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(54) **Foam detection and elimination method for washing machines**

(57) Foam detection and elimination method comprising the steps of continuously measuring the water level in the tub during the spinning (S304); checking whether or not the said measurement is above a predetermined threshold level (S306); measuring how long the measured level of water remains above the threshold level (S307); in the case that the measured time is above a certain threshold time, checking how many times the foam elimination process (S315) has been performed (S308); in the case that the number of performance of foam elimination process is less than a predetermined number, performing a foam elimination process (S315).

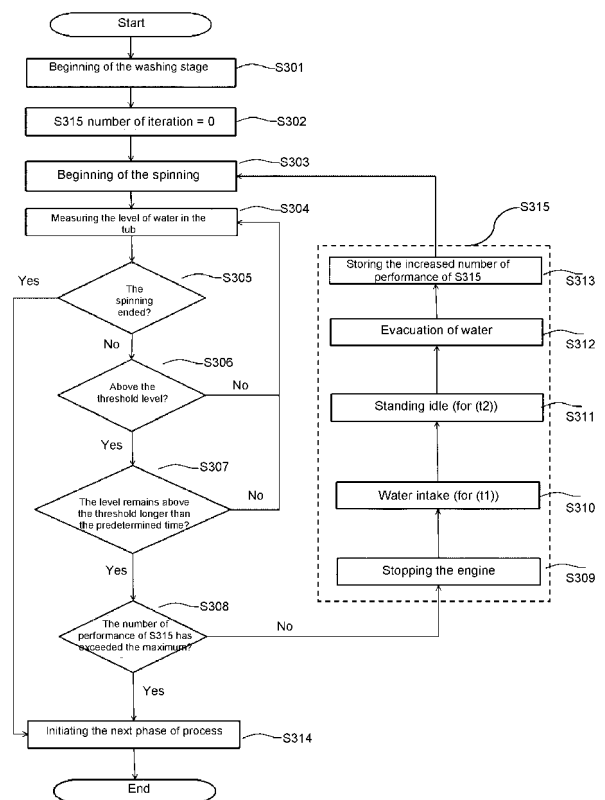


Figure - 1

Description

Technical Field

[0001] Present invention relates to methods for detecting excess foam produced in washing machines and for eliminating such foam.

Prior Art

[0002] As is known, more than adequate amount of foam is occasionally produced in washing machines, which may overflow from the machine. Excess foam needs to be eliminated since the overflowing foam may also damage the machine as well as the objects around the machine. Foam production usually stems from such common reasons as excessive use of detergent, overloading the washing machine, type of the articles to be washed (for instance, towels increase foam production), use of wrong type detergents (i.e. using hand wash detergent in the machine). Various studies for detecting and eliminating foam production have been conducted in the prior art, including the patent application No WO2009016009 which sets an example for the case. According to the document, foam production is checked when the rotational speed of the drum increases during a spinning run-up of the drum. The rotational speed of the drum is decreased as the height of the foam increases; the drum is stopped when the height of the foam exceeds a determined maximum value. The engine is stopped by means of the algorithm which is activated when foam at a maximum level is sensed; and the tub is fed with a small amount of water continuously or discontinuously.

Brief Description of the Invention

[0003] The method for detecting and eliminating foam comprises the steps of continuously measuring the water level in the tub during the spinning; checking whether or not the said measurement is above a predetermined threshold level; measuring how long the measured level of water remains above the threshold level; in the case that the measured time is above a certain threshold time, checking how many times the foam elimination process has been performed; in the case that the number of performance of foam elimination process is less than a predetermined number, performing a foam elimination process.

[0004] In the method disclosed by the invention, the level of water is continuously measured during the spinning; and measured value's remaining above a certain threshold value for a certain time is construed as foam production. Thus, the art of the invention checks foam production not only at a single step but during the whole spinning process, which renders the method more reliable. Furthermore, the measured value's remaining above the threshold value for a certain time, which is the con-

dition for sensing foam production, prevents activation of foam elimination process at a wrong time, offering advantage with regard to energy and water saving.

Objective of the Invention

[0005] The aim of the invention is to provide a foam detection and elimination method for washing machines.

[0006] Another aim of the invention is to provide a foam detection and elimination method which is effective and reliable.

[0007] A further aim of the invention is to provide a foam elimination process which consumes little water and energy.

Description of the Drawings

[0008] Foam detection and elimination method of the invention is illustrated in the annexed figures wherein, Figure 1 is the flow chart of the foam detection and elimination method.

Disclosure of the Invention

[0009] Overflowing of foam in washing machines occurs at spinning at the end of main washing, spinning at the end of rinsing or final spinning processes where the drum speed increases. Foam detection and elimination method of the invention is applied at these spinning processes. (In washing machines used for carrying out the method of the invention, electrical components such as engine, pump, valves, heaters and sensors (temperature and pressure sensors, for instance) are operated by the control unit in the machine.)

[0010] Figure 1 shows the flow chart of the foam detection and elimination method of the invention. In this method, the steps of which are elaborated in the following, the level of water in the tub is continuously measured (S304); it is checked whether or not the measured level is above a predetermined threshold level (S306); it is measured how long the measured level of water remains above the said threshold level (S307); in the case that the measured time is above a certain threshold time, it is checked how many times the foam elimination process (S315) has been performed (S308); in the case that the number of performance of foam elimination process is less than a predetermined number, foam elimination process (S315) is performed.

[0011] In the foam elimination process (S315) of the inventive method; the engine (therefore the tub drum) of the machine at the spinning process is stopped (S309), the machine tub is filled with water (S310) for a predetermined time (t1); a predetermined time (t2) elapses while the engine is off (S311); then the water in the tub is evacuated (S312) and the increased number of the performance of the foam elimination process is stored (in the control unit memory) (S313).

[0012] Detailed steps of the foam detection and elim-

ination method illustrated in Figure 1 are as follows. The first step is deemed to be the beginning (S301) of any washing phase (this phase is a process such as main washing, rinsing etc.). The number of the performance of foam elimination process (S315) is set to "zero" (S302) at the second step. The machine starts spinning (S303) at the third step. The level of water in the tub is continuously measured (S304) at the fourth step. At the fifth step, it is checked whether or not the spinning has ended (S305). If spinning has ended, another phase or process is initiated (without detecting and eliminating the foam) (S314); if not, it is checked whether or not the level of water measured at the fourth step (S304) is higher than a predetermined threshold level (this threshold level is an empirically predetermined value which indicates that the foam production is excessive) at the sixth step (S306). If the level of water is not high, the fourth step (S304) is resumed; if high (i.e. excessive foam production), next (seventh) step is initiated. The seventh step measures how long the said level of water remains at a high value (S307); if the measured time has exceeded a certain threshold time (i.e. if the produced foam has not break), the eighth step is initiated; if not, the fourth step is resumed. At the eighth step, it is checked (S308) how many times the foam elimination process (S315) has been performed; if the number of the performance of said elimination is less than a predetermined number, foam elimination process (S315) is performed; if not, next process in the washing program is initiated (S314).

[0013] A short threshold time at the seventh step leads to foam elimination process being unnecessarily performed when the foam instantaneously increases without posing a risk of overflowing. On the contrary, a long threshold time may lead to foam elimination process not being activated when overflowing takes place. Therefore, the threshold time is experimentally predetermined and is ideally between two to four seconds.

[0014] Another crucial point of the present invention is that it checked how many times the foam elimination process (S315) has been performed, and that the maximum number of iteration thereof is predetermined. In the case that the user wishes to wash, with an excessive amount of detergent, such articles as towels which increase foam production; even though foam elimination process is activated, a high level of foam may be observed during the spinning process which follows the same washing program. In such situations, limiting the maximum number of iterating the foam elimination process ensures saving in time, energy and water consumption. Experimental studies show that the maximum number of iteration, which is checked at the eighth step, should be ideally between two to four.

[0015] Another point in foam elimination process (S315) is that the less than enough amount of water, which is added to the tub, may be unable to eliminate foam. Adding more than enough water may cause an increase in water consumption. For this reason, experimental studies show that the water filling time (t1) at the

tenth step (S310) should be ideally between thirty to ninety seconds. In addition, a short waiting time (t2) at the eleventh step (S311) may lead to loss of time while a long waiting time may cause the foam not to be adequately eliminated. Therefore, waiting time (t2) should be ideally between thirty to ninety seconds.

Claims

1. Foam detection and elimination method for washing machines **characterized by** comprising the steps of
 - continuously measuring the level of water in the tub during the spinning (S304);
 - checking whether or not this measurement is above a predetermined threshold level (S306);
 - measuring how long the measured level of water remains above the said threshold level (S307);
 - in the case that the measured time is above a certain threshold time, checking how many times the foam elimination process (S315) have been performed (S308);
 - in the case that the number of performance of foam elimination process is less than a predetermined number, performing foam elimination process (S315).
2. Foam detection and elimination method according to Claim 1 **characterized by** comprising, in the foam elimination process (S315), the steps of stopping the engine of the machine which is at the spinning process (S309); filling the machine tub with water (S310) for a predetermined time (t1); waiting for a predetermined time (t2) while the engine is off (S311); then evacuating the water in the tub (S312), and storing the increased number of the performance of the foam elimination process (S313).
3. Foam detection and elimination method according to Claim 1 **characterized in that** the threshold time at the seventh step (S307) is between two to four seconds.
4. Foam detection and elimination method according to Claim 1 **characterized in that** the maximum number of iterating the foam elimination process (S315) is between two to four.
5. Foam detection and elimination method according to Claim 2 **characterized in that** water filling in time (t1) at the tenth step (S310) is between thirty to ninety seconds.
6. Foam detection and elimination method according to Claim 2 **characterized in that** the waiting time (t2) at the eleventh step is between thirty to ninety seconds.

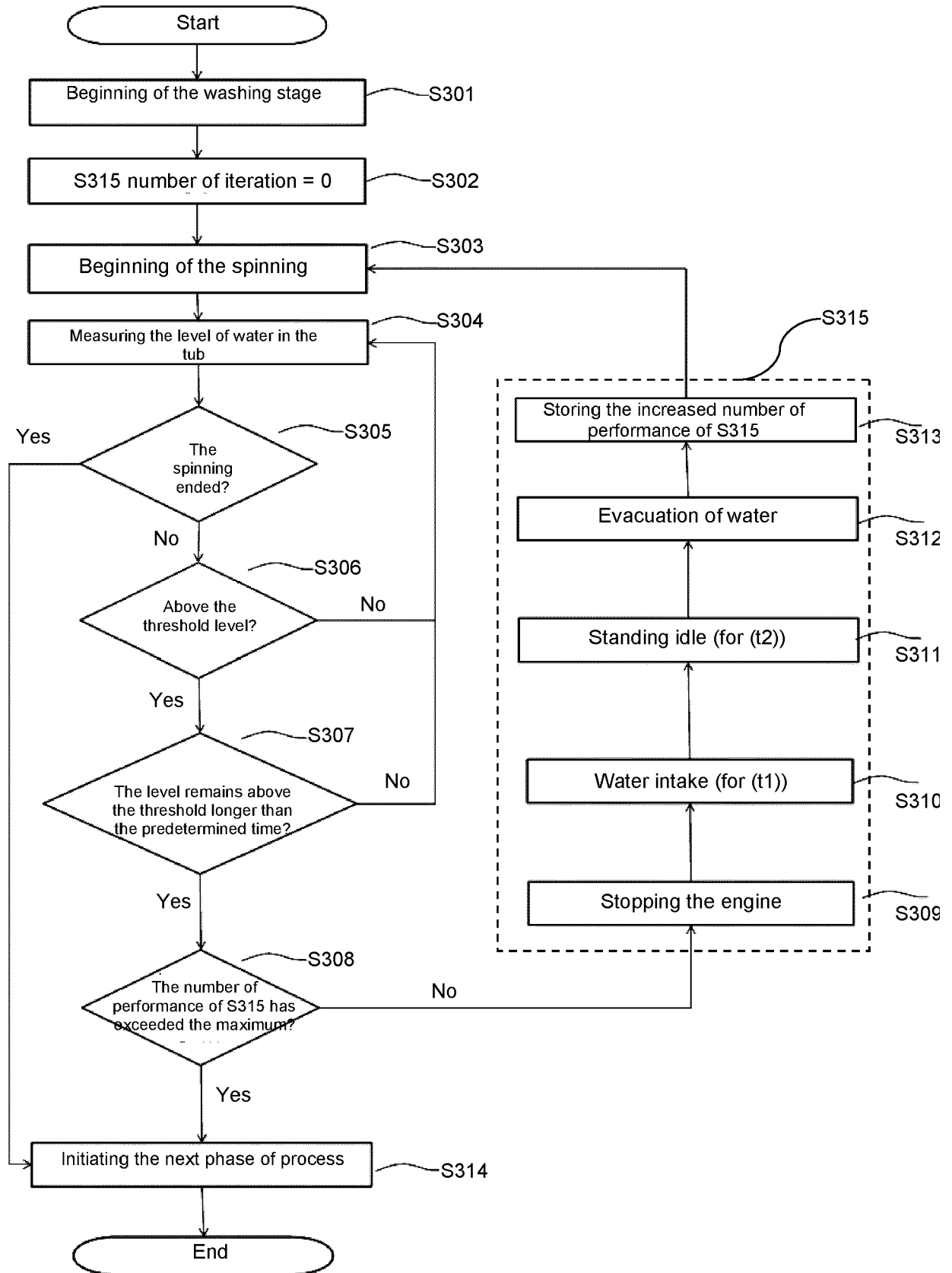


Figure – 1



EUROPEAN SEARCH REPORT

Application Number
EP 12 15 5119

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 8 August 2012	Examiner Clivio, Eugenio
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