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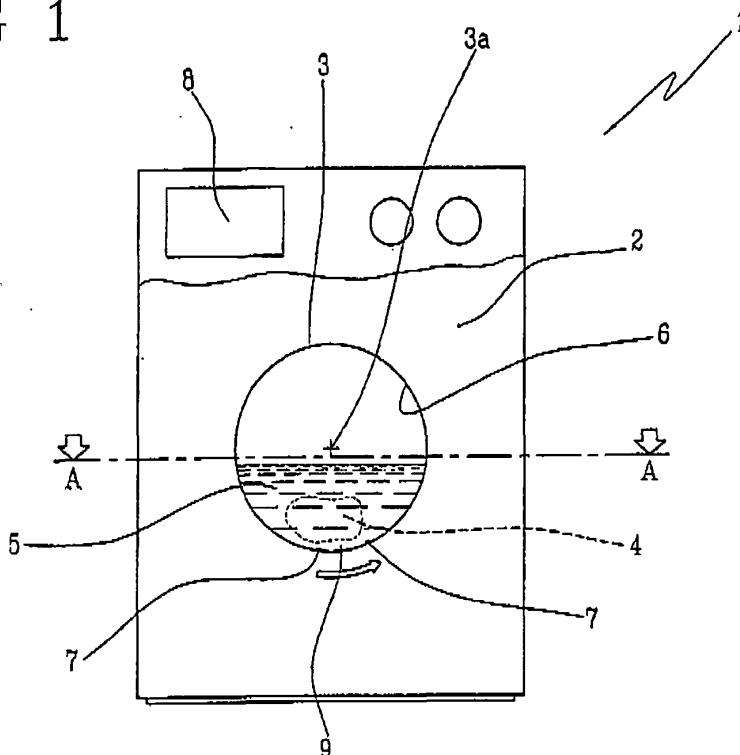
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(54) **Method for washing delicate textile articles using an automatic washing machine**

(57) A method for washing delicate textile articles using a washing machine comprising a washing compartment (2) in which a rotary drum (3) is positioned, comprising the steps of:
putting the articles to be washed (4) in the rotary drum (3);

making the drum (3) rotate;
introducing into the drum (3) a quantity of washing liquid (5) such that the articles to be washed (4) are lifted by means of an Archimedes thrust which allows the articles to detach from the drum (3) and float inside the drum (3).

FIG 1



Description

[0001] This invention relates to a method for washing delicate textile articles using a washing machine comprising a washing compartment in which a rotary drum is positioned.

[0002] Generally speaking, during washing in a washing machine, the articles inside the drum are moved when the drum is rotated and, in particular, they are moved both through friction between the articles and the inner wall of the drum which lifts the articles by contact and through a drawing action applied by specific drawing elements located at a certain distance from each other along the full axial extension of the drum. The articles to be washed are lifted to the highest point of the drum and then drop to the bottom again by gravity.

[0003] All this movement causes a considerable amount of rubbing on the articles. In the case of delicate or ultra delicate articles, the mechanical action the articles are thus subjected to can cause damage to them.

[0004] For washing delicate textile articles, the prior art teaches the use of certain measures such as, for example, not heating the water to a particularly high temperature, rotating the drum at a low speed to avoid crumpling the fibres excessively or disabling the spin drying function.

[0005] Another measure used for washing delicate articles is what is known as "satellization", that is to say, rotating the drum at a particular speed, slower than the speed used for spin drying but still allowing the centrifugal force transmitted to the articles by the drum to neutralize the force of gravity. This reduces the mechanical action on the articles, forcing the articles to be washed to adhere to the wall of the drum, rotating as one therewith but without moving relative to it and thus preventing the articles from rubbing continuously against the inner wall of the drum.

[0006] Although washing programmes have been developed which adopt all or nearly all of the above mentioned measures, the drawbacks linked with the shrinkage and/or relaxation of delicate fabrics continue to constitute a problem, albeit to a lesser extent.

[0007] Thus, the use of a washing machine to wash delicate or very delicate fabrics is still not recommended.

[0008] This invention has for an aim to overcome the above mentioned washing problems.

[0009] The aim of this invention is therefore to provide a method for washing delicate textile articles using a washing machine and which reduces damage to the fibres of delicate articles (wool, silk, articles with sequins or inserts of various kinds, and so on), also preventing dimensional alterations (shrinkage and/or relaxation of the fibres) detachment of fabric decorations or surface scuffing making the articles unsuitable for wearing.

[0010] The technical purpose and aims specified are substantially achieved by a method for washing delicate textile articles using a washing machine comprising the technical features set out in one or more of the accom-

panying claims.

[0011] Further features and advantages of the invention are more apparent in the non-limiting description which follows of a preferred non-limiting embodiment of a method for washing delicate textile articles using a washing machine illustrated in the accompanying drawings, in which:

- Figure 1 is a schematic front view, with some parts cut away in order to better illustrate others, of a washing machine which implements the washing method according to this invention;
- Figure 2 is a cross section along the plane A-A of the washing machine illustrated in Figure 1.

[0012] With reference to the accompanying drawings, the numeral 1 denotes in its entirety a washing machine 1 comprising a washing compartment 2 in which a rotary drum 3 that rotates about an axis 3a is positioned and in which the method for washing delicate articles according to this invention can be implemented.

[0013] Before starting any washing cycle, a user must place the articles 4 to be washed into the rotary drum 3 and fill the detergent in the required amount into the drawer 8 or directly into the drum 3.

[0014] The user also selects the type of wash the washing machine 1 is to carry out.

[0015] One step in the washing cycle performed by the washing machine 1 is that of introducing washing liquid 5 into the drum 3. Introducing a first quantity of washing liquid advantageously allows soaking of the articles to be washed. The drum 3 is then made to rotate at a predetermined speed, lower than the spin drying speed, so as to facilitate soaking of the articles being washed. In the preferred embodiment, the drum 3 is set in rotation after the first predetermined quantity of washing liquid has been introduced into the compartment 2.

[0016] In prior art dryers, the drum 3 rotates at a speed such as to make the articles complete at least half a turn, lifting them from the lowermost point to a point near the uppermost point of the drum, where the articles 4 fall down again by gravity. This mechanical action, however, may cause damage to delicate or ultra delicate articles.

[0017] The use of a step known as "satellization" of the articles 4 is therefore advantageous. In other words, the normal speed of rotation of the drum 3 is increased to a value such that the centrifugal force equals or, if necessary, slightly exceeds, the force of gravity.

[0018] That way, the articles 4 to be washed are forced to adhere to the inner wall 6 of the drum 3 but without being forcefully crumpled against the drum wall. The result is a sort of "gentle" spinning action.

[0019] Satellization, however, is not sufficient to limit the damage which friction against the inner wall 6 of the drum 3 may cause to the articles 4.

[0020] To further reduce the damaging action, in the method according to the invention, the step of introducing a washing liquid comprises flooding the rotary drum 3

with a further quantity of washing liquid 5. Thus, the total quantity of washing liquid inside the drum 3 is such as to impart to the articles to be washed 4 a thrusting action which allows them to come away from the inner wall 6 of the drum 3, since they receive from the washing liquid an Archimedes thrust from the bottom upwards. This allows a step of floating the articles 4 being washed while the drum 3 rotates around them. The step of introducing a washing liquid may therefore be split into two or more different stages (which may be separated at least by the step of making the drum 3 rotate).

[0021] That way, the thrusting action applied by the drum 3 on the articles is particularly delicate because there is a layer 9 of washing liquid between the wall 6 of the drum 3 as it rotates and the core of articles 4 being washed. The layer 9 of washing liquid 5 transfers to the articles 4 being washed a gentle rotational movement imparted by the drum 3.

[0022] Obviously, as the drum 3 rotates, the articles 4 may still come accidentally into contact with the drum wall 6, but even should this happen, the movement transmitted is attenuated and made more gradual by the liquid layer 9.

[0023] Preferably, the amount of water in the washing compartment 2 to achieve this effect of the articles floating in the drum 3 is variable from 24 to 28 litres, preferably 26 litres.

[0024] During the floating step of the articles 4 to be washed the drum 3 rotates at a speed of between 18 and 32 revolutions per minute (rpm), preferably between 22 and 28 rpm.

[0025] In any case, during the entire washing cycle for delicate articles, the speed of rotation of the drum 3 must be slow at all times, remaining, for example, at a preferred value of 25 rpm.

[0026] The method described also comprises at least one pause step during which the drum 3 remains stationary, allowing the washing liquid and the detergent to delicately pass through the fibres.

[0027] The entire washing cycle comprises a plurality of steps of rotating the drum 3 alternated with a plurality of drum pause steps.

[0028] The drum 3 rotation and pause steps are suitably combined with each other and their duration varies according to the type of article to be washed.

[0029] For example, a preferred but non-limiting combination, comprises rotation steps with duration of three time units each, alternated with pause steps each having a duration of eight time units.

[0030] Advantageously, the drum may have drawing bands 7 (known as "lifters" in the jargon of the trade) located on the inner wall 6 of the drum 3, parallel with the axis 3a of rotation of the drum itself. Conveniently, the lifters 7 are located only along a portion of the entire axial length of the inner wall 6 of the drum (typically towards the bottom of the drum, as shown in Figure 2) and this may produce in the washing water inside the drum 3 a rotational component according to an axis transversal

to the axis 3a of rotation of the drum 3.

[0031] Advantageously, the washing liquid 5 is heated, during the entire washing cycle, to a temperature between 25°C and 30°C.

5 **[0032]** Described in detail below by way of an example are all the steps in a possible complete washing cycle performed according to the method of the invention.

10 **[0033]** The method for washing delicate or ultra delicate articles comprises a first step of filling water or washing liquid 5 into the washing compartment 2 up to a first predetermined level with the drum 3 stationary and simultaneously heating the water (through the agency of an electrical heating element in thermal contact with the washing compartment) to a predetermined and preferred washing temperature, for example, 28°C. The amount of water corresponding to the first level is approximately 5 litres.

15 **[0034]** The drum 3 then satellizes the load of articles 4 to be washed (advantageously at approximately 88 rpm) for 2 minutes and, at the same time, approximately 3 litres of water are introduced and heated to a predetermined temperature. The first filling step comprises introducing into the washing compartment 2 water and detergent mixed together (to form the washing liquid 5). Conveniently, the detergent is in a relatively high concentration and is activated when a predetermined temperature threshold is exceeded (in effect, the temperature of the washing liquid 5 is approximately 28 °C and is greater than the predetermined temperature threshold). As a whole, this step has the purpose of filling approximately 8 litres of washing liquid into the compartment 2 so as to completely soak the articles 4 to be washed and keeping them at the required temperature without subjecting them to any mechanical action: the water and detergent pass through the fibres delicately while satellization forces the articles to adhere to the inner wall 6 of the drum 3 but without moving relative to it as it rotates. At the same time, the right quantity of foam is formed so as to contribute to making more delicate the light mechanical action which will be applied in the later steps.

30 **[0035]** Following satellization, the drum 3 stops and, if necessary, is allowed to return to the predetermined, preferred washing temperature.

35 **[0036]** Next, a certain quantity of water is added (conveniently until reaching a second predetermined level) to enable the load of articles to be lifted by means of an Archimedes thrust. The reaching of the second predetermined level corresponds to approximately 26 litres of water in the drum.

40 **[0037]** The next step, of floating, has a duration variable between 25 and 30 minutes, for example 27 minutes, and at the same time the washing liquid 5 introduced into the drum is heated to the predetermined, preferred washing temperature. During this step, the drum is moved at a variable speed between 20 and 27 revolutions per minute (rpm), for example 25 rpm.

45 **[0038]** At the end of the floating step, the washing liquid 5 is drained out with the drum 3 stationary.

[0039] Advantageously, this is followed by at least one rinse, preferably two rinses, with duration 8-12 minutes, preferably 10 minutes, with rotational movement at the same slow speed, for example approximately 25 rpm, and alternating steps of rotating the drum 3 with steps of pausing it.

[0040] Rinsing is terminated with a step of satellizing the articles (for example at a variable speed of between 90 and 100 rpm, preferably 96 rpm) with the drain pump running. Satellization of the articles, in combination with the draining out step, helps remove the right quantity of water from the load, so that the articles do not drip when they are taken out, while at the same time preventing the centrifugal force from causing the decorative elements from being pulled off the articles.

[0041] Advantageously, the washing method according to the invention is selectable from a list of distinct washing cycles for delicate or ultra delicate products.

[0042] This invention achieves the preset aims and overcomes the above mentioned drawbacks of the prior art.

[0043] The method according to the invention, described herein, makes it possible to wash delicate articles (wool, silk, articles with sequins or inserts of various kinds, and so on), considerably reducing damage to the fibres and also preventing dimensional alterations (shrinkage and/or relaxation of the fibres) or surface scuffing of the articles.

[0044] The method described also prevents decorative items, if any, applied to the articles from being detached during washing.

Claims

1. A method for washing delicate textile articles using a washing machine comprising a washing compartment (2) in which a rotary drum (3) is positioned, comprising the steps of:

- putting the articles to be washed (4) in the rotary drum (3);
- introducing washing liquid (5) into the drum (3);
- making the drum (3) rotate;

characterised in that the step of introducing washing liquid comprises flooding the drum (3) with a quantity of washing liquid such that it imparts to the articles to be washed (4) an Archimedes thrust which allows the articles to detach from the drum (3), thus allowing a step during which the articles float inside the drum (3).

2. The method according to claim 1, **characterised in that** during the step in which the articles float inside the drum (3), interposed between the inner wall (6) of the drum (3) and the articles to be washed (4) there is a layer (9) of washing liquid (5) which trans-

mits to the articles to be washed (4) a delicate rotary movement imparted by the rotary drum (3).

3. The method according to claim 1 or 2, **characterised in that** during the floating step the compartment (2) holds a quantity of washing liquid (5) which is variable from 24 to 28 litres, preferably 26 litres, allowing the articles to be washed (4) to float inside the drum (3).
4. The method according to any of the foregoing claims, **characterised in that** it comprises a pause step with the drum (3) stationary, allowing the washing liquid (5) and the detergent to delicately pass through the fibres.
5. The method according to claim 4, **characterised in that** it comprises a plurality of drum (3) rotation steps and a plurality of drum (3) pause steps.
6. The method according to claim 5, **characterised in that** the drum (3) rotation and pause steps are suitably combined with each other and their duration varies according to the type of article to be washed.
7. The method according to any of the foregoing claims, **characterised in that** during the floating step of the articles to be washed (4) the drum (3) rotates at a speed of between 18 and 32 rpm, preferably between 22 and 28 rpm.
8. The method according to any of the foregoing claims, **characterised in that** it comprises a step of forcing the articles to be washed (4) to adhere to the wall of the drum.
9. The method according to any of the foregoing claims, **characterised in that** the washing liquid (5) is heated, during the entire washing cycle, to a temperature between 25°C and 30°C.
10. The method according to any of the foregoing claims, **characterised in that** a further rotational component, transversal to the axis (3a) of rotation of the drum (3), is transmitted to the articles to be washed (4) by drawing bands (7) located on the inner wall of the drum (3), parallel with the axis (3a) of rotation, and extending at least along a portion of the entire axial length of the inner wall (6) of the drum.
11. The method according to any of the foregoing claims, **characterised in that** it comprises at least one step of rinsing the articles to be washed (4), in such a way as to remove the washing liquid (5) and the detergent.
12. The method according to any of the foregoing claims, **characterised in that** it comprises a step of draining out the washing liquid (5).

13. The method according to claim 12, **characterised in that** it comprises a step of forcing the articles to be washed, which are located in the drum (3), to adhere to the wall of the drum, said step being associated with the draining step, for expelling a pre-determined quantity of washing liquid (5) from the articles (4) in such a way as to prevent liquid from dripping from the articles (4), but without subjecting them to a spin cycle.

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FIG 1

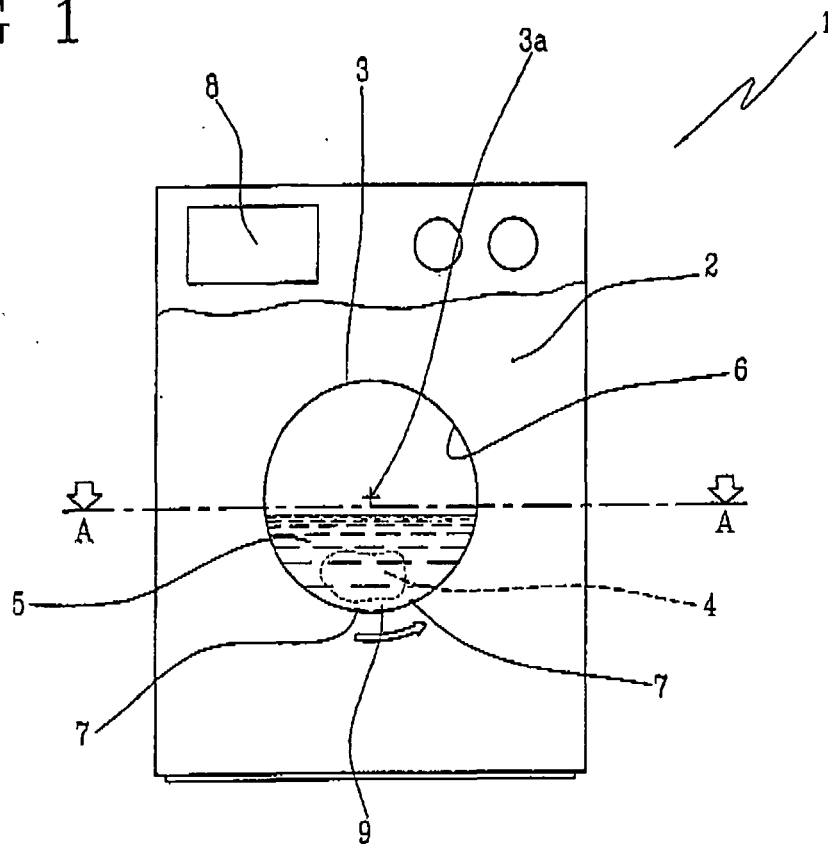
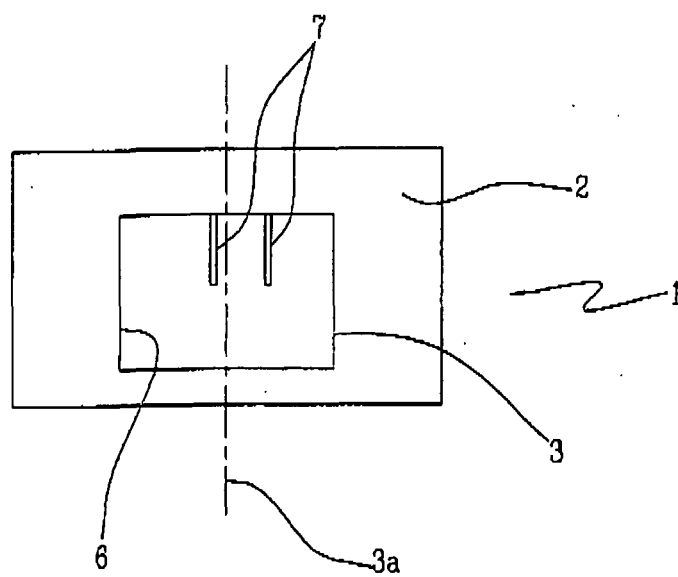


FIG 2





EUROPEAN SEARCH REPORT

Application Number
EP 12 00 0273

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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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EPO FORM 1503 03.82 (P04C01)

**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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