



(11) **EP 1 831 447 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
01.10.2014 Bulletin 2014/40

(51) Int Cl.:
D06F 35/00 ^(2006.01) *D06F 25/00* ^(2006.01)
D06F 33/02 ^(2006.01)

(21) Application number: **05821916.3**

(86) International application number:
PCT/KR2005/004448

(22) Date of filing: **22.12.2005**

(87) International publication number:
WO 2006/071022 (06.07.2006 Gazette 2006/27)

(54) **CONTROL METHOD FOR A DRUM WASHING MACHINE**

BETRIEBSVERFAHREN FÜR EINE TROMMELWASCHMASCHINE

PROCEDE DE COMMANDE POUR UNE MACHINE A LAVER A TAMBOUR

(84) Designated Contracting States:
DE ES FR GB IT

(30) Priority: **30.12.2004 KR 20040116166**

(43) Date of publication of application:
12.09.2007 Bulletin 2007/37

(73) Proprietor: **LG Electronics Inc.**
Seoul 150-721 (KR)

(72) Inventor: **LYU, Jae Cheol**
101-1301, Woosung Apt,
Gyeongsangnam-do 641-934 (KR)

(74) Representative: **Urner, Peter**
Ter Meer Steinmeister & Partner
Mauerkircherstrasse 45
81679 München (DE)

(56) References cited:
WO-A1-03/021027 WO-A1-2004/106614
WO-A1-2004/106614 US-A- 5 987 679
US-A1- 2004 154 645 US-A1- 2004 154 645

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

Technical Field

[0001] The present invention relates to a drum washing machine, and more particularly, to a control method for a drum washing machine capable of economizing in washing water as well as in electric power through enhancing a control method thereof.

Background Art

[0002] Generally, a control method for a drum washing machine is that washing is performed by using friction power between a drum rotating by a motor and cloth item, cloths and beddings (hereinafter, "the laundry" in a state of the laundry being introduced within the drum. Thereby, during a washing cycle, the laundry may get little damage, may not be tangled, and washing efficiency may be enhanced.

[0003] FIGS. 1 and 2 schematically illustrate a related art structure of the conventional drum washing machine.

[0004] That is, referring to FIGS. 1 and 2, the conventional drum washing machine includes a body case 10, a tub 20 provided within the body case 10, a drum 20 rotatably mounted within the tub 20 and a driving part for driving the drum 30.

[0005] An opening 11 is formed in front of the body case 10, and is in communication with the drum 30.

[0006] Also, a door 40 is mounted at a surrounding portion of the opening 11 for opening/ closing the opening 11.

[0007] Furthermore, there are provided a water supply valve 14 connected with an external water pipe and a detergent chamber assembly 15 connected with the water supply valve 14.

[0008] The detergent chamber assembly 15 is connected with the tub 20 for drawing water from the water supply pipe into the tub 20.

[0009] A damper 21 is connected with a downside of an outer circumferential surface of the tub 20, and supported in the body case 10.

[0010] The damper 21 dampens vibrations generated in an operation of the drum washing machine.

[0011] The driving part includes a motor 71 for driving the drum 30, a belt 72 connected with belt pulleys 73 and 74 for transmitting driving force of the motor 71 to the drum 30.

[0012] According the conventional drum washing machine, a washing, rinsing and dehydrating cycle is performed in order by a controller (not shown), once there is a user's request for washing the laundry.

[0013] In the washing cycle, after a predetermined amount of washing water is introduced into the tub together with detergent of the detergent chamber assembly, the drum rotates with the laundry.

[0014] Hence, dirt is separated not only by detergent but also by friction between the laundry and the drum 30.

[0015] In the rinsing cycle, fresh washing water is supplied and the drum 30 rotates consistently to separate remaining detergent from the washing cycle and dirt from the laundry.

5 [0016] In the dehydrating cycle, the drum 30 rotates at a high speed (approximately 800 ~ 1300 RPM) to dehydrate the laundry.

[0017] However, the conventional drum washing machine may cause a problem of wasting washing water and detergent, and another problem of consumption of much more power than necessary.

[0018] Therefore, there have been efforts of developing a washing method adding functions economizing in power as well as in washing water.

15 [0019] WO 2004/106614 A1 relates to a method for washing laundry in a washing machine, including the steps of supplying predetermined amounts of washing water and detergent to an outer tub and an inner tub in the outer tub for holding laundry according to an amount of the laundry, and rotating the inner tub and a pulsator in the inner tub at a predetermined speed by a motor to wash the laundry by a centrifugal force.

Disclosure of Invention

Technical Problem

25 [0020] An object of the present invention devised to solve the problem lies on is to provide a control method for a drum washing machine capable of not only economizing in power and washing water but also enhancing washing efficiency.

Technical Solution

35 [0021] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a control method for a drum washing machine includes steps of sensing an amount of the laundry introduced within a drum; pre-determining a water level based on the sensed amount of the laundry; supplying an amount of washing water smaller than the predetermined water level, but enough to dampen the laundry as well as to cause pumping circulation; a first washing for washing the laundry roughly by means of circulating the small amount of the washing water; re-supplying washing water to the predetermined water level; and a second washing for washing the laundry with rotating the drum in a state without pumping circulation.

50 [0022] The step of the first washing includes a step of heating washing water.

[0023] Also, the step of the first washing is preformed by pumping-circulating and directly spraying washing water to the laundry.

55 [0024] In the step of the first washing, the step of heating washing water and the step of pumping-circulating washing water are performed alternatively.

[0025] Furthermore, the step of the first washing is performed for a predetermined period of time.

[0026] Still further, the step of heating washing water is performed to a predetermined temperature.

Advantageous Effects

[0027] First, a control method for a drum washing machine according to the present invention has an advantageous effect of economizing in washing water as well as in power, because washing is performed in an order of supplying a small amount of washing water and pumping-circulating washing water.

[0028] Second the control method for the drum washing machine according to the present invention has another advantageous effect that it is possible to sterilize the laundry, because washing water is heated as well as pumping-circulating washing water.

[0029] Third, the control method for the drum washing machine according to the present invention has another advantageous effect that it is possible to soak the laundry several times for separating dirt from the laundry more smoothly, because pumping-circulating water and heating water are performed alternatively.

[0030] Finally, the control method for the drum washing machine according to the present invention has another advantageous effect of enhancing washing efficiency as well as separating dirt, because a step is added in which washing water is re-supplied as much as a sensed amount of the laundry with rotating a drum.

Brief Description of the Drawings

[0031] The accompanying drawings, which are included to provide a further understanding of the invention, illustrate embodiments of the invention and together with the description serve to explain the principle of the invention.

[0032] In the drawings:

FIG. 1 is a longitudinally sectional view illustrating an inner structure of a related art drum washing machine.

FIG. 2 is a diagram from a front view of the inner structure of the related art drum washing machine.

FIG. 3 is a schematic diagram from a front view of an inner structure of a drum washing machine according to the present invention.

FIG. 4 is a longitudinally sectional view of the drum washing machine illustrated in FIG. 3.

FIG. 5 is a flow chart illustrating a control method for the drum washing machine according to the present invention.

Best Mode for Carrying Out the Invention

[0033] Reference will now be made in detail to the preferred embodiments of the present invention, examples

of which are illustrated in the accompanying drawings.

[0034] Referring to FIGS. 3 and 4, a preferred embodiment of the present invention will be described. First, a body case 110 is provided for defining an exterior of a drum washing machine.

[0035] A tub 120 is mounted within the body case 110 for holding washing water, and is supported in the body case 110.

[0036] A damper 148 is provided between the tub 120 and the body case 110 for dampening vibrations generated in an operation of the drum washing machine.

[0037] Also, a drum 130 is rotatably mounted within the tub 120 for having the laundry introduced therein.

[0038] As shown in FIG. 4, the drum 130 is in communication with an outside and has an opened side thereof, which is disposed toward an opening 110 of the body case 110.

[0039] A door 140 is provided at a portion where the opening 110 of the body case 110 is formed. Also, a gasket 150 is provided at an inner circumferential surface of the opening 111 for airtightness between the door 140 and the opening 111.

[0040] Furthermore, a plurality of penetrating holes (not shown) is formed along a circumferential surface of the drum 130 for drawing washing water and steam into the drum 130.

[0041] Still further, a dispenser 200 is provided for supplying detergent and washing water into the tub 120, and a water supply valve 118 is connected thereto.

[0042] The water supply valve 118 is connected with an external water pipe (not shown) for drawing cooling water into the drum washing machine.

[0043] The dispenser 200 is provided within the body case 110 and capable of filling up detergent.

[0044] A water supplying pipe 210 is provided in the dispenser 200 for supplying washing water into the tub 120.

[0045] A circulating pump 400 is provided in a lower portion of the drum washing machine for circulating washing water within the tub 120.

[0046] There is a circulating channel pipe 410 between the circulating pump 400 and the tub 120, which draws washing water discharged into the lower portion of the tub 120 and re-discharges the washing water to a second side of the circulating pump 400 to re-draw it into the tub 120.

[0047] That is, the circulating pump 400 pumps so as to re-discharge drawn washing water, and the washing water discharged from the circulating pump 400 passes upwardly through a circulating channel pipe 410 to be re-discharged at an upper front of the tub 120.

[0048] As shown in FIG. 4, preferably, the circulating channel pipe 410 is provided at the gasket 150 in an upper front of the tub so that washing water may be sprayed into the tub 120.

[0049] That is, a spray unit 415 is provided at the gasket 150 in an upper front of the tub 120 so as to spray washing water into the tub 120.

[0050] On the other hand a heater 500 is mounted in a downside of the tub 120 for enabling the laundry to be sterilized by boiling washing water.

[0051] Then, the heater 500 is employed for soaking the laundry when re-circulating washing water to help dirt separated from the laundry, as well as for heating washing water for sterilizing the laundry.

[0052] Since water in a down surface of the tub 120 is re-circulated by the circulating pump 400 and the water is sprayed into the rotating drum 130, not only the laundry may be dampened equally but also washing water may be saved.

[0053] Preferably, a filter (not shown) is provided at the circulating pump 400 or the circulating channel pipe 410 for filtering dirt of the circulating washing water.

[0054] Furthermore, as shown in FIG. 4, some part of the circulating channel pipe 410 may be formed as bellows 412 so that the circulating channel pipe 410 may maintain its position with the tub 120 safely in spite of vibrations generated in the operation of the drum washing machine, and the bellows 412 may be made of rubber.

[0055] Though not shown in FIGS, a drain pipe (not shown) is provided in a lower portion of the drum washing machine for draining washing water after a washing or a rinsing cycle having been completed.

[0056] A control method for the drum washing machine according to the present invention described above will be described.

[0057] Referring to FIGS. 3 and 4 illustrating the drum washing machine according to the preferred embodiment of the present invention and FIG. 5 illustrating the control method for the drum washing machine according to the present invention, a user introduces the laundry into a drum 130 first of all.

[0058] Next, the amount of the laundry is sensed, which is loaded into the drum 130 (S11).

[0059] Hence, a washing water level is predetermined based on the sensed amount of the laundry (S21).

[0060] Since it is well-known to anyone skilled in the art, the method of sensing the amount of the laundry as well as predetermining washing water level will be omitted.

[0061] Next, a smaller amount of washing water than the predetermined amount thereof is supplied enough to dampen the laundry and to cause pumping circulation (S31).

[0062] That is, a controller (not shown) controls the dispenser 200 to draw the smaller amount of the washing water into the tub 120. Thereby, a process of initially supplying washing water may start.

[0063] At that time, the smaller amount of the washing water means that some of the smaller washing water is enough to dampen the laundry and the rest of the washing water is enough to prevent cavitation in a process of pumping washing water.

[0064] If cavitation occurs, air would be included in a process of pumping circulation only to cause noise as well as to deteriorate pumping efficiency.

[0065] Hence, a step of a first washing is performed, in which the smaller amount of the washing water is supplied and pumping-circulated by the circulation pump 400 to wash the laundry (S41).

[0066] In the step of the first washing, washing water having been pumping-circulated is sprayed directly to the laundry through the spray unit 415 within the drum washing machine.

[0067] Preferably, a step is further included in which the drum 130 rotates at the same time that the washing water is sprayed.

[0068] That is for equally dampening the laundry with the sprayed washing water by spraying the washing water and rotating the drum 120 at the same time.

[0069] On the other hand, the step of the first washing includes a step of heating supplied washing water by means of the heater 500.

[0070] The heater 500 helps the laundry sterilized, and also helps dirt separated from the laundry.

[0071] In that case, preferably the step of heating washing water and the step of pumping-circulating washing water are performed alternatively.

[0072] Also, the step of the first washing is performed for a predetermined period of time, and the step of heating washing water is performed only to a predetermined temperature. Thereby, it is possible to prevent laundry damage due to an over-increase of the temperature.

[0073] After completing the step of the first washing, washing water is re-supplied to the predetermined washing water level set based on the sensed amount of the laundry (S51).

[0074] That is, predetermined washing water is re-supplied to the small amount of the washing water supplied before to reach the washing water level, which is predetermined based on the sensed amount of the laundry.

[0075] Hence, a step of a second washing is performed with rotating the drum 130 in a state of not performing the pumping circulation in the step of the first washing (S61).

[0076] After the laundry is already soaked by pumping circulation and sterilized by heated washing water in the step of the first washing, the step of the second washing is performed. Thus, the amount of the detergent and washing water may be reduced as well as electric power economizing, compared with the related art washing method in which the laundry is washed after washing water is introduced to a predetermined level at beginning.

[0077] Once the washing processes described above are completed, a rinsing and dehydrating cycle is performed to finish an entire washing.

[0078] On the other hand, a control method of the drum washing machine according to the present invention has following effects.

[0079] First, once washing water is introduced at a small amount, the washing water is heater by a heater. That process is repeated to perform a soaking cycle several times. Thereby, an enhanced washing efficiency such as a sterilizing function may be given.

[0080] Also, the control method of the drum washing machine according to the present invention has another effect of economizing in washing water as well as in power, because a small amount of washing water is re-supplied in spray several times.

[0081] Furthermore, the control method of the drum washing machine according to the present invention may have another effect of preventing laundry damage caused by a drastic increase of the temperature as well as preventing the temperature of the drum from getting too high in washing, because supplying washing water, rotating the drum and heating washing water are performed alternatively.

[0082] For example, a drum washing machine with a drying function having an air circulating channel, a heater and a fan may include the circulating pump, the circulating channel pipe and the spray unit. Hence, once a small amount of washing water is introduced and heated, and then circulated. Thereby, a washing method same as the washing method of the present invention may be performed.

Industrial Applicability

[0083] The present invention relates to a control method for a drum washing machine.

[0084] Since an entire washing according to the present invention is performed in an enhanced method to economizing in washing water as well as electric power, the present invention has an industrial applicability.

Claims

1. A control method for a drum washing machine, which has a tub (120) for holding, washing water, a circulating pump (400) provided in a lower portion of the drum washing machine, for circulating washing water within the tub (120) and a circulating channel pipe (410) for drawing washing water discharged from the tub (120) and re-discharging the washing water into the tub (120), comprising the following steps:

sensing an amount of the laundry introduced within a drum (130);
 predetermining a water level based on the sensed amount of the laundry;
 supplying an amount of washing water smaller than the predetermined water level into the tub (120), but enough to dampen the laundry as well as to cause pumping circulation by the circulation pump (400);
 a first washing step for washing the laundry roughly by means of pumping-circulating said smaller amount of washing water by said circulation pump (400);
 re-supplying washing water to the predetermined water level; and

a second washing step for washing the laundry with rotating the drum (130) in a state without pumping circulation.

2. The control method for the drum washing machine of claim 1, wherein the first washing step comprises a step of heating washing water.
3. The control method for the drum washing machine of claim 1, wherein the first washing step is performed by pumping-circulating and directly spraying washing water to the laundry.
4. The control method for the drum washing machine of claim 2, wherein in the first washing step, the step of heating washing water and the step of pumping-circulating washing water are performed alternatively.
5. The control method for the drum washing machine of claim 1, wherein the first washing step is performed for a predetermined period of time.
6. The control method for the drum washing machine of claim 2, wherein the step of heating washing water is performed to a predetermined temperature.

Patentansprüche

1. Steuerverfahren für eine Trommelwaschmaschine, die einen Bottich (120), um Waschwasser zu halten, eine Zirkulationspumpe (400), die in einem unteren Abschnitt der Trommelwaschmaschine vorgesehen ist, um Waschwasser in dem Bottich (120) zirkulieren zu lassen, und ein Zirkulationskanalrohr (410), um Waschwasser, das aus dem Bottich (120) entleert wird, zu entnehmen und das Waschwasser wieder in den Bottich (120) zu entleeren, enthält, das die folgenden Schritte umfasst:

Erfassen einer Menge der in eine Trommel (130) eingeführten Wäsche;
 im Voraus Bestimmen eines Wasserpegels anhand der erfassten Wäschemenge;
 Zuführen einer Menge von Waschwasser, die geringer als der im Voraus bestimmte Wasserpegel ist, in den Bottich (120), die jedoch ausreicht, um die Wäsche zu befeuchten und eine Pumpzirkulation durch die Zirkulationspumpe (400) hervorzurufen;
 einen ersten Waschschrift zum groben Waschen der Wäsche mittels Pumpzirkulation der geringeren Menge von Waschwasser durch die Zirkulationspumpe (400);
 erneutes Zuführen von Waschwasser bis zu dem im Voraus bestimmten Wasserpegel; und
 einen zweiten Waschschrift zum Waschen der

Wäsche mittels Drehung der Trommel (130) in einem Zustand ohne Pumpzirkulation.

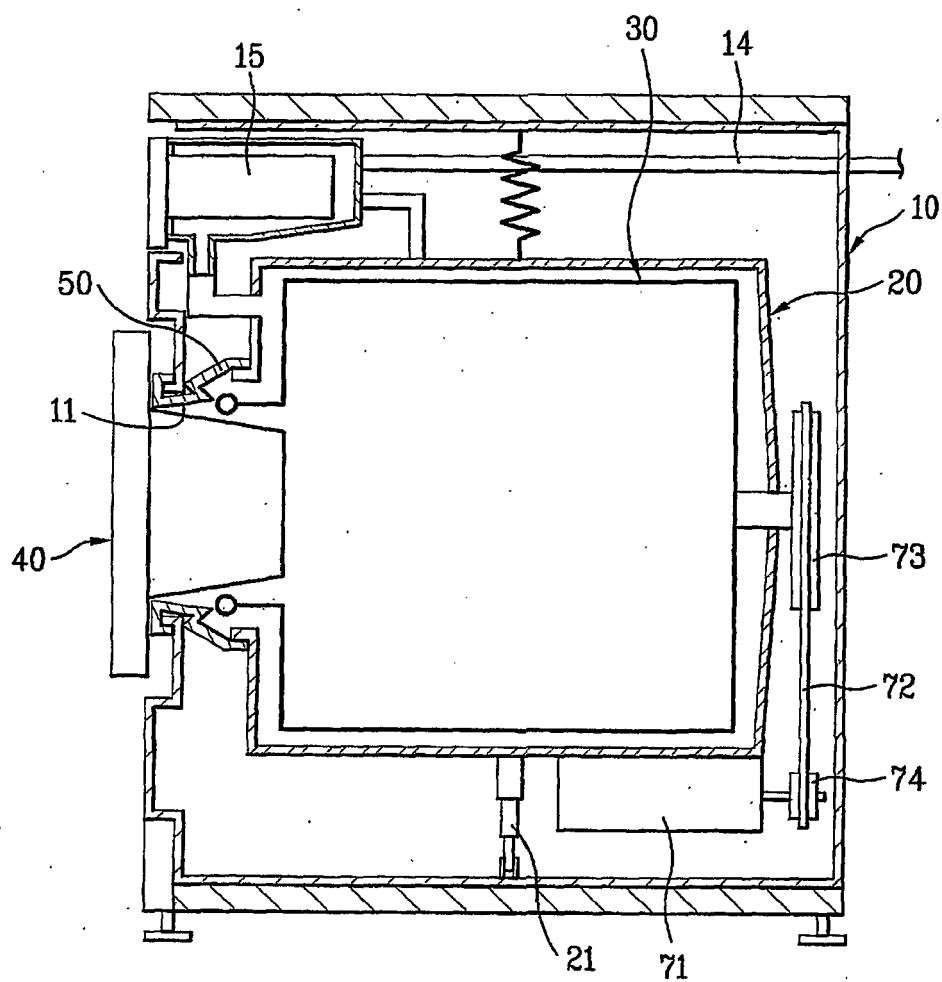
tout en faisant tourner le tambour (130) dans une situation sans circulation de pompage.

- | | | |
|--|--|--|
| <p>2. Steuerverfahren für die Trommelwaschmaschine nach Anspruch 1, wobei der erste Waschschrift einen Schritt des Erwärms von Waschwasser umfasst.</p> <p>3. Steuerverfahren für die Trommelwaschmaschine nach Anspruch 1, wobei der erste Waschschrift durch Pumpzirkulation und direktes Sprühen von Waschwasser auf die Wäsche ausgeführt wird.</p> <p>4. Steuerverfahren für die Trommelwaschmaschine nach Anspruch 2, wobei in dem ersten Waschschrift der Schritt des Erwärms von Waschwasser und der Schritt des Pumpzirkulierens von Waschwasser abwechselnd ausgeführt werden.</p> <p>5. Steuerverfahren für die Trommelwaschmaschine nach Anspruch 1, wobei der erste Waschschrift für eine vorgegebene Zeitdauer ausgeführt wird.</p> <p>6. Steuerverfahren für die Trommelwaschmaschine nach Anspruch 2, wobei der Schritt des Erwärms von Waschwasser bis auf eine vorgegebene Temperatur ausgeführt wird.</p> | <p>5</p> <p>10</p> <p>15</p> <p>20</p> <p>25</p> | <p>2. Procédé de commande pour la machine à laver à tambour selon la revendication 1, dans lequel la première étape de lavage comprend une étape consistant à chauffer l'eau de lavage.</p> <p>3. Procédé de commande pour la machine à laver à tambour selon la revendication 1, dans lequel la première étape de lavage est exécutée en faisant circuler par pompage et en pulvérisant directement l'eau de lavage sur le linge.</p> <p>4. Procédé de commande pour la machine à laver à tambour selon la revendication 2, dans lequel dans la première étape de lavage, l'étape consistant à chauffer l'eau de lavage et l'étape consistant à faire circuler l'eau de lavage par pompage sont exécutées en alternance.</p> <p>5. Procédé de commande pour la machine à laver à tambour selon la revendication 1, dans lequel la première étape de lavage est exécutée pendant une période temporelle prédéterminée.</p> <p>6. Procédé de commande pour la machine à laver à tambour selon la revendication 2, dans lequel l'étape de chauffage de l'eau de lavage est exécutée jusqu'à une température prédéterminée.</p> |
|--|--|--|

Revendications

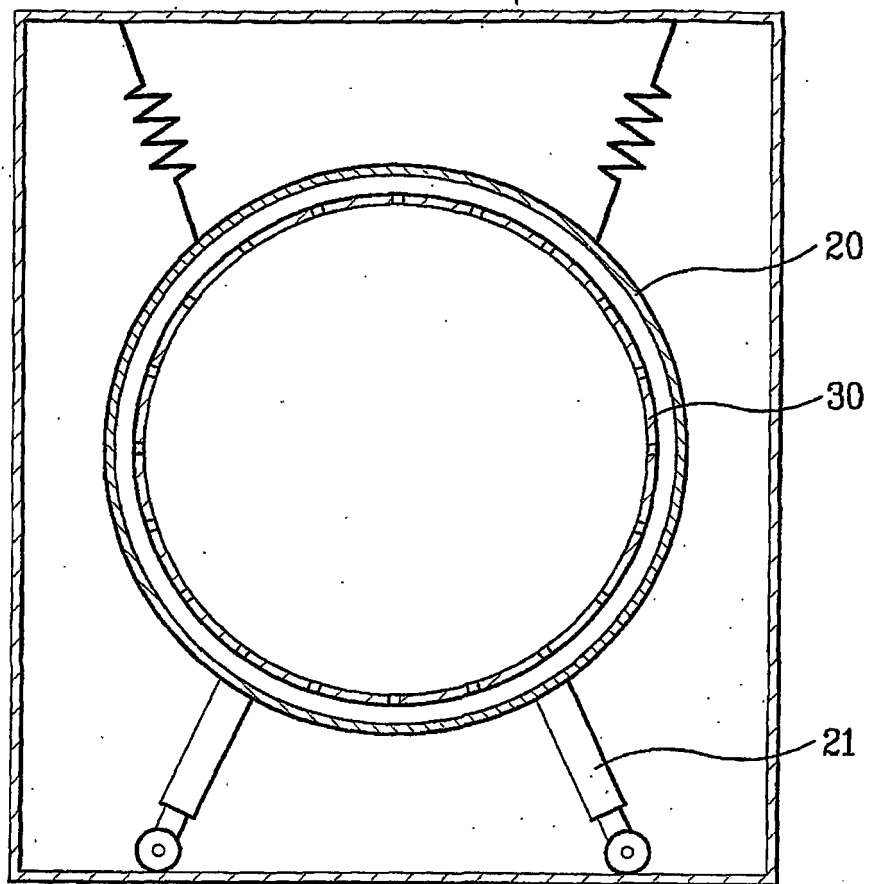
- | | |
|---|---|
| <p>1. Procédé de commande pour une machine à laver à tambour, qui comprend une cuve (120) pour contenir de l'eau de lavage, une pompe de circulation (400) prévue dans une portion inférieure de la machine à laver à tambour pour faire circuler l'eau de lavage dans la cuve (120), et un tube formant canal de circulation (410) pour aspirer l'eau de lavage déchargée hors de la cuve (120) et pour décharger à nouveau l'eau de lavage dans la cuve (120), comprenant les étapes suivantes :</p> <p>détection d'une quantité de linge à laver introduit dans un tambour (130) ;</p> <p>prédétermination d'un niveau d'eau en se basant sur la quantité détectée de linge à laver ;</p> <p>fourniture d'une quantité d'eau de lavage inférieure au niveau d'eau prédéterminé dans la cuve (120), mais suffisante pour humecter le linge ainsi que pour entraîner une circulation de pompage par la pompe de circulation (400) ;</p> <p>une première étape de lavage pour laver grossièrement le linge au moyen d'une circulation de ladite quantité inférieure d'eau de lavage par ladite pompe de circulation (400) ;</p> <p>réalimentation de l'eau de lavage jusqu'au niveau d'eau prédéterminé ; et</p> <p>une seconde étape de lavage pour laver le linge</p> | <p>30</p> <p>35</p> <p>40</p> <p>45</p> <p>50</p> <p>55</p> |
|---|---|

[Fig. 1]

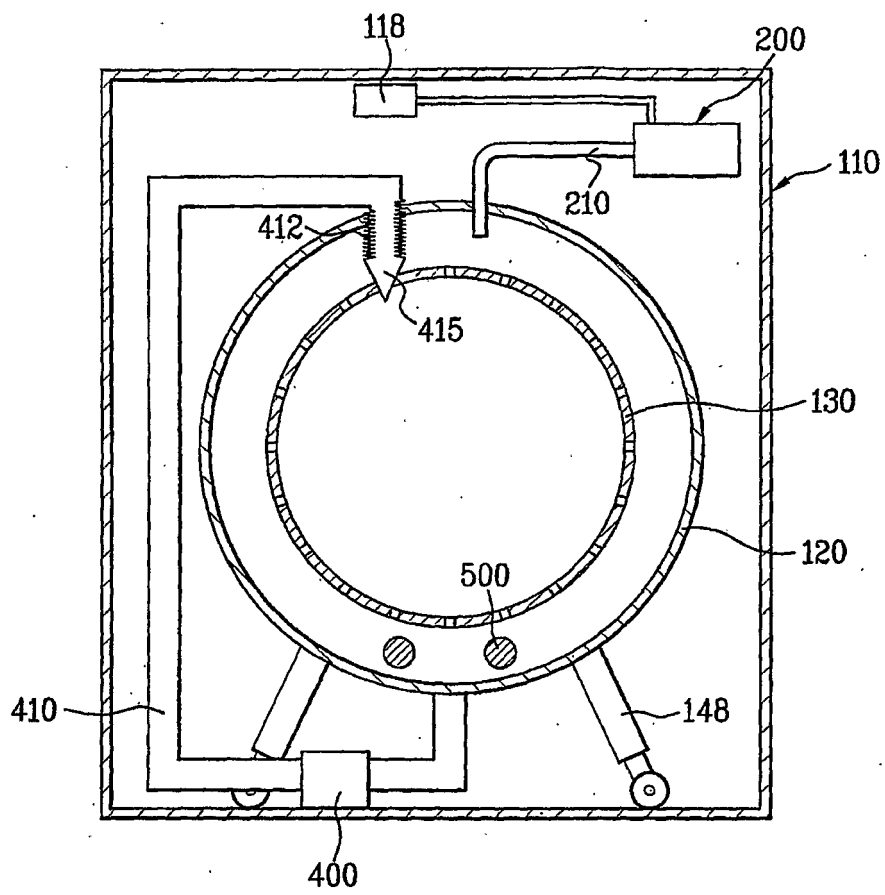


[Fig. 2]

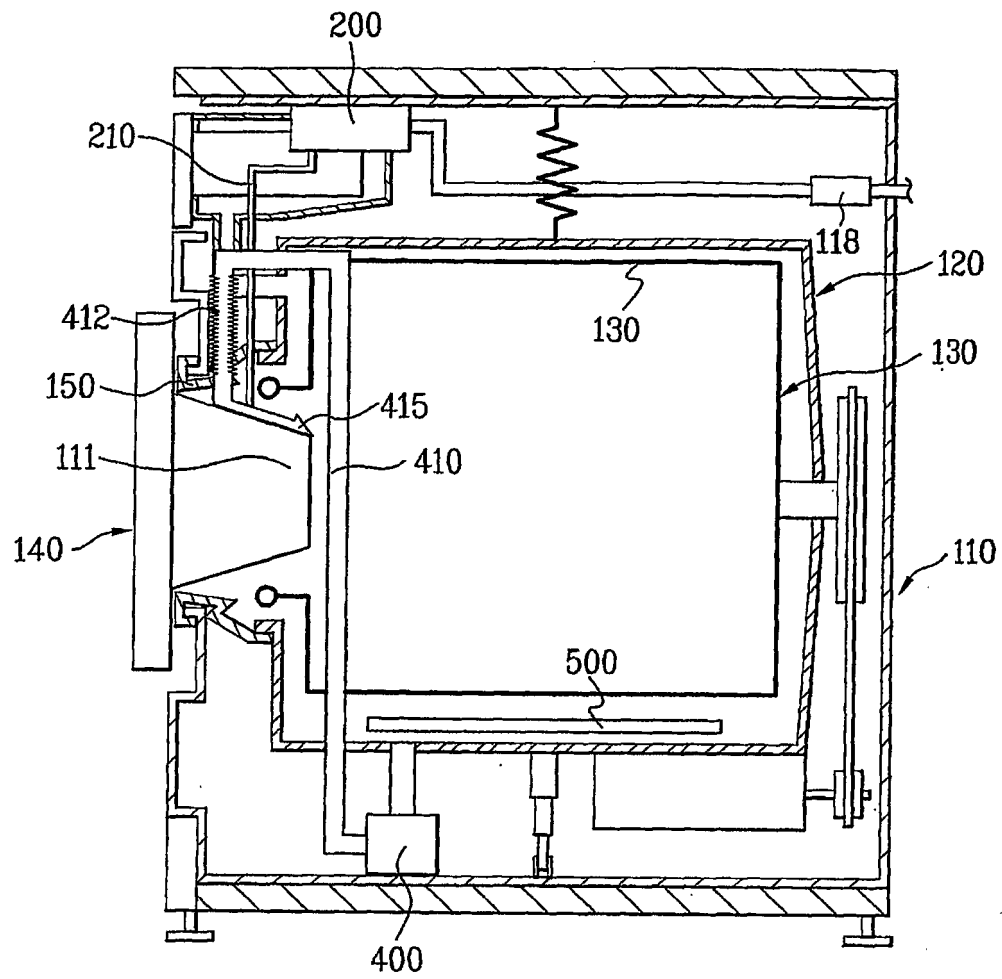
10



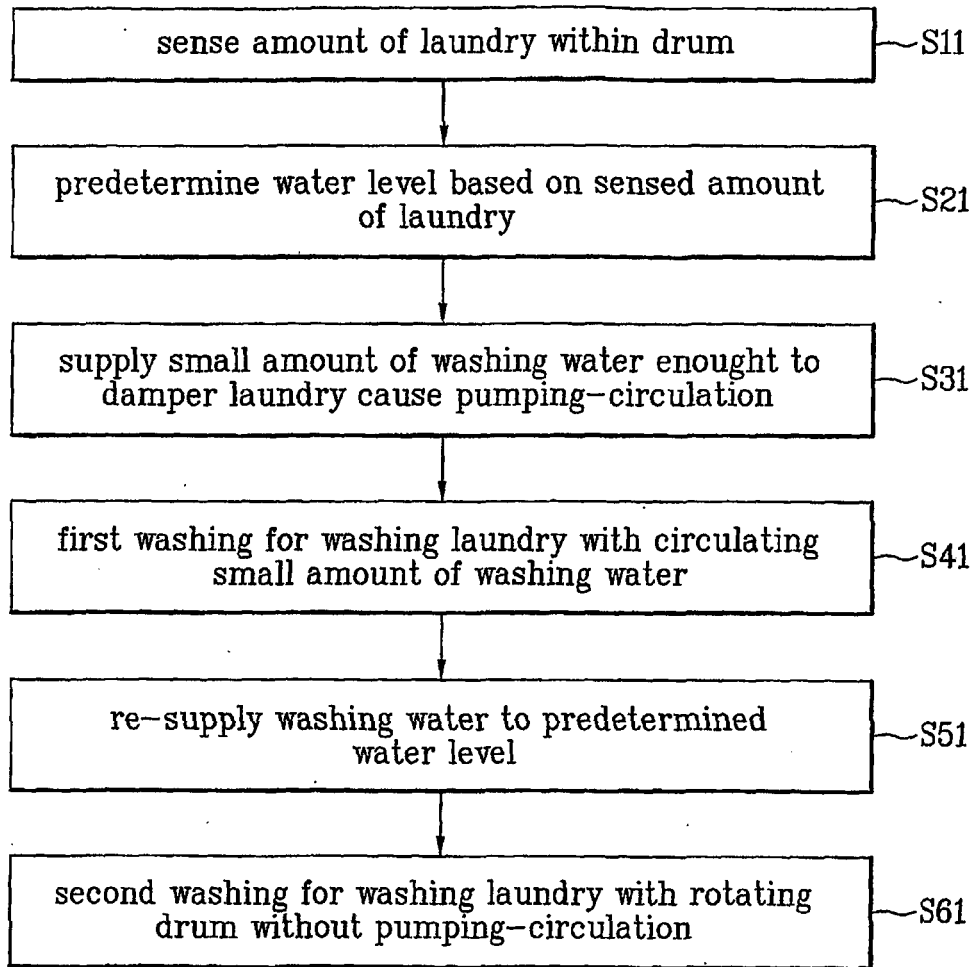
[Fig. 3]



[Fig. 4]



[Fig. 5]



REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2004106614 A1 [0019]