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(54) **WASHING METHOD TO ACHIEVE A SUPERIOR WASHING PERFORMANCE BY INTERMITTENT AND VARIABLE OSCILLATING DRUM MOVEMENTS**

WASCHVERFAHREN ZUM ERZIELEN EINER BESSEREN WASCHLEISTUNG DURCH
PERIODISCHE UND VARIABLE OSZILLIERENDE TROMMELBEWEGUNGEN

PROCEDE DE LAVAGE AMELIORANT LE RENDEMENT DU LAVAGE GRACE A DES
MOUVEMENTS INTERMITTENTS ET VARIABLE D'OSCILLATION DU TAMBOUR

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(56) References cited:
US-A- 5 507 054 **US-A- 5 560 061**

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Description

[0001] As the water used as the carrying medium during the washing operation is required priorly to carry the heat energy and the washing material (detergent) to the areas to be washed, and then to realize the process of removing the dirt decomposed from the textile (fabric) after being washed; a speed difference so that it can pass through the fibers of the fabric being washed and subsequently a difference of pressure acting on the water must be created. In addition to these, dirt is also removed off the fabric by mechanical movements through the friction provided between the fibers.

[0002] In the existing washing machines, the process of penetrating water into the fibers as well as the aid of mechanical movement to washing are obtained by means of rotating the drum both in clockwise and anti-clockwise directions with full tours at a constant speed. The rotational speed of the said movement is generally around 50-55 rpm and this value is determined according to the diameter of the drum. Due to the fact that the vertical component of the centrifugal force acting upon the clothes being washed is less than gravity just before the top point of the drum, the clothes are made to drop from the top point inside the drum down to the bottom of the drum.

[0003] Washing performance of the washing machines with tubs placed on a horizontal axis is higher than that of the washing machines with vertically positioned tubs and with loading ports on the top. The major reason of this is that the gravitational acceleration created due to its horizontal positioning assists together with the centrifugal acceleration created by rotation, the improvement of the process of removing dirt off the clothes.

[0004] In standard machines this process is realized by changing the number of drum revolutions. In this method, by keeping the vertical component of the centrifugal acceleration higher or lower than the gravitational acceleration, the drum angles or in other words the drop heights of the clothes within the drum at the moment of dropping (falling) can be controlled. Main problem seen in this method is the fact that the number of revolutions and the drop height cannot be controlled independently from each other. This limits the optimisation of the mechanical movements according to the characteristic of the fabric being washed.

[0005] A washing machine with a reversing mode is described in the document US 5560061 where the washing drum is intermittently driven in alternating rotary directions (reversing mode) during washing and/or rinsing, for accelerating the washing drum in one of the rotary directions to a first rpm being markedly below the contact rpm and accelerating the washing drum in the other of the rotary directions to a second rpm being markedly above the contact rpm.

[0006] Another significant drawback seen in the washing machines wherein the drum performs the

washing operation by making a full cycle, is the fact that they have to receive in more water during the wool washing programme, as compared to other programmes. Wool clothing's must be continuously within water in order to obtain an acceptable degree of shrinkage. In cases when the drum makes a full cycle the only solution to provide this condition is receiving more water into the machine. This brings the water consumption of the machine during the wool washing programme to high values.

[0007] One object of the present invention is to realize the rotational movements of any tub used in a washing machine as intermittent and with modulating oscillations, to increase or reduce the revolution cycle of the said tub with the desired acceleration that may be variable and to realize a method that provides an improvement in the washing performance by creating desired speed differences between water and clothes by means of stopping this movement at a desired angle and thus obtaining the intended falling angles and heights in desired cycles.

[0008] Another object of the present invention is to realize a method that assists keeping the wool clothes continuously in the water during washing cycle using less water, by applying to the drum the oscillating movements of variable amplitude and frequencies.

[0009] A general schematic drawing of an embodiment wherein the method realized to achieve the objects of the present invention is applied, is attached to this document. Here, the tub is horizontally positioned and supported by the body (1) by using spring (3) and damper elements (2). The drum (5) is positioned in' such a manner that it can perform rotational movements within the horizontal tub (4). Clothes (6) are loaded into the drum and washing is performed by means of rotation around the drum shaft axis (7). Drum movements are realized through the washing programmes selected in conformity with the type of the fabric to washed.

[0010] During wool programme, the drum rotates at approximately 3 rad/s^2 of angular acceleration and 20 rpm of rotational speed for 1.25 second clockwise and 1.25 seconds in anti-clockwise directions in order to meet the requirement of keeping the wool clothes to be washed continuously in water using less water and additionally in order to provide a better washing performance. Thus the drum never makes a full (complete) revolution and realizes an oscillating movement between the proper angle limit values towards both directions. As the result of the washing movement realised in this way, better shrinkage performance values as compared to a standard wool programme, can be obtained although 40% less main washing water is consumed.

[0011] Besides wool washing programme, the above mentioned oscillating movement can also be applied in cotton washing programme. As cotton fabrics do not require to be continuously kept in water, oscillation angles may reach to higher values compared to the wool programme during the washing cycle for cotton textiles. Ad-

ditionally, the fact that the acceleration acting upon the fabric during washing is variable improves the dirt removal process' off the clothes. By means of variable accelerations cleaning chemicals are carried into the pores of the fabric and dirt removed off the fabric is carried away from the clothes more efficiently.

[0012] For these reasons oscillating movement is provided in progressive amplitudes thus obtaining the modulation of the acceleration acting upon the fabric in the course of time, for cotton washing cases where washing performance is more important. This movement which starts as small oscillations and progressively increases its amplitude until it reaches full-cycle levels, is repeated periodically all through the washing programme.

[0013] By increasing or reducing the drum speed with a desired and variable acceleration and by stopping the rotation at a desired angle, the dropping of the clothes down from a desired height can be provided.

[0014] Another factor increasing the washing performance is simulating the rubbing action used while hand washing by providing the friction of the fabrics being washed. For this purpose, in addition to the drum movement with variable oscillations, the drum is rotated at such a speed that a centrifugal acceleration more than gravitational acceleration is obtained, thus the clothes in the tub are left immobile around the drum and the drum movement is suddenly stopped at 180° after the initial point, i.e. when the clothes are at the top point. As the result of this, the clothes within the drum drop off the peak point downwards and thus the washing performance is improved.

[0015] In cotton washing programme, the above mentioned operational process with the oscillating movement of variable amplitudes and stopping the drum at 180° position are used together with the other drum movements and thus the washing performance increases significantly.

[0016] In other words, the invention relates to a washing method obtaining a high washing performance by means of intermittent drum movements with varying directions, for a washing machine comprising a body, a tub spring and damper elements for supporting that tub by the body and a drum positioned in such a manner that it can rotate around its horizontal shaft axis; characterized in that the method comprises the steps of: rotating the drum once in the clockwise direction and then in the anti-clockwise direction while never making a complete revolution and realising an oscillating movement around the horizontal shaft axis. A preferred embodiment of the washing method is a washing method achieving an excellent washing performance in the said washing machines with drums, by intermittent and variable oscillating drum movements characterized in that the drum movement in said machine is stopped at a desired angle, and desired dropping angles and heights can be obtained at desired cycles. A preferred embodiment of the washing method is a washing method achieving an excellent washing performance in the said

washing machines with drums, by intermittent and variable oscillating drum movements characterized in that the drum is rotated with such a revolution that it provides a higher centrifugal acceleration than the gravitational acceleration in order to keep the laundry being washed immobile around the periphery of the drum and the drums is stopped suddenly about 180° after the starting point or in other words when the clothes are at the top (peak) point, so that the clothes fall down from the top point within the drum. A preferred embodiment of the washing method is a washing method used in the said washing machine with drum, during the wool washing cycle, that improves the washing performance with intermittent and variable oscillating drum movements, characterized in that the drum moves approximately at an angular acceleration of 2 to 4 radians/ sec² and 15 to 25 rpm for 1.0 to 1.5 seconds in the clockwise direction and for 1.0 to 1.5 seconds in the anti clockwise direction and makes oscillating movements of variable angles ; and enables clothes being washed are continuously kept in water by using less water.

Claims

1. A washing method obtaining a high washing performance by means of intermittent drum movements with varying directions, for a washing machine comprising a body. (1), a tub (4), spring (3) and damper elements (2) for supporting the tub (4) by the body (1), and a drum (5) positioned in such a manner that it can rotate around its horizontal shaft axis (7) within the said tub (4), characterized in that the method comprises the steps of: rotating the drum (5) once in the clockwise direction and then in the anti-clockwise direction while never making a complete revolution and realising an oscillating movement around the horizontal shaft axis (7).
2. A washing method according to claim 1, **characterized in that**, the drum (5) movement in said machine is stopped at a desired angle, and desired dropping angles and heights can be obtained at desired cycles.
3. A washing method according to claims 1 and 2, **characterized in that**, the drum (5) is rotated with such a revolution that a higher centrifugal acceleration than the gravitational acceleration is provided in order to keep the laundry being washed immobile around the periphery of the drum (5) and the drum (5) is stopped suddenly about 180° after the starting point or in other words when the clothes are at the top (peak) point, so that the clothes drop down from the top point within the drum (5).
4. A washing method according to claim 1, **character-**

ized in that, the drum (5) moves approximately at an angular acceleration of 2 to 4 radians/ sec² and 15 to 25 rpm for 1.0 to 1.5 seconds in the clockwise direction and for 1.0 to 1.5 seconds in the anti-clockwise direction and makes oscillating movements of variable angles; and enables the clothes being washed are continuously kept in water by using less water.

Patentansprüche

1. Waschverfahren für eine Waschmaschine, mit dem mittels intermittierender Trommelbewegungen in unterschiedlichen Richtungen eine hohe Waschleistung erhalten wird, wobei die Waschmaschine einen Körper (1), einen Trog (4), Federelemente (3) und Dämpferelemente (2) für die Unterstützung des Trogs (4) durch den Körper (1) und eine Trommel (5), die so positioniert ist, daß sie sich in dem Trog (4) um ihre horizontale Wellenachse (7) drehen kann, umfaßt, **dadurch gekennzeichnet, daß** das Verfahren die folgenden Schritte umfaßt: Drehen der Trommel (5) einmal im Uhrzeigersinn und dann im Gegenuhrzeigersinn, wobei niemals eine vollständige Umdrehung ausgeführt wird, und Ausführen einer oszillierenden Bewegung um die horizontale Wellenachse (7).
2. Waschverfahren nach Anspruch 1, **dadurch gekennzeichnet, daß** die Bewegung der Trommel (5) in der Maschine bei einem gewünschten Winkel angehalten wird und Abtropfwinkel und -höhen in gewünschten Zyklen erhalten werden können.
3. Waschverfahren nach den Ansprüchen 1 und 2, **dadurch gekennzeichnet, daß** die Trommel (5) mit einer Drehzahl gedreht wird, derart, daß eine höhere Zentrifugalbeschleunigung als die Erdbeschleunigung erzielt wird, um die zu waschende Wäsche längs des Umfangs der Trommel (5) unbeweglich zu halten, und die Trommel (5) bei etwa 180° nach dem Startpunkt, mit anderen Worten, wenn die Kleidungsstücke sich am oberen Punkt (Scheitel) befinden, plötzlich angehalten wird, so daß die Kleidungsstücke vom oberen Punkt in der Trommel (5) herabfallen.
4. Waschverfahren nach Anspruch 1, **dadurch gekennzeichnet, daß** sich die Trommel (5) ungefähr mit einer Winkelbeschleunigung von 2 bis 4 Radian/s² und mit 15 bis 25 min⁻¹ während 1,0 bis 1,5 Sekunden im Uhrzeigersinn und während 1,0 bis 1,5 Sekunden im Gegenuhrzeigersinn bewegt und oszillierende Bewegungen mit unterschiedlichen Winkeln ausführt; und ermöglicht, daß die zu waschenden Kleidungsstücke bei Verwendung von weniger Wasser ständig im Wasser gehalten werden.

Revendications

1. Un procédé de lavage permettant d'obtenir un rendement de lavage élevé grâce à des mouvements intermittents du tambour dans des dimensions variables, pour une machine à laver comprenant un corps (1), une cuve (4), un ressort (3) et des éléments d'amortissement (2) pour le support de la cuve (4) par le corps (1), et un tambour (5) positionné d'une manière telle qu'il puisse tourner autour de son axe horizontal (7) à l'intérieur de ladite cuve (4), **caractérisé en ce que** le procédé comprend les étapes consistant à : faire tourner le tambour (5) une fois dans le sens des aiguilles d'une montre, puis dans la direction inverse sans jamais effectuer un tour complet, et à provoquer un mouvement d'oscillation autour de l'axe de l'arbre horizontal (7).
2. Un procédé de lavage selon la revendication 1, **caractérisé en ce que** le mouvement du tambour dans ladite machine est interrompu à un angle désiré, et les angles et hauteurs de chute désirés peuvent être obtenus à des angles désirés.
3. Un procédé de lavage selon les revendications 1 et 2, **caractérisé en ce que** l'on fait tourner le tambour (5) à une vitesse de rotation telle qu'est assurée une accélération centrifuge supérieure à l'accélération gravitationnelle en vue de maintenir le linge en cours de lavage immobile sur la périphérie du tambour (5) et on interrompt brusquement la rotation du tambour (5) à environ 180° après le point de départ, soit, en d'autres termes, quand les vêtements sont au point haut (pic), de sorte que les vêtements retombent dans le tambour (5) depuis ce point haut.
4. Un procédé de lavage selon la revendication 1, **caractérisé en ce que** le tambour (5) tourne avec une accélération angulaire d'approximativement 2 à 4 radians/sec² et 15 à 25 t/min pendant 1,0 à 1,5 secondes dans le sens des aiguilles d'une montre et pendant 1,0 à 1,5 secondes dans la direction inverse, et prend des mouvements oscillatoires sous divers angles, ce qui permet aux vêtements en cours de lavage d'être maintenus continuellement dans l'eau tout en utilisant moins d'eau.

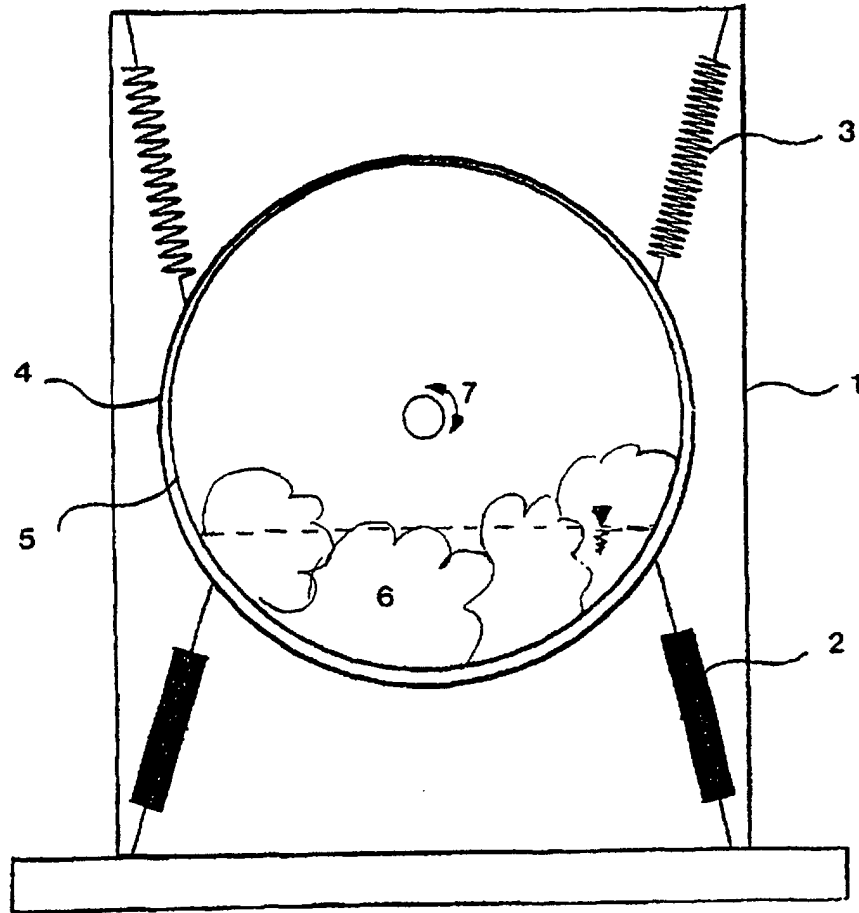


FIGURE 1