

DESCRIPTION

WASHING MACHINE

5 TECHNICAL FIELD

The present invention relates to a washing machine, and more specifically, relates to a washing machine that performs washing, rinsing, and spin-drying processes.

10 BACKGROUND ART

In a washing machine of this type conventionally proposed, in order to improving cleaning performance, a washing liquid is circulated through a circulating water channel installed in a washing/spin-drying tub, and clothing is washed while the washing liquid is sprayed on the clothing from an upper
15 portion of the washing/spin-drying tub (for example, see PTL 1).

FIG. 9 is a vertical cross-sectional view of a conventional washing machine described in PTL 1.

In FIG. 9, washing/spin-drying tub 53 is supported in body 55 in a vibration-isolating manner by suspension 54. A plurality of circulating water
20 channel covers 56 is attached to an inner surface of washing/spin-drying tub 53, and a plurality of independent circulating water channels 57a, 57b is formed between the plurality of water channel covers 56 and washing/spin-drying tub 53.

In addition, vane 58 is integrally provided on a back surface of
25 agitating blade (pulsator) 52, and pump chamber 59 is formed at an outer periphery of vane 58. Pump chamber 59 communicates with circulating water channels 57a, 57b. Openings 60 provided at upper portions of

circulating water channels 57a, 57b are opened toward inside washing/spin-drying tub 53. Sprinkler nozzle 61 is provided at opening 60 at the upper portion of circulating water channel 57b, and lint filter 62 is provided at opening 60 at the upper portion of circulating water channel 57a.

5 Motor 63 drives agitating blade 52 via V-belt 64 and speed-reducing mechanism 65. Water level sensor 66 is connected to a lower portion of water-receiving tub 51. Water level sensor 66 detects water levels a, b in washing/spin-drying tub 53. Output of water level sensor 66 is input to control device 67.

10 With the above configuration, in the washing process, agitating blade 52 rotates according to rotation of motor 63, laundry 73 and a washing liquid in washing/spin-drying tub 53 are agitated. In contrast, a washing liquid between vane 58 provided at agitating blade 52 and water-receiving tub 51 receives centrifugal force due to rotation of vane 58, and is pushed out to
15 outside of a bottom portion of water-receiving tub 51. The washing liquid pushed out to the outside of the bottom portion of water-receiving tub 51 passes through circulating water channels 57a, 57b, passes through sprinkler nozzle 61 and lint filter 62, and is intermittently sprinkled in washing/spin-drying tub 53 according to rotation of motor 63. Therefore, a
20 large amount of washing liquid is sprinkled on the laundry in washing/spin-drying tub 53 from above. In FIG. 9, the washing machine includes water supply valve 72 and drain valve 74.

 However, in a conventional configuration, a washing liquid is sprinkled in a washing/spin-drying tub from two opening portions facing each other.
25 Moreover, since one of the two opening portions is provided with a lint filter, the washing liquid is sprinkled from substantially only one sprinkler nozzle. Therefore, the washing liquid is not uniformly sprayed without unevenness on

laundry in the washing/spin-drying tub. As a result, there is a problem that washing unevenness of the laundry becomes great.

Citation List

Patent Literature

- 5 PTL 1: Unexamined Japanese Patent Publication No. H07-31785

SUMMARY

In various embodiments, a washing liquid is sprinkled in a wide range on laundry in a washing/spin-drying tub from a plurality of discharge ports
10 formed at an upper portion of a circulating water channel formed in the washing/spin-drying tub. Therefore, various embodiments prevent washing unevenness and improve foaming performance. As a result, a washing machine improved in cleaning performance is provided.

The washing machine according to one aspect includes a body, a water
15 tub, a washing/spin-drying tub, a pulsator, a vane, a motor, and at least one water channel cover. The water tub is provided inside the body. The washing/spin-drying tub is rotatably provided in the water tub. The pulsator is rotatably disposed at a central inner bottom portion of the washing/spin-drying tub, and forms a pump chamber at a position below the
20 pulsator in the water tub. The vane is formed integrally with the pulsator, and is disposed in the pump chamber. The motor drives and rotates the pulsator and the washing/spin-drying tub. The at least one water channel cover is provided on an inner wall of the washing/spin-drying tub, and forms a circulating water channel through which a washing liquid in the pump
25 chamber is circulated to the washing/spin-drying tub. The at least one water channel cover includes a side surface cover portion, an upper cover portion continuous to an upper portion of the side surface cover portion and having a

laterally long shape. The upper cover portion has a plurality of discharge ports supplying a washing liquid into the washing/spin-drying tub, the plurality of discharge ports being provided at an identical height in a circumferential direction of the washing/spin-drying tub wherein the upper
5 cover portion has the plurality of discharge ports at both side end portions in the circumferential direction of the washing /spin-drying tub, and an opening of each of the plurality of discharge parts is narrower as each of the plurality of discharge port separates from a center side of the upper cover portion.

10 BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a longitudinal cross-sectional schematic view of a washing machine according to a first exemplary embodiment of the present invention.

FIG. 2 is a cross-sectional view of a washing/spin-drying tub of the washing machine.

15 FIG. 3 is a cross-sectional view of the washing/spin-drying tub of the washing machine as seen from another direction.

FIG. 4 is a view of a water channel cover of the washing machine as seen from a circulating water channel side.

FIG. 5 is an enlarged view of a main portion of the water channel cover
20 of the washing machine.

FIG. 6 is a cutaway view illustrating a main portion of an upper water channel of the circulating water channel of the washing machine.

FIG. 7 is a cutaway view illustrating an upper water channel portion of the circulating water channel of the washing machine.

25 FIG. 8 is a view illustrating a relation between a discharge range from the circulating water channel and laundry in the washing machine.

FIG. 9 is a longitudinal cross-sectional view of a conventional washing

machine.

DESCRIPTION OF EMBODIMENT

Hereinafter, an exemplary embodiment of the present invention will be

described with reference to the drawings. Note that the present invention is not limited by the present exemplary embodiment.

FIRST EXEMPLARY EMBODIMENT

FIG. 1 is a longitudinal cross-sectional schematic view of a washing
5 machine according to a first exemplary embodiment of the present invention.
FIG. 2 is a cross-sectional view of a washing/spin-drying tub of the washing
machine. FIG. 3 is a cross-sectional view of the washing/spin-drying tub of
the washing machine as seen from another direction. FIG. 4 is a view of a
water channel cover of the washing machine as seen from a circulating water
10 channel side. FIG. 5 is an enlarged view of a main portion of the water
channel cover of the washing machine. FIG. 6 is a cutaway view illustrating
a main portion of an upper water channel of the circulating water channel of
the washing machine.

In FIG. 1, water tub 3 is supported in body 1 in a vibration-isolating
15 manner by a plurality of suspensions 2. Suspensions 2 absorb vibration
generated in water tub 3 during spin-drying. At a bottom portion of water
tub 3, drain port 25 and drain valve 26 are provided.

Washing/spin-drying tub 7 accommodating laundry is rotatably
disposed inside water tub 3. On a side wall of washing/spin-drying tub 7,
20 many spin-drying holes 5 are provided. Ring-shaped fluid balancer 6 is
attached to an upper portion of washing/spin-drying tub 7. Fluid balancer 6
is for reducing vibration during spin-drying.

Washing/spin-drying tub 7 is rotatably disposed about
washing/spin-drying shaft 4. Washing/spin-drying shaft 4 has a hollow
25 double structure. Pulsator 8 is rotatably disposed at an inner bottom portion
of washing/spin-drying tub 7. Pulsator 8 agitates clothing (laundry).

Motor 9 is attached to the bottom portion of water tub 3. Motor 9

incorporates a clutch mechanism and a brake mechanism. Motor 9 brakes a spin-drying shaft of washing/spin-drying shaft 4 during washing. During washing, motor 9 simultaneously drives a washing shaft of washing/spin-drying shaft 4, and rotatably drives pulsator 8. In addition, during spin-drying, motor 9 cancels braking of the spin-drying shaft of washing/spin-drying shaft 4. During spin-drying, motor 9 simultaneously drives washing/spin-drying shaft 4 and rotatably drives washing/spin-drying tub 7. During spin-drying, drain valve 26 is opened, and a washing liquid or a rinsing liquid in water tub 3 is drained outside the machine from drain port 25 via drain valve 26.

Upper frame body 21 covers an upper portion of body 1. Upper frame body 21 has opening and closing lid 28 openably provided to cover laundry input port 27. Laundry input port 27 is formed at a substantially central portion of the upper portion of body 1. Operation display section 23 is provided at a front surface portion of upper frame body 21. Control device 24 is provided inward of operation display section 23. Water supply valve 22 is provided inward of a rear portion of upper frame body 21. Water supply valve 22 supplies water into washing/spin-drying tub 7.

Control device 24 includes a control means (not illustrated) configured of a microcomputer. Control device 24 is configured to sequentially control a series processes of washing, rinsing, and spin-drying by controlling motor 9, water supply valve 22, drain valve 26, and the like.

Bottom surface member 31 made of synthetic resin is mounted to a lower portion of washing/spin-drying tub 7. Bottom surface member 31 configures a bottom surface portion of washing/spin-drying tub 7. Bottom surface member 31 has a step portion (not illustrated) provided at a side surface of bottom surface member 31 so as to be in proximity to and face

pulsator 8. A space for containing pulsator 8 is formed between the step portion and an inner bottom surface of bottom surface member 31. In this space, pump chamber 19 is formed between a back surface of pulsator 8 and the inner bottom surface of bottom surface member 31. Vane 18 is disposed in pump chamber 19. Vane 18 is provided at pulsator 8. Outer peripheral end portion 8a of pulsator 8 is positioned above the step portion.

As illustrated in FIGS. 2 to 6, a pair of water channel covers 14 is provided at an inner wall of washing/spin-drying tub 7 so as to face each other. Lint filter 32 is disposed at one of the positions rotated by 90° from water channel cover 14. In addition, cover 33 is provided at a position which is the other position rotated by 90° from water channel cover 14 and which faces lint filter 32. Here, each of the position and the other position rotated by 90° from water channel cover 14 is a position rotated clockwise/counterclockwise by 90° from a position of water channel cover 14 when water tub 3 is seen from above (that is, about spin-drying shaft 4). Low water level discharge port 34 is formed on cover 33 at a substantially intermediate position of a height of washing/spin-drying tub 7.

A portion of bottom surface member 31 to which water channel cover 14 is mounted has an arc shape having substantially the same diameter as that of washing/spin-drying tub 7. Due to this shape of bottom surface member 31, a space communicating with pump chamber 19 is formed. In addition, bottom surface member 31 is configured such that circulating water channel 10 formed by mounting water channel cover 14 and pump chamber 19 are communicated with each other. A surface of bottom surface member 31 and a surface of water channel cover 14 are configured such that there is almost no level difference between them. Water channel cover 14 has step portion 37 provided at a lower end portion of water channel cover 14. Step

portion 37 of water channel cover 14 and the step portion of bottom surface member 31 are configured so as to be continuous with each other.

Water channel cover 14 has a substantially T-shape. Water channel cover 14 includes side surface cover portion 15 and an upper cover portion 16.

5 Side surface cover portion 15 is disposed on an inner wall portion side surface of washing/spin-drying tub 7 so as to extend in a rotary axis (vertical) direction of washing/spin-drying tub 7. Upper cover portion 16 is disposed at a position below fluid balancer 6 at the upper portion of washing/spin-drying tub 7 so as to extend in the circumferential direction of washing/spin-drying tub 7. By

10 mounting water channel cover 14 on the side surface of washing/spin-drying tub 7, circulating water channel 10 is formed. Specifically, side surface cover portion 15 is water-tightly mounted to the side surface of washing/spin-drying tub 7 via a packing member or the like. Rear cover portion 38 (see FIG. 7) is mounted from a side surface side of washing/spin-drying tub 7 and therefore

15 upper cover portion 16 is mounted on the side surface of washing/spin-drying tub 7. Circulating water channel 10 is configured of side surface water channel 17 formed in side surface cover portion 15, and upper water channel 20 formed in upper cover portion 16. Upper water channel 20 is configured of first upper water channel 41, second upper water channel 42, and third upper

20 water channel 43.

When pulsator 8 is rotated, due to rotation of vane 18, a washing liquid in pump chamber 19 is fed to circulating water channel 10 of water channel cover 14. In addition, the washing liquid is also fed into lint filter 32 and cover 33.

25 Upper cover portion 16 has first discharge port 11 at a position above side surface cover portion 15 in a central portion of upper cover portion 16. Upper cover portion 16 has second discharge port 12 provided at a left side end

portion (when seen from a rotation center of washing/spin-drying tub 7) of upper cover portion 16, and has third discharge port 13 provided at a right side end portion (when seen from the rotation center of washing/spin-drying tub 7) of upper cover portion 16. First discharge port 11, second discharge port 12, and third discharge port 13 are disposed below fluid balancer 6, and are disposed at substantially the same heights in the circumferential direction of washing/spin-drying tub 7.

As illustrated in FIG. 4, water channel cover 14 has first guide wall 35 and second guide wall 36 provided on a circulating water channel 10 side and ranging from an upper portion of side surface cover portion 15 to an upper end portion side of upper cover portion 16.

First guide wall 35 is disposed with an interval between first guide wall 35 and a right inner side surface of water channel cover 14. First guide wall 35 is curved toward second upper water channel 42 as proceeding to an upside so as to guide a washing liquid flowing upward through side surface water channel 17 toward upper water channel 20 to second upper water channel 42. An upper end portion of first guide wall 35 configures a port edge portion of a right side of first discharge port 11. At a right end portion of second upper water channel 42, first regulating wall 44 is disposed substantially in parallel to the right inner side surface of water channel cover 14 so as to be disposed along an end portion of second discharge port 12. First regulating wall 44 is configured to cause a washing liquid in second upper water channel 42 to flow toward second discharge port 12.

Second guide wall 36 is disposed with an interval between second guide wall 36 and a left inner side surface of water channel cover 14. Second guide wall 36 is curved toward third upper water channel 43 as proceeding to an upside so as to guide the washing liquid flowing upward through side surface

water channel 17 toward upper water channel 20 to third upper water channel 43. An upper end portion of second guide wall 36 configures a port edge portion of a left side of first discharge port 11. At a left end portion of third upper water channel 43, second regulating wall 45 is disposed substantially in parallel to the left inner side surface of water channel cover 14 so as to be disposed along an end portion of third discharge port 13. Second regulating wall 45 is configured to cause a washing liquid in third upper water channel 43 to flow toward third discharge port 13.

A gap is provided between first guide wall 35 and second guide wall 36 so as to guide the washing liquid flowing upward through side surface water channel 17 toward upper water channel 20 to first discharge port 11. First upper water channel 41 is provided between first guide wall 35 and second guide wall 36. First upper water channel inlet 41a, which is an inlet to first upper water channel 41, is narrower than each of second upper water channel inlet 42a, which is an inlet to second upper water channel 42, and third upper water channel inlet 43a, which is an inlet to third upper water channel 43. Due to this configuration, a washing liquid at substantially the same flow rate flows toward each of first discharge port 11, second discharge port 12, and third discharge port 13.

First discharge port 11 has a shape in which a lower edge of a central portion of an opening is raised upward, and the central portion of the opening is narrow. In addition, first discharge port 11 has a shape in which lower edges of both end portions of the opening are raised upward as proceeding to both ends, and the both ends of the opening are narrower as proceeding to both end sides. Due to such a configuration, the washing liquid is substantially uniformly sprinkled in a wide range from first discharge port 11.

Second discharge port 12 has a shape in which a lower edge of an

opening is raised upward as proceeding to an end portion and an opening is narrower as proceeding to the end portion. Due to such a configuration, the washing liquid is sprinkled in a wide range from second discharge port 12.

Third discharge port 13 has a shape in which a lower edge of an opening is raised upward as proceeding to an end portion and the opening is narrower as proceeding to the end portion. Due to such a configuration, the washing liquid is sprinkled in a wide range from third discharge port 13.

Hereinafter, operation and effects of the washing machine configured as described above will be described.

In order to start the washing process, a user inputs laundry in washing/spin-drying tub 7, and pushes a start button (not illustrated) of operation display unit 23. Then, a cloth amount detecting means (not illustrated) detects a cloth amount, and an amount of a detergent corresponding to the cloth amount is displayed on operation display unit 23. When the user inputs the displayed amount of the detergent, under control of control device 24, water supply valve 22 operates, water is supplied into a water level corresponding the cloth amount, pulsator 8 rotates, and the washing process is started.

When the washing process is started, the detergent is efficiently dissolved in the supplied water due to rotation of pulsator 8. A washing liquid obtained by dissolving the detergent in the water flows up from pump chamber 19 via side surface water channel 17 of circulating water channel 10 to upper water channel 20 due to a centrifugal force generated by rotation of vane 18. Then, the washing liquid is divided into first upper water channel 41, second upper water channel 42, and third upper water channel 43 by means of first guide wall 35 and second guide wall 36. Then, the washing liquid is sprinkled to the laundry in washing/spin-drying tub 7 from first

discharge port 11, second discharge port 12, and third discharge port 13, and the washing liquid permeates the laundry.

Water channel cover 14 has first guide wall 35 that guides the washing liquid to second upper water channel 42 and second guide wall 36 that guides
5 the washing liquid to third upper water channel 43. First guide wall 35 and second guide wall 36 range from an upper portion of side surface cover portion 15 to an upper end portion side of upper cover portion 16 on a circulating water channel 10 side of water channel cover 14. Water channel cover 14 has first upper water channel 41 provided between first guide wall 35 and second
10 guide wall 36. Therefore, washing water flowing through circulating water channel 10 can be efficiently branched into first discharge port 11, second discharge port 12, and third discharge port 13.

By adjusting shapes of first guide wall 35 and second guide wall 36, cross-sectional areas of first upper water channel 41, second upper water
15 channel 42, and third upper water channel 43, and the like, flow rates of the washing water flowing to first discharge port 11, second discharge port 12, and third discharge port 13 can be made substantially equal to one another.

As illustrated in FIG. 4, first discharge port 11 has the shape in which the lower edge of the central portion of the opening is raised upward, and the
20 central portion of the opening is narrow. In a case where an opening width of the central portion is not narrowed, since the washing liquid most easily flows out from the central portion, an amount of the washing liquid from the central portion increases, and the washing liquid cannot be sprinkled in a wide range. In the present exemplary embodiment, since the central portion of the opening
25 of first discharge port 11 is narrowed, it is possible to reduce the concentration of the washing liquid on the central portion, and to sprinkle the washing liquid in a wide range from entire first discharge port 11.

In addition, first discharge port 11 has the shape in which the lower edges of the both end portions of the opening are raised upward as proceeding to the both ends, and the both end portions of the opening are narrower as proceeding to the both end sides. In a case where the both end portions of the opening are not narrowed, the washing liquid is guided by first guide wall 35 and second guide wall 36 and spreads to entire first discharge port 11, and a flow of the washing liquid is blocked at the both end portions by first guide wall 35 and second guide wall 36. Therefore, flow rates of the washing liquid from the both end portions of first discharge port 11 increase.

According to the present exemplary embodiment, first discharge port 11 has the shape in which the lower edges of the both end portions of the opening are raised upward as proceeding to the both ends, and the both end portions of the opening are narrower as proceeding to the both end sides. Therefore, the flow rates of the washing liquid from the both end portions of first discharge port 11 can be suppressed, and the washing liquid can be substantially uniformly sprinkled in a wide range from entire first discharge port 11.

Second discharge port 12 has the shape in which the lower edge of the opening is raised upward as proceeding to the end portion and the opening is narrower as proceeding to the end portion. Third discharge port 13 has the shape in which the lower edge of the opening is raised upward as proceeding to the end portion and the opening is narrower as proceeding to the end portion.

A flow of the washing water having flowed in second upper water channel 42 is regulated by first regulating wall 44, and the washing water flows toward second discharge port 12. At that time, in a case where an opening width of second discharge port 12 is constant, a flow rate of the washing water on a first regulating wall 44 (right side end portion) side of

second discharge port 12 increases, the washing water easily flows in an extending direction of second upper water channel 42, and the washing water is non-uniformly discharged. In contrast, in the present exemplary embodiment, since second discharge port 12 has the shape in which the lower edge of the opening is raised upward and the opening is narrower as proceeding to the right side end portion, an amount of washing water discharged from a right end portion side is reduced. Therefore, the washing water discharged from second discharge port 12 is uniformly sprinkled in a wide range to the laundry.

A flow of washing water having flowed in third upper water channel 43 is regulated by second regulating wall 45, and the washing water flows toward third discharge port 13. At that time, in a case where an opening width of third discharge port 13 is constant, a flow rate of the washing water on a second regulating wall 45 (left side end portion) of third discharge port 13 increases, the washing water easily flows in an extending direction of third upper water channel 43, and the washing water is non-uniformly discharged. In contrast, in the present exemplary embodiment, since third discharge port 13 has the shape in which the lower edge of the opening is raised upward and the opening is narrower as proceeding to the left side end portion, an amount of the washing water discharged from a left side end portion side is reduced. Therefore, the washing water discharged from third discharge port 13 is uniformly sprinkled in a wide range to the laundry.

FIG. 8 is a view illustrating a relation between a discharge range from the circulating water channel and laundry in the washing machine according to the exemplary embodiment of the present invention.

As illustrated in FIG. 8, an area to which a washing liquid is sprinkled from first discharge port 11, second discharge port 12, and third discharge port

13 of one of circulating water channels 10 occupies about half of an area in washing/spin-drying tub 7. Therefore, since the washing liquid is sprinkled from the pair of circulating water channels 10, the washing liquid can be sprinkled from above on almost entire laundry 30 in washing/spin-drying tub 7,
5 and the washing liquid can permeate the laundry. Thus, washing unevenness can be prevented and washing performance can be improved.

As a result of experiments, each of an angle between a center position of first discharge port 11 and a center position of second discharge port 12, and an angle between the center position of first discharge port 11 and a center
10 position of third discharge port 13 is preferable set within a range from 35° to 45°. Here, the angle between the center position of first discharge port 11 and the center position of second discharge port 12/third discharge port 13 means an angle (absolute value of angle) of counterclockwise/clockwise rotation from the center position of first discharge port 11 to the center position of second
15 discharge port 12/third discharge port 13 when water tub 3 is seen from above (that is, about spin-drying axis 4). Due to this configuration, the washing liquid can be sprinkled without unevenness in entire washing/spin-drying tub 7. Although depending on a flow speed of the washing liquid in the circulating water channel, shapes of the discharge ports, or the like, the
20 washing liquid can be sprinkled in the entire washing/spin-drying tub 7 by setting the angle in the above range.

Note that also in the rinsing process, since rinsing water is sprinkled widely from above the laundry similarly to the washing process, rinsing can be promoted and rinsing performance can be improved.

25 FIG. 7 is a cutaway view illustrating upper water channel 20 of circulating water channel 10 according to the exemplary embodiment of the present invention.

As illustrated in FIG. 7, upper cover portion 16 has inclined surfaces 39 at both end portions on a front surface side. Since inclined surfaces 39 are provided at the both end portions of upper cover portion 16, the both end portions of upper cover portion 16 continue to an inner peripheral surface of washing/spin-drying tub 7 at smooth inclination. Therefore, in the washing process and the rinsing process, the laundry is less likely to be caught at the both end portions of upper cover portion 16, and washing unevenness and rinsing unevenness occurring when the laundry is caught at the both end portions and does not easily rotate can be suppressed.

10 In addition, upper cover portion 16 has raised portion 40 provided at opening peripheral edge of each of first discharge port 11, second discharge port 12, and third discharge port 13, on an inner surface side of washing/spin-drying tub 7. Since raised portion 40 is provided, the laundry is less likely to enter or be caught in first discharge port 11, second discharge port 12, and third discharge port 13, and washing unevenness and rinsing unevenness caused when the laundry is caught in the discharge ports can be prevented.

Note that in the above present exemplary embodiment, three discharge ports, that is, first discharge port 11, second discharge port 12, and third discharge port 13, are formed on water channel cover 14; however, first discharge port 11 may be omitted and only second discharge port 12 and third discharge port 13 may be provided. In addition, one of second discharge port 12 and third discharge port 13 may be omitted. Alternatively, on upper cover portion 16, two discharge ports may be formed on each of right and left of side surface cover portion 15, that is, four discharge ports in total may be formed.

In the present invention, water channel cover 14 has a plurality of discharge ports provided at an upper portion of water channel cover 14 in a

circumferential direction of washing/spin-drying tub 7, and the shapes, a number, and the like of the discharge ports are not limited by those in the exemplary embodiment.

As described above, in the present exemplary embodiment, water
5 channel cover 14, which forms circulating water channel 10 in a watertight manner, is integrally formed in an substantially T-shape by including side surface cover portion 15, which has a vertically long shape on an inner wall portion of washing/spin-drying tub 7, and upper cover portion 16, which has a horizontally long shape at the upper portion of washing/spin-drying tub 7.
10 When seen from a center of washing/spin-drying tub 7, upper cover portion 16 has first discharge portion 11 at a central portion, second discharge port 12 on a left side of first discharge port 11, and third discharge port 13 on a right side of first discharge port 11. When pulsator 8 rotates, the washing liquid passes through circulating water channel 10 and is sprinkled in washing/spin-drying
15 tub 7 from first discharge port 11, second discharge port 12, and third discharge port 13. Therefore, in the washing process and the rinsing process, the laundry in washing/spin-drying tub 7 can be agitated while the washing liquid is sprinkled on all over the laundry from above. As a result, washing unevenness and rinsing unevenness can be prevented, and washing
20 performance and rinsing performance can be improved.

As described above, a washing machine according to a first aspect of the present invention includes a body, a water tub, a washing/spin-drying tub, a pulsator, a vane, a motor, and at least one water channel cover. The water tub is provided inside the body. The washing/spin-drying tub is rotatably
25 provided in the water tub. The pulsator is rotatably disposed at a central inner bottom portion of the washing/spin-drying tub, and forms a pump chamber at a position below the pulsator in the water tub. The vane is

formed integrally with the pulsator, and is disposed in the pump chamber. The motor rotatably drives the pulsator and the washing/spin-drying tub. The at least one water channel cover is provided on an inner wall of the washing/spin-drying tub, and forms a circulating water channel through which
5 a washing liquid in the pump chamber is circulated to the washing/spin-drying tub. The at least one water channel cover includes a side surface cover portion, and an upper cover portion continuous to an upper portion of the side surface cover portion and having a laterally long shape. The upper cover portion has a plurality of discharge ports that supplies a washing liquid into
10 the washing/spin-drying tub, the plurality of discharge ports being provided at substantially the same heights in a circumferential direction of the washing/spin-drying tub. Due to this configuration, in a washing process, laundry in washing/spin-drying tub can be agitated while the washing liquid is sprinkled on all over laundry from above. As a result, washing unevenness
15 can be prevented, and washing performance can be improved.

In a second aspect of the present invention according to the first aspect of the present invention, the upper cover portion includes the plurality of discharge ports at each of side end portions in the circumferential direction of the washing/spin-drying tub, and an opening of each of the plurality of
20 discharge ports is narrower as separating from a center side of the upper cover portion. Due to this configuration, the washing liquid can be sprinkled in a wide range.

In a third aspect of the present invention according to one of the first aspect and the second aspect of the present invention, the upper cover portion
25 has the plurality of discharge ports including a first discharge port provided at a central portion of the upper cover portion, a second discharge port provided at a left side of the first discharge port, and a third discharge port at a right

side of the first discharge port. Due to this configuration, the washing liquid can be sprinkled in a wide range and can permeate the laundry. Therefore, washing unevenness can be prevented and washing performance can be improved.

5 In a fourth aspect of the present invention according to the third aspect of the present invention, the second discharge port and the third discharge port are provided in a range of 35° to 45° from the first discharge port on left and right of the first discharge port, respectively. Due to this configuration, the washing liquid can be sprinkled in a wider range.

10 In a fifth aspect of the present invention according to one of the first to fourth aspects of the present invention, two of the at least one water channel covers are provided at positions facing each other on the washing/spin-drying tub. Due to this configuration, the washing liquid can be sprinkled in a wide range.

15 In a sixth aspect of the present invention according to one of the first to fifth aspects of the present invention, the washing machine further includes a water supply valve that supplies water into the water tub, and a control means for controlling operation of the motor and the water supply valve and controlling each of washing, rinsing, and spin-drying processes, and the water
20 tub is supported in a vibration-isolating manner inside the body. Due to this configuration, washing can be automatically performed, and vibration can be reduced.

INDUSTRIAL APPLICABILITY

25 As described above, since the washing machine according to the present invention agitates laundry in the washing/spin-drying tub while sprinkling a washing liquid on all over the laundry from above, washing

unevenness can be suppressed and washing performance can be improved. Therefore, the washing machine can be applied to a drum type or another type of washing machine.

5 REFERENCE MARKS IN THE DRAWINGS

	1	body
	2	suspension
	3	water tub
	7	washing/spin-drying tub
10	8	pulsator
	9	motor
	10	circulating water channel
	11	first discharge port
	12	second discharge port
15	13	third discharge port
	14	water channel cover
	15	side surface cover portion
	16	upper cover portion
	17	side surface water channel
20	18	vane
	19	pump chamber
	20	upper water channel
	22	water supply valve
	24	control device
25	31	bottom surface member
	35	first guide wall
	36	second guide wall

CLAIMS

1. A washing machine comprising:
 - a body;
 - a water tub provided inside the body;
 - a washing/spin-drying tub rotatably provided in the water tub;
 - a pulsator rotatably disposed at a central inner bottom portion of the washing/spin-drying tub, the pulsator forming a pump chamber at a position below the pulsator in the water tub;
 - a vane formed integrally with the pulsator and disposed in the pump chamber;
 - a motor that drives and rotates the pulsator and the washing/spin-drying tub; and
 - at least one water channel cover provided on an inner wall of the washing/spin-drying tub, the at least one water channel cover forming a circulating water channel through which a washing liquid in the pump chamber is circulated to the washing/spin-drying tub,
 - the at least one water channel cover including a side surface cover portion, and an upper cover portion continuous to an upper portion of the side surface cover portion and having a laterally long shape,
 - the upper cover portion having a plurality of discharge ports that supplies a washing liquid into the washing/spin-drying tub, the plurality of discharge ports being provided at an identical height in a circumferential direction of the washing/spin-drying tub, wherein
 - the upper cover portion has the plurality of discharge ports at both side end portions in the circumferential direction of the washing/spin-drying tub, and

an opening of each of the plurality of discharge ports is narrower as each of the plurality of discharge ports separates from a center side of the upper cover portion.

2. The washing machine according to claim 1, wherein the upper cover portion has the plurality of discharge ports including a first discharge port provided at a central portion of the upper cover portion, a second discharge port provided at a left side of the first discharge port, and a third discharge port at a right side of the first discharge port.

3. The washing machine according to claim 2, wherein the second discharge port and the third discharge port are provided in a range of 35° to 45° from the first discharge port on left and right of the first discharge port, respectively.

4. The washing machine according to one of claims 1 to 3, wherein two of the at least one water channel covers are provided at positions facing each other on the washing/spin-drying tub.

5. The washing machine according to one of claims 1 to 4, further comprising:

a water supply valve that supplies water into the water tub; and

a control means for controlling operation of the motor and the water supply valve, and controlling each of washing, rinsing, and spin-drying processes,

wherein the water tub is supported in a vibration-isolating manner inside the body.