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(54) **METHOD FOR MACHINE WASHING OF TEXTILES**

VERFAHREN ZUM MASCHINELLEN WASCHEN VON TEXTILIEN

PROCÉDÉ DE LAVAGE DE TEXTILES EN MACHINE

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## Description

**[0001]** The present invention relates to machine-washing of textiles preferably in industrial scale.

**[0002]** More precisely the present invention relates to a method for machine-washing of textiles, in which method the existence of disinfectant in the washing process can be confirmed.

**[0003]** Disinfectants are typically used in the machine-washing processes of various textiles, such as textiles from food industry, healthcare and hospitality, for example. However, thus far there have not been a reliable way to confirm the proper introduction, and thus the effect, of disinfectant in the machine-washing processes utilized in automated laundry systems. This is mainly due to the continuously changing and the laundry related properties of the water in the washing process.

**[0004]** The disinfectant used in the washing processes of automated laundry systems are often conveyed to the actual washing process and machine(s) from a distance, such as from a separate room wherein the disinfectant is stored. Therefore, even though it is easily confirmable that the disinfectant has been sent to the washing process and machine(s), the actual introduction of the disinfectant to the washing process can still fail due to various reasons, such as pipe blockage, leakage or breakage, for example. Further, the continuously increasing requirements for washed and simultaneously disinfected textiles require more concrete proof of the actual disinfection of the textiles.

**[0005]** Publication WO 2012/026821 A1, presenting the closest prior art, discloses a method and a device for industrial washing of textile, wherein at least one process parameter related to process water is detected during at least two washing steps.

**[0006]** Publication EP 3 219 842 A1 discloses a method for wet treating of laundry, wherein predetermined quantity of at least one treatment additive is added to the laundry at the beginning of the wet treatment and the current content of at least one treatment additive is measured at least once.

**[0007]** Publication WO 2015/010143 A1 discloses a measuring apparatus for recording at least one parameter of a liquid, in particular a cleaning or disinfectant liquid.

**[0008]** Independent claim 1 is directed to the essential features of the present invention. Dependent claims 2-4 concern particular embodiments of that invention.

**[0009]** The present invention provides a novel solution for confirming the introduction and existence of a disinfectant in the machine-washing process in a reliable way. In the solution of the invention either the electrical conductivity or the pH value of the washing liquid is measured before the dosing of a disinfectant and after the dosing of the disinfectant, so that the differences in these two measurement values can be used to confirm that the disinfectant has been properly introduced and dosed in the washing process. Since many other factors, such as the

water itself, and dirt on textiles and washing agent(s) in the water, affects to the electrical conductivity and pH value of the washing liquid, two measurements are required for reliable confirmation.

**[0010]** In the method of the invention for machine-washing of textiles the textiles are washed in a washing machine with water and washing agent(s), and at least one disinfecting agent is dosed in the washing process for disinfecting the textiles in the washing process, wherein the electrical conductivity or the pH value of the washing liquid, which comprises at least water and washing agent(s), is measured during the washing process first before dosing of the disinfecting agent to the washing process and then second time after dosing of the disinfecting agent, and the two measurement values are compared to each other to confirm successful dosing of the disinfecting agent to the washing process.

**[0011]** In an embodiment of the method of the invention the dosing of the disinfecting agent and the measurements are done after washing of the textiles has started. This way dirt can be removed from the textiles, so that it cannot affect the disinfection of the textiles. However, it is to be noted that the dirt washed from the textiles remains in the washing liquid, thus affecting washing liquid's pH and electrical conductivity, for example.

**[0012]** According to the invention increased electrical conductivity of the washing liquid, or decreased pH value of the washing liquid, between the two measurements indicate successful dosing of disinfecting agent to the washing process.

**[0013]** In an embodiment of the method of the invention temperature of the washing liquid and disinfection time are also measured from the washing process to confirm successful disinfection of the textiles in the washing process. In this embodiment the successful disinfection of the textiles is guaranteed with a predefined time period and temperature of the washing liquid together with the confirmed dosing of the disinfecting agent.

**[0014]** In an embodiment of the method of the invention separate samples from the washing liquid in the washing process are taken for the measurements, which samples are measured with a measuring device. In this embodiment a small amount of the washing liquid is taken twice from the washing machine, once before and then after the dosing of the disinfecting agent, and preferably conveyed to a separate measuring vessel for the measurements of the pH value or the electrical conductivity. The method of the present invention can be implemented both with a continuous batch washer (CBW) and with an industrial single batch washing machine, preferably with a plurality of these single batch washing machines.

**[0015]** More precisely the features defining a method in accordance with the present invention are presented in claim 1. Dependent claims present advantageous features and embodiments of the invention.

**[0016]** Exemplifying embodiment of the invention and its advantages are explained in greater detail below in the sense of example and with reference to accompany-

ing drawings, where

Figure 1 shows schematically an embodiment of the invention, and

Figure 2 shows schematically an alternative embodiment of the invention.

**[0017]** Figure 1 shows a continuous batch washer (CBW) 1, which is an industrial washing machine used to handle large amounts of laundry as a continuous washing process. This kind of washing machine can typically handle up to about 10.000 kg of laundry in a single shift.

**[0018]** The continuous batch washer 1 in this embodiment comprises a feed chute 2 via which laundry batches of defined weight are fed into the machine. The washing section of the washer 1 comprises a plurality of drums 3a-3k, through which the laundry batch of textiles is automatically moved together with the washing liquid.

**[0019]** In the first drum 3a, the laundry batch is mixed with water and washing agents, which washing agents are pumped and dosed from container 4a and/or 4b. The actual washing of the laundry batch continues through drums 3a-3c.

**[0020]** When the laundry reaches drum 3d, disinfecting agent is dosed and mixed to the washing liquid in order to disinfect the textiles of the laundry batch. The disinfecting process is continued with drums 3d-3g predefined time at predefined temperature.

**[0021]** In the drums 3h-3j the laundry is rinsed, and in the drum 3j neutralizing agents are pumped and dosed to the drum from container 6a and/or 6b and mixed with the laundry to neutralize any residues of the washing agents and disinfecting agents left in the laundry. In press of centrifuge 3k the water is removed from the laundry.

**[0022]** From the drum 3d washing liquid samples are taken with a valve 7a, which is controlled to allow small amount of the washing liquid to exit the drum 3d to a sample measuring vessel 8. In the sample measuring vessel 8 is a sensor 9 which measures the electrical conductivity or the pH value of the sample. The sensor 9 comprises a measuring head extending to the washing liquid sample in the measuring vessel 8. The sample in the measuring vessel 8 is changed by opening the valve 7a at a suitable time for a suitable time period for new sample measurement. At certain measurement amounts or time intervals the measuring vessel 8 together with the measuring head of the sensor 9 is cleaned with fresh water vial valve 7b.

**[0023]** The measurement is done twice for two different samples, first to a first sample of the washing liquid taken before dosing the disinfecting agent, and second time to a second sample of the washing liquid after dosing the disinfecting agent.

**[0024]** When the two measurement values are compared, if measured electrical conductivity indicate increase from the first sample to the second sample, or if measured pH value indicate decrease from the first sam-

ple to the second sample, the dosing of the disinfecting agent to the washing process has been successful, and the washing process can continue.

**[0025]** If, however, there is no change between the measured values of the first and second sample, or the change is too small, this indicates that there are problems with the disinfecting process. Then the laundry batch in quest will be returned to the washing process for a new round after it has exited the washer 1, or a second measurement can be made later in the washing process, manually for example, to confirm the problem.

**[0026]** Figure 2 shows schematically an alternative embodiment of the invention, wherein batches of laundry are washed in a single industrial washing machine 11a-11f, which machines there normally are plurality of in an industrial laundry.

**[0027]** During washing process, to each of the machines 11a-11f is pumped and dosed the required washing agents from containers 12 and 13 at specific times in the washing process of the specific machine. Similarly, after the washing of the laundry batch of textiles has proceeded at a specific time in a specific machine 11a-11f, to the washing machine is pumped and dosed disinfecting agent from container 14.

**[0028]** Each of the machines 11a-11f are equipped with a conduit leading to a sample measuring vessel 15, to which a sample of the washing liquid from the washing machine can be conveyed via the conduit and by operating a valve 17. Each of the sample measurement vessels 15 are equipped with a suitable sensor 16 for measuring electrical conductivity or pH value of the sample, which sensor comprises a measuring head extending to the washing liquid sample in the measurement vessel. The sample in the measuring vessel 15 is changed by opening the valve 17 at a suitable time for a suitable time period for a new sample measurement. At certain measurement amounts or time intervals the measuring vessel 15 together with the measuring head of the sensor 16 is cleaned with fresh water vial valve 18.

**[0029]** In this embodiment, first sample of the washing liquid is taken just before dosing the disinfecting agent into the machine 11a-11f, and its electrical conductivity or pH value is measured. Second sample is taken after the disinfecting agent is added to the machine 11a-11f and mixed to the washing liquid, and its electrical conductivity or pH value is measured.

**[0030]** Similarly than in embodiment of figure 1, when the two measurement values are compared, if measured electrical conductivity indicate increase from the first sample to the second sample, or if measured pH value indicate decrease from the first sample to the second sample, the dosing of the disinfecting agent to the washing process has been successful, and the washing process can continue.

**[0031]** If, however, there is no change between the measured values of the first and second sample, or the change is too small, this indicates that there are problems with the disinfecting process. Then the dosing of the dis-

infectant can be done again, or the measurement redone, manually for example, before the washing process is allowed to proceed. Alternatively, the whole washing process can be started again.

**[0032]** In the above discussed embodiments, the measurement of electrical conductivity or pH value is done to a separate sample of the washing liquid taken from the washing machines. The present invention, however, may also be implemented with a measurement sensor located inside the washing machine measuring the washing liquid inside the machine.

**[0033]** The specific exemplifying embodiments of the invention shown in figures and discussed above should not be construed as limiting. A person skilled in the art can amend and modify the embodiments described in many evident ways within the scope of the attached claims. Thus, the invention is not limited merely to the embodiment described above.

### Claims

1. Method for machine-washing of textiles, in which method the textiles are washed in a washing machine (1; 11a-11f) with water and a washing agent or washing agents, and in which method at least one disinfecting agent is dosed in the washing process for disinfecting the textiles in the washing process, **characterized in that** the electrical conductivity or the pH value of the washing liquid, which comprises at least water and the washing agent or washing agents, is measured during the washing process first before the dosing of the disinfecting agent to the washing process and then a second time after the dosing of the disinfecting agent, and the two measurement values are compared to each other to confirm a successful dosing of the disinfecting agent to the washing process, and wherein the increased electrical conductivity of the washing liquid, or the decreased pH value of the washing liquid, between the two measurements indicate the successful dosing of the disinfecting agent to the washing process.
2. Method according to claim 1, wherein the dosing of the disinfecting agent and the measurements are done after the washing of the textiles has started.
3. Method according to claim 1 or 2, wherein the temperature of the washing liquid and the disinfection time are also measured from the washing process to confirm the successful disinfection of the textiles in the washing process.
4. Method according to any of claims 1-3, wherein samples from the washing liquid in the washing process are taken for the measurements, which samples are measured with a measuring device (8, 9; 15, 16).

### Patentansprüche

1. Verfahren zum Maschinenwaschen von Textilien, wobei bei dem Verfahren die Textilien in einer Waschmaschine (1; 11a-11f) mit Wasser und einem Waschmittel oder Waschmitteln gewaschen werden, und bei dem Verfahren mindestens ein Desinfektionsmittel zum Desinfizieren der Textilien in dem Waschprozess zudosiert wird, **dadurch gekennzeichnet, dass** die elektrische Leitfähigkeit oder der pH-Wert der Waschflüssigkeit, die mindestens Wasser und das Waschmittel oder die Waschmittel umfasst, während des Waschprozesses zunächst vor der Dosierung des Desinfektionsmittels zu dem Waschprozess und dann ein zweites Mal nach der Dosierung des Desinfektionsmittels gemessen wird und die beiden Messwerte miteinander verglichen werden, um eine erfolgreiche Dosierung des Desinfektionsmittels zu dem Waschprozess zu bestätigen, und wobei die erhöhte elektrische Leitfähigkeit der Waschflüssigkeit oder der verringerte pH-Wert der Waschflüssigkeit zwischen den beiden Messungen die erfolgreiche Dosierung des Desinfektionsmittels zu dem Waschprozess anzeigen.
2. Verfahren nach Anspruch 1, wobei die Dosierung des Desinfektionsmittels und die Messungen nach Beginn des Waschens der Textilien erfolgen.
3. Verfahren nach Anspruch 1 oder 2, wobei auch die Temperatur der Waschflüssigkeit und die Desinfektionszeit aus dem Waschprozess gemessen werden, um die erfolgreiche Desinfektion der Textilien in dem Waschprozess zu bestätigen.
4. Verfahren nach einem der Ansprüche 1 - 3, wobei Proben aus der Waschflüssigkeit in dem Waschprozess für die Messungen entnommen werden, die mit einer Messvorrichtung (8, 9; 15, 16) gemessen werden.

### Revendications

1. Procédé de lavage de textiles en machine, dans lequel les textiles sont lavés dans une machine à laver (1 ; 11a-11f) avec de l'eau et un détergent ou des détergents, et dans lequel au moins un agent désinfectant est ajouté au processus de lavage pour la désinfection des textiles dans le processus de lavage, **caractérisé en ce que** la conductivité électrique ou la valeur de pH de la lessive liquide, laquelle comprend au moins de l'eau et le détergent ou les détergents, est mesurée pendant le processus de lavage, d'abord avant l'ajout de l'agent désinfectant au processus de lavage et ensuite une deuxième fois après l'ajout de l'agent désinfectant, et les deux valeurs de mesure sont comparées entre elles pour

confirmer la réussite de l'ajout de l'agent désinfectant au processus de lavage, et dans lequel la conductivité électrique augmentée de la lessive liquide ou la valeur de pH réduite de la lessive liquide entre les deux mesures indique la réussite de l'ajout de l'agent désinfectant au processus de lavage. 5

2. Procédé selon la revendication 1, dans lequel l'ajout de l'agent désinfectant et les mesures sont réalisés une fois que le lavage des textiles a commencé. 10
3. Procédé selon la revendication 1 ou 2, dans lequel la température de la lessive liquide et le temps de désinfection sont également mesurés à partir du processus de lavage pour confirmer la réussite de la désinfection des textiles dans le processus de lavage. 15
4. Procédé selon l'une quelconque des revendications 1 - 3, dans lequel des échantillons de la lessive liquide dans le processus de lavage sont prélevés pour les mesures, lesdits échantillons étant mesurés à l'aide d'un dispositif de mesure (8, 9 ; 15, 16). 20

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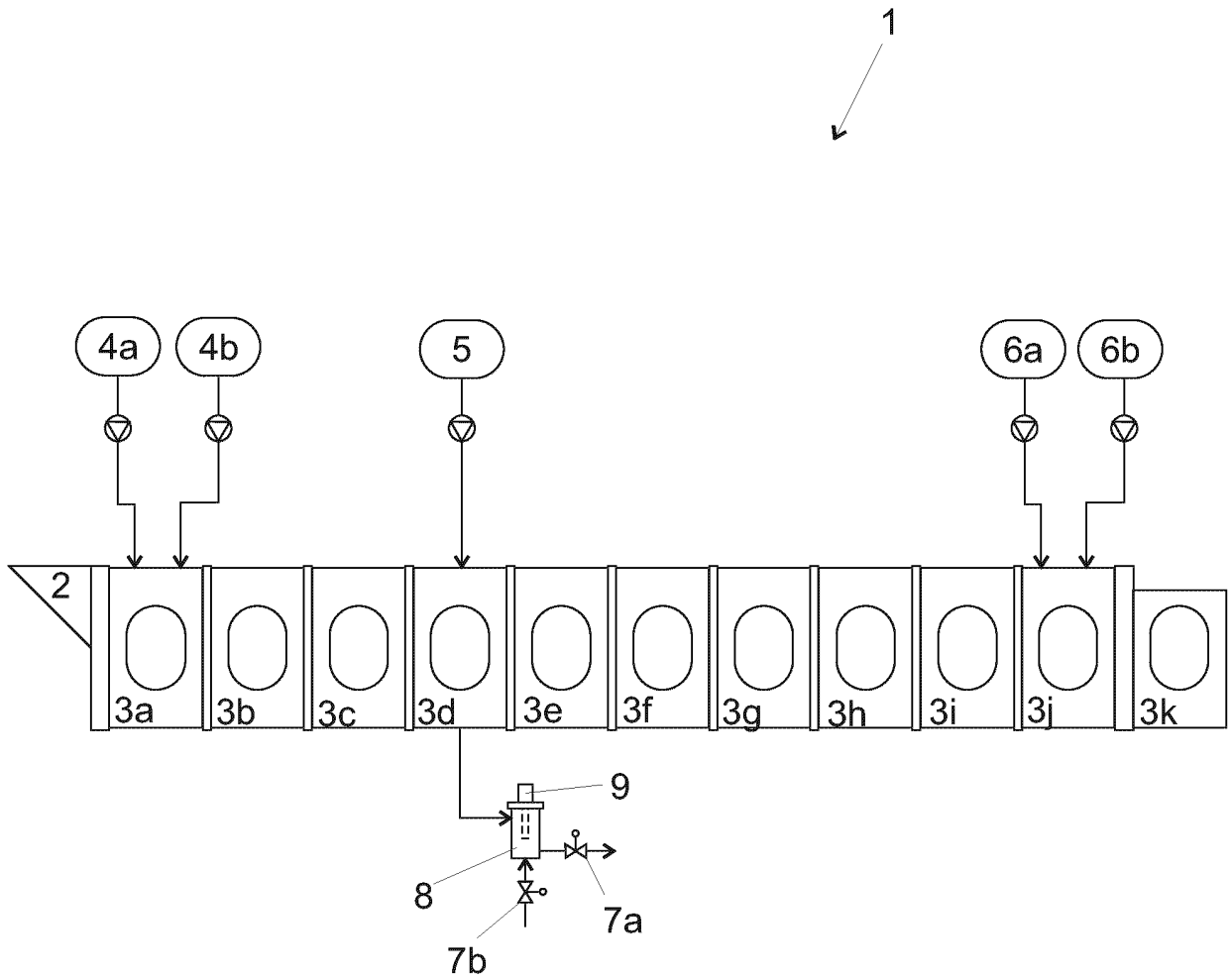


FIG. 1

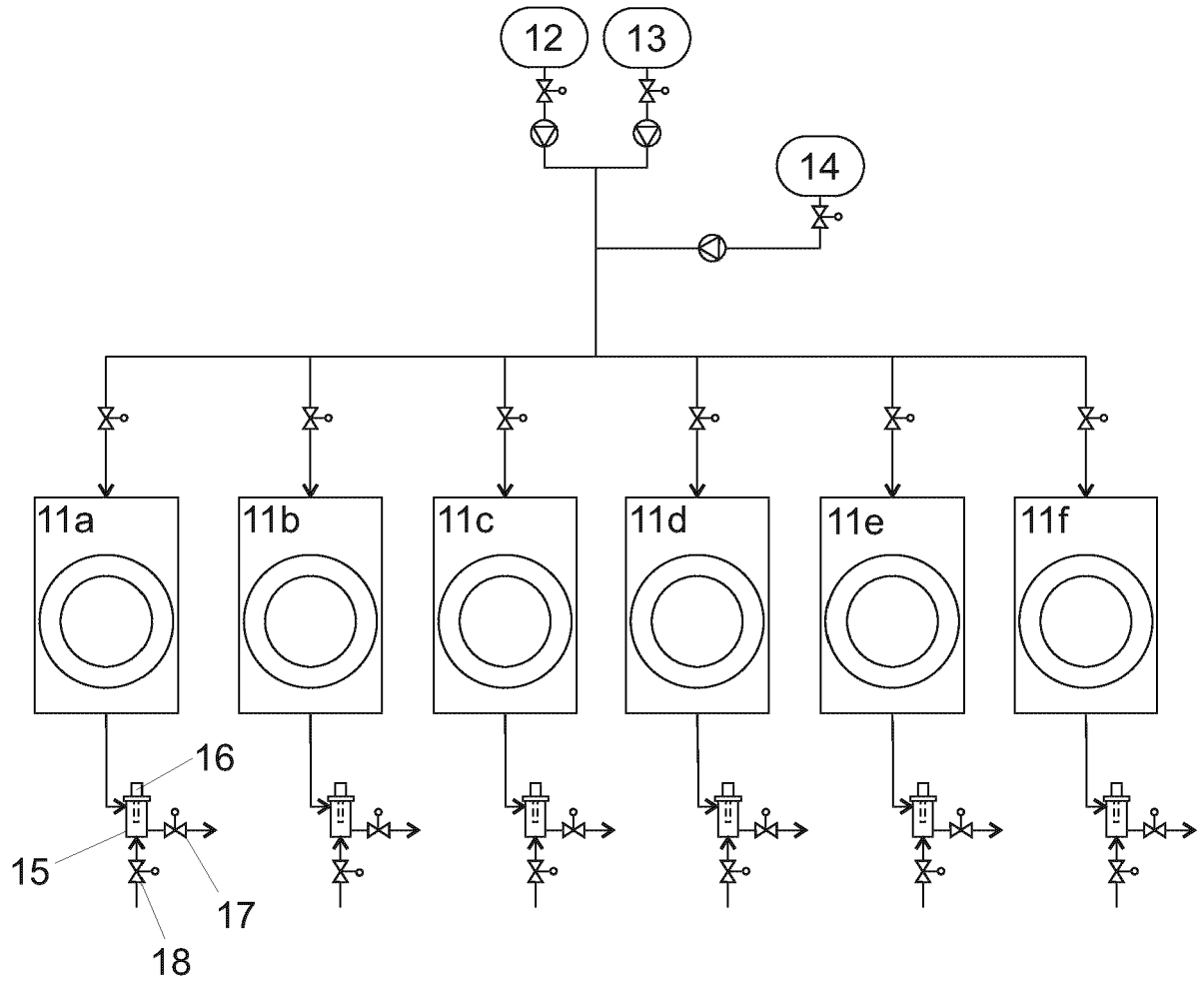


FIG. 2

**REFERENCES CITED IN THE DESCRIPTION**

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