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(54) **A WASHING MACHINE COMPRISING A HYDROCYCLONE AND A FILTRATION HYBRID ARRANGEMENT.**

WASCHMASCHINE MIT HYDROZYKLON UND EINER FILTRATIONSHYBRIDANORDNUNG

MACHINE À LAVER COMPRENANT UN HYDROCYCLONE ET UN AGENCEMENT HYBRIDE DE FILTRATION

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Description

[0001] The present invention relates to a washing machine wherein the fibers from the laundry washed are collected.

[0002] In washing machines, the water from the mains passes through the detergent box to be transferred to the tub and the drum rotating therein such that the washing process is performed. During the washing process, mechanical effects arising from the rotation of the drum and rubbing with water, effects of the spin-drying, type of fabric, temperature and amount of load, wearing down of the fabric by the detergent used cause the fibers to break off from the laundry. Fibers breaking off from the fabric during the main washing, rinsing and spin-drying steps are delivered from the tub together with the washing water to the discharge hose by means of the discharge pump. Consequently, the fibers breaking off from the laundry are released to the sewer system, underground waters and oceans. Said fibers which are generally synthetic are called microplastics. Microplastics are released into the environment and enter into the food chain, thus threatening the lives of living beings.

[0003] Due to the size of the pore openings the pump filter is insufficient in separating these waster materials. When the pore dimensions of the pump filter are reduced in order to retain the micro or millimetric fibers, the filter may get clogged, causing the failure of the pumping process or the disruption of the program flow.

[0004] In the state of the art Korean Patent Document No. KR20010040355, it is disclosed that the washing water is passed through a hydrocyclone and that the fibers collected are discharged together with the discharge water at the end of the program.

[0005] In the state of the art International Patent Application No. WO2014153924, a washing machine having a filtering component for filtering the water discharged by the washing tub is disclosed.

[0006] The aim of the present invention is to separate the fibers to be discharged with the discharge water from the discharge water, thus preventing the microplastic fibers from being released into the environment.

[0007] The washing machine realized in order to attain the aim of the present invention, explicated in independent claim 1 and dependent claims 2-5 comprises a hydrocyclone and a filtration hybrid system. Thus, the fibers breaking off during the washing process are passed through the hydrocyclone to be separated from the discharge water, and then the cleaned water is discharged. The fibers separated from the discharge water are transferred to the microfilter structure positioned behind the detergent box together with the water remaining in the tub by means of the circulation system at the end of the pumping process duration. While the fibers are retained by said filter structure, the cleaned water is delivered to the tub and discharged.

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charge water, and then the cleaned water is discharged. The fibers separated from the discharge water are transferred to the microfilter structure positioned behind the detergent box together with the water remaining in the tub by means of the circulation system at the end of the pumping process duration. While the fibers are retained by said filter structure, the cleaned water is delivered to the tub and discharged.

[0008] The washing machine comprises

- a detergent box having a detergent dispenser,
- a tub wherein the washing process is performed,
- a drum which is disposed into the tub and wherein the laundry to be washed is placed,
- a discharge pump and a discharge outlet for discharging the water outside.

[0009] The discharge pump comprises a discharge filter which can be accessed from the front wall.

[0010] The water from the mains is mixed with detergent in the detergent dispenser and then delivered to the tub. During the two-thirds of the pumping process duration, the water to be discharged is passed through the discharge pump and then delivered to the hydrocyclone to be cleaned. At this stage, the discharge valve is open while the circulation valve is closed. The cleaned water is directed to the discharge outlet from the upper part of the hydrocyclone as a result of the centrifugal movement generated due to the geometry of the latter, and then is discharged. At this time, particles in the water hit the walls of the hydrocyclone to be collected in the collection chamber.

[0011] During the remaining one-third of the pumping process duration, the discharge valve is closed while the circulation valve is open. At this stage, the particles collected in the collection chamber are passed together with the water remaining inside through the microfilter cartridge positioned behind the detergent dispenser, and the particles are collected in said cartridge. At the end of the program, said microfilter cartridge can be removed together with the detergent dispenser. Thus, waste water is prevented from being released into the environment.

[0012] The pumping duration can be adjusted as the two-thirds of the total pumping duration while the circulation and fiber collection duration can be adjusted as the one-third of the total pumping duration.

[0013] In an embodiment of the present invention, the microfilter is fixed at the rear side of the detergent dispenser. The user cannot see the filter while adding detergent; however, the filter can be cleaned when the dispenser is removed.

[0014] In another embodiment of the present invention, fibers can be collected by circulation at once after the last pumping step before the end of the program.

[0015] In another embodiment of the present invention, during the circulation process a special fiber collection program can be activated by pushing a function button.

[0016] With the hydrocyclone and microfilter hybrid de-

sign, microplastic fibers which are generally released into the environment with the discharge water are separated from the discharge water. When not filtered, said fibers are released into the sewer system and the oceans and swallowed by the fish. This causes the fish to move more slowly and to be more easily hunted by other fish, thus disrupting the food chain. Moreover, said fibers mix into the table salt and then are ingested by humans, causing health risks. By means of the present invention, the fibers collected in the washing machine are not released into the environment.

Claims

1. A washing machine **comprising** a detergent box having a detergent dispenser, a tub wherein the washing process is performed, a drum which is disposed into the tub and wherein the laundry to be washed is placed, a discharge pump and a discharge outlet for discharging the water inside the tub, a discharge valve, a circulation valve **characterized by** a hydrocyclone disposed on the discharge line for separating fibers breaking off during the washing process from the discharge water and a microfilter cartridge disposed at the rear side of the detergent box and whereto the fibers separated from the discharge water are transferred with the water remaining in the tub by means of the circulation system at the end of a pumping process duration such that the fibers are retained by said filter structure of the microfilter cartridge and the cleaned water is delivered to the tub and discharged.
2. A washing machine as in Claim 1, **characterized by** the hydrocyclone which enables the waste water discharged by the discharge pump when the discharge valve is open to be filtered, and by a collection chamber connected to the hydrocyclone for collecting the waste fibers and particles.
3. A washing machine as in Claim 2, **characterized by** the discharge pump which circulates the water required for collecting the fibers and waste collected in the collection chamber, and by a circulation valve which closes the discharge valve and opens the circulation line for the performance of the circulation process.
4. A washing machine as in any one of the above claims, **characterized in that** during the two-thirds of the discharge process duration the discharge valve is open and the circulation valve is closed.
5. A washing machine as in any one of the above claims, **characterized in that** during the one-third of the discharge process duration the discharge valve is closed and the circulation valve is open such

that the circulation process is performed.

Patentansprüche

1. Eine Waschmaschine umfasst einen Waschmittelkasten mit einem Waschmittelspender, eine Wanne, in dem der Waschvorgang durchgeführt wird, eine Trommel, die in die Wanne eingesetzt wird und in der die zu waschende Wäsche platziert wird, eine Ablaufpumpe und einen Ablaufauslass zum Ablassen des Wassers im Inneren der Wanne, ein Ablassventil, ein Zirkulationsventil, **gekennzeichnet ist sie dadurch**, dass ein in der Abflussleitung angeordneter Hydrozyklon zur Abtrennung von während des Waschvorgangs abbrechenden Fasern aus dem Abflusswasser und eine an der Rückseite des Waschmittelbehälters angeordnete Mikrofilterpatrone, in die die aus dem Abflusswasser abgetrennten Fasern mit dem in der Wanne verbleibenden Wasser mittels des Zirkulationssystems am Ende einer Pumpvorgangsdauer so überführt werden, dass die Fasern von der Filterstruktur der Mikrofilterpatrone zurückgehalten werden und das gereinigte Wasser in die Wanne gefördert und abgeleitet wird.
2. Eine Waschmaschine, wie in Anspruch 1 aufgeführt, **ist dadurch gekennzeichnet, dass** der Hydrozyklon, der es ermöglicht, das von der Entladepumpe bei geöffnetem Entleerungsventil abgegebene Abwasser zu filtern, und durch eine mit dem Hydrozyklon verbundene Sammelkammer zum Sammeln der Abfallfasern und -partikel besteht.
3. Eine Waschmaschine, wie in Anspruch 2 aufgeführt, **ist dadurch gekennzeichnet, dass** die Austragspumpe das zum Sammeln der in der Sammelkammer gesammelten Fasern und Abfälle benötigte Wasser umwälzt, und durch ein Zirkulationsventil, das das Austragsventil schließt und die Zirkulationsleitung für die Durchführung des Zirkulationsprozesses öffnet.
4. Eine Waschmaschine, wie in einem der vorherigen Ansprüchen aufgeführt, **ist dadurch gekennzeichnet, dass** während der zwei Drittel der Entleerungsdauer das Entleerungsventil geöffnet und das Zirkulationsventil geschlossen ist.
5. Eine Waschmaschine, wie in einem der vorherigen Ansprüchen aufgeführt, **ist dadurch gekennzeichnet, dass** während eines Drittels der Entleerungsdauer das Entleerungsventil geschlossen und das Zirkulationsventil geöffnet ist, so dass der Zirkulationsprozess durchgeführt wird.

Revendications

1. Une machine à laver **comprenant** une boîte à détergent avec un distributeur de détergent, une baignoire dans laquelle le processus de lavage est effectué, un tambour qui est disposé dans la baignoire et dans lequel le linge à laver est placé, une pompe de décharge et une sortie de décharge pour décharger l'eau à l'intérieur de la baignoire, une soupape de décharge, une vanne de circulation **caractérisée par** un hydrocyclone disposé sur la ligne d'évacuation pour séparer de l'eau d'évacuation les fibres qui se détachent pendant le processus de lavage et une cartouche de microfiltre disposée à l'arrière de la boîte à détergent et dans laquelle les fibres séparées de l'eau d'évacuation sont transférées avec l'eau restant dans la baignoire au moyen du système de circulation à la fin de la durée d'un processus de pompage, de sorte que les fibres sont retenues par ladite structure filtrante de la cartouche de microfiltre et que l'eau nettoyée est acheminée vers la baignoire et évacuée. 5
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2. Une machine à laver selon la déclaration 1, **caractérisée par** l'hydrocyclone qui permet de filtrer les eaux usées évacuées par la pompe de refoulement lorsque la vanne de refoulement est ouverte, et par une chambre de collecte reliée à l'hydrocyclone pour recueillir les fibres et les particules de déchets. 25
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3. Une machine à laver selon la déclaration 2, **caractérisée par** la pompe de décharge qui fait circuler l'eau nécessaire à la collecte des fibres et des déchets recueillis dans la chambre de collecte, et par une vanne de circulation qui ferme la vanne de décharge et ouvre la conduite de circulation pour l'exécution du processus de circulation. 35
4. Une machine à laver selon l'une quelconque des déclarations précédentes, **caractérisée par le fait que** pendant les deux tiers de la durée du processus de décharge, la vanne de décharge est ouverte et la vanne de circulation est fermée. 40
5. Une machine à laver telle que décrite dans l'une quelconque des déclarations ci-dessus, **caractérisée par le fait que** pendant le tiers de la durée du processus de décharge, la vanne de décharge est fermée et la vanne de circulation est ouverte, de sorte que le processus de circulation est effectué. 45
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REFERENCES CITED IN THE DESCRIPTION

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