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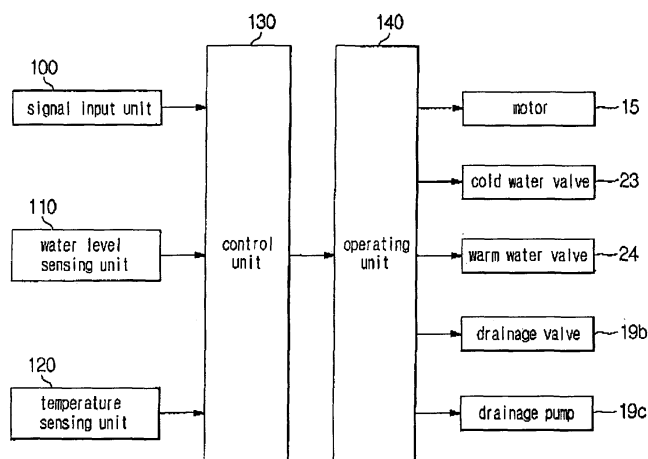
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(54) Washing machine and method for controlling supply of water thereof

(57) A washing machine for preventing contaminants from degenerating and laundry from being damaged when water is supplied in a washing operation, and a method for controlling the supply of water thereof. Particularly, a washing machine for supplying cold water (S110) to laundry for sufficiently soaking the laundry and then supplying warm water (S130) at a high temperature to the laundry so as to prevent contaminants from degenerating, and a method for controlling the supply of

water of the washing machine, thereby preventing the deterioration of washing performance of the washing machine. The method includes determining whether or not a water supply operation is selected, supplying cold water to soak laundry (S110) when it is determined that the water supply operation is selected and supplying warm water (S130), after the soaking of the laundry in the cold water, to prevent contaminants of the laundry from degenerating.

FIG. 2



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Description

[0001] The present Invention relates to washing machines and to methods for controlling the supply of water of a washing machine.

[0002] Generally, a washing machine (mainly, a drum washing machine) is an apparatus for washing laundry in a cylindrical rotary drum by force of lifting the laundry and then dropping the laundry when the rotary drum is rotated. Compared to a conventional pulsator washing machine, the drum washing machine has a long washing time, but minimizes damage to the laundry and has a low water consumption rate, and thus demand for drum washing machines is increasing.

[0003] In the above-described drum washing machine, when water is supplied to the inside of a tub so as to perform washing operation, the water is supplied from a water supply device to the inside of the tub so that the laundry soaks in the water coming up from the bottom of the tub, or the water is supplied directly to the laundry in the rotary drum through an opening formed through the front surface of the rotary drum so that the laundry soaks in the water.

[0004] In a front water supply structure of the above washing machine in which the water is supplied from the opening of the rotary drum directly to the laundry, warm water (at a temperature of approximately 57.2°C) directly contacts the laundry, thereby degenerating contaminants of the laundry and deteriorating the washing performance of the washing machine.

[0005] Further, when the warm water directly contacts the surface of laundry made of a material with poor heat resistance, such as wool, silk or delicate clothes, the warm water damages the laundry and causes detergent to stick to the laundry, thereby generating spots on the laundry.

[0006] Illustrative, non-limiting embodiments of the present invention aim to overcome the above disadvantages and/or other disadvantages not described above. In addition, the present invention is not required to overcome the disadvantages described above, and an illustrative, non-limiting embodiment of the present invention may not overcome any of the problems described above.

[0007] Therefore, one aim of preferred embodiments of the invention is to provide a washing machine for supplying cold water to laundry for sufficiently soaking the laundry and then supplying warm water at a high temperature to the laundry thereby preventing contaminants from degenerating, and a method for controlling the supply of water of the washing machine.

[0008] Another aim of preferred embodiments of the invention is to provide a washing machine for preventing laundry made of a material having poor heat resistance from becoming stained and damaged by warm water of a high temperature when the laundry is washed.

[0009] In accordance with one aspect, the present Invention provides a method for controlling the supply of water of a washing machine comprising a determination

of whether or not a water supply operation is selected; supplying cold water to soak laundry when it is determined that the water supply operation is selected; and supplying warm water after the soaking of the laundry in the cold water to prevent contaminants of the laundry from degenerating.

[0010] Preferably, the water supply operation may be a water supply step of a washing operation.

[0011] Further, preferably, the cold water may be supplied for a predetermined time, and the predetermined time may be set according to the quantity of the laundry.

[0012] Moreover, preferably, the cold and warm water may be supplied after the soaking of the laundry in the cold water, so that the level of the supplied water reaches a predetermined level, and the predetermined level may be a quantity of the washing water set according to the quantity of the laundry.

[0013] Preferably, the cold and warm water is supplied after the soaking of the laundry in the cold water, so that the temperature of the supplied water reaches a predetermined temperature, and the predetermined temperature may be a temperature set by a user.

[0014] In accordance with a further aspect, the present invention provides a method for controlling the supply of water of a washing machine having a rotary drum for containing laundry comprising a determination of whether or not a water supply operation is selected; supplying cold water to soak the laundry when it is determined that the water supply operation is selected; and supplying cold water and warm water after the soaking of the laundry in the cold water to control the level and the washing temperature of the supplied water.

[0015] Preferably, a motor drives the rotary drum during the soaking of the laundry in the cold water.

[0016] Preferably, the level and the washing temperature of the supplied water may be controlled by simultaneously or alternately supplying the warm water and the cold water.

[0017] In accordance with another aspect, the present Invention provides a method for controlling the supply of water of a washing machine, in which cold water or warm water is supplied directly to laundry, comprising a determination of whether or not a water supply operation is selected; supplying cold water for a designated time to soak the laundry when it is determined that the water supply operation is selected; simultaneously supplying cold water and warm water after the soaking of the laundry in the cold water so that the level of the supplied water reaches a predetermined level; and alternately supplying cold water and warm water after the soaking of the laundry in the cold water so that the temperature of the supplied water reaches a predetermined washing temperature.

[0018] In accordance with yet another aspect, the present invention provides a method for controlling the supply of water of a washing machine having a rotary drum for containing laundry comprising: a water supply unit for supplying cold water or warm water directly to the

laundry; and a control unit for controlling supply of water when a water supply operation is selected so that cold water is first supplied to the rotary drum to soak the laundry and warm water is then supplied to the rotary drum.

[0019] The control of the supply of the water may be performed during a washing operation.

[0020] Further, the control unit may control the water supply unit so that cold and warm water is simultaneously supplied to the rotary drum after the soaking of the laundry in cold water and the level of the supplied water reaches a predetermined level.

[0021] Moreover, the control unit may control the water supply unit so that cold water and warm water are alternately supplied to the rotary drum after the soaking of the laundry in cold water and the temperature of the supplied water reaches a predetermined temperature.

[0022] In accordance with a still further aspect of the present invention, there is provided a washing machine having a rotary drum for containing laundry comprising: a water supply unit for supplying cold water or warm water directly to the laundry; and a control unit for controlling supply of water, wherein when a water supply operation is selected, cold water is first supplied to the rotary drum to soak the laundry and warm water is then supplied to the rotary drum.

[0023] Further features of the present invention are set out in the appended claims.

[0024] The present invention will become apparent and more readily appreciated from the following description of the illustrative, non-limiting embodiments, taken in conjunction with the accompanying drawings in which:

FIG. 1 is a sectional view of a washing machine consistent with an exemplary embodiment of the present invention;

FIG. 2 is a block diagram of an apparatus for controlling the supply of water of the washing machine consistent with an exemplary embodiment of the present invention; and

FIG. 3 is a flow chart illustrating a method for controlling the supply of water of the washing machine consistent with an exemplary embodiment of the present invention.

[0025] Reference will now be made in detail to an illustrative, non-limiting embodiment of the present invention, an example of which is illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout. The illustrative, non-limiting embodiment is described below to explain the present invention by referring to the annexed drawings.

[0026] FIG. 1 is a sectional view of a washing machine consistent with an exemplary embodiment of the present invention.

[0027] In FIG. 1, the washing machine of an embodiment of the present invention comprises a drum-shaped tub 11 installed in a main body 10 for containing washing water, and a rotary drum 12 rotatably installed in the tub

11.

[0028] The tub 11 slopes toward the installation ground of the washing machine at a designated angle (α) so that a front surface 11a of the tub 11, through which an opening 11b is formed, is located at a position higher than that of the rear surface 11c of the tub 11. The rotary drum 12 installed in the tub 11 has the same structure as that of the tub 11 so that a front surface 12a of the rotary drum 12, through which an opening 12b is formed, is located at a position higher than that of the rear surface 12c of the rotary drum 12.

[0029] That is, the front surface 12a of the rotary drum 12 provided with the opening 12b ascends forward in a slantwise fashion such that a rotary central line A of the rotary drum 12 meets the installation ground of the washing machine at the designated angle (α). Here, since a rotary shaft 13, connected to the central portion of the rear surface 12c of the rotary drum 12, is rotatably supported by the central portion of the rear surface 11c of the tub 11, the rotary drum 12 is rotated in the tub 11.

[0030] A plurality of through holes 12d are formed through the cylindrical surface of the rotary drum 12, and a plurality of lifters 14 for lifting and dropping the laundry when the rotary drum 12 is rotated are installed on the inner surface of the rotary drum 12.

[0031] A motor 15 serving as a driving device for rotating the rotary shaft 13 connected to the rotary drum 12 is installed outside the rear surface 11c of the tub 11. The motor 15 comprises a stator 15a fixed to the rear surface 11c of the tub 11, a rotor 15b rotatably disposed outside the stator 15a, and a rotary plate 15c connecting the rotor 15b and the rotary shaft 13.

[0032] An opening 16 is formed through the front surface of the main body 10 at a position corresponding to the opening 12b of the rotary drum 12 and the opening 11b of the tub 11 so that the laundry is inserted into or taken out of the rotary drum 12 through the opening 16. A door 17 for opening and closing the opening 16 is installed on the front surface of the main body 10.

[0033] A detergent supply device 18 for supplying detergent and a water supply device 20 for supplying washing water are installed above the tub 11. A drainage device 19 comprising a drainage pipe 19a, a drainage valve 19b and a drainage pump 19c for discharging water from the inside of the tub 11 to the outside of the tub 11 is installed below the tub 11.

[0034] The detergent supply device 18 comprises a space for containing the detergent, and is installed in the front surface of the main body 10 so that a user can easily put the detergent into the detergent supply device 18.

[0035] The water supply device 20 comprises cold and warm water supply pipes 21 and 22 for respectively supplying cold water and warm water, and cold and warm water valves 23 and 24, respectively installed in the cold and warm water supply pipes 21 and 22, for controlling the supply of the water to the cold and warm water supply pipes 21 and 22.

[0036] Here, the cold and warm water supply pipes 21

and 22 are connected to the detergent supply device 18 so that water is supplied from the outside to the detergent supply device 18. A separate water supply pipe 25 is installed between the detergent supply device 18 and the tub 11 so that the water, passed through the detergent supply device 18, is supplied to the tub 11, and a water supply nozzle 26 is installed at the outlet of the water supply pipe 25. The above structure causes the water supplied to the inside of the tub 11 to pass through the detergent supply device 18, thereby causing the detergent in the detergent supply device 18 to be supplied to the tub 11.

[0037] FIG. 2 is a block diagram of an apparatus for controlling the supply of water of the washing machine in accordance with an embodiment of the present invention. The apparatus comprises a signal input unit 100, a water level sensing unit 110, a temperature sensing unit 120, a control unit 130 and an operating unit 140.

[0038] The signal input unit 100 serves to input operating data, such as a washing course, a washing temperature, a dehydration speed, and whether or not a rinsing operation is added, which are selected by a user, to the control unit 130. The water level sensing unit 110 serves to sense the level of the washing water supplied to the tub 11, and the temperature sensing unit 120 serves to sense the temperature of the washing water supplied to in the tub 11.

[0039] The control unit 130 is a microcomputer for controlling the operation of the cold and warm water valves 23 and 24 according to the operating data inputted from the signal input unit 100 and the values sensed by the water level sensing unit 110 and the temperature sensing unit 120. The control unit 130 includes a timer for counting operating times of the cold and warm water valves 23 and 24, and a read-only memory for storing data, such as predetermined times and predetermined water levels according to quantities of the laundry.

[0040] The control unit 130 first supplies cold water to soak the laundry, thereby preventing the laundry from degenerating when warm water at a high temperature is supplied to the laundry. The control unit 130 secondarily supplies cold water and warm water simultaneously to soak the laundry, thereby causing the supplied water to have a temperature between the temperature of the cold water and the temperature of the warm water. The control unit 130 thirdly supplies cold water and warm water in an alternating fashion, thereby controlling the washing temperature.

[0041] The operating unit 140 drives the motor 15, the cold water valve 23, the warm water valve 24, the drainage valve 19b and the drainage pump 19c according to a driving control signal of the control unit 130.

[0042] Hereinafter, the operation and function of the above washing machine of the present invention and a method for controlling the supply of water of the washing machine will be described.

[0043] FIG. 3 is a flow chart illustrating a method for controlling the supply of water of the washing machine

in accordance with an embodiment of the present invention.

[0044] When a user puts laundry into the rotary drum 12 and selects the operating data, such as a washing course, a washing temperature, a dehydration speed, and whether or not a rinsing operation is added, according to materials of the laundry, the operating data selected by the user are inputted to the control unit 130 through the signal input unit 100 (S100).

[0045] Then, in order to prevent contaminants of the laundry from degenerating due to the warm water of a high temperature (approximately 57.2°C) in the first supply of cold water, the control unit 130 drives the operating unit 140 to open the cold water valve 23 so that cold water (at a temperature of approximately 15.6°C) is supplied to the inside of the tub 11 through the cold water supply pipe 21 (S110).

[0046] In the above supply of cold water, the control unit 130 drives the operating unit 140 to drive the motor 15 so that the rotary drum 12 is rotated at a predetermined number of revolutions per minute and a predetermined operation ratio (on/off ratio), thereby causing the laundry to soak in cold water by force for lifting the laundry in the rotary drum 12 and dropping the laundry.

[0047] Here, the turning-on time of the cold water valve 23 is checked, and it is determined whether or not the turning-on time of the cold water valve 23 exceeds a predetermined time (time set by the quantity of the laundry for preventing the contaminants of the laundry from degenerating, due to the supply of warm water of the high temperature, by soaking the laundry in the first-supplied cold water) (S120).

[0048] When the turning-on time of the cold water valve 23 exceeds the predetermined time, in order to perform the second simultaneous supply of the cold and warm water to soak the laundry, the control unit 130 drives the operating unit 140 to simultaneously open the cold water valve 23 and the warm water valve 24 so that cold water and warm water are simultaneously supplied to the inside of the tub 12 through the cold and warm water supply pipes 21 and 22 (S130).

[0049] In the above simultaneous supply of cold and warm water, in order to sense the level of the washing water supplied to the tub 11, the level of the washing water is sensed, and it is determined whether or not the level of the washing water reaches a predetermined level (level set by the quantity of the laundry for allowing the supplied water to have a temperature half of a predetermined temperature by soaking the laundry in the simultaneously supplied-cold and warm water) (S140).

[0050] When the level of the washing water reaches the predetermined level, in order to adjust the washing temperature by alternating the supply of cold and warm water, the control unit 130 drives the operating unit 140 to alternate the opening and closing of the cold water valve 23 and the warm water valve 24 so that cold water and warm water are alternately supplied to the inside of the tub 11 through the cold and warm water supply pipes

21 and 22 (S150).

[0051] In the above alternating supply of cold and warm water, the temperature of the washing water supplied to the tub 11 is sensed, and it is determined whether or not the sensed temperature of the washing water reaches a predetermined temperature (the washing temperature) (S160).

[0052] When the sensed temperature of the washing water reaches the predetermined temperature, the control unit 130 commands the operating unit 140 to close the cold water valve 23 and the warm water valve 24 so that the supply of the water to the cold and warm water supply pipes 21 and 22 is stopped (S170).

[0053] After the supply of the water is stopped, the control unit 130 drives the operating unit 140 to drive the motor 15 so that the rotary drum 12 is rotated at a low speed and other remaining operations (washing, rinsing, and dehydrating operations) are performed according to the selected washing course (S180).

[0054] As apparent from the above description, preferred embodiment of the present invention provide a washing machine for supplying cold water to laundry for sufficiently soaking the laundry and then supplying warm water at a high temperature to the laundry, and a method for controlling the supply of water of the washing machine, thereby preventing contaminants from degenerating, and preventing the laundry made of a material having poor heat resistance from being stained and being damaged by warm water of the high temperature directly contacting the laundry when the laundry is washed.

[0055] Although an embodiment of the invention has been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.

[0056] Attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

[0057] All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

[0058] Each feature disclosed in this specification (including any accompanying claims, abstract and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

[0059] The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features

disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. A method for controlling the supply of water of a washing machine comprising:

determining whether or not a water supply operation is selected;
supplying cold water to soak laundry when it is determined that the water supply operation is selected; and
supplying warm water after the soaking of the laundry in the cold water to prevent contaminants of the laundry from degenerating.

2. The method as set forth in claim 1, wherein the water supply operation is a water supply step of a washing operation.

3. The method as set forth in claim 1 or claim 2, wherein cold water is supplied for a predetermined time.

4. The method as set forth in claim 3, wherein the predetermined time is set according to the quantity of the laundry.

5. The method as set forth in any preceding claim, wherein cold and warm water is supplied, after the soaking of the laundry in cold water, so that the level of the supplied water reaches a predetermined level.

6. The method as set forth in claim 5, wherein the predetermined level is a quantity of the washing water set according to the quantity of the laundry.

7. The method as set forth in any preceding claim, wherein cold and warm water is supplied, after the soaking of the laundry in the water, so that the temperature of the supplied water reaches a predetermined temperature.

8. The method as set forth in claim 7, wherein the predetermined temperature is a temperature set by a user.

9. A method for controlling the supply of water of a washing machine having a rotary drum for containing laundry comprising:

determining whether or not a water supply operation is selected;
supplying cold water to soak the laundry when it is determined that the water supply operation

- is selected; and
supplying cold water and warm water, after the soaking of the laundry in cold water, to control the level and the washing temperature of the supplied water.
10. The method as set forth in claim 9, wherein a motor drives to rotate the rotary drum during the soaking of the laundry in cold water.
11. The method as set forth in claim 9 or claim 10, wherein the level and the washing temperature of the supplied water are controlled by simultaneously or alternately supplying warm water and cold water.
12. A method for controlling the supply of water of a washing machine, in which cold water or warm water is supplied directly to laundry, comprising:
- determining whether or not a water supply operation is selected;
supplying cold water for a designated time to soak the laundry when it is determined that the water supply operation is selected;
simultaneously supplying cold water and warm water, after the soaking of the laundry in cold water, so that the level of the supplied water reaches a predetermined level; and
alternately supplying cold water and warm water, after the soaking of the laundry in cold water, so that the temperature of the supplied water reaches a predetermined washing temperature.
13. A washing machine having a rotary drum (12) for containing laundry comprising:
- a water supply (20) unit for supplying cold water or warm water directly to the laundry; and
a control unit (130) for controlling supply of water, wherein when a water supply operation is selected, cold water is first supplied to the rotary drum to soak the laundry and warm water is then supplied to the rotary drum.
14. The washing machine as set forth in claim 13, wherein the control of the supply of the water is performed during a washing operation.
15. The washing machine as set forth in claim 13 or claim 14, wherein the control unit (130) controls the water supply unit (20) so that cold and warm water is simultaneously supplied to the rotary drum (12) after the soaking of the laundry in cold water and the level of the supplied water reaches a predetermined level.
16. The washing machine as set forth in any one of claims 13-14, wherein the control unit (130) controls the water supply unit (20) so that cold water and warm water are alternately supplied to the rotary drum (12) after the soaking of the laundry in the water and the temperature of the supplied water reaches a predetermined temperature.
17. The washing machine as set forth in any one of claims 13-16, wherein the water supply unit (20) comprises:
- a cold water valve (23) opens or closes based on a command from an operating unit (140); and
a hot water valve (24) that opens or closes based on a command from the operating unit.
18. The washing machine as set forth in claim 17, wherein the water supply unit (20) further comprises a detergent supply device (18).
19. The washing machine as set forth in any one of claims 13-18, wherein the control unit (130) comprises a read-only memory for storing data associated with predetermined times for supplying hot and cold water and predetermined water levels according to a quantity of laundry.

FIG. 1

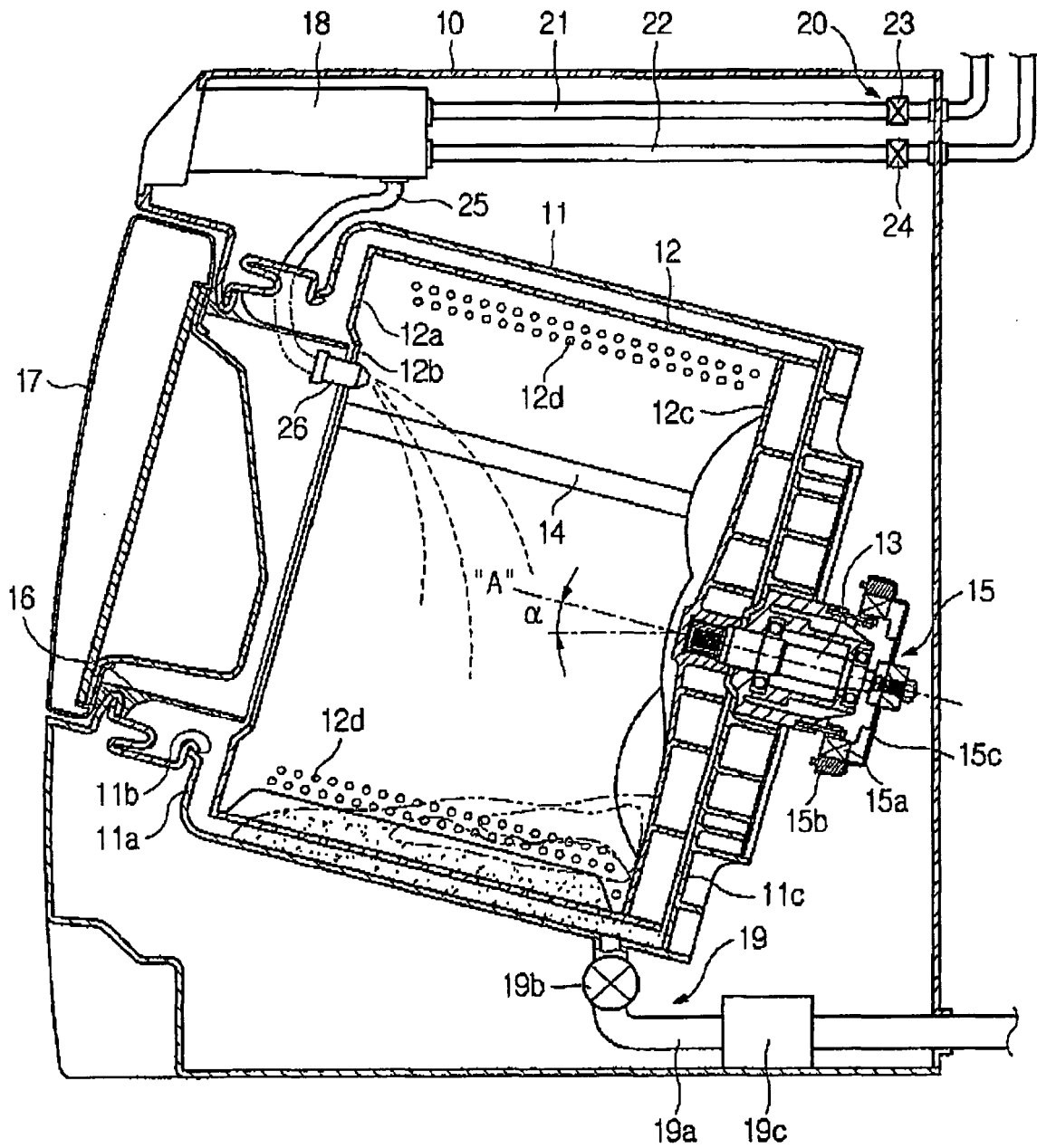


FIG. 2

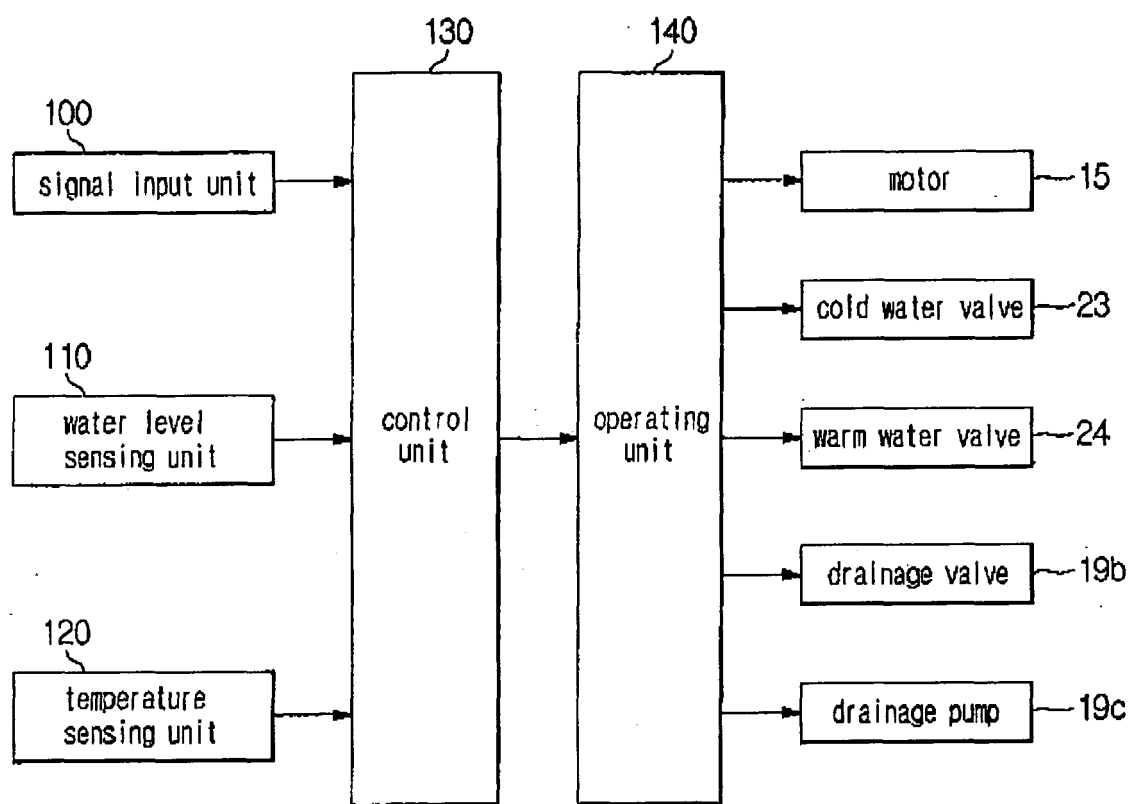
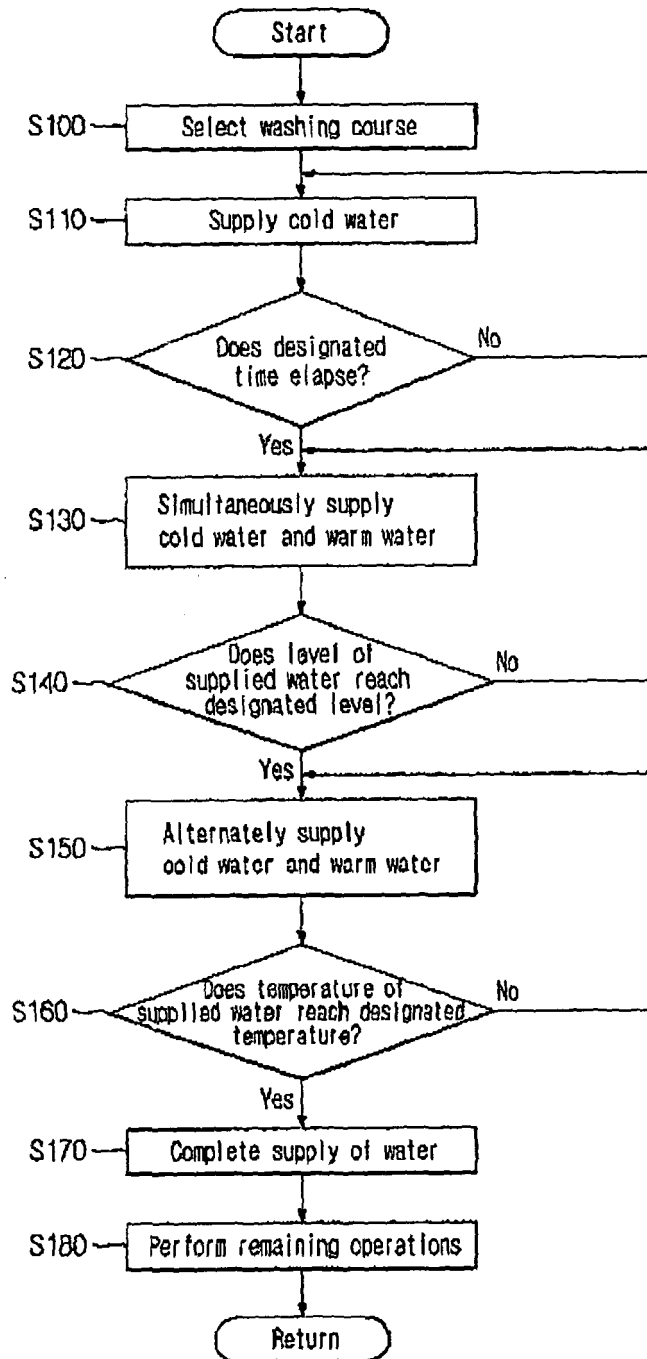


FIG. 3





European Patent
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Place of search Munich		Date of completion of the search 4 April 2006	Examiner Falkentoft, C
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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