

DESCRIPTION

DRUM WASHING MACHINE

5 TECHNICAL FIELD

The present disclosure relates to a drum washing machine including a baffle that agitates laundry contained in a drum.

BACKGROUND ART

10 A conventional drum washing machine includes a drum that is rotatably supported in a horizontal direction and contains laundry, and a receiving cylinder that surrounds an outside of the drum. The drum is rotated with a predetermined amount of water stored in the receiving cylinder. Beating washing is repeatedly performed in which the laundry in the drum is
15 lifted by a substantially mountain-shaped baffle provided on an inner peripheral surface of the drum, and is naturally dropped from a certain height toward a water surface. For example, it has been proposed to form, at a top of the baffle, a recessed surface that is recessed toward a side of the inner peripheral surface of the drum, to improve a washing performance by
20 improvement of a washing machine power (see, for example, PTL 1).

Citation List

Patent Literature

PTL 1: Unexamined Japanese Patent Publication No. 2009-22688

25 SUMMARY OF THE INVENTION

However, in the above-described conventional configuration, in addition to the beating washing, which is an original washing method of the

drum washing machine, scrubbing washing by rubbing with an uneven surface is also performed. As a result, the washing machine power is improved and the washing performance is improved, but there is a problem that clothes are easily damaged especially in a case of delicate clothes such as wool. The present disclosure is to provide a drum washing machine that improves a washing performance while damage to laundry is suppressed, by improvement of a shape of a baffle for agitating the laundry.

In an embodiment, a drum washing machine according to the present disclosure includes a main body, a receiving cylinder that is provided in the main body, a drum that is rotatably supported inside the receiving cylinder and contains laundry, a baffle that is provided on an inner peripheral surface of the drum and agitates the laundry, a controller, and a cloth material detector. The baffle is formed to have a trapezoidal cross section, and includes a first side surface portion and a second side surface portion, the first side surface portion where a plurality of water passage holes communicating with an inner space of the baffle is provided, the second side surface portion faces the first side portion in front view and where unevenness is provided. The cloth material detector detects a cloth material of the laundry put in the drum, wherein the controller sets, in a washing process, a ratio of time of clockwise and counterclockwise rotations of the drum according to the cloth material of the laundry detected by the cloth material detector.

As a result, it is possible to perform washing by a washing method suitable for the laundry according to a type of the laundry.

The drum washing machine of the present disclosure can improve the washing performance while suppressing the damage to the laundry by improvement of the washing machine power.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a side cross-sectional view of a drum washing machine according to a first exemplary embodiment of the present disclosure.

FIG. 2 is a block circuit diagram of the drum washing machine.

FIG. 3 is a perspective view illustrating a left side surface of a baffle of the

drum washing machine.

FIG. 4 is a perspective view illustrating a right side surface of the baffle of the drum washing machine.

FIG. 5 is a front view of a drum and the baffle of the drum washing machine.

5 FIG. 6 is a flowchart illustrating an operation of the drum washing machine.

DESCRIPTION OF EMBODIMENTS

A drum washing machine according to a first aspect includes a main
10 body, a receiving cylinder that is provided in the main body, a drum that is rotatably supported inside the receiving cylinder and contains laundry, a baffle that is provided on an inner peripheral surface of the drum and agitates the laundry, and a controller. The baffle is formed to have a trapezoidal cross section, and includes a first side surface portion where a plurality of water
15 passage holes communicating with an inner space of the baffle is provided.

As a result, it is possible to improve a washing performance while damage to the laundry is suppressed.

In a drum washing machine according to a second aspect, particularly, in the first aspect, the baffle includes a second side surface portion where
20 unevenness is provided.

As a result, a washing machine power can be improved and the washing performance can be improved.

In a drum washing machine according a third aspect, particularly, in the first or second aspect, the baffle includes an upper surface portion where a
25 plurality of water passage holes communicating with the inner space of the baffle is provided.

As a result, it is possible to improve the washing performance while

the damage to the laundry is suppressed.

A drum washing machine according to a fourth aspect, particularly, in any one of the first to third aspects, includes a cloth material detector that detects a cloth material of the laundry put in the drum. The controller sets,
5 in a washing process, a ratio of time of clockwise and counterclockwise rotations of the drum according to the cloth material of the laundry detected by the cloth material detector.

As a result, according to a type of the laundry, the washing performance can be greatly improved or can be improved while the damage to
10 the laundry is suppressed.

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

(First exemplary embodiment)

15 FIG. 1 is a longitudinal cross-sectional view of a drum washing machine according to a first exemplary embodiment of the present invention. FIG. 2 is a block circuit diagram of the drum washing machine. FIG. 3 is a perspective view illustrating a left side surface of a baffle of the drum washing machine. FIG. 4 is a perspective view illustrating a right side surface of the
20 baffle of the drum washing machine. FIG. 5 is a front view of a drum and the baffle of the drum washing machine.

As illustrated FIGS. 1 and 2, inside main body 1 of drum washing machine 100, receiving cylinder 4 is horizontally (including a substantially horizontal state) supported in a vibration-damping manner by damper 2 and
25 suspension 3. Inside receiving cylinder 4, drum 5 that contains laundry is rotatably supported in a horizontal direction (including a substantially horizontal direction). Drum 5 is fixed to one end side of rotary shaft 8

rotatably supported on a center of receiving cylinder 4. Drum pulley 9 is fixed to the other end side of rotary shaft 8. Motor 10 is attached to a bottom of receiving cylinder 4. Motor pulley 11 provided to motor 10 and drum pulley 9 are connected by belt 12. As a result, a power of motor 10 is transmitted to drum 5 and drum 5 rotates.

Drum 5 includes a large number of spin-drying holes 6 on a side surface of drum 5 and a plurality of baffles 7 that agitates the laundry on an inner peripheral surface of drum 5. Each of baffles 7 is formed to have a trapezoidal cross section (including a substantially trapezoidal cross section). Note that the plurality of baffles 7 may be disposed at equal intervals. In the present exemplary embodiment, three baffles 7 are provided.

As illustrated in FIGS. 3, 4, and 5, baffle 7 is provided with uneven surface 21 on a right side surface portion in a front view. Furthermore, a plurality of side surface water passage holes 22 and a plurality of upper surface water passage holes 23 that communicate with an inner space of baffle 7 are provided on a left side surface portion and an upper surface portion of baffle 7, respectively.

Clothes put-in opening 25 is provided on a front surface of main body 1, and clothes put-in opening 25 is openably and closably covered by lid 24. A user opens lid 24 to put the laundry in and out of drum 5 through the clothes put-in opening 25.

At positions above receiving cylinder 4, detergent putting container 13 that contains a detergent and water supply valve 14 are provided. Detergent putting container 13 and water supply valve 14 are connected by water supply path 15. Water supply valve 14 sends water from an outside of main body 1 to detergent putting container 13 via water supply path 15. The water sent to detergent putting container 13 is sent to receiving cylinder 4 and drum 5

together with the detergent through water injection hose 16 connecting receiving cylinder 4 and detergent putting container 13.

Drain pump 17 is provided below receiving cylinder 4. Drain pump 17 is connected to a bottom surface of receiving cylinder 4 by drain hose 18, and
5 the water in receiving cylinder 4 is drained to an outside of the machine through drain path 19.

Operation display 30 that allows the user to select an operation course is provided on an upper part of the front surface of main body 1. The user inputs operation content from input setting unit 31 that constitutes operation
10 display 30. The input information is displayed on display 32 to inform the user.

Water level detector 35 detects a water level of washing water in receiving cylinder 4.

Cloth amount detector 33 detects, as an input current, a load torque
15 applied to motor 10 when motor 10 is rotated for a predetermined time in a state where dry laundry is put in drum 5. Cloth amount detector 33 then determines an amount of the laundry put in drum 5 based on the load torque.

Cloth material detector 34 detects a cloth material of the laundry based on a water supply flow rate detected by water supply flow rate detector
20 36, the cloth amount detected by cloth amount detector 33, and information regarding water supply time until the water level set according to the cloth amount is reached.

When the operation content is set on operation display 30, controller 20 receives input of data from water level detector 35, cloth amount detector 33,
25 water supply flow rate detector 36, and the like. Controller 20 controls motor 10, water supply valve 14, drain pump 17, and the like to execute a washing operation including washing, rinsing, and spin-drying.

Furthermore, controller 20 controls time counter 37 to count elapsed time from any time point.

An operation and an effect of drum washing machine 100 configured as described above will be described.

5 FIG. 6 is a flow chart illustrating the operation of the drum washing machine according to the first exemplary embodiment of the present invention.

Lid 24 is opened, and the laundry is put in drum 5 through clothes put-in opening 25 (step S1). After that, a power supply switch (not illustrated) is turned on by input setting unit 31 of operation display 30. When a start
10 switch (not illustrated) is operated to start the operation (step S2), drum 5 rotates only for a short time. At this time, the cloth amount of the laundry in a dry state is detected by cloth amount detector 33 (step S3), and the detected cloth amount is input to controller 20.

When the cloth amount is detected, the water level and a detergent
15 amount set according to the cloth amount are displayed on display 32 (step S4).

Water supply valve 14 then operates to start water supply, and water is supplied into receiving cylinder 4 together with the detergent put in detergent putting container 13. Then, water supply flow rate detector 36 detects the water supply flow rate (step S5) and time counter 37 counts the water supply
20 time (step S6).

The cloth material is then detected based on the cloth amount, the water supply flow rate, and the information regarding the water supply time until the water level set according to the cloth amount is reached (step S7). That is, it is detected whether there are a large amount of general cotton
25 clothes or a large amount of delicate clothes such as wool clothes.

In a washing process, drum 5 is rotated, in a front view, clockwise and counterclockwise alternately to rotate the laundry so that washing is

performed. If there are a large amount of general cotton clothes as a result of the detection of the cloth material (No in step S8), controller 20 sets a ratio of agitation by drum 5 rotating counterclockwise (see FIG. 5) higher (step S9). On the other hand, if there are a large amount of delicate clothes (Yes in step
5 S8), controller 20 sets a ratio of agitation by drum 5 rotating clockwise (see FIG. 5) higher (step S10). Controller 20 executes a washing and agitating process based on such settings (step S11).

In the washing process, the lifted laundry is lifted to a certain height. When the lifted laundry reaches the certain height, the laundry is dropped
10 toward the water surface on a lower side of drum 5. The laundry is beaten on the water surface so that beating washing is performed, and dirt of the laundry is removed.

During the washing process, when drum 5 rotates counterclockwise in a front view, the laundry is lifted by being caught by uneven surface 21 when
15 lifted upward. When the lifted laundry is dropped, the laundry is rubbed against uneven surface 21 of baffle 7 and then dropped.

Furthermore, when drum 5 rotates clockwise in a front view, the laundry is lifted by the left side surface portion where side surface water passage holes 22 are provided, and drum 5 rotates while the washing water in
20 drum 5 is taken into baffle 7. When the laundry is dropped and baffle 7 rotates to an upper side of drum 5, the washing water taken into baffle 7 is discharged from side surface water passage holes 22 and upper surface water passage holes 23 to the lower side of drum 5, and the discharged washing water is applied to the dropped laundry.

25 In determination of the cloth material in the washing process, if it is determined that there are a large amount of general cotton clothes (No in step S8) and the ratio of agitation by drum 5 rotating counterclockwise is set higher

(step S9), uneven surface 21 of baffle 7 and the laundry are rubbed many times. As a result, a washing machine power is further improved, so that the washing machine power can be strengthened to remove dirt.

In the determination of the cloth material, if it is determined that
5 there are a large amount of delicate clothes (Yes in step S8) and the ratio of agitation by drum 5 rotating clockwise is set higher (step S10), a ratio of lifting the laundry on the surface where side surface water passage holes 22 are formed is higher. For this reason, when drum 5 rotates while the washing water in drum 5 is taken into baffle 7, and baffle 7 rotates to the upper side of
10 drum 5, the washing water contained in baffle 7 is discharged to the lower side of drum 5 from side surface water passage holes 22 and upper surface water passage holes 23. As a result, a ratio of applying the discharged washing water to the dropped laundry is higher.

As a result, circulation of the washing water in drum 5 increases, and
15 an amount of the washing water applied to a portion of the laundry above the water surface increases. Therefore, dirt is more likely to be washed off. Furthermore, since a ratio of agitation on uneven surface 21 is lower, the washing is performed while the washing machine power is reduced, so that damage to the laundry can be suppressed and the washing can be performed
20 gently.

When the washing process (step S11) is completed, controller 20 shifts to the next process.

Note that sides of baffle 7 where uneven surface 21 and the side surface including side surface water passage holes 22 are disposed is not
25 limited to the present exemplary embodiment. Uneven surface 21 and the side surface including side surface water passage holes 22 may be provided with the right and left sides reversed, but in this case, directions of clockwise

and counterclockwise rotations described above are reversed.

Furthermore, baffle 7 according to the present exemplary embodiment has been described in a form including uneven surface 21, side surface water passage holes 22, and upper surface water passage holes 23, but is not limited to this. Baffle 7 is only required to be provided with at least one of uneven surface 21, side surface water passage holes 22, and upper surface water passage holes 23.

As described above, in the present exemplary embodiment, baffle 7 has a structure in which uneven surface 21 is provided on the right side surface portion, the plurality of side surface water passage holes 22 is provided on the left side surface portion, and the plurality of upper surface water passage holes 23 is provided on the upper surface portion, in a front view. As a result, according to a type of the laundry, a washing performance can be greatly improved or can be improved while the damage to the laundry is suppressed.

Furthermore, in the washing process, controller 20 is configured to set a ratio of time of clockwise and counterclockwise rotations of drum 5 according to the cloth material of the laundry detected by cloth material detector 34. As a result, according to the type of the laundry, the washing performance can be greatly improved or can be improved while the damage to the laundry is suppressed.

As described above, the drum washing machine according to the present disclosure optimizes a shape of the baffle and controls the rotation of the drum, so that the washing performance can be greatly improved or can be improved while the damage to the laundry is suppressed according to the type of laundry, and thus can be applied to applications for other washing machines or the like.

REFERENCE MARKS IN THE DRAWINGS

	1	main body
	4	receiving cylinder
	5	drum
5	7	baffle
	10	motor
	14	water supply valve
	20	controller
	21	uneven surface
10	22	side surface water passage hole
	23	upper surface water passage hole
	33	cloth amount detector
	34	cloth material detector
	35	water level detector
15	36	water supply flow rate detector
	37	time counter
	100	drum washing machine

CLAIMS

1. A drum washing machine comprising:

a main body;

5 a receiving cylinder that is provided in the main body;

a drum that is rotatably supported inside the receiving cylinder and contains laundry;

a baffle that is provided on an inner peripheral surface of the drum and agitates the laundry;

a controller,

10 wherein the baffle is formed to have a trapezoidal cross section, and includes a first side surface portion and a second side surface portion, the first side surface portion where a plurality of water passage holes communicating with an inner space of the baffle is provided, the second side surface portion faces the first side portion in front view and where unevenness is provided; and

15 a cloth material detector that detects a cloth material of the laundry put in the drum, wherein the controller sets, in a washing process, a ratio of time of clockwise and counterclockwise rotations of the drum according to the cloth material of the laundry detected by the cloth material detector.

2. The drum washing machine according to claim 1, wherein the baffle includes an
20 upper surface portion where a plurality of water passage holes communicating with the inner space of the baffle is provided.