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(54) **WATER DRAINING METHOD OF WASHING MACHINE**

(57) Disclosed is a water draining method of a washing machine. The water draining method comprises the following steps in order: a draining step, controlling a water drainage pump (4) to work intermittently until the water level inside an outer drum (2) reaches a set drainage water level; and a spin-drying step, controlling the electric motor to drive the inner drum to rotate to remove water, while also controlling the water drainage pump (4) to work intermittently. By controlling the water drainage pump (4) to work intermittently, when the water drainage pump (4) is working, the washing water inside the outer drum (2) enters a water drain pipe (3), and is then pumped by the water drainage pump (4) to be discharged via a riser seg-

ment of the water drain pipe (3); when the water drainage pump (4) stops working, the washing water in the riser segment of the water drain pipe (3) flows back under the action of gravity, and the the water drainage pump (4) alternately working and stopping makes the washing water in the riser segment also flow back intermittently, and that facilitates foam floating on the washing water being discharged outside the washing machine. Therefore, the rinsing effect of the washing machine is improved and foam overflow is avoided.

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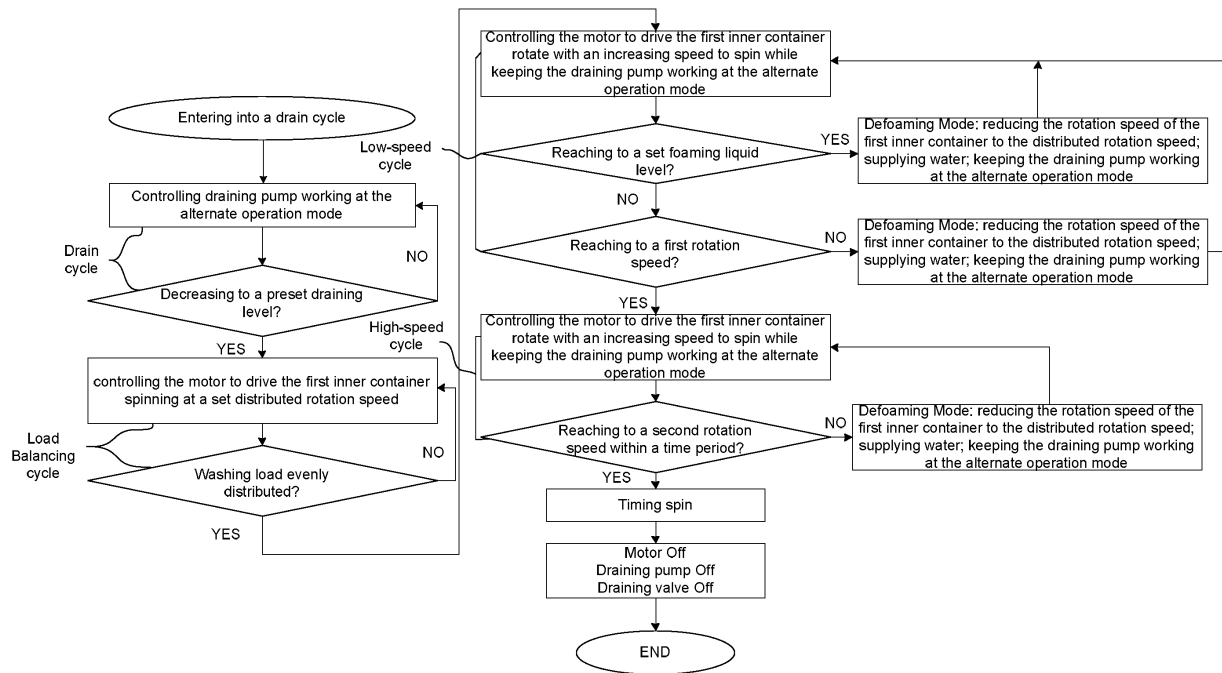


FIG. 2

Description

TECHNICAL FIELD

[0001] The invention belongs to the technical field of laundry treating appliances, and in particular relates to a water draining method of washing machine.

BACKGROUND

[0002] A drum washing machine typically includes an outer container and a drum provided within. The drum washing machine further includes a door which mounted on the front panel of a cabinet defining a housing within which the first outer container and the drum reside. Good sealing performance between the door and the first outer container has to be ensured because the inside pressure is required to maintain at a comparatively high value during the entire operation. Normally, the drum washing machine has an upper draining system, which is called an upper-drain type washing machine, specifically indicating a first draining conduit provided including an upward section. A draining pump provided on the first draining conduit is used for enabling water within the draining conduit to flow through the upward section and then drain from the draining conduit.

[0003] The user of drum washing machine is inclined to put in excessive treating chemistry manually due to lack of information about the appropriate dosing of detergent for different laundry loads, laundry items made of various textiles, or uneven dirty level. Even though the laundry items or laundry loads are unchanged, the correct dosage of detergent of different manufacturers is changeable. Too much detergent may result in excess bubbles and foam created and maintained in the first outer container, which is also an auxiliary effect of the good sealing performance between the door and the first outer container. Those bubbles may further intrigue an increase of pressure within the first outer container and finally result in overflow. Especially in the spin cycle, the drum rotates at a high speed, and the quantity of bubbles created may boost. Excessive detergent may further cause over residual and leaves lingering odor of detergent on laundered clothes.

[0004] Besides the excessive detergent put in, another reason for over residual of suds is that, in a normal operation of the prior art, the drum remains stationary in the cycle of draining, during which washing water is drained from the bottom of the first outer container but bubbles and foam left on the liquid surface, and that is to say, the liquid is drained out with very few suds. Most of the bubbles and foam still resides in the washer and only could be flushed out in sequential rinse cycle.

BRIEF SUMMARY

[0005] The present invention provides a water draining method, with which much more suds formed could be

drained from the washer during drain cycle so as to reinforce the rinse effect and prevent overflow.

[0006] The technical solution is illustrated as follows:

[0007] A water draining method of washing machine, wherein the washing machine is an upper-drain type and further including a first outer container configured to receive washing water, a first inner container provided within the first outer container, a motor configured to drive the first inner container rotating, a first draining system, which is communicated with the bottom of the first outer container, including a first draining conduit and a draining pump, comprising: initiating a drain cycle, during which keeping the draining pump working at an alternate operation mode until the liquid level within the first outer container decreasing to a preset draining level; and initiating a spin cycle, during which controlling the motor to drive the first inner container rotating and spinning while keeping the draining pump working at an alternate operation mode.

[0008] Further, the alternate operation mode comprises: keeping the draining pump running 10 to 20 seconds and pausing 2 to 10 seconds alternately.

[0009] Preferably, the alternate operation mode comprises: keeping the draining pump running 12 to 18 seconds and pausing 4 to 6 seconds alternately.

[0010] During the drain cycle, the determination that whether the liquid level within the first outer container reaches the preset draining level is fulfilled by the following steps: detecting the liquid level within the first outer container, comparing the detected result with the preset draining level; if the liquid level detected is higher than the set value, the draining pump continues to work at the alternate operation mode; if the liquid level detected meets or decreasing to lower than the set value, the draining pump is being stopped.

[0011] Further, initiating a load balancing cycle before the spin cycle, during which controlling the motor to drive the first inner container spinning at a set distributed rotation speed and during which determining whether the load is evenly distributed based on rotation speed values detected.

[0012] The load balancing cycle further comprising: detecting real-time rotation speed values of the driveshaft of the motor at a plurality of points respectively; comparing those detected speed values with set values corresponding to each of them; and determining the fact that the laundry load is evenly distributed within the first inner container if all of the differences between the detected speed values and the set values belong to a preset range and terminating the load balancing cycle; or determining the fact that the laundry load is unevenly distributed within the first inner container if any one of the difference value is beyond the set range and resuming the load balancing cycle.

[0013] Further, the distributed rotation speed is 90 to 120 rpm.

[0014] Preferably, the distributed rotation speed is 90 to 100 rpm.

[0015] Further, the spin cycle further comprising a low-speed spin, the low-speed spin comprising:

- a. controlling the motor to drive the first inner container spinning at an increasing rotation speed while keeping the draining pump working at the alternate operation mode; wherein the highest rotation speed capable of reaching in the low-speed spin is set as a first rotation speed;
- b. determining whether an over-suds condition occurs in the washer by detecting the liquid level within the first outer container; if the over-suds condition occurs, then entering into a step c followed; if the over-suds condition does not occur, entering into a defoaming mode and then back to the step a sequentially; wherein the defoaming mode comprises: reducing the rotation speed of the first inner container to the distributed rotation speed, and sequentially supplying fresh water into the washer in a period while keeping the draining pump working at the alternate operation mode;
- c. detecting the rotation speed of the first inner container and determining whether it meets the first rotation speed or not; if the rotation speed reaches the first rotation speed, the low-speed spin ends; if the rotation speed is lower than the first rotation speed, performing the defoaming mode and back to the step a sequentially.

[0016] Further, the first rotation speed is 350 to 450 rpm.

[0017] Further, the alternate operation mode in the low-speed spin comprises: keeping the draining pump running 10 to 20 seconds and pausing 2 to 10 seconds alternately.

[0018] Preferably, the alternate operation mode in the low-speed spin comprises: keeping the draining pump running 8 to 12 seconds and pausing 2 to 6 seconds alternately.

[0019] Further, the period of supplying water in the defoaming mode is 30 to 60 seconds.

[0020] Further, the alternate operation mode in the defoaming mode comprises: keeping the draining pump running 8 to 12 seconds and pausing 2 to 6 seconds alternately.

[0021] Further, the distributed rotation speed is 90 to 100 rpm.

[0022] Further, in step b, the occurrence of the over-suds condition is determined by comparing the liquid level within the first outer container with a preset foaming liquid level; if the liquid level within the first outer container detected is higher than or meets the set foaming liquid level, the over-suds condition exists in the first outer container.

[0023] Further, the rotation speed of the inner container, which is driven by the motor, reduces to the predetermined distributed rotation speed as the low-speed spin ends.

[0024] The spin cycle further comprising a high-speed spin, the high-speed spin comprising:

- A. controlling the motor to drive the first inner container spinning at an increasing rotation speed while keeping the draining pump working at the alternate operation mode; wherein the highest rotation speed capable of reaching in the high-spin is set as a second rotation speed;
- B. determining whether an over-suds condition is occurred in the washer by detecting whether the rotation speed reaches the second rotation speed in a set period of time; if an over-suds condition does not occur, the high-speed spin ends and the motor is being stopped; if an over-suds condition occurs, entering a deforming mode and back to the step A sequentially; wherein the deforming mode comprising: reducing the rotation speed of the first inner container to the distributed rotation speed, and sequentially supplying fresh water into the washer in a period while keeping the draining pump working at the alternate operation mode.

[0025] Further, the second rotation speed is 500 to 1000 rpm.

[0026] The spin cycle further comprising a timing spin followed the high-speed spin, wherein the timing spin comprising: increasing the rotation speed of the first inner container which is driven by the motor to a third rotation speed and spinning while keeping the draining pump working at the alternate operation mode; stopping the motor and shutting down a first draining valve as the time expires.

[0027] Further, the third rotation speed is 1100 to 1200 rpm.

[0028] Further, the draining system includes a first draining valve and the first draining valve is being maintaining open as the draining method being executed.

[0029] The water draining method may be utilized in a dual-drum washing machine further including a second washing system, wherein the second washing system including a second outer container, a second draining conduit communicated with the second outer container, and a second draining valve provided on the second draining conduit. The first draining conduit further includes a bottom section, which is communicated with the first outer container and provided with a first draining valve and the draining pump, an upward section and a free section. The second draining conduit connected with the portion of the bottom section between the first draining valve and the first draining conduit. The water draining method further comprises the following steps: initiating an occupation detecting cycle preceding the drain cycle, during which sensing whether the first draining valve or the draining pump is working for another washing system; if either of them is being occupied, remaining the current status.

BENEFICIAL EFFECT

[0030] With the configuration of this alternation, on one hand, washing water within the first outer container flows into the first draining conduit and then is being pumped to drain out through the upward section of the first draining conduit as the draining pump working, and on the other hand, washing water within the upward section of the first draining conduit flows back by gravity as the draining pump stopping. Hence, washing water within the upward section of the first draining conduit alternately flows forwards and backwards. The alternate movement of washing water could easily bring more suds out of the washer so as to improve the rinse effect, also could prevent the overflow of bubbles.

[0031] Other features and advantages of the present invention will become clearer with the following detailed description of the preferred embodiments of the invention referring to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032]

FIG. 1 is a schematic view of a washing machine incorporating the water draining method of a first embodiment of the present invention;

FIG. 2 is a flow chart of a first embodiment of the present invention;

FIG. 3 is a schematic view of a washing machine incorporating the water draining method of a second embodiment of the present invention;

FIG. 4 is a flow chart of a second embodiment of the present invention;

FIG. 5 is a schematic view of a washing machine incorporating the water draining method of a third embodiment of the present invention;

FIG. 6 is a flow chart of a third embodiment of the present invention.

DETAILED DESCRIPTION

[0033] To make the objectives, technical solutions, and advantages of the embodiments of the present invention clearer, the technical solutions in the embodiments of the present invention will be described clearly and completely with reference to the accompanying drawings in the embodiments of the present invention.

[0034] In the description of the present invention, it should be noted that the directions or position indicated by the terms "up", "down", "left", "right", "front" and "back" is merely for convenience in describing the present invention and simplifying the description, rather than indi-

cating or implying that the indicated apparatus or portion must have a specific orientation and be constructed and operated in a specific orientation, and therefore should not be construed as limiting the present invention. In addition, the terms "first" and "second" are used for descriptive purposes only and are not to be construed as indicating or implying relative importance.

[0035] A first embodiment of the invention can be utilized with a drum washing machine with an upper draining system as illustrated in FIG. 1, and the sequence of steps of the water draining method is depicted in FIG. 2. The drum washing machine includes a cabinet 1, a first outer container 2, a first inner container, a motor and a first draining system communicated with the bottom of the first outer container 2, wherein the draining system includes a first draining conduit 3 and a draining pump 4. The first inner container is provided within the first outer container 2 defining a chamber for receiving a laundry load for treatment. Washing water resides within the first outer container 2. The first draining conduit 3 includes a bottom section 31, an upward section 32 and a free section 33, wherein the bottom section 31 is communicated with the bottom of the first outer container 2, and the upward section 32 is fixedly arranged on the cabinet 1. The draining pump 4 is arranged on the bottom section 31 to pump washing water flowing through the upward section 32. The motor is fixed on the first outer container 2 to drive the first inner container rotating.

[0036] Illustrated in FIG. 2 is a flow chart of the water draining method, which defines a operation includes a drain cycle and a spin cycle, wherein the drain cycle comprises: keeping the draining pump working at an alternate operation mode until the liquid level within the first outer container decreasing to a preset draining level; and the spin cycle comprises: controlling the motor to drive the first inner container rotating and spinning while keeping the draining pump working at an alternate operation mode; the alternate operation mode comprising: running and pausing the draining pump 4 alternately.

[0037] With the configuration of this alternation, on one hand, washing water within the first outer container 2 flows into the first draining conduit 3 and then is being pumped to drain out through the upward section 32 thereof as the draining pump working, and on the other hand, washing water within the upward section 32 of the first draining conduit 3 flows back by gravity as the draining pump stopping. In this way, washing water within the upward section of the first draining conduit 3 alternately flows forwards and backwards. The alternate movement of washing water could easily bring more suds out of the washer so as to improve the rinse effect, also could prevent the overflow of bubbles. Specifically, in the drain cycle, the first inner container remains stationary as the motor stopping, the liquid level in the first outer container 2 decreases with a constant speed as water draining; in the meanwhile, washing water within the upward section alternately flows back against the washing water left in the washer to make it be tumbled, so part of suds on the

surface of the washing water left could be drawn into the first draining conduit 3 and then be drained out from the washer through the upward section as the draining pump working. The alternate movement of washing water could further ensure the normal operation of the draining pump 4 because air within the draining pump 4 could be pushed out under the force exerted by the washing water flowing back intermittently, so as to avoid the failure of the draining pump caused by the problem that air is introduced into the inner cavity of the draining pump as only little water being left in the washer. Moreover, due to the configuration of the upward section, bubbles and foam on the liquid surface could flows to the free section 33 in the first place and then be drained out, followed with the washing water, so if the draining pump 4 stops, the washing water within the upward section may flow back to the bottom section but suds is discharged from the washer separately; accordingly, washing water could flow back to draw more suds again in this alternate way.

[0038] In this embodiment, the alternate operation of the draining pump 4 comprises: keeping running 10 to 20 seconds and then pausing 2 to 10 seconds, preferably the running time is set in a range from 12 to 18 seconds and the pause is set in a range from 4 to 6 seconds, more preferably, the running time is set as 15s and the pause is set as 5s.

[0039] During the drain cycle, the determination that whether the liquid level within the first outer container 2 reaches the preset draining level is fulfilled by the following steps: detecting the liquid level within the first outer container 2, comparing the detected result with the preset draining level; if the liquid level detected is higher than the set value, the draining pump continues to work at the alternate mode; if the liquid level detected meets or decreases to lower than the set value, the draining pump is being stopped and it marks the end of the drain cycle.

[0040] The preset draining level could be flexibly set according to various types of washing machine. Typically, the preset draining level could be established corresponding to the liquid level of the bottom of the first outer container 2, that is, if the liquid level detected decreasing to the point corresponding to the bottom of the first outer container 2, the drain cycle ends and the next cycle is followed.

[0041] In this embodiment, the drain cycle is followed by a load balancing cycle. The load balancing cycle includes: controlling the motor to drive the first inner container spinning at a set distributed rotation speed; detecting real-time operation speeds of the driveshaft of the motor at a plurality of points respectively, and then comparing those detected speed values with set values corresponding to each of them; if all of the differences between the detected speed values and the set values belong to a set range, it could be determined that the laundry load is evenly distributed within the first inner container and the balancing cycle ends; if any one of the difference value is beyond the set range, it could be determined that the laundry load is unevenly distributed within the first

inner container and the balancing cycle continues.

[0042] In the present embodiment, the set distributed rotation speed is preferably in a range from 90 to 120 rpm (rotation/minute), that is to say, the rotation speed of the first inner container is set in a range from 90 to 120 rpm, more preferably 90 to 100 rpm, and more preferably at 95 rpm.

[0043] The distribution of laundry load could be adjusted by controlling the motor to drive the first inner container rotating at a set distributed rotation speed, so as to avoid the excessive tumble caused by uneven distribution in the spin cycle; further the distribution status could be determined by detecting the change of driveshaft speed.

[0044] In this embodiment, the spin cycle includes a low-speed spin and a high-speed spin, wherein the low-speed spin comprises:

a. Controlling the motor to drive the first inner container rotate with an increasing speed to spin while keeping the draining pump 4 working at the alternate operation mode; wherein the highest speed capable of reaching in the low-speed spin is set as a first rotation speed.

[0045] The range of the first rotation speed is preferably from 350 to 450 rpm, and a more preferable value is 400 rpm. That is to say, followed by the load balancing cycle, the speed of the motor is subject to an increase from the distributed rotation speed to the first rotation speed; in the low-speed spin, the alternate operation of the draining pump 4 is set to be keeping running 12 to 18 seconds and the pause is set in a range from 4 to 6 seconds, more preferably, the running time is set in a time of 15s and the pause is 5s.

b. determining whether an over-suds condition occurs in the washer by detecting the liquid level within the first outer container; if the over-suds condition occurs, then entering into a step c followed, if the over-suds condition does not occur, entering into a defoaming mode and back to the step a sequentially.

[0046] In the step b, the defoaming mode comprises: reducing the rotation speed of the first inner container to the distributed rotation speed, and sequentially supplying fresh water into the washer in a period while keeping the draining pump working at the alternate operation mode.

[0047] The occurrence of the over-suds condition could be determined by the liquid level detected because it is subject to a substantial increase with increment of bubbles and foam which is caused by the fact that, during the low-speed spin, much of the water with detergent solution could be removed from the saturated clothes as the first inner container is being driven by the motor to rotate at a comparatively high speed.

[0048] Specifically, the occurrence of the over-suds is determined by comparing the detected liquid level within the first outer container with a set foaming liquid level; if

the liquid level within the first outer container is higher than or meets the set foaming liquid level, the over-suds exists in the first outer container; wherein the set foaming liquid level is preferable set as the liquid level corresponding to the bottom of the first inner container.

[0049] As the rotation speed of the first inner container reduces to the distributed rotation speed in the defoaming mode, the increment of suds caused by rotation could be effectively contained to prevent the overflow of bubbles; it is also a protective measure because the development of high levels of suds could produce an excessive load on the motor and may damage it. Further, as the first inner container is operating at the distributed rotation speed, clothes within the first inner container could contact and be saturated with fresh water supplied and rinsed, and part of the suds on the clothes could be washed and drained out by a washing pump. This operation can effectively enable the level of suds to diminish and can advantageously reinforce the rinse effect without wasting fresh water merely contained few bubbles, and additionally, the quantity of suds capable of being created further could be reduced to avoid the occurrence of over-suds again.

[0050] The alternate operation mode of the draining pump is set as running 12 to 18 seconds and pausing 2 to 6 seconds during the defoaming mode; preferably setting the running time as 10 seconds and the pausing time as 5 seconds respectively. The shortening of the periods in comparison with those in the step a could be advantageous of draining more suds created out of the washer to make the defoaming effect better. The period of water supply is set as 30 to 60 seconds.

c. Detecting the rotation speed of the first inner container and determining whether it meets the first rotation speed or not; if the real-time operation rotation speed reaches the first rotation speed, it is indicative of the end of the low-speed spin; if the rotation speed is lower than the first rotation speed, performing the defoaming mode and back to the step a sequentially.

[0051] In the step c, the defoaming mode comprises: controlling the motor to drive the first inner container rotating at a reduced speed, namely the distributed rotation speed, and sequentially supplying fresh water into the washer in a period while keeping the draining pump working at the alternate operation mode.

[0052] After the deforming mode in the step b, a high suds level condition may still exist but could not be determined by the liquid level detected, under this condition, the first inner container is driven by the motor to rotate at a high speed in the step c, and therefore water within the clothes residing in the first inner container could be squeezed out with suds. Those suds may prevent the rotation of the first inner container, and the resistance may grow as the speed increases. In order to overcome the resistance, the motor is required to output much more power than in normal operation. As the power of the motor

reaches its maximum capacity, the increment of the rotation speed could not be continued so that the real-time rotation speed may not reach the set rotation speed. The procedure for determining whether the maximum rotation speed reaches the first rotation speed is being incorporated is to address this problem. This procedure could further so as to prevent the over-suds and overflow of suds, and further avoid the damage to the motor caused by excessive load produced by the high levels of suds.

[0053] In this embodiment, the rotation speed of the first inner container is reduced to the distributed rotation speed during the low-speed spin, and then the high-speed spin is initiated; wherein the high-speed spin comprises the following steps:

A. Controlling the motor to drive the first inner container rotate with an increasing speed to spin while keeping the draining pump 4 working at the alternate operation mode; wherein the highest speed capable of reaching in the high-speed spin is set as a second rotation speed.

[0054] The range of the second rotation speed is preferably from 800 to 1200 rpm, and a more preferable value is 1000 rpm. In the high-speed spin, the alternate operation of the draining pump 4 is set to be keeping running 12 to 18 seconds and the pause is set in a range from 4 to 6 seconds, more preferably, the running time is set in a time of 15s and the pause is 5s.

[0055] A further increase of the rotation speed of the first inner container driven by the motor allows water in clothes to be squeezed out continually, and the alternate operation of the draining pump 4 could drain out more suds.

B. determining whether an over-suds condition is occurred in the washer by detecting whether the rotation speed reaches the second rotation in a set period of time; if an over-suds condition does not occur, the high-speed spin ends and the motor is being stopped; if an over-suds condition occurs, entering a deforming mode and back to the Step A sequentially.

[0056] In the step B, the defoaming mode comprises: reducing the rotation speed of the first inner container to the distributed rotation speed, and sequentially supplying fresh water into the washer in a period while keeping the draining pump working at the alternate operation mode.

[0057] In the step B, it is preferably to determine whether an over-suds condition is occurred in the washer by detecting whether the rotation speed increases to 1000 rpm from 400 rpm in a set time period, 3 to 8 seconds.

[0058] In this embodiment, the end of the high-speed spin mode indicates the end of the drain cycle.

[0059] In this embodiment, the over-suds could be accurately sensed relying on various detection methods applied in different stages and the overflow could be effec-

tively prevented.

[0060] A second embodiment of the invention can be utilized with a drum washing machine with an upper draining system as illustrated in FIG. 3, and the sequence of steps of the water draining method is depicted in FIG. 4. The modifications made to the second embodiment are: on one hand, the high-speed spin is followed by a timing spin during the spin cycle, and on the other hand, the draining conduit is further provided with a draining valve. Other features of the first embodiment could also be utilized as those in the second embodiment.

[0061] Referring to FIG. 3, the washing machine includes a cabinet 1, a first outer container 2, a first inner container, a motor and a first draining system communicated with the bottom of the first outer container 2, wherein the first draining system includes a first draining conduit 3, a draining pump 4 and a first draining valve 5. The first inner container is provided within the first outer container 2 defining a chamber for receiving a laundry load for treatment. Washing water resides within the first outer container 2. The first draining conduit 3 includes a bottom section 31, an upward section 32 and a free section 33, wherein the bottom section 31 is communicated with the bottom of the first outer container 2, and the upward section 32 is fixedly arranged on the cabinet 1. The draining pump 4 and the first draining valve 5 is arranged on the bottom section 31 to pump washing water flowing through the upward section 32. The motor is fixed on the first outer container 2 to drive the first inner container rotating.

[0062] Illustrated in FIG. 4 is a flow chart of the water draining method, which defines an operation includes a drain cycle and a spin cycle, wherein the first draining valve 5 is open before the drain cycle in advance and closed as the draining method expires. The drain cycle comprises: running and pausing the draining pump 4 alternately until the liquid level within the first outer container 2 decreasing to a preset draining level, and the spin cycle comprises: controlling the motor to rotate and spin while keeping the draining pump 4 running and pausing alternately.

[0063] With the configuration of this alternation, on one hand, washing water within the first outer container 2 flows into the first draining conduit 3 and then is being pumped to drain out through the upward section 32 of the first draining conduit 3 as the draining pump working, and on the other hand, washing water within the upward section 32 of the first draining conduit 3 flows back by gravity as the draining pump stopping. In this way, washing water within the upward section of the first draining conduit 3 alternately flows forwards and backwards. The alternate movement of washing water could easily bring more suds out of the washer so as to improve the rinse effect, also could prevent the overflow of bubbles. Specifically, in the drain cycle, the first inner container remains stationary as the motor stopping, the liquid level in the first outer container 2 decreasing with a stable speed as the washing water draining; in the meanwhile, washing water within the upward section alternately flows

back against the washing water left in the washer to make it be tumbled, so part of suds on the surface of the washing water left could be drawn into the first draining conduit 3 and then be drained out from the washer through the upward section as the draining pump working. The alternate movement of washing water could further ensure the normal operation of the draining pump 4 because air within the draining pump 4 could be pushed out under the force of the washing water flowing back intermittently, so as to avoid the failure of the draining pump caused by the problem that air is introduced into the inner cavity of the draining pump as only little water being left in the washer. Moreover, due to the configuration of the upward section, bubbles and foam on the liquid surface could flows to the free section 33 in the first place and then be drained out, followed with the washing water, so if the draining pump 4 stops, the washing water within the upward section may flow back to the bottom section but suds is discharged from the washer; accordingly, washing water could flow back to drawn more suds again in an alternate way.

[0064] In this embodiment, the alternate operation of the draining pump 4 is set to be keeping running 10 to 20 seconds and then pausing 2 to 10 seconds, preferably the running time is set in a range from 12 to 18 seconds and the pause is set in a range from 4 to 6 seconds, more preferably, the running time is set as 15s and the pause is set as 5s.

[0065] During the drain cycle, the determination that whether the liquid level within the first outer container 2 reaches the preset draining level is fulfilled by the following steps: detecting the liquid level within the first outer container 2, comparing the detected result with the preset draining level; if the liquid level detected is higher than the set value, the draining pump continues to work at the alternate mode; if the liquid level detected meets or decreasing to lower than the set value, the draining pump is being stopped and it marks the end of the drain cycle.

[0066] The preset draining level could be flexibly set according to various modes of washing machine. Typically, the preset draining level could be established as the liquid level of the bottom of the first outer container 2, that is, if the liquid level detected decreasing to the point corresponding to the bottom of the first outer container 2, the drain cycle ends and the next cycle is followed.

[0067] In this embodiment, the drain cycle is followed by a load balancing cycle. The load balancing cycle includes: controlling the motor to drive the first inner container spinning at a set distributed rotation speed; detecting real-time operation speeds of the driveshaft of the motor at a plurality of points respectively, and then comparing those detected speed values with set values corresponding to each of them; if all of the differences between the detected speed values and the set values belong to a set range, it could be determined that the laundry load is evenly distributed within the first inner container and the balancing cycle ends; if any one of the difference

value is beyond the set range, it could be determined that the laundry load is unevenly distributed within the first inner container and the balancing cycle continues.

[0068] In the present embodiment, the set distributed rotation speed is preferably in a range from 90 to 120 rpm (rotation/minute), that is to say, the rotation speed of the first inner container is set in a range from 90 to 120 rpm, more preferably 93 to 100 rpm, and more preferably at 95 rpm.

[0069] The distribution of laundry load could be adjusted by controlling the motor to drive the first inner container rotating at a set distributed rotation speed, so as to avoid the excessive tumble caused by uneven distribution in the spin cycle; further the distribution status could be determined by detecting the change of driveshaft speed.

[0070] In this embodiment, the spin cycle includes a low-speed spin, a high-speed spin and a timing spin, wherein the low-speed spin comprises:

a. Controlling the motor to drive the first inner container rotate with an increasing speed to spin while keeping the draining pump 4 working at the alternate operation mode; wherein the highest speed capable of reaching in the low-speed spin is set as a first rotation speed.

[0071] The range of the first rotation speed is preferably from 350 to 450 rpm, and a more preferable value is 400 rpm. That is to say, followed by the load balancing cycle, the speed of the motor is subject to an increase from the distributed rotation speed to the first rotation speed; in the low-speed spin, the alternate operation of the draining pump 4 is set to be keeping running 12 to 18 seconds and the pause is set in a range from 4 to 6 seconds, more preferably, the running time is set in a time of 15s and the pause is 5s.

b. determining whether an over-suds condition occurs in the washer by detecting the liquid level within the first outer container; if the over-suds condition occurs, then entering into a step c followed, if the over-suds condition does not occur, entering into a defoaming mode and back to the step a sequentially.

[0072] In the step b, the defoaming mode comprises: reducing the rotation speed of the first inner container to the distributed rotation speed, and sequentially supplying fresh water into the washer in a period while keeping the draining pump working at the alternate operation mode.

[0073] The occurrence of the over-suds condition could be determined by the liquid level detected because it is subject to a substantial increase with increment of bubbles and foam which is caused by the fact that, during the low-speed spin, much of the water with detergent solution could be removed from the saturated clothes as the first inner container is being driven by the motor to rotate at a comparatively high speed.

[0074] Specifically, the occurrence of the over-suds is

determined by comparing the liquid level within the first outer container with a set foaming liquid level; if the liquid level within the first outer container is higher than or meets the set foaming liquid level, the over-suds exists in the first outer container; wherein the set foaming liquid level is preferable set as the liquid level corresponding to the bottom of the first inner container.

[0075] As the rotation speed of the first inner container reduces to the distributed rotation speed in the defoaming mode, the increment of suds caused by rotation could be effectively contained to prevent the overflow of bubbles; it is also a protective measure because the development of high levels of suds could produce an excessive load on the motor and may damage it. Further, as the first inner container is operating at the distributed rotation speed, clothes within the first inner container could contact and be saturated with fresh water supplied and rinsed, and part of the suds on the clothes could be washed and drained out by a washing pump. This operation can effectively enable the level of suds to diminish and can advantageously reinforce the rinse effect without wasting fresh water merely contained few bubbles, and additionally, the quantity of suds capable of being created further could be reduced to avoid the occurrence of over-suds again.

[0076] The alternate operation mode of the draining pump is set as running 12 to 18 seconds and pausing 2 to 6 seconds during the defoaming mode; preferably setting the running time as 10 seconds and the pausing time as 5 seconds respectively. The shortening of the periods in comparison with those in the step a could be advantageous of draining more suds created out of the washer to make the defoaming effect better. The period of water supply is set as 30 to 60 seconds.

c. Detecting the rotation speed of the first inner container and determining whether it meets the first rotation speed or not; if the rotation speed reaches the first rotation speed, it is indicative of the end of the low-speed spin; if the rotation speed is lower than the first rotation speed, performing the defoaming mode and back to the step a sequentially.

[0077] In the step c, the defoaming mode comprises: controlling the motor to drive the first inner container rotating at a reduced speed, namely the distributed rotation speed, and sequentially supplying fresh water into the washer by a period while keeping the draining pump working at the alternate operation mode.

[0078] After the defoaming mode in the step b, a high suds level condition may still exist but could not be determined by the liquid level detected, under this condition, the first inner container is driven by the motor to rotate at a high speed in step c, and therefore water within the clothes residing in the first inner container could be squeezed out with suds. Those suds may prevent the rotation of the first inner container, and the resistance may grow as the speed increases. In order to overcome

the resistance, the motor is required to output much more power than in normal operation. As the power of the motor reaches its maximum, the increment of the rotation speed could not be continued so that the real-time rotation speed may not reach the set rotation speed. The procedure for determining whether the maximum rotation speed reaches the first rotation speed is being incorporated is to address this problem. This procedure could further so as to prevent the over-suds and overflow of suds, and further avoid the damage to the motor caused by excessive load produced by the high levels of suds.

[0079] In this embodiment, the rotation speed of the first inner container is reduced to the distributed rotation speed during the low-speed spin, and then the high-speed spin is initiated; wherein the high-speed spin comprises the following steps:

A. Controlling the motor to drive the first inner container rotate with an increasing speed to spin while keeping the draining pump 4 working at the alternate operation mode; wherein the highest speed capable of reaching in the high-speed spin is set as a second rotation speed.

[0080] The range of the second rotation speed is preferably from 800 to 1200 rpm, and a more preferable value is 1000 rpm. In the high-speed spin, the alternate operation of the draining pump 4 is set to be keeping running 12 to 18 seconds and the pause is set in a range from 4 to 6 seconds, more preferably, the running time is set in a time of 15s and the pause is 5s.

[0081] A further increase of the rotation speed of the first inner container driven by the motor allows water in clothes to be squeezed out continually, and the alternate operation of the draining pump 4 could drain out more suds.

B. determining whether an over-suds condition is occurred in the washer by detecting whether the rotation speed reaches the second rotation in a set period of time; if an over-suds condition does not occur, the high-speed spin ends and the motor is being stopped; if an over-suds condition occurs, entering a deforming mode and back to the Step A sequentially.

[0082] In the step B, the defoaming mode comprises: reducing the rotation speed of the first inner container to the distributed rotation speed, and sequentially supplying fresh water into the washer in a period while keeping the draining pump working at the alternate operation mode.

[0083] In the step B, it is preferably to determine whether an over-suds condition is occurred in the washer by detecting whether the rotation speed increases to 1000 rpm from 400 rpm in a set time period, 3 to 8 seconds.

[0084] In this embodiment, the high-speed spin is followed by a timing spin, wherein the timing spin comprises: running the motor and increasing the rotation speed

to a third rotation speed for spinning while keeping the alternation operation of the draining pump 4 until the time expires, then stopping the motor and shutting down the draining pump 4 and the first draining valve 5. The water draining method ends.

[0085] The range of the third rotation speed is preferably from 1100 to 1200 rpm, namely the rotation speed of the first inner container is 1100 to 1200 rpm, and a more preferable value is 1200 rpm; the alternation operation of the draining pump 4 is set to be keeping running 12 to 18 seconds and the pause is set in a range from 4 to 6 seconds, more preferably, the running time is set in a time of 15s and the pause is 5s.

[0086] With these configurations of the timing spin and alternate operation of the draining pump, the spin effect is reinforced.

[0087] A third embodiment of the invention can be utilized with a washing machine with a dual-drum washing machine as illustrated in FIG. 5, wherein a first draining conduit and a draining pump is provided for both of the first inner containers. The sequence of steps of the water draining method is depicted in FIG. 6. The modification made in the third embodiment mainly is the washing machine is a dual-drum washing machine, and other features of the second embodiment could be utilized as those in the third embodiment.

[0088] Referring to FIG. 5, the washing machine is a dual-drum washing machine including a first washing system and a second washing system, wherein the first washing system includes a cabinet 1, a first outer container 2, a first inner container, a motor and a first draining system communicated with the bottom of the first outer container 2, wherein the first draining system includes a first draining conduit 3, a draining pump 4 and a first draining valve 5; the first inner container is provided within the first outer container 2 defining a chamber for receiving a laundry load for treatment, and washing water resides within the first outer container 2; the first draining conduit 3 includes a bottom section 31, an upward section 32 and a free section 33, wherein the bottom section 31 is communicated with the bottom of the first outer container 2, and the upward section 32 is fixedly arranged on the cabinet 1; the draining pump 4 is arranged in the bottom section 31 to pump washing water flowing through the upward section 32; and the motor is fixed on the first outer container 2 to drive the first inner container rotating. The second washing system includes a second outer container 6 and a second draining conduit 7 communicated with the second outer container 6, a second draining valve 8 is arranged on the second draining conduit which is connected to the portion of the bottom section 31 between the first draining valve 5 and the draining pump 4; with this configuration, the upward section 32 and the free section 33 of the first draining conduit 3 and the draining pump 4 could service for both of the first washing system and the second washing system. But it is also easy to understand that the first washing system and the second washing system could not drain washing

water in the meanwhile.

[0089] It is exemplary to regard the first washing system as a main washing system in the dual-drum washer utilized. The sequence of steps of the water draining method is depicted in FIG. 6, which defines an operation includes an occupation detecting cycle, a drain cycle and a spin cycle.

[0090] The occupation detecting cycle comprises: sensing whether the draining pump 4 is working for draining washing water of the second washing system or not; if the draining pump 4 is occupied, remaining the current status; if the draining pump 4 is not occupied, the first draining valve 5 is being opened in advance before the drain cycle.

the drain cycle comprises: running and pausing the draining pump 4 alternately until the liquid level within the first outer container 2 decreasing to a preset draining level, and the spin cycle comprises: controlling the motor to rotate and spin while running and pausing the draining pump 4 alternately.

[0091] With the configuration of this alternation, on one hand, washing water within the first outer container 2 flows into the first draining conduit 3 and then is being pumped to drain out through the upward section 32 of the first draining conduit 3 as the draining pump working, and on the other hand, washing water within the upward section 32 of the first draining conduit 3 flows back by gravity as the draining pump stopping. Hence, washing water within the upward section of the first draining conduit 3 alternately flows forwards and backwards. The alternate movement of washing water could easily bring more suds out of the washer so as to improve the rinse effect, also could prevent the overflow of bubbles. Specifically, in the drain cycle, the first inner container remains stationary as the motor stopping, the liquid level in the first outer container 2 decreasing with a stable speed as the washing water draining; in the meanwhile, washing water within the upward section alternately flows back against the washing water left in the washer to make it be tumbled, so part of suds on the surface of the washing water left could be drawn into the first draining conduit 3 and then be drained out from the washer through the upward section as the draining pump working. The alternate movement of washing water could further ensure the normal operation of the draining pump 4 because air within the draining pump 4 could be pushed out under the force of the washing water flowing back intermittently, so as to avoid the failure of the draining pump caused by the problem that air is introduced into the inner cavity of the draining pump as only little water being left in the washer. Moreover, due to the configuration of the upward section, bubbles and foam on the liquid surface could flows to the free section 33 in the first place and then be drained out, followed with the washing water, so if the draining pump 4 stops, the washing water within the upward section may flow back to the bottom section but suds is discharged from the washer; accordingly, washing water could flow back to drawn more suds again in

an alternate way.

[0092] In this embodiment, the alternate operation of the draining pump 4 is set to be keeping running 10 to 20 seconds and then pausing 2 to 10 seconds, preferably the running time is set in a range from 12 to 18 seconds and the pause is set in a range from 4 to 6 seconds, more preferably, the running time is set as 15s and the pause is set as 5s.

[0093] During the drain cycle, the determination that whether the liquid level within the first outer container 2 reaches the preset draining level is fulfilled by the following steps: detecting the liquid level within the first outer container 2, comparing the detected result with the preset draining level; if the liquid level detected is higher than the set value, the draining pump continues to work at the alternate mode; if the liquid level detected meets or decreasing to lower than the set value, the draining pump is being stopped and it marks the end of the drain cycle.

[0094] The preset draining level could be flexibly set according to various modes of washing machine. Typically, the preset draining level could be established as the liquid level of the bottom of the first outer container 2, that is, if the liquid level detected decreasing to the point corresponding to the bottom of the first outer container 2, the drain cycle ends and the next cycle is followed.

[0095] In this embodiment, the drain cycle is followed by a load balancing cycle. The load balancing cycle includes: controlling the motor to drive the first inner container spinning at a set distributed rotation speed; detecting real-time operation speeds of the driveshaft of the motor at a plurality of points respectively, and then comparing those detected speed values with set values corresponding to each of them; if all of the differences between the detected speed values and the set values belong to a set range, it could be determined that the laundry load is evenly distributed within the first inner container and the balancing cycle ends; if any one of the difference value is beyond the set range, it could be determined that the laundry load is unevenly distributed within the first inner container and the balancing cycle continues.

[0096] In the present embodiment, the set distributed rotation speed is preferably in a range from 90 to 100 rpm (rotation/minute), that is to say, the rotation speed of the first inner container is set in a range from 90 to 100 rpm, more preferably 93 to 95 rpm, and more preferably at 95 rpm.

[0097] The distribution of laundry load could be adjusted by controlling the motor to drive the first inner container rotating at a set distributed rotation speed, so as to avoid the excessive tumble caused by uneven distribution in the spin cycle; further the distribution status could be determined by detecting the change of driveshaft speed.

[0098] In this embodiment, the spin cycle includes a low-speed spin, a high-speed spin and a timing spin, wherein the low-speed spin comprises:

a. Controlling the motor to drive the first inner con-

tainer rotate with an increasing speed to spin while keeping the draining pump 4 working at the alternate operation mode; wherein the highest rotation speed capable of reaching in the low-speed spin is set as a first rotation speed.

[0099] The range of the first rotation speed is preferably set from 350 to 450 rpm, and a more preferable value is 400 rpm. That is to say, followed by the load balancing cycle, the speed of the motor is subject to an increase from the distributed rotation speed to the first rotation speed; in the low-speed spin, the alternate operation of the draining pump 4 is set to be keeping running 12 to 18 seconds and the pause is set in a range from 4 to 6 seconds, more preferably, the running time is set in a time of 15s and the pause is 5s.

b. determining whether an over-suds condition occurs in the washer by detecting the liquid level within the first outer container; if the over-suds condition occurs, then entering into a step c followed, if the over-suds condition does not occur, entering into a defoaming mode and back to the step a sequentially.

[0100] In the step b, the defoaming mode comprises: reducing the rotation speed of the first inner container to the distributed rotation speed, and sequentially supplying fresh water into the washer in a period while keeping the draining pump working at the alternate operation mode.

[0101] The occurrence of the over-suds condition could be determined by the liquid level detected because it is subject to a substantial increase with increment of bubbles and foam which is caused by the fact that, during the low-speed spin, much of the water with detergent solution could be removed from the saturated clothes as the first inner container is being driven by the motor to rotate at a comparatively high speed.

[0102] Specifically, the occurrence of the over-suds is determined by comparing the liquid level within the first outer container with a preset foaming liquid level; if the liquid level detected within the first outer container is higher than or meets the set foaming liquid level, the over-suds exists in the first outer container; wherein the set foaming liquid level is preferable set as the liquid level corresponding to the bottom of the first inner container.

[0103] As the rotation speed of the first inner container reduces to the distributed rotation speed in the defoaming mode, the increment of suds caused by rotation could be effectively contained to prevent the overflow of bubbles; it is also a protective measure because the development of high levels of suds could produce an excessive load on the motor and may damage it. Further, as the first inner container is operating at the distributed rotation speed, clothes within the first inner container could contact and be saturated with fresh water supplied and rinsed, and part of the suds on the clothes could be washed and drained out by a washing pump. This operation can effectively enable the level of suds to diminish

and can advantageously reinforce the rinse effect without wasting fresh water merely contained few bubbles, and additionally, the quantity of suds capable of being created further could be reduced to avoid the occurrence of over-suds again.

[0104] The alternate operation mode of the draining pump is set as running 12 to 18 seconds and pausing 2 to 6 seconds during the defoaming mode; preferably setting the running time as 10 seconds and the pausing time as 5 seconds respectively. The shortening of the periods in comparison with those in the step a could be advantageous of draining more suds created out of the washer to make the defoaming effect better. The period of water supply is set as 30 to 60 seconds.

c. Detecting the rotation speed of the first inner container and determining whether it meets the first rotation speed or not; if the rotation speed reaches the first rotation speed, it is indicative of the end of the low-speed spin; if the rotation speed is lower than the first rotation speed, performing the defoaming mode and back to the step a sequentially.

[0105] In the step c, the defoaming mode comprises: controlling the motor to drive the first inner container rotating at a reduced speed, namely the distributed rotation speed, and sequentially supplying fresh water into the washer by a period while keeping the draining pump working at the alternate operation mode.

[0106] After the deforming mode in the step b, a high suds level condition may still exist but could not be determined by the liquid level detected, under this condition, the first inner container is driven by the motor to rotate at a high speed in step c, and therefore water within the clothes residing in the first inner container could be squeezed out with suds. Those suds may prevent the rotation of the first inner container, and the resistance may grow as the speed increases. In order to overcome the resistance, the motor is required to output much more power than in normal operation. As the power of the motor reaches its maximum, the increment of the rotation speed could not be continued so that the real-time rotation speed may not reach the set rotation speed. The procedure for determining whether the maximum rotation speed reaches the first rotation speed is being incorporated is to address this problem. This procedure could further so as to prevent the over-suds and overflow of suds, and further avoid the damage to the motor caused by excessive load produced by the high levels of suds.

[0107] In this embodiment, the rotation speed of the first inner container is reduced to the distributed rotation speed during the low-speed spin, and then the high-speed spin is initiated; wherein the high-speed spin comprises the following steps:

A. Controlling the motor to drive the first inner container rotate with an increasing speed to spin while keeping the draining pump 4 working at the alternate

operation mode; wherein the highest speed capable of reaching in the high-speed spin is set as a second rotation speed.

[0108] The range of the second rotation speed is preferably from 800 to 1200 rpm, and a more preferable value is 1000 rpm. In the high-speed spin, the alternate operation of the draining pump 4 is set to be keeping running 12 to 18 seconds and the pause is set in a range from 4 to 6 seconds, more preferably, the running time is set in a time of 15s and the pause is 5s.

[0109] A further increase of the rotation speed of the first inner container driven by the motor allows water in clothes to be squeezed out continually, and the alternate operation of the draining pump 4 could drain out more suds.

B. determining whether an over-suds condition is occurred in the washer by detecting whether the rotation speed reaches the second rotation speed in a set period of time; if an over-suds condition does not occur, the high-speed spin ends and the motor is being stopped; if an over-suds condition occurs, entering a deforming mode and back to the Step A sequentially.

[0110] In the step B, the defoaming mode comprises: reducing the rotation speed of the first inner container to the distributed rotation speed, and sequentially supplying fresh water into the washer in a period while keeping the draining pump working at the alternate operation mode.

[0111] In the step B, it is preferably to determine whether an over-suds condition is occurred in the washer by detecting whether the rotation speed increases to 1000 rpm from 400 rpm in a set time period, 3 to 8 seconds.

[0112] In this embodiment, the high-speed spin is followed by a timing spin, wherein the timing spin comprises: running the motor and increasing the rotation speed to a third rotation speed for spinning while keeping the alternation operation of the draining pump 4 until the time expires, then stopping the motor and shutting down the draining pump 4 and the first draining valve 5. The water draining method ends.

[0113] The range of the third rotation speed is preferably from 1100 to 1200 rpm, namely the rotation speed of the first inner container is 1100 to 1200 rpm, and a more preferable value is 1200 rpm; the alternation operation of the draining pump 4 is set to be keeping running 12 to 18 seconds and the pause is set in a range from 4 to 6 seconds, more preferably, the running time is set in a time of 15s and the pause is 5s.

[0114] With these configurations of the timing spin and alternate operation of the draining pump, the spin effect is reinforced.

[0115] It should also be understood that, although described with respect to preferred embodiments of the invention, various changes and /or modifications can be made to the invention without departing from the spirit

thereof. In any event, the invention is only intended to be limited by the scope of the following claims.

5 Claims

1. A water draining method of washing machine, wherein the washing machine is an upper-drain type and further including a first outer container configured to receive washing water, a first inner container provided within the first outer container, a motor configured to drive the first inner container rotating, a first draining system, which is communicated with the bottom of the first outer container, including a first draining conduit and a draining pump, comprising:

initiating a drain cycle, during which keeping the draining pump working at an alternate operation mode until the liquid level within the first outer container decreasing to a preset draining level; and
initiating a spin cycle, during which controlling the motor to drive the first inner container rotating and spinning while keeping the draining pump working at an alternate operation mode.

2. The water draining method according to claim 1, wherein the alternate operation mode comprising keeping the draining pump running 10 to 20 seconds and pausing 2 to 10 seconds alternately.

3. The water draining method according to claim 1, further comprising:

initiating a load balancing cycle before the spin cycle, during which controlling the motor to drive the first inner container spinning at a set distributed rotation speed and during which determining whether the load is evenly distributed based on rotation speed values detected.

4. The water draining method according to claim 3, wherein the load balancing cycle further comprising:

detecting real-time rotation speed values of the driveshaft of the motor at a plurality of points respectively;
comparing those detected speed values with set values corresponding to each of them; and
determining the fact that the laundry load is evenly distributed within the first inner container if all of the differences between the detected speed values and the set values belong to a preset range and terminating the load balancing cycle; or determining the fact that the laundry load is unevenly distributed within the first inner container if any one of the difference value is beyond

the set range and resuming the load balancing cycle.

5. The water draining method according to any one of claim 1 to claim 4, wherein the spin cycle further comprising a low-speed spin, the low-speed spin comprising:
 - a. controlling the motor to drive the first inner container spinning at an increasing rotation speed while keeping the draining pump working at the alternate operation mode; wherein the highest rotation speed capable of reaching in the low-speed spin is set as a first rotation speed;
 - b. determining whether an over-suds condition occurs in the washer by detecting the liquid level within the first outer container; if the over-suds condition occurs, then entering into a step c followed; if the over-suds condition does not occur, entering into a defoaming mode and then back to the step a sequentially; wherein the defoaming mode comprises: reducing the rotation speed of the first inner container to the distributed rotation speed, and sequentially supplying fresh water into the washer in a period while keeping the draining pump working at the alternate operation mode;
 - c. detecting the rotation speed of the first inner container and determining whether it meets the first rotation speed or not; if the rotation speed reaches the first rotation speed, the low-speed spin ends; if the rotation speed is lower than the first rotation speed, performing the defoaming mode and back to step a sequentially.
6. The water draining method of claim 5, wherein the alternate operation mode in the low-speed spin is keeping the draining pump running 8 to 12 seconds and pausing 2 to 6 seconds alternately.
7. The water draining method of claim 5, wherein the occurrence of the over-suds condition is determined by comparing the liquid level within the first outer container with a preset foaming liquid level; if the liquid level within the first outer container detected is higher than or meets the set foaming liquid level, the over-suds condition exists in the first outer container.
8. The water draining method of claim 4, wherein the spin cycle further comprising a high-speed spin, the high-speed spin comprising:
 - A. controlling the motor to drive the first inner container spinning at an increasing rotation speed while keeping the draining pump working at the alternate operation mode; wherein the highest rotation speed capable of reaching in

the high-spin is set as a second rotation speed; B. determining whether an over-suds condition is occurred in the washer by detecting whether the rotation speed reaches the second rotation speed in a set period of time; if an over-suds condition does not occur, the high-speed spin ends and the motor is being stopped; if an over-suds condition occurs, entering a defoaming mode and back to the step A sequentially; wherein the defoaming mode comprising: reducing the rotation speed of the first inner container to the distributed rotation speed, and sequentially supplying fresh water into the washer in a period while keeping the draining pump working at the alternate operation mode.

9. The water draining method of claim 7, further comprising a timing spin followed the high-speed spin, wherein the timing spin comprising: increasing the rotation speed of the first inner container which is driven by the motor to a third rotation speed and spinning while keeping the draining pump working at the alternate operation mode; stopping the motor and shutting down a first draining valve as the time expires.
10. The water draining method of any one of claim 1,2,3,4,6,7,8,9, which is utilized in a dual-drum washing machine further including a second washing system, wherein the second washing system including a second outer container, a second draining conduit communicated with the second outer container, a second draining valve provided on the second draining conduit; the first draining conduit further including a bottom section, which is communicated with the first outer container and provided with a first draining valve and the draining pump, an upward section and a free section, and the second draining conduit connected with the portion of the bottom section between the first draining valve and the first draining conduit; further comprising:
 - initiating an occupation detecting cycle preceding the drain cycle, during which sensing whether the draining pump is working for another washing system; if it is being occupied, remaining the current status.

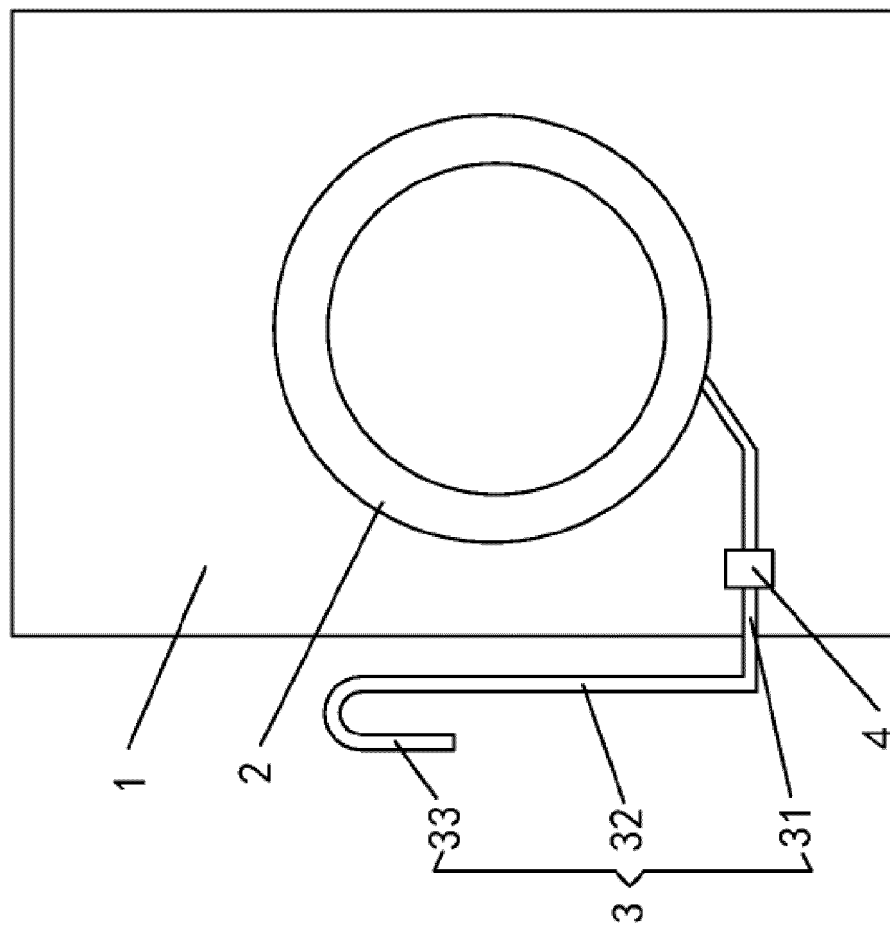


FIG. 1

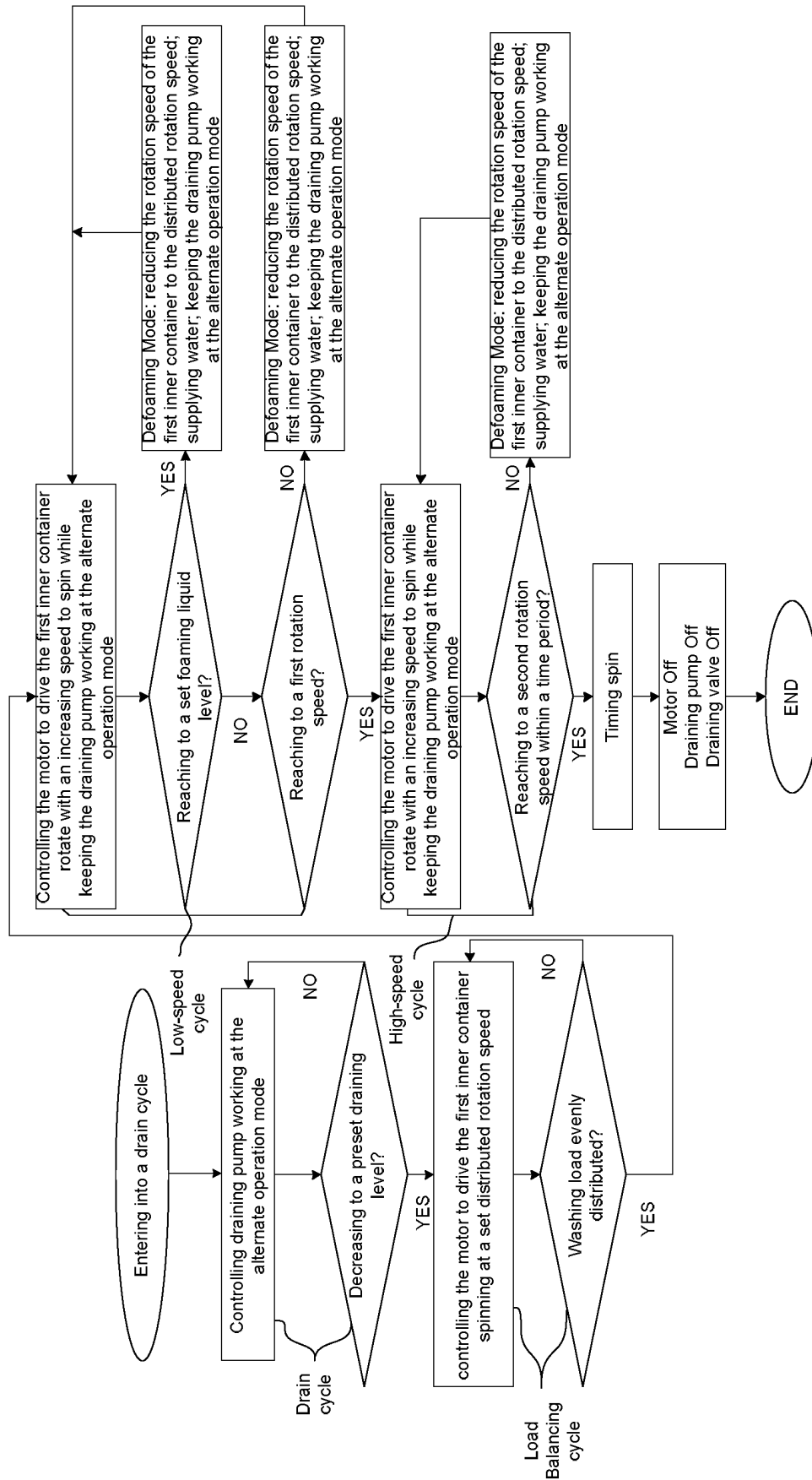


FIG. 2

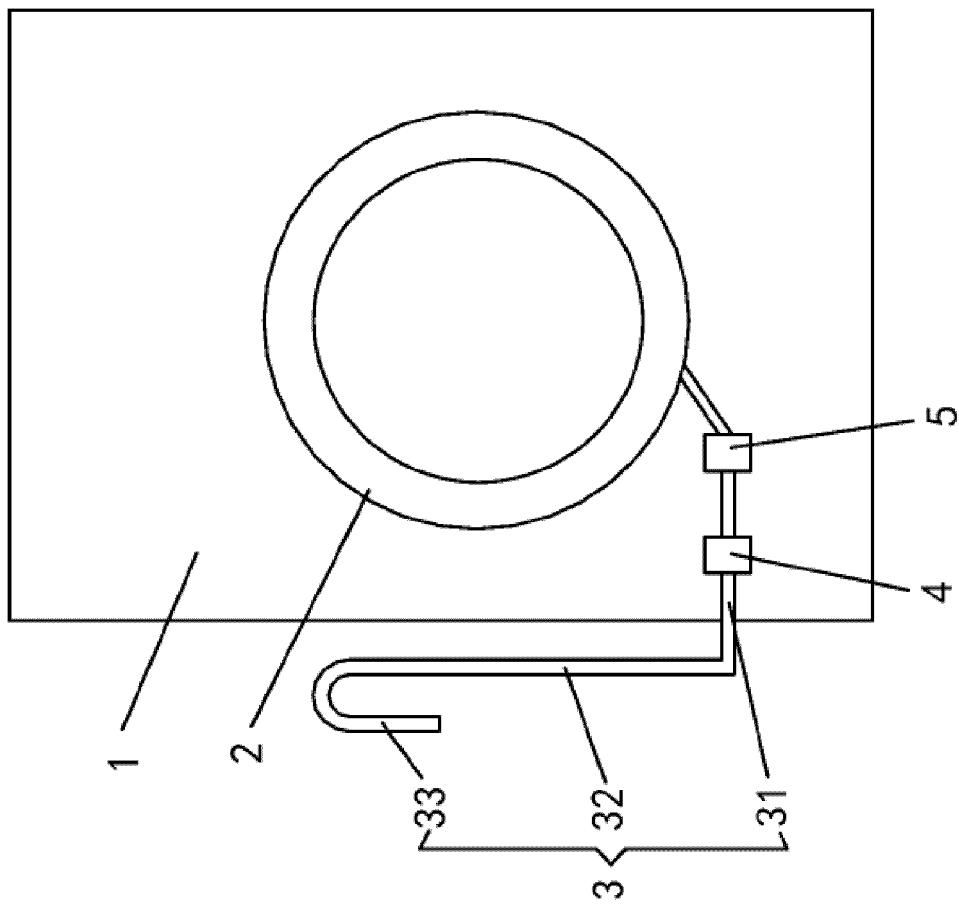


FIG. 3

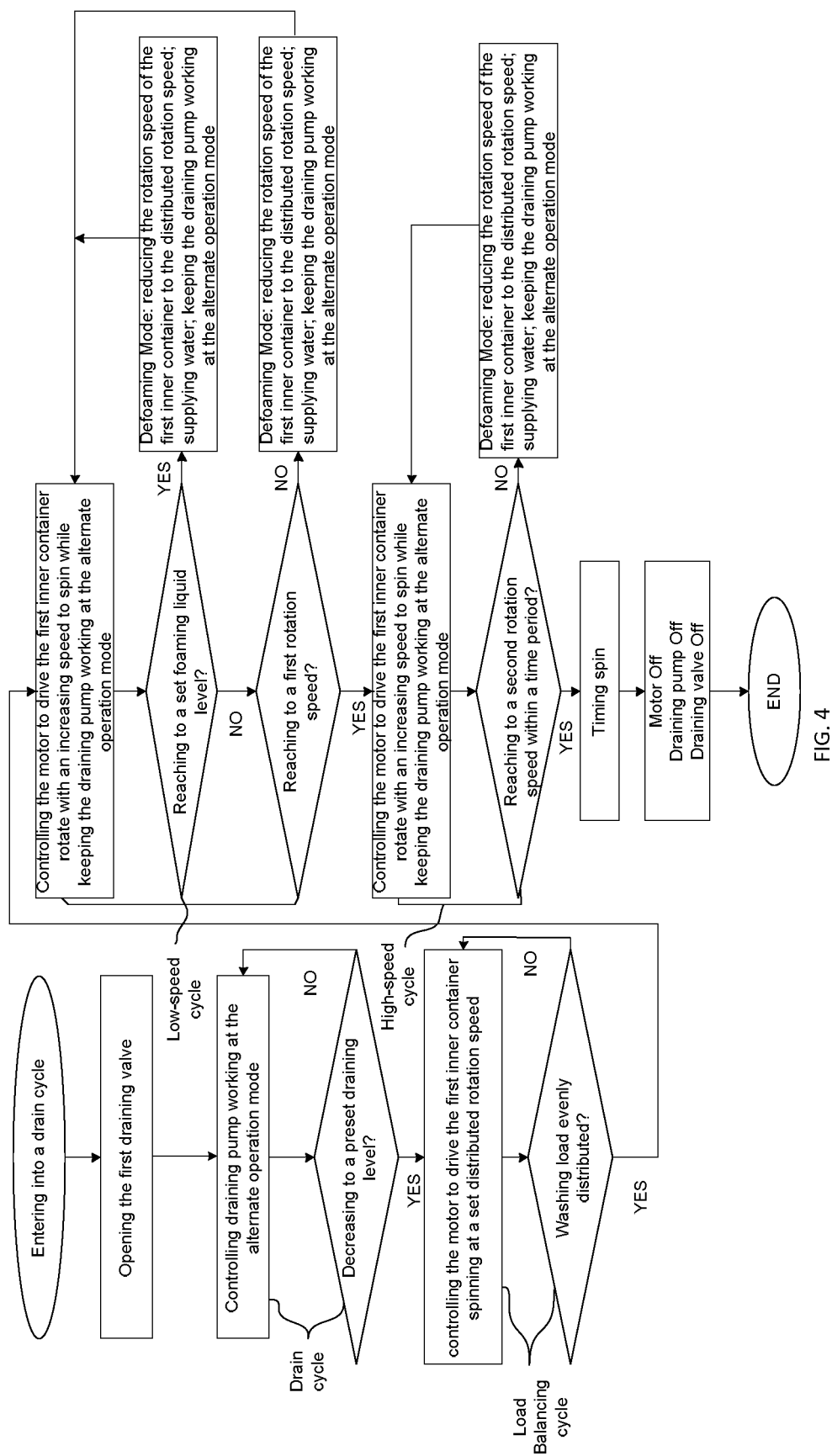
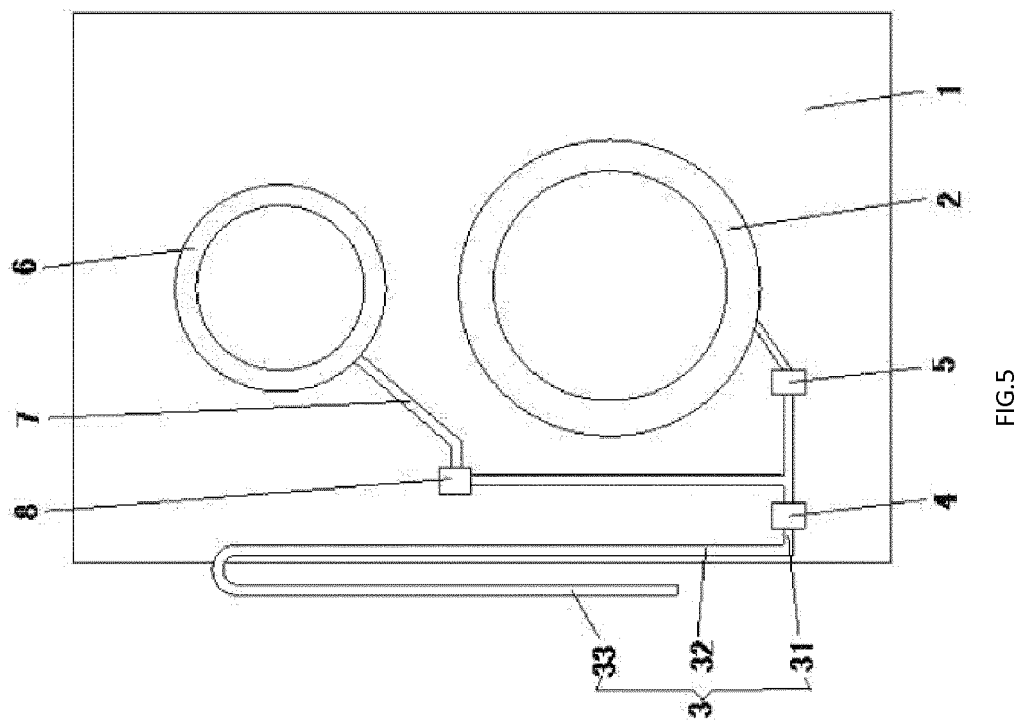


FIG. 4



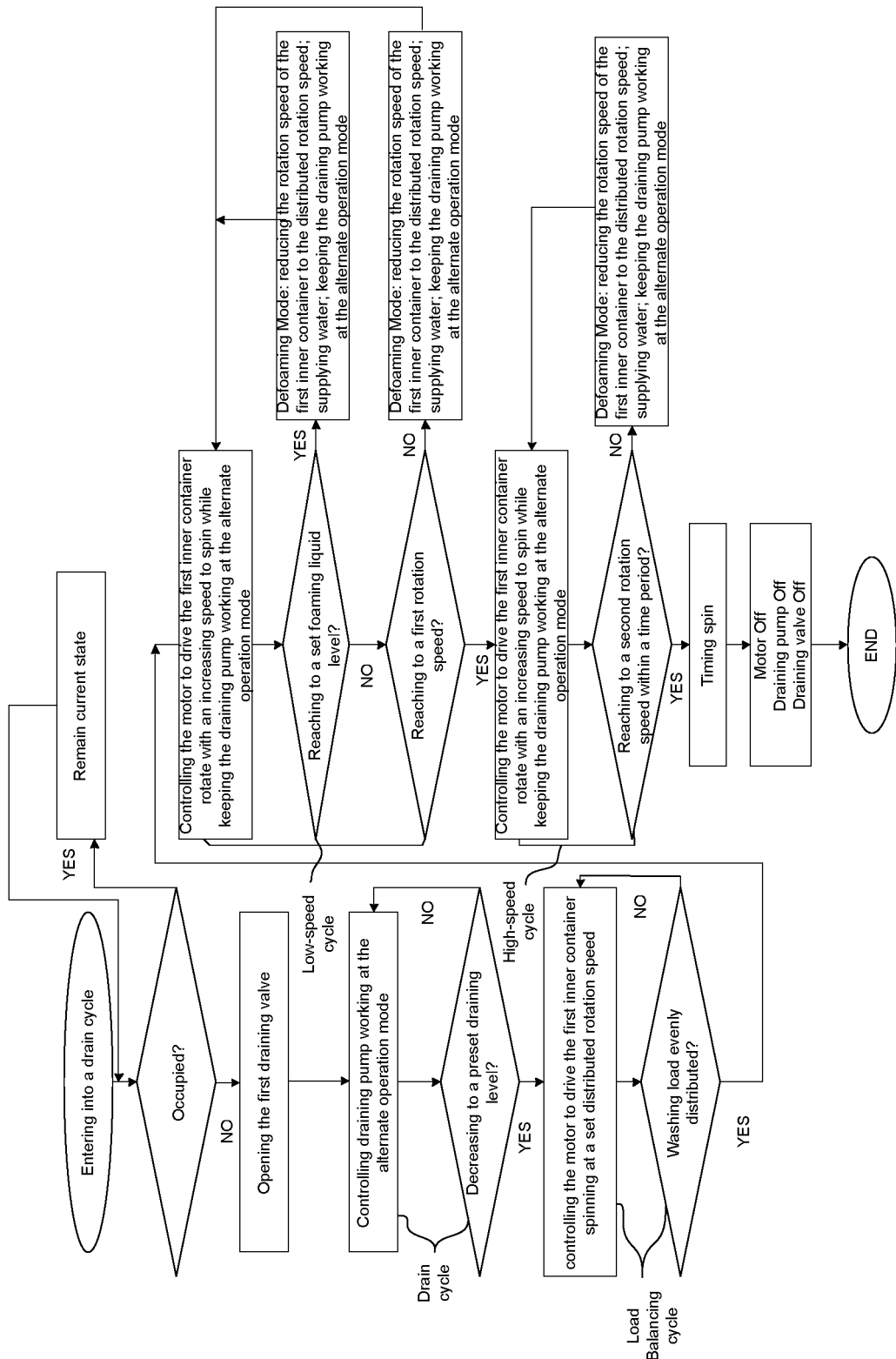


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2016/103968

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)

CNABS; CNTXT; VEN: up drainage, emptying, discharge, spin drying, electromotor, discontinuous, interrupted, drain+, spin+, dehydrat+, dewater+, pump, motor, intermittence, interval+, pause, interlude, foam, bubble

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 1240854 A (SANYO ELECTRIC CO., LTD.), 12 January 2000 (12.01.2000), claims 1 and 4, and figure 1	1-4, 10
Y	CN 102535095 A (PANASONIC HOME APPLIANCES R&D CENTER (HANGZHOU) CO., LTD. et al.), 04 July 2012 (04.07.2012), description, paragraph 38	1-4, 10
A	CN 104099756 A (HAIER ELECTRONICS GROUP CO., LTD. et al.), 15 October 2014 (15.10.2014), the whole document	1-10
A	KR 20010076577 A (LG ELECTRONICS INC.), 16 August 2001 (16.08.2001), the whole document	1-10

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

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"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
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"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	"&" document member of the same patent family

Date of the actual completion of the international search 23 January 2017 (23.01.2017)	Date of mailing of the international search report 07 February 2017 (07.02.2017)
Name and mailing address of the ISA/CN: 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 GUO, Xu Telephone No.: (86-10) 62084600

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2016/103968

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 1240854 A	12 January 2000	JP 2000014964 A	18 January 2000
		AU 3578399 A	13 January 2000
		AU 749680 B	04 July 2002
CN 102535095 A	04 July 2012	None	
CN 104099756 A	15 October 2014	None	
KR 20010076577 A	16 August 2001	KR 339003 B	31 May 2002

Form PCT/ISA/210 (patent family annex) (July 2009)