of the right and left ends, partition portion 42b, outlet portions 42c, ribs 42d, or the like. Inlet portions 42a of right and left ends respectively communicate with opening 32a of first water injector 31a and
10 opening 32b of third water injector 31c. Outlet portions 42c are provided on both sides in a state where partition portion 42b formed at the center of flow regulator 42 is interposed therebetween. Multiple ribs 42d are provided inside the portions between inlet portions 42a and outlet portions 42c of flow regulator 42 such that water meanderingly flows.

As shown in FIG. 7, flow regulator 42 is combined to water injection case 31. Accordingly, flow regulator 42 forms two channels in which each of the flows of water supplied from first water injector 31a and third water injector 31c is direction-changed by 90° and is directed to the center of water injection case 31.
15

As shown in FIG. 2, second water injector 31b is disposed in the vicinity of the portion immediately above rear wall 29h of accommodation case 29 in a state where accommodation case 29 is accommodated in water injection case 31. In the present embodiment, second water injector 31b is disposed such that an approximately half of the opened hole area (opening area) thereof overlap
20 accommodation case 29.

As shown in FIG. 2, rear wall 29h of accommodation case 29 is disposed to be close to flow regulator 42. In this case, flow regulator 42 includes wall

surface shape 42f formed along the inclination of rear wall 29h. Accordingly, gap S3 having a predetermined size is formed between rear wall 29h and wall surface shape 42f of flow regulator 42.

Hereinafter, a channel through which water flows in water injection
5 device 39 having the above-described configuration will be described.

First, a channel through which water shown by arrow A in FIGS. 7 and 8 flows will be described.

Water shown by arrow A, which flows from first water supply valve 28a disposed on the right side of water injection case 31, passes through first water
10 injector 31a. The water passing through first water injector 31a flows from opening 32a of the right bottom portion of first water injector 31a to inlet portion 42a on right side of flow regulator 42. The water flowed into inlet portion 42a passes through the right channel of flow regulator 42 and reaches right outlet portion 42c.

15 Next, a channel through which water shown by arrow C flows will be described.

Water (warm water) shown by arrow C, which flows from third water supply valve 28c disposed on the left side of water injection case 31, passes through third water injector 31c. The water passing through third water
20 injector 31c flows from opening 32b of the left bottom portion of third water injector 31c to left inlet portion 42a of flow regulator 42. The water flowed in inlet portion 42a passes through the left channel of flow regulator 42 and reaches left outlet portion 42c.

In this case, the water shown by arrow A and arrow C reaching outlet
25 portion 42c of flow regulator 42 is meandered by rids 42d formed inside flow regulator 42 and flows in flow regulator 42. Accordingly, the supply pressure of the water reaching outlet portion 42c of flow regulator 42 decreases, and a

force of the water flow decreases. The water flowed from outlet portion 42c of flow regulator 42 flows out to the vicinity of substantially the center of flowing water surface 35 of water injection case 31. The water flowed out to the vicinity of substantially the center smoothly flows on flowing water surface 35,
5 and the water is supplied from front end 35a shown in FIG. 2 to washing tub 15. As a result, water is prevented from being scattered to the outside of washing tub 15.

Next, a channel through which water shown by arrow B in FIGS. 2 and 7 flows will be described.

10 Water shown by arrow B which flows from second water supply valve 28b passes through second water injector 31b. The water passing through second water injector 31b is divided into water flows of two directions shown by arrow B1 and arrow B2 by rear wall 29h of accommodation case 29 disposed in the vicinity of the portion immediately below second water injector 31b.

15 As shown in FIG. 2, the divided water flow shown by arrow B1 is directed to the outside (gap S3 side) of accommodation case 29 and spreads to the right and left sides. In this case, the water flow is regulated to be a smooth flow by gap S3 between flow regulator 42 having arc wall surface shape 42f and rear wall 29h of accommodation case 29. The water flowed on wall surface
20 shape 42f of flow regulator 42 flows out to flowing water surface 35 of water injection case 31, and is supplied from front end 35a of flowing water surface 35 to washing tub 15.

As shown in FIGS. 2, 5, and 6, the divided water flow shown by arrow B2 flows into accommodation portion 29b of accommodation case 29 along the
25 arc inclination of rear wall 29h of accommodation case 29. The water flowed into accommodation portion 29b swirly flows inside accommodation portion 29b, and passes through siphon channel 44 while being mixed with the washing aid

agent loaded on accommodation portion 29b before the operation of the washing machine starts. The water mixed with the washing aid agent flows out from accommodation case 29 to flowing water surface 35.

5 In a case where water shown by arrow B2 injected to accommodation case 29 is stopped, water remaining on accommodation case 29 is suctioned by Siphon effects of siphon channel 44.

Accordingly, the water remaining on accommodation case 29 almost flows out to flowing water surface 35 of water injection case 31. Accordingly, the loaded washing aid agent almost flows out.

10 The water shown by arrow B2 flowed out from accommodation case 29 to flowing water surface 35 combines with the water flow shown by arrow B1 which flows out to the outside of accommodation case 29. The combined water is supplied from front end 35a of flowing water surface 35 to washing tub 15.

That is, the water injected to accommodation case 29 of water injection 15 device 39 is only the water flow shown by arrow B2 which is supplied from second water injector 31b. In the present embodiment, only a portion of the water supplied from second water injector 31b is injected into accommodation case 29. Accordingly, an amount of water injected into accommodation portion 29b is limited, and it is possible to decrease the force of the water flow. As a 20 result, it is possible to prevent an aid agent including the washing aid agent or the like from overflowing or being scattered from accommodation case 29.

As described above, second water injector 31b is disposed to inject water to rear wall 29h of accommodation case 29 from above. Rear wall 29h of accommodation case 29 is formed to be inclined, and the inclined surface 25 receives the water injected from second water injector 31b. Accordingly, in a state where the injected water becomes a smooth water flow due to the inclination of rear wall 29h of accommodation case 29, the injected water stirs

the washing aid agent loaded on accommodation portion 29b of accommodation case 29. That is, the washing aid agent is not scattered due to a smooth water flow, and all the washing aid agent is stirred to be dissolved in the water. As a result, it is possible to prevent the washing aid agent from remaining on
5 accommodation case 29.

In general, when the washing machine is used, the washing aid agent having an amount equal to or more than an allowance amount may be loaded on accommodation case 29, or the water pressure of the water supply may be high and the amount of water injected to accommodation portion 29b may be
10 more than the assumed amount of the water. In this case, a water level becomes higher than loading portion 43a of cover 43 of accommodation case 29, and water overflows from cover 43.

However, according to accommodation case 29 of the present embodiment, the water overflowing from loading portion 43a flows into groove
15 29f of accommodation case 29. The water flowed into groove 29f is introduced into through holes 29g provided on the right and left sides of groove 29f, and falls on flowing water surface 35 of water injection case 31. Accordingly, the water overflowing from loading portion 43a is prevented from reaching the outer portion of accommodation case 29. As a result, it is possible to prevent
20 occurrence of contamination of accommodation case 29 due to the washing aid agent mixed with water in advance.

According to accommodation case 29 of the present embodiment, through holes 29g are provided in the vicinities of rear wall 29h side of right and left grooves 29f. Accordingly, water overflowing from loading portion 43a
25 falls on flowing water surface 35 inside the vicinity of rear wall 29h side. In this case, the overflowed water irregularly falls on flowing water surface 35. However, the falling water is an original water flow supplied to washing tub 15,

and combines with the water flow shown by arrow B1 from the rear side of the rear wall 29h and the water flow shown by arrow B2 from siphon channel 44 described above on flowing water surface 35. Accordingly, the water flows to flowing water surface 35 as a smooth water flow. As a result, it is possible to
5 effectively prevent the water irregularly falling from through holes 29g from being scattered.

The operation and effects of the washing machine having the above-described configuration will be described below.

First, a user opens lid body 26, and loads laundry to be washed on
10 washing tub 15 via opening portion 25.

Next, the user extracts accommodation case 29 of water injection device 39 from water injection case 31. The user loads the washing aid agent having a predetermined amount on loading portion 43a of accommodation case 29. After the washing aid agent is loaded, the user accommodates accommodation
15 case 29 into water injection case 31. A detergent having a predetermined amount is loaded on a predetermined position (for example, on the loaded laundry) of washing tub 15.

Next, the user operates a start switch disposed on operation display unit 37 to start the washing operation of the washing machine. Accordingly,
20 control device 36 starts a washing step.

In the washing step, first, control device 36 opens first water supply valve 28a to supply water from first water injector 31a to water injection case 31. In a case where warm water is used to perform washing, control device 36 opens third water supply valve 28c to supply warm water from third water
25 injector 31c to water injection case 31.

The supply pressure of water supplied to water injection case 31 is reduced and regulated by flow regulator 42 described above, and the water

flows to flowing water surface 35. Water is injected from front end 35a of flowing water surface 35 to washing tub 15. In this case, since the water supply pressure is reduced by flow regulator 42, water being scattered outside of washing tub 15, which occurs in a case where the water supply pressure is
5 high, is prevented. An appearance when water is supplied is improved due to a smooth water flow.

Next, if the level of the water supplied into washing tub 15 reaches a predetermined water level, control device 36 closes first water supply valve 28a or third water supply valve 28c to stop the water supply. Control device 36
10 drives motor 20 to rotate pulsator 18 and performs the washing step during a predetermined time.

If the washing step ends, control device 36 drives a drain valve to drain contaminated washing water. Control device 36 performs an intermediate spin-drying to start the rinsing step.

15 In the rinsing step, control device 36 opens second water supply valve 28b. In this case, water having an approximately half flow rate of the water passing through second water injector 31b flows into accommodation case 29 on which a washing aid agent such as a softening agent is loaded. As described above, the water shown by arrow B1 flowing into water injection case 31 and
20 the water shown by arrow B2 flowing into accommodation case 29 are combined with each other on flowing water surface 35 and are supplied to washing tub 15.

Next, if the water level of the water supplied into washing tub 15 reaches a predetermined water level, control device 36 closes second water
25 supply valve 28b to stop the water supply. Control device 36 drives motor 20 to rotate pulsator 18 and performs the rinsing step during a predetermined time.

If the rinsing step ends, control device 36 drives a drain valve to drain the rinsed water, and starts the spin-drying step. After a predetermined time elapses, the spin-drying step ends, and the series of washing operations ends.

As described above, in the washing machine of the present embodiment,
5 water injection device 39 includes accommodation case 29 on which the washing aid agent is loaded, water injection case 31 which holds accommodation case 29 integrally formed, flow regulator 42, first water supply valve 28a which communicates with flow regulator 42, second water injector 31b which injects water to accommodation case 29, and second water supply
10 valve 28b which communicates with second water injector 31b.

That is, water injection device 39 includes water injection case 31 which is integrally formed without using a fixing method performed by bonding such as welding. Accordingly, occurrence of operation failures or the like due to water leakage from water injection device 39 is prevented, and it is possible to
15 improve reliability of the washing machine. A bonding step such as welding of water injection case 31 and a leakage inspection step of water are not required. Accordingly, it is possible to realize a reasonable manufacturing step having improved productivity.

First water injector 31a is provided to inject water to at least any one of
20 the right side and the left side on the rear side of accommodation case 29.

Flow regulator 42 is provided on the rear side of the bottom portion of accommodation case 29. Outlet portion 42c of flow regulator 42 is disposed in the vicinity of the portion including substantially the center of accommodation case 29. Accordingly, water reaching outlet portion 42c of flow regulator 42
25 flows to the vicinity of the portion including substantially the center of flowing water surface 35 of water injection case 31. The water flowed to the vicinity of the portion smoothly flows on flowing water surface 35 and is supplied to

washing tub 15. As a result, water is prevented from being scattered to the outside of washing tub 15 in advance.

Second water injector 31b is configured such that only a portion of the water supplied from second water supply valve 28b is injected into accommodation case 29. Accordingly, an amount of water injected into accommodation case 29 is limited, and it is possible to decrease the force of the water flow. As a result, it is possible to prevent the washing aid agent from overflowing from accommodation case 29.

Second water injector 31b is disposed to inject water to rear wall 29h of accommodation case 29 from above. Rear wall 29h of the accommodation case is formed to be inclined, and the inclined surface receives the water injected from second water injector 31b. Accordingly, in a state where the injected water becomes a smooth water flow due to the inclination of rear wall 29h, the injected water stirs the washing aid agent in accommodation portion 29b. As a result, scattering of the washing aid agent due to turbulence or the like is reduced, and it is possible to prevent the washing aid agent of accommodation case 29 from remaining.

Flow regulator 42 includes ribs 42d inside flow regulator 42. Ribs 42d meanders water in flow regulator 42. Accordingly, the pressure of supplied water is reduced when water is supplied, and it is possible to regulate the flow of water supplied to washing tub 15. As a result, it is possible to effectively prevent scattering of water.

Accommodation case 29 includes through holes 29g, through which the water which has flowed into accommodation case 29 and has overflowed falls, on the right and left sides. Accordingly, the overflowed water falls on flowing water surface 35 in the inner side on rear wall 29h side of accommodation case 29. The falling water combines with the water which is mainly supplied to

washing tub 15 and flows on flowing water surface 35. As a result, the water is smoothly supplied to washing tub 15 as a water flow.

The present embodiment describes the configuration of the washing machine including the washing tub and the pulsator which are used for both
5 washing and spin-drying in the water tub as an example. However, the present invention is not limited to this. For example the present invention may be applied to a two-tub type washing machine in which a spin-drying tub is separately provided and a pulsator is provided inside a fixed washing tub. The present invention may be applied to a drum type washing machine in
10 which a washing tub is rotated by a horizontal or inclined rotary shaft.

The present embodiment describes the configuration in which the washing aid agent for rinse is loaded on the accommodation case, water is supplied from the first water injector in the washing step, and water is supplied from the second water injector in the rinsing step to supply the washing aid
15 agent as an example. However, the present invention is not limited to this. For example, the rinsing step and the washing step are replaced with each other, and the washing aid agent for washing is loaded on the accommodation case. Water may be supplied from the second water injector in the washing step, water may be supplied from the first water injector in the rinsing step, and the washing aid agent may be supplied to the washing tub. In this case,
20 the washing aid agent for rinse is loaded on a softening agent case provided on the washing tub in the rinsing step.

The present embodiment describes the configuration in which the water supply in the rinsing step is performed by only the second water supply valve,
25 and the amount of the water injected into the accommodation case is adjusted by the disposition between the accommodation case and the rear wall as an example. However, the present invention is not limited to this. For example,

the flow rate of the second water supply valve may be decreased to accommodate all flow rates in the accommodation case, and simultaneously, the first water supply valve may open to supply water to the washing tub. Accordingly, it is possible to easily adjust the amount of water injected to the accommodation case.

The present embodiment describes the configuration in which the multiple water supply valves are directly attached to the corresponding water injectors as an example. However, the present invention is not limited to this. For example, the water supply valves may be connected to the water injectors by communication pipes such as pipes or hoses, and the water supply valves may be disposed at positions away from the water injectors. Accordingly, it is possible to increase versatility.

The present embodiment describes the water injector which injects water from above as an example. However, the present invention is not limited to this. For example, the first water injector and the third water injector may have a configuration in which water is injected from the rear side or the side of the water injection device. The first water supply valve and the third water supply valve may be connected to the first water injector in parallel, and the third water injector may be omitted. Accordingly, the water injector can have a simple configuration.

The present embodiment describes the example in which the rear wall of the accommodation case is inclined to be formed in a smooth arc shape over the bottom surface as an example. However, the present invention is not limited to this. For example, an inclined surface in which one plane or multiple planes are combined with each other may be formed.

The present embodiment describes the configuration in which the ribs are provided inside the flow regulator as an example. However, the present

invention is not limited to this. For example, a shape may be adopted in which the sectional area or the length of the channel is adjusted to reduce the force of the water flowing through the flow regulator.

The present embodiment describes the configuration in which the
5 grooves including the through holes communicate with each other in a U shape extending from the front portion of the accommodation portion to the right and left sides as an example. However, the present invention is not limited to this. For example, a barrier may be provided on the front portion of the accommodation portion to prevent overflowing of water, and the grooves may be
10 formed only on the right and left side of the accommodation portion.

The present embodiment describes the configuration which includes the third water supply valve and the third water injector as an example. However, the present invention is not limited to this. That is, in a case where warm water is not used, the third water supply valve and the third water injector may
15 be omitted.

As described above, the washing machine of the present invention includes the washing tub which is provided inside the main body, the water injection device which supplies water to the washing tub, and the control device which performs the washing operation. The water injection device includes
20 the accommodation case on which the washing aid agent is loaded, the water injection case which has the opening on a front portion of the water injection case, is integrally formed, and holds the accommodation case so as to be freely taken in and out, and the flow regulator which is disposed inside the water injection case and forms a channel. The water injection device may further
25 include the first water injector which communicates with the flow regulator, the first water supply valve which communicates with the first water injector, the second water injector which is provided in the water injection case and

injects water into the accommodation case, and the second water supply valve which communicates with the second water injector.

According to this configuration, the water injection device includes the water injection case which is integrally formed without using a fixing method
5 performed by bonding such as welding. Accordingly, occurrence of operation failures or the like due to water leakage from the water injection device is prevented, and it is possible to improve reliability of the washing machine. Since the bonding step such as welding of the water injection case and the leakage inspection step of water or the like are not required, it is possible to
10 realize a reasonable manufacturing step having improved productivity.

According to the washing machine of the present invention, the first water injector may be provided on at least one of the right side or the left side of the accommodation case on the rear side of the accommodation case, and the flow regulator may be provided on the rear side of the bottom portion of the
15 accommodation case and may include an outlet portion at substantially the center of the accommodation case.

Accordingly, water reaching the outlet portion of the flow regulator flows to the vicinity of substantially the center of the flowing water surface of the water injection case, smoothly flows on the flowing water surface, and is
20 supplied to the washing tub. As a result, water is prevented from being scattered to the outside of the washing tub.

In the washing machine of the present invention, the second water injector may be provided such that only a portion of the water supplied via the second water supply valve is injected into the accommodation case.

25 Accordingly, the amount of the injected water is limited, and it is possible to decrease the force of the water. As a result, it is possible to prevent the washing aid agent from overflowing from the accommodation case in

advance.

In the washing machine of the present invention, the second water injector may be provided above the rear side of the accommodation case, and the accommodation case may be configured such that the portion receiving the
5 water injected from the second water injector is inclined.

According to this configuration, the injected water becomes a smooth water flow due to the inclination and can be supplied to the accommodation case. Accordingly, it is possible to stir the washing aid agent loaded on the accommodation case without scattering the washing aid agent. As a result, it
10 is possible to more reliably prevent the washing aid agent from remaining on the accommodation case.

In the washing machine of the present invention, the ribs may be provided inside the flow regulator. Accordingly, it is possible to decrease a water supply pressure when water is supplied, and it is possible to decrease the
15 force of the water. As a result, it is possible to more reliably prevent the water supplied to the washing tub from being scattered.

The accommodation case of the washing machine of the present invention may be configured so as to have through holes, through which the water which has flowed into accommodation case and has overflowed falls, on
20 the right and left sides.

According to this configuration, the water overflowing from the accommodation case falls on the flowing water surface from the through holes provided on the inner side of the accommodation case. Accordingly, it is possible to prevent the water overflowing from the accommodation case from
25 irregularly falling, and it is possible to prevent scattering of the water. As a result, it is possible to prevent occurrence of contamination due to scattering of water outside the washing tub, or operation failures or breakdowns of electric

circuit components in advance.

The accommodation case of the washing machine of the present invention may include the accommodation portion which holds the washing aid agent and the grooves which are provided on at least the right and left sides of
5 the accommodation portion, and through holes may be provided on the grooves.

Accordingly, the water overflowing from the accommodation case reaches the outside of the accommodation case, and the accommodation case is not contaminated by the washing aid agent. As a result, it is possible to obtain a washing machine having a high appearance quality and which contamination
10 or the like does not easily occur.

INDUSTRIAL APPLICABILITY

The washing machine of the present invention includes the water injection device having the water injection case which is integrally formed
15 without using a fixing method by bonding. Accordingly, the present invention is effectively used in the washing machine in which prevention with respect to leakage of water including a washing aid agent is required when the water is supplied, or the like.

20 REFERENCE MARKS IN THE DRAWINGS

11, 101: main body

12: suspension

13, 102: water tub

14: rotary shaft

25 15, 103: washing tub

16, 103b: water passage hole

17: fluid balancer

	18, 104: pulsator
	19, 106: transmission mechanism
	20, 105: motor
	21: motor-side pulley
5	22: mechanism-side pulley
	23: belt
	24, 107: upper frame
	25: opening portion
	26: lid body
10	28a: first water supply valve
	28b: second water supply valve
	28c: third water supply valve
	29: accommodation case
	29a: knob
15	29b: accommodation portion
	29c, 43b: boss
	29c1: through port
	29d, 42d: rib
	29e: peripheral wall
20	29f: groove
	29g: through hole
	29h: rear wall
	31: water injection case
	31a: first water injector
25	31b: second water injector
	31c: third water injector
	32a, 32b: opening

	35: flowing water surface
	35a: front end
	36, 109: control device
	37, 109a: operation display unit
5	38, 111: lower surface cover
	39, 110, 121: water injection device
	42: flow regulator
	42a: inlet portion
	42b: partition portion
10	42c: outlet portion
	42f: wall surface shape
	43: cover
	43a: loading portion
	44: siphon channel
15	108: lid
	112: detergent case
	113: water supply valve
	113a: connection port
	114: water injection case
20	114a: lower water injector
	114b: upper water injector
	114c: bottom surface wall
	115a: upper water supply port
	115b: lower water supply port
25	122: washing aid agent
	123: aid-agent loading portion
	124: aid-agent case

125: flowing water port

126: water injection port

127, S1, S2, S3: gap

CLAIMS

1. The washing machine comprising,
 - a washing tub which is provided inside a main body;
 - a water injection device which supplies water to the washing tub; and
 - a control device which performs a washing operation,wherein the water injection device includes:
 - an accommodation case into which a washing aid agent is loaded;
 - a water injection case which has an opening on a front portion of the water injection case, is integrally formed, and holds the accommodation case so as to be freely taken in and out;
 - a flow regulator which is disposed inside the water injection case and forms a channel;
 - a first water injector which communicates with the flow regulator;
 - a first water supply valve which communicates with the first water injector;
 - a second water injector which is provided in the water injection case and injects water into the accommodation case; and
 - a second water supply valve which communicates with the second water injector,wherein the first water injector is provided on at least one of a right side or a left side of the accommodation case on a rear side of the accommodation case, and
 - wherein the flow regulator is provided on the rear side of a bottom portion of the accommodation case, and includes an outlet portion at

substantially a center of the accommodation case.

2. The washing machine comprising,
a washing tub which is provided inside a main body;
a water injection device which supplies water to the washing tub; and
a control device which performs a washing operation,
wherein the water injection device includes:
an accommodation case into which a washing aid agent is loaded;
a water injection case which has an opening on a front portion of the water injection case, is integrally formed, and holds the accommodation case so as to be freely taken in and out;
a flow regulator which is disposed inside the water injection case and forms a channel;
a first water injector which communicates with the flow regulator;
a first water supply valve which communicates with the first water injector;
a second water injector which is provided in the water injection case and injects water into the accommodation case; and
a second water supply valve which communicates with the second water injector,
wherein the second water injector is provided to inject, into the accommodation case, only a portion of water supplied via the second water supply valve.

3. The washing machine of Claim 1,
wherein the second water injector is provided above a rear side of the accommodation case, and
wherein the accommodation case is configured such that a portion receiving water injected from the second water injector is inclined.

4. The washing machine of Claim 1,
wherein the flow regulator includes a rib inside the flow regulator.

5. The washing machine of Claim 1,

wherein the accommodation case includes through holes on a right side and a left side of the accommodation case, and water which flows into the accommodation case and overflows falls through the through holes.

6. The washing machine of Claim 5,

wherein the accommodation case includes an accommodation portion which holds the washing aid agent, and grooves which are provided on at least the right side and the left side of the accommodation portion, and

wherein the through holes are provided on the grooves.