

WASHING MACHINE

FIELD OF THE INVENTION

The present invention relates to a washing machine for successively
5 performing the steps of washing, rinsing and dewatering.

BACKGROUND OF THE INVENTION

A conventional washing machine recited in Unexamined Japanese
Patent Publication No. 08-117478 (Patent Literature 1) is described below.

10 The washing machine recited in Patent Literature 1 performs a rinsing
without storing water in a washing and dewatering tub for resource saving
in the rinsing step. More specifically, the washing machine recited in
Patent Literature 1 rinses laundry in the washing and dewatering tub by
rotating the tub while pouring shower-like water on the laundry from an
15 upper section thereof.

Fig. 4 is a side sectional view of the conventional washing machine.

Fig. 5 is a flow chart of a washing step by the conventional washing machine.

Fig. 6 is a flow chart of a rinsing step by the conventional washing machine.

In Fig. 4, cabinet 101 has therein outer tub 103 elastically suspended by
20 a plurality of suspensions 102. Accordingly, vibrations of outer tub 103 in a
dewatering step are absorbed by suspensions 102. Outer tub 103 is
provided therein with washing and dewatering tub 104 in which laundry is
put. Washing shaft 105a placed in hollow dewatering shaft 105, thereby
forming a dual structure. Washing and dewatering tub 104 is rotatable on
25 dewatering shaft 105. Pulsator 106 for agitating the laundry, such as

clothes to be washed, is rotatably mounted to an inner bottom section of washing and dewatering tub 104. A bottom section of outer tub 103 is provided with drain port 107 and drain valve 108.

5 An inner peripheral wall of washing and dewatering tub 104 is provided with multiple small holes 104a for draining water. Motor 109 mounted to a bottom section of outer tub 103 drives drive mechanism 111 using belt 110. Drive mechanism 111 has a clutch mechanism, a brake mechanism and a clutch switching device (none of these devices is shown). Drive mechanism 111 brakes dewatering shaft 105 and releases the brake. Drive mechanism 10 111 brakes dewatering shaft 105 during the wash and yet drives washing shaft 105a, thereby rotating pulsator 106 for agitating the clothes. To dewater the clothes, drive mechanism 111 releases the brake of dewatering shaft 105, opens drain valve 108, and then rotates washing and dewatering tub 104.

15 Washing liquid or rising liquid in outer tub 103 is drained from the washing machine through drain port 107 in the bottom section of outer tub 103 and then through drain valve 108. Water level detecting device 112 detects a water level in washing and dewatering tub 104. During the wash, water is supplied until it reaches predetermined water level A, and water 20 level detecting device 112 detects this water level. A pressure sensor, for example, constitutes water level detecting device 112. The washing and rinsing liquid is tap water used for wash and rinse. The washing and rinsing liquid includes dirt of the laundry and detergent. Hereinafter, the washing liquid is called washing water, and the rinsing liquid is called 25 rinsing water.

Cabinet cover 114 covers an upper section of cabinet 101. Cabinet cover 114 has lid 115, water supply valve 117 and control device 116. Lid 115 is mounted to cabinet cover 114 so that it can be opened and closed. Water supply valve 117 is coupled with, for example, a tap water faucet to supply tap water into washing and dewatering tub 104. Control device 116 has an operation display unit (not shown). Control device 116 further has a microcomputer (not shown) for controlling motor 109, a clutch switching device, water supply valve 117 and drain valve 108. Control device 116 successively controls a sequence of the steps of washing, rinsing and dewatering.

So far was described the structure of the conventional washing machine. An operation of the conventional washing machine is described using flow charts illustrated in Figs. 5 and 6.

First, the washing step is described. When the washing step starts (Step S100), lid 115 is opened, and clothes to be washed are put in washing and dewatering tub 104 (Step S101). Then a power switch is turned on (Step S102). When a start switch is turned on (Step S103), water supply valve 117 is opened (Step S104), while drain valve 108 is kept closed. Then water supply to washing and dewatering tub 104 starts. Water level detecting device 112 detects the water level (Step S105). In the case where the water level is below predetermined water level A (No in Step S105), the operation returns to Step S105 to continue the water supply. When the water level reaches predetermined water level A (Yes in Step S105), the water supply valve is closed (Step S106) to discontinue the water supply. Motor 109 is then turned on, and pulsator 106 is rotated in clockwise and

anticlockwise directions (Step S107), so that the clothes are washed.

It is determined in Step S108 whether or not a given period of time has passed since the rotation of pulsator 106 started. When it is determined that the given period of time has not passed (No in Step S108), the operation returns to Step S108. When it is determined that the given period of time has passed (Yes in Step S108), motor 109 is turned off (Step S109), and pulsator 106 stops its rotation. Then the washing step ends (Step S110).

After the washing step illustrated in Fig. 5 ends, the rinsing step illustrated in Fig. 6 starts. When the rinsing step starts (Step S200), drain valve 108 is opened (Step S201). Then the brake of dewatering shaft 105 is released by switching the clutch switching device in drive mechanism 111 (Step S202). Accordingly, washing and dewatering tub 104 is rotatable on dewatering shaft 105.

It is determined in Step S203 whether or not the drain has been completed. When it is determined that the drain has not been completed (No in Step S203), the operation returns to Step S203. When it is determined that the drain has been completed (Yes in Step S203), motor 109 is turned on so that washing and dewatering tub 104 is rotated for an intermediate dewatering, that is to dewater the clothes in the rinsing step (Step S204). More specifically, washing and dewatering tub 104 is rotated at approximately 700 to 800 rpm so that the clothes are centrifugally dewatered. As a result, detergent remaining in the clothes is squeezed out of the clothes along with the washing water.

It is determined in Step S205 whether or not a given period of time

has passed since washing and dewatering tub 104 started to rotate. When it is determined that the given period of time has not passed (No in Step S205), the operation returns to Step S205. When it is determined that the given period of time has passed (Yes in Step S205), motor 109 is turned off (Step S206), and the rotation of washing and dewatering tub 104 gradually slows down. Then dewatering shaft 105 is braked by switching the clutch switching device in drive mechanism 111 (Step S207), and washing and dewatering tub 104 is thereby halted temporarily.

The brake of dewatering shaft 105 is released again by switching the clutch switching device in drive mechanism 111 (Step S208), and washing and dewatering tub 104 is thereby allowed to rotate on dewatering shaft 105. After that, motor 109 is turned on (Step S209) and turned off (Step S210) repeatedly. When motor 109 is thus turned on and off repeatedly, washing and dewatering tub 104 is constantly rotated over a given period of time at such a low speed that the number of rotations thereof is sustained in the range of 30 to 50 rpm on average. In synchronization with this, water supply valve 117 is opened (Step S211), and shower-like tap water is poured into washing and dewatering tub 104. The water is evenly spattered on the clothes stuck to an inner wall of washing and dewatering tub 104. The water absorbed by the clothes serves to weaken or remove the detergent remaining in the clothes.

It is determined in Step S212 whether or not a given period of time has passed since the water supply in Step S211 started. When it is determined that the given period of time has not passed (No in Step S212), the operation returns to Step S209 and Step S211. When it is determined

that the given period of time has passed (Yes in Step S212), the operation proceeds to Step S213, Step S214 and Step S215. More specifically, water supply valve 117 is closed (Step S213), drain valve 108 is closed (Step S214), and dewatering shaft 105 is braked by switching the clutch switching device
5 in drive mechanism 111 (Step S215). Then washing and dewatering tub 104 stops, and the rinsing step ends (Step S216).

After the rinsing step ends, the operation advances to the dewatering step. In the dewatering step, washing and dewatering tub 104 is rotated at such a high speed as approximately 700 to 800 rpm. The high-speed
10 centrifugal dewatering at such high speed removes the water from the clothes. Then all of the operation steps of the washing machine end.

In the case where a laundry volume of the conventional washing machine described so far is 8 kg, a water volume at water level A in the washing step is approximately 50 to 70 liters (L), whereas the water volume
15 in the rinsing step is approximately 15 to 25 L. In the conventional washing machine, therefore, approximately 15 to 25 L of water, which is less than the water consumption in the washing step, is spattered on the clothes in the rinsing step. The conventional washing machine is advantageous in that the clothes can be rinsed with as little water as possible.

20 The conventional structure, however, supplies tap water on the clothes in the rinsing step by opening and closing water supply valve 117 over the given period of time. Therefore, the volume of supplied water is reduced in the case where a tap water pressure is low, resulting in insufficient water supply for the clothes. This disadvantage is more evident
25 particularly when a large volume of clothes are washed because the

operation advances to the next step before the supplied water penetrates through the clothes, leaving some of the clothes unrinsed. Thus, the conventional washing machine has a problem to be solved, that is poor rinsing performance caused by a low tap water pressure.

SUMMARY OF THE INVENTION

Embodiments of the present invention provide a washing machine capable of efficiently exerting constant rinsing performance with less water regardless of a low tap water pressure.

According to an aspect of the present invention, there is provided a washing machine comprising: a washing and dewatering tub provided with a rotatable pulsator in an inner bottom section thereof; an outer tub for housing the washing and dewatering tub; an upper cover provided in an upper section of the outer tub; a motor for rotating the washing and dewatering tub and the pulsator; a drain port provided in a bottom section of the outer tub; a drain valve for opening and closing the drain port; a vane provided in an outer-peripheral bottom surface section of the washing and dewatering tub; a plurality of discharge ports provided in an upper section of the washing and dewatering tub; a first discharge port and a second discharge port provided in upper sections of the washing and dewatering tub; a first lower inflow port provided in an inner peripheral surface of the outer tub at a bottom thereof; a second lower inflow port provided in the inner peripheral surface of the outer tub above the level of the first lower inflow port; a first water convey portion for connecting the first lower inflow port with the first discharge port; and a second water convey portion for connecting the second lower inflow port with the second discharge port.

The foregoing structure allows the vane to circulate tap water supplied in a small volume due to its low water pressure, and constant rinsing performance can be thereby reliably exerted irrespective of the tap water pressure. Thus, water consumption can be also reduced.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 shows a side sectional view of a washing machine according to an embodiment of the present invention.

Fig. 2 shows a flow chart of a washing step performed by the washing machine according to the embodiment.

Fig. 3 shows a flow chart of a rinsing step performed by the washing machine according to the embodiment.

Fig. 4 shows a side sectional view of a conventional washing machine.

Fig. 5 shows a flow chart of a washing step performed by the conventional washing machine.

Fig. 6 shows a flow chart of a rinsing step performed by the conventional washing machine.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Exemplary Embodiment Fig. 1 is a side sectional view of a washing machine according to an embodiment of the present invention. Fig. 2 is a flow chart of a washing step performed by the washing machine according to the embodiment. Fig. 3 is a flow chart of a rinsing step performed by the washing machine according to the embodiment.

In Fig. 1, cabinet 1 has therein outer tub 20 elastically suspended by a plurality of suspensions 2. Accordingly, vibrations of outer tub 20 during dewatering are absorbed by suspensions 2. Outer tube 20 is provided therein with washing and dewatering tub 18 in which laundry is put. Washing shaft 5a placed in hollow dewatering shaft 5, thereby forming a dual structure. Washing and dewatering tub 18 is rotatable on dewatering shaft 5. Pulsator 6 for agitating clothes to be washed is rotatably provided in an inner bottom section of washing and dewatering tub 18. Drain port 7 and drain valve 8 are provided in bottom sections of outer tub 20.

An inner peripheral wall of washing and dewatering tub 18 is provided with multiple small holes 18a for draining water. Motor 9 mounted to a bottom section of outer tub 20 drives to drive mechanism 11 using belt 10. Drive mechanism 11 has a clutch mechanism, a brake mechanism and a clutch switching device (none of these devices is shown). Drive mechanism 11 brakes dewatering shaft 5 and releases the brake. Drive mechanism 11 brakes dewatering shaft 5 during the wash to drive washing shaft 5a so that pulsator 6 for agitating the clothes is rotated. To dewater the clothes, drive mechanism 11 releases the brake of dewatering

shaft 5, opens drain valve 8, and rotates washing and dewatering tub 18.

Washing water or rinsing water in outer tub 20 is drained from the washing machine through drain port 7 in the bottom section of outer tub 20 and then through drain valve 8. A plurality of vanes 19 each having the
5 shape of a fin are radially formed in outer-peripheral bottom surface sections of washing and dewatering tub 18.

Cabinet cover 14 covers an upper section of cabinet 1. Cabinet cover 14 has lid 15, water supply valve 17 and control device 25. Lid 15 is mounted to cabinet cover 14 so that it can be opened and closed. Water
10 supply valve 17 is coupled with, for example, a tap water faucet to supply tap water into washing and dewatering tub 18. Control device 25 has an operation display unit (not shown). Control device 25 further has a microcomputer (not shown) for controlling motor 9, a clutch switching device, water supply valve 17 and drain valve 8. Control device 25 successively
15 controls a sequence of steps of washing, rinsing and dewatering.

Water level detecting device 24 detects a water level in washing and dewatering tub 18. A pressure sensor connected with a lower section of outer tub 20, for example, constitutes water level detecting device 24.

Water level detecting device 24 converts a water pressure transmitted from
20 outer tub 20 into an electrical signal and compares the electrical signal with water level values preset in control device 25, so that the water level in washing and dewatering tub 18 is detected. During the wash, water is supplied to reach predetermined water level A, and water level detecting device 24 detects the water level. During rinse, water level detecting device
25 24 detects the water level reaching to predetermined water level B lower

than water level A.

Inner wall 21 is formed between outer tub 20 and washing and dewatering tub 18. A space between inner wall 21 and a side wall of outer tub 20 constitutes water convey portion 23 having the shape of a tube through which water can be conveyed. Lower inflow port 22 is provided in a bottom section of inner wall 21, i.e. a lower section of water convey portion 23. When washing and dewatering tub 18 is rotated, vanes 19 work as a pump, and a water-flow introduced through lower inflow port 22 travels upward through water convey portion 23.

An upper section of outer tub 20 is provided with flat upper cover 26 formed in the shape of a donut and having, in a central portion thereof, opening 30 through which clothes are put. Upper cover 26 is, for example, fixedly mounted to outer tub 20.

Water intake portion 27 having a plurality of holes is provided in a part of upper cover 26. Water intake portion 27 serves as a water channel when water is supplied into washing and dewatering tub 18 via water supply valve 17. Discharge port 29 is provided in an upper section of washing and dewatering tub 18. Discharge port 29 is disposed in vicinity of an end portion of upper cover 26 on the side of opening 30. Water is discharged downward through discharge port 29 into washing and dewatering tub 18. Upper inflow port 28 is provided at a position corresponding to an upper end of water convey portion 23 formed by the side wall of outer tub 20 and inner wall 21 so as to prevent water leak and to communicate with discharge port 29.

Accordingly, water supplied via water supply valve 17 passes

through water intake portion 27 of upper cover 26 and then flows into washing and dewatering tub 18 through discharge port 29. Further, the water-flow through lower inflow port 22 passes through water convey portion 23 and upper inflow port 28 and then flows into washing and dewatering tub 18 through discharge port 29.

When washing and dewatering tub 18 is rotated after water is stored up to such a low water level as water level B illustrated in Fig. 1, the water is agitated by the pumping action of vanes 19 and transported to water convey portion 23 through lower inflow port 22, and then, passes through upper inflow port 28 and finally flows into washing and dewatering tub 18. The water dispersedly supplied into washing and dewatering tub 18 falls on the bottom to be delivered again by the pumping action of vanes 19. The water is thus supplied in the manner of a circulating water flow. Water level B illustrated in Fig. 1 is, for example, such a water level that a part of pulsator 6 is immersed in water.

The operation of the foregoing washing machine is described referring to flow charts illustrated in Figs. 5 and 6.

First, the washing step is described. When the washing step starts (Step S400), lid 15 is opened, and clothes to be washed are put into washing and dewatering tub 18 (Step S401). A power switch is then turned on (Step S402). When a start switch is turned on (Step S403), water supply valve 17 is opened (Step S404). Drain valve 8 remains closed at this time. Washing and dewatering tub 18 is supplied with water. Water level detecting device 24 detects the water level (Step S405). In the case where the water level fails to reach predetermined water level A (No in Step S405), the operation

returns to Step S405 to continue the water supply. When the water level reaches predetermined water level A (Yes in Step S405), the water supply valve is closed (Step S406) to discontinue the water supply. Motor 9 is then turned on, and pulsator 6 is rotated in clockwise and anticlockwise directions
5 (Step S407), so that the clothes are washed.

It is determined in Step S408 whether or not a given period of time has passed since the rotation of pulsator 6 started. When it is determined that the given period of time has not passed (No in Step S408), the operation returns to Step S408. When it is determined that the given period of time
10 has passed (Yes in Step S408), motor 9 is turned off (Step S409), and pulsator 6 stops its rotation. Then the washing step ends (Step S410).

The washing step illustrated in Fig. 2 ends, and the operation proceeds to the rinsing step illustrated in Fig. 3. When the rinsing step starts (Step S500), drain valve 8 is opened (Step S501). Then the brake of
15 dewatering shaft 5 is released by switching the clutch switching device in drive mechanism 11 (Step S502). Accordingly, washing and dewatering tub 18 is rotatable on dewatering shaft 5.

It is determined in Step S503 whether or not the drain has been completed. When it is determined that the drain has not been completed
20 (No in Step S503), the operation returns to Step S503. When it is determined that the drain has been completed (Yes in Step S503), motor 9 is turned on so that washing and dewatering tub 18 is rotated for an intermediate dewatering, which is to dewater the clothes in the rinsing step (Step S504). More specifically, washing and dewatering tub 18 is rotated by
25 approximately 700 to 800 rpm so that the clothes are centrifugally dewatered.

As a result, detergent remaining in the clothes is squeezed out of the clothes along with the washing water.

It is determined in Step S505 whether or not a given period of time has passed since washing and dewatering tub 18 started to rotate. When it is determined that the given period of time has not passed (No in Step S505), the operation returns to Step S505. When it is determined that the given period of time has passed (Yes in Step S505), motor 9 is turned off (Step S506), and the rotation of washing and dewatering tub 18 gradually slows down. Then dewatering shaft 5 is braked by switching the clutch switching device in drive mechanism 11 (Step S507), and washing and dewatering tub 18 is thereby halted temporarily. Drain valve 8 is then closed (Step S508), so that water can be stored in outer tub 20.

After that, the brake of dewatering shaft 5 is released by switching the clutch switching device in drive mechanism 11 (Step S509), and washing and dewatering tub 18 is thereby allowed to rotate on dewatering shaft 5. Then water supply valve 17 is opened (Step S510), and tap water is supplied into washing and dewatering tub 18.

Water level detecting device 24 detects the water level (Step S511). In the case where the water level fails to reach predetermined wave level B which is a low position near an outer periphery of pulsator 6 (No in Step S511), the operation returns to Step S510 to continue the water supply. When the water level reaches predetermined water level B (Yes in Step S511), the water supply valve is closed (Step S512) to discontinue the water supply.

Then motor 9 is turned on again so that washing and dewatering tub

18 is rotated (Step S513). Washing and dewatering tub 18 then continues rotating at such number of rotations as approximately 180 to 200 rpm over a given period of time. To be more specific, it is determined in Step S514 whether or not the given period of time has passed since the rotation of washing and dewatering tub 18 started. When it is determined that the given period of time has not passed (No in Step S514), the operation returns to Step S514. In this case, the rinsing water is agitated then in a circumferential direction by vanes 19, and flows in through lower inflow port 22, passes through water convey portion 23 and upper inflow port 28, and then spatters on the clothes in washing and dewatering tub 18 from the upper section thereof through discharge port 29. When it is determined that the given period of time has passed (Yes in Step S514), motor 9 is turned off (Step S515).

The rinsing water is absorbed by the clothes and then centrifugally squeezed out of the clothes. At this time, the water passing through the clothes removes detergent included in the clothes. The water passed through the clothes runs through multiple small holes 18a provided in the inner peripheral wall of washing and dewatering tub 18 and drops on the bottom section of outer tub 20. The dropping water is conveyed again through lower inflow port 22, water convey portion 23 and then upper inflow port 28 by the pumping action of vanes 19. The water is then supplied onto the clothes in washing and dewatering tub 18 through discharge port 29. As the water is thus forcibly circulated by the pumping action repeatedly during the given period of time in Step S514, the detergent remaining in all of the clothes is evenly weakened. Further, the circulating water is

repeatedly supplied into washing and dewatering tub 18 from the upper section, so that an impression of rinsing the clothes well can be given to a user.

After the given period of time in Step S514 passed, motor 9 is turned
5 off (Step S515), followed by the clutch of drive mechanism 11 is switched. Accordingly, dewatering shaft 5 is braked (Step S516) to discontinue the rotation of washing and dewatering tub 18, so that the rinsing step ends (Step S517).

After the rinsing step ends, the operation advances to the dewatering
10 step. In the dewatering step, washing and dewatering tub 18 is rotated at such a high speed as approximately 700 to 800 rpm. The centrifugal dewatering at such high speed removes water included in the clothes. The dewatering step takes longer time than the intermediate dewatering in the rinsing step. A sequence of operation steps of the washing machine is then
15 completed.

In the case where a laundry volume of the washing machine according to this embodiment is 8 kg, a water volume at water level A in the washing step is approximately 50 to 70 L, whereas the water volume in the rinsing step is approximately 15 to 25 L which is the water volume indicated
20 by low water level B near the outer periphery of pulsator 6. In other words, approximately 15 to 25 L of water is stored temporarily, and washing and dewatering tub 18 is rotated so that the rinsing water is forcibly circulated. Accordingly, the water is evenly spattered on and absorbed by all of the clothes, so that the detergent included in the clothes can be removed. Then
25 water is spattered again so that the clothes are rinsed repeatedly. Thus,

the detergent remaining in the clothes can be effectively weakened with less water, in other words, a constant rinsing performance can be reliably obtained with less water. Unlike the conventional washing machine which supplies the clothes with water by controlling an opening duration of water supply valve 17, less water is stored to rinse the clothes. This novel mechanism solves the conventional problem that clothes may be unevenly rinsed when a tap water pressure is low. Therefore, a constant rinsing performance can be reliably obtained without any adverse effect of the tap water pressure.

In the washing machine according to the embodiment, water convey portion 23a may be provided in an anterior section of the washing machine in addition to water convey portion 23 provided in a rear portion of the washing machine (right side in Fig. 1). In such a structure, two circulation paths for the rinsing water are available, which increases a volume of circulating water. As a result, the rinsing performance can be further improved.

As illustrated in Fig. 1, upper cover 26 has upper inflow port 28a and discharge port 29a at diagonal positions relative to upper inflow port 28 and discharge port 29 when viewed along a rotational axis. An inner peripheral surface of outer tub 20 is provided with lower inflow ports 22 and 22a at positions corresponding to upper inflow ports 28 and 28a, and is further provided with water convey portions 23 and 23a that respectively connect upper inflow ports 28 and 28a with lower inflow ports 22 and 22a.

One of lower inflow ports 22 and 22a (lower inflow port 22 in Fig. 1) is provided in the inner peripheral surface of outer tub 20 at its bottom, while

the other (lower inflow port 22a in Fig. 1) is provided in an inner peripheral surface of outer tub 20 at its substantial center in a vertical direction.

Accordingly, water circulated through lower inflow port 22 is supplied when the water level is low, and water circulated through two lower inflow ports

5 22 and 22a is supplied when the water level is high. Thus, water can be supplied differently depending on the volume of water supply.

If water is supplied through the two ports, i.e. upper discharge ports 29 and 29a when the water level is low with less water, the water volume is not enough for the circulation, and this may adversely effect the rinsing
10 performance. According to the embodiment, water is circulated through lower inflow port 22 alone in the case of a small volume of water supply. As a result, a good rinsing performance can be exerted with less water. The water supply is obtained from one position when the water level is low with less water, whereas a large volume of water supply is obtained from two
15 positions when the water level is high with more water. Thus, the rinsing operation can be flexibly performed depending on the volume of water supply. The embodiment is characterized in that two sets of lower inflow ports, water convey portions and discharge ports are provided. However, three sets or more than three sets of inflow ports, water convey portions and discharge
20 ports will produce a similar effect.

Claims:

1. A washing machine comprising:
 - a washing and dewatering tub provided with a rotatable pulsator in an inner bottom section thereof;
 - an outer tub for housing the washing and dewatering tub;
 - an upper cover provided in an upper section of the outer tub;
 - a motor for rotating the washing and dewatering tub and the pulsator;
 - a drain port provided in a bottom section of the outer tub;
 - a drain valve for opening and closing the drain port;
 - a vane provided in an outer-peripheral bottom surface section of the washing and dewatering tub;
 - a plurality of discharge ports provided in an upper section of the washing and dewatering tub;
 - a first discharge port and a second discharge port provided in upper sections of the washing and dewatering tub;
 - a first lower inflow port provided in an inner peripheral surface of the outer tub at a bottom thereof;
 - a second lower inflow port provided in the inner peripheral surface of the outer tub above the level of the first lower inflow port;
 - a first water convey portion for connecting the first lower inflow port with the first

discharge port; and

a second water convey portion for connecting the second lower inflow port with the second discharge port.

2. The washing machine according to Claim 1, wherein

when a water level in the washing and dewatering tub is equal to a first predetermined water level which is lower than the level of the second lower inflow port, the washing machine keeps the drain valve closed in a rinsing step, rotates the washing and dewatering tub, and supplies rinsing water from a lower section of the outer tub into the washing and dewatering tub through the first discharge port by way of the first water convey portion while spattering supplied water using the vane, and

when the water level in the washing and dewatering tub is equal to a second predetermined water level which is higher than the level of the second lower inflow port, the washing machine keeps the drain valve closed in the rinsing step, rotates the washing and dewatering tub, and supplies rinsing water from the lower section of the outer tub into the washing and dewatering tub through the first and second discharge ports by way of the first and second water convey portions while spattering supplied water using the vane.

WASHING MACHINE

ABSTRACT

5 An upper cover is provided in an upper section of an outer tub for housing a washing and dewatering tub. The upper cover has an upper inflow port and discharge ports communicating with each other. The outer tub has lower inflow ports in an inner peripheral surface thereof, and water convey portions are provided for connecting the lower inflow ports with the
10 upper inflow port. Each one of discharge ports, the lower inflow ports, and the water convey portions makes a set. In a rinsing step, the washing and dewatering tub is rotated when a water level reaches a predetermined water level, and rinsing water supplied from a lower section of the outer tub through the of discharge ports by way of the water convey portions is
15 spattered in the washing and dewatering tub by a vane provided in an outer-peripheral bottom surface section of the washing and dewatering tub. Accordingly, a constant rinsing performance can be reliably exerted with less water even if a tap water pressure is low.

20 Fig. 1