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(54) **WASHING MACHINE AND WASHING METHOD**

(57) A washing machine and a washing method thereof comprises at least one washing tub for washing or containing water, and the tub is arranged with a washing medium layer (3) which is a polymer adsorption layer. The present invention, depending on the washing medium layer (3) arranged on the washing tub, is to handle the dirt on the clothes (5) and in the washing water, to achieve the purpose of washing, which not only simplifies the washing procedure like other ordinary washing machines, but also greatly reduces the material cost and the manufacturing cost. In addition, the wearing to clothes (5) is less serious during washing.

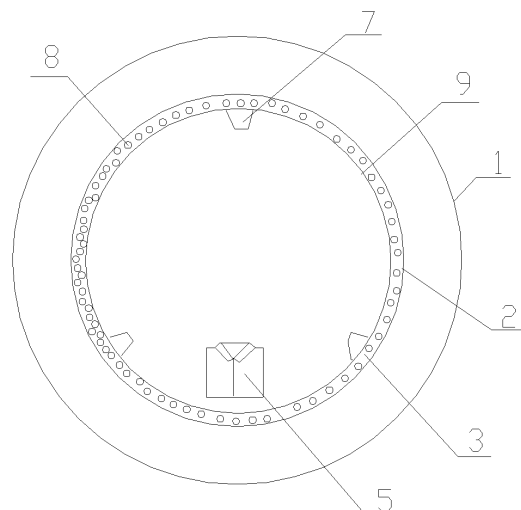


Fig. 3

Description

Field of the Invention

[0001] The present invention refers to a washing machine, in particular to a washing machine using polymer adsorption materials for washing as well as the washing method thereof. The present invention belongs to the field of washing machine technology.

Background of the Invention

[0002] In the washing method of a traditional washing machine, the washing medium is water, adding water and detergents into the washing machine for washing; after washing, discharging the sewage from the washing machine via dewatering function, and then adding clean water again for continuing the washing or rinsing process, finally discharging water after the washing is entirely finished. In this method, the water is simply discharged and then the clean water is refilled, thus causes large water consumption. Meanwhile, lots of chemical substances which are harmful to the environment are contained in the washing liquid and the washing process is time-consuming, with large power consumption each time.

[0003] To overcome the shortcomings of the aforesaid traditional washing method, in the prior art, some washing machines use an organic solvent as the medium, for example, a dry cleaning machine, in which the organic solvent is recycled. After the completion of one washing process, the organic solvent containing dirt is collected in a container, disposed by filtration and distillation, and then put back into the washing tub to continue the washing process. Due to the high toxicity of the organic solvent and the relatively low safety factor of medium recovery by distillation, it is not suitable for household use.

[0004] There is another washing method by using air in the prior art, such as CO₂. In this method, the medium is required to achieve the phase changes between gas and liquid, that is, medium is used for washing in liquid phase and then recycled in gas phase. The method demands not only a highly airtight structure, but also a high pressure for liquefying gas, which requires a high-pressure installation, so it is of low safety factor and complex process.

[0005] To overcome the shortcomings of the aforesaid washing methods, a washing method with the specially-made solid particles as the washing medium is provided, in which the dirt on clothes is adsorbed and then removed through the friction between the solid particles and clothes, so as to achieve the purpose of washing. The washing method can save over 80% water. Moreover, the solid particles as washing medium can be recycled and reused with a long service life, having no need to change and being safe and environmentally friendly. Generally, a washing machine that uses the washing method is generally arranged with a storage space of particles as well as a feed opening and a discharge open-

ing on the outer tub. Before washing, the particles is put into the outer tub from the feeding opening, and then recycled back into the storage space of particles fully after washing. The washing method has some shortcomings. During the washing, the friction between the particles and the clothes can cause the clothes to wear to a certain degree. In addition, the particles should be put in the inner tub before washing and then recycled after washing. If particles are needed to dehydrate, the particles are required to be put and recycled again, which cause a complex washing process. And the inner structure of the washing machine needs to be improved vastly accordingly, thereby the material and manufacturing costs are required to increase greatly.

Summary of the Invention

[0006] A main purpose of the present invention is to solve the aforesaid problems and shortcomings by providing a washing machine that can simplify the washing procedure and meet the washing effect with no need to add and recycle particles.

[0007] Another main purpose of the present invention is to provide a washing method that can simplify the washing procedure and meet the washing effect.

[0008] To achieve the aforesaid purposes, the technical scheme of the present invention comprises:

A washing machine comprising at least one washing tub for washing or containing water, and on which a washing medium layer is arranged.

[0009] Furthermore, the medium layer is coated or installed on an inner surface and/or an outer surface of the wall of the washing tub.

[0010] Furthermore, a surface of the medium layer is smooth, or provided with a plurality of continuous or discontinuous humps, or of porous structure.

[0011] Furthermore, the medium layer is an interlayer containing solid polymer particles fixed on the inner surface and/or the outer surface of the wall of the washing tub.

[0012] Furthermore, an interlayer wall is provided with through-holes for the washing water flowing through.

[0013] Furthermore, a diameter of the through-hole is 0.5-1.5mm.

[0014] Furthermore, the particles are of porous structure on the surface.

[0015] Furthermore, a surface of the interlayer wall is smooth, or provided with a plurality of continuous or discontinuous humps, or of porous structure.

[0016] Furthermore, the middle space of the interlayer is completely through.

[0017] Furthermore, the interlayer includes a plurality of chambers separated from each other, and the solid particles are contained in each chamber.

[0018] Furthermore, the chambers are fixed on the wall of the washing tub in the continuously corrugated form.

[0019] Furthermore, the chambers are arranged on the wall of the washing tub dispersedly.

[0020] Furthermore, the medium layer is coated or installed on a lifting block arranged on the washing tub.

[0021] Furthermore, the washing medium layer is a polymer adsorption layer.

[0022] Furthermore, the polymer comprises hydrophilic and hydrophobic components, as well as a surfactant component.

[0023] Furthermore, the holes on the surface of the medium layer, the particles and the interlayer wall are of mutually disconnected structure, and the diameter of the hole is 0.01-0.1mm.

[0024] A washing method comprise: a washing tub being provided with a washing medium layer via which the dirt on the clothes and/or in the washing water is handled during the washing process to complete the clothes washing.

[0025] Furthermore, before the clothes washing, the process of adding the washing water to the washing tub is included; the washing water is used to soak the clothes to be washed.

[0026] Furthermore, when the washing water is added to soak the clothes, the clothes to be washed need to be soaked for a certain time.

[0027] Furthermore, after the completion of the clothes washing, the process of making the medium layer and/or the clothes dehydrated, and/or the process of providing hot wind to the washing tub to dry the clothes and/or the medium layer are included.

[0028] Furthermore, the washing medium layer is a polymer adsorption layer which is to adsorb the dirt on the clothes and /or the washing water.

[0029] In summary, the washing machine and the washing method thereof in the present invention are of simple structure. The present invention, depending on the washing medium layer arranged on the washing tub, is to handle the dirt on the clothes and in the washing water, to achieve the purpose of washing, without particles putting, recycling as well as self-cleaning steps and devices. Thus not only simplifies the washing procedure like other ordinary washing machines, but also greatly reduces the material cost and the manufacturing cost. In addition, the wearing to clothes is less serious during washing.

Brief Description of the Drawings

[0030]

Figure 1 is a structure schematic view of Embodiment 1 of the present invention;

Figure 2 is a structure schematic view of the inner tub of the present invention;

Figure 3 is a structure schematic view of Embodiment 3 of the present invention;

Figure 4 is a structure schematic view of Embodiment 4 of the present invention;

Figure 5 is a structure schematic view of Embodiment 5 of the present invention;

Figure 6 is a structure schematic view of Embodiment 6 of the present invention.

[0031] As shown in Figures 1-6, outer tub 1, inner tub 2, medium layer 3, the first opening hole 4, clothes 5, hump 6, lifting block 7, particles 8, interlayer wall 9, chamber 10, division plate 11.

Embodiments

[0032] The present invention is further described in combination with the attached drawings and specific embodiments:

As shown in Figures 1 and 2, a washing machine, both a pulsator washing machine and a roller washing machine in present use, comprises a shell (not shown in figures), in which an outer tub 1 and an inner tub 2 are arranged. The washing tub in the present invention may be the inner tub 2 for washing or the outer tub 1 for containing water. Wherein, the outer tub 1 is a closed structure, and fixed without rotating; the inner tub 2 is arranged inside the outer tub 1. The wall of the inner tub 2 is provided with a plurality of first opening holes 4 with round, rectangle or polygon etc. in shape, for the washing water flowing through. The inner tub 2 may be driven to rotate by a driving device. On the upper side of the outer tub 1, a water inlet (not shown in figure) is arranged for water inflow during washing and rinsing. On the lower side of the outer tub 1, a water outlet (not shown in figure) is arranged for discharging water after dehydration. During washing, the clothes 5 are placed in the inner tub 2.

[0033] On the wall of the inner tub 2, a washing medium layer 3 is arranged, which may be made from ceramic or polymer materials etc. Polymer is preferably used as the washing medium in the embodiment. The polymer is selected from the group consisting of PP, PE, PS, PVC, or EVA etc., or the mixture of the aforesaid materials, which comprises hydrophilic and hydrophobic components as well as a surfactant component, with a relatively strong capacity of adsorbing the dirt. The polymer medium layer 3 may be arranged on the inner surface and/or the outer surface of the wall of the inner tub 2, so as to increase the adsorbing area and improve the adsorbing capacity of the medium layer 3. In addition to arranging the medium layer 3 on the wall of the inner tub 2, the medium layer 3 may also be arranged on the wall of the outer tub 1 for further increasing the adsorbing area and adsorbing capacity of the medium layer 3. Based on comprehensive considerations about cost, manufacturing process and the total weight of the machine etc., preferably it is recommended to only arrange one medium layer 3 on the inner surface of the wall of the inner tub 2. If the medium

layer 3 is arranged on other positions, the structure similar to the followings may be adopted.

Embodiment 1:

[0034] In the embodiment, the medium layer 3 may be coated on the inner surface of the inner tub 2 via coating technique, or fixedly installed on the wall of the inner tub 2 by fasteners, such as screw. As same with the inner tub 2, the medium layer 3 is provided with a plurality of through-holes (not shown in figure) with round, rectangle or polygon etc. in shape, as the same as the shape of the first opening hole 4 shown in Figure 2, for the washing water flowing through. The water flows in the tub via the through-holes during washing; the washing water is discharged into the outer tub 1 when dehydration, and finally the water is discharged from the water outlet at the bottom of the outer tub 1. If the medium layer 3 is arranged on the wall of the outer tub 1, the medium layer 3 is not arranged with the through-holes for the water flowing through.

[0035] The medium layer 3 may be coated or installed on the overall wall of the inner tub 2, or coated or installed on a part of the wall of the inner tub 2. The former structure has a better adsorbing capacity and is favorable to the rotary balance of the inner tub 2. During washing, the medium layer 3 adsorbs the dirt in washing water from the clothes 5 to the utmost through contacting with the washing water contiguously. Thus during washing, the washing water keeps a certain cleanliness, and the clothes 5 directly contact with the medium layer 3 contiguously so as to let the medium layer 3 directly adsorb the dirt on the clothes 5. Therefore, a small amount of water is enough, which can achieve the purpose of saving water.

[0036] The structure of the medium layer 3 may be provided with a smooth surface for expanding the contact area between the medium layer 3 and the washing water and improving the capacity of adsorbing the dirt. As shown in Figure 1, the surface of the medium layer 3 is provided with a plurality of humps 6 which may be arranged continuously or dispersedly.

[0037] To increase the contact area between the medium layer 3 and the washing water, the medium layer 3 may be provided with a porous structure on the polymer surface. The holes on the surface are disconnected with and separated from each other, so as to drain the stored water inside the hole and improve the regeneration capacity of the medium layer 3. The diameter of hole is preferred 0.01-0.1mm.

[0038] In a roller washing machine, the inner tub 2 needs to be arranged with at least one lifting block 7 that is protruding inward. During washing, driven by the lifting block 7, the clothes 5 are lifted up and down in the inner tub 2 continually in circles to reach the washing effect. The number of the lifting blocks 7 may be 1-3, preferably three lifting blocks 7 are arranged along the circumference of the inner tub 2 uniformly. The medium layer 3

and the lifting blocks 7 are staggered, or the medium layer 3 is spread on the whole inner wall of the inner tub 2 while the lifting blocks 7 are fixed on the medium layer 3.

[0039] The following further describes the washing method of the aforesaid washing machine in combination with Figure 1.

[0040] Taking a roller washing machine as an example, the washing method comprises the following steps:

Step 1: like a normal roller washing machine, putting the clothes 5 to be washed into the inner tub 2, in the meantime, opening the water inlet on the upper side of the outer tub 1, via which the water flows in the outer tub 1; the washing water mixing with the detergent flows into the outer tub 2; and then the water flows through the first opening hole 4 on the inner tub 2 and the through-holes on the medium layer 3 to be fully mixed with the clothes 5 to be washed. In this process, only an appropriate amount of water and detergent is needed, to ensure the clothes 5 to be soaked in the water.

[0041] When the washing water in pour and soak the clothes 5, the clothes 5 to be washed need to be soaked for a certain time so as to fully soak the clothes 5 in the washing water and further improve the cleaning effect.

[0042] Step 2: the inner tub 2 is driven to rotate and then the medium layer 3 rotates correspondingly; driven by the lifting block 7, the clothes 5 are lifted up and down in the tub in circles; during washing, the dirt on the clothes 5 is removed by the washing water and then the washing water with the dirt scours the medium layer 3 continually; during continually contacting with the washing water, the medium layer 3 adsorbs the dirt in the washing water. Furthermore, during washing, the clothes 5 may also directly contact with the medium layer 3 continually, via which the dirt on the clothes 5 is directly adsorbed, so as to achieve the purpose of cleaning the clothes 5.

[0043] As for a pulsator washing machine, during washing, the pulsator rotates clockwise and anticlockwise alternately to form a rotating water flow inside the tub by driving the rotation of the pulsator. The dirt on the clothes 5 is removed by the washing water and the washing water with the dirt scours the medium layer 3 continually; during continually contacting with the washing water, the medium layer 3 adsorbs the dirt in the washing water. Furthermore, during washing, the clothes 5 may also directly contact with the medium layer 3 continually, via which the dirt on the clothes 5 is directly adsorbed, so as to achieve the purpose of cleaning the clothes 5.

[0044] Step 3: the inner tub 2 is driven to rotate at a high speed, and the medium layer 3 also correspondingly rotates rapidly; the clothes 5 and the medium layer 3 are dehydrated in the meantime, and then the water is discharged from the water outlet at the bottom of the outer tub 1. The dehydration process of the medium layer 3 is also its self-cleaning process, which improves the regeneration capacity and prolongs the service life of the me-

dium layer 3 to some extent.

[0045] Step 4: during rinsing process, adding appropriate clean water into the tub, rinsing the clothes 5 according to the aforesaid process, conducting dehydration after the rinsing, and finally completing the entire washing process of the clothes 5.

[0046] After the dehydration of the clothes 5 and the medium layer 3, utilizing a heat pump device or heating pipe to blow hot wind into the inner tub 2 for drying the clothes 5 and the medium layer 3. Thus may also further prolong the service life of the medium layer 3 and be helpful to ensure the dryness inside the tub and reduce mildew breeding because of the dampness inside the tub.

Embodiment 2:

[0047] In an old-fashioned double cylinder washing machine, the washing tub for washing is of single-tub structure, in which a rotating water flow is formed by the pulsator rotating clockwise and anticlockwise alternately during washing. The dirt on the clothes 5 is removed by the washing water. In this washing machine, a polymer washing medium layer 3, which is not arranged with through-holes for the water flowing through, may be coated on the inner surface and/or the outer surface of the wall of the washing tub. The structure of the medium layer 3 is as the same as that in Embodiment 1, so it is not described additionally hereby.

[0048] In this washing machine, on account of that the dehydration of the clothes 5 being accomplished in another spin dryer tub, therefore, the medium layer 3 has no the process of dehydration. The method of adding hot wind in the tub may be adopted.

Embodiment 3:

[0049] As shown in Figure 3, the difference from the Embodiment 1 is that, the medium layer 3 arranged on the inner surface of the inner tub 2 is an interlayer containing solid polymer particles 8 in the middle and being fixed on the wall of the inner tub 2. An interlayer wall 9 is arranged with through-holes (not shown in figure) for the washing water flowing through. The medium layer 3 is fixed on the wall of the inner tub 2 by the fasteners, such as screw, to ensure that the medium layer 3 rotates with the inner tub 2.

[0050] To avoid the particles 8 leaking out of the inner tub 2 and the medium layer 3, the diameter of the first opening hole 4 on the inner tub 2 and the through-holes on the medium layer 3 are less than the minimum diameter of the particles 8. The diameter of the particles 8 is generally 2-4mm; therefore, the diameter of the first opening hole 4 and the through-holes are less than 2mm. Preferably the diameter of the first opening hole 4 and the through-holes is 1-1.5mm. Thus can not only ensure the washing water to flow in or out successfully, but also avoid the leakage of the particles 8.

[0051] To increase the adsorbing capacity of the me-

dium layer 3, in addition to the solid polymer particles 8 containing adsorbing capacity, the interlayer wall 9 is also made from polymer material. The interlayer wall 9 is also with adsorbing capacity as same as that in Embodiment 1. The surface of the interlayer wall 9 may be smooth. In order to increase the contact area between the interlayer wall 9 and the washing water and enhance the capacity of adsorbing the dirt, the surface of the interlayer wall 9 is provided with a plurality of humps 6 which may be arranged continuously or dispersedly, as the same as the one in Embodiment 1. For increasing the contact area between the interlayer wall 9 and the washing water, the surface of the interlayer wall 9 may be provided with porous structure on the polymer surface. The holes on the surface are disconnected with and separated from each other, so as to drain the stored water inside the hole and improve the regeneration capacity of the interlayer wall 9. The diameter of the hole is preferably 0.01-0.1mm.

[0052] Similarly, to order to improve the adsorbing capacity of the particles 8, the particles 8 are of porous structure on the surface. The holes on the surface are disconnected with and separated from each other, so as to drain the stored water inside the hole and improve the regeneration capacity of the medium layer 3. The diameter of the hole is preferably 0.01-0.1mm.

[0053] The interlayer of the medium layer 3 is spread on the whole wall of the inner tub 2. The middle space of the interlayer is completely through. The interlayer wall 9 equals to forming into a second inner tub. During washing, the washing water which flows in and out of the interlayer of the medium layer 3, contacts with the interlayer wall 9 and the particles 8 in the interlayer in the mean time. The dirt in the washing water from the clothes 5 is adsorbed by the interlayer wall 9 and the particles 8 jointly. During washing, the clothes 5 directly contact with the interlayer wall 9 continually, via which the dirt on the clothes 5 is adsorbed, so as to achieve the purpose of washing.

[0054] In the roller washing machine, the inner tub 2 is provided with at least one lifting block 7 that is protruding inward and fixed on the interlayer wall 9.

[0055] The following further describes the washing method of the aforesaid washing machine in combination with Figure 3.

[0056] Taking a roller washing machine as an example, the washing method comprises the following steps:

Step 1: like a normal roller washing machine, putting the clothes 5 to be washed into the inner tub 2, in the meantime, opening the water inlet on the upper side of the outer tub 1, via which the water flows in the outer tub 1; the washing water mixing with the detergent flows into the outer tub 2; and then the water flows through the first opening hole 4 on the inner tub 2 and the through-holes on the interlayer wall 9 of the medium layer 3 to be fully mixed with the clothes 5 to be washed. In this process, only an appropriate amount of water and detergent is need-

ed, to ensure the clothes 5 to be soaked in the water.

[0057] When the washing water in pour and soak the clothes 5, the clothes 5 to be washed need to be soaked for a certain time so as to fully soak the clothes 5 in the washing water and further improve the cleaning effect.

[0058] Step 2: the inner tub 2 is driven to rotate and then the medium layer 3 rotates correspondingly; the clothes 5 are lifted up and down in the tub in circles. During washing, the dirt on the clothes 5 is removed by the washing water, and then the washing water with the dirt scours the interlayer wall 9 continually, and to enter the inside of the interlayer to contact with the particles 8. During continually contacting with the washing water, the interlayer wall 9 and the particles 8 adsorb the dirt in the washing water. Furthermore, during washing, the clothes 5 may also directly contact with the interlayer wall 9 continually, via which the dirt on the clothes 5 is directly adsorbed, so as to achieve the purpose of cleaning towards the clothes 5.

[0059] As for a pulsator washing machine, during washing, the pulsator rotates clockwise and anticlockwise alternately to form a rotating water flow inside the tub by drive the rotation of the pulsator. The dirt on the clothes 5 is removed by the washing water. Then the washing water with the dirt scours the interlayer wall 9 continually, and enters the inside of the interlayer to contact with the particles 8 in the interlayer. During continually contacting with the washing water, the interlayer wall 9 and the particles 8 adsorb the dirt in the washing water. Furthermore, during the washing, the clothes 5 may also directly contact with the interlayer wall 9, via which the dirt on the clothes 5 is directly adsorbed, so as to achieve the purpose of cleaning the clothes 5.

[0060] Step 3: the inner tub 2 is driven to rotate at a high speed, and the medium layer 3 also correspondingly rotates rapidly. The clothes 5, the interlayer wall 9 and the particles 8 are dehydrated in the meantime, and then the water is discharged from the water outlet at the bottom of the outer tub. The dehydration process of the medium layer 3 is also its self-cleaning process, which improves the regeneration capacity and prolongs the service life of the medium layer 3 to some extent.

[0061] Step 4: during rinsing process, adding appropriate clean water into the tub, rinsing the clothes 5 according to the aforesaid process, conducting dehydration after the rinsing, and finally completing the entire washing process of the clothes 5.

[0062] After the dehydration of the clothes 5 and the medium layer 3, utilizing a heat pump device or heating pipe to blow hot wind into the inner tub 2 for drying the clothes 5 and the medium layer 3. Thus may also further prolong the service life of the medium layer 3 and be helpful to ensure the dryness inside the tub and reduce mildew breeding because of the dampness inside the tub.

[0063] The structure of the medium layer 3 in the embodiment also applies to a single-tub washing machine.

Embodiment 4:

[0064] As shown in Figure 4, the difference from Embodiment 3 is that, the interlayer of the medium layer 3 is provided with a plurality of chambers 10 separated from each other, so as to avoid the uneven distribution of the particles 8 in the interlayer influencing the adsorbing effect. The chambers 10 containing the adsorbing particles 8 are separated by a division plate 11.

[0065] The structure of the medium layer 3 in the embodiment also applies to a single-tub washing machine.

Embodiment 5:

[0066] As shown in Figure 5, the difference from Embodiment 3 is that, the interlayer of the medium layer 3 includes a plurality of chambers 10 separated from each other and the particles 8 are contained in the chambers 10. Since the chambers 10 are separated from each other, the chambers may be arranged on the wall of the inner tub 2 discretely. The chambers 10 are arranged to stagger a lifting block 7, and the lifting block 7 is directly fixed on the wall of the inner tub 2.

[0067] In both a roller washing machine and a pulsator washing machine, the chambers 10 are arranged along the axial direction linearly or the radial direction annularly of the inner tub 2.

[0068] In a roller washing machine, when the chambers 10 are arranged along the axial direction of the inner tub 2 discontinuously, the lifting block 7 is not arranged. The medium layer 3 that is protruding towards the inner surface of the inner tub 2 is used as the lifting block to lift the clothes 5 during washing.

[0069] The structure of the medium layer 3 in the embodiment also applies to a single-tub washing machine.

Embodiment 6:

[0070] As shown in Figure 6, the difference from Embodiment 5 is that, the chambers 10 are fixed on the wall of the inner tub 2 in the continuously corrugated form, which may further expand the contact area between the medium layer 3 and the water, so as to improve the adsorbing capacity of the medium layer 3.

[0071] In a roller washing machine, when the chambers 10 are arranged along the axial direction of the inner tub 2 discontinuously, the lifting block 7 is not arranged. The medium layer 3 that is protruding towards the inner surface of the inner tub 2 is used as the lifting block to lift the clothes 5 during washing.

[0072] The structure of the medium layer 3 in the embodiment also applies to the single-tub washing machine.

Embodiment 7:

[0073] The difference from the Embodiment 1 is that, in a roller washing machine, the medium layer 3 may be coated on the lifting block 7 of the inner tub 2 via coating

technique, or fixed on the lifting block 7 of the inner tub 2 by fasteners, such as screw. In the structure, the medium layer 3 has no need to be provided with through-holes for the water flowing through.

[0074] The structure in each aforesaid embodiment also applies to a multi-tub washing machine. One, two or each of the washing tubs thereof may be arranged with a medium layer 3.

[0075] As the foregoing, combining the disclosed solution content of the attached drawings, similar technical solutions may be derived. Without departing from the content of the technical solution of the present invention, according to the technical essence of the present invention, any simple amendment, equivalent changes and modifications all fall within the scope of the technical solution of the present invention.

Claims

1. A washing machine, comprising at least one washing tub for washing or containing water, wherein, a washing medium layer is arranged on at least one washing tub.
2. The washing machine according to claim 1, wherein, the medium layer is coated or installed on an inner surface and/or an outer surface of a wall of the washing tub, and/or coated or installed on a lifting block arranged on the washing tub.
3. The washing machine according to claim 2, wherein, a surface of the medium layer is smooth, or provided with a plurality of continuous or discontinuous humps, or of porous structure.
4. The washing machine according to claim 1, wherein, the medium layer is an interlayer containing solid polymer particles and being fixed on the inner surface and/or the outer surface of the wall of the washing tub.
5. The washing machine according to claim 4, wherein, an interlayer wall is provided with through-holes for washing water flowing through.
6. The washing machine according to claim 5, wherein, a diameter of the through-hole is 0.5-1.5mm.
7. The washing machine according to claim 4, wherein, the surface of the particles are of porous structure.
8. The washing machine according to claim 4, wherein, the surface of the interlayer wall is smooth, or provided with a plurality of continuous or discontinuous humps, or of porous structure.
9. The washing machine according to claim 4, wherein,

a middle space of the interlayer is completely through.

10. The washing machine according to claim 4, wherein, the interlayer includes a plurality of chambers separated from each other, and the solid particles are contained in each chamber.
11. The washing machine according to claim 10, wherein, the chambers are fixed on the wall of the washing tub in the continuously corrugated form, or the chambers are arranged on the wall of the washing tub dispersedly.
12. The washing machine according to any one of claims 1-11, wherein, the washing medium layer is a polymer adsorption layer.
13. The washing machine according to claim 12, wherein, the polymer comprises hydrophilic and hydrophobic components, as well as a surfactant component.
14. The washing machine according to any one of claims 3, 7 and 8, wherein, the holes on the surface of the medium layer, the particles and the interlayer wall are of mutually disconnected structure, and a diameter of the hole is 0.01-0.1mm.
15. A washing method, wherein, a washing tub is provided with a washing medium layer via which dirt on clothes and/or in washing water is handled during a washing process to complete the clothes washing.
16. The washing method according to claim 15, wherein, before the clothes washing, a process of adding the washing water to the washing tub is included; and the clothes is soaked in the washing water.
17. The washing method according to claim 16, wherein, when the washing water is added to soak the clothes, the clothes need to be soaked for a certain time.
18. The washing method according to claim 15, wherein, after the completion of washing the clothes, a process of making the medium layer and /or the clothes dehydrated, and/or a process of providing hot wind to the washing tub to dry the clothes and/or the medium layer are included.
19. The washing method according to any one of claims 15-18, wherein, the washing medium layer is a polymer adsorption layer which is to adsorb the dirt on the clothes and /or in the washing water.

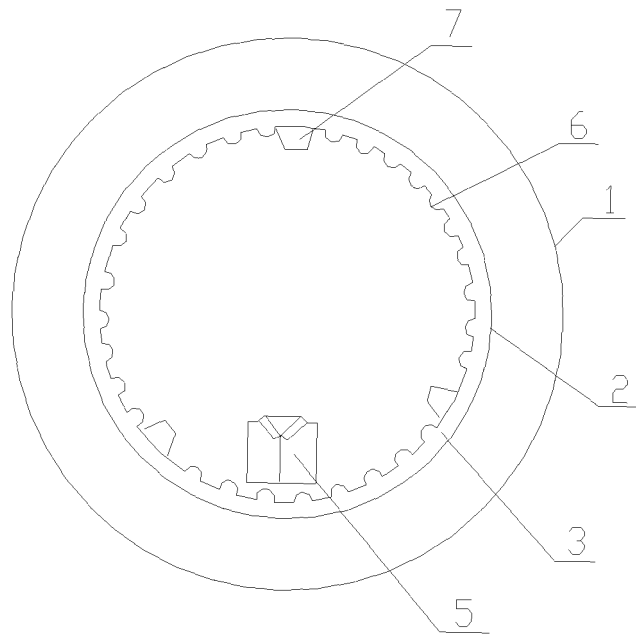


Fig. 1

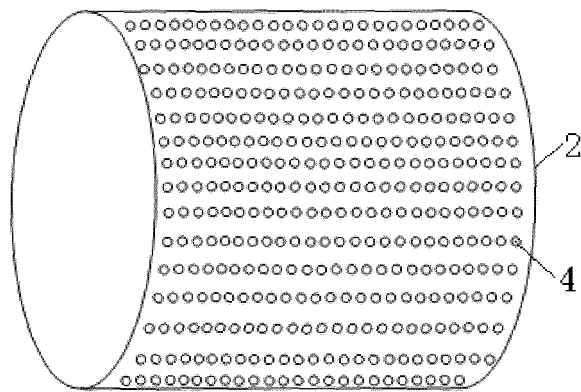


Fig. 2

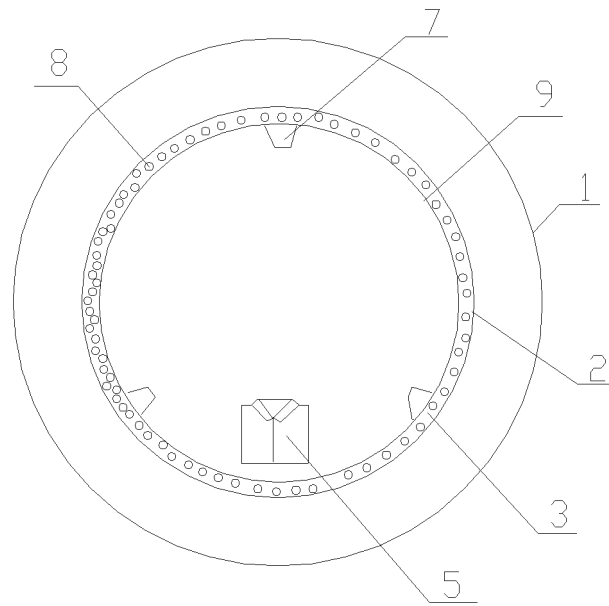


Fig. 3

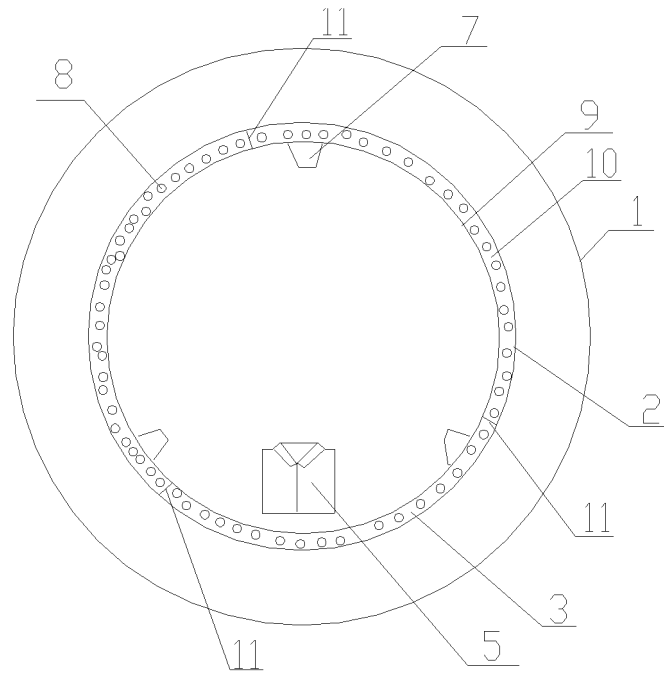


Fig. 4

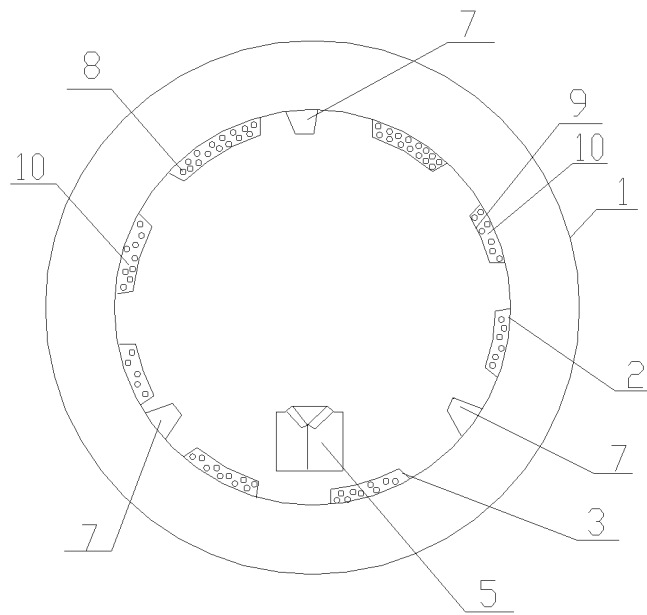


Fig. 5

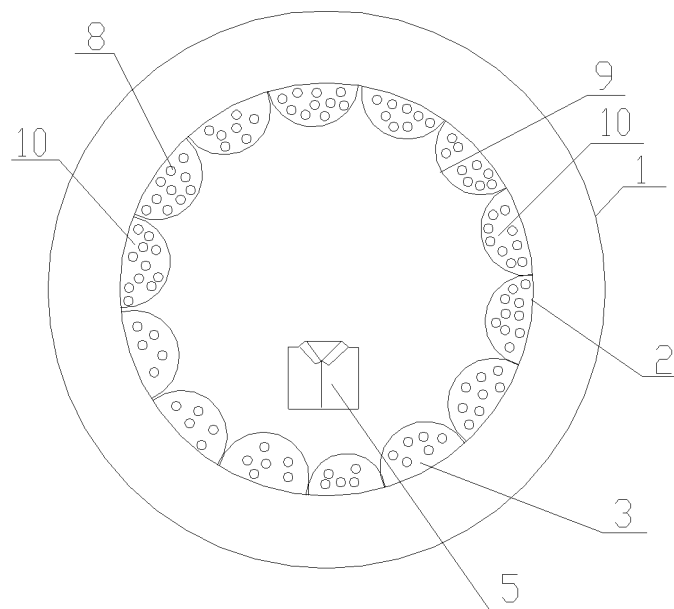


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2011/081505

A. CLASSIFICATION OF SUBJECT MATTER

D06F 35/00 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: D06F; F-term: 3B 155

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, DWPI, SIPOABS, CNKI: medium layer, washing layer, micro pore, adsorption pore, bubble, covering, coating, wash???, drum, tub, tank, medium, porous, spongy, aperture, bore, hole, layer, coat, poly+, adsor+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2003236295 A (SHARP KK), 26 August 2003 (26.08.2003), description, paragraphs 9-14, and figure 2	1-3, 15
X	CN 201313996 Y (WANG, Chunlin), 23 September 2009 (23.09.2009), claims 1-2	1-2
X	CN 86101576 A (HITACHI LTD.), 15 October 1986 (15.10.1986), description, page 4, paragraphs 1 and 5, and page 7, paragraph 3	1-3, 12, 15-19
A	KR 20060023752 A (LG ELECTRONICS INC.), 15 March 2006 (15.03.2006), the whole document	1-19
A	KR 20050108616 A (DAEWOO ELECTRONICS CORP.), 17 November 2005 (17.11.2005), the whole document	1-19

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 14 May 2012 (14.05.2012)	Date of mailing of the international search report 31 May 2012 (31.05.2012)
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer CHEN, Pengfei Telephone No.: (86-10) 62084627

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2011/081505

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 2003236295 A	26.08.2003	None	
CN 201313996 Y	23.09.2009	None	
CN 86101576 A	15.10.1986	CN 86101576 B	27.04.1988
		JP 61185299 A	18.08.1986
		JP 2051356 B	07.11.1990
		JP 1627367 C	28.11.1991
		AU 5333186 A	21.08.1986
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		US 4771615 A	20.09.1988
KR 20060023752 A	15.03.2006	None	
KR 20050108616 A	17.11.2005	None	

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