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(54) **A load measuring method for washing devices**

(57) A load measuring method for washing devices of the invention comprises following steps: taking an amount of water into the tub (1); measuring water level in the tub and recording (3); rotating the drum for a time (4); measuring water level in the tub again and recording (6); determining the difference of the values; determining (7) the ratio of the calculated difference to the time difference between the first measuring (3) and second measuring (6); comparing the ratio with a threshold value (8); returning to the step of rotating the drum for a certain time (4) in the event that the ratio is higher than the threshold value and proceeding from there; and determining load amount in compliance with the values of water level differences and ratios in the event that the ratio is lower than the threshold value (9). With the method of the invention, the laundry amount placed in the device is able to be sensed with little error margin.

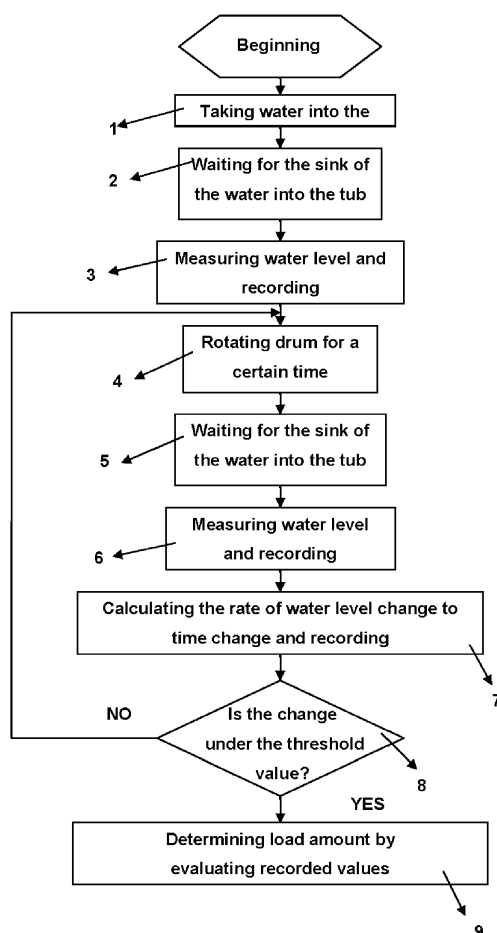


Figure 1

Description**Technical Field**

5 [0001] Present invention relates to measuring the amount of the laundry which is washed in washing devices.

Prior Art

10 [0002] In the washing devices of the state of art, half load or full load choices can be made according to the laundry amount to be washed. When half load is chosen, the device decreases the water usage which is used for washing, and at the same time changes drum rotation speed and power. Therefore, both drum vibrations, which are caused by low load, are avoided, and water and electricity saving are provided.

15 [0003] However, since the choice, which is necessarily made manually, is left to the user's intuition, it is not always possible to gain effective results. In cases that the user makes wrong choices (choosing half load while there is great amount of load or choosing full load while there is little amount of load), the laundries are not be able to washed well or water and electricity consumption increase and vibrations are generated in the device.

[0004] Especially in the washing devices, power saving of which is upper class (A class- A-50% class); correctly adjustment of washing parameters for decreasing the consumption gains more importance. Thus, the need of automatically determination of the load amount by the device instead of choosing the load amount manually is arisen.

20 [0005] In the new generation washing devices of the state of art, various methods are used for the determination of the load amount. One of the applied methods for the determination of the load amount is to measure net load amount by a weight sensor placed in the device. However, the cost of the device highly increases since placing weight sensor in a moveable drum mechanism is a hard and expensive application.

25 [0006] In said devices, water amount, which is taken into the tub in the device, is measured by present pressure sensors or flowmeters. Since laundry placed in the drum leads to water pressure decrease in the tub by soaking a part of water, when water is taken in the device, determination of the load amount by using the pressure change is become a widespread application.

30 [0007] However, the change of tub water pressure is not only related to the laundry amount but also closely related to the laundry type (cotton, synthetic, wool). For this reason, right choice of the type of the laundry by the user is necessary for the effectiveness of said methods. Otherwise load amount can be measured wrongfully. Also, using said methods are not possible since laundry type is not chosen in commonly usable programs for more than one laundry type. Owing to said problems, it is necessary to develop a load measuring method which does not lead to wrong measuring.

35 [0008] The patent document no GB2262363A, which is in the state of art, discloses a washing device which determines load type and amount by measuring dry load weight in the drum and water level in the tub. In said device, the weight of the dry load is calculated when the drum is loaded and water level is measured twice during washing and load type is estimated according to the measured values. However, since these two measuring do not give net information about the water soaking speed of the laundry, they are not sufficient on the determination of the laundry type. Moreover, used water level sensor is different from standard sensors and thus; the cost of the device increases.

Brief Description of Invention

40 [0009] A load measuring method for washing devices of the invention comprises following steps: taking predefined amount of water into the tub; measuring water level in the tub and recording measured value; rotating the drum for a certain time; measuring water level in the tub for a second time and recording measured value; and calculating the difference between the measured value of the first measuring and the measured value of the second measuring and recording that calculated value; calculating the ratio of the calculated difference to the time difference between the first measuring and second measuring and recording; comparing the recorded ratio with a predefined threshold value; re-
45 turning to the step of rotating the drum for a certain time in the event that the recorded ratio is higher than the threshold value and proceeding from this step; and determining load amount in compliance with the recorded values of water level differences and recorded ratios in the event that recorded ratio is lower than threshold value.

50 [0010] With the method of the invention, the laundry amount placed in a washing device, in other words the load amount, is able to be measured with little error margin . Apart from that, since the method of the invention uses the present water level sensor used in the washing devices of the state of art, automatically sensing of the load amount is ensured without changing the cost of the device.

Objective of the Invention

55 [0011] The aim of the invention is to develop a load amount measuring method for washing devices.

[0012] The other aim of the invention is to develop a load measuring method which allows measurement of the load amount independently from load type.

[0013] Another aim of the invention is to develop a load measuring method which allows measurement of the load amount by using tub water level sensor disposed in the washing devices.

[0014] A further aim of the invention is to develop a load measuring method which allows measuring laundry load amount correctly independent from the laundry type choice chosen by the user.

Description of Drawings

[0015] Exemplary embodiments of the load measuring method of the invention are shown in the attached drawings wherein:

Figure 1 is a flow diagram of an exemplary embodiment of the method of the invention.

Figure 2 is a graphic of the water level change per time in a washing device which the method of the invention is applied.

[0016] The parts in the figures are individually enumerated and the corresponding terms of reference numbers are as follows:

Taking water into the tub	(1)
Waiting for the sink of the water into the tub	(2, 5)
Measuring water level and recording	(3, 6)
Rotating drum for a certain time	(4)
Rating water level change to time change and recording	(7)
Comparing change ratio with threshold ratio	(8)
Evaluating recorded values and determining load amount	(9)

Description of the Invention

[0017] In the washing devices of the state of art, for automatically sensing the load, a water level sensor, disposed in a tub comprised by the device, is made use of. In said devices, at the beginning of the washing, a predefined amount of water is taken into the tub. After that, water level decrease, due to the fact that laundries soak water at the end of a certain time, is measured and load amount estimation is made according to said decrease.

[0018] However, it is not always possible to make correct load estimation with said method of measuring load amount. The reason of the error is that different laundry types (e.g. cotton, wool) soak different amount of water in different times. Even if laundry type is chosen on the device, since water soaking time can be changed in the same type of laundries, load amount can be measured differently by said method. Besides, since the laundry type can be chosen incorrectly by the user or different types of laundries can be washed together, the possibility of incorrect load measuring by said method increases.

[0019] Said errors are able to be prevented with the load amount measuring method of the present invention. In the present invention, apart from the ratio of the amount of water change, the change of water amount to the time is also measured and load amount estimation is made by evaluating change amount and change ratio together. Therefore, more precise results are gained in the load amount measuring.

[0020] The method of the invention is for a washing device which comprises at least one tub (not shown), at least one drum (not shown) located in this tub and in which laundries are placed, and at least one sensor (not shown) measuring water level of this tub; and in the first phase of said method, flow diagram of an exemplary embodiment of which is shown in figure 1, a predefined amount of water is taken into the tub (1). Then, it is waited for the sinking of the water, taken into the tub, to the bottom of the tub for a while (2). It is ensured with said waiting (2) that sensor senses correct level of water. Without waiting, since the water taken into the tub contacts with laundry first, and then accumulated at the base of the tub by seeping, wrong measuring can be done. After that, water level in the tub is measured and recorded (3).

[0021] In the next phase, mixing of the laundry and starting of the soaking of the water in the tub is ensured by means of rotation of the drum for a certain time (4). With the rotation of the drum, it is ensured that all of the laundries contact with water and water reaches every part of the laundry. Then, the drum is stopped, sinking of the water into the tub is waited (5) again, water level is measured again and recorded (6).

[0022] The difference between the first measuring (3) and the second measuring (6) shows the amount laundry soaks. With the method of the invention, the ratio of the difference between two measuring (3, 6) to the difference between times, in which two measuring is done, is calculated, recorded (7) and thus the ratio of the water level change to the

time is gained. Said ratio can change according to laundry types. For example, in synthetic fabrics, the ratio is low since they soak water in a long time and they soak little water, while in cotton fabrics, the ratio is high since they soak great amount of water quickly.

[0023] In the next phase, calculated change ratio is compared with a predefined threshold value (8). In the event that the ratio is over the threshold value, the state is interpreted as laundries do not fully soak water and the drum is rotated again for a certain time (3). Until said ratio decreases under the threshold value; the process of rotating the drum (4), waiting for the sink of water into the tub (5), measuring the water level and recording (6), and calculating and recording the ratio of water level change to the time change (7) are repeated. In the event that the calculated ratio is under the threshold value, the state is interpreted as the laundries reaches saturation in terms of water soaking and estimation of laundry load is made (8) according to the recorded water level values and the value of the ratio of water level to the time difference. Thus, the load amount is able to be correctly determined independently from the laundry type.

[0024] Figure 2 shows change of water level in time in a washing device in which method of the invention is used. When the device is operated, water is taken into the tub until t1 moment and water level reaches to L1 level. After that, sink of the water into the tub is ensured by waiting until t2 moment and at t2 moment, water level reaches to L2 level. After the drum is rotated for a certain time, the drum is stopped at t3 moment. When the drum is stopped, water level decreases to L3 level. At this moment, the water level change, in other words L2 - L3 value, and the ratio of this change to time difference, i.e. t3 - t2 value, is calculated and calculated values are recorded. In the event that calculated ratio is over the threshold value, the drum is rotated again for t4 - t3 and the drum is stopped at the t4 moment, the water level difference and the ratio of the water level difference to the time difference (to t4 - t3 value) is calculated, and values are recorded again. The process is re-done until water level change decreases under the threshold value (t10 moment). At t10 moment, since the calculated ratio decreases under the threshold value, laundry amount at t10 moment, in other words load amount, is estimated according to recorded water level change values and calculated ratios. By estimating the load, appropriate amount of water is taken into the tub according to the load and washing process is started.

[0025] In the method of the invention, threshold value can be a predefined constant value or can be changed according to the different laundry type choices of the device. Therefore, load amount estimation can be associated with the laundry type. In a preferred embodiment of the invention, the method comprises the step of changing the drum's rotation direction in the step of rotating the drum for a certain time (3). For example, in the first application of rotating the drum step (3), the drum is rotated clockwise, then since the calculated ratio is over the threshold value, in the step of re-rotating the drum (3), the drum is rotated counter clockwise. By means of changing the rotation direction of the drum, it is ensured that the laundries are mixed better and the water is soaked by laundries more quickly and easily.

[0026] Via the method of the invention, the amount of the laundry, which is placed in the washing device, is able to be correctly measured independently from the laundry type.

Claims

1. A load measuring method for a washing device which comprises at least one tub; at least one drum which is located in the tub and in which laundries are placed; and at least one sensor measuring water level in the tub **characterized by** comprising following steps:

- taking predefined amount of water into the tub (1);
- measuring water level in the tub and recording measured value (3);
- rotating the drum for a certain time (4);
- measuring water level in the tub for a second time and recording measured value (6);
- calculating the difference between the measured value of the first measuring (3) and the measured value of the second measuring (6) and recording this calculated value;
- calculating the ratio of the calculated difference to the time difference between the first measuring (3) and second measuring (6) and recording (7) this ratio;
- comparing the recorded ratio with a predefined threshold value (8);
- returning to the step of rotating the drum for a certain time (4) in the event that the recorded ratio is higher than the threshold value and proceeding from this step (4); and
- determining load amount in compliance with the recorded values of water level differences and recorded ratios in the event that recorded ratio is lower than threshold value (9),

2. A load measuring method according to claim 1 **characterized by** comprising the step of waiting for a predefined time (2) after the step of taking a predefined amount of water into the tub (1).

3. A load measuring method according to claim 1 **characterized by** comprising the step of waiting for a predefined

time (5) after the step of rotating the drum for a certain time (4).

4. A load measuring method according to claim 1 **characterized in that**; the threshold value is changed according to at least one laundry type choice located in the device.

5. A load measuring method according to claim 1 **characterized by** comprising the step of changing the drum's rotation direction in every repeat of the step of rotating the drum for a certain time (4).

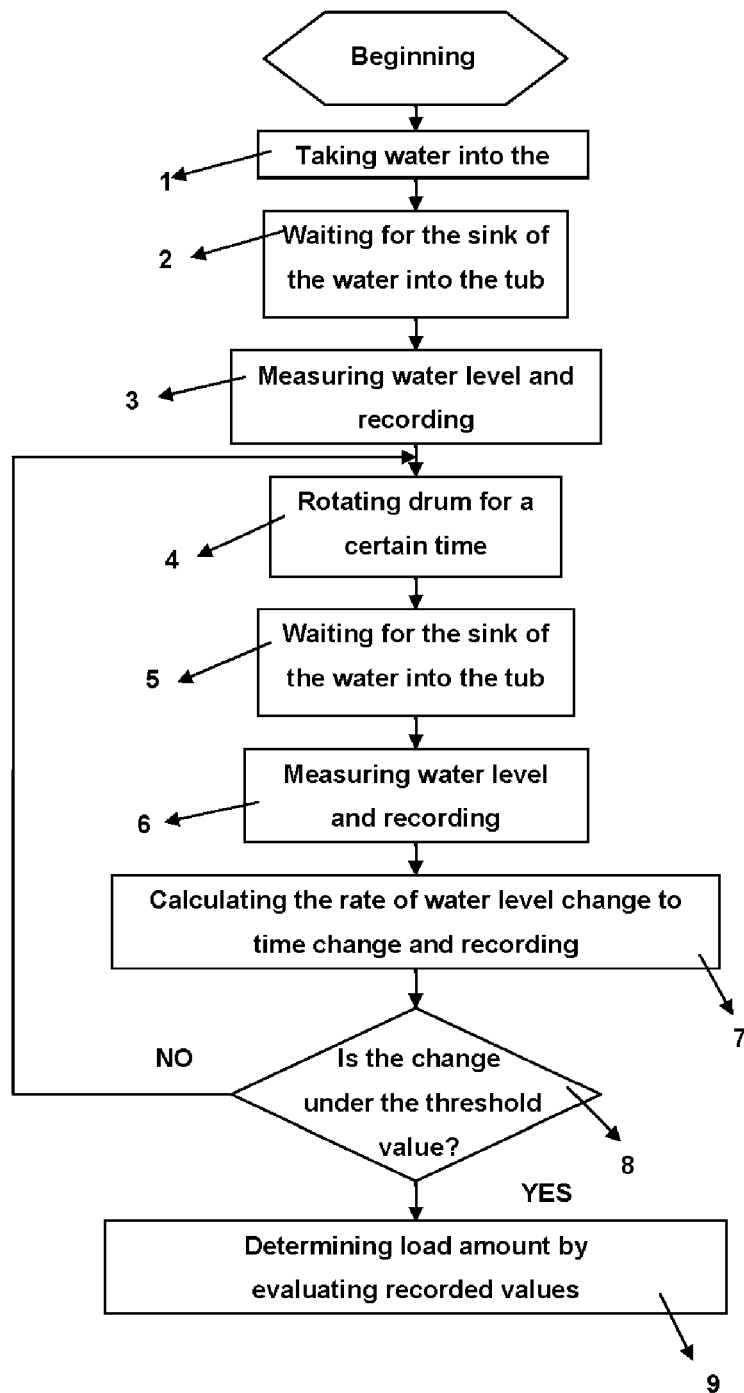


Figure 1

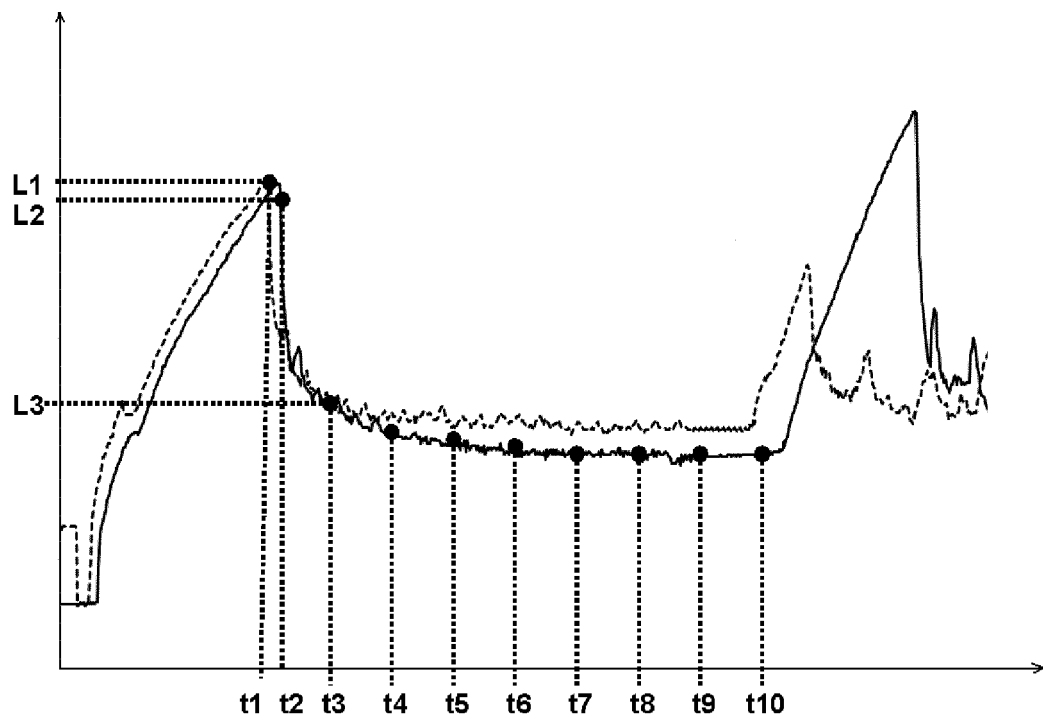


Figure 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- GB 2262363 A [0008]