

DESCRIPTION**DRUM-TYPE WASHING MACHINE****TECHNICAL FIELD**

[0001] The present disclosure relates to a drum-type (front-loading) washing machine,
5 and particularly to a so-called washing tub maintenance.

BACKGROUND ART

[0002] Patent Literature (PTL) 1 discloses a washing machine which includes a tub
cleaning course. The washing machine includes a water tub, a rotary tub which is
rotatably housed in the water tub, and a driving means which rotates the rotary tub. The
10 tub cleaning course performs a first process in combination with a second process. The
first process is a process of rotating the rotary tub at a first rotational speed in a state
where water is filled in the water tub to a water level that is higher than the water level in
the washing process of a clothes washing course. The second process is a process of
rotating the rotary tub at a second rotational speed that is higher than the first rotational
15 speed, with a centrifugal force acting on the water adhered to the rotary tub that is greater
than gravity and less than the resonance point.

[0003] Moreover, the rotation direction at the second rotational speed is only one
direction, and the rotation direction is set such that the water blown from the rotary tub at
the time of rotation of the rotary tub is less likely to flow into the dry air channel which is
20 positioned in the upper portion of the water tub.

Citation List**Patent Literature**

[0004] [PTL 1] Japanese Unexamined Patent Application Publication No. 2016-43171
25

SUMMARY OF THE INVENTION

[0005] The present disclosure provides a drum-type (front-loading) washing machine
which is capable of efficiently removing the grime on the inner surface of the water tub
and the inner and outer surfaces of the rotary tub within a short period without using a tub
30 cleaning agent, and keeping the water tub and the rotary tub clean more easily.

[0006] A drum-type washing machine according to the present disclosure includes a
water tub, a rotary tub, a motor, a water supply unit, a draining unit, a drain outlet, an
overflow outlet, and a controller. The water tub stores water. The rotary tub is rotatably
provided in the water tub. The motor drives the rotary tub. The water supply unit

supplies water into the water tub. The draining unit drains water in the water tub. The drain outlet is provided in the lower portion of the water tub. The overflow outlet is provided on the water tub and above the drain outlet. The controller performs a first process after causing the water supply unit to supply water into the water tub, and performs a second process after causing the draining unit to drain the water in the water tub through the drain outlet and causing the water supply unit to supply water into the water tub again. The first process is a process of rotating the rotary tub in a first rotation direction at a rotational speed at which the water in the water tub is lifted to the height of the overflow outlet. The second process is a process of causing the motor to rotate the rotary tub in a second rotation direction that is opposite to the first rotation direction. The first rotation direction is set such that the lower portion of the rotary tub is directed toward the overflow outlet.

[0007] The drum-type washing machine according to the present disclosure is capable of efficiently removing the grime on the inner surface of the water tub and the inner and outer surfaces of the rotary tub within a short period without using a tub cleaning agent, and keeping the water tub and the rotary tub clean more easily.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

[FIG. 1] FIG. 1 is a side cross-sectional view of a drum-type washing machine according to a first embodiment.

[FIG. 2] FIG. 2 is a flowchart illustrating an operation of a maintenance course of the drum-type washing machine according to the first embodiment.

[FIG. 3A] FIG. 3A is a schematic front view of a water tub and a rotary drum of the drum-type washing machine in a first process according to the first embodiment.

[FIG. 3B] FIG. 3B is a schematic front view of the water tub and the rotary drum of the drum-type washing machine in the first process according to the first embodiment.

[FIG. 3C] FIG. 3C is a schematic front view of the water tub and the rotary drum of the drum-type washing machine in a second process according to the first embodiment.

DESCRIPTION OF EMBODIMENT

[0009] (Underlying Knowledge Forming Basis of the Present Disclosure)

At the time when the inventor arrived at the present disclosure, a conventional washing machine was known which included a tub cleaning course in which a tub

cleaning agent was put into a water tub to clean the tub thoroughly over about three hours. However, the tub cleaning course of such a conventional washing machine cannot be used daily because the operating time of the tub cleaning course is excessively long. This reduces the maintenance frequency carried out by the tub cleaning course, accelerating
5 accumulation and fixation of the grime in the water tub.

[0010] In addition, although water alone is sufficient for daily maintenance without using a tub cleaning agent, the user cannot perform the maintenance every day due to the above reasons. As a result, the user performs maintenance, for example, once every three
10 months, which causes such an inconvenience that it is always necessary to purchase a tub cleaning agent in order to remove the accumulated and fixed grime in the water tub. Moreover, when a tub cleaning agent is used, it is always necessary to rinse the inside of the water tub, which inevitably increases the maintenance time and the amount of water used.

[0011] On the other hand, in order for the user to easily perform maintenance, the user
15 may manually set “one minute for washing time, no rinsing, one minute for spinning time”, etc. for the standard clothes washing course and perform operation. However, in the standard course, the water level and the rotational speed of the rotary tub are not as high as those in the tub cleaning course, so that the water tub cannot be sufficiently cleaned.

[0012] Additionally, in the washing process of the tub cleaning course, once water is
20 supplied to the water tub, cleaning is continued for a long period of time, such as two hours, without draining the water. Accordingly, such problems occur that the grime peeled off from the surface of the water tub or the rotary tub adheres to another portion in the water tub, and at the same time, the detergent residue that has accumulated in the
25 water tub abnormally foams due to long-term washing.

[0013] The inventor has found such problems, and arrived at the subject matter of the present disclosure in order to solve the problems.

[0014] In view of the above, the present disclosure provides a drum-type (front-loading)
30 washing machine which is capable of efficiently removing the grime on the inner surface of the water tub and the inner and outer surfaces of the rotary tub within a short period without using a tub cleaning agent, and keeping the water tub and the rotary tub clean more easily.

[0015] Hereinafter, an embodiment will be described in detail with reference to the drawings. However, more detailed explanation than necessary may be omitted. For

example, detailed explanations of already well-known matters or duplicate explanations for substantially the same configuration may be omitted. This is to prevent the following explanation from becoming unnecessarily redundant and to facilitate the understanding of those skilled in the art.

5 [0016] It should be noted that the accompanying drawings and the following description are provided for those skilled in the art to fully understand the present disclosure, and are not intended to limit the subject matter described in the claims.

[0017] (First Embodiment)

10 Hereinafter, a first embodiment will be described with reference to FIG. 1 to FIG. 3C.

[0018] [1-1. Configuration]

First, a configuration of drum-type washing machine 10 will be described with reference to FIG. 1. FIG. 1 is a side cross-sectional view of drum-type washing machine 10. In the following description, the vertical direction in the state where drum-type washing machine 10 is installed as illustrated in FIG. 1 may be referred to as top-bottom directions. Moreover, in a state where drum-type washing machine 10 is installed as illustrated in FIG. 1, the side where lid 37 is provided may be referred to as the front or front direction, and the side where motor 35 is provided may be referred to as the back or back direction.

20 [0019] As illustrated in FIG. 1, drum-type washing machine 10 includes water tub 33, rotary drum 31, motor 35, water supply valve 44, water level detector 46, drain valve 43, drain outlet 40, overflow outlet 60, and controller 57. Water level detector 46 includes air trap 46a and pressure sensor 46b, and detects the water level in water tub 33. Rotary drum 31 corresponds to an example of the rotary tub according to the present disclosure, 25 water supply valve 44 corresponds to an example of the water supply unit according to the present disclosure, and drain valve 43 corresponds to an example of the draining unit according to the present disclosure.

[0020] Water tub 33 of drum-type washing machine 10 is supported such that water tub 33 can be oscillated and protected from vibration by suspension 41a provided in the upper portion of washing machine body 39 and vibration-proof member 41b provided in the lower portion of washing machine body 39, and stores water (hereinafter, also referred to as “washing water”).

[0021] Rotary drum 31 is rotatably provided in water tub 33, and is arranged such that the central axis of rotation is inclined downward from the front side to the back side.

Here, although it has been described that rotary drum 31 is arranged such that the central axis of rotation is inclined downward from the front side to the back side, the central axis of rotation may be arranged so as to be horizontal. Rotary drum 31 has a bottom surface, is cylinder in shape, and includes a large number of water passage holes 32 on the entire
 5 outer peripheral surface of rotary drum 31. The inner wall surface of rotary drum 31 includes a plurality of protrusions 36 for agitating clothes. Opening 38 is provided on the front side of water tub 33 and rotary drum 31. Opening 38 is covered with lid 37 so as to be openable and closable. The user is able to put the laundry in and out of rotary drum 31 through opening 38 by opening lid 37.

10 [0022] Water supply valve (water supply unit) 44 supplies water into water tub 33 through water supply path 45.

[0023] Controller 57 is provided in the lower portion of washing machine body 39. Controller 57 performs a first process after causing water supply valve 44 to supply water into water tub 33, and performs a second process after causing drain valve 43 to drain the
 15 water in water tub 33 through drain outlet 40, and causing water supply valve 44 to supply water into water tub 33 again. Details of the first process and the second process will be described later. Controller 57 includes a computer system which includes a processor and a memory. The processor executes the program stored in the memory, so that the computer system functions as controller 57. Although the program executed by
 20 the processor is pre-recorded in the memory of the computer system here, the program may be recorded in a non-transitory recording medium such as a memory card and provided, or may be provided via a telecommunications line such as the Internet.

[0024] Moreover, drain conduit 42 has a first end connected to drain outlet 40 which is provided in the lower portion of water tub 33, and a second end connected to a drain
 25 valve (draining unit) 43. Drain valve 43 drains the washing water in water tub 33.

[0025] Rotary shaft 34 is provided at the back of rotary drum 31, and motor 35 which is attached to the back of water tub 33 is connected to rotary shaft 34. Motor 35 is made of a DC brushless motor or the like, and drives rotary drum 31. Motor 35 is rotated by
 30 controller 57, a drive circuit (not illustrated), and the like in forward and reverse directions at a variable rotational speed, and a load applied to motor 35, which is the amount of laundry, is detected by a signal from a current detection circuit (not illustrated).

[0026] Controller 57 receives, as input, the information from input setting unit 58 used by the user to set the operation course and the like, and performs display corresponding to the input information on display unit 59 to inform the user. When the operation start is

set by input setting unit 58, controller 57 receives data from, for example, water level detector 46 including air trap 46a and pressure sensor 46b in order to detect the water level in water tub 33, and performs control as below. In other words, controller 57 controls the operations of drain valve 43, water supply valve 44, and the like via a load driver (not illustrated) based on the input data. Controller 57 also controls motor 35 via a drive circuit (not illustrated) and operates a series of processes such as washing, rinsing, spinning, and drying.

[0027] Drum-type washing machine 10 also includes a drying function. Drum-type washing machine 10 includes heater 47, blower fan 48, and hot air blowing path 49 to achieve the drying function. Specifically, drum-type washing machine 10 includes hot air inlet 52 for drawing in the air from water tub 33 in the front portion of the upper surface of water tub 33, and hot air outlet 51 in the upper portion of the back of water tub 33. Drum-type washing machine 10 causes hot air to flow into water tub 33 and rotary drum 31 in the hot air flow direction b, and heats and circulates the air in rotary drum 31 and water tub 33 to dry the laundry.

[0028] The side surface of water tub 33 includes overflow outlet 60 (for example, at a water level height of 160 mm) at a position that is slightly lower than the lower end of opening 38 of water tub 33 (for example, at a water level height of 170 mm). In other words, overflow outlet 60 is provided on water tub 33 and above drain outlet 40. Overflow outlet 60 is connected to one end of overflow path 61 on the side surface of water tub 33. The other end of overflow path 61 is connected to the position downstream of drain valve 43 and closer to the outside of the machine.

[0029] Drum-type washing machine 10 also includes circulation pump 80 that communicates with drain outlet 40 via drain conduit 42. Drum-type washing machine 10 is configured such that circulation path 81, which communicates with circulation pump 80, communicates with circulation outlet 82 at the lower front portion of water tub 33, and the washing water during the washing process is circulated along the washing water flow a.

[0030] [1-2. Operation and Effects]

With respect to drum-type washing machine 10 configured as described above, the operation and effects of the maintenance course that is performed in a shorter period than the conventional tub cleaning course will be described with reference to FIG. 2 to FIG. 3C. FIG. 2 is a flowchart illustrating an operation of a maintenance course of drum-type washing machine 10. FIG. 3A and FIG. 3B are schematic front views of water tub

33 and rotary drum 31 of drum-type washing machine 10 in the first process. FIG. 3C is a schematic front view of water tub 33 and rotary drum 31 of drum-type washing machine 10 in the second process.

[0031] In the tub cleaning course, the operating time is generally lengthy, such as three hour and twelve hour lengths, in order to remove the detergent residue and grime accumulated and stuck in the inside of water tub 33 and the inside and the outside of rotary drum 31. The breakdown of the three-hour and twelve-hour lengths are two hours and eleven hours for the washing time, respectively, which consume most of the operating time, and the rest is the rinsing process, the spinning process, and the like.

[0032] Additionally, in order to enhance the cleaning effect, the user puts a tub cleaning agent into rotary drum 31. Since the tub cleaning agent contains many surfactants and bleaching ingredients, a larger number of rinsing cycles (for example, four times) than the number of rinsing cycles (for example, twice) in the standard clothes washing course is required.

[0033] In addition, as described above, the washing time of the tub cleaning course is longer than the washing time of the standard course (for example, about 9 minutes) and the tub cleaning agent contains a large amount of various cleaning components. Accordingly, the amount of foam during the washing process in the tub cleaning course is significantly larger than that of the standard course. This is also one of the factors that a large number of rinsing cycles is required in the tub cleaning course.

[0034] As described above, the conventional tub cleaning course cannot be used daily because the operating time of the tub cleaning course is excessively long. As a result, the maintenance frequency carried out by the tub cleaning course is reduced, accelerating accumulation and fixation of the grime in the water tub. In addition, although water alone is sufficient for daily maintenance without using the tub cleaning agent, the user is not able to perform daily maintenance due to the above reasons. Accordingly, maintenance is performed by the tub cleaning course, for example, once every three months, which results in such an inconvenience that a tub cleaning agent always needs to be purchased and used.

[0035] Accordingly, a maintenance course that can be easily used for daily maintenance with a short operating time and does not require a tub cleaning agent would be extremely useful for users. In addition to the daily maintenance, there are situations when the user feels like performing a special maintenance operation. Examples of such situations include after washing clothes with a lot of mud stains, after washing toilet mats, and after

performing washing and drying operations (a lot of lint remains in the tub). This is because in these situations, too much grime is generated in the previous washing operation and some of the grime remains in water tub 33, so that the user feels anxious that the remaining grime might adhere to the clothes in the next washing operation.

- 5 Another example of such situations is before washing baby clothes. This is because in this situation, the user feels like cleaning the inside of water tub 33 just in case, before washing the clothes (baby clothes) that the user wants to be specially cleaned.

[0036] As illustrated in FIG. 2, when the maintenance course operation is started (step S100), controller 57 starts water supply into water tub 33 by opening water supply valve
 10 44 (step S101). Subsequently, controller 57 determines whether or not the water level in water tub 33 has reached a first predetermined water level based on the output of pressure sensor 46b (step S102). Controller 57 continues water supply until the water level in water tub 33 reaches the first predetermined water level (No in step S102). When the water level reaches the first predetermined water level (Yes in step S102), controller 57
 15 closes water supply valve 44 to stop the water supply (step S103). It takes about one minute to perform steps S101 to S103. Here, the first predetermined water level is set to a water level (for example, the water level height of 90 mm) that is higher than the water level of a standard clothes washing course (for example, water level height of 60 mm) and lower than overflow outlet 60 (for example, water level height of 160 mm).

20 [0037] Note that controller 57 may rotate rotary drum 31 (for example, at a rotational speed of 35 r/min) or drive circulation pump 80 during this water supply process (steps S101 to S103). By doing so, drum-type washing machine 10 is capable of facilitating cleaning of the inside of water tub 33, the inside and the outside of rotary drum 31, and the inside of circulation path 81.

25 [0038] Moreover, controller 57 may cause drain valve 43 to operate for a certain period of time before step S101 to perform the draining operation. This is because water may remain in water tub 33 or drain conduit 42 when the user turns off the power during the rinsing or final spinning process in the previous washing operation, and the above operation may be performed to prevent the tub cleaning operation from being performed
 30 while such water remains.

[0039] Next, controller 57 performs the first process (step S200). The first process is a process of causing motor 35 to rotate rotary drum 31 in a first rotation direction at a first rotational speed at which the water in water tub 33 is lifted to the height of overflow outlet 60. Specifically, controller 57 causes motor 35 to start the rotation of rotary drum

31 at the first rotational speed (for example, 80 r/min) in the first rotation direction (step S201). The first rotational speed is set to be higher than the rotational speed (for example, 45r/min) in a standard clothes washing course. With this, the water in water tub 33 is agitated, facilitating removal of the grime adhered to the inside of water tub 33 and the inside and outside of rotary drum 31. Moreover, when the detergent residue remaining in water tub 33 is agitated, foam slightly occurs even without the tub cleaning agent. As illustrated in FIG. 3A, such removed grime and generated foams are collected near the surface of the water lifted by the rotation of rotary drum 31.

[0040] Here, as described above, the first rotational speed is set such that the water in water tub 33 is lifted to the height of overflow outlet 60. Moreover, as illustrated in FIG. 3B, the first rotation direction, which is the rotation direction of rotary drum 31, is set such that the lower portion of rotary drum 31 is directed toward overflow outlet 60. Accordingly, the removed grime and the generated foams are naturally and sequentially drained to the outside of the machine through overflow outlet 60 via overflow path 61.

Hence, it is possible to prevent such a problem that the grime removed once and the generated foams adhere to another portion of the inside of water tub 33 and the inside and outside of rotary drum 31. Similarly, since the removed detergent residue is also sequentially drained through overflow outlet 60, it is possible to prevent such a problem that continuously generated foam due to the rotation of rotary drum 31 results in abnormal foaming.

[0041] Subsequently, controller 57 determines whether or not a predetermined period of time (for example, 30 seconds) has elapsed from the start of the rotation of rotary drum 31 in step S201 (step S202), and causes rotary drum 31 to continue rotating until the predetermined period of time elapses (No in step S202). In the present embodiment, the first process (step S200) includes steps S201 and S202, but may include another step, for example, step S203 to be described later. In other words, the first process in the present disclosure may include another step as long as the first process includes causing the motor in the present disclosure to rotate the rotary tub in the present disclosure in the first rotation direction at a rotational speed at which the water in the water tub in the present disclosure is lifted to the height of the overflow outlet in the present disclosure.

[0042] Subsequently, when the predetermined period of time elapses (Yes in step S202), controller 57 opens drain valve 43 to drain the water in water tub 33 through drain outlet 40 (step S203). It takes about thirty seconds to perform steps S201 to S203. At this time, it is preferable to keep rotary drum 31 in a stationary state.

[0043] This is because, among the adhered grime removed by rotating rotary drum 31 at the first rotational speed, grime with a relatively low specific gravity is drained through overflow outlet 60 as described above. However, when adhered grime with a significantly high specific gravity is present, such adhered grime with a significantly high specific gravity does not reach the vicinity of the surface of the water lifted by the rotation of rotary drum 31, and may not be drained through overflow outlet 60. Accordingly, in step S203, in order to promptly drain the adhered grime with a significantly high specific gravity through drain conduit 42 to the outside of the machine, a water flow that hinders the draining should not be unnecessarily generated by driving rotary drum 31.

[0044] As described above, it may be difficult to drain the adhered grime with a significantly high specific gravity through overflow outlet 60. Hence, it is preferable to always drain water through drain conduit 42 between the first process and the second process.

[0045] After that, controller 57 closes drain valve 43 and opens water supply valve 44 to start water supply into water tub 33 again (step S300). Similarly to step S102, controller 57 determines whether or not the water level in water tub 33 has reached the first predetermined water level (step S301). Controller 57 continues water supply until the water level in water tub 33 reaches the first predetermined water level (No in step S301), and closes water supply valve 44 when the water level reaches the first predetermined water level (Yes in step S301) to stop the water supply (step S302). It takes about one minute to perform steps S300 to S302.

[0046] Next, controller 57 performs the second process (step S400). The second process is a process of causing motor 35 to rotate rotary drum 31 in the second rotation direction that is opposite to the first rotation direction. Specifically, in a similar manner to the first process, controller 57 causes motor 35 to start the rotation of rotary drum 31 at the first rotational speed (for example, 80 r/min) (step S401). Here, as illustrated in FIG. 3C, the second rotation direction, which is the rotation direction of rotary drum 31, is the direction in which the lower portion of rotary drum 31 is directed toward the opposite side to overflow outlet 60. In other words, the second rotation direction is opposite to the first rotation direction.

[0047] Generally, the grime in water tub 33 mostly adheres to the vicinity of the draft surface of the water level in the standard clothes washing course. In the first process, as illustrated in FIG. 3A, the area on the right side of water tub 33 (overflow outlet 60 side)

when viewed from the front is cleaned first. Next, in the second process, as illustrated in FIG. 3C, the area on the left side of water tub 33 (opposite side to overflow outlet 60) when viewed from the front is cleaned. By performing the first process and the second process in such a manner, it is possible to prevent the area to be cleaned from being uneven.

[0048] Moreover, as illustrated in FIG. 3A and FIG. 3B, the adhered grime in water tub 33 and the foam generated by the remaining detergent residue in water tub 33 have also been drained through overflow outlet 60 in the first process. Hence, in the second process, final cleaning can be performed with less grime and foam.

[0049] Subsequently, controller 57 determines whether or not a predetermined period of time (for example, thirty seconds) has elapsed from the start of rotation of rotary drum 31 in step S401 (step S402), and continues rotation of rotary drum 31 until the predetermined period of time elapses (No in step S402). In the present embodiment, the second process (step S400) includes steps S401 and S402, but may include another step, for example, step S403 to be described later. In other words, the second process according to the present disclosure may include another step as long as the second process includes causing the motor in the present disclosure to rotate the rotary tub in the present disclosure in the second rotation direction that is opposite to the first rotation direction.

[0050] Subsequently, when the predetermined period of time elapses (Yes in step S402), controller 57 opens drain valve 43 to drain the water in water tub 33 through drain outlet 40 (step S403). It takes about thirty seconds to perform steps S401 to S403. Subsequently, the processing of controller 57 proceeds to the next step (step S500).

[0051] In the standard tub cleaning course, a tub cleaning agent is put in the washing process, and the rinsing process is performed such that the tub cleaning agent does not remain in water tub 33. On the other hand, since the maintenance course according to the present embodiment is a course for easy daily maintenance without using the tub cleaning agent, the tub cleaning agent is not put into water tub 33. Accordingly, step S500 is a final spinning process instead of the rinsing process. It takes about one minute to perform the final spinning process.

[0052] With the sequence described above, the operation time of the maintenance course is extremely short (for example, about five minutes), which makes the maintenance course so useful that the user is able to use the course whenever the user feels like using it.

[0053] By making it possible to set, to input setting unit 58, both the tub cleaning course for fully cleaning the inside of water tub 33 with a tub cleaning agent and the short-time maintenance course according to the present embodiment, wide ranging maintenance can be performed on drum-type washing machine 10 depending on the situation, which is extremely useful.

[0054] Moreover, in step S301 of the second process, controller 57 may control water supply valve 44 such that the water supply level is set to a second predetermined water level (for example, a water level height of 110 mm) that is higher than the first predetermined water level (for example, a water level height of 90 mm). This is because, in the first process, the water level in water tub 33 is lifted to the height of overflow outlet 60 due to the rotation of rotary drum 31, and further increasing the water supply level simply results in an increase in the amount of water overflowing through overflow outlet 60. On the other hand, in the second process, the water is lifted in water tub 33 by the rotation of rotary drum 31 on the opposite side to overflow outlet 60, so that as the water supply level increases, the cleaning effect of water tub 33 increases.

[0055] Similarly, in order to further enhance the cleaning effect of water tub 33, controller 57 may perform control as below. In other words, controller 57 may cause motor 35 to rotate rotary drum 31 in S401 of the second process at a second rotational speed (for example, 100 r/min) that is higher than the first rotational speed (for example, 80r/min). Moreover, controller 57 may cause motor 35 to rotate rotary drum 31 in step S402 of the second process longer (for example, sixty seconds) than the predetermined period of time (for example, thirty seconds) in the first process. In this way, the cleaning effect of water tub 33 is enhanced by increasing the rotational speed of rotary drum 31 or increasing the rotation time of rotary drum 31.

[0056] [1-3. Advantageous Effects, etc.]

As described above, in the present embodiment, drum-type washing machine 10 includes water tub 33, rotary drum 31, motor 35, water supply valve 44, drain valve 43, drain outlet 40, overflow outlet 60, and controller 57. Water tub 33 stores water. Rotary drum 31 is rotatably provided in water tub 33. Motor 35 drives rotary drum 31. Water supply valve 44 supplies water into water tub 33. Drain valve 43 drains the water in water tub 33. Drain outlet 40 is provided in the lower portion of water tub 33. Overflow outlet 60 is provided on water tub 33 and above drain outlet 40. Controller 57 performs a first process after causing water supply valve 44 to supply water into water tub 33, and performs a second process after causing drain valve 43 to drain the water in water tub 33

through drain outlet 40 and causing supply valve 44 to supply water into water tub 33 again. The first process is a process of causing motor 35 to rotate rotary drum 31 in the first rotation direction at a rotational speed at which the water in water tub 33 is lifted to the height of overflow outlet 60. The second process is a process of causing motor 35 to rotate rotary drum 31 in the second rotation direction that is opposite to the first rotation direction. The first rotation direction is the direction in which the lower portion of rotary drum 31 is directed toward overflow outlet 60.

[0057] With this, after drum-type washing machine 10 drains the grime and foam through overflow outlet 60 in the first process, drum-type washing machine 10 is capable of further cleaning the inside of water tub 33 easily within a short period in the second process without using a tub cleaning agent or the like. Accordingly, the grime on the inner surface of water tub 33 and the inner and outer surfaces of rotary drum 31 can be efficiently removed within a short period without using a tub cleaning agent, so that water tub 33 and rotary drum 31 can be kept clean more easily.

[0058] In the present embodiment, it may be that drum-type washing machine 10 further includes water level detector 46 which detects the water level in water tub 33, and controller 57 controls water supply valve 44 to cause the water level in the second process to be higher than the water level in the first process.

[0059] With this, in the second process, the water in water tub 33 is lifted by the rotation of rotary drum 31 on the opposite side to overflow outlet 60. Hence, as the height of the water supply level increases within a predetermined range, the cleaning effect of water tub 33 increases. Accordingly, drum-type washing machine 10 is capable of efficiently removing the grime on the inner surface of water tub 33 and the inner and outer surfaces of rotary drum 31 within a short period, so that water tub 33 and rotary drum 31 can be kept clean more easily.

[0060] As in the present embodiment, controller 57 may cause motor 35 to rotate rotary drum 31 in the second process at a rotational speed that is higher than the rotational speed of rotary drum 31 in the first process.

[0061] With this, in the second process, as the rotational speed of rotary drum 31 increases within a predetermined range, the cleaning effect of water tub 33 increases. Accordingly, drum-type washing machine 10 is capable of efficiently removing the grime on the inner surface of water tub 33 and the inner and outer surfaces of rotary drum 31 within a short period, so that the tub can be kept clean more easily.

[0062] As in the present embodiment, controller 57 may cause motor 35 to rotate rotary

drum 31 longer in the second process than in the first process.

[0063] With this, in the second process, as the rotating time of rotary drum 31 increases within a predetermined range, the cleaning effect of water tub 33 increases. Accordingly, drum-type washing machine 10 is capable of efficiently removing the grime on the inner surface of water tub 33 and the inner and outer surfaces of rotary drum 31 within a short period, so that the tub can be kept clean more easily

[0064] Since the above-described embodiment exemplifies the technique in the present disclosure, various changes, replacements, additions, omissions, etc. can be made within the scope of the claims or the equivalent thereof.

10 INDUSTRIAL APPLICABILITY

[0065] The present disclosure can be used for maintenance of the drum-type washing machine.

REFERENCE MARKS IN THE DRAWINGS

15	[0066]	10	drum-type (front-loading) washing machine
		31	rotary drum (rotary tub)
		32	water passage hole
		33	water tub
		34	rotary shaft
20		35	motor
		36	protrusion
		37	lid
		38	opening
		39	washing machine body
25		40	drain outlet
		41a	suspension
		41b	vibration-proof member
		42	drain conduit
		43	drain valve (draining unit)
30		44	water supply valve (water supply unit)
		45	water supply path
		46	water level detector
		46a	air trap
		46b	pressure sensor

	47	heater
	48	blower fan
	49	hot air blowing path
	51	hot air blowing hole
5	52	hot air inlet
	57	controller
	58	input setting unit
	59	display unit
	60	overflow outlet
10	61	overflow path
	80	circulation pump
	81	circulation path
	82	circulation outlet
	a	washing water flow
15	b	hot air direction

CLAIMS

1. A drum-type washing machine, comprising:

a water tub which stores water;

a rotary tub which is rotatably provided in the water tub;

5 a motor which drives the rotary tub;

a water supply unit which is provided to supply water into the water tub;

a draining unit which is provided to drain the water in the water tub;

a drain outlet which is provided in a lower portion of the water tub;

an overflow outlet which is provided on the water tub and above the drain outlet;

10 and

a controller which performs a first process after causing the water supply unit to supply water into the water tub, and performs a second process after causing the draining unit to drain the water in the water tub through the drain outlet and causing the water supply unit to supply water into the water tub again, the first process being a process of causing the motor to rotate the rotary tub in a first rotation direction at a rotational speed at which the water in the water tub is lifted to a height of the overflow outlet, the second process being a process of causing the motor to rotate the rotary tub in a second rotation direction that is opposite to the first rotation direction,

20 wherein the first rotation direction is a direction in which a lower portion of the rotary tub is directed toward the overflow outlet.

2. The drum-type washing machine according to claim 1, further comprising

a water level detector which detects a water level in the water tub,

25 wherein the controller controls the water supply unit to cause the water level in the second process to be higher than the water level in the first process.

3. The drum-type washing machine according to claim 1 or claim 2,

wherein the controller causes the motor to rotate the rotary tub in the second process at a rotational speed that is higher than the rotational speed in the first process.

30

4. The drum-type washing machine according to any one of claims 1 to 3,

wherein the controller causes the motor to rotate the rotary tub longer in the second process than in the first process.