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(54) **A WASHING MACHINE WITH IMPROVED RINSING AND SPIN-DRYING PERFORMANCES**
WASCHMASCHINE MIT VERBESSERTEN SPÜL- UND SCHLEUDEREIGENSCHAFTEN
LAVE-LINGE AVEC DES PROPRIÉTÉS DE RINÇAGE ET D'ESSORAGE AMÉLIORÉES

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(56) References cited:
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Description

[0001] The present invention relates to a washing machine the rinsing and spin-drying performances of which are improved.

[0002] The rinsing/spin-drying performance of the washing machine is adversely affected when the load capacity is exceeded or when loaded with the type of laundry absorbing plenty of water for example such as towels, bathrobes, 100 % cotton clothes or when more detergent than required is used, as a result the laundry contains detergent residue at the end of the washing program.

[0003] The laundry that absorbs plenty of water such as towels retain the detergent water and this water retained by the laundry cannot be easily removed from the laundry during the discharge and spin-drying steps. In this situation, the required spinning speed cannot be reached in the spin-drying step. Another reason why the discharge becomes difficult is that the intensive foam formed due to too much detergent during the washing step prevents the discharge pump from operating effectively. In either situation, the water discharge that becomes difficult disrupts the spin-drying profile, the motor is strained and the desired spin speed cannot be reached. During the rinsing step, detergent cannot be removed from the laundry and the rinsing performance deteriorates since the motor cannot reach the desired spin speed.

[0004] In the situation the load capacity of the washing machine is exceeded, detergent cannot be removed from the laundry effectively since the rinsing water received for each laundry load unit remains insufficient, the spin-drying and respectively the rinsing performance deteriorate.

[0005] In the state of the art German Patent Application no DE10234472, the explanation is given for rotating the drum intermittently in order to prevent the foaming.

[0006] In the state of the art German Patent Application no DE4210577, during the rinsing step several spinning stages are performed and the water is removed from the laundry after the last spinning stage by operating the discharge pump.

[0007] In the state of the art German Patent Application no DE4115776, after the ending of the main wash, and the drum speed is then lowered to 100 rpm from 1,000 rpm and after a specific amount of rinsing water is taken into the drum, the drum is subsequently brought to a speed of 800 rpm.

[0008] United States Patent Application US 2007/124871 discloses a control method for a washing machine comprising a step of performing water draining by rotating a motor at a speed lower than a resonance generation speed and a step of performing a main-spinning by rotating the motor at a speed higher than the resonance generation speed.

[0009] International Patent Application WO 03/046271 A1 discloses a method for determining the unbalanced

load in a washing machine, said method comprising discharging, distribution, prespinning and spinning cycles. During distribution, rotation in clockwise and counterclockwise direction at the speed of washing cycle alternate, and a discharge pump operates continuously. During prespinning and spinning, rotation speed is higher than the resonance spinning speed.

[0010] The aim of the present invention is the realization of a washing machine the rinsing and spin-drying performances of which are improved.

[0011] The washing machine realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a control unit which provides to execute the water releasing step wherein water is discharged gradually, and wherein the drum is rotated in the washing speed at least once in clockwise and at least once in counterclockwise direction at certain intervals after the main washing step and the following water discharge process, before the spin-drying and rinsing step, and which executes a gradual spin-drying step wherein the drum is rotated successively, for a short time, at a speed significantly much lower than the spin-drying step of the drum but at a speed greater than the resonance speed.

[0012] Thus, the discharge is facilitated by removing water from the laundry retaining plenty of water and by reducing the foam especially in the situation when excessive foam is formed.

[0013] In an embodiment of the present invention, the water releasing step lasts approximately for 5 minutes.

[0014] In an embodiment of the present invention, the discharge pump is operated intermittently in the water releasing step.

[0015] In another embodiment of the present invention, the water removed from the laundry at the end of the water releasing step is provided to be discharged by operating the discharge pump between the water releasing and the gradual spin-drying steps.

[0016] In another embodiment of the present invention, the spin speed in the gradual spin-drying step is executed at between 300 to 400 rpm.

[0017] In another embodiment of the present invention, the water releasing step is executed after clean water is taken. Consequently, foam reducing and discharge of detergent is improved.

[0018] By means of the present invention, the adverse effect on the rinsing and spin-drying performance of the washing machine is minimized when the load capacity is exceeded, when the laundry type that absorbs plenty of water is loaded or when more detergent than required is used.

[0019] A washing machine realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the perspective view of a washing machine.

Figure 2 - is the speed - time graph of the washing

program in the prior art.

Figure 3 - is the speed - time graph of the washing program in the embodiment of the present invention.

[0020] The elements illustrated in the figures are numbered as follows:

1. Washing machine
2. Drum
3. Control unit

[0021] The washing machine (1) of the present invention comprises a drum (2) wherein the laundry to be washed is placed, and a control unit (3) which executes the washing program, consisting of main washing, rinsing and spin-drying steps, at the spin speed determined by the producer according to the washing program that is selected by the user (Figure 1).

[0022] The control unit (3) provides the execution of a water releasing step (A) wherein water is discharged gradually, wherein the drum (2) is rotated in the washing speed at least once in clockwise and at least once in counterclockwise direction at certain intervals after the main washing step and the following water discharge process, before the spin-drying and rinsing steps, and afterwards provides the execution of a gradual spin-drying step (B) wherein the drum (2) is rotated successively, for a short time, at a speed significantly much lower than the spin-drying step of the drum (2) but at a speed greater than the resonance speed (Figure 3). While the drum (2) is rotated at under 100 rpm in the water releasing step (A), it is rotated at around 300 to 400 rpm in the gradual spin-drying step (B).

[0023] Consequently, removing water from the laundry absorbing plenty of water and reducing the foam particularly in the situation when excessive foam is formed are provided and the continuity of the discharge is maintained with the water draining from the laundry.

[0024] The washing machine (1) furthermore comprises a discharge pump providing the water to be discharged. The discharge pump is operated at intervals during the water releasing step (A). In water releasing step (A), this provides the water drained from the laundry to be discharged at intervals in between the low percentage mechanical movements performed by the drum (2).

[0025] In an embodiment of the present invention, the detergent water is discharged at the end of the main washing. Right after, the water releasing step (A) is executed by the control unit (3) for approximately 5 minutes. In the water releasing step (A), the drum (2) performs low percentage mechanical movements and the discharge pump is operated intermittently during these movements. Water is provided to be effectively removed from the laundry retaining plenty of water by the water releasing step (A) and the discharge is provided to be facilitated in the situation when excessive foaming is formed. After the water releasing step (A), the gradual spin-drying step (B) is executed. In this step, the drum

(2) performs several, preferably 3 successive low speed and short duration spin-dryings, at a speed lower than the spin-drying speed. After the gradual spin-drying step (B) is completed, the normal spin-drying and rinsing steps are executed. A more uniform spin-drying profile is provided to be executed before the rinsing step since the water contained in the laundry is removed from the washing machine (1) significantly by means of the water releasing (A) and gradual spin-drying (B) steps. Accordingly, the rinsing performance is increased that much more since detergent is removed from the laundry before the rinsing step.

[0026] In another embodiment of the present invention, the discharge pump is also operated between the water releasing step (A) and the gradual spin-drying step (B).

[0027] In another embodiment of the present invention, some amount of clean water is taken after the main washing step is completed and before the water releasing step (A). Consequently, reducing of the foam and the discharge of detergent are improved. In this embodiment, by taking clean water, an effective rinsing is provided by reducing the foam together with the low percentage mechanical movement rather than releasing of the water contained in the laundry.

[0028] By means of the present invention, the rinsing and spin-drying performance of the washing machine (1) being adversely affected is minimized in the situation when the load capacity is exceeded, when the laundry type that absorbs plenty of water is loaded or when more detergent than required is used.

[0029] It is to be understood that the present invention is not limited to the embodiments disclosed above and a person skilled in the art can easily introduce different embodiments. These different embodiments should be considered within the scope of the claims of the present invention, too.

Claims

1. A washing machine (1) comprising a drum (2) wherein the laundry to be washed is placed, a discharge pump providing the water to be discharged, and a control unit (3) which executes the washing program, consisting of main washing, rinsing and spin-drying steps, at a spin speed determined by the producer according to the washing program that is selected by the user,

wherein the control unit (3) which provides operation of the washing machine (1) by the realization of the following steps in the following order:

- main washing, wherein the detergent water is discharged at the end of the main washing,
- a water releasing step (A) after the main washing step and the following water discharging process, before the spin-drying and rinsing steps, wherein the drum (2) is rotated at certain

intervals at washing speed, at least once in clockwise and at least once in counterclockwise direction and wherein water is discharged gradually by operating the discharge pump at intervals in the water releasing step (A), thus providing the water drained from the laundry to be discharged at intervals in between the low percentage mechanical movements performed by the drum (2),

and afterwards

- a gradual spin-drying step (B) wherein the drum (2) is rotated successively, for a short time, at a second speed of between 300 to 400 rpm and thereby significantly lower than the spin speed determined by the producer but greater than the resonance speed,
- further spin-drying and rinsing steps wherein the drum (2) is rotated at the spin speed determined by the producer.

2. The washing machine (1) as in Claim 1, **characterized by** the discharge pump that is operated between the water releasing step (A) and the gradual spin-drying step (B).
3. The washing machine (1) as in Claim 1, **characterized by** the water releasing step (A) that lasts for approximately 5 minutes.
4. The washing machine (1) as in Claim 1, **characterized by** the water releasing step (A) that is started after taking clean water.

Patentansprüche

1. Eine Waschmaschine (1) bestehend aus einer Trommel (2), wo die zum waschenden Wäsche hingelegt wird, einer Abgabepumpe, die sicherstellt, daß das Wasser abgegeben wird, und einer Kontrolleinheit (3), die das Waschprogramm abläuft, das aus Schritten der Primärwaschung, Abspülen und Trockenschleuder besteht, an einer Drehgeschwindigkeit festgestellt vom Hersteller nach dem Waschprogramm, das vom Benutzer ausgewählt ist, **wobei** die Kontrolleinheit (3) die Bearbeitung der Waschmaschine (1) durch Verwirklichung von folgenden Schritten in folgender Reihenfolge sicherstellt:
 - Primär Waschung, wobei Spülmittel Wasser am Ende der Primärwaschung abgeflossen wird,
 - ein Schritt für Freilassung von Wasser (A) nach dem Primärwaschungsschritt und folgender Wasserabflußvorgang vor Trockenschleuder- und Abspülenschritten, wobei die Trommel (2) in bestimmten Intervallen an der Waschge-

schwindigkeit rotiert wird, mindestens einmal in Richtung im Uhrzeigersinn und mindestens einmal in Richtung gegen den Uhrzeigersinn und wobei das Wasser allmählich abgeflossen wird durch Betätigung der Abflusspumpe in Intervallen im Schritt für Freilassung von Wasser (A), sodaß das Wasser von der Wäscherei abgeflossen wird, um in Intervallen in zwischen dem niedrigen Anteil von mechanischen Bewegungen sicherzustellen, die von der Trommel (2) ausgeführt werden,

und nachher

- ein allmählicher Trockenschleuderschritt (B) wobei die Trommel (2) erfolgreich rotiert wird, für eine kurze Zeit, an einer zweiten Geschwindigkeit zwischen 300 bis 400 rpm und wo bedeutsam niedriger als der Schleudergeschwindigkeit ist, die von Vorgehensweise festgestellt wird, aber größer als Resonanzgeschwindigkeit ist,
- weitere Trockenschleuder- und Abspülen schritte, wobei die Trommel (2) rotiert ist an einer Schleudergeschwindigkeit, die vom Hersteller bestimmt wird.

2. Die Waschmaschine (1) nach Anspruch 1, **dadurch gekennzeichnet, daß** die Abflusspumpe zwischen dem Schritt für Freilassung von Wasser (A) und allmählichen Trockenschleuderschritt (B) betätigt wird.
3. Die Waschmaschine (1) nach Anspruch 1, **dadurch gekennzeichnet, daß** der Schritt für Freilassung von Wasser (A) für ungefähr 5 Minuten weiterdauert.
4. Die Waschmaschine (1) nach Anspruch 1, **dadurch gekennzeichnet, daß** der Schritt für Freilassung von Wasser (A) nach der Aufnahme von Reinwasser anfängt.

Revendications

1. Une machine à laver (1) comprenant un tambour (2) dans lequel est placé le linge à laver, une pompe à décharger fournissant l'eau à évacuer, et une unité de commande (3) qui exécute le programme de lavage, composé d'un lavage principal, un rinçage et les étapes de séchage par essorage, à une vitesse d'essorage déterminée par le producteur selon le programme de lavage sélectionné par l'utilisateur, **dans lequel** l'unité de commande (3) qui assure le fonctionnement de la machine à laver (1) par la réalisation des étapes suivantes dans l'ordre suivant:
 - lavage principal, dans lequel l'eau détergente est déchargée à la fin du lavage principal,

- une étape de libération d'eau (A) après l'étape de lavage principale et le processus de déchargement d'eau suivant, avant les étapes de séchage par essorage et de rinçage, dans lequel le tambour (2) tourne à certains intervalles à la vitesse de lavage, au moins une fois dans le sens horaire et au moins une fois dans le sens anti-horaire et dans lequel l'eau est déchargée progressivement en actionnant la pompe de décharge à des intervalles dans l'étape de libération de l'eau (A), ce qui provoque l'évacuation de l'eau drainée du linge à des intervalles entre le faible pourcentage de mouvements mécaniques effectués par le tambour (2)

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et après

- une étape de séchage graduelle par essorage (B) dans laquelle le tambour (2) tourne successivement, pendant une courte période, à une seconde vitesse comprise entre 300 et 400 tr/min et donc significativement inférieure à la vitesse d'essorage déterminée par la procédure mais supérieure à la vitesse de résonance,
- d'autres étapes de séchage par essorage et de rinçage dans lesquelles le tambour (2) tourne à la vitesse d'essorage déterminée par le producteur.

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2. Machine à laver (1) selon la revendication 1, **caractérisée** par la pompe de décharge qui fonctionne entre l'étape de libération de l'eau (A) et l'étape de séchage graduelle par essorage (B). 30
3. Machine à laver (1) selon la revendication 1, **caractérisée** par l'étape de libération d'eau (A) qui dure environ 5 minutes. 35
4. Machine à laver (1) selon la revendication 1, **caractérisée** par l'étape de libération de l'eau (A) qui commence après avoir pris de l'eau propre. 40

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Figure 1

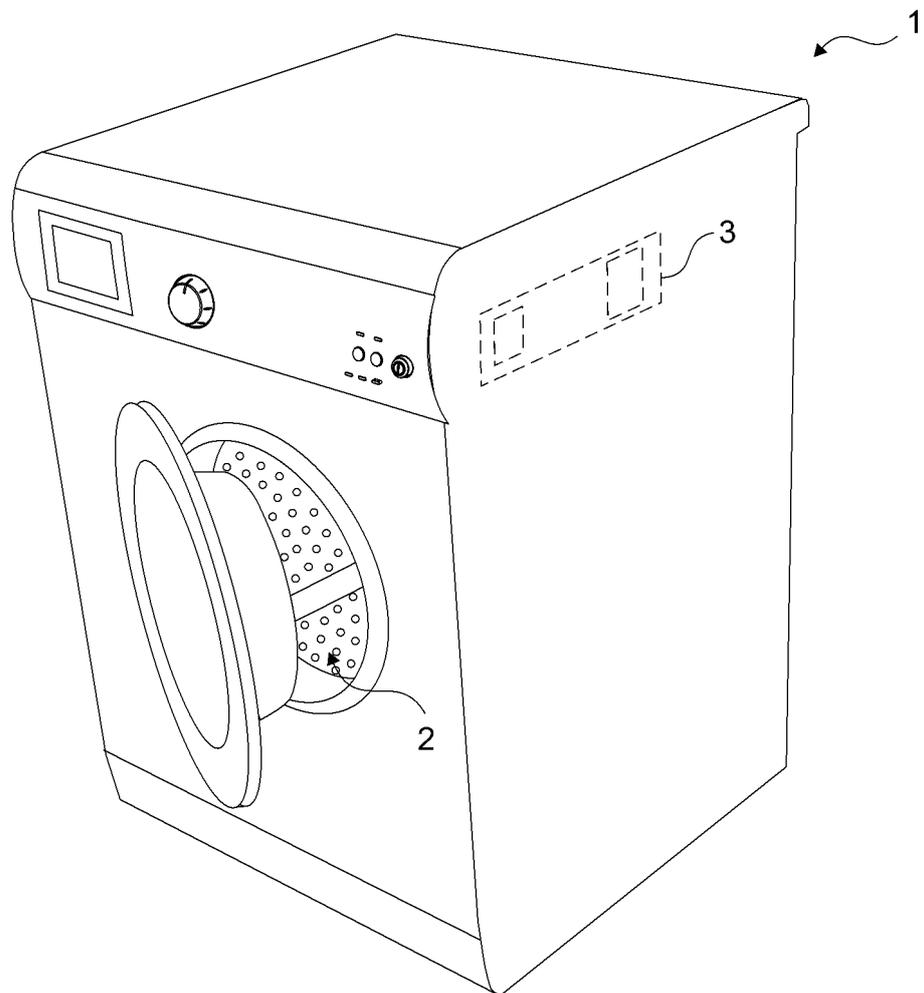


Figure 2

Speed(rpm)

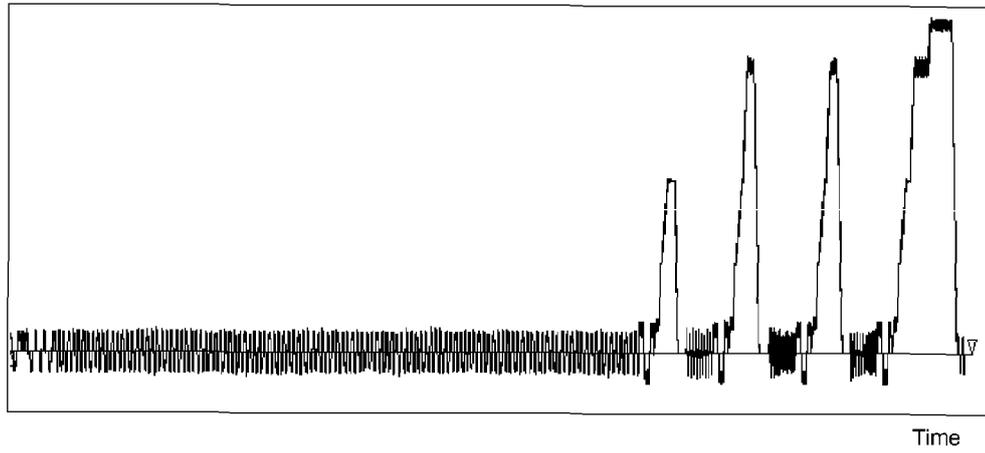
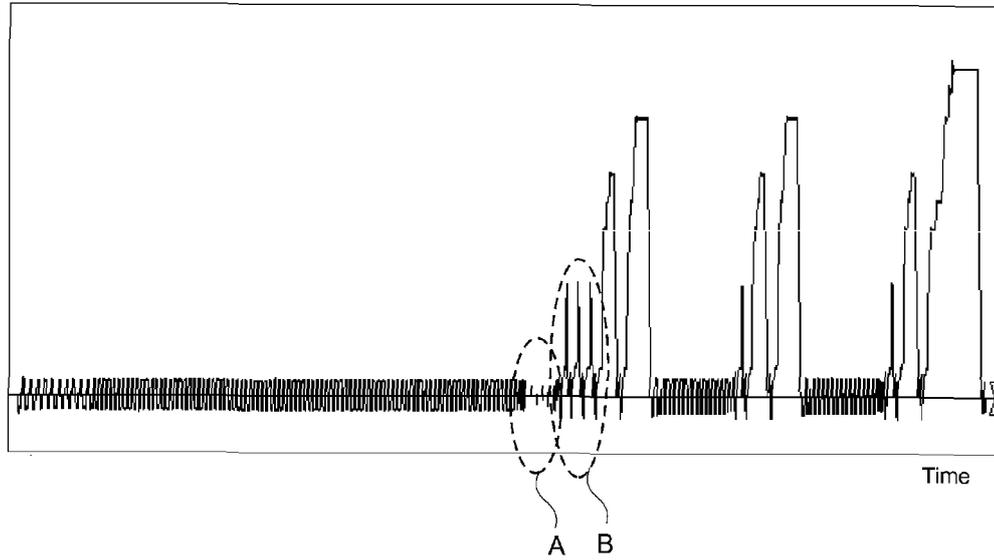


Figure 3

Speed(rpm)



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 10234472 [0005]
- DE 4210577 [0006]
- DE 4115776 [0007]
- US 2007124871 A [0008]
- WO 03046271 A1 [0009]