INTEGRATED STRUCTURE OF INNER BARREL AND PULSATOR, WASHING MACHINE AND WASHING METHOD

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Publication Classification

Int. Cl.
D06F 13/04 (2006.01)
D06F 37/26 (2006.01)
D06F 37/30 (2006.01)

U.S. Cl.
CPC ............... D06F 13/04 (2013.01); D06F 37/306 (2013.01); D06F 37/264 (2013.01)

ABSTRACT

An inner barrel and pulsator integrated structure has a vertically used inner barrel and a plurality of water repellent blades being integrated with a bottom of the inner barrel. The plurality of water repellent blades is a projection structure disposed at the inner barrel bottom. The number of the water repellent blades is at least two. Each water repellent blade extends from the center of the inner barrel bottom to an inner barrel wall. Each water repellent blade rises and extends along a radial outward direction of the inner barrel bottom, after extending to the highest point, is connected with the inner barrel wall, and after rising and extending to the highest point along a circumferential direction from one side in a shape of a gentle slope, drops back to the inner barrel bottom in a shape of an abrupt slope.
Place the clothing

Place a detergent

The washing machine begins water injection, and repeats forward rotation, pause and reverse rotation

Even distribution and dewatering

The washing machine begins water injection, and repeats forward rotation, pause and reverse rotation

Even distribution and dewatering

End

Repeat the rinsing process

Repeat the washing process

FIG. 7
FIG. 8

FIG. 9

FIG. 10
INTEGRATED STRUCTURE OF INNER BARREL AND PULSATOR, WASHING MACHINE AND WASHING METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation application of International Patent Application No. PCT/CN2013/000110, filed Dec. 20, 2013, which itself claims the priority to Chinese Patent Application Nos. 201310132537.9, and 201310134110.2, both filed Apr. 17, 2013 in the State Intellectual Property Office of P.R. China, which are hereby incorporated herein in their entireties by reference.

FIELD OF THE INVENTION

[0002] The present invention relates generally to the field of washing machines, and more particularly, to an inner barrel and pulsator integrated structure and a washing machine using the structure, and a washing method of a washing machine as well.

BACKGROUND OF THE INVENTION

[0003] The background description provided herein is for the purpose of generally presenting the context of the present invention. The subject matter discussed in the background of the invention section should not be assumed to be prior art merely as a result of its mention in the background of the invention section. Similarly, a problem mentioned in the background of the invention section or associated with the subject matter of the background of the invention section should not be assumed to have been previously recognized in the prior art. The subject matter in the background of the invention section merely represents different approaches, which in and of themselves may also be inventions. Work of the presently named inventors, to the extent it is described in the background of the invention section, as well as aspects of the description that may not otherwise qualify as prior art at the time of filing, are neither expressly nor impliedly admitted as prior art against the present invention.

[0004] In the prior art, it is common to divide washing machines into drum washing machines, pulsator washing machines and agitator washing machines. In principle, the pulsator washing machines and the agitator washing machines are very similar. The pulsator washing machines rely on a pulsator to stir water currents, and water currents moving irregularly stir the clothing, so as to complete washing and rinsing processes of the clothing; the agitator washing machines rely on a stirring pole, to drag the clothing to move in water directly or by means of water power, so as to complete washing of the clothing. The drum washing machines rely on a plurality of ribs fixed to inner walls of the inner drum to lift the clothing, and the clothing is repeatedly lifted and falls in the drum to complete washing and rinsing processes.

[0005] Conventionally, it is considered that the drum washing machines use less water, have a low clothing wear rate, do not intertwine the clothing, can be provided with a water heating device, and achieve automation easily, but have weak detergency, a long washing time, a complicated structure and huge volume, consume many raw metal materials, and have a higher cost, which are relatively difficult to control during high speed dewatering. The agitator washing machines have good washing uniformity, strong detergency, a small clothing wear rate and large washing capacity, but have a long washing time, great noise, a complicated swing mechanism of a stirring wing, difficult machining, a higher cost, and large volume. The pulsator washing machines have a simple structure, strong detergency, a short washing time, a low cost, and are lightweight, but have higher clothing wear rate and intertwine rate, poor washing uniformity and more water consumption.

[0006] Currently, washing machines have been widely used in families, but existing washing machines are mostly dual power or double-drum machines, have a relatively complicated structure and a greater size, and occupy larger family space. An inner barrel of a general pulsator washing machine is provided with a pulsator, the structure is relatively complicated, the installation process is cumbersome, and the cost is high; if the inner barrel and the pulsator can be designed into an integrated structure, the complexity, the installation process and the cost will be reduced greatly. How to integrate the advantages of the various washing machines is a facing major problem.

[0007] Chinese Patent Application No. CN200510094191.3 discloses a clothing washing manner with a good washing effect, a low cost and no environmental pollution, which mainly includes the following steps: (i) adding an appropriate amount of washing water and defoaming agent to a washing machine that contains clothing to be washed; (ii) controlling a rotation speed of a tank of the washing machine to be 3-12 rpm through a control device, wherein, during operation of the tank, forward rotation and reverse rotation are carried out at intervals, the number of turns of the forward rotation each time is 0.3-1.5 turns, and the number of turns of the reverse rotation each time is 0.3-1.5 turns; after the tank operates continuously in this way for 0.4-1.5 minutes, the tank stops operating for 0.3-1.5 minutes; (iii) repeating the procedure in step (ii) 3-20 times; (iv) then making the tank rotate unidirectionally, carrying out a procedure of uniform distribution, and after the uniform distribution ends, carrying out quick dewatering for 0.3-3.5 minutes in a rotating drum; and (v) repeating the procedures in steps (i) to (iv) 2-12 times, so as to complete a washing process. However, the drum form still has a problem that balancing is relatively difficult to control during high speed dewatering.

[0008] Chinese Patent No. CN03276136.8 discloses a washing machine with good dirt removal, and low intertwining and wear. The screw-type washing machine increases a cleaning ratio and washing uniformity, and decreases the intertwining rate and the wear rate. However, the structure of the washing machine is simple, the pulsator (the inner barrel bottom) and the inner barrel wall are connected into one piece, there is no clutch, and the inner barrel is full of rifling threads therein. During forward rotation, stop and reverse rotation of the inner barrel, the clothing is cleaned through combined actions such as pressured and multi-direction rubbing, centrifugal force washing without side effects, cavitation and high-speed start up inertia. However, the washing machine involved in the patent merely increases a screw structure for the inner barrel wall, no definition is given to the inner barrel bottom structure, and the space of the inner barrel bottom is wasted, which cannot have a washing effect on the clothing.

[0009] Chinese Patent No. CN00215731.4 discloses an automatic washing machine without a pulsator, including an inner barrel, an outer barrel, an inner barrel bottom water repellent rib and a motor, characterized in that the inner barrel and the inner barrel bottom water repellent rib are integrated, and the inner barrel bottom water repellent rib replaces the
pulsator of the existing pulsator washing machine. A motor rotor is fixed onto a main shaft of the inner barrel, and the motor rotor and the inner barrel share the main shaft of the inner barrel. As the inner barrel and the inner barrel bottom water repellent rib are integrated, when the motor drives the inner barrel to make forward and reverse intermittent operation, the inner barrel bottom water repellent rib drives water currents to move, to play a role of pulsator. The patent discloses a non-pulsator structure, which does not specifically describe the inner barrel bottom and a side structure thereof; the inner barrel bottom structure illustrated does not have a strengthening effect on turning of the clothing, and the side face does not have a corresponding water repellent blade to stir the internal washing water.

Therefore, a heretofore unaddressed need exists in the art to address the aforementioned deficiencies and inadequacies.

**SUMMARY OF THE INVENTION**

**[0010]** An objective of the present invention is to provide an inner barrel and pulsator integrated structure and add at least one water repellent blade structure to the inner barrel bottom, so as to overcome the shortcomings of the prior art; the structure extends from the inner barrel bottom to the inner barrel wall, enables the clothing to be lifted, fall and be hit in the circumferential direction, and also enables the clothing to be turned in a radial direction, to uniformly wash the clothing in all directions, which has a good washing effect, can complete washing, rinsing and dewatering processes by making the clothing only pass through one washing barrel, makes the washing machine have a simple structure, simplifies the installation process and reduces the cost.

**[0012]** Another objective of the present invention is to provide a washing machine having the inner barrel and pulsator integrated structure.

**[0013]** Yet another objective of the present invention is to provide a washing method of the washing machine; the method includes forward and reverse rotation at intervals and reduces intertwining, and the forward rotation angle each time is not equal to the reverse rotation angle, to avoid that the clothing is repeatedly washed and rubbed in the same position to cause non-uniform washing, which uniformly washes the clothing in all directions through combined actions of lifting, beating, centrifugal force turning, hitting and rubbing by means of the inner barrel and pulsator integrated structure.

**[0014]** In one aspect, the present invention relates to an inner barrel and pulsator integrated structure. The structure includes an inner barrel vertically used and at least one water repellent blade of an inner barrel bottom, wherein the water repellent blade is integrated with the inner barrel bottom, the water repellent blade is a projection structure disposed at the inner barrel bottom, the number of the water repellent blades is at least two, each water repellent blade extends from the center of the inner barrel bottom to an inner barrel wall, and each water repellent blade rises and extends along a radial outward direction of the inner barrel bottom, after extending to the highest point, is connected with the inner barrel wall, and after rising and extending to the highest point along a circumferential direction from one side in a shape of a gentle slope, drops back to the inner barrel bottom in a shape of an abrupt slope.

**[0015]** The number of the water repellent blades is 2-4, and the water repellent blades are evenly distributed around an axis of the inner barrel radially along the circumference of the inner barrel bottom clockwise or counterclockwise, and rise and extend along the circumference of the inner barrel bottom clockwise or counterclockwise in the same direction.

**[0016]** A gentle slope rising side of the water repellent blade smoothly rises, an abrupt slope falling side of the water repellent blade smoothly falls, the inner barrel bottom transits smoothly with the gentle slope rising side and the abrupt slope falling side, the water repellent blade smoothly rises outwardly along a radial direction of the inner barrel bottom, and the inner barrel wall transits smoothly with the water repellent blade.

**[0017]** Highest points of the water repellent blade form a ridge of the water repellent blade in different radial positions of the inner barrel bottom, the ridge is formed of two arcs, circle centers of the two arcs are distributed on different sides of the ridge, the circle center of the arc near the center of the inner barrel is on the gentle slope rising side, and the circle center of the arc near the inner barrel wall is on the abrupt slope falling side.

**[0018]** The water repellent blade tilts on two sides of any point on the ridge in different degrees, and a tilt degree of the gentle slope rising side is less than that of the abrupt slope falling side.

**[0019]** An intersecting line between the water repellent blade and the inner barrel bottom is an arc, bending directions of an intersecting line between the gentle slope rising side and the inner barrel bottom and an intersecting line between the abrupt slope falling side and the inner barrel bottom are the same, and each intersecting line smoothly transits with the outermost circumference of the inner barrel bottom.

**[0020]** A ratio range of the height of the inner barrel to the diameter of the inner barrel is 0.4-2, preferably the height of the inner barrel is less than or equal to the diameter of the inner barrel.

**[0021]** A ratio of the height of the inner barrel to the diameter of the inner barrel is 0.6.

**[0022]** The central position of the inner barrel bottom is provided with an axle hole that allows a power shaft to penetrate, and multiple water leakage holes are distributed on the inner barrel wall and/or the inner barrel bottom of the inner barrel.

**[0023]** In another aspect of the present invention, a washing machine has the inner barrel and pulsator integrated structure, wherein inside an outer barrel of the washing machine is coaxially provided with the inner barrel and pulsator integrated structure, and a power shaft of the washing machine extends into the axle hole in the central position of the inner barrel bottom in the inner barrel and pulsator integrated structure.

**[0024]** In yet another aspect of the present invention, a washing method turns clothing in an inner barrel by controlling a washing machine to rotate forward and reversely at intervals, to complete washing, in the method, the washing machine rotates forward and reversely at different angles each time, the forward rotation angle each time is not equal to the reverse rotation angle each time, by means of an inner barrel and pulsator integrated structure, in the event of forward rotation in a circumferential direction, the clothing is pulled up and then falls subvertically, in the event of reverse rotation, the clothing is impacted by a subvertical plane in the circumferential direction, and in forward and reverse rotation processes, under the guide of centrifugal force produced by radial rotation and an inner barrel bottom structure, the cloth-
ing is turned outwardly and upwardly, and is turned inwardly and downwardly after arriving at an inner barrel wall.

[0025] Falling and beating of the clothing after pull-up when rotating forward in the circumferential direction or striking when rotating reversely and turning in the radial direction are carried out at the same time, to make the clothing always in a continuous rolling state in the inner barrel and collide with and rub the inner barrel bottom and the inner barrel wall, to be evenly washed.

[0026] Motions of the clothing in the circumferential direction and in the radial direction are guided by a projection structure of the inner barrel bottom.

[0027] The number of the projection structure is at least two, preferably 2-4, the projection structures are evenly distributed, and an axis of the inner barrel radially along the circumference of the inner barrel bottom clockwise or counterclockwise, and rise and extend along the circumference of the inner barrel bottom clockwise or counterclockwise in the same direction, and the projection structures rise and extend along a radial outward direction of the inner barrel bottom, after extending to the highest point, are connected with the inner barrel wall, and after rising and extending to the highest point along the circumferential direction from one side in a shape of a gentle slope, drop back to the inner barrel bottom in a shape of an abrupt slope.

[0028] In the washing process, in the circumferential direction, during forward rotation, the clothing, after rising to the highest point along a smooth rising and extending plane of the projection structure, falls and beats along a subvertical abrupt slope plane, and during reverse rotation, the clothing hits the subvertical abrupt slope plane.

[0029] In the washing process, in a barrel diameter direction, centrifugal force produced by rotation makes the clothing turned outwardly and upwardly along the projection structure, and turned inwardly and downwardly after going to the inner barrel wall.

[0030] In the washing method, in a washing or rinsing process, the inner barrel increases to a forward rotation speed X at a certain acceleration, rotates forward for a certain time T1, pauses for a period of time, then increases to a reverse rotation speed Y at a certain acceleration, and rotates reversely for a certain time T2, a forward rotation angle each time is not equal to a reverse rotation angle, and the process is repeated 5-500 times for each washing or rinsing.

[0031] The forward rotation speed X and the reverse rotation speed Y are 20-100 rpm respectively, the forward rotation time T1 and the reverse rotation time T2 are 1-5 s respectively, and X×T1≠Y×T2.

[0032] In certain embodiments, the washing method includes the following steps:

[0033] (1) placing a detergent along with the clothing into a washing inner barrel, and starting the washing machine; (2) controlling the washing inner barrel to increase to the forward rotation speed X at a certain acceleration, rotate forward for a certain time T1, pause for a period of time, then increase to a reverse rotation speed Y at a certain acceleration, and rotate reversely for a certain time T2, a forward rotation angle each time being not equal to a reverse rotation angle, and the process being repeated 5-500 times; (3) proceeding to a dewatering stage: controlling the washing inner barrel to rotate forward and reversely, and after even distribution of the clothing, the inner barrel rotating at a high speed for dewatering; (4) if the clothing needs to be washed multiple times, adding the detergent again to repeat steps (2) and (3); and (5) controlling water injection of the washing machine, and repeating steps (2) and (3) 1-8 times.

[0034] After the technical solution of the present invention is adopted, the following beneficial effects are brought about:

[0035] 1. The inner barrel and pulsator integrated structure in the present invention can complete washing, rinsing and dewatering processes only through one washing barrel, makes the structure of the washing machine simple, simplifies the installation process and reduces the cost.

[0036] 2. In the present invention, at least one water repellent blade structure is added to the inner barrel bottom, and the structure extends from the inner barrel bottom to the inner barrel wall, enables the clothing to be lifted, fall and be hit in the circumferential direction, and also enables the clothing to be turned in a radial direction, to uniformly wash the clothing in all directions, which has a good washing effect.

[0037] 3. In the present invention, gradual rising and rapid falling of the water repellent blade of the inner barrel bottom in the circumferential direction have an effect of lifting and then beating the clothing during forward rotation, and have an effect of impacting the clothing during reverse rotation; the inner barrel gradually rises in a direction from the center to the inner barrel wall, and the highest point is connected with the inner barrel wall, to have an effect of turning the clothing upwardly and outwardly in the radial direction and turning the clothing downwardly and inwardly after going to the inner barrel wall.

[0038] 4. The height of the inner barrel is small, which saves installation space.

[0039] 5. In the washing method according to the present invention, forward rotation and reverse rotation are set at intervals, reducing intertwining of the clothing.

[0040] 6. In the washing method according to the present invention, the forward rotation angle each time is not equal to the reverse rotation angle, to avoid that the clothing is repeatedly washed and rubbed in the same position to cause non-uniform washing.

[0041] 7. In the washing method according to the present invention, trajectories of the clothing are varied, and the clothing is uniformly washed in all directions through combined actions of lifting, beating, centrifugal force turning, hitting and rubbing.

[0042] 8. In the washing method according to the present invention, turning of the clothing in the circumferential direction and turning in the radial direction are carried out at the same time, to wash the clothing uniformly and increase the washing rate.

[0043] These and other aspects of the present invention will become apparent from the following description of the preferred embodiment taken in conjunction with the following drawings, although variations and modifications therein may be affected without departing from the spirit and scope of the novel concepts of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0044] The accompanying drawings illustrate one or more embodiments of the invention and, together with the written description, serve to explain the principles of the invention. Wherever possible, the same reference numbers are used throughout the drawings to refer to the same or like elements of an embodiment. The drawings do not limit the present
invention to the specific embodiments disclosed and described herein. The drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the invention.

**[0049]** FIG. 1 is a structural view of an inner barrel and pulsator integrated structure according to the present invention.

**[0050]** FIG. 2 is a top view of a structure of two water repellent blades of the inner barrel and pulsator integrated structure according to the present invention.

**[0051]** FIG. 3 is a top view of four water repellent blades of the inner barrel and pulsator integrated structure according to the present invention.

**[0052]** FIG. 4 is an installation view of the inner barrel and pulsator integrated structure according to the present invention.

**[0053]** FIG. 5 is a structural view of three water repellent blades of the inner barrel and pulsator integrated structure according to the present invention.

**[0054]** FIG. 6 is a structural view of four water repellent blades of the inner barrel and pulsator integrated structure according to the present invention.

**[0055]** FIG. 7 is a flowchart of the washing method according to the present invention.

**[0056]** FIG. 8 is a view of a radial trajectory of the clothing in the washing method according to the present invention.

**[0057]** FIG. 9 is a view of a trajectory of the clothing in the circumferential direction during forward rotation in the washing method according to the present invention.

**[0058]** FIG. 10 is a view of a trajectory of the clothing in the circumferential direction during reverse rotation in the washing method according to the present invention.

**[0059]** In FIGS. 1-10 of the drawings, numeral 1 refers to an inner barrel, numeral 11 refers to an inner barrel bottom, numeral 12 refers to an inner barrel wall, numeral 2 refers to at least one water repellent blade, numeral 21 refers to a gentle slope rising side, numeral 22 refers to an abrupt slope falling side, numeral 23 refers to a ridge, numeral 3 refers to a reinforcing rib, numeral 4 refers to an axle hole, numeral 5 refers to a water leakage hole, numeral 6 refers to an outer barrel, and numeral 7 refers to a power shaft.

**DETAILED DESCRIPTION OF THE INVENTION**

**[0060]** The present disclosure will now be described more fully hereinafter with reference to the accompanying drawings, in which exemplary embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numerals refer to like elements throughout.

**[0061]** The terms used in this specification generally have their ordinary meanings in the art, within the context of the invention, and in the specific context where each term is used. Certain terms that are used to describe the invention are discussed below, or elsewhere in the specification, to provide additional guidance to the practitioner regarding the description of the invention. For convenience, certain terms may be highlighted, for example using italics and/or quotation marks. The use of highlighting has no influence on the scope and meaning of a term; the scope and meaning of a term is the same, in the same context, whether or not it is highlighted. It will be appreciated that the same thing can be said in more than one way. Consequently, alternative language and synonyms may be used for any one or more of the terms discussed herein, nor is any special significance to be placed upon whether or not a term is elaborated or discussed herein. Synonyms for certain terms are provided. A recital of one or more synonyms does not exclude the use of other synonyms. The use of examples anywhere in this specification including examples of any terms discussed herein is illustrative only, and in no way limits the scope and meaning of the invention or of any exemplified term. Likewise, the invention is not limited to various embodiments given in this specification.

**[0062]** It will be understood that when an element is referred to as being "on" another element, it can be directly on the other element or intervening elements may be present therebetween. In contrast, when an element is referred to as being "directly on" another element, there are no intervening elements present. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

**[0063]** It will be understood that, although the terms first, second, third etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another element, component, region, layer or section. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the invention.

**[0064]** The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a", "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising", or "includes" and/or "including" or "has" and/or "having" when used in this specification, specify the presence of stated features, regions, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, regions, integers, steps, operations, elements, components, and/or groups thereof.

**[0065]** Furthermore, relative terms, such as "lower" or "bottom", "upper" or "top", and "left" and "right", may be used herein to describe one element's relationship to another element as illustrated in the Figures. It will be understood that relative terms are intended to encompass different orientations of the device in addition to the orientation depicted in the Figures. For example, if the device in one of the figures is turned over, elements described as being on the "lower" side of other elements would then be oriented on "upper" sides of the other elements. The exemplary term "lower", can therefore, encompasses both an orientation of "lower" and "upper", depending of the particular orientation of the figure. Similarly, if the device in one of the figures is turned over, elements described as "below" or "beneath" other elements would then be oriented "above" the other elements. The exemplary terms "below" or "beneath" can, therefore, encompass both an orientation of above and below.

**[0066]** Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to
which this invention belongs. It will be further understood that terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and the present disclosure, and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

As used herein, “around”, “about” or “approximately” shall generally mean within 20 percent, preferably within 10 percent, and more preferably within 5 percent of a given value or range. Numerical quantities given herein are approximate, meaning that the term “around”, “about” or “approximately” can be inferred if not expressly stated.

The description will be made as to the embodiments of the present disclosure in conjunction with the accompanying drawings in FIGS. 1-10. In accordance with the purposes of this disclosure, as embodied and broadly described herein, this invention, in one aspect, relates to an inner barrel and pulsator integrated structure and a washing machine using the structure, and a washing method of a washing machine as well.

As shown in FIG. 1, the present invention discloses an inner barrel and pulsator integrated structure. The structure includes an inner barrel 1 vertically used and at least one water repellent blade 2 of an inner barrel bottom 11, wherein the water repellent blade 2 is integrated with the inner barrel 1. The water repellent blade 2 is a projection structure disposed at the inner barrel bottom 11, wherein the number of the water repellent blades 2 is at least two, each water repellent blade 2 extends from the center of the inner barrel bottom 11 to an inner barrel wall 12, and each water repellent blade 2 rises and extends along a circumferential direction of the inner barrel bottom 11 and a barrel diameter outward direction respectively, after extending to the highest point along a radial outward direction of the inner barrel bottom 11, is connected with the inner barrel wall 12, and after rising and extending to the highest point along the circumferential direction from one side in a shape of a gentle slope, drops back to the inner barrel bottom 11 in a shape of an abrupt slope.

That is, the water repellent blade 2 extends from the center of the inner barrel bottom 11 to the inner barrel wall 12, the water repellent blade 2 of the inner barrel bottom 11 slowly rises to the highest point in a circumferential direction and then rapidly falls, the inner barrel 1 gradually rises in a direction from the center to the inner barrel wall 12, and the highest point is connected with the inner barrel wall 12.

In the washing process, in the circumferential direction, during forward rotation, the clothing rises along a smooth gentle slope rising side 21 of the water repellent blade 2 to the highest point and then falls and is beaten along a subvertical abrupt slope falling side 22 to be affected by an impact force, and during reverse rotation, the clothing hits the subvertical abrupt slope falling side 22 to be affected by an impact force. In a barrel diameter direction, centrifugal force produced by rotation and the tendency that the water repellent blade 2 of the inner barrel bottom 11 gradually rises from the center of the inner barrel to the inner barrel wall make the clothing turned outwardly and upwardly along the water repellent blade 2, and turned inwardly and downwardly after going to the inner barrel wall 12. Falling and beating of the clothing after pull-up when rotating forward in the circumferential direction or striking when rotating reversely and turning in the radial direction are carried out at the same time, to make the clothing always in a continuous rolling state in the inner barrel and collide with and rub the inner barrel bottom and the inner barrel wall, so as to always wash different positions.

It is provided that, when the inner barrel 1 rotates along a rising and extending direction, it is called reverse rotation, and otherwise called forward rotation.

Preferably, the number of the water repellent blades 2 is 2-4, and the water repellent blades 2 are evenly distributed around an axis of the inner barrel 1 along the inner barrel bottom 11, and rise and extend along the circumference of the inner barrel bottom 11 clockwise or counterclockwise in the same direction. When the number of the water repellent blades 2 is two, the two water repellent blades 2 are centro symmetrically distributed, when the number of the water repellent blades is three, an angle between any two water repellent blades 2 is 120 degrees, and when the number of the water repellent blades 2 is multiple, the multiple water repellent blades 2 are evenly distributed around the axis of the inner barrel 1 like a spoke.

When rising and extending along the circumference of the inner barrel bottom 11 clockwise or counterclockwise, the water repellent blade 2 smoothly transits from low to high, the water repellent blade 2 smoothly transits from low to high along a direction in which the barrel diameter extends outwardly, and the width between two sides in an extending direction from low to high gradually increases, which is maximum at the inner barrel wall 12.

A gentle slope rising side 21 of the water repellent blade 2 smoothly rises, an abrupt slope falling side 22 of the water repellent blade 2 smoothly falls, the inner barrel bottom 11 transits smoothly with the gentle slope rising side 21 and the abrupt slope falling side 22, the water repellent blade 2 smoothly rises outwardly along a radial direction of the inner barrel bottom 11, and the inner barrel wall 12 transits smoothly with the water repellent blade 2.

Highest points of the water repellent blade 2 form a ridge 23 of the water repellent blade 2 in different radial positions of the inner barrel bottom 11, the ridge 23 is formed of two areas, circle centers of the two areas are distributed on different sides of the ridge 23, the circle center of the arc near the center of the inner barrel 1 is on the gentle slope rising side 21, and the circle center of the arc near the inner barrel wall 12 is on the abrupt slope falling side 22. A joint between the two areas smoothly butts, and the water repellent blade 2 is similar to “—” when viewed from top to bottom along the inner barrel 1.

A cross section cut by a cylindrical surface, where any point on the ridge 23 is coaxial with the inner barrel 1 tilts on two sides of the point in different degrees, and a tilt degree of the gentle slope rising side 21 is less than that of the abrupt slope falling side 22.

An intersecting line between the water repellent blade 2 and the inner barrel bottom 11 is an arc, bending directions of an intersecting line a between the gentle slope rising side 21 and the inner barrel bottom 11 and an intersecting line b between the abrupt slope falling side 22 and the inner barrel bottom 11 are the same, bending radii are different, the bending radius of the intersecting line a between the gentle slope rising side 21 and the inner barrel bottom 11 is less than that of the intersecting line b between the abrupt slope falling side 22 and the inner barrel bottom 11, and each intersecting line smoothly transits with the outermost circumference of the inner barrel bottom 11. Such a structure will definitely result in that the width between two sides in an
extending direction from low to high gradually increases, which is maximum at the inner barrel wall 12.

[0079] A ratio range of the height of the inner barrel 1 to the diameter of the inner barrel 1 is 0.4-2, preferably the height of the inner barrel 1 is less than or equal to the diameter of the inner barrel 1, the height of the washing portion inside the inner barrel is less than the minimum diameter of the inner barrel, and preferably, the ratio range of the height of the inner barrel 1 to the diameter of the inner barrel 1 is 0.6, which makes full use of hitting and centrifugal rolling effects of the water repellent blade on the clothing.

[0080] The inner barrel wall 12 and/or the inner barrel bottom 11 of the inner barrel 1 are/is provided thereon with reinforcing ribs 3 that reduces deformation of the inner barrel 1, the reinforcing ribs 3 are disposed on an outer surface of the inner barrel wall 12 of the inner barrel 1 along an axial direction and/or a circumferential direction, and reinforcing ribs 3 are disposed an outer surface of the inner barrel bottom 11 of the inner barrel 1 along a radial direction and/or a circumferential direction.

[0081] The reinforcing ribs 3 on the outer surface of the inner barrel wall 12 are disposed on the outer surface of the inner barrel wall 12 along the radial direction or horizontally disposed along the circumferential direction or staggered axially or circumferentially; the reinforcing ribs on the outer surface of the inner barrel bottom 11 are disposed on the outer surface of the inner barrel bottom 11 along the circumferential direction or disposed along the radial direction or staggered circumferentially or radially, which greatly increases the strength of the inner barrel 1.

[0082] The central position of the inner barrel bottom 11 is provided with an axle hole 4 (refer to FIG. 4) that allows a power shaft to penetrate, the axle hole 4 penetrates the axle hole to drive the inner barrel to rotate, to complete a washing process, and multiple water leakage holes 5 are distributed on the inner barrel wall 12 and/or the inner barrel bottom 11 of the inner barrel 1, to facilitate exchange of internal and external water currents during washing and drainage.

[0083] The present invention discloses a washing method, wherein the method turns clothing in an inner barrel by controlling a washing machine to rotate forward and reversely at intervals, to complete washing, in the method, the washing machine rotates forward and reversely at different angles each time, the forward rotation angle each time is not equal to the reverse rotation angle each time, by means of an inner barrel and pulsator integrated structure, in the event of forward rotation in a circumferential direction, the clothing is pulled up and then falls subvertically, in the event of reverse rotation, the clothing is impacted by a subvertical plane in the circumferential direction, and in forward and reverse rotation processes, under the guide of centrifugal force produced by radial rotation and an inner barrel bottom structure, the clothing is turned outwardly and upwardly, and is turned inwardly and downwardly after arriving at an inner barrel wall.

[0084] Falling and beating of the clothing after pull-up when rotating forward in the circumferential direction or striking when rotating reversely and turning in the radial direction are carried out at the same time, to make the clothing always in a continuous rolling state in the inner barrel and collide with and rub the inner barrel bottom and the inner barrel wall, to be evenly washed and increase the washing rate.

[0085] Motions of the clothing in the circumferential direction and in the radial direction are guided by a projection structure of the inner barrel bottom.

[0086] In the washing process, in the circumferential direction, during forward rotation, the clothing, after rising to the highest point along a smooth rising and extending plane of the projection structure, falls and beats along a subvertical abrupt slope plane, and during reverse rotation, the clothing hits the subvertical abrupt slope plane. In the washing process, in a barrel diameter direction, centrifugal force produced by rotation makes the clothing turned outwardly and upwardly along the projection structure, and turned inwardly and downwardly after going to the inner barrel wall.

[0087] In the washing method, in a washing or rinsing process, the inner barrel increases to a forward rotation speed X at a certain acceleration, rotates forward for a certain time T1, pauses for a period of time, then increases to a reverse rotation speed Y at a certain acceleration, and rotates reversely for a certain time T2, a forward rotation angle each time is not equal to a reverse rotation angle, and the process is repeated 5-500 times for each washing or rinsing. The forward rotation angle each time is greater than or less than the reverse rotation angle.

[0088] The forward rotation speed X and the reverse rotation speed Y are 20-100 rpm respectively, the forward rotation time T1 and the reverse rotation time T2 are 1-5 s respectively, and X×T1=Y×T2, X×T1=Y×T2 or X×T1=Y×T2.

[0089] The washing method includes the following steps:

1) placing a detergent along with the clothing into a washing inner barrel, and starting the washing machine;

2) controlling the washing inner barrel to increase to the forward rotation speed X at a certain acceleration, rotate forward for a certain time T1, pause for a period of time, then increase to a reverse rotation speed Y at a certain acceleration, and rotate reversely for a certain time T2, a forward rotation angle each time being not equal to a reverse rotation angle, and the process being repeated 5-500 times;

3) proceeding to a dewatering stage: controlling the washing inner barrel to rotate forward and reversely, and after even distribution of the clothing, the inner barrel rotating at a high speed for dewatering;

4) if the clothing needs to be washed multiple times, adding the detergent again to repeat steps 2) and 3; and

5) controlling water injection of the washing machine, and repeating steps 2) and 3) 1-8 times.

[0090] A washing machine that uses the washing method is provided. Trajectories of the clothing are varied, and the clothing is uniformly washed in all directions through combined actions of lifting, beating, centrifugal force turning, hitting and rubbing. Turning of the clothing in the circumferential direction and turning in the radial direction are carried out at the same time, to wash the clothing more evenly and have a better washing effect.

[0091] Without intent to limit the scope of the invention, examples and their related results according to the embodiments of the present invention are given below.

Embodiment 1

[0092] As shown in FIG. 2, in this embodiment, the number of the water repellent blades 2 is two, the two water repellent blades are centrosymmetrically distributed, each water repellent blade 2 extends from the center of the inner barrel bottom 11 to the inner barrel wall 12, the water repellent blade 2 of the inner barrel 11 gradually slowly rises to the highest point in
the circumferential direction and then rapidly falls, the inner barrel 1 gradually rises in a direction from the center to the inner barrel wall 12, and the highest point is connected with the inner barrel wall 12.

*0098* A ratio range of the height of the inner barrel 1 to the diameter of the inner barrel 1 is 0.8, which makes full use of hitting and centrifugal rolling effects of the water repellent blades on the clothing, has a small height and saves installation space.

**Embodiment 2**

*0099* As shown in FIG. 5, in this embodiment, the number of the water repellent blades 2 is three, the three water repellent blades are evenly distributed along the center of the inner barrel, an angle between each two water repellent blades is 120 degrees, each water repellent blade 2 extends from the center of the inner barrel bottom 11 to the inner barrel wall 12, the water repellent blade 2 of the inner barrel 11 gradually slowly rises to the highest point in the circumferential direction and then rapidly falls, the inner barrel 1 gradually rises in a direction from the center to the inner barrel wall 12, and the highest point is connected with the inner barrel wall 12.

*0100* A ratio range of the height of the inner barrel 1 to the diameter of the inner barrel 1 is 0.7, which makes full use of hitting and centrifugal rolling effects of the water repellent blades on the clothing, has a small height and saves installation space.

**Embodiment 3**

*0101* As shown in FIG. 3 and FIG. 6, in this embodiment, the number of the water repellent blades 2 is four, the four water repellent blades are evenly distributed along the center of the inner barrel, an angle between each two water repellent blades is 90 degrees, each water repellent blade 2 extends from the center of the inner barrel bottom 11 to the inner barrel wall 12, the water repellent blade 2 of the inner barrel 11 gradually slowly rises to the highest point in the circumferential direction and then rapidly falls, the inner barrel 1 gradually rises in a direction from the center to the inner barrel wall 12, and the highest point is connected with the inner barrel wall 12.

*0102* A ratio range of the height of the inner barrel 1 to the diameter of the inner barrel 1 is 0.9, which makes full use of hitting and centrifugal rolling effects of the water repellent blades on the clothing, has a small height and saves installation space.

**Embodiment 4**

*0103* As shown in FIG. 4, in this embodiment provides a washing machine having the inner barrel and pulsator integrated structure, inside an outer barrel of the washing machine is coaxially provided with the inner barrel and pulsator integrated structure, and a power shaft of the washing machine extends into the axle hole in the central position of the inner barrel bottom 11. When the washing machine is started, the power shaft drives the inner barrel and pulsator integrated structure to rotate, to wash the clothing inside the inner barrel 1.

*0104* According to the inner barrel and pulsator integrated structure of the present invention, washing, rinsing and dewatering processes can be completed only through one washing barrel, which makes the structure of the washing machine simple, simplifies an installation process and reduces the cost; at least one water repellent blade structure is added to the inner barrel bottom, and the structure extends from the center of the inner barrel bottom to the inner barrel wall, enables the clothing to be lifted, fall and be hit in the circumferential direction, and also enables the clothing to be turned in a radial direction, to uniformly wash the clothing in all directions, which has a good washing effect; gradual rising and rapid falling of the water repellent blade of the inner barrel bottom in the circumferential direction have an effect of lifting and then beating the clothing during forward rotation, and have an effect of impacting the clothing during reverse rotation; the inner barrel gradually rises in a direction from the center to the inner barrel wall, and the highest point is connected with the inner barrel wall, to turn the clothing upwardly and outwardly in the radial direction and turn the clothing downwardly and inwardly after going to the inner barrel wall.

**Embodiment 5**

*0105* As shown in FIG. 7, the washing method includes the following steps:

*0106* 1) placing a detergent along with the clothing into a washing inner barrel, wherein, if necessary, a softener may also be added, and starting the washing machine;

*0107* 2) controlling the washing inner barrel to increase to the forward rotation speed X at a certain acceleration, rotate forward for a certain time T1, pause for a period of time, then increase to a reverse rotation speed Y at a certain acceleration, and rotate reversely for a certain time T2, a forward rotation angle each time being not equal to a reverse rotation angle, and the process being repeated 30 times, wherein the forward rotation speed X and the reverse rotation speed Y are 20-100 rpm respectively, the forward rotation time T1 and the reverse rotation time T2 are 1-5 s respectively, and X>X1>T1>YX1, the forward rotation speed X and the reverse rotation speed Y are set as 50 rpm, and the forward rotation time T1 and the reverse rotation time T2 are respectively 3 s and 2 s;

*0108* 3) proceeding to a dewatering stage: controlling the washing inner barrel to rotate forward and reversely, and after even distribution of the clothing, the inner barrel rotating at a high speed for dewatering;

*0109* 4) if the clothing is dirty and needs to be washed twice, adding the detergent again to repeat steps 2) and 3); and

*0110* 5) controlling water injection of the washing machine, and repeating steps 2) and 3) twice, to complete rinsing and dewatering.

*0111* After the last dewatering ends, the inner barrel is controlled to rotate forward and reversely, and the clothing squeezed together after dewatering is scattered, to facilitate the user to take out and dry the clothing.

**Embodiment 6**

*0112* As shown in FIG. 7, the washing method includes the following steps:

*0113* 1) placing a detergent along with the clothing into a washing inner barrel, wherein, if necessary, a softener may also be added, and starting the washing machine;

*0114* 2) controlling the washing inner barrel to increase to the forward rotation speed X at a certain acceleration, rotate forward for a certain time T1, pause for a period of time, then increase to a reverse rotation speed Y at a certain acceleration, and rotate reversely for a certain time T2, a forward rotation angle each time being not equal to a reverse rotation angle, and the process being repeated 30 times, wherein the forward
rotation speed X and the reverse rotation speed Y are 20-100 rpm respectively, the forward rotation time T1 and the reverse rotation time T2 are 1-5 s respectively, and X < X1 < Y < T2, the forward rotation speed X and the reverse rotation speed Y are set as 50 rpm, and the forward rotation time T1 and the reverse rotation time T2 are respectively 2 s and 3 s;

[0115] 3) proceeding to a dewatering stage: controlling the washing inner barrel to rotate forward and reversely, and after even distribution of the clothing, the inner barrel rotating at a high speed for dewatering;

[0116] 4) if the clothing is dirty and needs to be washed twice, adding the detergent again to repeat steps 2) and 3); and

[0117] 5) controlling water injection of the washing machine, and repeating steps 2) and 3) twice, to complete rinsing and dewatering.

[0118] After the last dewatering ends, the inner barrel is controlled to rotate forward and reversely, and the clothing squeezed together after dewatering is scattered, to facilitate the user to take out and dry the clothing.

Embodiment 7

[0119] As shown in FIG. 8, FIG. 9 and FIG. 10, in this embodiment, trajectories of the clothing in the inner barrel I are analyzed, and it is defined that, when the inner barrel I rotates along a rising and extending direction, it is called reverse rotation, and otherwise called forward rotation.

[0120] FIG. 8 is a cross section obtained by cutting the inner barrel along a vertical plane of the center line of the inner barrel, as shown in the figure, due to the tendency that the water repellent blade 2 gradually rises along a radial direction, the clothing moves outwardly and upwardly along the radial direction, and after arriving at the inner barrel wall 12, the clothing is affected by an opposite acting force of the inner barrel wall 12 and begins to move inwardly and downwardly.

[0121] FIG. 9 and FIG. 10 are expanded views of a cross section of the inner barrel cut along a cylindrical surface coaxial with the inner barrel I, as shown in FIG. 9, during forward rotation, due to the tendency that the water repellent blade 2 gradually rises along a circumferential direction, the clothing is gradually pulled up along the circumferential direction, and as the water repellent blade 2 rapidly falls after rising to the highest point along the circumferential direction, the clothing is pulled up and then falls, during pull-up, the clothing rubs with the inner barrel, and during falling, the clothing is beaten, to have a washing effect on the clothing.

[0122] As shown in FIG. 10, during reverse rotation, the clothing moves downward along the gentle slope rising side of the water repellent blade 2, and after arriving at the abrupt slope falling side, the clothing hits the abrupt slope falling side to be stricken, which has a washing effect on the clothing with rubbing between the clothing and the inner barrel.

[0123] In the washing process, falling and beating of the clothing after pull-up when rotating forward in the circumferential direction or striking when rotating reversely and turning in the radial direction are carried out at the same time, to make the clothing always in a continuous rolling state in the inner barrel and collide with and rub the inner barrel bottom and the inner barrel wall, to be evenly washed.

[0124] The foregoing description of the exemplary embodiments of the invention has been presented only for the purposes of illustration and description and is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Many modifications and variations are possible in light of the above teaching.

[0125] The embodiments were chosen and described in order to explain the principles of the invention and their practical application so as to enable others skilled in the art to utilize the invention and various embodiments and with various modifications as are suited to the particular use contemplated. Alternative embodiments will become apparent to those skilled in the art to which the present invention pertains without departing from its spirit and scope. Accordingly, the scope of the present invention is defined by the appended claims rather than the foregoing description and the exemplary embodiments described therein.

What is claimed is:

1. An inner barrel and pulsator integrated structure, comprising:
   an inner barrel (1) being vertically used; and
   a plurality of water repellent blades (2) being integrated with a bottom (11) of the inner barrel (1), wherein the plurality of water repellent blades (2) is a projection structure disposed at the inner barrel bottom (11), the number of the water repellent blades (2) is at least two, each water repellent blade (2) extends from the center of the inner barrel bottom (11) to an inner barrel wall (12), and each water repellent blade (2) rises and extends along a radial outward direction of the inner barrel bottom (11), after extending to the highest point, is connected with the inner barrel wall (12), and after rising and extending to the highest point along a circumferential direction from one side in a shape of a gentle slope, drops back to the inner barrel bottom (11) in a shape of an abrupt slope.

2. The inner barrel and pulsator integrated structure according to claim 1, wherein the number of the water repellent blades (2) is 2-4, and the water repellent blades (2) are evenly distributed around an axis of the inner barrel radially along the circumference of the inner barrel bottom (11) clockwise or counterclockwise, and rise and extend along the circumference of the inner barrel bottom (11) clockwise or counterclockwise in the same direction.

3. The inner barrel and pulsator integrated structure according to claim 2, wherein a gentle slope rising side (21) of each water repellent blade (2) smoothly rises, an abrupt slope falling side (22) of each water repellent blade (2) smoothly falls, the inner barrel bottom (11) transits smoothly with the gentle slope rising side (21) and the abrupt slope falling side (22), each water repellent blade (2) smoothly rises outwardly along a radial direction of the inner barrel bottom (11), and the inner barrel wall (12) transits smoothly with each water repellent blade (2).

4. The inner barrel and pulsator integrated structure according to claim 3, wherein highest points of the water repellent blades (2) form a ridge (23) of the water repellent blade (2) in different radial positions of the inner barrel bottom (11), the ridge (23) is formed of two arcs, circle centers of the two arcs are distributed on different sides of the ridge (23), the center circle of the arc near the center of the inner barrel (1) is on the gentle slope rising side (21), and the circle center of the arc near the inner barrel wall (12) is on the abrupt slope falling side (22).

5. The inner barrel and pulsator integrated structure according to claim 4, wherein each water repellent blade (2) tilts on two sides of any point on the ridge (23) in different
degrees, and a tilt degree of the gentle slope rising side (21) is less than that of the abrupt slope falling side (22).

6. The inner barrel and pulsator integrated structure according to claim 5, wherein an intersecting line between each water repellant blade (2) and the inner barrel bottom (11) is an arc, bending directions of an intersecting line between the gentle slope rising side (21) and the inner barrel bottom (11) and an intersecting line between the abrupt slope falling side (22) and the inner barrel bottom (11) are the same, and each intersecting line smoothly transits with the outermost circumference of the inner barrel bottom (11).

7. The inner barrel and pulsator integrated structure according to claim 1, wherein a ratio range of the height of the inner barrel (1) to the diameter of the inner barrel (1) is 0.4-2, preferably the height of the inner barrel (1) is less than or equal to the diameter of the inner barrel (1).

8. The inner barrel and pulsator integrated structure according to claim 7, wherein a ratio of the height of the inner barrel (1) to the diameter of the inner barrel (1) is 0.6.

9. The inner barrel and pulsator integrated structure according to claim 8, wherein the central position of the inner barrel bottom (11) is provided with an axle hole (4) that allows a power shaft to penetrate, and multiple water leakage holes are distributed on the inner barrel wall (12) and/or the inner barrel bottom (11) of the inner barrel.

10. A washing machine comprising the inner barrel and pulsator integrated structure according to claim 1, wherein inside an outer barrel (6) of the washing machine is coaxially provided with the inner barrel and pulsator integrated structure, and a power shaft (7) of the washing machine extends into the axle hole (4) in the central position of the inner barrel bottom (11) in the inner barrel and pulsator integrated structure.

11. A washing method, the method turning clothing in an inner barrel by controlling a washing machine to rotate forward and reversely at intervals, to complete washing, characterized in that, in the method, the washing machine rotates forward and reversely at different angles each time, the forward rotation angle each time is not equal to the reverse rotation angle each time, by means of an inner barrel and pulsator integrated structure, in the event of forward rotation in a circumferential direction, the clothing is pulled up and then falls subvertically, in the event of reverse rotation, the clothing is impacted by a subvertical plane in the circumferential direction, and in forward and reverse rotation processes, under the guide of centrifugal force produced by radial rotation and an inner barrel bottom structure, the clothing is turned outwards and upwards, and is turned inwardly and downwards after arriving at an inner barrel wall.

12. The washing method according to claim 11, wherein falling and beating of the clothing after pull-up when rotating forward in the circumferential direction or striking when rotating reversely and turning in the radial direction are carried out at the same time, to make the clothing always in a continuous rolling state in the inner barrel and collide with and rub the inner barrel bottom and the inner barrel wall, to be evenly washed.

13. The washing method according to claim 12, wherein motions of the clothing in the circumferential direction and in the radial direction are guided by a projection structure of the inner barrel bottom.

14. The washing method according to claim 13, wherein the number of the projection structure is at least two, preferably 2-4, the projection structures are evenly distributed around an axis of the inner barrel radially along the circumference of the inner barrel bottom clockwise or counterclockwise, and rise and extend along the circumference of the inner barrel bottom clockwise or counterclockwise in the same direction, and the projection structures rise and extend along a radial outward direction of the inner barrel bottom, after extending to the highest point, are connected with the inner barrel wall, and after rising and extending to the highest point along the circumferential direction from one side in a shape of a gentle slope, drop back to the inner barrel bottom in a shape of an abrupt slope.

15. The washing method according to claim 14, wherein in the washing process, in the circumferential direction, during forward rotation, the clothing, after rising to the highest point along a smooth rising and extending plane of the projection structure, falls and beats along a subvertical abrupt slope plane, and during reverse rotation, the clothing hits the subvertical abrupt slope plane.

16. The washing method according to claim 14, wherein in the washing process, in a barrel diameter direction, centrifugal force produced by rotation makes the clothing turned outwards and upwards along the projection structure, and turned inwardly and downwardly after going to the inner barrel wall.

17. The washing method according to claim 11, wherein in the washing method, in a washing or rinsing process, the inner barrel increases to a forward rotation speed X at a certain acceleration, rotates forward for a certain time T1, pauses for a period of time, then increases to a reverse rotation speed Y at a certain acceleration, and rotates reversely for a certain time T2, a forward rotation angle each time is not equal to a reverse rotation angle, and the process is repeated 5-500 times for each washing or rinsing.

18. The washing method according to claim 15, wherein in the forward rotation speed X and the reverse rotation speed Y are 20-100 rpm respectively, the forward rotation time T1 and the reverse rotation time T2 are 1-5 s respectively, and X×T1=Y×T2.

19. The washing method according to claim 18, wherein the washing method comprises the following steps:

1) placing a detergent along with the clothing into a washing inner barrel, and starting the washing machine;
2) controlling the washing inner barrel to increase to the forward rotation speed X at a certain acceleration, rotate forward for a certain time T1, pause for a period of time, then increase to a reverse rotation speed Y at a certain acceleration, and rotate reversely for a certain time T2, a forward rotation angle each time being not equal to a reverse rotation angle, and the process being repeated 5-500 times;
3) proceeding to a dewatering stage: controlling the washing inner barrel to rotate forward and reversely, and after even distribution of the clothing, the inner barrel rotating at a high speed for dewatering;
4) if the clothing needs to be washed multiple times, adding the detergent again to repeat steps 2) and 3); and
5) controlling water injection of the washing machine, and repeating steps 2) and 3) 1-8 times.

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