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(54) WASHING MACHINE

(57) A washing machine capable of executing until a preset ending time a preset operation ending a washing and focusing on a good condition of washed items such as clothes and a cleaning power; the washing machine (1) comprises a washing machine body (2), a washing drum (4) and an electric motor (61) and is capable of executing until a preset ending time the preset operation ending multiple processes for washing clothes; the washing machine (1) further comprises a time acquiring device (27) and a control device (7); before a washing process (SP2) is started, the time acquiring device (27) acquires a remaining time until an target ending time set on the basis of the preset ending time; according to the remaining time acquired by the time acquiring device (27), the control device (7) determines whether to execute each of plural processes under a normal preset mode or a special preset mode; the normal preset mode comprises adjusting an average rotation speed of the electric motor (61) to a prescribed value and executing each of the processes in a prescribed time; compared to the normal preset mode, the special preset mode comprises setting a smaller average rotation speed of the electric motor (61) and executing the mode with a longer execution time. The washing machine realizes a preset operation for reducing damage and wrinkling of washed items with a simple control A washing machine capable of executing until a preset ending time a preset operation ending a washing and focusing on a good condition of washed items such as clothes and a cleaning power; the washing machine (1) comprises a washing machine body (2), a washing drum (4) and an electric motor (61) and is capable of executing until a preset ending time the preset operation ending multiple processes for washing clothes; the washing machine (1) further comprises a time acquiring device (27) and a control device (7); before a washing process (SP2) is started, the time acquiring device (27) acquires a remaining time until an target ending time set on the basis of the preset ending time; according to the remaining time acquired by the time acquiring device (27), the control device (7) determines whether to execute each of plural processes under a normal preset mode or a special preset mode; the normal preset mode comprises adjusting an average rotation speed of the electric motor (61) to a prescribed value and executing each of the processes in a prescribed time; compared to the normal preset mode, the special preset mode comprises setting a smaller average rotation speed of the electric motor (61) and executing the mode with a longer execution time. The washing machine realizes a preset operation for reducing damage and wrinkling of washed items with a simple control.

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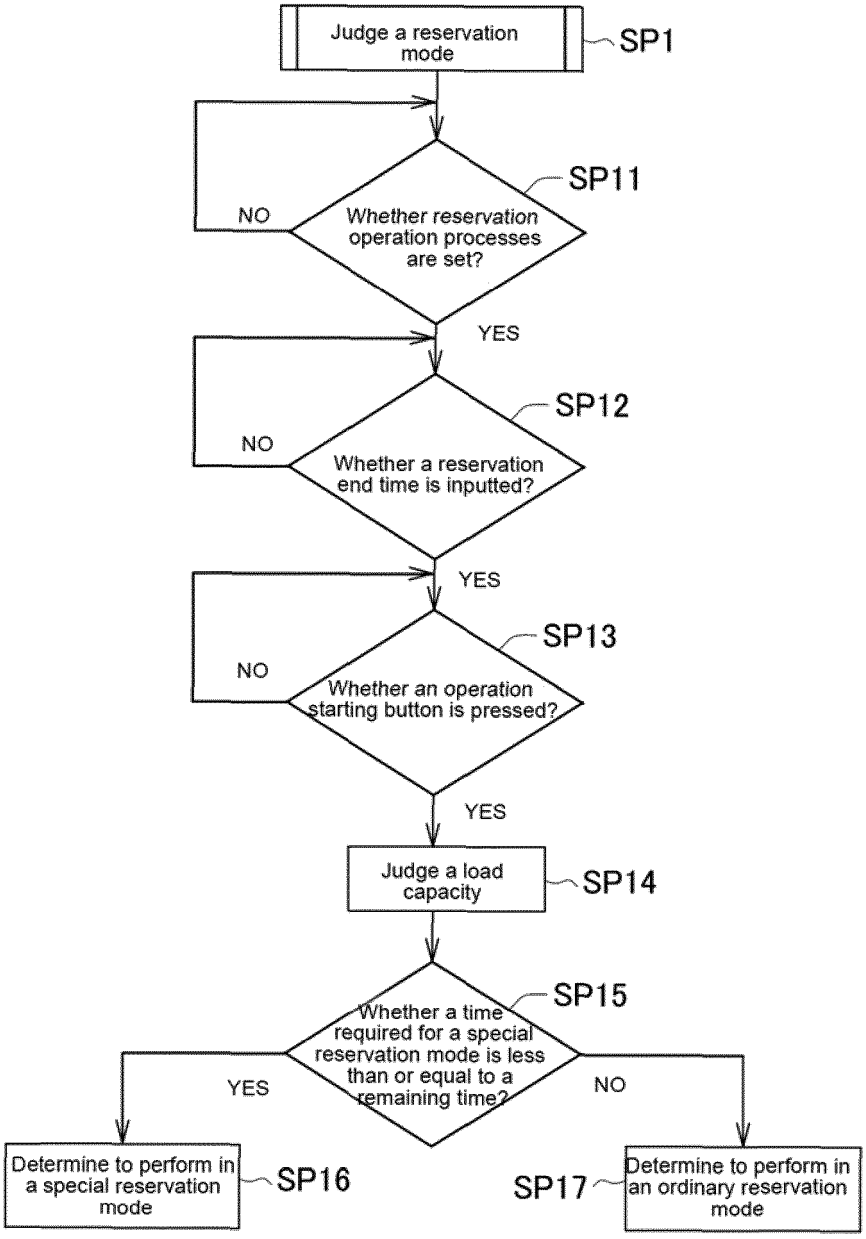
Judge a reservation mode
SP1
SP11
Whether reservation operation processes are set?
NO
YES
SP12
Whether a reservation end time is inputted?
NO
YES
SP13
Whether an operation starting button is pressed?
NO
YES
Judge a load capacity
SP14
SP15
Whether a time required for a special reservation mode is less than or equal to a remaining time?
YES
NO
Determine to perform in a special reservation mode
SP16
SP17
Determine to perform in an ordinary reservation mode

FIG.5

Description

TECHNICAL FIELD

[0001] The present invention relates to a washing machine which can perform a reservation operation for the ending washing and paying attention to intact conditions and cleaning power for washings such as clothes until a reservation end time.

BACKGROUND

[0002] In the past, a known washing machine includes: a washing machine body; a washing drum arranged inside the washing machine body; and a motor for supplying driving force for rotating washings such as clothes contained in the washing drum and capable of automatically ending a reservation operation for multiple processes (such as a washing process, a rinsing process and a dewatering process) for washing the washings until a reservation end time inputted by a user. In a patent literature 1, such a washing machine capable of performing the reservation operation is disclosed. The washing machine disclosed in the patent literature 1 does not start a washing operation immediately even if a reservation operation start key is operated, but actually starts the washing operation after a reservation waiting time since the reservation operation start key is operated.

Current Technical Literature

Patent Literature

[0003] Patent Literature 1: Japanese Laid-Open Patent Publication No. 2004-65408

Problems to be solved in invention

[0004] However, a conventional washing machine tends to focus on shortening an operation time, such as increasing a rotation speed of the motor, increasing the rotation speed of the washings in the washing drum and improving cleaning power per unit time, in ordinary washing operation rather than the reservation operation. But, the washings are easy to be damaged and wrinkled in the case of increasing the rotation speed in this way, and intact conditions of the washings may be sacrificed to some extent to ensure the shortening of the operation time and the cleaning power.

[0005] On the other hand, the washing machine having a reservation operation function described above usually performs the ordinary washing operation and the reservation operation in substantially same conditions, besides starting the washing operation after the reservation waiting time. Therefore, the washing machine disclosed in the patent literature 1 has a space for improvement in an aspect of considering that the operation times (execution times) of various processes and the rotation speeds of the motor in various processes during the ordinary washing operation and the reservation operation are substantially the same and in an aspect of considering that the intact conditions of the washings also are sacrificed in the case of the reservation operation regardless of the shortening of the operation time.

SUMMARY

[0006] The purpose of the present invention is to provide a washing machine which can perform a reservation operation for ending washing and paying attention to intact conditions and cleaning power for washings such as clothes until a reservation end time.

Solutions for solving problems

[0007] In order to achieve the purpose, the present invention adopts the following solution.

[0008] Namely, the washing machine of the present invention includes: a washing machine body having an input portion capable of arbitrarily inputting a reservation end time of a washing; a washing drum arranged inside the washing machine body; and a motor for supplying driving force for rotating washings contained in the washing drum and capable of performing a reservation operation for ending multiple processes of washing the washings until the reservation end time. The washing machine includes: a time acquisition unit for acquiring a remaining time until a target end time set based on the reservation end time before starting an initial process of the multiple processes; and a mode determination unit for determining to perform each of the multiple processes in an ordinary reservation mode or a special reservation mode on the basis of the remaining time acquired by the time acquisition unit, where the ordinary reservation mode refers to a mode for setting an average rotation speed of the motor as a specified value and performing each of the multiple processes at a specified execution time; and the special reservation mode refers to a mode for setting an average rotation speed of the motor to be lower than that in the ordinary reservation mode and setting the execution time to be longer than that in the ordinary reservation mode.

[0009] Specifically, the present invention preferably adopts the following solution: the multiple processes include a washing process, a rinsing process and a dewatering process; and the mode determination unit determines to perform all the processes in the special reservation mode when judging that the remaining time acquired by the time acquisition unit is greater than a time required for performing the washing process, the rinsing process and the dewatering process in the special reservation mode, and the mode determination unit determines to perform all the processes in the ordinary reservation mode when judging that the remaining time acquired by the time acquisition unit is not greater than the time required for performing the washing process, the

rinsing process and the dewatering process in the special reservation mode.

[0010] Alternatively, the present invention preferably adopts the following solution: the multiple processes include the washing process, the rinsing process and the dewatering process; and the mode determination unit determines to perform all the processes in the special reservation mode when judging that the remaining time acquired by the time acquisition unit is greater than the time required for performing the washing process, the rinsing process and the dewatering process in the special reservation mode, and the mode determination unit determines to perform only portion of the processes in the special reservation mode when judging that the remaining time is not greater than the time required for performing all the processes in the special reservation mode and judging that the remaining time is greater than the time required for performing portion of the multiple processes in the special reservation mode and performing the other processes in the ordinary reservation mode.

[0011] Alternatively, the present invention preferably adopts the following solution: the multiple processes include the washing process, the rinsing process and the dewatering process; the time acquisition unit also acquires the remaining time until the target end time before the start of the rinsing process and before the start of the dewatering process respectively, except in the initial process, i.e., before the start of the washing process; and the mode determination unit determines to perform the next process in the ordinary reservation mode or the special reservation mode based on the remaining time when the time acquisition unit acquires the remaining time.

[0012] In addition, the present invention preferably adopts the following solution: the time at which the reservation end time inputted by the input portion is advanced by the specified time is set as the target end time.

Effects of invention

[0013] According to the present invention described above, the time acquisition unit acquires the remaining time until the target end time before the start of the initial process when the reservation end time is inputted by the input portion of the washing machine body and the reservation operation is performed. The mode determination unit can determine to perform various processes in the ordinary reservation mode or the special reservation mode based on the remaining time. In the special reservation mode, since the average rotation speed of the motor is lower than that in the ordinary reservation mode, the rotation speed of the washings in the washing drum is decreased to reduce damages and winkles of the washings. Then, since the execution time in the special reservation mode is longer than that in the ordinary reservation mode, the rotation speed of the washings in the washing drum is decreased to make up for the reduced cleaning power, rinsing power and dewatering power per unit time. Thus, the washing machine of the present invention can perform the special reservation mode until the reservation end time when the time during a period until the target end time set based on the reservation end time is sufficient, and can end the washing and perform the reservation operation for paying attention to intact conditions of the washings such as clothes and the cleaning power until the reservation end time.

[0014] Specifically, the washing machine of the present invention performs all the processes in the special reservation mode when judging that the remaining time is greater than the time required for performing all the processes in the special reservation mode, and otherwise, the washing machine of the present invention performs all the processes in the ordinary reservation mode. According to the present invention, the washing machine can end the washing and realize the reservation operation for reducing the damages and winkles of the washings through simple control until the target end time.

[0015] Alternatively, the washing machine of the present invention determines to perform portion of the processes in the special reservation mode when judging that the remaining time is greater than the time required for performing only portion of the processes in the special reservation mode. According to the present invention, when the time is not sufficient to perform all the processes in the special reservation mode, only portion of the processes can be performed in the special reservation mode to increase an opportunity of performing the reservation operation capable of reducing the damages and winkles of the washings.

[0016] Alternatively, the washing machine of the present invention may determine to perform the ordinary reservation mode or the special reservation mode when the remaining time is acquired at every time. According to the present invention, the washing machine can re-evaluate to perform the ordinary reservation mode or the special reservation mode before the start of each process, so the washing can be ended until the reservation end time even if unconventional actions and the like need to be performed and time loss is generated.

[0017] In addition, according to the present invention, the time at which the reservation end time inputted by the input portion is advanced by the specified time is set as the target end time, so the specified time can make up for the loss, and the washing can be ended in the period until the reservation end time even if the unconventional actions and the like are needed to be performed and the time loss is generated. In addition, the specified time can be set as, for example, about 15 minutes to make up for the time loss and to avoid generating bad smell since the washed washings are placed in the washing drum.

BRIEF DESCRIPTION OF DRAWINGS

[0018]

Fig. 1 is a perspective view illustrating an appear-

ance of a washing machine of a first embodiment of the present invention.
Fig. 2 is a longitudinal section view illustrating a general structure of the washing machine.
Fig. 3 is a block diagram illustrating an electrical structure of the washing machine.
Fig. 4 is a flow chart illustrating a flow of reservation operation processes of the washing machine.
Fig. 5 is a flow chart illustrating a flow of judging a reservation mode in reservation operation processes.
Fig. 6 is a flow chart illustrating a flow of a washing process in reservation operation processes.
Fig. 7 is a flow chart illustrating a flow of an intermediate dewatering process in reservation operation processes.
Fig. 8 is a flow chart illustrating a flow of a rinsing process in reservation operation processes.
Fig. 9 is a flow chart illustrating a flow of a final dewatering process in reservation operation processes.
Fig. 10 is a flow chart illustrating a flow for judging a reservation mode of a washing machine according to a second embodiment of the present invention.
Fig. 11 is a flow chart illustrating a flow of reservation operation processes of a washing machine according to a third embodiment of the present invention.
Fig. 12 is a flow chart illustrating a flow of a washing process in reservation operation processes.
Fig. 13 is a flow chart illustrating a flow of an intermediate dewatering process in reservation operation processes.
Fig. 14 is a flow chart illustrating a flow of a rinsing process in reservation operation processes.
Fig. 15 is a flow chart illustrating a flow of a final dewatering process in reservation operation processes.

A list of reference numerals

[0019]

1: washing machine; 2: washing machine body; 4: washing drum; 61: motor;

7: mode determination unit (control portion); 27: time acquisition unit (time acquisition portion);

SP2 and SP2a: washing process; SP4 and SP4a: rinsing process;

SP3 and SP3a: dewatering process (intermediate dewatering process);

SP5 and SP5a: dewatering process (final dewatering process).

DETAILED DESCRIPTION

[0020] Hereinafter, embodiments of the present invention are described with reference to drawings.

<First embodiment>

[0021] Fig. 1 is a perspective view illustrating an appearance of a vertical washing machine (hereinafter referred to as "washing machine") 1 according to a first embodiment of the present invention. In addition, Fig. 2 is a longitudinal section view illustrating a general structure of the washing machine 1 of the first embodiment.

[0022] The washing machine 1 of the present embodiment includes a washing machine body 2, an outer drum 3, a washing drum 4, an impeller 5, a driving unit 6 and a control portion 7 (referring to Fig. 3). Such washing machine 1 can perform a reservation operation (reservation washing) for ending multiple processes of washing clothes, such as a washing process, an intermediate dewatering process, a rinsing process and a final dewatering process, until a reservation end time inputted by an input portion 23.

[0023] The washing machine body 2 is a substantially rectangular shape, its upper surface 20 includes: an opening 21 for putting into and taking out the clothes as the washings from the washing drum 4; and an retractable cover 22 capable of opening and closing the opening 21, wherein the clothes can be put into and taken out from the washing drum 4 via the opening when the retractable cover 22 is opened. In addition, the upper surface 20 of the washing machine body 2 is provided with a reservation operation process button, a time setting button, an operation starting button and the like and also provided with an input portion 23 (referring to Fig. 1) which is capable of arbitrarily inputting the washing process, the reservation end time of washing and the like.

[0024] The outer drum 3 shown in Fig. 2 is arranged inside the washing machine body 2 and is a bottomed cylindrical member capable of storing water.

[0025] The washing drum 4 is a bottomed cylindrical member configured coaxially with the outer drum 3 and inside the outer drum 3 and rotatably supported by the outer drum 3. The washing drum 4 has a diameter smaller than that of the outer drum 3, has a plurality of holes (not shown) on its wall, and also functions as a dewatering drum. A water flow is generated through the holes (not shown) in the washing process and the rinsing process. The water flows out of a drain outlet (not shown) arranged in the outer drum 3 through the holes in the intermediate dewatering process and the final dewatering process.

[0026] The impeller (a stirring wing) 5 is rotatably arranged in the center of a bottom 41 of the washing drum 4, to stir the water stored in the outer drum 3 to generate the water flow. The faster the rotation speed of the impeller 5 is, the greater a water flow value is. In addition, the greater the proportion of a rotation time of the impeller 5 relative to the execution time of each process described

later is, the greater the water flow value is.

[0027] The driving unit 6 includes a motor 61 and a clutch 62. The motor 61 enables the washing drum 4 and the impeller 5 to rotate to supply driving force for rotating the clothes contained in the washing drum 4.

[0028] Specifically, the motor 61 enables a driving shaft 63 protruding toward the bottom 41 of the washing drum 4 to rotate, so that the washing drum 4 rotates. In addition, a rotating force generated by the motor 61 also supplies the driving force to the impeller 5 by switching the clutch 62 so that the impeller 5 rotates. Thus, in multiple processes of washing the clothes of the washing machine 1, only the impeller 5 mainly rotate in the washing process and the rinsing process, and the washing drum 4 and the impeller 5 integrally rotate at high speed in the intermediate dewatering process and the final dewatering process.

[0029] Fig. 3 is a block diagram illustrating an electrical structure of the washing machine 1 of the present embodiment. Actions of the washing machine 1 are controlled by a control portion 7 including a microcomputer. The control portion 7 includes an ROM 71 and an RAM 72, and performs a program stored in the ROM 71 by the microcomputer, thereby performing a reserved operation action. Data (such as the reservation end time inputted by the input portion 23) and the like used when the program is performedare temporarily stored in the RAM 72.

[0030] Besides the motor 61 and the clutch 62, the control portion 7 is connected with a water supply valve 24 for supplying the water to the outer drum 3 and a drain valve 25 for draining the water in the outer drum 3 which are as a control object. It should be noted that the water supply valve 24 and the drain valve 25 are not shown in Fig. 2.

[0031] In addition, besides the signals from the input portion 23, the control portion 7 also is inputted the signals from a load capacity sensor 26, a time acquisition portion 27 as the time acquisition unit, a timer 28, a water level sensor 29 and the like.

[0032] The load capacity sensor 26 detects a weight and the like of the clothes contained in the washing drum 4. The control portion 7 can judge (solve) a load capacity corresponding to the quantity of the clothes based on a detection result of the load capacity sensor 26. The control portion 7 employs the load capacity to adjust the rotation speed, the execution time and other data of the motor 61 extracted from the ROM 71, or reads out a value corresponding to the load capacity from a table prestored in the ROM 71. In the same mode, the more the quantity of the clothes is, the more the quantity of the water supplied to the outer drum 3 is, then the longer the washing time is set. It should be noted that the load capacity can also be judged based on the quantity of the water inputted from the input portion 23. In addition, the load capacity can be adjusted by multiplying the data extracted from the ROM 71 and a load factor.

[0033] The time acquisition portion 27 acquires the remaining time until a target end time set by the control portion 7 based on the reservation end time inputted by the input portion 23 when a reservation operation process is selected. The target end time is set as a time at which the reservation end time is advanced by a specified time. The specified time is preferably 30 minutes, more preferably about 15 minutes. When such target end time is set, even if it is necessary to perform unconventional actions, such as a situation of performing a water injection action for loosening the clothes biased in the washing drum 4 in the dewatering process and the like and generating time loss, the loss can be made up and the washing can be ended in the period until the reservation end time. In addition, the specified time can be set, for example, to be less than 30 minutes to make up for the time loss and to avoid generating bad smell since the clothes after the reservation operation are placed in the washing drum 4. In the present embodiment, the time acquisition portion 27 acquires the remaining time in the initial process, i.e., before the start of the washing process, in the multiple processes of washing the clothes.

[0034] The timer 28 acquires an elapsed time from the start in each process. The water level sensor 29 detects the quantity of the water in the outer drum 3.

[0035] Such washing machine 1 of the present embodiment can perform an ordinary reservation mode for setting an average rotation speed of the motor 61 as a specified value and being performed within a specified execution time, or a special reservation mode for setting the average rotation speed of the motor 61 to be smaller than that in the ordinary reservation mode and setting the execution time to be longer than that in the ordinary reservation mode when the reservation operation processes are selected. The control portion 7 determines to perform each process in the ordinary reservation mode or the special reservation mode based on the remaining time acquired by the time acquisition portion 27. Namely, the control portion 27 also functions as the mode determination unit.

[0036] Herein, the average rotation speed of the motor 61 refers to the average rotation speed of the motor 61 at the time of performing each process, and is defined based on each process. In the present embodiment, the average rotation speed of the motor 61 is adjusted by for example, a frequency conversion control way and by changing the rotation speed of the motor 61 according to the rotation speed of the motor 61 extracted from the ROM 71.

[0037] Cleaning which pays attention to the operation time is shortened exists in the ordinary washing process of non-reservation operation processes, but in the reservation operation processes, even if the operation time gets longer, the washing can be ended by the reservation end time. In the special reservation mode, the average rotation speed of the motor 61 is lower than that in the ordinary reservation mode, so the rotation speed of the washings in the washing drum 4 can be reduced, and the damages and winkles of the clothes can be reduced. And further, compared with the ordinary reservation

mode, since the execution time in the special reservation mode is longer, the cleaning power, rinsing power and dewatering power per unit time reduced due to the decreased rotation speed of the clothes in the washing drum 4 can be made up. Therefore, the washing machine 1 of the present embodiment can perform the special reservation mode and can perform the reservation operation for ending washing and paying attention to intact conditions and the cleaning power for the clothes until the reservation end time when the time in the period until the target end time set based on the reservation end time is sufficient.

[0038] The ROM 71 prestores the rotation speed and the execution time (a washing time, an intermediate dewatering time, a rinsing time and a final dewatering time) of the motor 61 in the ordinary reservation mode, and the rotation speed and the execution time (the washing time, the intermediate dewatering time, the rinsing time and the final dewatering time) of the motor 61 in the special reservation mode and the like.

[0039] Specifically, for the washing time, the ROM 71 stores an ordinary washing time applicable to the ordinary reservation mode and a special reservation washing time applicable to the special reservation mode respectively. In addition, for a water flow value, the ROM 71 stores an ordinary water flow value applicable to the ordinary reservation mode and a special reservation mode water flow value applicable to the special reservation mode respectively. The water flow value is adjusted by adjusting the rotation speed of the motor. The special reservation mode water flow value is set to be smaller than the ordinary water flow value. Furthermore, the water flow value can also be adjusted by adjusting the proportion of the rotation time of the impeller 5 relative to the execution time of each process.

[0040] In addition, for the intermediate dewatering time, the ROM 71 stores an ordinary intermediate dewatering time applicable to the ordinary reservation mode and a special reservation intermediate dewatering time applicable to the special reservation mode respectively. Furthermore, for the rotation speed of the motor, the ROM 71 stores an ordinary rotation speed applicable to the ordinary reservation mode and a special reservation mode rotation speed applicable to the respectively. The special reservation mode rotation speed is set as a value smaller than the ordinary rotation speed.

[0041] In addition, for the rinsing time, the ROM 71 stores an ordinary rinsing time applicable to the ordinary reservation mode and a special reservation rinsing time applicable to the special reservation mode respectively. Furthermore, when the water values in the washing process and the rinsing process of the same mode are different, for the water flow value used in the rinsing process, the ROM 71 stores an ordinary water flow value applicable to the ordinary reservation mode and a special reservation mode water flow value applicable to the special reservation mode respectively.

[0042] Further, for the final dewatering time, the ROM 71 stores an ordinary final dewatering time applicable to the ordinary reservation mode and a special reservation final dewatering time applicable to the special reservation mode respectively. In addition, when the rotation speeds of the motor in the intermediate dewatering process and the final dewatering process of the same mode are different, for the rotation speed of the motor used in the final dewatering process, the ROM 71 stores an ordinary rotation speed applicable to the ordinary reservation mode and a special reservation mode rotation speed applicable to the special reservation mode respectively.

[0043] Herein, Fig. 4 to Fig. 9 illustrates various flows of situations of performing the reservation operation. Fig. 4 is a flow chart illustrating a flow of situations of washing in reservation operation processes. Fig. 5 is a flow chart illustrating a flow of judging SP1 based on a reservation mode in the reservation operation processes. Fig. 6 is a flow chart illustrating a flow of the washing process SP2 in the reservation operation processes. Fig. 7 is a flow chart illustrating a flow of the intermediate dewatering process SP3 in the reservation operation processes. Fig. 8 is a flow chart illustrating a flow of the rinsing process SP4 in the reservation operation processes. Fig. 9 is a flow chart illustrating a flow of the final dewatering process SP5 in the reservation operation processes.

[0044] Firstly, an outline of the flow of situations of the washing in the reservation operation processes is illustrated with reference to Fig. 4.

<Step SP1>

[0045] In step SP1, the control portion 7 judges (determines) to perform various processes in the ordinary reservation mode or the special reservation mode.

<Step SP2>

[0046] In step SP2, the control portion 7 performs the washing process.

<Step SP3>

[0047] In step SP3, the control portion 7 performs the intermediate dewatering process.

<Step SP4>

[0048] In step SP4, the control portion 7 performs the rinsing process.

<Step SP5>

[0049] In step SP5, the control portion 7 performs the final dewatering process.

[0050] Next, a judgment flow in the reservation mode of step SP1 shown in Fig. 4 is illustrated in detail with reference to Fig. 5.

<Step SP11>

[0051] In step SP11, the control portion 7 judges whether a reservation operation process button of the input portion 23 is pressed to set the reservation operation process.

<Step SP12>

[0052] In step SP12, the control portion 7 judges whether the input portion 23 is inputted the reservation end time when judging that the reservation operation process is set (step SP11: YES). The control portion 7 acquires the target end time based on the reservation end time when the reservation end time is inputted.

<Step SP13>

[0053] In step SP13, the control portion 7 judges whether an operation starting button of the input portion 23 is pressed when judging that the reservation end time is inputted (step SP12: YES).

<Step SP14>

[0054] In step SP14, the control portion 7 determines the load capacity based on the detected value of the load capacity sensor 26 and acquires the time required for the special reservation mode when judging that the operation starting button is pressed (step SP13: YES). The time required for the special reservation mode is the time required when the washing process SP2, the intermediate dewatering process SP3, the rinsing process SP4 and the final dewatering process SP5 are performed in the special reservation mode, and can be acquired from the data pre-stored in the ROM 71 based on the load capacity. For example, the time required for the special reservation mode can be acquired by adjusting the time (the execution time of each process, a sum of the execution times and the like) pre-stored in the ROM 71 as a reference based on the load capacity or by reading out the value corresponding to the load capacity from the table pre-stored in the ROM 71. Other required times described later are also the same.

<Step SP15>

[0055] In step SP15, the control portion 7 judges whether the remaining time until the target end time acquired by the time acquisition portion 27 is greater than the time required for the special reservation mode. When it is judged that the remaining time is greater than the time required for the special reservation mode, go to step SP16 (step SP15: YES). When it is judged that the remaining time is not greater than the time required for the special reservation mode, go to step SP17 (step SP15 : NO).

<Step SP16>

[0056] In step SP16, the control portion 7 determines to perform all the processes in the special reservation mode.

<Step SP17>

[0057] In step SP17, the control portion 7 determines to perform all the processes in the ordinary reservation mode.

[0058] Next, the flow of the washing process of step SP2 shown in Fig. 4 is illustrated in detail with reference to Fig. 6.

<Step SP21>

[0059] In step SP21, the control portion 7 judges whether all the processes are performed in the special reservation mode in step SP16 shown in Fig. 5, i.e., judges whether to be the special reservation mode. When it is judged to be the special reservation mode, go to step SP22 (step SP21: YES). When it is judged to be not in the special reservation mode, go to step SP24 (step SP21: NO).

<Step SP22>

[0060] In step SP22, the control portion 7 acquires a special washing time from the ROM 71 and sets the washing time according to the special washing time. Specifically, the washing time is set based on the special washing time extracted from the ROM 71 and adjusted according to the load capacity; or, the special washing time which corresponds to the load capacity and is extracted from the table pre-stored in the ROM 71 is set as the washing time. In the steps described later of setting the execution time, the water flow value and the rotation speed of the motor of each process, the value corresponding to such load capacity is also set.

<Step SP23>

[0061] In SP23, the control portion 7 acquires the special reservation mode water flow value from the ROM 71 and sets the water flow value according to the special reservation mode water flow value.

<Step SP24>

[0062] In step SP24, the control portion 7 acquires the ordinary washing time from the ROM 71 and sets the washing time according to the ordinary washing time.

<Step SP25>

[0063] In step SP25, the control portion 7 acquires the ordinary water flow value from the ROM 71 and sets the

water flow value according to the ordinary water flow value.

<step SP26>

[0064] In step SP26, the control portion 7 sends a signal to the driving unit 6 and the water supply valve 24 and the like, thus the washing operation is started and the timer 28 starts the counting of the elapsed time. The water flow value at the time of the washing operation is the water flow value set in step SP23 or step SP25. The water flow value is adjusted by adjusting the rotation speed of the motor 61. Therefore, the average rotation speed of the motor 61 in the case of setting the special reservation mode is lower than the average rotation speed of the motor 61 in the case of setting the ordinary reservation mode.

<Step SP27>

[0065] In step SP27, the control portion 7 judges whether the washing time set in step SP22 or step SP24 is reached according to the elapsed time acquired by the timer 28.

<Step SP28>

[0066] In step SP28, the control portion 7 ends the washing operation when the washing time is reached.

[0067] Next, the flow of the intermediate dewatering process of step SP3 shown in Fig. 4 is illustrated in detail with reference to Fig. 7.

<Step SP31>

[0068] In step SP31, the control portion 7 judges whether all the processes are performed in the special reservation mode in step SP16 shown in Fig. 5, i.e., judges whether to be the special reservation mode. When it is judged to be the special reservation mode, go to step SP32 (step SP31: YES). When it is judged to be not in the special reservation mode, go go step SP34 (step SP31: NO).

<Step SP32>

[0069] In step SP32, the control portion 7 acquires the special reservation intermediate dewatering time from the ROM 71 and sets the intermediate dewatering time according to the special reservation intermediate dewatering time.

<Step SP33>

[0070] In step SP33, the control portion 7 acquires the special reservation mode rotation speed from the ROM 71 and sets the rotation speed of the motor according to the special reservation mode rotation speed.

<Step SP34>

[0071] In step SP34, the control portion 7 acquires the ordinary intermediate dewatering time from the ROM 71 and sets the intermediate dewatering time according to the ordinary intermediate dewatering time.

<Step SP35>

[0072] In step SP35, the control portion 7 acquires the ordinary rotation speed from the ROM 71 and sets the rotation speed of the motor according to the ordinary rotation speed.

<Step SP36>

[0073] In step SP36, the control portion 7 sends the signal to the driving unit 6 and the drain valve 25 and the like, thus the intermediate dewatering operation is started and the timer 28 starts the counting of the elapsed time. The rotation speed of the motor during the intermediate dewatering operation is the rotation speed of the motor set in step SP33 or step SP35. Therefore, the average rotation speed of the motor 61 in the case of setting the special reservation mode becomes lower than that in the case of setting the ordinary reservation mode.

<Step SP37>

[0074] In step SP37, the control portion 7 judges whether the intermediate dewatering time set in step SP32 or step SP34 is reached according to the elapsed time acquired by the timer 28.

<Step SP38>

[0075] In step SP38, the control portion 7 ends the intermediate dewatering operation when the intermediate dewatering time is reached.

[0076] Next, the flow of the rinsing process of step SP4 shown in Fig. 4 is illustrated in detail with reference to Fig. 8.

<Step SP41>

[0077] In step SP41, the control portion 7 judges whether all the processes are performed in the special reservation mode in step SP16 shown in Fig. 5, i.e., judges whether to be the special reservation mode. When it is judged to be the special reservation mode, go to step SP42 (step SP41: YES). When it is judged to be not in the special reservation mode, go to step SP44 (step SP41: NO).

<Step SP42>

[0078] In step SP42, the control portion 7 acquires the special reservation rinsing time from the ROM 71 and

sets the rinsing time according to the special reservation rinsing time.

<Step SP43>

[0079] In step SP43, the control portion 7 acquires the special reservation mode water flow value from the ROM 71 and sets the water flow value according to the special reservation mode water flow value.

<step SP44>

[0080] In step SP44, the control portion 7 acquires the ordinary rinsing time from the ROM 71 and sets the rinsing time according to the ordinary rinsing time.

<Step SP45>

[0081] In step SP45, the control portion 7 acquires the ordinary water flow value from the ROM 71 and sets the water flow value according to the ordinary water flow value.

<Step SP46>

[0082] In step SP46, the control portion 7 sends the signal to the driving unit 6and the water supply valve 24 and the like, thus the rinsing operation is started and the timer 28 starts the counting of the elapsed time. The water flow value during the rinsing operation is the water flow value set in step SP43 or step SP45. The water flow value is adjusted by adjusting the rotation speed of the motor 61. Therefore, the average rotation speed of the motor 61 in the case of setting the special reservation mode is lower than that in the case of setting the ordinary reservation mode.

<Step SP47>

[0083] In step SP47, the control portion 7 judges whether the rinsing time set in step SP42 or step SP44 is reached according to the elapsed time acquired by the timer 28.

<Step SP48>

[0084] In step SP48, the control portion 7 ends the rinsing operation when the rinsing time is reached.

[0085] Next, the flow of the final dewatering process of step SP5 shown in Fig. 4 is illustrated in detail with reference to Fig. 9.

<Step SP51>

[0086] In step SP51, the control portion 7 judges whether all the processes are performed in the special reservation mode in step SP16 shown in Fig. 5, i.e., judges whether to be the special reservation mode. When it is judged to be the special reservation mode, go to step SP52 (step SP51: YES). When it is judged to be not in the special reservation mode, go to step SP54 (step SP51: NO).

<Step SP52>

[0087] In step SP52, the control portion 7 acquires the special reservation final dewatering time from the ROM 71 and sets the final dewatering time according to the special reservation final dewatering time.

<Step SP53>

[0088] In step SP53, the control portion 7 acquires the special reservation mode rotation speed from the ROM 71 and sets the motor rotation speed according to the special reservation mode rotation speed.

<Step SP54>

[0089] In step SP54, the control portion 7 acquires the ordinary final dewatering time from the ROM 71 and sets the final dewatering time according to the ordinary final dewatering time.

<Step SP55>

[0090] In step SP55, the control portion 7 acquires the ordinary rotation speed from the ROM 71 and sets the rotation speed of the motor according to the ordinary rotation speed.

<Step SP56>

[0091] In step SP56, the control portion 7 sends the signal to the driving unit 6and the drain valve 25 and the like, thus the final dewatering operation is started and the timer 28 starts the counting of the elapsed time. The rotation speed of the motor during the final dewatering operation is the rotation speed of the motor set in step SP53 or step SP55. Therefore, the average rotation speed of the motor 61 in the case of setting the special reservation mode is lower than that in the case of setting the ordinary reservation mode.

<Step SP57>

[0092] In step SP57, the control portion 7 judges whether the final dewatering time set in step SP52 or step SP54 is reached according to the elapsed time acquired by the timer 28.

<Step SP58>

[0093] In step SP58, the control portion 7 ends the final dewatering operation when the final dewatering time is reached.

[0094] In this way, when it is judged that the remaining time acquired by the time acquisition portion 27 is greater than the time required for the special reservation mode, all the processes are performed in the special reservation mode; otherwise, all the processes are performed in the ordinary reservation mode. Thus, the washing can be ended, and the reservation operation capable of reducing the damages and winkles of the clothes is realized through simple control until the target end time.

<Second embodiment>

[0095] Fig. 10 is a flow chart illustrating a flow of judging a reservation mode of a washing machine according to a second embodiment of the present invention. Portion of the flow of judging the reservation mode of the washing machine 1 of the present embodiment is different from that of the first embodiment. The solutions, except the solution recorded below, are the same as those in the first embodiment and are omitted herein.

<Step SP15>

[0096] During judgement of the reservation mode of step SP1A, in step SP15, the control portion 7 judges whether the remaining time acquired by the time acquisition portion 27 until the target end time is greater than the time required for the special reservation mode. When it is judged that the remaining time is greater than the time required for the special reservation mode, go to step SP16 (Step SP15: YES). When it is judged that the remaining time is not greater than the time required for the special reservation mode, go to step SP18 (step SP15: NO).

<Step SP18>

[0097] In step SP18, the control portion 7 judges whether portion of the processes can be performed in the special reservation mode. Specifically, it is judged whether the remaining time acquired by the time acquisition portion 27 is greater than the time required for performing portion (such as the intermediate dewatering process and the final dewatering process) of the washing process, the intermediate dewatering process, the rinsing process and the final dewatering process in the special reservation mode and performing other processes (such as the washing process and the rinsing process) in the ordinary reservation mode. It should be noted that the required time is the time acquired from the data prestored in the ROM 71 based on the load capacity. When it is judged that the remaining time is greater than the time required for performing portion of the processes in the special reservation mode and performing other processes in the ordinary reservation mode, go to step SP19 (step SP18: YES). When it is judged that the remaining time is not greater than the time required for performing portion of the processes in the special reservation mode and performing other processes in the ordinary reservation mode, go to step SP20 (step SP18: NO).

<Step SP19>

[0098] In step SP19, the control portion 7 determines to perform portion of the processes in the special reservation mode and perform the other processes in the ordinary reservation mode.

<Step SP20>

[0099] In step SP20, the control portion 7 determines to perform all the processes in the ordinary reservation mode.

[0100] After the judgment SP1A of the reservation mode described above, the control portion 7 sequentially operates the washing process SP2, the intermediate dewatering process SP3, the rinsing process SP4 and the final dewatering process SP5 shown in Fig. 6 to Fig. 9 based on the determined reservation mode.

[0101] In this way, when the time is not sufficient to perform all the processes in the special reservation mode, only portion of the processes are performed in the special reservation mode, thereby increasing an opportunity of performing the reservation operation capable of reducing the damages and wrinkles of the clothes.

<Third Embodiment>

[0102] The flow of situations of performing the reservation operation by the washing machine according to a third embodiment of the present invention is illustrated with reference to Fig. 11 to Fig. 15. Fig. 11 is a flow chart illustrating a flow of situations of washing in the reservation operation processes. Fig. 12 is a flow chart illustrating a flow of the washing process SP2a in the reservation operation processes. Fig. 13 is a flow chart illustrating a flow of an intermediate dewatering process SP3a in the reservation operation processes. Fig. 14 is a flow chart illustrating a flow of the rinsing process SP4a in the reservation operation processes. Fig. 15 is a flow chart illustrating a flow of the final dewatering process SP5a in the reservation operation processes.

[0103] In the present embodiment, the time acquisition portion 27 (referring to Fig. 3) further acquires the remaining time until the target end time before the start of the intermediate dewatering process SP3a, before the start of the rinsing process SP4a and before the start of the final dewatering process SP5a respectively, besides before the start of the washing process SP2a.

[0104] In addition, whenever the time acquisition portion 27 acquires the remaining time, the control portion 7 determines to perform the next process in the ordinary reservation mode or the special reservation mode based on the remaining time.

[0105] Specifically, firstly, in a general flow of the situations of washing in the reservation operation processes

shown in Fig. 11, the operation process is set in step SP1a. The flow of setting the operation process in step SP1a is the same as that in steps SP11-SP14 shown in Fig. 5. Then, the washing process SP2a, the intermediate dewatering process SP3a, the rinsing process SP4a and the final dewatering process SP5a are performed in order.

[0106] The washing process of step SP2a shown in Fig. 12 is the same as the flow of the washing process SP2 shown in Fig. 6, except that step 21 shown in Fig. 6 of determining whether it is judged to be the special reservation mode is replaced with step SP21a of judging whether the remaining time acquired by the time acquisition portion 27 is greater than the time required for a first special reservation mode. The time required for the first special reservation mode is the time required for performing the washing process SP2a, the intermediate dewatering process SP3a, the rinsing process SP4a and the final dewatering process SP5a in the special reservation mode. When it is judged that the remaining time is greater than the time required for the first special reservation mode, go to step SP22. When it is judged that the remaining time is not greater than the time required for the first special reservation mode, go to step SP24.

[0107] The intermediate dewatering process of step SP3a shown in Fig. 13 is the same as the flow of the intermediate dewatering process SP3 shown in Fig. 7, except that step 31 shown in Fig. 7 of determining whether it is judged to be the special reservation mode is replaced with step SP31a of judging whether the remaining time acquired by the time acquisition portion 27 is greater than the time required for a second special reservation mode. The time required for the second special reservation mode is the time required for performing the intermediate dewatering process SP3a, the rinsing process SP4a and the final dewatering process SP5a in the special reservation mode. When it is judged that the remaining time is greater than the time required for the second special reservation mode, go to step SP32. When it is judged that the remaining time is not greater than the time required for the second special reservation mode, go to step SP34.

[0108] The rinsing process of step SP4a shown in Fig. 14 is the same as the flow of the rinsing process SP4 shown in Fig. 8, except that step 41 shown in Fig. 8 of determining whether it is judged to be the special reservation mode is replaced with step SP41a of judging whether the remaining time acquired by the time acquisition portion 27 is greater than the time required for a third special reservation mode. The time required for the third special reservation mode is the time required for performing the rinsing process SP4a and the final dewatering process SP5a in the special reservation mode. When it is judged that the remaining time is greater than the time required for the third special reservation mode, go to step SP42. When it is judged that the remaining time is not greater than the time required for the third special reservation mode, go to step SP44.

[0109] The final dewatering process of step SP5a shown in Fig. 15 is the same as the flow of the final dewatering process SP5 shown in Fig. 9, except that step 51 shown in Fig. 9 of determining whether it is judged to be the special reservation mode is replaced with step SP51a of judging whether the remaining time acquired by the time acquisition portion 27 is greater than the time required for a fourth special reservation mode. The time required for the fourth special reservation mode is the time required for performing the final dewatering process SP5a in the special reservation mode. When it is judged that the remaining time is greater than the time required for the fourth special reservation mode, go to step SP52. When it is judged that the remaining time is not greater than the time required for the fourth special reservation mode, go to step SP54. It should be noted that the control portion 7 performs the judgement in steps SP21a-SP51a. In addition, the times required for the first to fourth special reservation modes are the times acquired from the data pre-stored in the ROM 71 based on the load capacity.

[0110] In this way, the washing machine can re-evaluate to perform the ordinary reservation mode or the special reservation mode before the start of each of the processes SP2a, SP3a, SP4a and SP5a, so the washing can be ended until the reservation end time even if the unconventional actions and the like are needed to be performed and the time loss is generated.

[0111] It should be noted that a specific structure of each portion is not just limited to embodiments described above.

[0112] For example, in embodiments described above, the average rotation speed of the motor 61 is adjusted by changing the rotation speed of the motor 61 based on the special reservation mode speed, the ordinary speed or the like extracted from the ROM 71, but not limited to the solution. A proportion of the operation time and a stop time of the motor 61 in each process may also be changed by the operation/stop control of the motor 61 to adjust the average rotation speed of the motor 61 to the specified value. It should be noted that in this case, the water flow values in the washing process and the rinsing process are adjusted by adjusting the proportion of the rotation time of the impeller 5 relative to the execution time of each process.

[0113] In addition, in embodiments described above, although the target end time is set to be a time that is earlier than the reservation end time, the target end time can also be set as a time that is the same time as the reservation end time.

[0114] In addition, although embodiments described above illustrate the vertical washing machine 1, the reservation operation can also be performed in a drum washing machine. In this case, the motor 61 enables the washing drum to rotate.

[0115] Further, the multiple processes of washing the clothes are not limited to the washing process SP2 (SP2a), the intermediate dewatering process SP3 (SP3a), the rinsing process SP4 (SP4a) and the final

dewatering process SP5 (SP5a). Besides these processes, other processes can also be adopted. Or, any of these processes is not adopted.

[0116] Various changes can also be made to other structures without departing from a scope of technical spirit of the present invention.

Claims

1. A washing machine, comprising: a washing machine body (2) having an input portion (23) capable of arbitrarily inputting a reservation end time of a washing; a washing drum (4) arranged inside the washing machine body (2); and a motor (61) for supplying driving force for rotating washings contained in the washing drum (4) and capable of performing a reservation operation for ending multiple processes of washing the washings until a reservation end time, wherein the washing machine (1) comprises:

   a time acquisition unit (27) for acquiring a remaining time until a target end time set based on the reservation end time before starting an initial process of the multiple processes; and
   a mode determination unit (7) for determining to perform each of the multiple processes in an ordinary reservation mode or a special reservation mode on the basis of the remaining time acquired by the time acquisition unit (27), wherein the ordinary reservation mode refers to a mode for setting an average rotation speed of the motor (61) as a specified value and performing each of the multiple processes at a specified execution time; and the special reservation mode refers to a mode for setting an average rotation speed of the motor (61) to be lower than a rotation speed in the ordinary reservation mode and setting an execution time to be longer than an execution time in the ordinary reservation mode.

2. The washing machine according to claim 1, wherein the multiple processes comprise a washing process (SP2, SP2a), a rinsing process (SP4, SP4a) and a dewatering process (SP3, SP3a; SP5, SP5a); and
   the mode determination unit (7) determines to perform all the processes in the special reservation mode when judging that the remaining time acquired by the time acquisition unit (27) is greater than time required for performing the washing process (SP2, SP2a), the rinsing process (SP4, SP4a) and the dewatering process (SP3, SP3a; SP5, SP5a) in the special reservation mode, and
   the mode determination unit (7) determines to perform all the processes in the ordinary reservation mode when judging that the remaining time acquired by the time acquisition unit (27) is not greater than the time required for performing the washing process (SP2, SP2a), the rinsing process (SP4, SP4a) and the dewatering process (SP3, SP3a; SP5, SP5a) in the special reservation mode.

3. The washing machine according to claim 1, wherein

   the multiple processes comprise the washing process (SP2, SP2a), the rinsing process (SP4, SP4a) and the dewatering process (SP3, SP3a; SP5, SP5a); and
   the mode determination unit (7) determines to perform all the processes in the special reservation mode when judging that the remaining time acquired by the time acquisition unit (27) is greater than time required for performing the washing process (SP2, SP2a), the rinsing process (SP4, SP4a) and the dewatering process (SP3, SP3a; SP5, SP5a) in the special reservation mode, and
   the mode determination unit (7) determines to perform only portion of the processes in the special reservation mode when judging that the remaining time is not greater than the time required for performing all the processes in the special reservation mode and judging that the remaining time is greater than the time required for performing portion of the multiple processes in the special reservation mode and performing other processes in the ordinary reservation mode.

4. The washing machine according to claim 1, wherein

   the multiple processes comprise the washing process (SP2, SP2a), the rinsing process (SP4, SP4a) and the dewatering process (SP3, SP3a; SP5, SP5a);
   the time acquisition unit (27) also acquires the remaining time until the target end time before the start of the rinsing process (SP4, SP4a) and before the start of the dewatering process (SP3, SP3a; SP5, SP5a) respectively, except in the initial process, i.e., before the start of the washing process (SP2, SP2a); and
   the mode determination unit (7) determines to perform the next process in the ordinary reservation mode or the special reservation mode based on the remaining time whenever the time acquisition unit (27) acquires the remaining time.

5. The washing machine according to any one of claims 1 to 4, wherein

   the time at which the reservation end time inputted by the input portion (23) is advanced by the specified time is set as the target end time.

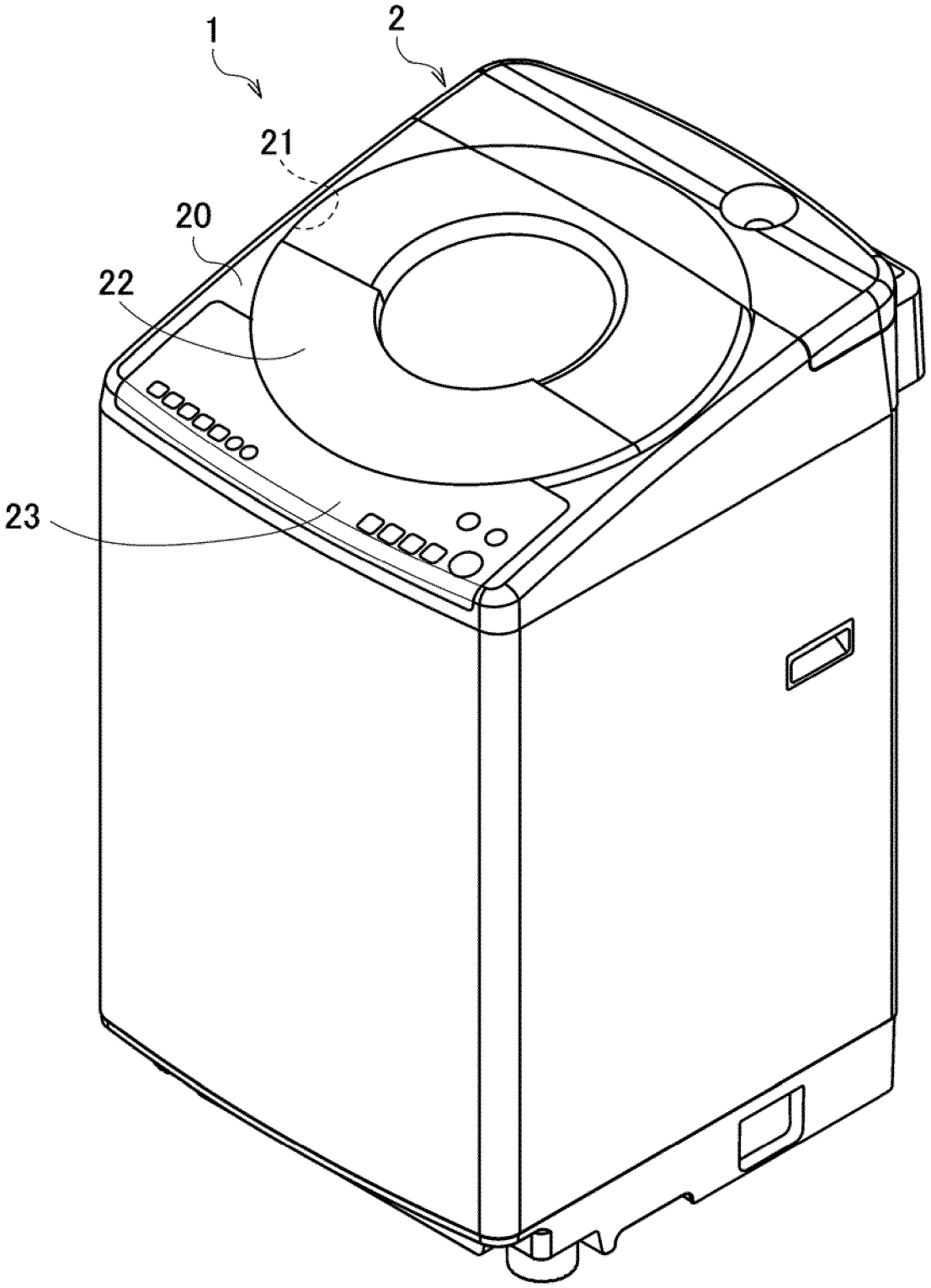

FIG.1

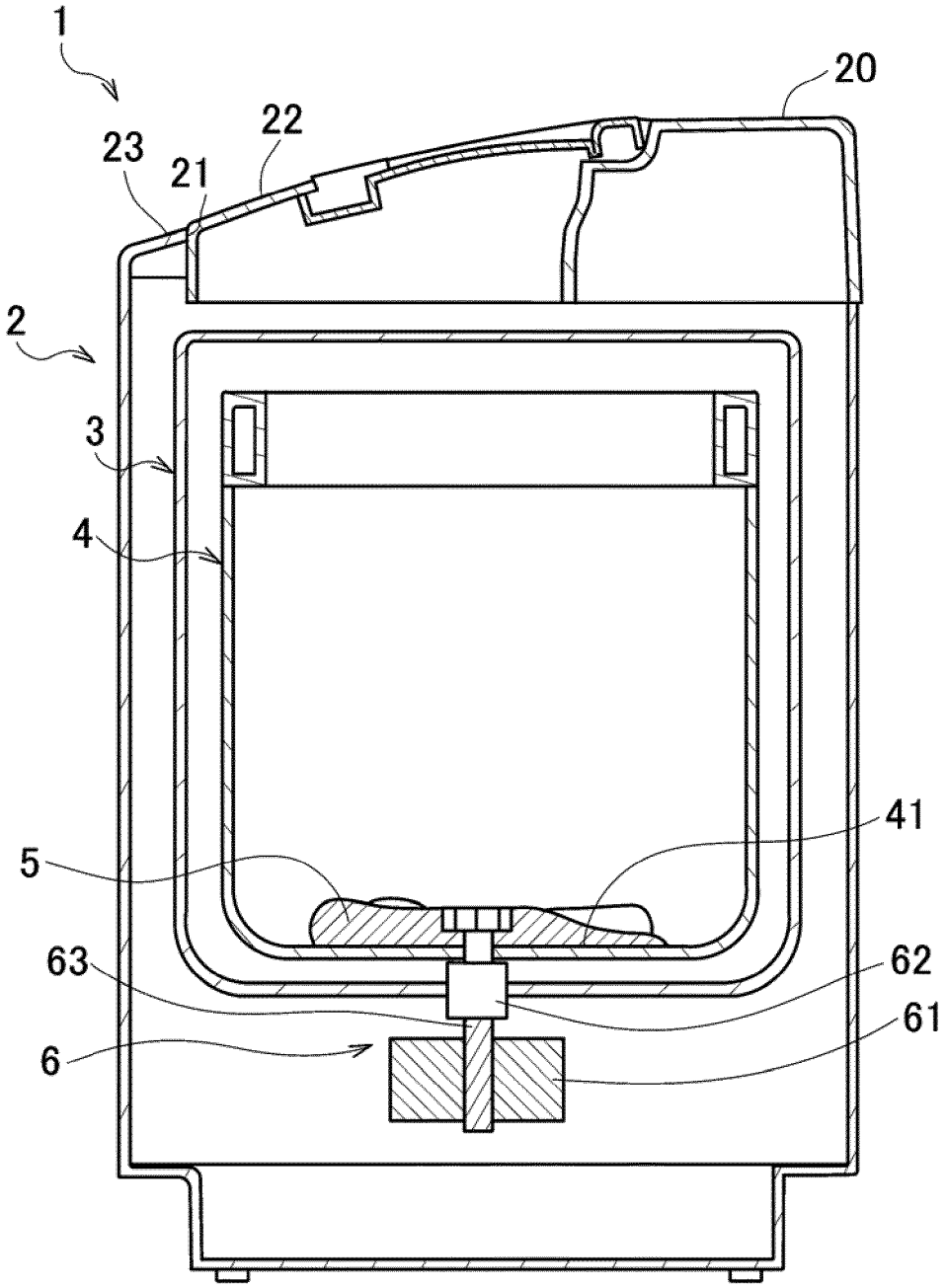

FIG.2

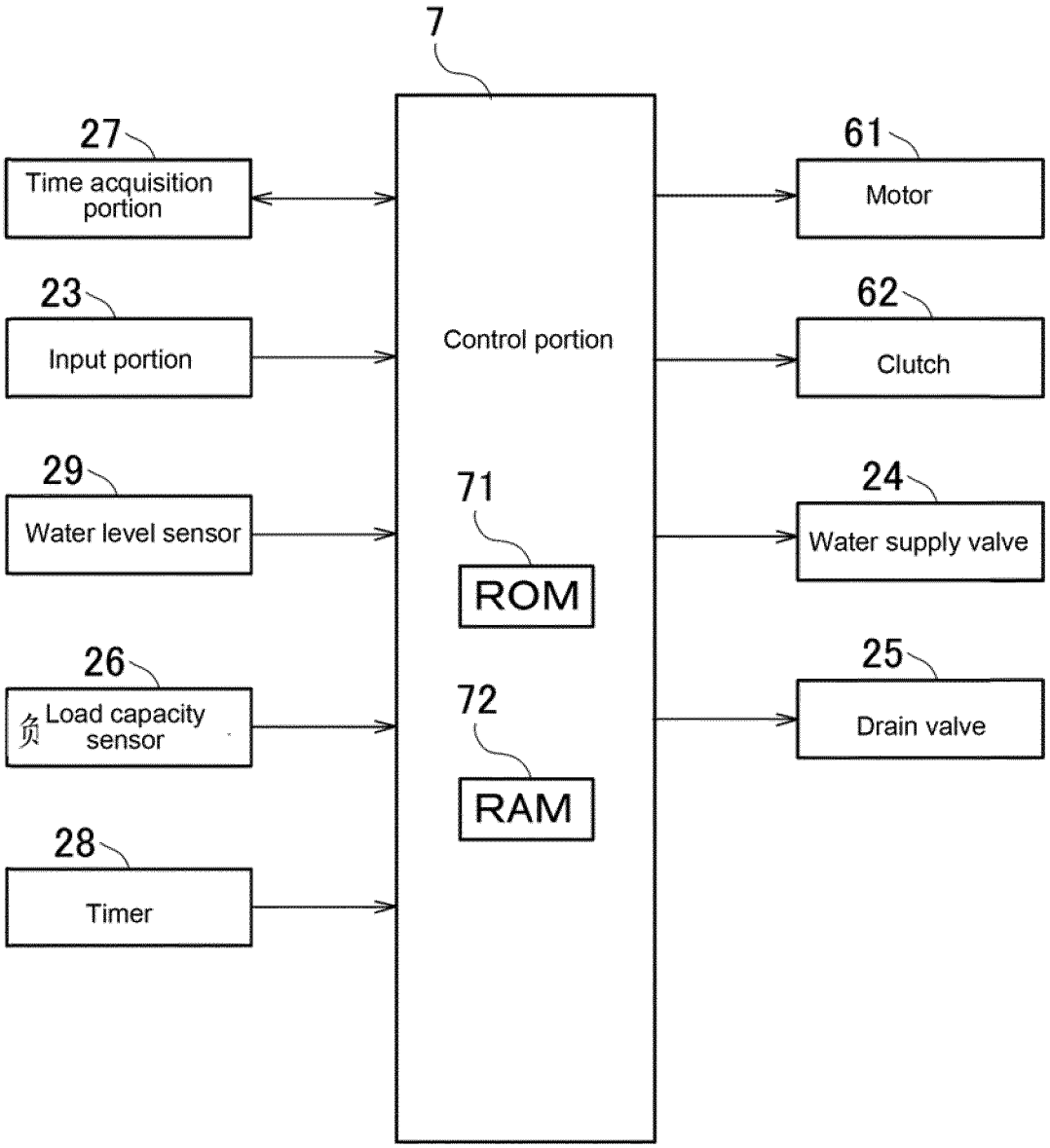
7
27
Time acquisition portion
23
Input portion
29
Water level sensor
26
Load capacity sensor
28
Timer
Control portion
71
ROM
72
RAM
61
Motor
62
Clutch
24
Water supply valve
25
Drain valve

FIG.3

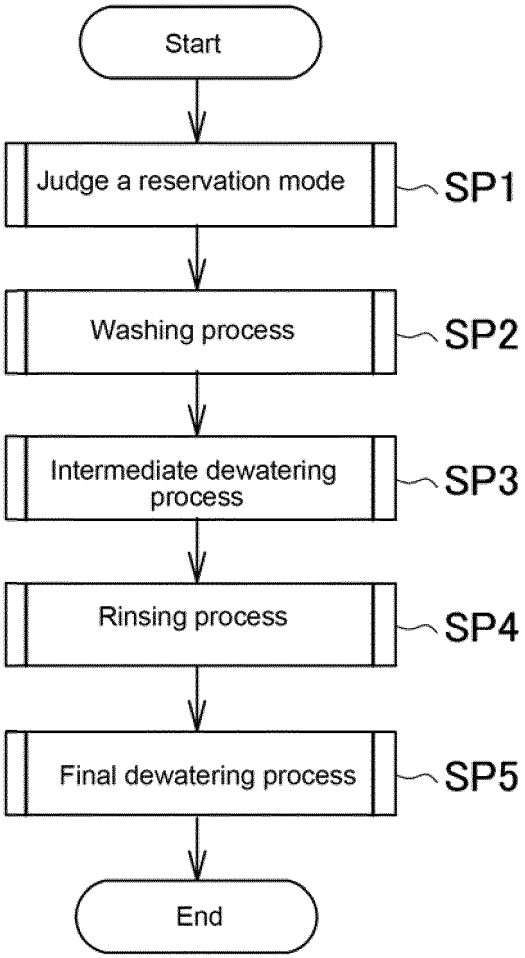
Start
Judge a reservation mode
SP1
Washing process
SP2
Intermediate dewatering process
SP3
Rinsing process
SP4
Final dewatering process
SP5
End

FIG.4

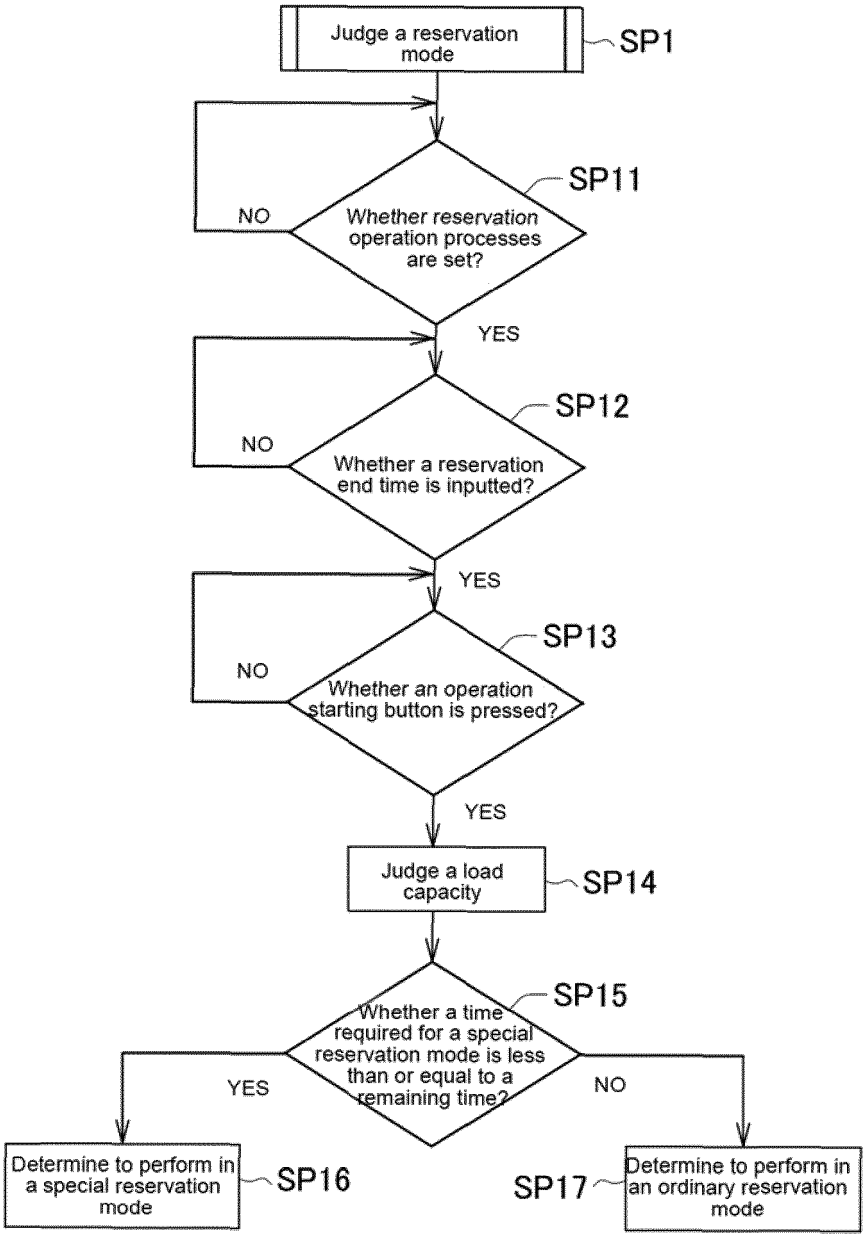
Judge a reservation mode
SP1
SP11
Whether reservation operation processes are set?
NO
YES
SP12
Whether a reservation end time is inputted?
NO
YES
SP13
Whether an operation starting button is pressed?
NO
YES
Judge a load capacity
SP14
SP15
Whether a time required for a special reservation mode is less than or equal to a remaining time?
YES
NO
Determine to perform in a special reservation mode
SP16
SP17
Determine to perform in an ordinary reservation mode

FIG.5

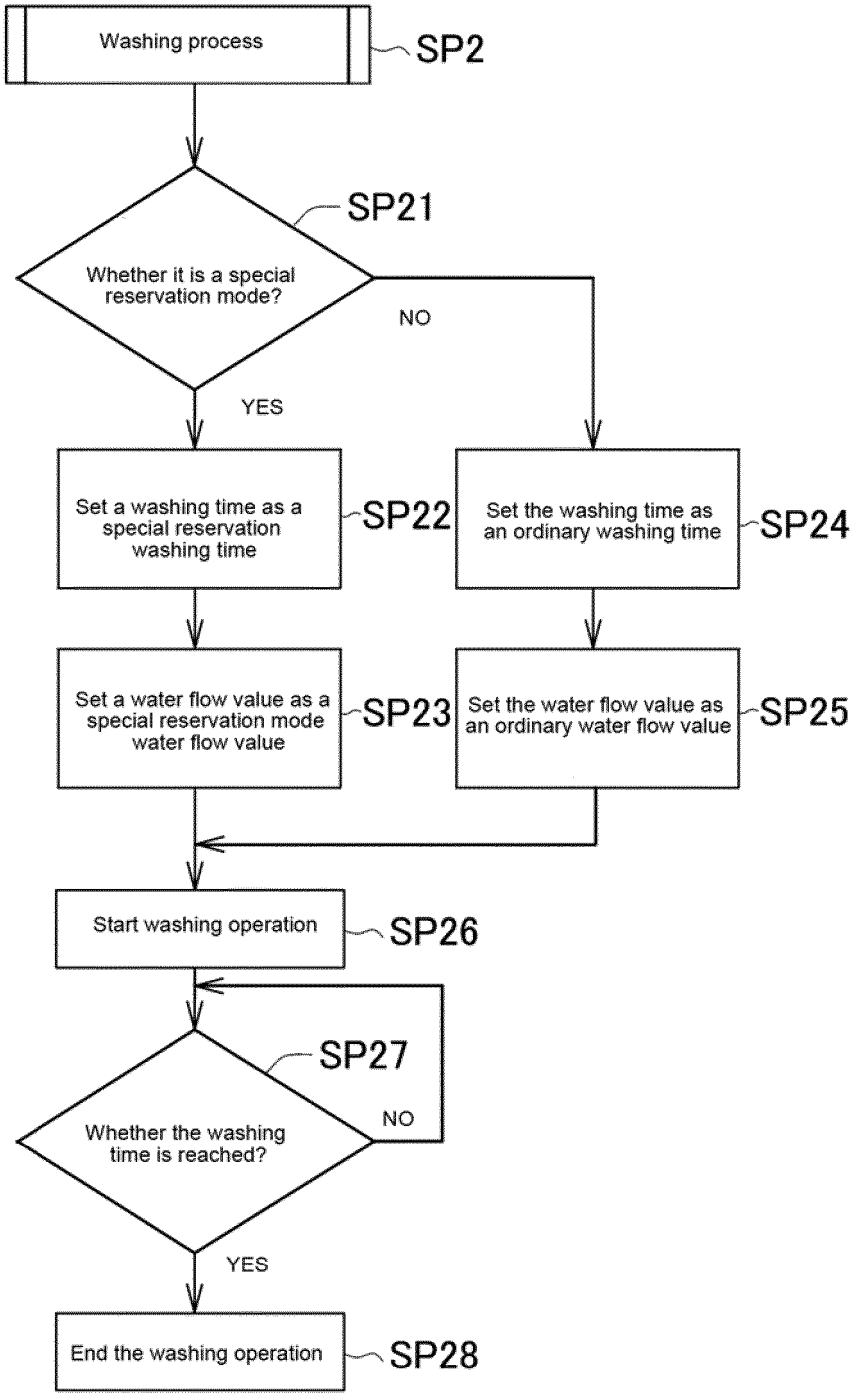
Washing process
SP2
SP21
Whether it is a special reservation mode?
NO
YES
Set a washing time as a special reservation washing time
SP22
Set the washing time as an ordinary washing time
SP24
Set a water flow value as a special reservation mode water flow value
SP23
Set the water flow value as an ordinary water flow value
SP25
Start washing operation
SP26
SP27
Whether the washing time is reached?
NO
YES
End the washing operation
SP28

FIG.6

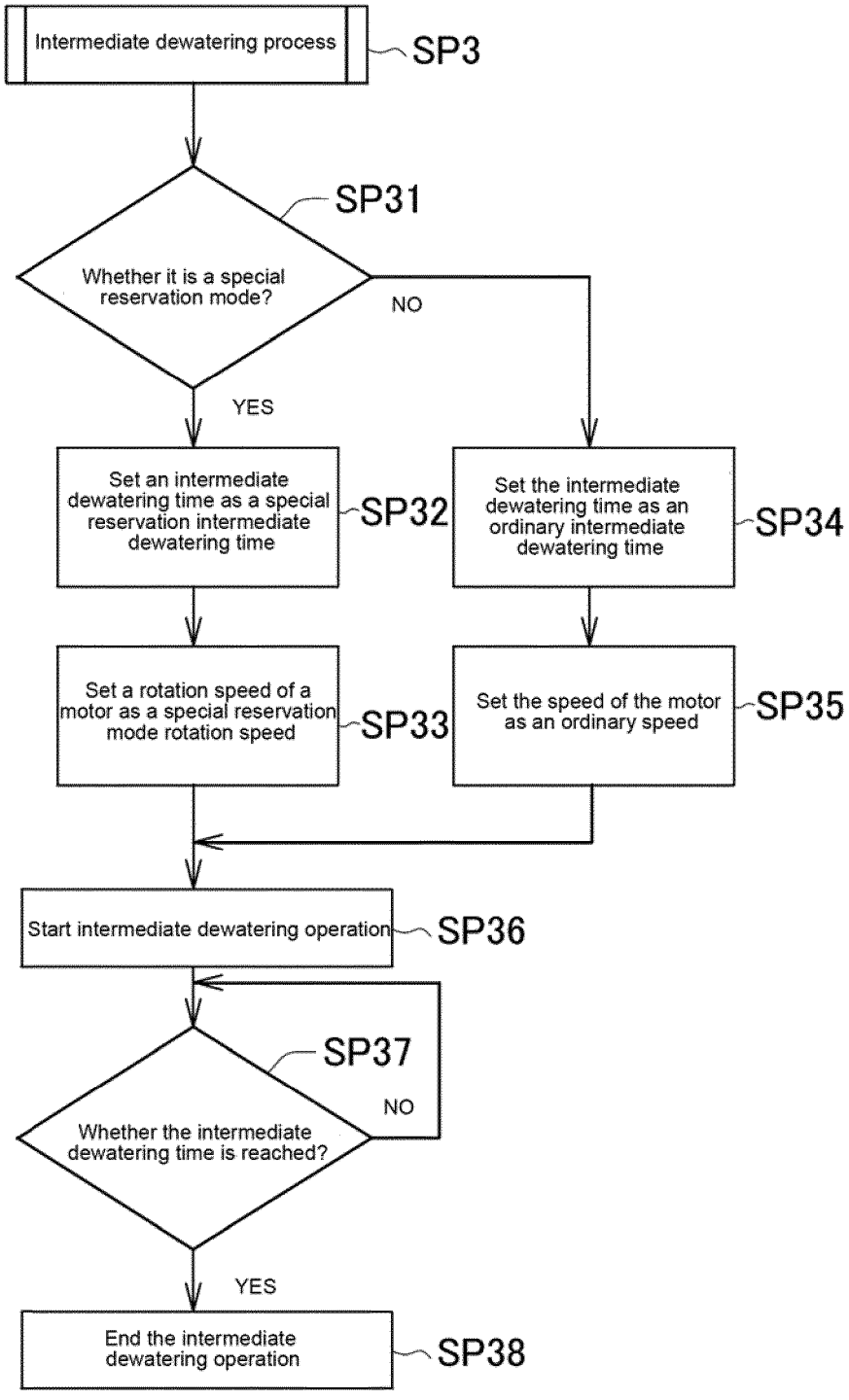
Intermediate dewatering process
SP3
SP31
Whether it is a special reservation mode?
NO
YES
Set an intermediate dewatering time as a special reservation intermediate dewatering time
SP32
Set the intermediate dewatering time as an ordinary intermediate dewatering time
SP34
Set a rotation speed of a motor as a special reservation mode rotation speed
SP33
Set the speed of the motor as an ordinary speed
SP35
Start intermediate dewatering operation
SP36
SP37
NO
Whether the intermediate dewatering time is reached?
YES
End the intermediate dewatering operation
SP38

FIG.7

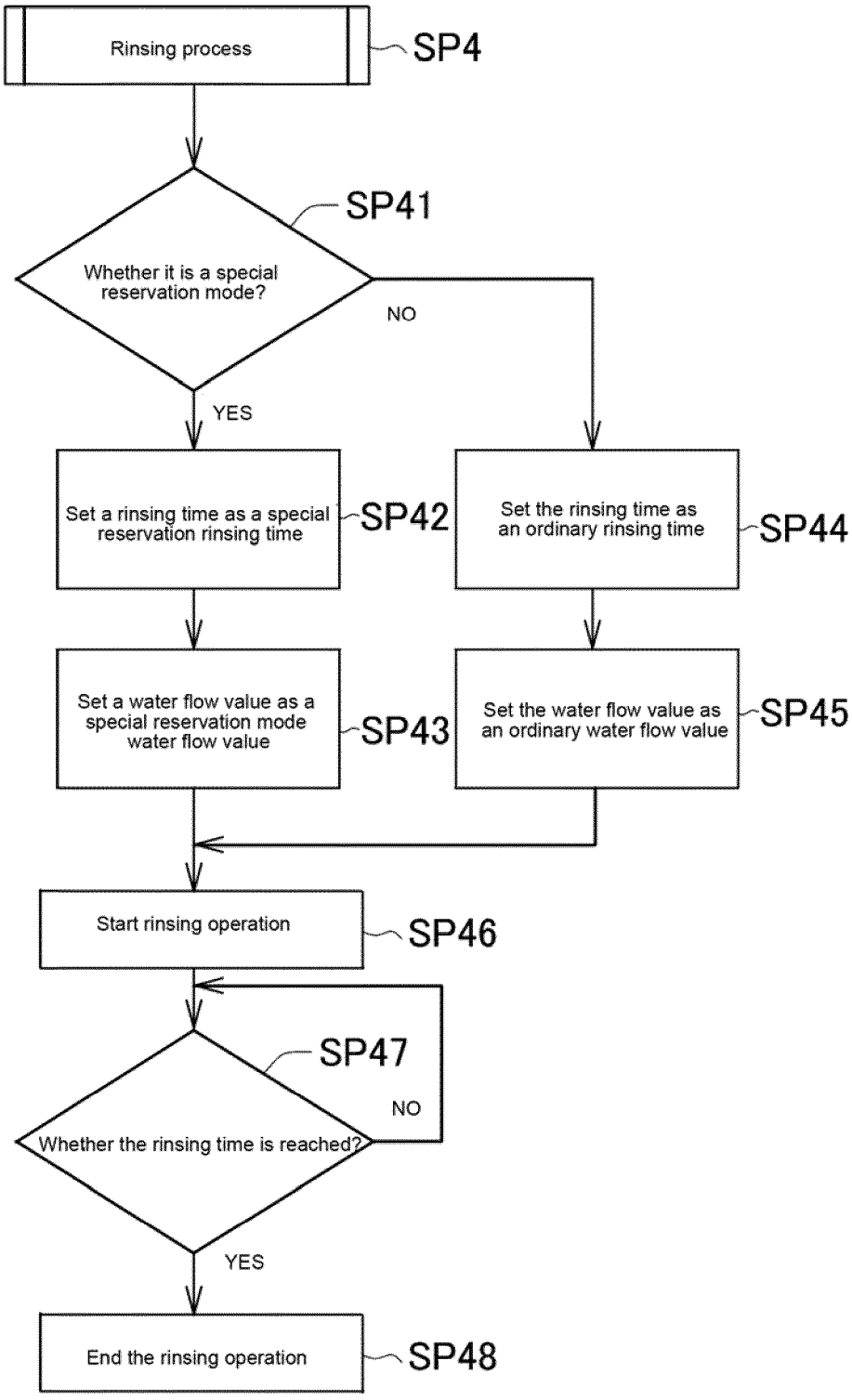
Rinsing process
SP4
SP41
Whether it is a special reservation mode?
NO
YES
Set a rinsing time as a special reservation rinsing time
SP42
Set the rinsing time as an ordinary rinsing time
SP44
Set a water flow value as a special reservation mode water flow value
SP43
Set the water flow value as an ordinary water flow value
SP45
Start rinsing operation
SP46
SP47
NO
Whether the rinsing time is reached?
YES
End the rinsing operation
SP48

FIG.8

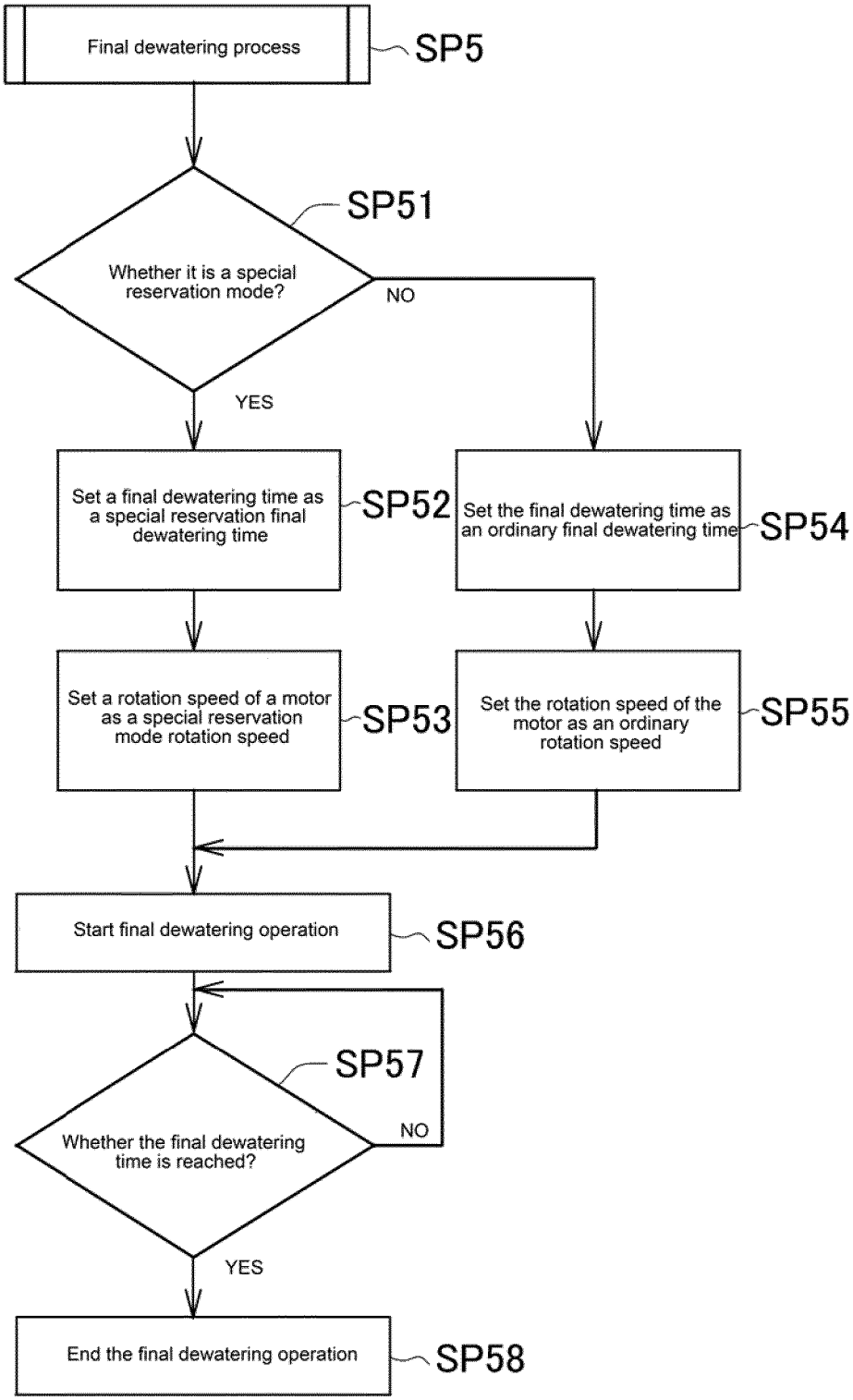
Final dewatering process
SP5
SP51
Whether it is a special reservation mode?
NO
YES
Set a final dewatering time as a special reservation final dewatering time
SP52
Set the final dewatering time as an ordinary final dewatering time
SP54
Set a rotation speed of a motor as a special reservation mode rotation speed
SP53
Set the rotation speed of the motor as an ordinary rotation speed
SP55
Start final dewatering operation
SP56
SP57
Whether the final dewatering time is reached?
NO
YES
End the final dewatering operation
SP58

FIG.9

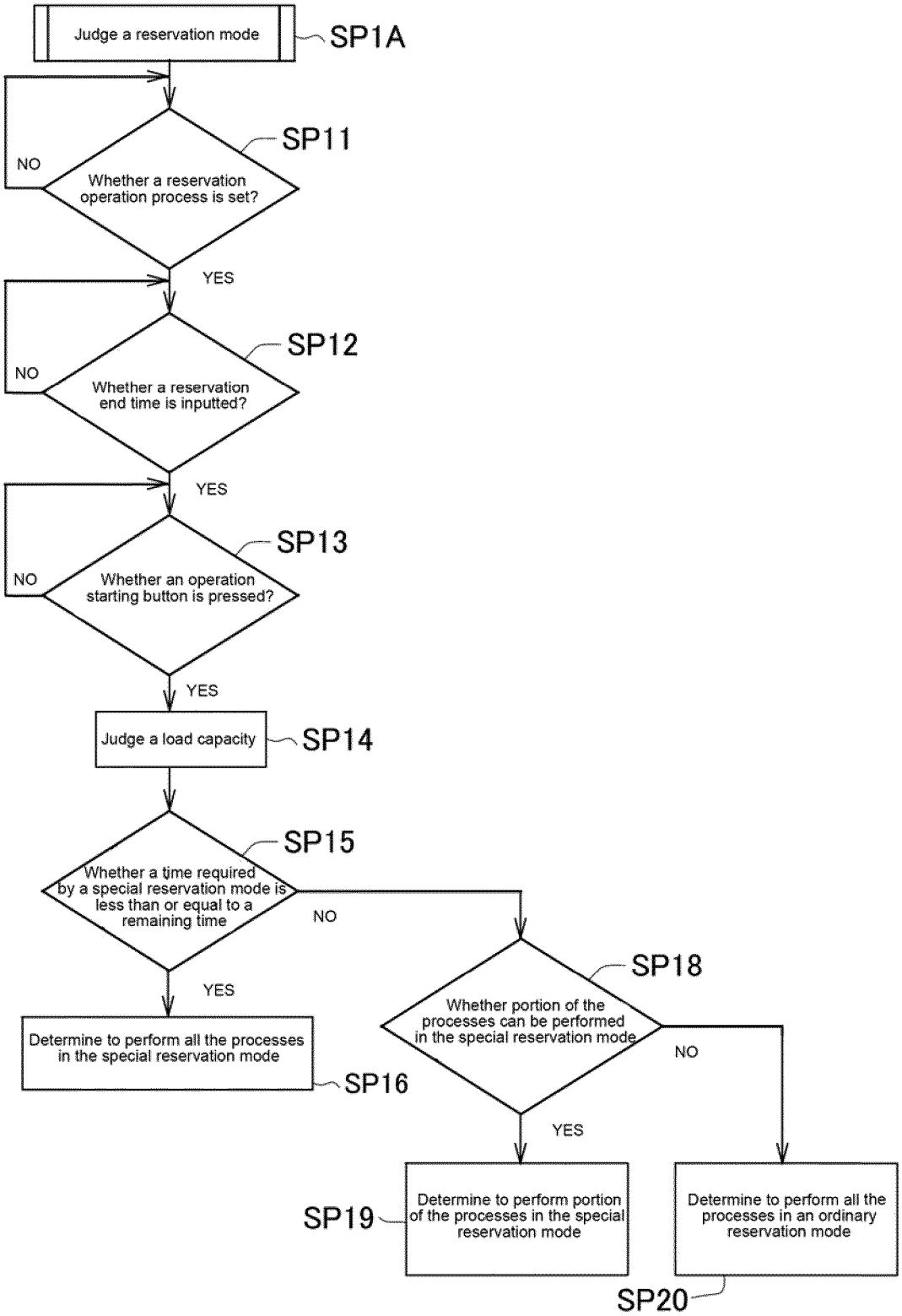
Judge a reservation mode
SP1A
SP11
NO
Whether a reservation operation process is set?
YES
SP12
NO
Whether a reservation end time is inputted?
YES
SP13
NO
Whether an operation starting button is pressed?
YES
Judge a load capacity
SP14
SP15
Whether a time required by a special reservation mode is less than or equal to a remaining time
NO
YES
Determine to perform all the processes in the special reservation mode
SP16
SP18
Whether portion of the processes can be performed in the special reservation mode
NO
YES
SP19
Determine to perform portion of the processes in the special reservation mode
Determine to perform all the processes in an ordinary reservation mode
SP20

FIG.10

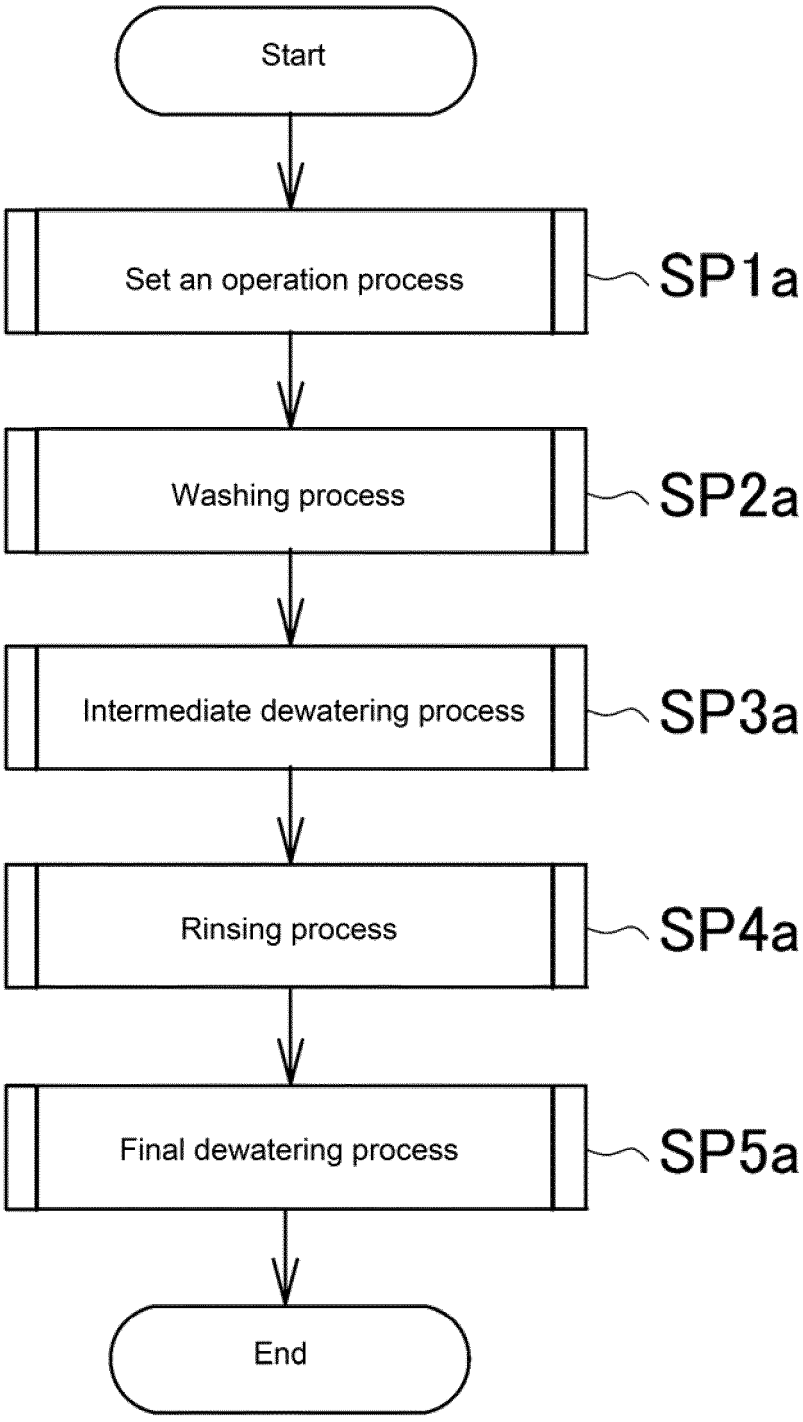
Start
Set an operation process
SP1a
Washing process
SP2a
Intermediate dewatering process
SP3a
Rinsing process
SP4a
Final dewatering process
SP5a
End

FIG.11

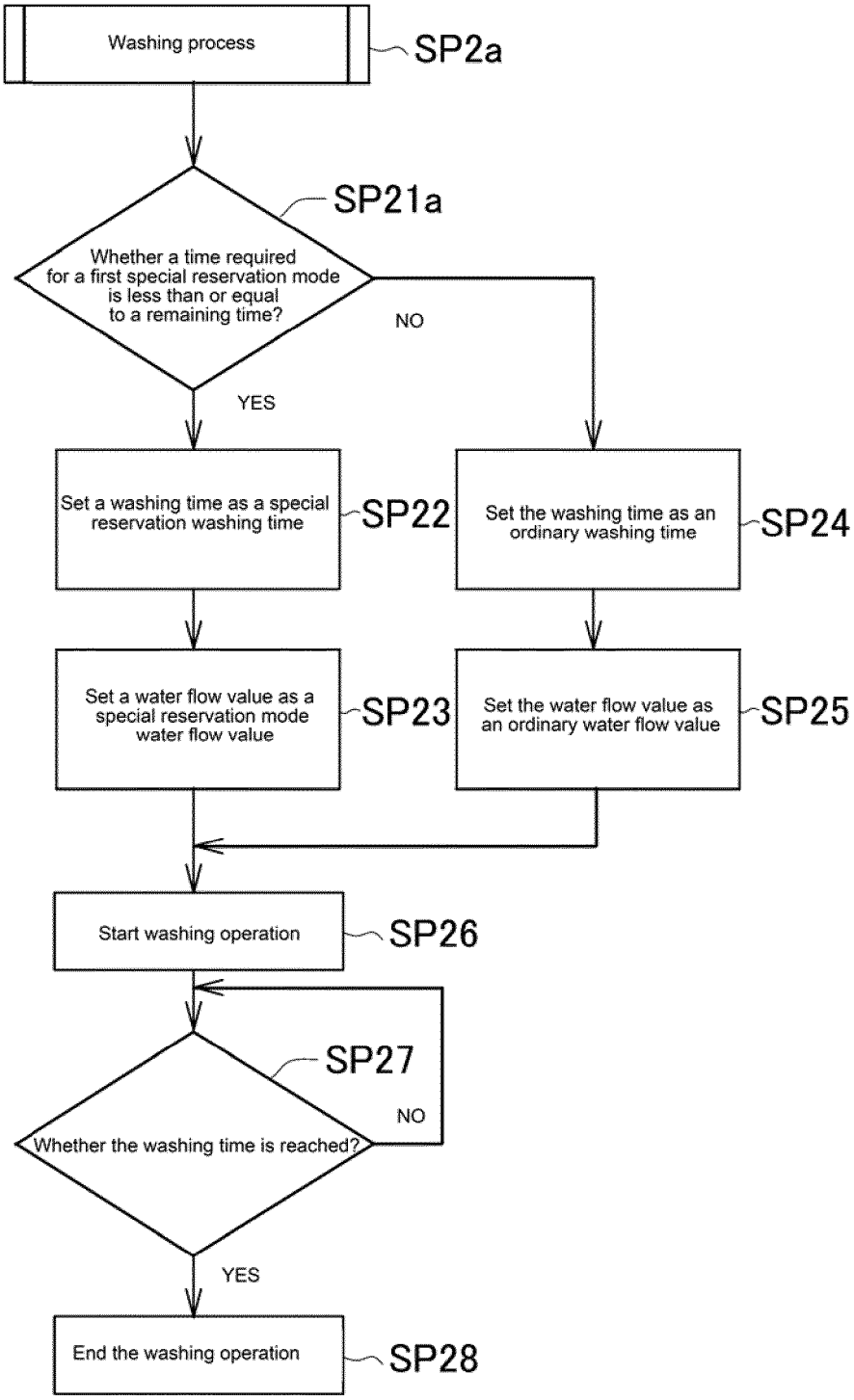
Washing process
SP2a
SP21a
Whether a time required for a first special reservation mode is less than or equal to a remaining time?
NO
YES
Set a washing time as a special reservation washing time
SP22
Set the washing time as an ordinary washing time
SP24
Set a water flow value as a special reservation mode water flow value
SP23
Set the water flow value as an ordinary water flow value
SP25
Start washing operation
SP26
SP27
NO
Whether the washing time is reached?
YES
End the washing operation
SP28

FIG.12

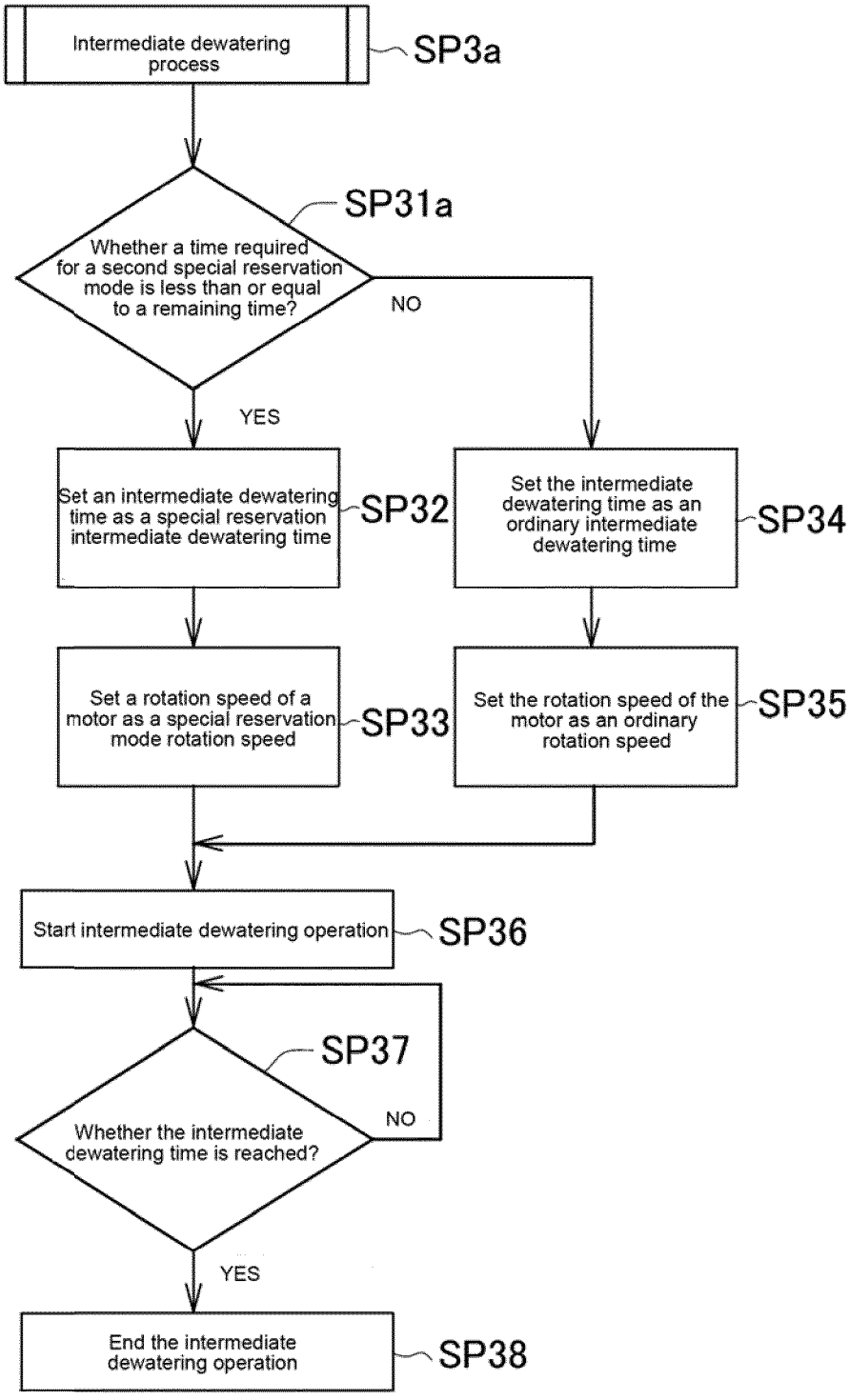
Intermediate dewatering process
SP3a
SP31a
Whether a time required for a second special reservation mode is less than or equal to a remaining time?
NO
YES
Set an intermediate dewatering time as a special reservation intermediate dewatering time
SP32
Set the intermediate dewatering time as an ordinary intermediate dewatering time
SP34
Set a rotation speed of a motor as a special reservation mode rotation speed
SP33
Set the rotation speed of the motor as an ordinary rotation speed
SP35
Start intermediate dewatering operation
SP36
SP37
Whether the intermediate dewatering time is reached?
NO
YES
End the intermediate dewatering operation
SP38

FIG.13

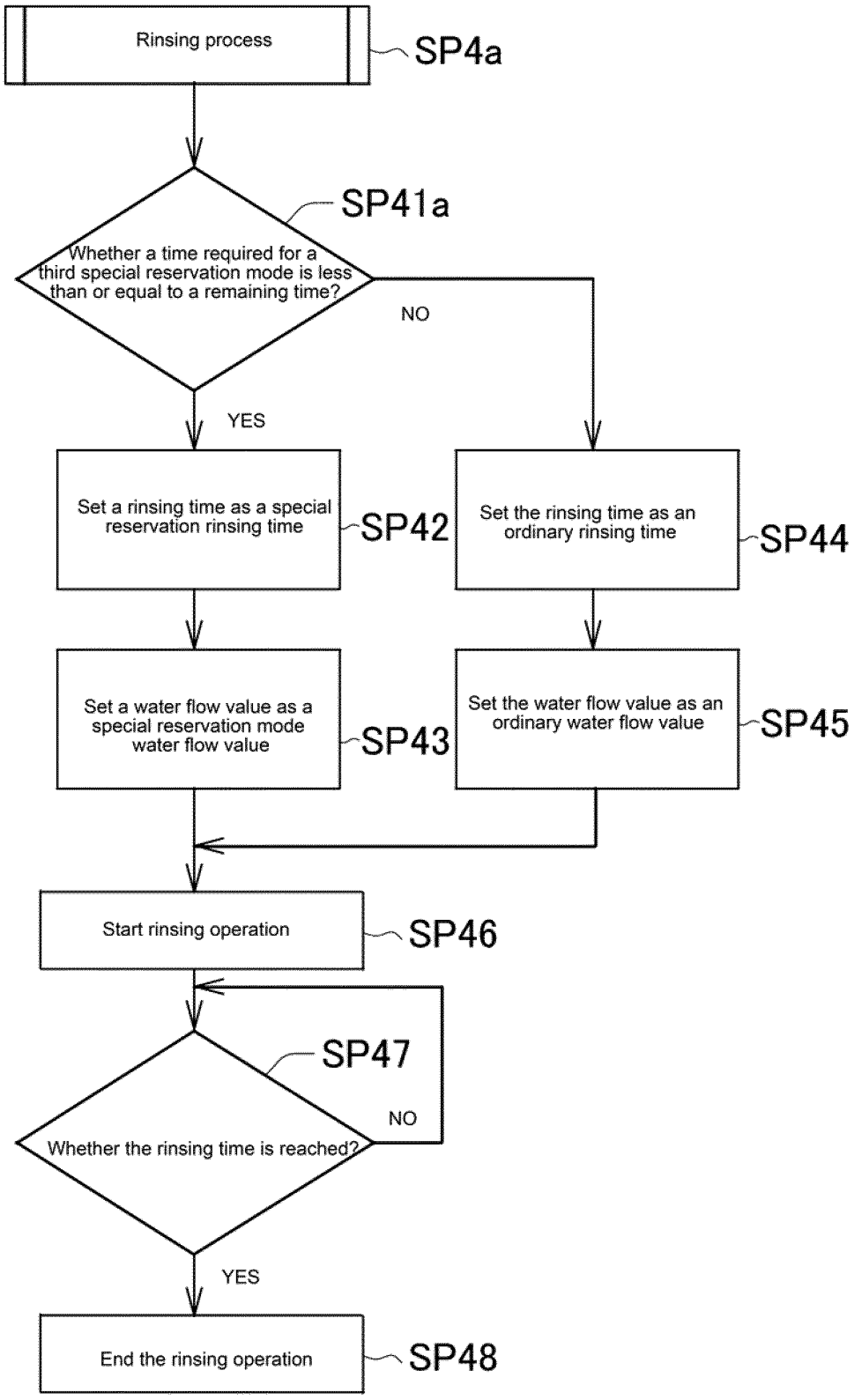
Rinsing process
SP4a
SP41a
Whether a time required for a third special reservation mode is less than or equal to a remaining time?
NO
YES
Set a rinsing time as a special reservation rinsing time
SP42
Set the rinsing time as an ordinary rinsing time
SP44
Set a water flow value as a special reservation mode water flow value
SP43
Set the water flow value as an ordinary water flow value
SP45
Start rinsing operation
SP46
SP47
NO
Whether the rinsing time is reached?
YES
End the rinsing operation
SP48

FIG.14

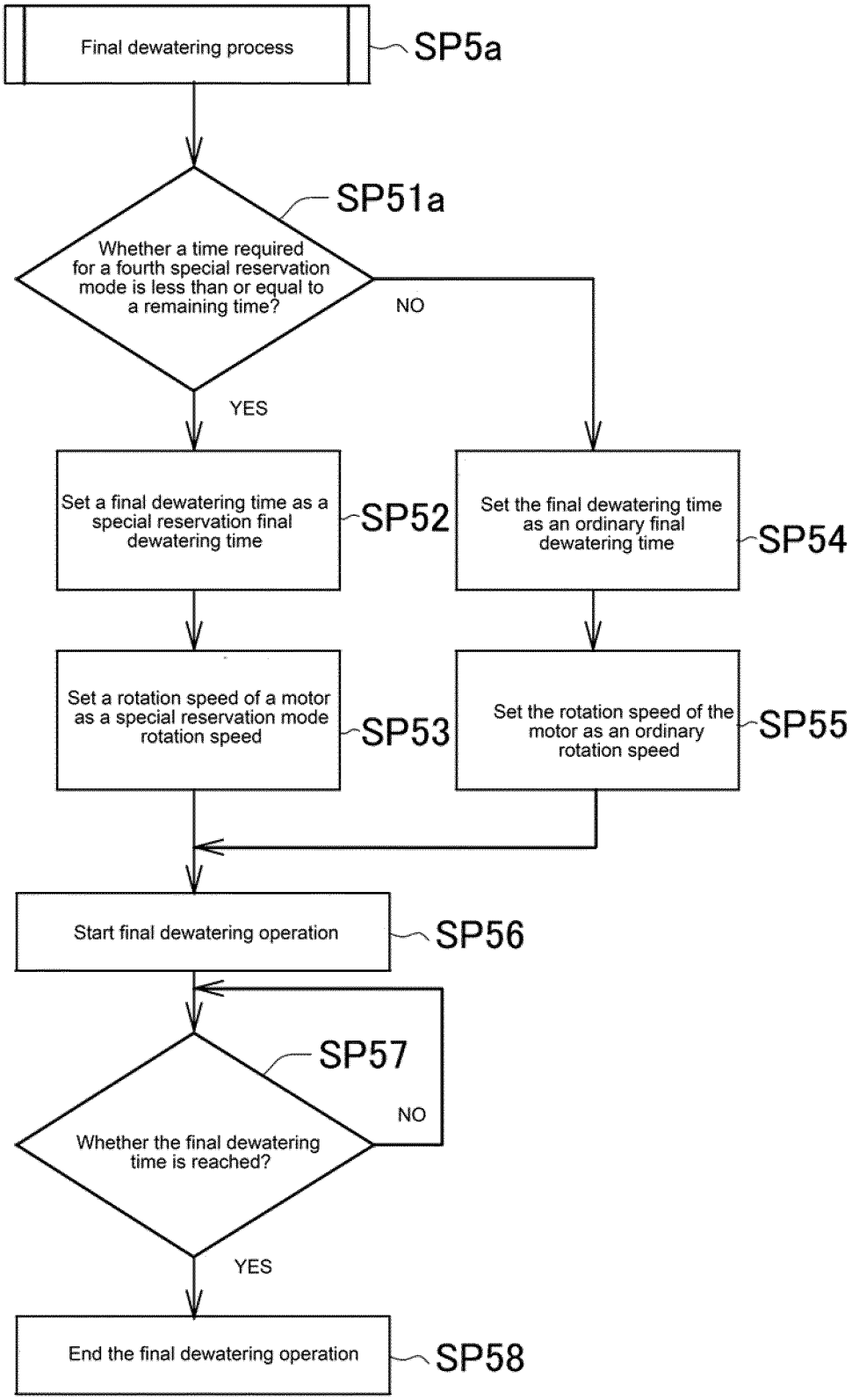
Final dewatering process
SP5a
SP51a
Whether a time required for a fourth special reservation mode is less than or equal to a remaining time?
NO
YES
Set a final dewatering time as a special reservation final dewatering time
SP52
Set the final dewatering time as an ordinary final dewatering time
SP54
Set a rotation speed of a motor as a special reservation mode rotation speed
SP53
Set the rotation speed of the motor as an ordinary rotation speed
SP55
Start final dewatering operation
SP56
SP57
Whether the final dewatering time is reached?
NO
YES
End the final dewatering operation
SP58

FIG.15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/098174

A. CLASSIFICATION OF SUBJECT MATTER

D06F 33/02 (2006.01) 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

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

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

CNPAT, CNKI, EPODOC, WPI: end, finish+, complet+, accomplish+, fulfil+, speed+, velocity, time, timing, remain+, left, big???, small??, long??, short???, slow??, fast??, motor?, rinsing, dewater+, dehydrat+, wash+, set

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 101525834 A (NANJING LG PANDA APPLIANCES CO., LTD.) 09 September 2009 (09.09.2009) description, pages 3-5, and figure 4	1-5
A	CN 1891894 A (LG ELECTRONIC (TIANJIN) CECO ,LTD (CECO.,LTD.) 10 January 2007 (10.01.2007) the whole document	1-5
A	CN 102465421 A (BSH ELECTRICAL APPLIANCES (JAINGSU) CO., LTD.) 23 May 2012 (23.05.2012) the whole document	1-5
A	JPH 06343790 A (TOSHIBA CORP.) 20 December 1994 (20.12.1994) the whole document	1-5
A	JPH 0482590 A (TOSHIBA CORP.) 16 March 1992 (16.03.1992) the whole document	1-5

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

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 March 2016	17 March 2016
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer SUN, Yushuai Telephone No. (86-10) 62413172

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/098174

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2004065408 A (SANYO ELECTRIC CO.) 04 March 2004 (04.03.2004) the whole document	1-5

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2015/098174

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 101525834 A	09 September 2009	KR 101028092 B1	08 April 2011
		KR 20100052213 A	19 May 2010
		CN 101525834 B	26 January 2011
CN 1891894 A	10 January 2007	None	
CN 102465421 A	23 May 2012	CN 102465421 B	30 September 2015
JPH 06343790 A	20 December 1994	JP 3131528 B2	05 February 2001
JPH 0482590 A	16 March 1992	None	
JP 2004065408 A	04 March 2004	None	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2004065408 A **[0003]**