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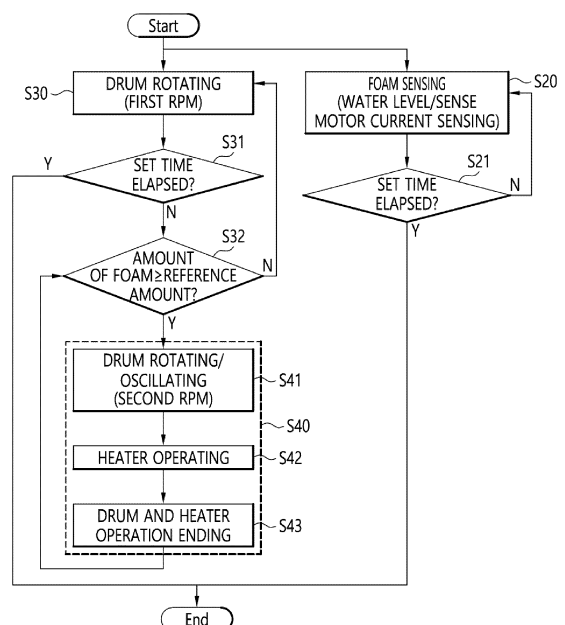
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(54) **METHOD FOR CONTROLLING CLOTHES TREATMENT APPARATUS**

(57) The present application provides a method for controlling a clothes treatment apparatus including: a tub storing water; a drum that is provided inside the tub and stores clothes; a heating unit that forms an eddy current in the drum to heat the drum; and a detection unit that detects foam inside the tub, the method comprising: a detection step of detecting, by the detection unit, the amount of foam inside the tub; and a separation step of, if the amount of foam inside the tub is greater than or equal to a reference amount, heating the drum by using the heating unit while the drum rotates, so as to remove the foam inside the tub.

[FIG. 6]



Description

[Technical Field]

[0001] The present disclosure relates to a method for controlling a laundry treating apparatus.

[Background]

[0002] In general, a laundry treating apparatus is a concept that includes a washing machine that washes an object-to-be-washed, such as laundry, and a dryer that dries an object-to-be-dried.

[0003] Existing laundry treating apparatuses for washing include a tub that provides a space for storing water, a drum rotatably disposed inside the tub to store the object-to-be-washed therein, a water supply that supplies water to the tub, a detergent supplier that supplies detergent to the tub, and a drainage that discharges water stored in the tub to the outside of the tub.

[0004] The laundry treating apparatus of the above-described structure performs the washing by repeating a foreign substance separation process of removing foreign substances remaining in the object-to-be-washed by supplying water and the detergent to the tub via the water supply and the detergent supplier and then rotating the drum, a draining process of discharging water stored in the tub, and a dehydration process of removing water remaining in the object-to-be-washed by rotating the drum.

[0005] When the foreign substance separation process proceeds, foam is generated inside the tub. The foam generated during the foreign substance separation process causes problems such as foam being discharged to the outside of the tub, causing a great load on a driver that rotates the drum, and making it difficult to rotate the drum with a great number of rotations during dehydration, so that a device or a control method to measure an amount of foam and remove the foam is an important design consideration.

[0006] Among the existing laundry treating apparatuses, there was a scheme of sensing the foam via a change in the number of rotations of the drum or a change in a torque of the driver (a change in a torque of a motor) (Publication No. 10-2000-0025493 and Publication No. 10-2006-0115264), and the foam inside the tub was removed by repeating the process of draining water inside the tub and supplying water to the tub. However, the existing foam removal scheme that repeats the draining process and the water supplying process had disadvantages of using a lot of water and taking a long time to remove the foam.

[Summary]

[Technical Problem]

[0007] The present disclosure is to provide a method

for controlling a laundry treating apparatus that may quickly remove foam inside the tub.

[0008] Additionally, the present disclosure is to provide a method for controlling a laundry treating apparatus that removes foam inside a tub by providing heat energy to the foam.

[Technical Solutions]

[0009] Provided is a method for controlling a laundry treating apparatus including a tub where water is stored, a drum disposed inside the tub to store laundry therein, a heater that heats the drum by generating an eddy current in the drum, and a sensor that senses foam inside the tub.

[0010] The method includes a sensing step of sensing, by the sensor, an amount of foam inside the tub, and a removal step of removing the foam inside the tub by heating the drum via the heater while the drum rotates when the amount of foam inside the tub is equal to or greater than a reference amount.

[0011] The removal step may include a rotation step of rotating the drum in only one of a clockwise direction and a counterclockwise direction, and a rotation heating step of heating the drum via the heater while the rotation step is in progress.

[0012] The rotation step may include rotating the drum with a number of rotations creating a centrifugal force smaller than 1G.

[0013] The removal step may include an oscillation step of alternately rotating the drum in a clockwise direction and a counterclockwise direction, and an oscillation heating step of heating the drum via the heater while the oscillation step is in progress.

[0014] The oscillation step may include rotating the drum with a number of rotations creating a centrifugal force smaller than 1G.

[0015] The method may further include a washing water supplying step of supplying water to the tub while the removal step is in progress, and a washing water draining step of draining water inside the tub while the removal step is in progress.

[0016] The washing water supplying step and the washing water draining step may be performed sequentially or simultaneously.

[0017] The method may further include a tub water supplying step of supplying a preset amount of water to the tub, wherein the tub water supplying step is started before the removal step, and a foreign substance separation step of removing foreign substances from the laundry by rotating the drum with a preset first number of rotations.

[0018] The sensing step may be periodically executed while the foreign substance separation step is in progress.

[0019] The removal step may include a rotation step of rotating the drum in one of a clockwise direction and a counterclockwise direction with a second number of

rotations smaller than the first number of rotations, and a rotation heating step of heating the drum via the heater while the rotation step is in progress.

[0020] The method may further include a tub draining step of discharging water inside the tub to the outside of the tub when the amount of foam inside the tub sensed after completion of the removal step is equal to or greater than the reference amount, an oscillation step of alternately rotating the drum in a clockwise direction and a counterclockwise direction with a second number of rotations, and an oscillation heating step of heating the drum via the heater while the oscillation step is in progress.

[0021] A washing water supplying step of supplying water to the tub, and a washing water draining step of draining water inside the tub may be executed after completion of the tub draining step.

[0022] The washing water supplying step may be started before the oscillation step and the oscillation heating step are executed, and the washing water draining step may be started after the oscillation step and the oscillation heating step are completed.

[0023] The method may further include a dehydration step of separating water from the laundry by rotating the drum with a number of rotations for dehydration creating a centrifugal force equal to or greater than 1G, wherein the dehydration step is started before the removal step, and the sensing step may be periodically executed while the dehydration step is in progress.

[0024] The removal step may include a rotation step of rotating the drum in one of a clockwise direction and a counterclockwise direction with a number of rotations creating the centrifugal force equal to or greater than 1G, but smaller than the number of rotations for dehydration, and a rotation heating step of heating the drum via the heater while the rotation step is in progress.

[0025] A rotation direction of the drum set in the rotation step may be the same as a rotation direction of the drum set in the dehydration step.

[0026] The method may further include an oscillation step of alternately rotating the drum in the clockwise direction and the counterclockwise direction with a number of rotations creating a centrifugal force smaller than 1G when the amount of foam inside the tub sensed after completion of the removal step is equal to or greater than the reference amount or when a temperature inside the tub measured while the rotation heating step is in progress is equal to or higher than a preset reference temperature, and an oscillation heating step of heating the drum via the heater while the oscillation step is in progress.

[0027] A washing water supplying step of supplying water to the tub, and a washing water draining step of draining water inside the tub may be executed while the oscillation step and the oscillation heating step are in progress.

[0028] The washing water supplying step may be started before the oscillation step and the oscillation heating

step are executed, and the washing water draining step may be started after the oscillation step and the oscillation heating step are completed.

5 [Advantageous Effects]

[0029] The present disclosure provides the method for controlling the laundry treating apparatus that may quickly remove the foam inside the tub.

10 **[0030]** Additionally, the present disclosure provides the method for controlling the laundry treating apparatus that removes the foam inside the tub by providing the heat energy to the foam.

15 [Brief Description of the Drawings]

[0031]

FIGS. 1 and 2 show an example of a laundry treating apparatus.

FIGS. 3, 4, and 5 show an example of a heater.

FIGS. 6 and 7 show an example of a control method for removing foam.

FIG. 8 shows another example of a control method for removing foam.

FIG. 9 shows an example of a control method for removing foam inside a tub during washing or rinsing.

FIG. 10 shows an example of a control method for removing foam inside a tub during rinsing.

FIG. 11 shows an example of a control method for removing foam inside a tub during dehydration.

[Best Mode]

35 **[0032]** Hereinafter, embodiments of a laundry treating apparatus and a control method will be described in detail with reference to the attached drawings. A configuration of the apparatus or the control method to be described below is only for describing the embodiments of the laundry treating apparatus and is not intended to limit the scope of the present disclosure, and the same reference numerals used throughout the present document refer to the same components.

40 **[0033]** As shown in FIG. 1, a laundry treating apparatus 100 may include a cabinet 1 having a laundry inlet 11 defined therein, a tub 2 disposed inside the cabinet 1 to store water therein, and a drum 3 that is rotatably disposed inside the tub and accommodates an object-to-be-treated (hereinafter, referred to as 'laundry') therein.

[0034] The laundry inlet 11 may be defined in a front surface of the cabinet 1 and may be closed by a door 12 pivotably coupled to the cabinet 1.

50 **[0035]** The cabinet 1 may have a control panel 13. FIG. 1 shows a case in which the control panel 13 is located on the front surface of the cabinet 1 above the laundry inlet 11 as an example.

[0036] The control panel 13 may include an input unit

131 and a display 132. The input unit 131 may be a means of receiving a control command from a user, and the display 132 may be a means of displaying the control commands selectable by the user and execution information of the control command selected by the user.

[0037] As shown in FIG. 2, the tub 2 may be formed as a tub body 21 disposed inside the cabinet 1 to provide a space for storing water. The tub body 21 may be formed as a hollow cylinder, and a tub inlet 22 may be defined in one surface of the cylinder.

[0038] The tub body 21 may be fixed inside the cabinet 1 via a support. FIG. 2 shows a case in which the support is composed of a spring 24 that connects an upper portion of a circumferential surface of the tub body 21 to the cabinet 1, and a damper 25 that connects a lower portion of the circumferential surface of the tub body 21 to the cabinet 1 as an example.

[0039] The tub inlet 22 may be connected to the laundry inlet 11 via a gasket 23. To prevent water stored inside the tub body 21 from leaking to the cabinet 1, the gasket 23 may be formed as a tube connecting the laundry inlet 11 with the tub inlet 22. Additionally, to minimize transmission of vibration of the tub body 21 to the cabinet 1, the gasket 23 may be made of an elastic material such as rubber.

[0040] The drum 3 may include a drum body 31 that is disposed inside the tub body 21 to provide a space for storing the laundry.

[0041] The drum body 31 may be formed as a hollow cylinder, and may have a drum inlet 32 defined in one surface (a surface facing the tub inlet) of the cylinder. The drum body 31 is preferably made of a conductor.

[0042] A communication hole 33 that allows inside of the drum body 31 to be in communication with inside of the tub body 21 may be defined in a circumferential surface of the drum body 31 or the like, and a lifter that lifts the laundry inside the drum body 31 when the drum body 31 rotates may be disposed on the circumferential surface of the drum body 31.

[0043] The drum body 31 may be rotatably fixed to the tub body 21 via a driver 4.

[0044] The driver 4 may include a stator 41 that is fixed to a rear surface of the tub body 21 and forms a rotating field when current is supplied, a rotor 42 that is located outside the tub body 21 to rotate by the rotating field, and a rotation shaft 43 that extends through the rear surface of the tub body 21 and connects the rotor 42 with a rear surface of the drum body 31.

[0045] The tub body 21 may receive water via a water supply 5, and water stored in the tub body 21 may be discharged to the outside of the tub body 21 via a drainage 6.

[0046] The water supply 5 may include a water supply pipe 52 that connects a water supply source 51 to the tub body 21, and a water supply valve 53 that controls opening and closing of the water supply pipe 52 in response to a control signal of a controller 91.

[0047] The drainage 6 may include a pump 61, a first

drain pipe 62 that connects the tub body 21 to the pump 61, and a second drain pipe 63 that guides water discharged from the pump 61 to the outside of the cabinet 1.

[0048] The laundry treating apparatus 100 may further include a supplier 7 that supplies detergent to the tub body 21. The supplier 7 may include a drawer that is extended from the front surface of the cabinet 1, and a storage space defined in the drawer to store the detergent therein.

[0049] FIG. 2 shows a case in which the storage space is defined to connect the water supply pipe 52 with the tub body 21 as an example. In this case, the water supply pipe 52 may be composed of a first water supply pipe 521 that guides water supplied from the water supply source 51 to the storage space, and a second water supply pipe 522 that guides the detergent discharged from the storage space and water to the tub body 21.

[0050] The laundry treating apparatus 100 may further include a heater 8 that heats the drum body 31.

[0051] The heater 8 is as means of heating the drum body 31 by generating an eddy current in the drum body 31 via electromagnetic induction. An induction heater may be an example of the heater.

[0052] As shown in FIG. 3, the heater 8 is preferably located in a space located above a horizontal line H passing through a center of the tub body (a horizontal line passing through a center of rotation of the drum body) on the circumferential surface of the tub body 21. This is because it is advantageous for heating the drum body 31 that there is no water between the heater 8 and the drum body 31.

[0053] As shown in FIG. 4, the heater 8 may include a housing 81 fixed to an upper space of the tub body 21, a coil 82 fixed to the housing 81, and a cover 83 that is fixed to the housing 81 and prevents exposure of the coil 82.

[0054] To prevent overheating of the coil 82, the cover 83 may further include a cooler 84. The cooler 84 may be formed as a fan that exhausts air in a space created by the housing 81 and the cover 83 to the outside. As shown in FIG. 5, the coil 82 may be fixed to the housing 81, and current supplied to the coil 82 may be controlled by the controller 91.

[0055] As shown in FIG. 2, the laundry treating apparatus 100 may further include a sensor 92 that senses an amount of foam inside the tub body 21. The sensor 92 may be formed as a water level sensor that senses an amount of water supplied to the tub body 21.

[0056] As shown in the drawing, the water level sensor may be composed of a communication pipe 921 connected to the first drain pipe 62, and a sensor 922 that generates a control signal based on a pressure inside the communication pipe 921.

[0057] The communication pipe 921 may be formed as a hose fixed inside the cabinet 1 such that one end thereof is connected to the first drain pipe 62 and the other end thereof is located at a point higher than the highest water level of the tub body 21, or a point higher

than the horizontal line H.

[0058] The communication pipe 921 is closed by the sensor 922, and a water level inside the communication pipe 921 changes to be the same as a water level inside the tub body 21. Therefore, the sensor 922 may transmit a control signal corresponding to the pressure inside the communication pipe 921, which varies depending on the water level inside the tub body 21, to the controller 91, and the controller 91 may determine the water level inside the tub body 21 via the control signal provided by the sensor 922.

[0059] In one example, when the foam is generated inside the tub body 21 because of the rotation of the drum body 31 or the like, the pressure inside the communication pipe 921 increases. Therefore, when the sensor 922 senses the increase in the pressure inside the communication pipe 921 even though there is no additional water supply via the water supply 5 during operation of the laundry treating apparatus 100, the controller 91 will be able to estimate whether the foam is generated inside the tub body 21 and the amount of foam.

[0060] Although not shown in the drawing, the sensor 92 may be formed as a current amount sensor that senses an amount of current supplied to the stator 41 or a number of rotations sensor that senses the number of rotations of the drum body 31.

[0061] When the foam is generated inside the tub body 21, a resistance that hinders the rotation of the drum body 31 increases, so that an amount of current that should be supplied to the stator 41 to rotate the drum body 31 with a preset number of rotations increases. In one example, when the foam is generated inside the tub body 21 while maintaining the amount of current supplied to the stator 41 constant, the number of rotations of the drum body 31 is lowered. Accordingly, the controller 91 may estimate whether the foam is generated in the tub body 21 and the amount of foam via the control signal provided by the current amount sensor or the number of rotations sensor.

[0062] The laundry treating apparatus 100 may further include a temperature sensor 93 that measures a temperature inside the tub body 21. FIG. 2 shows a case in which the temperature sensor 93 is fixed to the upper space of the circumferential surface of the tub body 21 and senses a temperature of a space between the tub body 21 and the drum body 31.

[0063] The laundry treating apparatus 100 described above should rotate the drum body 31 in a process of separating foreign substances from the laundry (a process of rubbing water with the laundry, a washing cycle or a rinsing cycle is an example thereof) or a dehydration cycle (a process of separating water and the foreign substances from the laundry). When the drum body 31 rotates, foam may be generated in the tub body 21 because of detergent supplied to the tub body 21 or the foreign substances separated from the laundry.

[0064] The foam inside the tub body 21 may cause problems such as the foam being discharged to the out-

side of the tub body 21, causing a load on the driver 4, and making it difficult to rotate the drum body 31 with a great number of rotations during the dehydration.

[0065] The present disclosure provides a control method that may quickly remove the foam inside the tub body 21 to solve the above-mentioned problems.

[0066] FIG. 6 shows an example of a control method for removing foam. A control method in FIG. 6 includes a separation step (S30) of separating the foreign substances from the laundry or water from the laundry by rotating the drum body 31 via the driver 4, and a sensing step (S20) executed while the separation step (S30) is in progress.

[0067] The separation step (S30), as a step of rotating the drum body 31 with a preset number of rotations, may be a foreign substance separation step of separating the foreign substances from the laundry or a water separation step (a dehydration step) of separating water from the laundry.

[0068] When the separation step (S30) is the foreign substance separation step, the number of rotations of the drum body 31 may be set to a first number of rotations that creates a centrifugal force smaller than 1G in the laundry, and when the separation step (S30) is the dehydration step, the number of rotations of the drum body 31 may be set to a number of rotations for dehydration that creates a centrifugal force equal to or greater than 1G in the laundry.

[0069] The sensing step (S20) is a step of determining an amount of foam inside the tub body 21 via the sensor 92. The sensing step (S20) may be periodically executed (S21) while the separation step (S30) is in progress.

[0070] In the control method, whether an execution time of the separation step (S30) has reached a preset reference time during the execution of the separation step (S30) is determined (S31). When the execution time of the separation step (S30) has reached the reference time, the control method ends the separation step (S30) and the sensing step (S20).

[0071] When the execution time of the separation step (S30) has not reached the reference time, in the control method, whether the amount of foam inside the tub body 21 is equal to or greater than a preset reference amount is determined (S32) based on data provided by the sensor 92.

[0072] When the amount of foam inside the tub body 21 is smaller than the reference amount, the control method proceeds with the separation step (S30) and the sensing step (S20). However, when it is determined that the amount of foam inside the tub body 21 is equal to or greater than the reference amount (S32), the control method proceeds with a removal step (S40, a first removal step) to remove the foam inside the tub body 21.

[0073] The first removal step (S40) is a step of heating the drum body 31 by operating the heater 8 while the drum body 31 rotates.

[0074] The foam maintains a shape thereof by a surface tension, and the surface tension of the foam de-

creases as a temperature increases. The heater 8 disposed in the laundry treating apparatus 100 may directly heat the drum body 31 via an eddy current generated in the drum body 31 by electromagnetic induction. When the drum body 31 is rotated and comes into contact with the foam while the heater 8 is operating, heat energy of the drum body 31 may be transferred to the foam, thereby enabling rapid removal of the foam.

[0075] That is, the first removal step (S40) may include a rotation step (S41) of rotating the drum body 31 in one of a clockwise direction and a counterclockwise direction, and a rotation heating step (S42) of heating the drum body 31 via the heater 8 while the rotation step (S41) is in progress.

[0076] As shown in FIG. 7, the lower the rotation speed of the drum body 31, the faster the temperature of a point R of the drum body 31 closest to the heater 8 increases. Therefore, when a number of rotations smaller than the first number of rotations is set for the rotation step (S41), the temperature of the partial area R of the drum body 31 may be temporarily maintained higher than those of other areas, and the area R with the high temperature may be brought into contact with foam B, which may be more effective in removing the foam. That is, the number of rotations of the drum body 31 set in the rotation step (S41) is set to a number of rotations that creates a centrifugal force smaller than 1G in the laundry, but is preferably set to a number of rotations smaller than the first number of rotations.

[0077] The rotation step (S41) and the rotation heating step (S42) are performed for a preset removal time, and the rotation step (S41) and the rotation heating step (S42) are ended when the removal time has elapsed (S43).

[0078] FIG. 8 shows another embodiment of a control method for removing foam.

[0079] A control method in FIG. 8 includes the separation step (S30) of separating the foreign substances from the laundry or water from the laundry by rotating the drum body 31 via the driver 4, a sensing step (S20) executed while the separation step (S30) is in progress, and a foam removal step (S60) executed based on the amount of foam inside the tub body.

[0080] Because the separation step (S30) and the sensing step (S20) are the same as the separation step and the sensing step in the control method in FIG. 7, detailed descriptions thereof will be omitted.

[0081] The removal step (S60, a second removal step) in the control method in FIG. 8 may include an oscillation step (S61) of alternately performing the clockwise rotation and the counterclockwise rotation of the drum body 31, and an oscillation heating step (S62) of heating the drum body 31 via the heater 8 while the oscillation step (S61) is in progress.

[0082] When the drum body 31 rotates clockwise and counterclockwise alternately via the oscillation step (S61), foam located on a right side and foam located on a left side of the drum body 31 are simultaneously removed, thereby minimizing a possibility of the foam re-

maining inside the tub body 21.

[0083] A number of rotations of the drum body 31 set in the oscillation step (S61) is preferably set to a number of rotations that creates the centrifugal force smaller than 1G in the laundry, but is preferably set to a number of rotations smaller than the first number of rotations.

[0084] The second removal step (S60) may execute a washing water supplying step and a washing water draining step (S64) while the oscillation step (S61) and the oscillation heating step (S62) are in progress.

[0085] The washing water supplying step is a step of supplying water to the tub body 21 via the water supply 5, and the washing water draining step is a step of draining water inside the tub body 21 via the drainage 6. The washing water supplying step and the washing water draining step may be performed sequentially or simultaneously. FIG. 8 shows the latter as an example.

[0086] When there are the washing water supplying step and the washing water draining step (S64), the foam inside the tub body 21 may be discharged more effectively. Therefore, the second removal step (S60) may remove the foam more quickly than the first removal step (S40) when a large amount of foam is generated in the tub body 21. The oscillation step (S61), the oscillation heating step (S62), and the washing water supplying and draining step (S64) proceed for the preset removal time and then are ended (S63).

[0087] FIG. 9 shows an example in which the above-described removal steps (S40 and S60) are applied to the processes of separating the foreign substances from the laundry (the washing cycle, the rinsing process, and the like).

[0088] A control method in FIG. 9 includes a tub water supplying step (S10) of supplying water to the tub body 21. The tub water supplying step (S10) is a step in which the controller 91 controls a water supply valve 53 to supply a preset amount of water to the tub body 21.

[0089] An amount of water supplied to the tub body 21 via the tub water supplying step (S10) may be set to increase in proportion to an amount of laundry input to the drum body 31. That is, the control method may include a laundry amount determination step of determining the amount of laundry stored in the drum body 31 before the tub water supplying step (S10), and the tub water supplying step (S10) may include supplying water in an amount set based on the amount of laundry to the tub body 21.

[0090] While the tub water supplying step (S10) is in progress, the control method proceeds with a water level sensing step (S11) of sensing a water level inside the tub body 21, and the tub water supplying step (S10) is ended when the preset amount of water is supplied to the tub body. The water level sensing step (S11) is performed via water level sensors 921 and 923.

[0091] While the tub water supplying step (S10) is in progress or after completion of the tub water supplying step (S10), the control method executes the separation step (S30, the foreign substance separation step) of sep-

arating the foreign substances from the laundry by rotating the drum body 31 with the first number of rotations.

[0092] While the foreign substance separation step (S30) is in progress, the control method executes the sensing step (S20) of sensing the amount of foam inside the tub body 21. The sensing step (S20) may be performed via the water level sensors 921 and 922, a number of rotations sensor, or a current amount sensor. The sensing step (S20) may be periodically executed (S21) while the foreign substance separation step (S30) is in progress.

[0093] The foreign substance separation step (S30) is performed for a set separation step setting time. When the separation step setting time has elapsed (S31), the control method proceeds with a tub draining step (S80). The tub draining step (S80) is a step of allowing water stored in the tub body 21 to flow to the outside of the cabinet 1 via the drainage 6.

[0094] In one example, when an execution time of the foreign substance separation step (S30) has not reached the separation step setting time, the control method executes a step (S32) of comparing the amount of foam measured via the sensing step (S20) with the preset reference amount.

[0095] When the sensing step (S20) is performed via the water level sensors 921 and 922, whether the foam has been generated in the tub body 21 and the amount of foam may be determined via comparison of the water level measured in the water level sensing step (S11) and a water level measured in the foam sensing step (S20).

[0096] The water level measured in the foam sensing step (S20) being higher than the water level measured in the water level sensing step (S11) while the foreign substance separation step (S30) is in progress means that a pressure inside the tub body 21 has increased because of the foam. Accordingly, the controller 91 may determine that the foam has generated in the tub body 21 when the water level measured in the foam sensing step (S20) is higher than the water level measured in the water level sensing step (S11) while the foreign substance separation step (S30) is in progress.

[0097] In addition, the controller 91 may determine that a greater amount of foam has been generated in the tub body 21 as a difference between the water level measured in the foam sensing step (S20) and the water level measured in the water level sensing step (S11) increases.

[0098] When it is determined that the foam has been generated in the tub body 21 in an amount smaller than the reference amount, the control method continues to execute the foreign substance separation step (S30) and the foam sensing step (S20). However, when it is determined (S32) that the foam has been generated in the tub body 21 in an amount exceeding the reference amount, the control method executes the first removal step (S40).

[0099] The first removal step (S40) may include the rotation step (S41) of rotating the drum body 31 via the driver 4 and the rotation heating step (S42) of heating

the drum body 31 via the heater 8.

[0100] The rotation step (S41) is a step of rotating the drum body 31 in one of the clockwise direction and the counterclockwise direction with a second number of rotations smaller than the first number of rotations. For the same reason as described above, the rotation direction of the drum body 31 set in the rotation step (S41) may be set to be the same as the rotation direction of the drum body 31 set in the foreign substance separation step (S30).

[0101] The rotation step (S41) and the rotation heating step (S42) are ended when a time set in the first removal step (S40) (a first removal time) has elapsed (S43).

[0102] When the rotation step (S41) and the rotation heating step (S42) are ended, the control method executes a step (S45) of determining whether the amount of foam inside the tub body 21 sensed after completion of the first removal step (S40) is equal to or greater than the reference amount.

[0103] When the amount of foam inside the tub body 21 sensed after the completion of the first removal step (S40) is smaller than the reference amount, the control method continues to execute the foreign substance separation step (S30) and the foam sensing step (S20). However, the amount of foam inside the tub body 21 sensed after the completion of the first removal step (S40) is equal to or greater than the reference amount, the control method may execute the tub draining step (S50) of draining water inside the tub body 21 and the second removal step (S60).

[0104] The tub draining step (S50) is a step of allowing water inside the tub body 21 to flow to the outside of the cabinet 1 via the drainage 6.

[0105] The second removal step (S60) may include the oscillation step (S61) and the oscillation heating step (S62).

[0106] The oscillation step (S61) may be the step of alternately performing the clockwise rotation and the counterclockwise rotation of the drum body 31, and the oscillation heating step (S62) may be the step of heating the drum body 31 via the heater 8 while the oscillation step is in progress. A number of rotations of the drum body 31 set in the oscillation step (S61) may be set to the second number of rotations.

[0107] The oscillation step (S46) and the oscillation heating step (S62) are ended when a time set in the second removal step (S60) (a second removal time) has elapsed (S63).

[0108] The washing water supplying step and the washing water draining step (S64) may be executed while the oscillation step (S61) and the oscillation heating step (S62) are in progress. The washing water supplying step and the washing water draining step may be performed sequentially or simultaneously.

[0109] The washing water supplying step may be started before the execution of the oscillation step (S61) and the oscillation heating step (S62), and the washing water draining step may be started after the completion of the

oscillation step (S61) and the oscillation heating step (S62). When the washing water supplying step is started before the execution of the oscillation step (S61) or the like, contact between the drum body 31 and the foam may be induced, and when the washing water draining step is started after the completion of the oscillation step (S61) and the oscillation heating step (S62), the foam remaining in the tub body 21 may be removed.

[0110] When the second removal step (S60) is completed, the control method proceeds with a step (S70) of re-supplying water to the tub body 21 via the water supply 5, which is ended when the separation step setting time set in the foreign substance separation step has elapsed.

[0111] FIG. 10 shows an example of a control method that facilitates removal of foam generated in a process of separating detergent or foreign substances from water (a rinsing cycle).

[0112] Because an amount of foam generated in the rinsing cycle is generally smaller than an amount of foam generated in the washing cycle, a control method in FIG. 10 may effectively remove the foam inside the tub body 21 using only the second removal step without the first removal step.

[0113] The control method in FIG. 10 includes the tub water supplying step (S10) of supplying water to the tub body 21, and the foreign substance separation step (S30) of separating the foreign substances from the laundry by rotating the drum body 31.

[0114] The amount of water supplied to the tub body 21 via the tub water supplying step (S10) is controlled via the water level sensing step (S11), and the amount of foam inside the tub body while the foreign substance separation step (S30) is in progress is determined via the foam sensing step (S20).

[0115] When it is determined (S32) that the amount of foam inside the tub body 21 is equal to or greater than the reference amount while the foreign substance separation step (S30) is in progress, the control method executes the second removal step (S60).

[0116] The second removal step (S60) may be composed of the oscillation step (S61) and the oscillation heating step (S62), and the oscillation step (S61) and the oscillation heating step (S62) may be ended when the second removal time set in the second removal step (S60) has elapsed.

[0117] FIG. 11 shows an example of a control method that facilitates removal of foam generated in a process of separating water from laundry (a dehydration cycle or the like).

[0118] A control method in FIG. 11 may be performed after the completion of the tub draining step (S12) of discharging water stored in the tub body 21 to the outside. When the control method in FIG. 11 follows the process of separating the foreign substances from the laundry (the control method in FIG. 9 or 10), the tub draining step (S12) will be the same step as the tub draining step (S80) in FIG. 9 or 10.

[0119] After the completion of the tub draining step

(S12), the control method proceeds with the water separation step (the dehydration step, S30) of separating water from the laundry by rotating the drum body 31 with the number of rotations for dehydration (a first number of rotations for dehydration). The number of rotations of the drum body 31 set in the dehydration step (S30) is preferably set to a number of rotations that creates the centrifugal force equal to or greater than 1G in the laundry.

[0120] The control method periodically executes the sensing step (S20) of sensing the amount of foam inside the tub body 21 while the dehydration step (S30) is in progress (S21).

[0121] When it is determined that the foam has been generated in the tub body 21 in an amount smaller than the reference amount while the dehydration step (S30) is in progress, the control method continues to execute the dehydration step (S30) and the foam sensing step (S20). However, when it is determined (S32) that the foam has been generated in the tub body 21 in an amount equal to or greater than the reference amount, the control method executes the first removal step (S40).

[0122] The first removal step (S40) may include the rotation step (S41) of rotating the drum body 31 via the driver 4 and the rotation heating step (S42) of heating the drum body 31 via the heater 8.

[0123] The rotation step (S41) may be a step of rotating the drum body 31 with a number of rotations (a second number of rotations for dehydration) that is smaller than the first number of rotations for dehydration but creates the centrifugal force equal to or greater than 1G in the laundry. In addition, the rotation direction of the drum body 31 set in the rotation step (S41) is preferably set to be the same as the rotation direction of the drum body set in the dehydration step (S30).

[0124] While the rotation step (S41) and the rotation heating step (S42) are in progress, the first removal step (S40) may execute a first washing water supplying step and a first washing water draining step (S44). The first washing water supplying step and the first washing water draining step may be performed sequentially or simultaneously.

[0125] The first washing water supplying step may be started before the execution of the rotation step (S41) and the rotation heating step (S42), and the first washing water draining step may be started after the completion of the rotation step (S41) and the rotation heating step (S42).

[0126] The rotation step (S41), the rotation heating step (S42), and the first water supplying and draining step (S44) are ended when the time set in the first removal step (S40) (the first removal time) has elapsed (S43).

[0127] When the first removal step (S40) is ended, the control method executes a step (S45) of determining whether the amount of foam inside the tub body 21 sensed after the completion of the first removal step (S40) is equal to or greater than the reference amount.

[0128] When the amount of foam inside the tub body

21 sensed after the completion of the first removal step (S40) is smaller than the reference amount, the control method continues to execute the dehydration step (S30) and the foam sensing step (S20).

[0129] However, when at least one of a condition (S45) in which the amount of foam inside the tub body 21 sensed after the completion of the first removal step (S40) is equal to or greater than the reference amount and a condition (S46) in which a temperature inside the tub body 21 measured while the rotation heating step (S42) is in progress is equal to or higher than a preset reference temperature is met, the control method may execute the second removal step (S60). FIG. 11 shows a case in which the second removal step (S60) is started when both of the above-mentioned conditions are met as an example.

[0130] The second removal step (S60) may include the oscillation step (S61) and the oscillation heating step (S62).

[0131] The oscillation step (S61) may be the step of alternately performing the clockwise rotation and the counterclockwise rotation of the drum body 31, and the oscillation heating step (S62) may be the step of heating the drum body 31 via the heater 8 while the oscillation step is in progress.

[0132] The number of rotations of the drum body 31 set in the oscillation step (S61) may be set to the number of rotations that creates the centrifugal force equal to or smaller than 1G in the laundry (the second number of rotations or the like). The oscillation step (S61) and the oscillation heating step (S62) are ended when the time set in the second removal step (S60) (the second removal time) has elapsed (S63).

[0133] The second washing water supplying and draining step (S64) may be executed while the oscillation step (S61) and the oscillation heating step (S62) are in progress.

[0134] The second water supplying and draining step may be composed of a second washing water supplying step and a second washing water draining step. The second washing water supplying step and the second washing water draining step may be performed sequentially or simultaneously.

[0135] The second washing water supplying step may be started before the execution of the oscillation step (S61) and the oscillation heating step (S62), and the second washing water draining step may be started after the completion of the oscillation step (S61) and the oscillation heating step (S62).

[0136] The laundry treating apparatus described above may be modified and implemented in various forms, so that the scope of rights of the present disclosure is not limited to the above-described embodiments.

Claims

1. A method for controlling a laundry treating apparatus

including a tub where water is stored, a drum disposed inside the tub to store laundry therein, a heater configured to heat the drum by generating an eddy current in the drum, and a sensor configured to sense foam inside the tub, the method comprising:

a sensing step of sensing, by the sensor, an amount of foam inside the tub; and
a removal step of removing the foam inside the tub by heating the drum via the heater while the drum rotates when the amount of foam inside the tub is equal to or greater than a reference amount.

2. The method of claim 1, wherein the removal step includes:

a rotation step of rotating the drum in only one of a clockwise direction and a counterclockwise direction; and
a rotation heating step of heating the drum via the heater while the rotation step is in progress.

3. The method of claim 2, wherein the rotation step includes rotating the drum with a number of rotations creating a centrifugal force smaller than 1G.

4. The method of claim 1, wherein the removal step includes:

an oscillation step of alternately rotating the drum in a clockwise direction and a counterclockwise direction; and
an oscillation heating step of heating the drum via the heater while the oscillation step is in progress.

5. The method of claim 4, wherein the oscillation step includes rotating the drum with a number of rotations creating a centrifugal force smaller than 1G.

6. The method of one of claims 1 to 5, further comprising:

a washing water supplying step of supplying water to the tub while the removal step is in progress; and
a washing water draining step of draining water inside the tub while the removal step is in progress.

7. The method of claim 6, wherein the washing water supplying step and the washing water draining step are performed sequentially or simultaneously.

8. The method of claim 1, further comprising:

a tub water supplying step of supplying a preset

amount of water to the tub, wherein the tub water supplying step is started before the removal step; and

a foreign substance separation step of removing foreign substances from the laundry by rotating the drum with a preset first number of rotations, wherein the sensing step is periodically executed while the foreign substance separation step is in progress.

9. The method of claim 8, wherein the removal step includes:

a rotation step of rotating the drum in one of a clockwise direction and a counterclockwise direction with a second number of rotations smaller than the first number of rotations; and a rotation heating step of heating the drum via the heater while the rotation step is in progress.

10. The method of claim 8, further comprising:

a tub draining step of discharging water inside the tub to the outside of the tub when the amount of foam inside the tub sensed after completion of the removal step is equal to or greater than the reference amount;

an oscillation step of alternately rotating the drum in a clockwise direction and a counterclockwise direction with a second number of rotations; and

an oscillation heating step of heating the drum via the heater while the oscillation step is in progress.

11. The method of claim 10, wherein a washing water supplying step of supplying water to the tub; and a washing water draining step of draining water inside the tub are executed after completion of the tub draining step.

12. The method of claim 11, wherein the washing water supplying step is started before the oscillation step and the oscillation heating step are executed, wherein the washing water draining step is started after the oscillation step and the oscillation heating step are completed.

13. The method of claim 1, further comprising a dehydration step of separating water from the laundry by rotating the drum with a number of rotations for dehydration creating a centrifugal force equal to or greater than 1G, wherein the dehydration step is started before the removal step, wherein the sensing step is periodically executed while the dehydration step is in progress.

14. The method of claim 13, wherein the removal step

includes:

a rotation step of rotating the drum in one of a clockwise direction and a counterclockwise direction with a number of rotations creating the centrifugal force equal to or greater than 1G, but smaller than the number of rotations for dehydration; and

a rotation heating step of heating the drum via the heater while the rotation step is in progress.

15. The method of claim 14, wherein a rotation direction of the drum set in the rotation step is the same as a rotation direction of the drum set in the dehydration step.

16. The method of claim 14, further comprising:

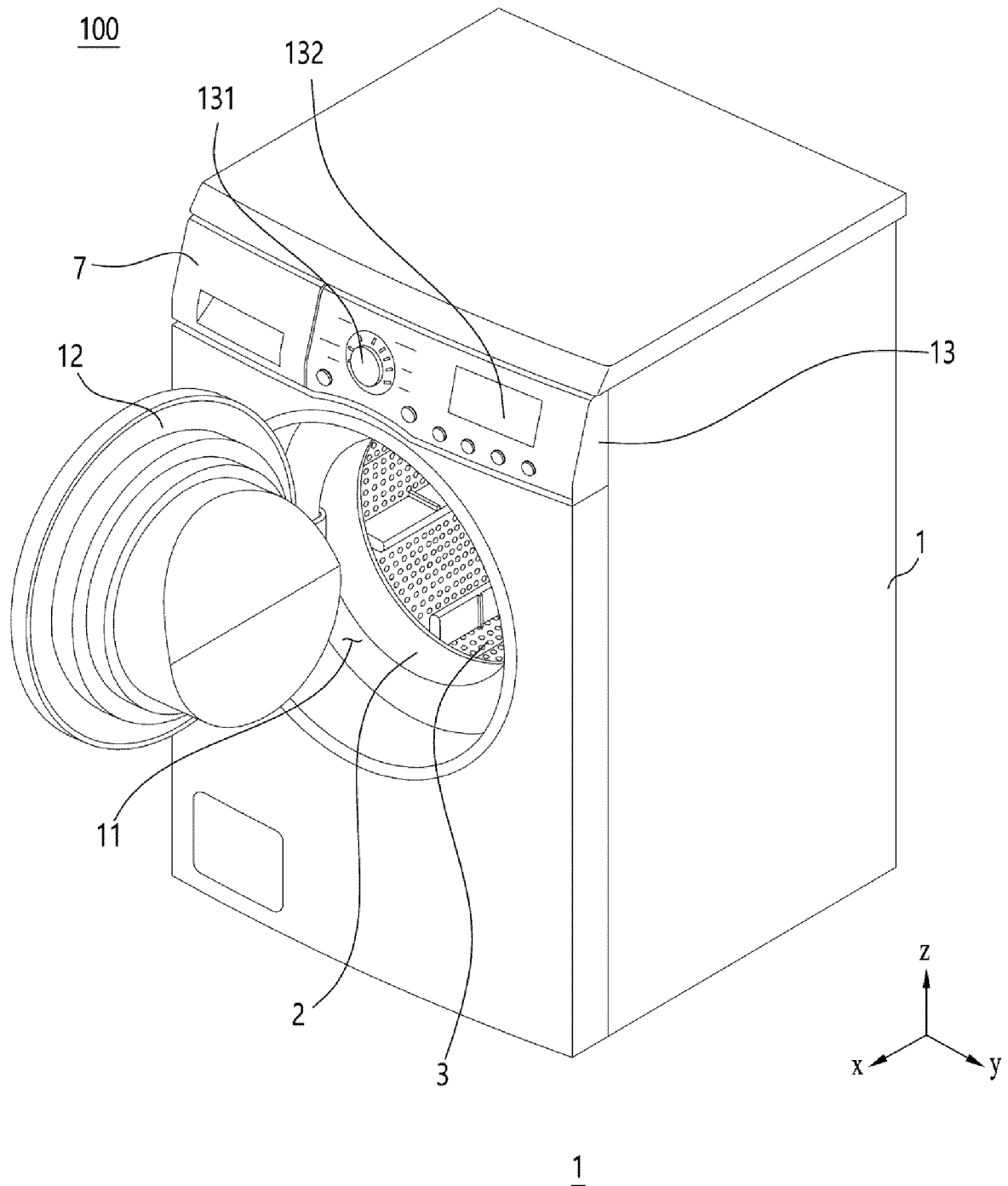
an oscillation step of alternately rotating the drum in the clockwise direction and the counterclockwise direction with a number of rotations creating a centrifugal force smaller than 1G when the amount of foam inside the tub sensed after completion of the removal step is equal to or greater than the reference amount or when a temperature inside the tub measured while the rotation heating step is in progress is equal to or higher than a preset reference temperature; and

an oscillation heating step of heating the drum via the heater while the oscillation step is in progress.

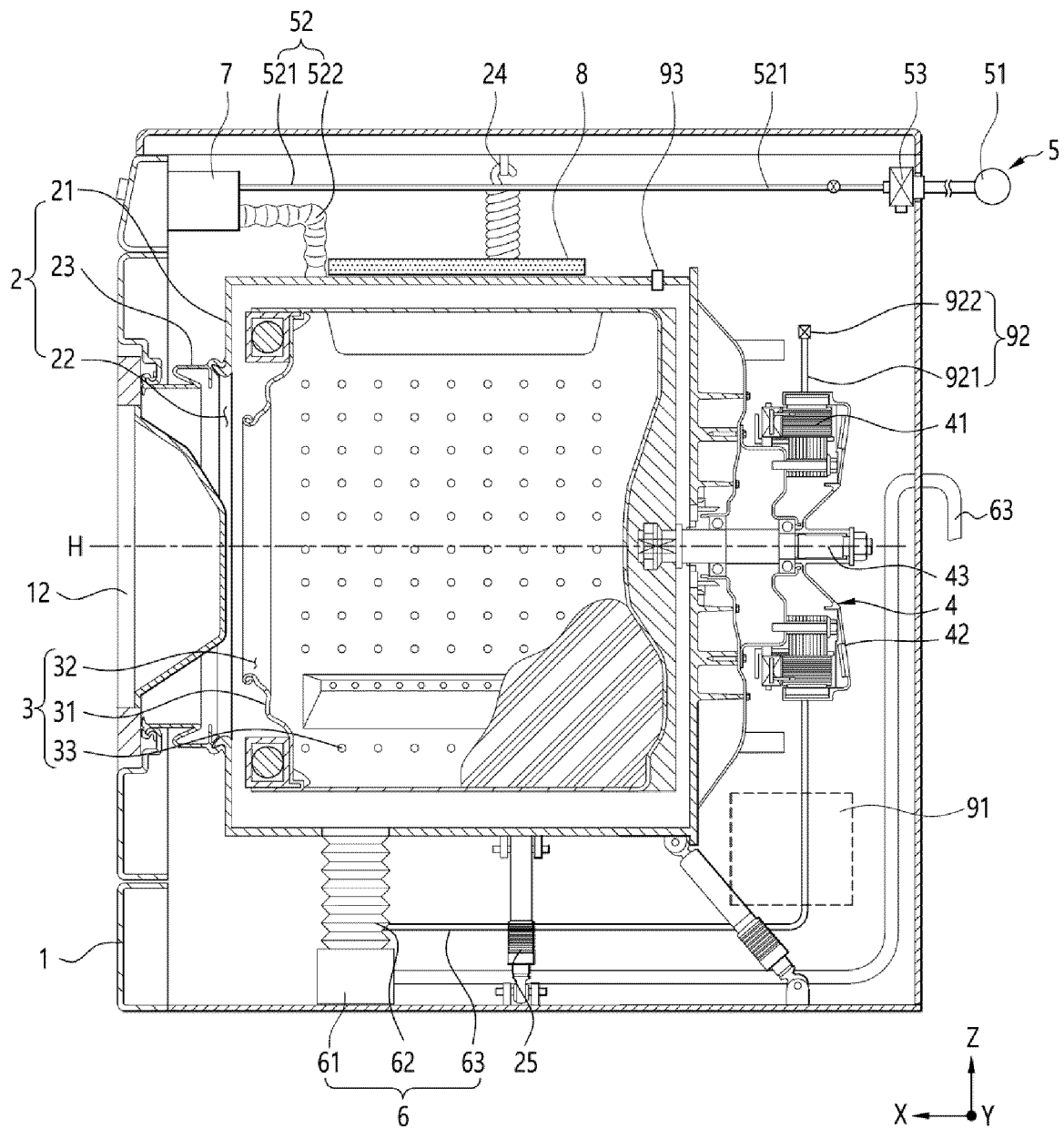
17. The method of claim 16, wherein a washing water supplying step of supplying water to the tub; and a washing water draining step of draining water inside the tub are executed while the oscillation step and the oscillation heating step are in progress.

18. The method of claim 17, wherein the washing water supplying step is started before the oscillation step and the oscillation heating step are executed, wherein the washing water draining step is started after the oscillation step and the oscillation heating step are completed.

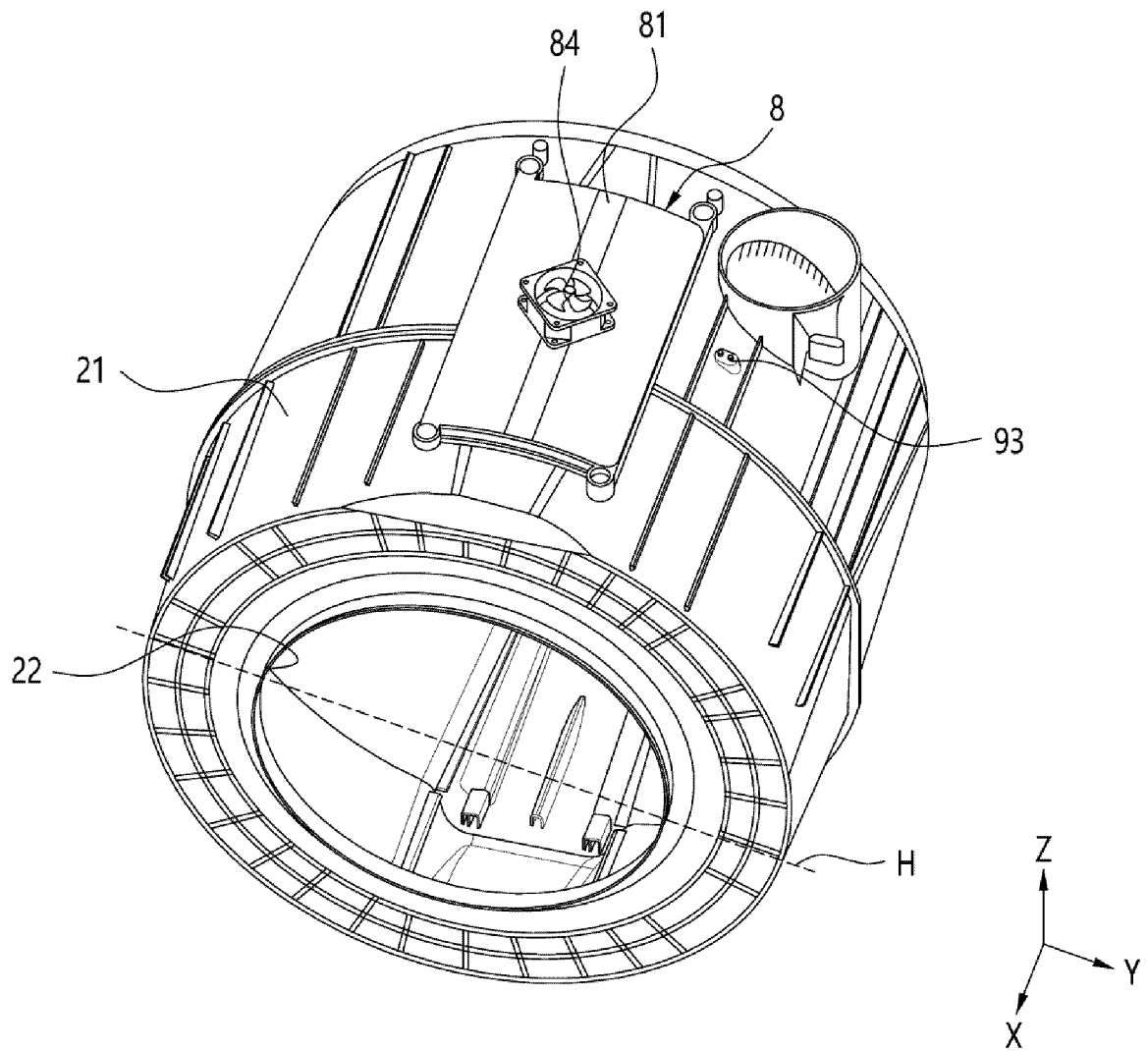
[FIG. 1]



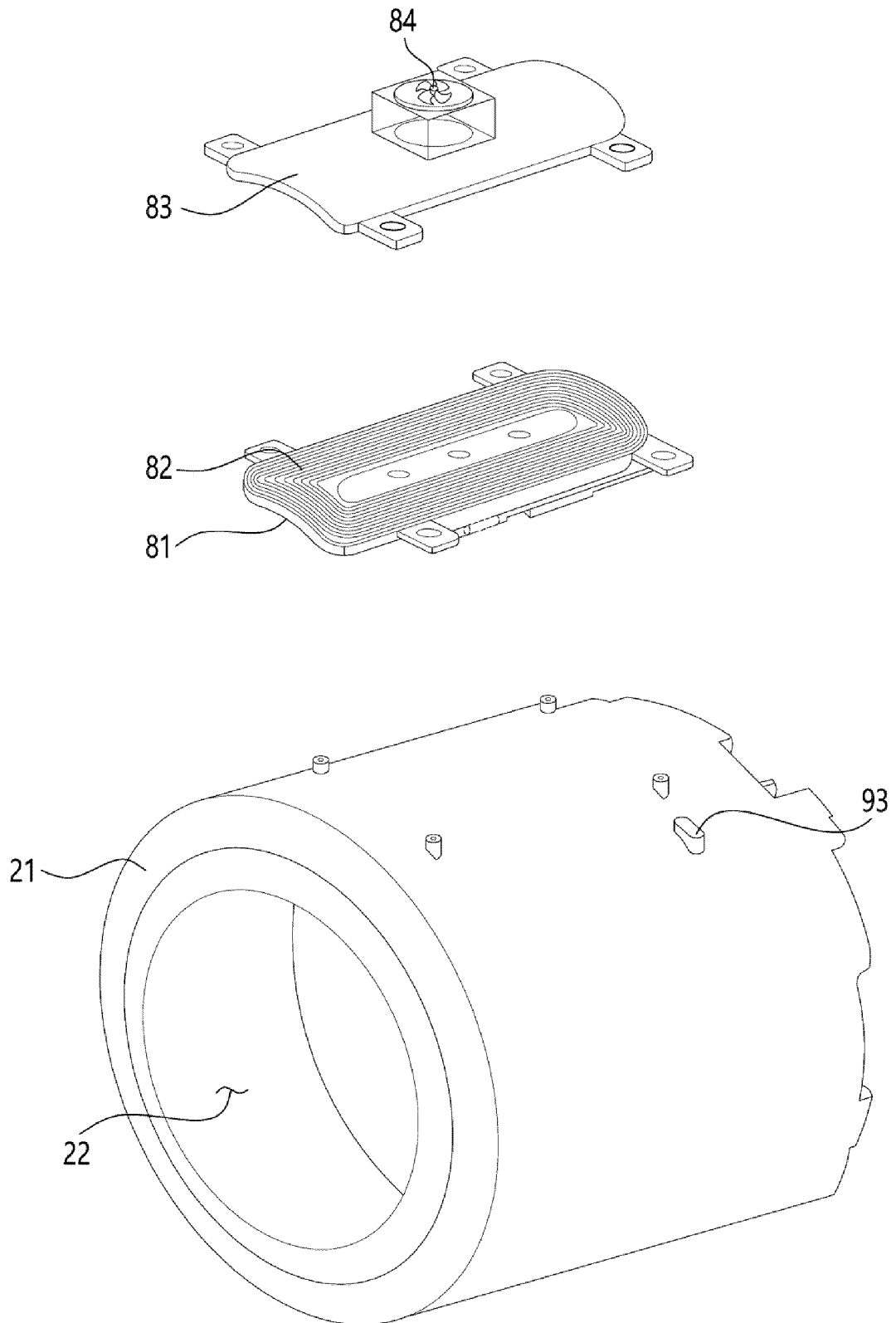
[FIG. 2]



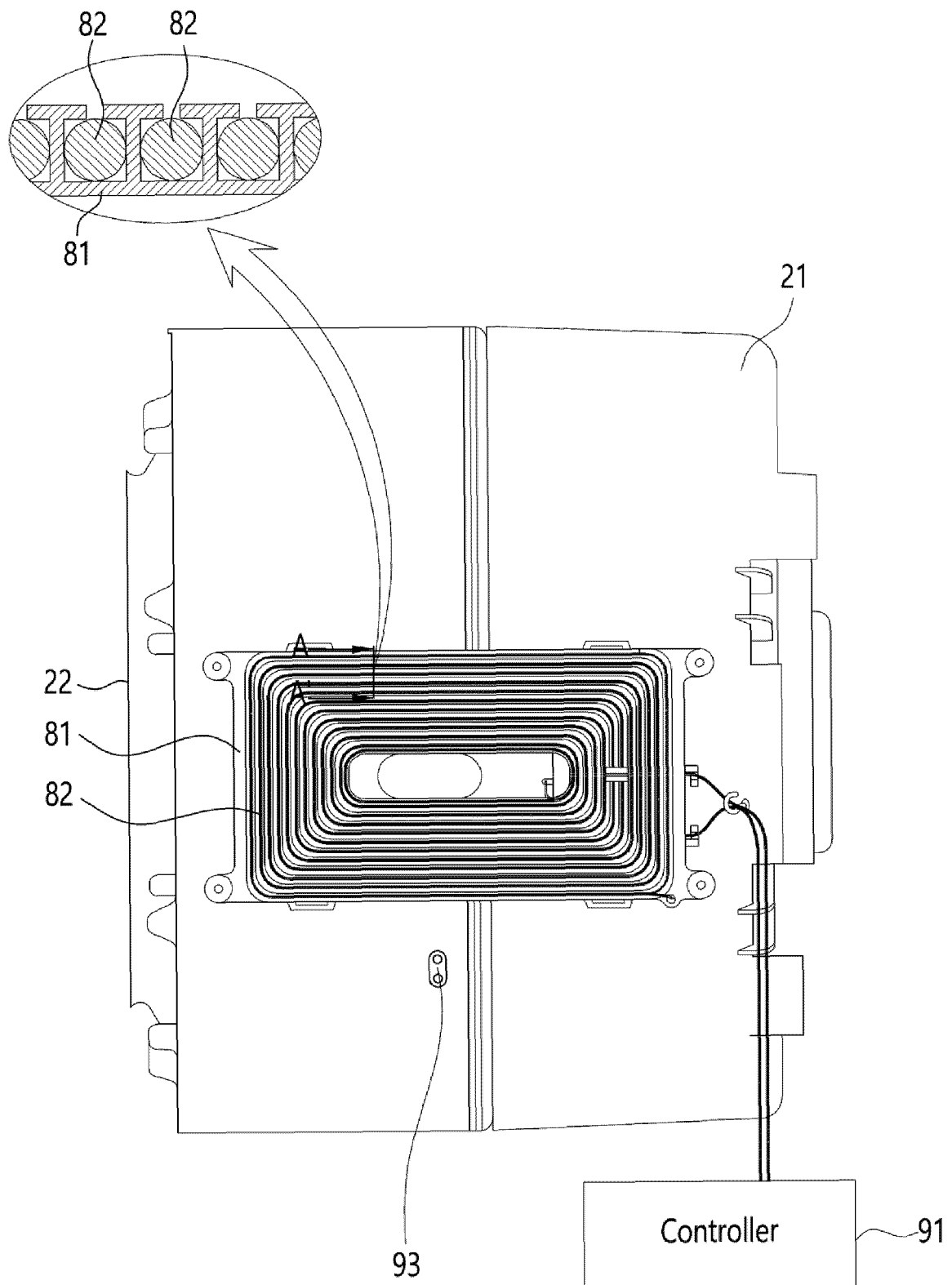
[FIG. 3]



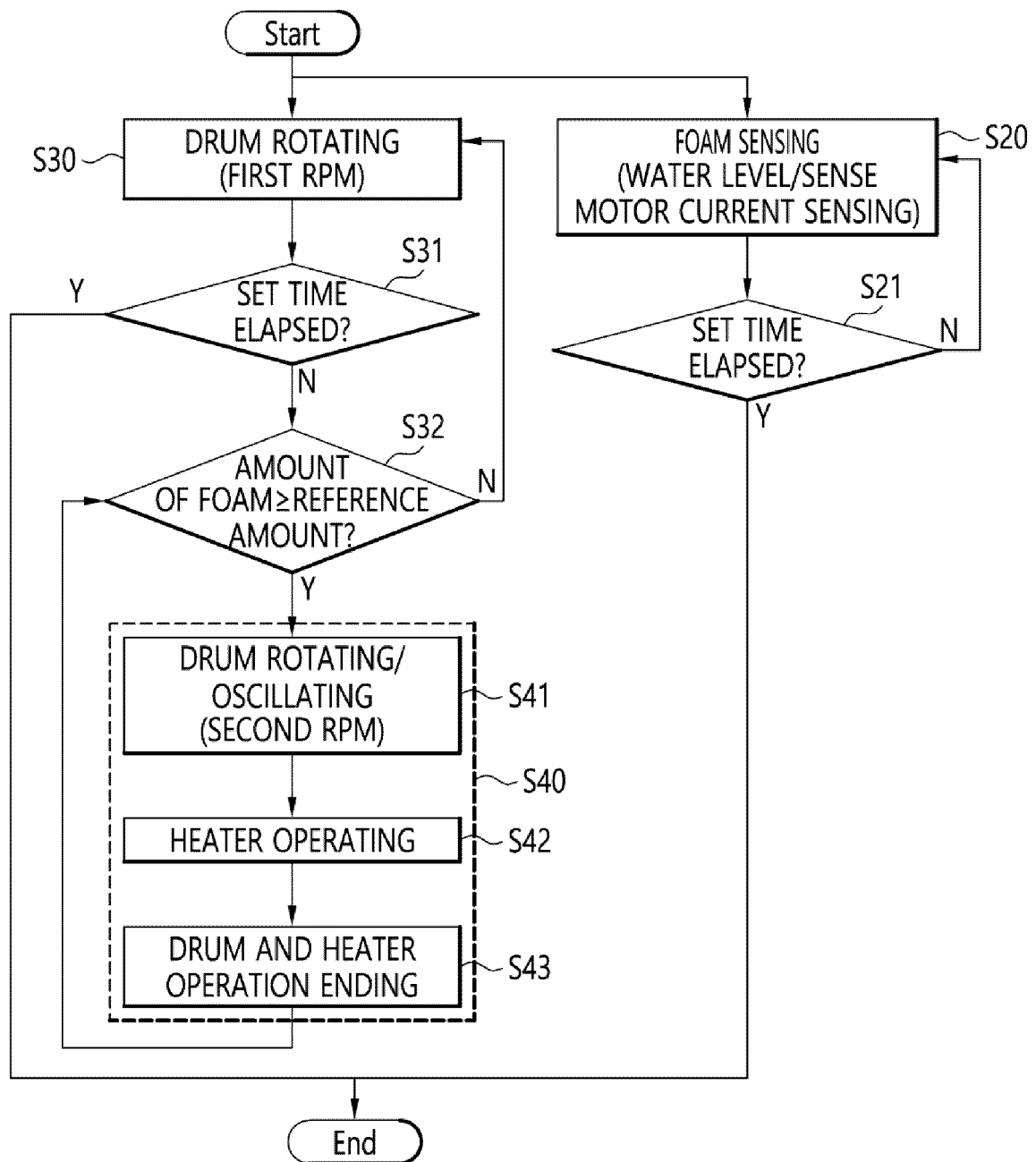
[FIG. 4]



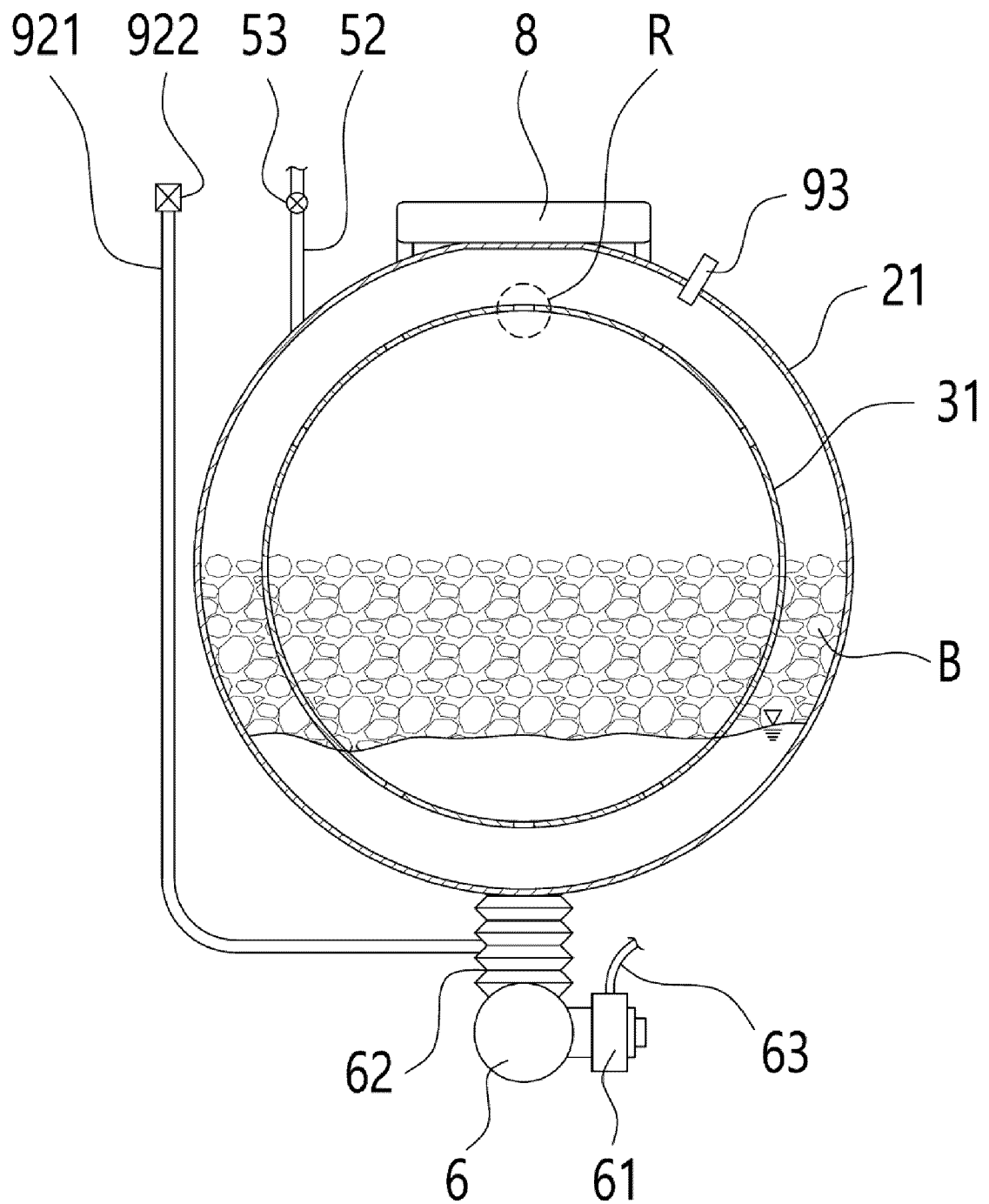
[FIG. 5]



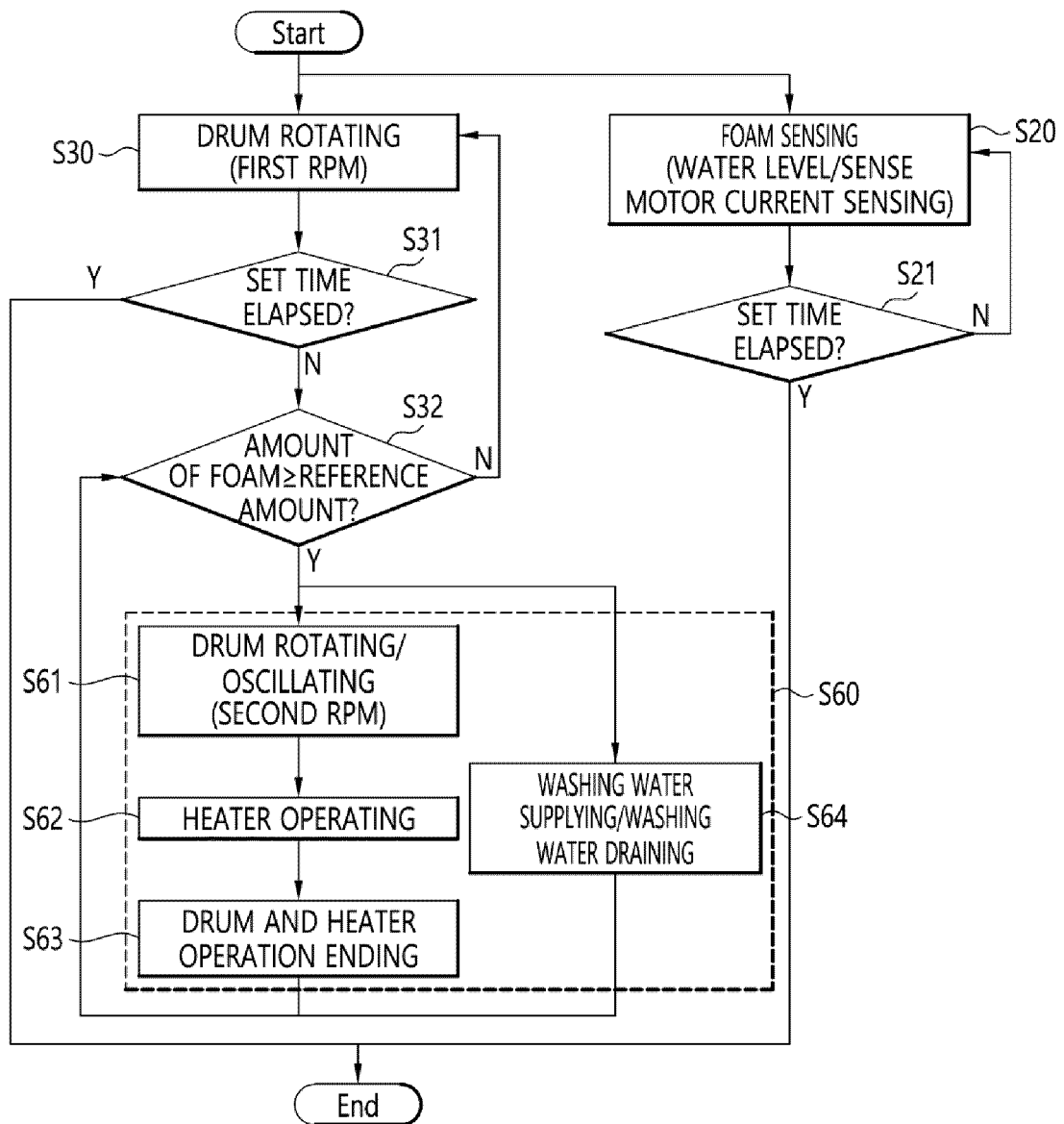
[FIG. 6]



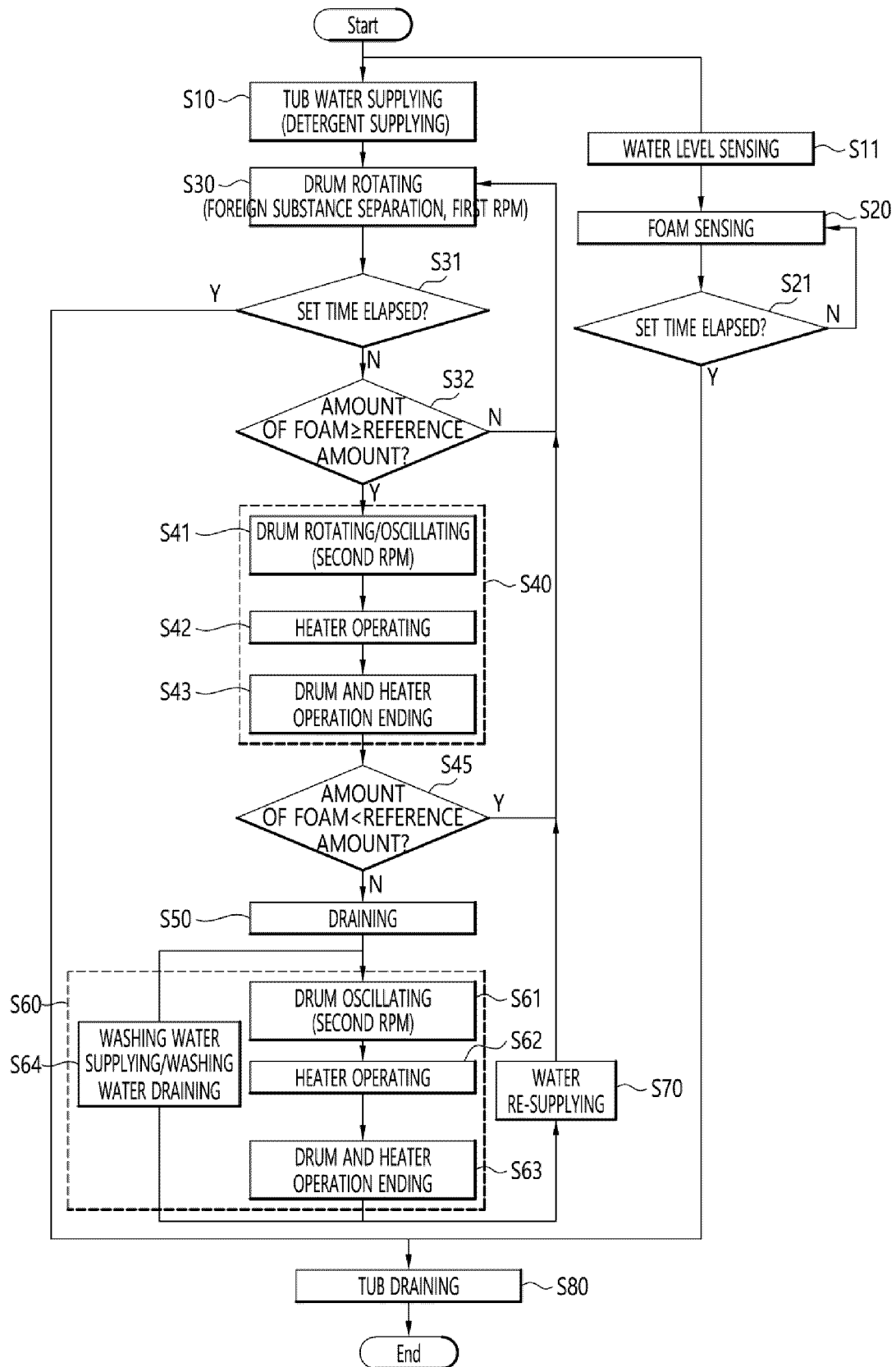
[FIG. 7]



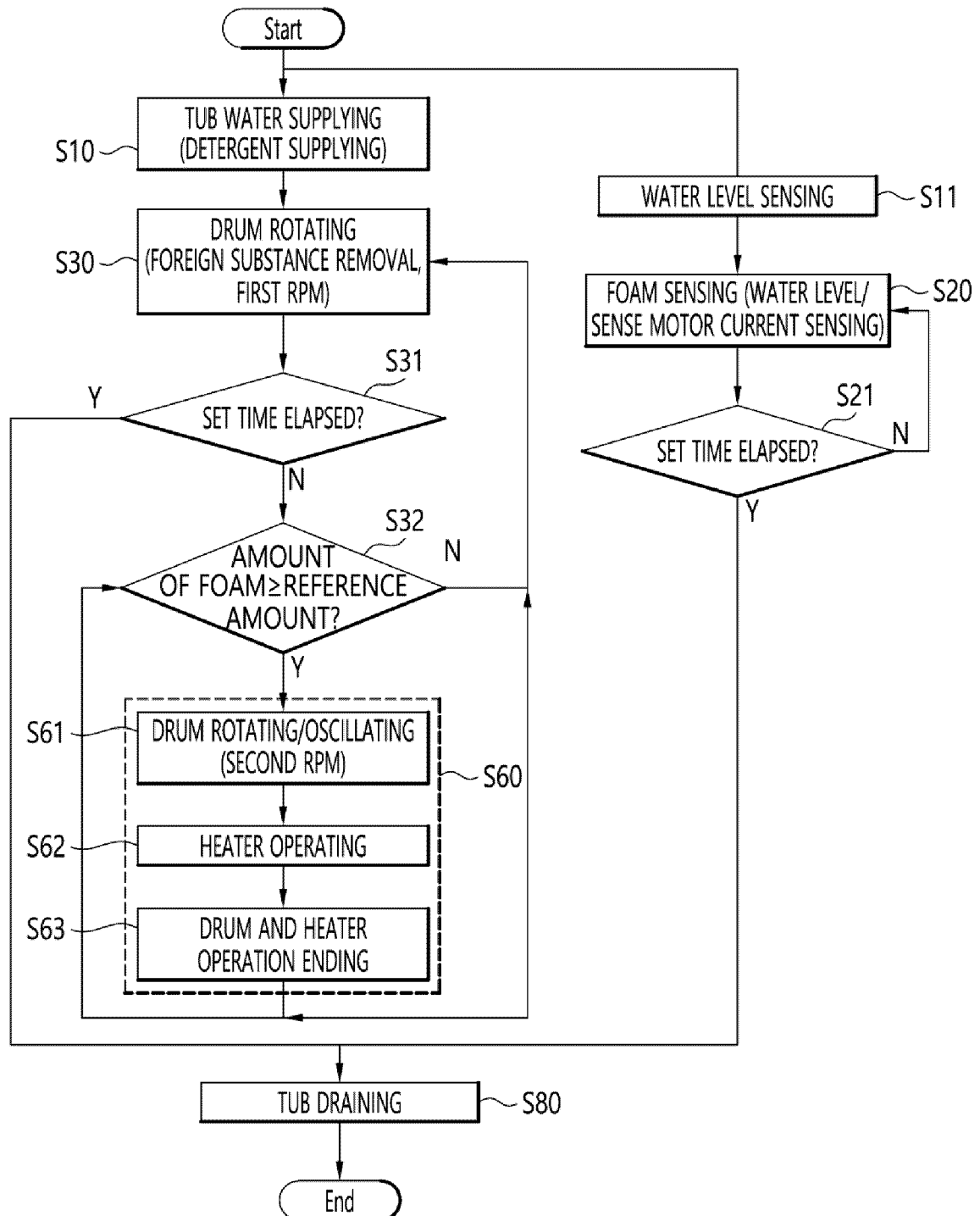
[FIG. 8]



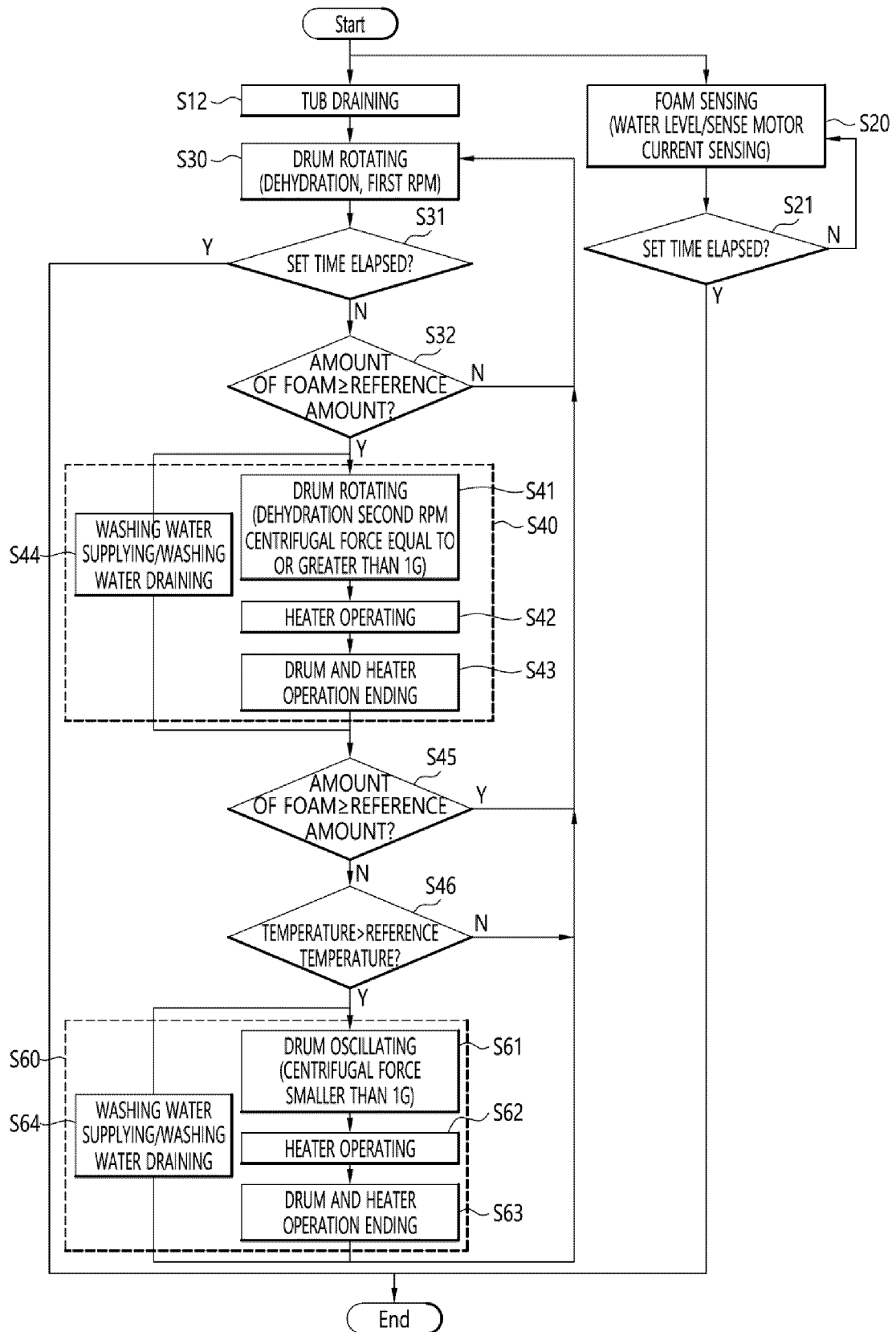
[FIG. 9]



[FIG. 10]



[FIG. 11]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2023/019546

A. CLASSIFICATION OF SUBJECT MATTER

D06F 39/04(2006.01)i; D06F 103/20(2020.01)i; D06F 105/20(2020.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D06F 39/04(2006.01); D06F 33/00(2006.01); D06F 33/02(2006.01); D06F 35/00(2006.01); D06F 39/02(2006.01);
D06F 39/06(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models: IPC as above

Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords: 세탁기(washing machine), 거품(suds), 가열부(heater), 회전(rotation), 탈수
(dehydration)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012-0144871 A1 (HARDAWAY, Anthony H.) 14 June 2012 (2012-06-14) See paragraphs [0017]-[0032] and figures 1-2.	1-3,6-7
Y		4-5,8-18
Y	KR 10-2018-0089967 A (LG ELECTRONICS INC.) 10 August 2018 (2018-08-10) See paragraphs [0061]-[0063] and figures 1-2.	4-5,10-12,16-18
Y	KR 10-2017-0094648 A (LG ELECTRONICS INC.) 21 August 2017 (2017-08-21) See paragraphs [0057]-[0061] and figure 2.	8-12
Y	KR 10-2007-0009192 A (DAEWOO ELECTRONICS CORPORATION) 18 January 2007 (2007-01-18) See claims 3-6 and figures 1-4.	13-18
A	KR 20-0209987 Y1 (DAEWOO ELECTRONICS CO., LTD.) 15 January 2001 (2001-01-15) See claim 1 and figure 2.	1-18

☐ Further documents are listed in the continuation of Box C.
☒ See patent family annex.

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Date of the actual completion of the international search

12 March 2024

Date of mailing of the international search report

12 March 2024

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2023/019546

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KR 10-2018-0089967 A	10 August 2018	None	
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KR 20-0209987 Y1	15 January 2001	None	

REFERENCES CITED IN THE DESCRIPTION

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