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(54) **Method for controlling a washing machine for eliminating odours**

(57) Method for controlling a washing machine, including the execution of a washing step in which the speed of rotation of the drum of said machine is subject to a plurality of increases alternated with respective de-

creases, each increase and each decrease being executed, while maintaining or bringing the temperature of the washing water contained in said drum, to determined values.

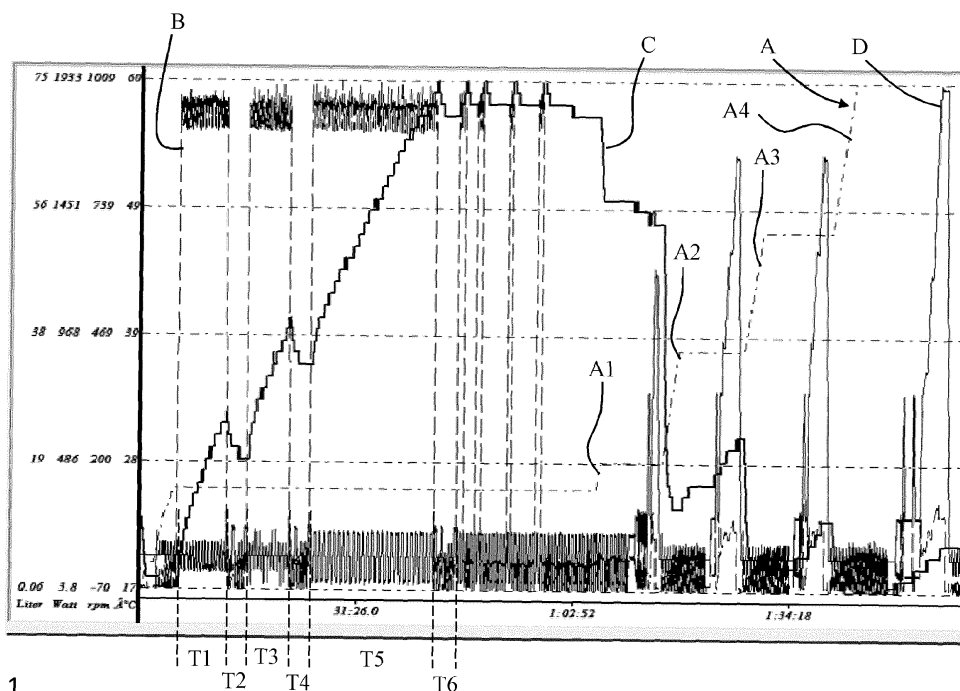


FIG. 1

Description**[FIELD OF THE INVENTION]**

[0001] The present invention relates to a method for controlling a washing machine for the elimination of.

[PRIOR ART]

[0002] As known, the washing machines have the purpose to clean the fabrics and remove any stains on the same.

[0003] This aim is typically obtained through suitable washing cycles, selected according to the type of clothes to be washed.

[0004] The Applicant has noted that the washing programs of known type, as performing under the profile of the stain removal, are sometimes not very satisfactory with reference to the elimination of bad smells.

[0005] Bad smells are usually caused by bacteria that remain infiltrates in the fibers of the fabrics so that the latter, even if apparently cleaned because free from stains, remain characterized by an unpleasant smell.

[0006] The Applicant has therefore known that by means of a new washing program, studied in a focused manner to the elimination of bad smells, the results obtained from washing machines could be significantly improved.

[PURPOSE AND ABSTRACTS OF THE INVENTION]

[0007] Aim of the present invention is to provide a method for controlling a washing machine that is capable not only to eliminate the stains, but which also allows to eliminate the bad smells that sometimes remain in the fabrics.

[0008] This and other aims are achieved by a method for controlling a washing machine as described in the attached claims.

[0009] In particular, the object of the present invention is a method for controlling a washing machine, including the execution of a washing step in which the rotation speed of the drum of said machine is subject to a plurality of increases alternated with respective decreases, each increase and each decrease being performed by keeping or bringing the temperature of the wash water contained in said drum at/to certain values.

[0010] Preferably in said washing step the following operations are performed:

- a) the temperature of the washing water is increased up to a first value while the drum is rotated at a first speed;
- b) when said temperature reaches said first value, the heating of the was water is stopped and the drum is rotated at a second speed of rotation higher than said first speed;
- c) when the water temperature decreases up to a

first threshold or after a predetermined time, the water temperature is increased again up to a second value higher than said first value while the drum is rotated at a speed lower than said second speed and preferably substantially equal to said first speed;

d) when said temperature reaches said second value, the heating of the wash water is stopped and the drum is moved at a speed of rotation higher than said first speed and preferably substantially equal to said second speed.

[0011] Preferably after step d) the following operations are performed:

- e) when the water temperature decreases up to a second threshold or after a predetermined time, the water temperature is increased again up to a third value higher than said second value while the drum is rotated at a speed lower than said second speed and preferably substantially equal to said first speed;
- f) when said temperature reaches said third value, the heating of the wash water is stopped and the drum is moved at a speed of rotation higher than said first speed and preferably substantially equal to said second speed.

[0012] Preferably said first speed is comprised between 25 rpm and 45 rpm.

[0013] Preferably said second speed is comprised between 50 rpm and 70 rpm.

[0014] Preferably said first temperature value is comprised between 35 °C and 45 °C.

[0015] Preferably said second temperature value is comprised between 40 °C and 50 °C.

[0016] Preferably said third temperature value is comprised between 50 °C and 70 °C.

[0017] Preferably, wherein once said wash step has finished and before one or more spin steps, a topping up of water in said drum is carried out, preferably with a amount of water comprised between 5 liters and 10 liters.

[0018] Preferably a plurality of rinse steps is carried up, preferably three rinse steps, in particular after said topping up step.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[0019] Some examples of preferred and advantageous embodiments of the invention are provided for purely illustrative purposes and not limiting, with reference to the attached figure 1, which shows a diagram representing some characteristic parameters of the method according to the invention.

[DETAILED DESCRIPTION OF THE INVENTION].

[0020] The method according to the invention, as said, has the main purpose to eliminate the bad smells that can remain in the fabrics.

[0021] The method includes the execution of a washing step provides, that is a step in which the clothes are subject in a substantially simultaneous manner to a mechanical, chemical and thermal action.

[0022] The mechanical action is mainly due to the rotation of the drum in which the clothes are located. The more the rotation speed is high, the greater is the mechanical action to which the fabrics are subject.

[0023] The chemical action is due to the use of cleaning substances, such as, for example, the detergents, which attack chemically the substances deposited on the fabrics and, reacting with the same, facilitate their detachment.

[0024] The thermal action is performed by the wash water, which is suitably heated, as provided in each washing cycle.

[0025] The washing step according to the invention provides that the rotation speed of the drum is subject to a plurality of increases alternated with respective decreases; advantageously each increase and each decrease are performed by keeping or by bringing the temperature of the wash water contained in said drum at/to determined values.

[0026] In this manner the fibers of the fabrics are stressed so as to facilitate in optimal manner a progressive release of the water of which are impregnated and a resulting discharge from substances that cause bad smells.

[0027] In greater detail, the washing step involves the execution of the following operations:

a) the wash water temperature is increased up to a first value while the drum is rotated at a first speed. The first value may be for example comprised between 35 °C and 45 °C; the first speed of the drum can be comprised between 25 rpm and 45 rpm.

b) when wash temperature reaches said first value, the heating of the wash water is stopped and the drum is rotated at a second speed of rotation higher than said first speed; the second speed may be, for example, comprised between 50 rpm and 70 rpm.

c) when the water temperature decreases up to a first threshold or after a predetermined time, the water temperature is increased again up to a second value higher than said first value while the drum is rotated at a speed lower than said second speed and preferably substantially equal to said first speed. The new increase of the water temperature can be controlled on the basis of a minimum threshold that the temperature can reach as a result of the interruption of heating provided in the previous step. In a different embodiment, the new increase of temperature can be controlled after a predetermined time has elapsed from said interruption. The second temperature value can be for example comprised between 40 °C and 50 °C.

d) when the temperature reaches said second value, the heating of the wash water is stopped and the

drum is moved at a speed rotation higher than said first speed and preferably substantially equal to the second speed.

[0028] In this way, the fabrics are subjected to an alternating mechanical action, in which the drum is rotated in an alternating manner between a speed equal to, for example, 40 rpm, and a second speed equal to, for example, 60 rpm.

[0029] While the drum rotates at the lowest speed, the water is heated.

[0030] While the drum rotates at the highest speed, the water heating is stopped.

[0031] The controlled and alternating water heating causes a relaxation of the fibers of which the clothes are composed and contributes to make the water associated with the clothes themselves is released, bringing with itself the substances that cause bad smells.

[0032] Advantageously steps similar to those previously described may be after carried out.

[0033] In fact, it is expected that, after the above-mentioned step d), the following operations are carried out:

e) when the water temperature decreases up to a second threshold or after a predetermined time, the water temperature is increased again up to a third value higher than said second value while the drum is rotated at a speed lower than said second speed and preferably substantially equal to said first speed; the third temperature value can be, for example, comprised between 50 °C and 70 °C.

f) When the temperature reaches said third value, the heating of the wash water is stopped and the drum is moved at a speed of rotation higher than said first speed and preferably substantially equal to said second speed.

[0034] In other words, it is carried out a further iteration of the process above described, in which the water is heated again, keeping the rotation speed of the drum to a low value, and then interrupting the heating of the water and controlling the drum with a pulse at a higher speed.

[0035] It should be noted that, preferably, the values of the water temperature in the various iterations of the method are increasing over time.

[0036] Advantageously, at the end of the washing step and before the final spin step, a topping up of water in the drum is carried out.

[0037] The amount of water used in this topping up step can be preferably comprised between 5 and 10 liters, for example, equal to 7 liters.

[0038] The topping up step has the purpose to bring in a condition of substantial suspension the unwanted substances extracted from the fabrics, so as to facilitate the elimination during the subsequent rinse steps.

[0039] Advantageously, the method can be completed with a plurality of rinse steps, for example three rinse steps. These steps are preferably carried out after said

topping up step, and before the final spin step.

[0040] Figure 1 shows by way of example representative graphs of the implementation of the method according to the invention.

[0041] The x-axis represents the time, on the y-axis are represented the water consumption of the machine (A), the electric power absorbed by the machine (B), the temperature of the wash water (C) and the drum speed rotation (D).

[0042] In the time interval T1 it is possible to notice an intense absorption of power due to the current flowing in the resistance designated to the heating of the wash water; correspondingly, the water temperature grows. In the same interval T1 the speed of rotation drum is kept to a low value (e.g. 40 rpm), corresponding to said first speed.

[0043] The time interval T1 ends when the water temperature reaches a determined value, corresponding to said first value, in this case about 30 °C.

[0044] In the time interval T2 power absorption takes on a very small value, since the heating resistance is no longer powered by electric current. The temperature then progressively decreases. The speed of rotation drum instead increased, for example up to 60 rpm, corresponding to the said second speed.

[0045] In the time interval T3 there is a new increase of the power absorption and a corresponding increase of the water temperature, up to about 40 °C, corresponding to the said second temperature value, the speed of rotation drum is kept low, for example at 40 rpm (the first rotation speed).

[0046] The time interval T3 therefore ends when the water reaches a temperature of about 40 °C.

[0047] In the time interval T4 the physical quantities have variations fully similar to that at the time interval T2: the power absorption is low, the temperature decreases and the speed of rotation drum is high (60 rpm), that is equal to the second rotation speed.

[0048] The intervals T5, T6 propose again qualitative trends similar to the ones of the intervals T1, T3 and T2, T4, respectively: the water temperature increases to 60 °C, with high power absorption and low rotation speed, and then the temperature and the power absorption decrease, while the speed of rotation drum becomes again high.

[0049] The segment marked A1 represents the topping up step, while the segments A2-A4 represent the three rinse steps carried out after the topping up step.

Claims

1. A method for controlling a washing machine, comprising the execution of a wash step wherein the speed of rotation of the drum of said machine is subject to a plurality of increases alternated with respective decreases, each increase and each decrease being performed by keeping or by bringing the temperature of the wash water contained in said drum

at/to determined values.

2. A method according to claim 1, wherein said wash step comprises the following operations:

- a) the wash water temperature is increased up to a first value while the drum is rotated at a first speed;
- b) when said temperature reaches said first value, the heating of the wash water is stopped and the drum is rotated at a second speed of rotation higher than said first speed;
- c) when the water temperature decreases up to a first threshold or after a predetermined time, the water temperature is increased again up to a second value, preferably higher than said first value, while the drum is rotated at a speed lower than said second speed and preferably substantially equal to said first speed;
- d) when said temperature reaches said second value, the heating of the wash water is stopped and the drum is moved at a speed of rotation higher than said first speed and preferably substantially equal to said second speed.

3. A method according to claim 2, wherein, after the step d) :

- e) when the water temperature decreases up to a second threshold or after a predetermined time, the water temperature is increased again up to a third value, preferably higher than said second value, while the drum is rotated at a speed lower than said second speed and preferably substantially equal to said first speed;
- f) when said temperature reaches said third value, the heating of the wash water is stopped and the drum is moved at a speed of rotation higher than said first speed and preferably substantially equal to said second speed.

4. A method according to claim 2 or 3, wherein said first speed is comprised between 25 rpm and 45 rpm.

5. A method according to any one of the claims 2 to 4, wherein said second speed is comprised between 50 rpm and 70 rpm.

6. A method according to any one of the claims 2 to 5, wherein said first temperature value is comprised between 35°C and 45°C.

7. A method according to any one of the claims 2 to 6, wherein said second temperature value is comprised between 40°C and 50°C.

8. A method according to claim 3 or to any one of the claims 4 to 7 when dependent from claim 3, wherein

said third temperature value is comprised between 50°C and 70°C.

9. A method according to any one of the preceding claims, wherein once said wash step has finished and before one or more spin steps, a topping up of water in said drum is carried out, preferably with an amount of water comprised between 5 litres and 10 litres.
10. A method according to any one of the preceding claims, wherein a plurality of rinse steps is carried out, preferably three rinse steps, in particular after said topping up step.

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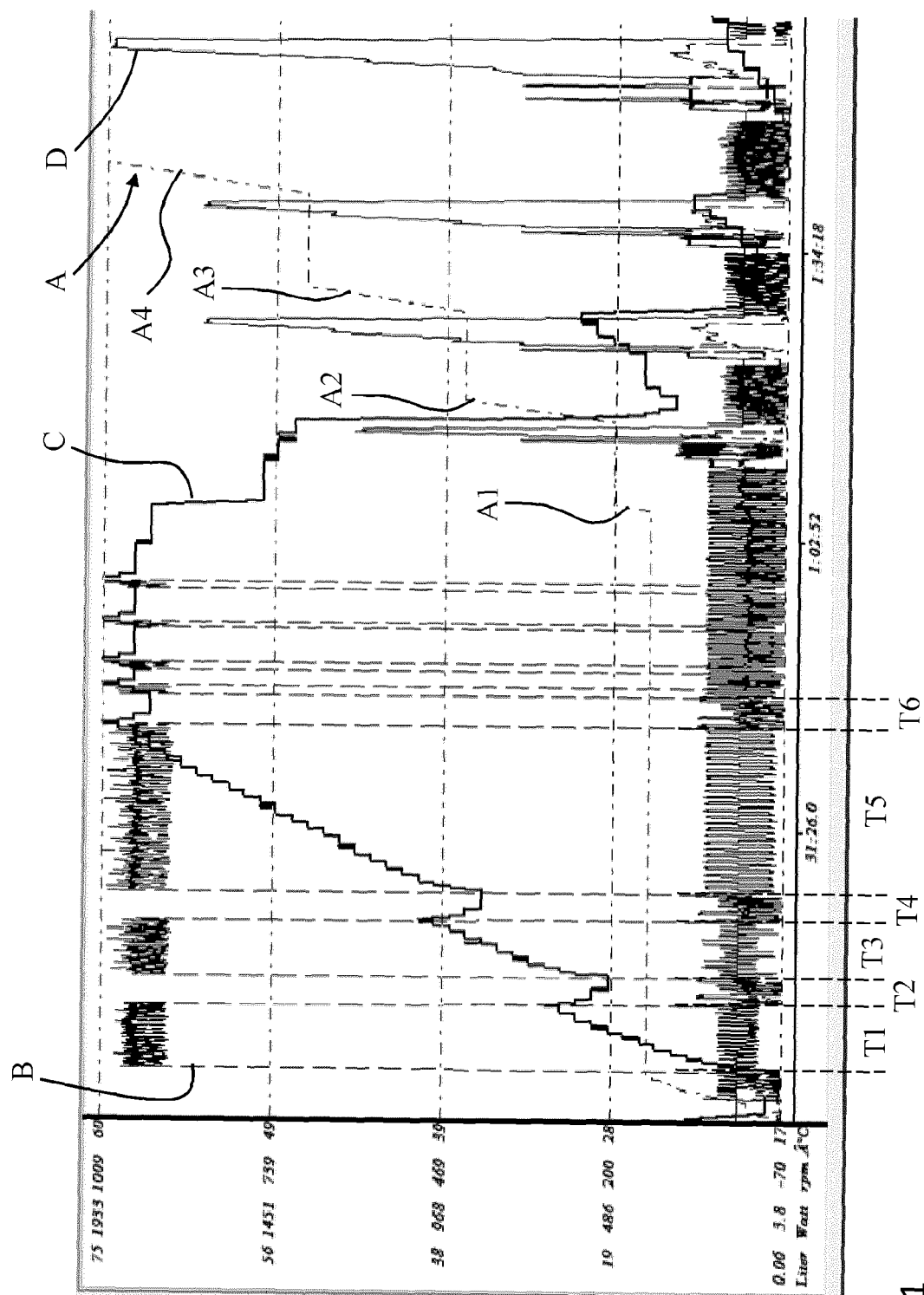


FIG. 1



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 Application Number
EP 13 19 7656

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search Munich		Date of completion of the search 10 February 2014	Examiner Fachin, Fabiano
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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The members are as contained in the European Patent Office EDP file on
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