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(54) **SELF-CLEANING METHOD FOR FILTER ASSEMBLY OF WASHING MACHINE**

(57) Provided is a self-cleaning method for a filter assembly of a washing machine, the method comprising: receiving a user operation instruction for starting a self-cleaning process; executing the self-cleaning process, so as to clean the filter assembly of the washing machine, and before the self-cleaning process is completed, only receiving user operation instructions for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process, and prohibiting receipt of or ignoring the user operation instructions other than user operation instructions for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process. According to the present invention, during cleaning of the filter assembly, the self-cleaning process of the washing machine prohibits receipt of or ignores user operation instructions other than user operation instructions for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process, so that the filter assembly of the washing machine is thoroughly cleaned, prolonging the service life of the filter assembly in the washing machine and ensuring that the filter assembly always has a high filtration flux.

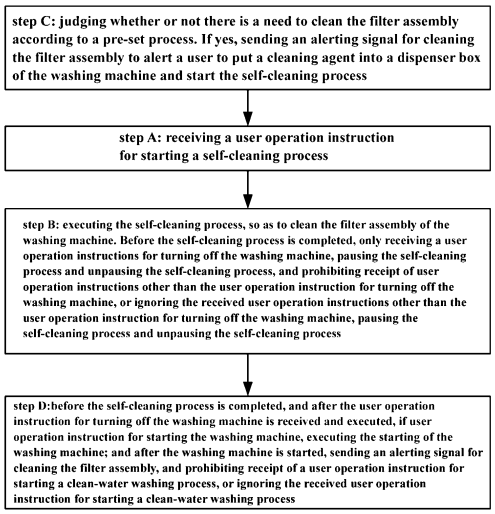

Fig. 3

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Description

Technical Field

[0001] The present invention relates to a washing machine, in particular to a self-cleaning method for a filter assembly of a washing machine.

Background of the Invention

[0002] The laundry process of the existing conventional washing machines usually comprises water intake, washing - spin-drying - drainage, repeated rinsing - spin-drying - drainage, etc., wherein the washing and each rinsing need to consume a lot of water. The washed or rinsed water is drained to the outside of the washing machine through a drainage pipe. The water consumption of the entire laundry process is relatively large, and the water resource is greatly wasted.

[0003] In order to achieve the purpose of water saving, a filter assembly can be used to filter the water and/or rinsing water of the washing machine for recycling. However, with the increase in the number of times of washing in the washing machine, separated substances and some other impurities are gradually accumulated on the surface of a filter membrane, resulting in the blockage and pollution problems of the filter membrane, so that the filtering effect thereof will be greatly affected. As some of the current washing machines with an automatic cleaning function on the filter assembly, however, the filter assembly in the existing washing machines is not thoroughly cleaned, and the cleaning agent or the like is easily remained on the filter assembly. Therefore, how to thoroughly clean the filter assembly is a problem to be solved in the field of household washing machines.

Summary of the Invention

[0004] An object of the present invention is to overcome at least one defect of the prior art washing machines and to provide a self-cleaning method for a filter assembly of a washing machine to thoroughly clean the filter assembly of the washing machine so as to prolong the service life of the filter assembly, particularly the ultrafiltration membrane assembly and ensure its normal flux.

[0005] To this end, the present invention provides a self-cleaning method for a filter assembly of a washing machine, comprising:

step A: receiving a user operation instruction for starting a self-cleaning process; and
step B: executing the self-cleaning process, so as to clean the filter assembly of the washing machine.

[0006] Optionally, the step B further comprises: before the self-cleaning process is completed, only receiving a user operation instruction for turning off the washing machine, and prohibiting receipt of user operation instructions other than the user operation instruction for turning off the washing machine or ignoring the received user operation instructions other than the user operation instruction for turning off the washing machine.

[0007] Optionally, the step B further comprises: before the self-cleaning process is completed, only receiving a user operation instructions for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process, and prohibiting receipt of user operation instructions other than the user operation instruction for turning off the washing machine or ignoring the received user operation instructions other than the user operation instruction for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process.

[0008] Optionally, prior to the step A, the method further comprises step C: judging whether or not there is a need to clean the filter assembly according to a pre-set process, if yes, sending an alerting signal for cleaning the filter assembly to alert a user to put a cleaning agent into a dispenser box of the washing machine and start the self-cleaning process.

[0009] Optionally, the pre-set process is configured to: determine that the filter assembly needs to be cleaned when the accumulated amount of output water of the filter assembly reaches a defined threshold, and to clear the accumulated amount of output water of the filter assembly when the cleaning of the filter assembly is completed.

[0010] Optionally, the step B further comprises: during the execution of the self-cleaning process, memorizing each of the steps of the self-cleaning process that have been executed to continue execution of the remaining steps of the self-cleaning process in the case that the washing machine is powered off and then powered on again.

[0011] Optionally, after the step B, the method further comprises step D:

before the self-cleaning process is completed, and after the user operation instruction for turning off the washing machine is received and executed so that the washing machine is turned off, if user operation instruction for starting the washing machine, executing the starting of the washing machine; and after the washing machine is started, sending an alerting signal for cleaning the filter assembly, and prohibiting receipt of a user operation instruction for starting a clean-water washing process or ignoring the received user operation instruction for starting a clean-water washing process.

[0012] Optionally, the clean-water washing process comprises: a recycled water rinsing stage for rinsing clothing in a washing tub of the washing machine with rinsing water, in the recycled water rinsing step of the recycled water rinsing stage, the rinsing water in the washing tub flowing into the filter assembly and flowing

back into the washing tub after filtration in the filter assembly.

[0013] Optionally, the self-cleaning process comprises: an alkaline liquid cleaning stage and an acid liquid cleaning stage executed successively, the alkaline liquid cleaning stage and the acid liquid cleaning stage each comprising a respective liquid injection and immersion step in which the cleaning liquid is discharged from the washing tub of the washing machine and is injected into the filter assembly from a water inlet of the filter assembly until a filter membrane of the filter assembly is completely or partially immersed in the cleaning liquid, the injection of the cleaning liquid is stopped, and the injected cleaning liquid is placed in the filter assembly to immerse the filter membrane of the filter assembly.

[0014] Optionally, the alkaline liquid cleaning stage and the acid liquid cleaning stage, after their respective liquid injection and immersion steps, further comprise an air cleaning step of injecting an airflow into the filter assembly, and cleaning the filter assembly with the air.

[0015] Optionally, the alkaline liquid cleaning stage and the acid liquid cleaning stage, after their respective air cleaning steps, further comprise: continuing repeating the liquid injection and immersion step and the air cleaning step until the respective predetermined number of repetitions is completed, wherein the cleaning liquid injected in the liquid injection and immersion step following the air cleaning step displaces the air-washed cleaning liquid in the filter assembly from the filter assembly to outside the washing machine.

[0016] Optionally, the alkaline liquid cleaning stage and the acid liquid cleaning step further comprises, prior to their respective first liquid injection and immersion steps, a cleaning liquid preparation step of injecting water into the washing tub, the water flow carrying the cleaning agent which has been placed in the dispenser box of the washing machine into the washing tub, mixing the water and the cleaning agent into the cleaning liquid in the washing tub, and heating the cleaning liquid in the washing tub to the respective initially predetermined temperature; wherein the dispenser box comprises a first compartment and a second compartment in which an alkaline cleaning agent and an acid cleaning agent are respectively provided, and in the cleaning liquid preparation step of the alkaline liquid cleaning stage and the acid liquid cleaning stage, and the water flows through the first compartment and the second compartment, respectively, into the washing tub. The alkaline liquid cleaning stage and the acid liquid cleaning stage, after the respective predetermined number of repetitions of their respective liquid injection and immersion steps and air cleaning steps are carried out, further comprise a flushing step of pumping a predetermined amount of clear water from the washing tub of the washing machine into the filter assembly to flush same, and then discharging the water to the outside of the washing machine.

[0017] According to the present invention, during cleaning of the filter assembly of the washing machine, the self-cleaning process of the washing machine prohibits receipt of or ignores user operation instructions other than user operation instructions for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process, so that the filter assembly of the washing machine is thoroughly cleaned, prolonging the service life of the filter assembly in the washing machine and ensuring that the filter assembly always has a high filtration flux.

[0018] In addition, the present invention has carried out a special cleaning of the filter assembly to further prolong the service life of the filter assembly in the washing machine of the present invention and to ensure that the filter assembly has a high filtration flux.

[0019] The foregoing and other objects, advantages and features of the present invention will become more apparent to those skilled in the art from the following detailed description of specific embodiments of the invention taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

[0020] Some specific embodiments of the present invention will be described in detail by way of example only rather than by way of limitation with reference to the accompanying drawings. The same reference numerals in the accompanying drawings denote the same or similar components or parts. It should be understood by those skilled in the art that these drawings are not necessarily to scale. In the accompanying drawings:

Fig. 1 is a schematic diagram of a washing machine according to an embodiment of the present invention;

Fig. 2 is a schematic flow chart of a self-cleaning method for a filter assembly of the washing machine according to the embodiment of the present invention;

Fig. 3 is a schematic flow chart of a self-cleaning method for a filter assembly of a washing machine according to another embodiment of the present invention;

Fig. 4 is a schematic flow chart of a self-cleaning process for the washing machine according to the embodiment of the present invention;

Fig. 5 is a schematic flow chart of each cleaning stage in the self-cleaning process for the washing machine according to the embodiment of the present invention;

Fig. 6 is a schematic flow chart of an alkaline liquid cleaning stage in the self-cleaning process for the washing machine according to the embodiment of the present invention; and

Fig. 7 is a schematic flow chart of an acid liquid cleaning stage in the self-cleaning process for the washing machine according to the embodiment of the present invention.

Detailed Description of the Invention

[0021] Fig. 1 is a schematic diagram of a washing machine according to an embodiment of the present invention. The washing machine may comprise a washing tub 12, a drainage pump 22, and a filter assembly. The filter assembly comprises a front filter 24 and an ultrafiltration membrane assembly 26. The washing tub 12 is usually composed of an outer tub and an inner tub which is rotatable within the outer tub. An upper part of the washing tub 12 is provided with a fresh water inlet which is connected to a water supply port through a pipeline 11, and when a valve 13 on the pipeline 11 is opened, fresh washing water or fresh rinsing water may enter the washing tub 12. A lower part of the washing tub 12 is provided with a drainage port, and the drainage port is in communication with the filter assembly via a drainage pump 22 through a pipeline. A water output port of the ultrafiltration membrane assembly 26 is in communication with the washing tub 12 through a water intake pipeline 14.

[0022] In the case of using the clean-water washing function of the washing machine, i.e. using the clean-water washing process for washing clothing in the washing machine, the water in the washing tub 12 is pumped out and conveyed into the filter assembly for filtration, and the filtered water passes through the water output port of the ultrafiltration membrane assembly 26 and the water intake pipeline 14, and is returned to the washing tub 12 for reuse. For example, in the clean-water washing process of the washing machine, when the clothing is rinsed, the water in the washing tub 12 may flow into the filter assembly, and then flows back into the washing tub 12 after filtration in the filter assembly; and in the clean-water washing process of the washing machine, when the clothing is washed or dewatered, the water in the washing tub is discharged directly from the washing machine.

[0023] The washing machine of the embodiment of the present invention may further comprise an air pump 32, and an air outlet of the air pump 32 is in communication with an air inlet of the filter assembly through an airflow pipeline. A check valve 34 is provided on the airflow pipeline. When air cleaning is required for the filter assembly, the air pump 32 and the check valve 34 are opened, and the air pump 32 provides an airflow to the filter assembly for air cleaning, so as to loose and remove impurities remained or adhered in the filter assembly with the airflow. A dense drainage port of the rough filter 24 and a sewage draining port of the ultrafiltration membrane assembly 26 may be respectively in communication with two inlets of a three-way valve 36, and an outlet of the three-way valve 36 is in communication with an efflux pipeline 18 of the washing machine, such that the fluid having performed the air cleaning or water washing on the rough filter 24 and/or the ultrafiltration membrane assembly 26 is directly discharged from the washing machine. The washing water of the washing machine may pass through the drainage pump 22 and the rough filter 24, and the washing water which is not filtered by the rough filter flows out of the washing machine through the outlet of the three-way valve 36 and the efflux pipeline 18 of the washing machine.

[0024] In particular, the filter assembly of the embodiment of the present invention is capable of effectively reducing the clothing residues and lints, and can effectively remove particles, colloids, bacteria, micro-organisms and macromolecule organic matter from the rinsing water, in order to purify the washing water or the rinsing water for recycling, so as to achieve the purpose of water saving. However, with the increase in the number of times of washing in the washing machine, separated substances and some other impurities are gradually accumulated on the surface of the filter assembly, resulting in the blockage and pollution problems of the filter assembly, so that the filtering effect thereof will be affected to some extent. In view of the above problems with the filter assembly in the washing machine, by appropriately cleaning the filter assembly of the washing machine thoroughly, it is possible to significantly improve the filtration effect of the filter assembly, especially the ultrafiltration membrane assembly, to prolong the service life of the filter assembly, especially the ultrafiltration membrane assembly, and to ensure that the filter assembly, especially the ultrafiltration membrane assembly, is reliably operated in its service life.

[0025] The self-cleaning method for the filter assembly of the washing machine of the embodiment of the present invention enables thorough cleaning of the filter assembly. Specifically, the self-cleaning method for a filter assembly of a washing machine may comprise:

> Step A: receiving a user operation instruction for starting a self-cleaning process.
> Step B: executing the self-cleaning process, so as to clean the filter assembly of the washing machine.

[0026] In some embodiments of the present invention, reference is made to Fig. 2, the step B further comprises: before the self-cleaning process is completed, only receiving a user operation instruction for turning off the washing machine, and prohibiting receipt of user operation instructions other than the user operation instruction for turning off the washing machine or ignoring the received user operation instructions other than the user operation instruction for turning off the washing machine.

[0027] In some embodiments of the present invention, reference is made to Fig. 3, the step B further comprises: before the self-cleaning process is completed, only receiving a user operation instructions for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process, and prohibiting receipt of user operation instructions other than the user operation instruction for turning off the washing machine or ignoring the received user operation instructions other than the user operation instruction for turning off the washing machine, pausing the self-cleaning process and

unpausing the self-cleaning process.

[0028] In order to prevent the self-cleaning process of cleaning the filter assembly from being non-forcibly interrupted to thoroughly clean the filter assembly, and to prevent the user operation instructions other than the user operation instructions for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process from interfering the cleaning of the filter assembly, the washing machine can prohibit receipt of user operation instructions other than user operation instructions for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process during the execution of the self-cleaning process, for example, buttons for generating the user operation instructions other than the user operation instructions for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process are set to be in an invalid state, or a user operation interface of the washing machine only displays information relating to the self-cleaning process. In some embodiments, the washing machine may also receive a user operation instruction during the execution of the self-cleaning process. In the case that the user operation instruction is received, it is determined whether the received user operation instruction is the user operation instruction for turning off the washing machine, pausing the self-cleaning process or unpausing the self-cleaning process, if yes, turning off the washing machine, pausing the cleaning of the filter assembly or continuing the cleaning of the filter assembly is executed; and if not, the received user operation instruction is ignored.

[0029] In some embodiments of the present invention, since the self-cleaning process takes a relatively long time, in the case that the filter assembly is not very dirty, the user cleans the filter assembly, allowing the washing machine to be forcibly turned off to end this self-cleaning process. The user is also allowed to forcibly turn off the washing machine to end this self-cleaning process in some burst situations, such as the washing tub leakage, the user finding that the cleaning agent is forgot to put after the self-cleaning process runs for a period of time. During the execution of self-cleaning process of the washing machine, the ongoing self-cleaning process is also allowed to be paused, for example, during the execution of self-cleaning process of the washing machine, the user is eager to go out, in order to ensure absolute safety, the user pauses the self-cleaning process of the washing machine, and when the user re-enters the home and unpauses the self-cleaning process to continue executing the remaining steps thereof. The user is also allowed to pause the self-cleaning process in some burst situations, for example, when the water supply pipeline does not have water.

[0030] Fig. 3 is a schematic flow chart of a self-cleaning method for a filter assembly of a washing machine according to another embodiment of the present invention. Prior to the step A, the method further comprises step C: judging whether or not there is a need to clean the filter assembly according to a pre-set process, if yes, sending an alerting signal for cleaning the filter assembly to alert a user to put a cleaning agent into a dispenser box of the washing machine and start the self-cleaning process. Specifically, the alerting signal may be a visual and/or audible signal. The pre-set process may be configured to: determine that the filter assembly needs to be cleaned when the accumulated amount of output water of the filter assembly reaches a defined threshold, and to clear the accumulated amount of output water of the filter assembly when the cleaning of the filter assembly is completed.

[0031] In some alternative embodiments of the present invention, the pre-set process may be configured to: after the number of times of starting the washing machine has reached a predetermined threshold number of times of starting, and/or after the cumulative operation time of the filter assembly has reached a predetermined time threshold, and/or after the filtration performance index of the filter assembly is detected to drop to a predetermined performance index threshold, and/or after the number of times of clean-water washing that the washing machine has run has reached a predetermined threshold number of times of clean-water washing of the washing machine, it is determined that the filter assembly needs to be cleaned, wherein the number of times of starting the washing machine is counted from zero when the washing machine is running for the first time or after the filter assembly is cleaned, the cumulative operation time of the filter assembly is counted from zero when the washing machine is running for the first time or after the filter assembly is cleaned, and the number of times of clean-water washing that the washing machine has run is counted from zero when the washing machine is running for the first time or after the filter assembly is cleaned. In some embodiments, the filtration performance index may be the turbidity of the recycled water filtered by the filter assembly.

[0032] In still other embodiments of the present invention, the step B further comprises: during the execution of the self-cleaning process, memorizing each of the steps of the self-cleaning process that have been executed to continue execution of the remaining steps of the self-cleaning process in the case that the washing machine is powered off and then powered on again, so as to ensure thorough cleaning of the filter assembly.

[0033] In some embodiments, after the step B, the method further comprises step D: before the self-cleaning process is completed, and after the user operation instruction for turning off the washing machine is received and executed so that the washing machine is turned off, if user operation instruction for starting the washing machine, executing the starting of the washing machine; and after the washing machine is started, sending an alerting signal for cleaning the filter assembly, and prohibiting receipt of a user operation instruction for starting a clean-water washing process or ignoring the received user operation instruction for starting a clean-water washing process. As the filter assembly of the washing

machine is not thoroughly cleaned, in order to protect the filter assembly, the clean-water washing process of the washing machine is locked to prevent the use of the filter assembly, and the clean-water washing process of the washing machine is unlocked after the cleaning of the filter assembly is completed again. In the embodiment of the present invention, it may be considered that the user operation instruction for turning off the washing machine is received by means of receiving the pressing or touching of a power key on a panel of the washing machine, and generally, it can be understood that if the washing machine is forcibly turned off, the washing machine receives a user operation instruction for forcibly turning off the washing machine.

[0034] The clean-water washing process may comprise: a recycled water rinsing stage for rinsing clothing in a washing tub of the washing machine with rinsing water, in the recycled water rinsing step of the recycled water rinsing stage, the rinsing water in the washing tub flowing into the filter assembly and flowing back into the washing tub after filtration in the filter assembly. The clean-water washing process may also comprise: a washing stage executed prior to the recycled water rinsing stage and a dewatering stage executed after the recycled water rinsing stage. The washing stage may comprise: a washing water injection step of supplying water from the water intake pipe of the washing machine to provide the washing water for the washing stage; a washing step of washing the clothing in the washing tub with a detergent and the washing water; and a washing dewatering step of dewatering the clothing in the washing tub. The recycled water rinsing stage may comprise: a rinsing water injection step of supplying water from the water intake pipe to provide the rinsing water for the recycled water rinsing stage; a recycled water rinsing step; and a rinsing dewatering step for dewatering the clothing in the washing tub. The dewatering stage is used to spin-dry the clothing in the washing tub. The rotation speed of the washing tub during the dewatering of the clothing in the washing dewatering step and in the rinsing dewatering step is lower than the rotation speed of the washing tub during the dewatering in the dewatering stage, and the time of the dewatering of the clothing in the washing dewatering step and in the rinsing dewatering step is shorter than the time of dewatering in the dewatering stage, because the dewatering of the clothing in the washing dewatering step and in the rinsing dewatering step is only as much as possible to remove the water in the laundry, whereas the dewatering of the clothing in the dewatering stage is to be as much as possible to remove the water in the clothing to facilitate drying. In some alternative embodiments of the present invention, the recycled water rinsing stage has no rinsing dewatering step.

[0035] Fig. 4 is a schematic flow chart of a self-cleaning process for the washing machine according to the embodiment of the present invention. The self-cleaning process may comprise an alkaline liquid cleaning stage S10 and an acid liquid cleaning stage S20 executed successively. In the alkaline liquid cleaning stage S10, the filter assembly can be cleaned using an alkaline cleaning liquid. In the acid liquid cleaning stage S20, the filter assembly can be cleaned using an acid cleaning liquid.

[0036] The alkaline liquid cleaning stage S10 and the acid liquid cleaning stage S20 each comprises a respective liquid injection and immersion step in which the cleaning liquid is discharged from the washing tub of the washing machine and is injected into the filter assembly from a water inlet of the filter assembly until a filter membrane of the filter assembly is completely or partially immersed in the cleaning liquid, the injection of the cleaning liquid is stopped, and the injected cleaning liquid is placed in the filter assembly to immerse the filter membrane of the filter assembly. In some embodiments, the time for immersion of the filter assembly with the cleaning liquid in the liquid injection and immersion step may be from 3 to 7 mins, for example, 5 mins.

[0037] In some embodiments, the remaining cleaning liquid in the washing tub may be discharged to the outside of the washing machine through the filter assembly or bypass the filter assembly if there is no next step of cleaning the filter assembly after the liquid injection and immersion step.

[0038] Reference is made to Fig. 5, in some embodiments, the alkaline liquid cleaning stage S10 and the acid liquid cleaning stage S20, after their respective liquid injection and immersion steps S202, may further comprise an air cleaning step S204 of injecting an airflow into the filter assembly, and washing the filter assembly with the air. In some embodiments of the present invention, an air pump may be provided inside the washing machine to provide an airflow for air cleaning the filter assembly. In the air cleaning step S204, the time of air cleaning of the filter assembly with the airflow is from 1 - 3 mins, for example, 2 mins. The airflow with which the filter assembly is air cleaned can be discharged from the filter assembly to the outside of the washing machine.

[0039] In some embodiments, the alkaline liquid cleaning stage S10 and the acid liquid cleaning stage S20, after their respective air cleaning steps S204, may further comprise: continuing repeating the liquid injection and immersion step and the air cleaning step until the respective predetermined number of repetitions is completed. The cleaning liquid injected in the liquid injection and immersion step S202 following the air cleaning step S204 displaces the air-washed cleaning liquid in the filter assembly from the filter assembly to outside the washing machine.

[0040] In some embodiments, the alkaline liquid cleaning stage S10 may last longer than the acid liquid cleaning stage S20. In some embodiments, the alkaline-cleaning predetermined number of repetitions of the liquid injection and immersion steps and the air cleaning steps in the alkaline liquid cleaning stage S10 is greater than the acid-cleaning predetermined number of repetitions of the liquid injection and immersion steps and the air cleaning

steps in the acid liquid cleaning stage S20. Optionally, the alkaline-cleaning predetermined number of repetitions of the liquid injection and immersion steps and the air cleaning steps in the alkaline liquid cleaning stage S10 is 5-15, preferably 10; and the acid-cleaning predetermined number of repetitions of the liquid injection and immersion steps and the air cleaning steps in the acid liquid cleaning stage S20 is 2-10, preferably 5.

[0041] In some embodiments, the alkaline liquid cleaning stage S10 and the acid liquid cleaning step S20 further comprises, prior to their respective first liquid injection and immersion steps S202, a cleaning liquid preparation step of injecting water into the washing tub, the water flow carrying the cleaning agent which has been placed in the dispenser box of the washing machine into the washing tub, mixing the water and the cleaning agent into the cleaning liquid in the washing tub, and heating the cleaning liquid in the washing tub to the respective initially predetermined temperature. In the cleaning liquid preparation step of the alkaline liquid cleaning stage S10, the alkaline cleaning liquid may be heated in the washing tub to 50 to 60°C, for example 55°C; and in the cleaning liquid preparation step of the acid liquid cleaning stage S20, the acid cleaning liquid may be heated in the washing tub to 35 to 45°C, for example 40°C.

[0042] In some embodiments, the dispenser box may comprise a first compartment and a second compartment in which an alkaline cleaning agent and an acid cleaning agent are respectively provided, and in the cleaning liquid preparation step of the alkaline liquid cleaning stage S10 and the acid liquid cleaning stage S20, and the water flows through the first compartment and the second compartment, respectively, into the washing tub. The alkaline cleaning agent and the acid cleaning agent can be placed in the first compartment and the second compartment of the dispenser box of the washing machine respectively by the user, and then the first compartment of the dispenser box is filled with water through the water intake pipeline of the washing tub, the water flow carries the alkaline cleaning agent which has been put in the dispenser box into the washing tub, the water and the alkaline cleaning agent are mixed into the alkaline cleaning liquid in the washing tub, and the liquid injection and immersion step S202 and the air cleaning step S204 can be repeatedly executed after the alkaline cleaning liquid in the washing tub is heated to an initially predetermined alkaline liquid temperature by a heating device inside the washing machine. After the alkaline liquid cleaning stage S10 is ended, the second compartment of the dispenser box is filled with water through the water intake pipeline of the washing tub, the water flow carries the acid cleaning agent which has been put in the dispenser box into the washing tub, the water and the acid cleaning agent are mixed into the acid cleaning liquid in the washing tub, and the liquid injection and immersion step S202 and the air cleaning step S204 can be repeatedly executed after the acid cleaning liquid in the washing tub is heated to an initially predetermined acid liquid temperature by a heating device inside the washing machine.

[0043] In some embodiments, the injection amount of the alkaline cleaning liquid in each liquid injection and immersion step S202 of the alkaline liquid cleaning stage S10 is determined by means of liquid level control according to the amount of the alkaline cleaning liquid in the washing tub and the and the alkaline-cleaning predetermined number of repetitions of the liquid injection and immersion steps S202 and the air cleaning steps S204 in the alkaline liquid cleaning stage S10. For example, in the cleaning liquid preparation step of the alkaline liquid cleaning stage S10, there is a total of 10 L of alkaline cleaning liquid in the washing tub, and the alkaline-cleaning predetermined number of repetitions of the liquid injection and immersion steps S202 and the air cleaning steps S204 is 10, then by means of the liquid level control, one-tenth of the alkaline cleaning liquid is pumped from the washing tub to the filter assembly each time. Rather than pumping 1 L of the alkaline cleaning liquid by flow to the filter assembly. The amount of cleaning liquid pumped by means of the liquid level control in the liquid injection and immersion step S202 can ensure that there is enough cleaning liquid in each liquid injection and immersion step S202 within the alkaline-cleaning predetermined number of repetitions, to avoid the phenomenon that there is no cleaning liquid in the washing tub before reaching the alkaline-cleaning predetermined number of repetitions due to the error of pumping by flow.

[0044] Accordingly, in some embodiments, the injection amount of the acid cleaning liquid in each liquid injection and immersion step S202 of the acid liquid cleaning stage S20 is determined by means of liquid level control according to the amount of the acid cleaning liquid in the washing tub and the and the acid-cleaning predetermined number of repetitions of the liquid injection and immersion steps S202 and the air cleaning steps S204 in the acid liquid cleaning stage S20. For example, in the cleaning liquid preparation step of the acid liquid cleaning stage S20, there is a total of 5 L of acid cleaning liquid in the washing tub, and the acid-cleaning predetermined number of repetitions of the liquid injection and immersion steps S202 and the air cleaning steps S204 is 5, then one-fifth of the acid cleaning liquid is pumped from the washing tub to the filter assembly each time.

[0045] In some embodiments, since the alkaline liquid cleaning stage S10 lasts for a relatively long time, in order to ensure the temperature of the alkaline cleaning liquid to optimize the cleaning performance thereof, the cleaning liquid in the washing tub may be subjected to secondary heating in the alkaline liquid cleaning stage S10. That is, the alkaline liquid cleaning stage S10, before the number of repetitions of its liquid injection and immersion steps and air cleaning steps has reached the alkaline-cleaning predetermined number of repetitions, further comprises:

a cleaning liquid secondary heating step of heating the remaining cleaning liquid in the washing tub to

the same temperature as the initially predetermined alkaline liquid temperature in the cleaning liquid preparation step of the alkaline liquid cleaning stage S10, for example, 50 - 60°C.

[0046] After the cleaning liquid secondary heating step, the repetition of the liquid injection and immersion steps and the air cleaning steps is continued until the alkaline-cleaning predetermined number of repetitions is completed. For example, the number of repetitions of the liquid injection and immersion steps and the air cleaning steps of the alkaline liquid cleaning stage S10 is any number less than the aforementioned alkaline-cleaning predetermined number of repetitions, the cleaning liquid secondary heating step may be performed.

[0047] In a preferred embodiment, the cleaning liquid secondary heating step of the alkaline liquid cleaning stage S10 is performed when the number of repetitions of the liquid injection and immersion steps and the air cleaning steps thereof is half the alkaline-cleaning predetermined number of repetitions. For example, if the alkaline-cleaning predetermined number of repetitions of the liquid injection and immersion steps S202 and the air cleaning steps S204 of the alkaline liquid cleaning stage S10 is 10, when the liquid injection and immersion steps S202 and the air cleaning steps S204 thereof are repeated 5 times, the cleaning liquid secondary heating step is performed; and when the remaining washing liquid in the washing tub is heated to 50 - 60°C, the liquid injection and immersion steps S202 and the air cleaning steps S204 are continued to repeat 5 times, to complete the alkaline liquid cleaning Stage S10.

[0048] In other embodiments, the heating may also be continued with the heating device in the washing tub throughout the alkaline liquid cleaning stage S10 and/or the acid liquid cleaning stage S20 to make the alkaline cleaning liquid or the acid cleaning liquid in the washing tub always maintain at the initially predetermined alkaline liquid temperature or the initially predetermined acid liquid temperature.

[0049] Fig. 6 is a schematic flow chart of an alkaline liquid cleaning stage S10 in the self-cleaning process for the washing machine according to the embodiment of the present invention.

[0050] After the alkaline liquid cleaning stage S10 is started, a cleaning liquid preparation step S302 may be executed: injecting a first predetermined amount of water into the washing tub, the water flow carrying the alkaline cleaning agent which has been placed in the first compartment of the dispenser box of the washing machine into the washing tub, mixing the water and the alkaline cleaning agent into the alkaline cleaning liquid in the washing tub, and heating the alkaline cleaning liquid in the washing tub to the respective initially predetermined alkaline liquid temperature.

[0051] A liquid injection and immersion step S304 lies in that the alkaline cleaning liquid is pumped out of the washing tub of the washing machine and is injected into the filter assembly from the water inlet of the filter assembly until a filter membrane of the filter assembly is completely or partially immersed in the alkaline cleaning liquid, and then the injection of the alkaline cleaning liquid is stopped. The injected alkaline cleaning liquid is then placed in the filter assembly to immerse the filter membrane of the filter assembly.

[0052] An air cleaning step S306 lies in injecting an airflow into the filter assembly, and cleaning the filter assembly with the air.

[0053] A first determining step S308 lies in determining whether the number of repetitions of the liquid injection and immersion steps and the air cleaning steps has reached a pre-set first number of repetitions, where the first number of repetitions is less than the alkaline-cleaning predetermined number of repetitions of the alkaline liquid cleaning stage S10.

[0054] If yes, the cleaning liquid secondary heating step S310 is executed; and if not, the liquid injection and immersion steps S304 and the air cleaning steps S306 are repeated until the number of times the liquid injection and immersion steps and the air cleaning steps are executed reaches the first number of repetitions. In some embodiments, the alkaline-cleaning predetermined number of repetitions may be 10, and the first number of repetitions may be 4 - 6, preferably 5.

[0055] As will be appreciated by those skilled in the art, in this embodiment, since the air cleaning step S306 is performed after each execution of the liquid injection and immersion step S304, the number of times the air cleaning steps are executed is the same as the number of repetitions of the liquid injection and immersion steps and the air cleaning steps. In one embodiment, in the first determining step S308, it is possible to determine whether or not to reach the first number of repetitions based only on the number of times the air cleaning steps are executed.

[0056] The cleaning liquid secondary heating step S310 lies in heating the remaining cleaning liquid in the washing tub to 50 - 60°C.

[0057] A liquid injection and immersion step S312 lies in that the re-heated cleaning liquid is pumped out of the washing tub of the washing machine and is injected into the filter assembly from the water inlet of the filter assembly until the filter membrane of the filter assembly is completely or partially immersed in the cleaning liquid, and then the injection of the cleaning liquid is stopped. The injected cleaning liquid is then placed in the filter assembly to immerse the filter membrane of the filter assembly.

[0058] An air cleaning step S314 lies in injecting an airflow into the filter assembly, and cleaning the filter assembly with the air.

[0059] A second determining step S316 lies in determining whether the number of repetitions of the liquid injection and immersion steps and the air cleaning steps has reached the alkaline-cleaning predetermined number of repetitions of the alkaline liquid cleaning stage S10.

[0060] If not, the liquid injection and immersion steps S312 and the air cleaning steps S314 are repeated until the number of times the liquid injection and immersion steps and the air cleaning steps are executed reaches the alkaline-cleaning predetermined number of repetitions. In some embodiments, is also possible to zero and re-accumulate the number of times of the liquid injection and immersion steps and the air cleaning steps after the cleaning liquid secondary heating step S310, and in the second determining step S316, it is determined that whether the number of repetitions of the liquid injection and immersion steps and the air cleaning steps has reached a second number of repetitions of the alkaline liquid cleaning stage S10, where the sum of the first number of repetitions and the second number of repetitions is the alkaline-cleaning predetermined number of repetitions.

[0061] In some embodiments, the alkaline liquid cleaning stage, after the alkaline-washing predetermined number of repetitions of the liquid injection and immersion steps and air cleaning steps are carried out, further comprises a flushing step S318 of pumping a predetermined amount of clear water from the washing tub of the washing machine into the filter assembly to flush same, and then discharging the water to the outside of the washing machine. In a specific embodiment, after all the liquid injection and immersion steps and air cleaning steps of the alkaline liquid cleaning stage S10 are ended (in the last liquid injection and immersion step, the alkaline cleaning liquid in the washing tub has been completely pumped out or there is a small amount of residue), a second predetermined amount of water can be re-injected into the washing tub and the water is pumped into the washing tub through the first compartment of the dispenser box of the washing machine, and the predetermined amount of clean water is pumped into the filter assembly from the washing tub of the washing machine and is the discharged to the outside of the washing machine after flushing the filter assembly. In the flushing step S318, the flushing of the filter assembly may be executed a predetermined number of times to achieve the purpose of discharging remaining alkaline liquid in the washing tub, the filter assembly and the flow path therebetween. After the flushing step S318, the alkaline liquid cleaning stage S10 is ended, and proceeds to the acid liquid cleaning stage S20.

[0062] Fig. 7 is a schematic flow chart of an acid liquid cleaning stage S20 in the self-cleaning process for the washing machine according to the embodiment of the present invention.

[0063] After the acid liquid cleaning stage S20 is started, a cleaning liquid preparation step S402 may be executed: injecting a third predetermined amount of water into the washing tub, the water flow carrying the acid cleaning agent which has been placed in the dispenser box of the washing machine into the washing tub, mixing the water and the acid cleaning agent into the acid cleaning liquid in the washing tub, and heating the acid cleaning liquid in the washing tub to the respective initially predetermined acid liquid temperature.

[0064] A liquid injection and immersion step S404 lies in that the acid cleaning liquid is pumped out of the washing tub of the washing machine and is injected into the filter assembly from the water inlet of the filter assembly until a filter membrane of the filter assembly is completely or partially immersed in the acid cleaning liquid, and then the injection of the acid cleaning liquid is stopped. The injected acid cleaning liquid is then placed in the filter assembly to immerse the filter membrane of the filter assembly.

[0065] An air cleaning step S406 lies in injecting an airflow into the filter assembly, and cleaning the filter assembly with the air.

[0066] A determining step S408 lies in determining whether the number of repetitions of the liquid injection and immersion steps S402 and the air cleaning steps S404 has reached the acid-cleaning predetermined number of repetitions of the acid liquid cleaning stage S20.

[0067] If not, the liquid injection and immersion steps S402 and the air cleaning steps S404 are repeated until the number of times the liquid injection and immersion steps and the air cleaning steps are executed reaches the acid-cleaning predetermined number of repetitions.

[0068] In some embodiments, the acid liquid cleaning stage, after the acid-washing predetermined number of repetitions of the liquid injection and immersion steps and air cleaning steps are carried out, further comprises a flushing step S410 of pumping a predetermined amount of clear water from the washing tub of the washing machine into the filter assembly to flush same, and then discharging the water to the outside of the washing machine. In a specific embodiment, after all the liquid injection and immersion steps and air cleaning steps of the acid liquid cleaning stage S20 are ended (in the last liquid injection and immersion step, the acid cleaning liquid in the washing tub has been completely pumped out or there is a small amount of residue), a fourth predetermined amount of water can be re-injected into the washing tub and the water is pumped into the washing tub through the first or second compartment of the dispenser box of the washing machine, and the predetermined amount of clean water is pumped into the filter assembly from the washing tub of the washing machine and is the discharged to the outside of the washing machine after flushing the filter assembly. In the flushing step S410, the flushing of the filter assembly may be executed a predetermined number of times to achieve the purpose of discharging remaining acid liquid in the washing tub, the filter assembly and the flow path therebetween. After the flushing step S410, the acid liquid cleaning stage S20 is ended, and the cleaning of the filter assembly is completed.

[0069] By appropriately cleaning the filter assembly of the washing machine with the aforementioned self-cleaning method, it is possible to significantly improve the fil-

tration effect of the filter assembly, to prolong the service life of the filter assembly, and to ensure that the filter assembly is reliably operated in its service life.

[0070] At this point, those skilled in the art will recognize that, while numerous exemplary embodiments of the present invention have been shown and described in detail herein, many other variations or modifications that conform to the principles of the present invention may be determined or derived directly from the disclosure of the present invention without departing from the spirit and scope of the present invention. It therefore should be understood and determined that the scope of the present invention covers all such other modifications or modifications.

Claims

1. A self-cleaning method for a filter assembly of a washing machine, comprising:

   step A: receiving a user operation instruction for starting a self-cleaning process; and
   step B: executing the self-cleaning process, so as to clean the filter assembly of the washing machine.

2. The self-cleaning method according to claim 1, wherein the step B further comprises:

   before the self-cleaning process is completed, only receiving a user operation instruction for turning off the washing machine, and prohibiting receipt of user operation instructions other than the user operation instruction for turning off the washing machine, or ignoring the received user operation instructions other than the user operation instruction for turning off the washing machine.

3. The self-cleaning method according to claim 1, wherein the step B further comprises:

   before the self-cleaning process is completed, only receiving a user operation instructions for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process, and prohibiting receipt of user operation instructions other than the user operation instruction for turning off the washing machine, or ignoring the received user operation instructions other than the user operation instruction for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process.

4. The self-cleaning method according to claim 3, prior to the step A, further comprising step C:

   judging whether or not there is a need to clean the filter assembly according to a pre-set process, if yes, sending an alerting signal for cleaning the filter assembly to alert a user to put a cleaning agent into a dispenser box of the washing machine and start the self-cleaning process.

5. The self-cleaning method according to claim 4, wherein the pre-set process is configured to:

   determine that the filter assembly needs to be cleaned when the accumulated amount of output water of the filter assembly reaches a defined threshold, and to clear the accumulated amount of output water of the filter assembly when the cleaning of the filter assembly is completed.

6. The self-cleaning method according to claim 1 or 3, wherein the step B further comprises:

   during the execution of the self-cleaning process, memorizing each of the steps of the self-cleaning process that have been executed to continue execution of the remaining steps of the self-cleaning process in the case that the washing machine is powered off and then powered on again.

7. The self-cleaning method according to claim 2 or 3, after the step B, further comprising step D:

   before the self-cleaning process is completed, and after the user operation instruction for turning off the washing machine is received and executed so that the washing machine is turned off, if user operation instruction for starting the washing machine, executing the starting of the washing machine;
   and after the washing machine is started, sending an alerting signal for cleaning the filter assembly, and prohibiting receipt of a user operation instruction for starting a clean-water washing process or ignoring the received user operation instruction for starting a clean-water washing process.

8. The self-cleaning method according to claim 7, wherein the clean-water washing process comprises:

   a recycled water rinsing stage for rinsing clothing in a washing tub of the washing machine with rinsing water, in the recycled water rinsing step of the recycled water rinsing stage, the rinsing water in the washing tub flowing into the filter assembly and flowing back into the washing tub after filtration in the filter assembly.

9. The self-cleaning method according to claim 1, wherein the self-cleaning process comprises:

an alkaline liquid cleaning stage and an acid liquid cleaning stage executed successively, the alkaline liquid cleaning stage and the acid liquid cleaning stage each comprising a respective liquid injection and immersion step in which the cleaning liquid is discharged from the washing tub of the washing machine and is injected into the filter assembly from a water inlet of the filter assembly until a filter membrane of the filter assembly is completely or partially immersed in the cleaning liquid, the injection of the cleaning liquid is stopped, and the injected cleaning liquid is placed in the filter assembly to immerse the filter membrane of the filter assembly.

10. The self-cleaning method according to claim 9, wherein
the alkaline liquid cleaning stage and the acid liquid cleaning stage, after their respective liquid injection and immersion steps, further comprise:

an air cleaning step of injecting an airflow into the filter assembly, and cleaning the filter assembly with the air.

11. The self-cleaning method according to claim 10, wherein
the alkaline liquid cleaning stage and the acid liquid cleaning stage, after their respective air cleaning steps, further comprise:

continuing repeating the liquid injection and immersion step and the air cleaning step until the respective predetermined number of repetitions is completed;
wherein the cleaning liquid injected in the liquid injection and immersion step following the air cleaning step displaces the air-washed cleaning liquid in the filter assembly from the filter assembly to outside the washing machine.

12. The self-cleaning method according to claim 11, wherein
the alkaline liquid cleaning stage and the acid liquid cleaning step further comprises, prior to their respective first liquid injection and immersion steps, a cleaning liquid preparation step of injecting water into the washing tub, the water flow carrying the cleaning agent which has been placed in the dispenser box of the washing machine into the washing tub, mixing the water and the cleaning agent into the cleaning liquid in the washing tub, and heating the cleaning liquid in the washing tub to the respective initially predetermined temperature;
wherein the dispenser box comprises a first compartment and a second compartment in which an alkaline cleaning agent and an acid cleaning agent are respectively provided, and in the cleaning liquid preparation step of the alkaline liquid cleaning stage and the acid liquid cleaning stage, and the water flows through the first compartment and the second compartment, respectively, into the washing tub; and the alkaline liquid cleaning stage and the acid liquid cleaning stage, after the respective predetermined number of repetitions of their respective liquid injection and immersion steps and air cleaning steps are carried out, further comprise a flushing step of pumping a predetermined amount of clear water from the washing tub of the washing machine into the filter assembly to flush same, and then discharging the water to the outside of the washing machine.

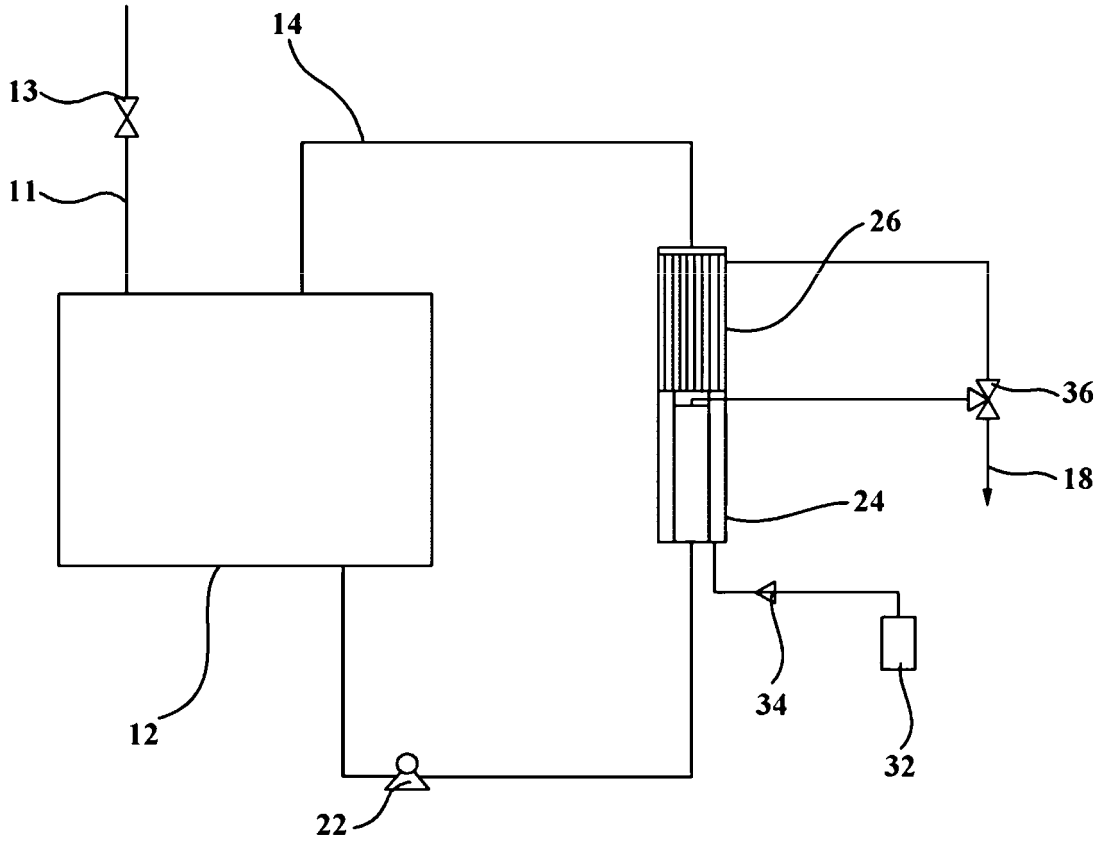
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Fig. 1

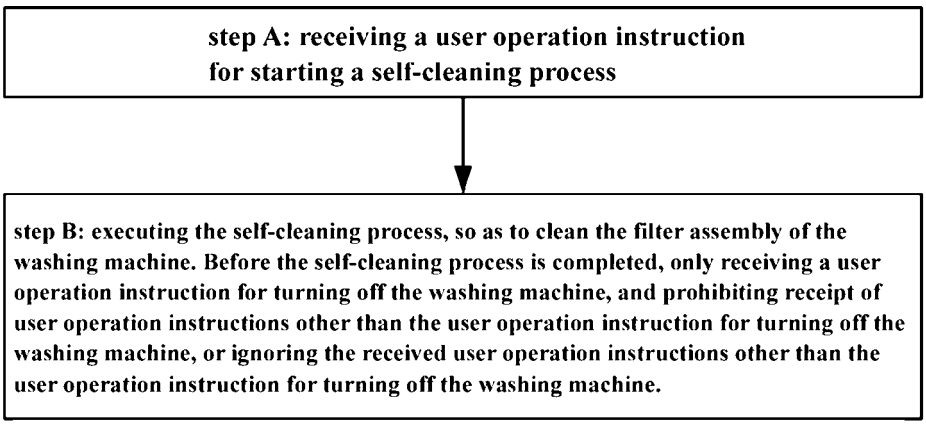
step A: receiving a user operation instruction for starting a self-cleaning process
step B: executing the self-cleaning process, so as to clean the filter assembly of the washing machine. Before the self-cleaning process is completed, only receiving a user operation instruction for turning off the washing machine, and prohibiting receipt of user operation instructions other than the user operation instruction for turning off the washing machine, or ignoring the received user operation instructions other than the user operation instruction for turning off the washing machine.

Fig. 2

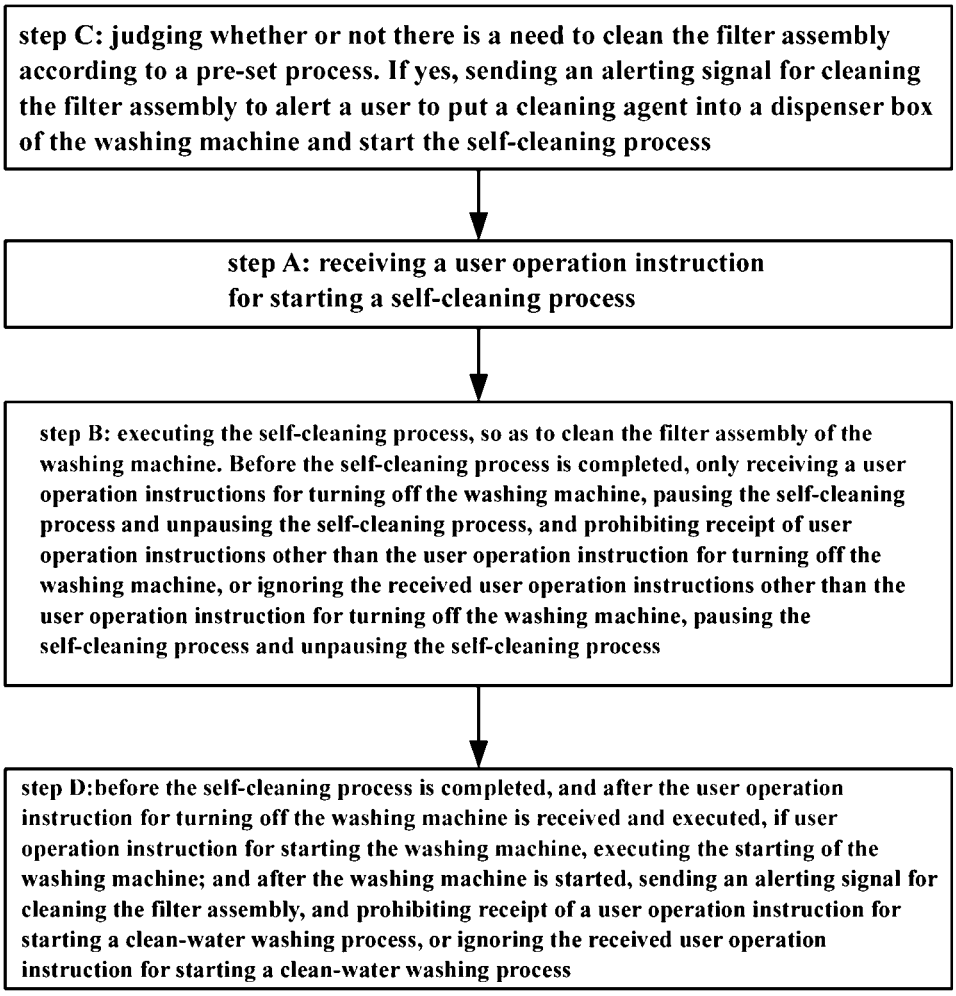
step C: judging whether or not there is a need to clean the filter assembly according to a pre-set process. If yes, sending an alerting signal for cleaning the filter assembly to alert a user to put a cleaning agent into a dispenser box of the washing machine and start the self-cleaning process
step A: receiving a user operation instruction for starting a self-cleaning process
step B: executing the self-cleaning process, so as to clean the filter assembly of the washing machine. Before the self-cleaning process is completed, only receiving a user operation instructions for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process, and prohibiting receipt of user operation instructions other than the user operation instruction for turning off the washing machine, or ignoring the received user operation instructions other than the user operation instruction for turning off the washing machine, pausing the self-cleaning process and unpausing the self-cleaning process
step D:before the self-cleaning process is completed, and after the user operation instruction for turning off the washing machine is received and executed, if user operation instruction for starting the washing machine, executing the starting of the washing machine; and after the washing machine is started, sending an alerting signal for cleaning the filter assembly, and prohibiting receipt of a user operation instruction for starting a clean-water washing process, or ignoring the received user operation instruction for starting a clean-water washing process

Fig. 3

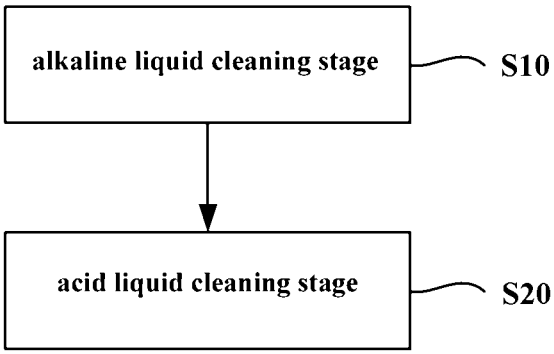
alkaline liquid cleaning stage
S10
acid liquid cleaning stage
S20

Fig. 4

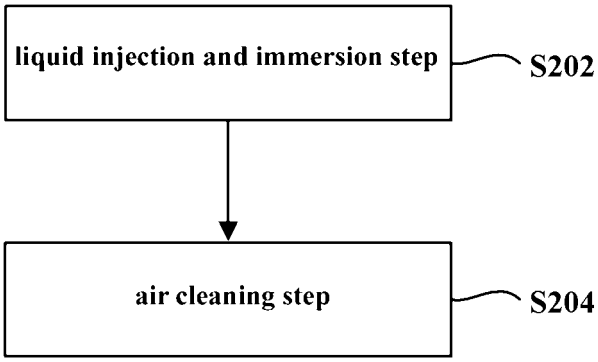
liquid injection and immersion step
S202
air cleaning step
S204

Fig. 5

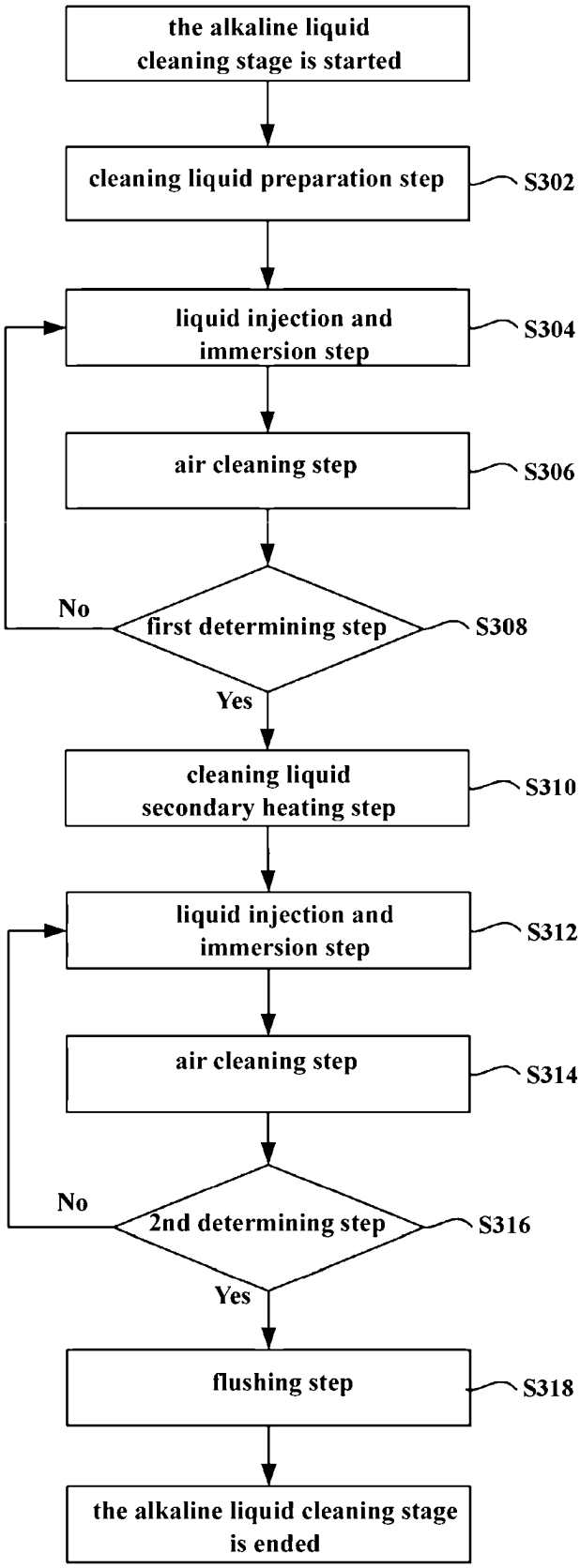
the alkaline liquid cleaning stage is started
cleaning liquid preparation step
S302
liquid injection and immersion step
S304
air cleaning step
S306
first determining step
S308
No
Yes
cleaning liquid secondary heating step
S310
liquid injection and immersion step
S312
air cleaning step
S314
2nd determining step
S316
No
Yes
flushing step
S318
the alkaline liquid cleaning stage is ended

Fig. 6

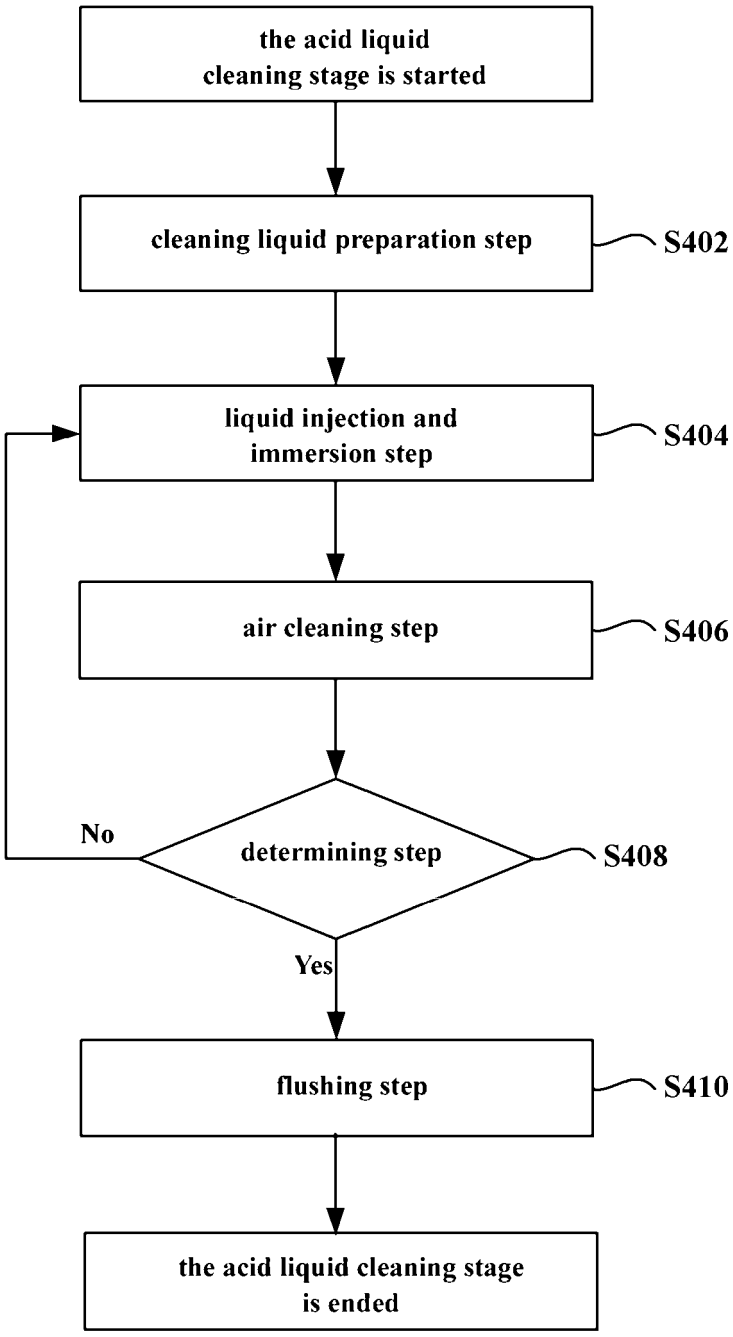
the acid liquid cleaning stage is started
cleaning liquid preparation step
S402
liquid injection and immersion step
S404
air cleaning step
S406
determining step
S408
No
Yes
flushing step
S410
the acid liquid cleaning stage is ended

Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2015/090057

A. CLASSIFICATION OF SUBJECT MATTER

D06F 39/10 (2006.01) i; D06F 33/02 (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)

D06F; A47L

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; VEN; CNKI: wash+, clean+, flush+, leach+, catch+, captur+, collect+, dictat+, instruction, order, command, operat+, user, button, start

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 103835095 A (HAIER GROUP TECH R & D CENT et al.) 04 June 2014 (04.06.2014) description, paragraphs [0022] to [0048]	1, 6, 9-12
Y	CN 102884245 A (LG ELECTRONICS INC.) 16 January 2013 (16.01.2013) description, paragraphs [0214] to [0219], figure 11	1, 6, 9-12
Y	CN 102133504 A (TENG, Guoxin) 27 July 2011 (27.07.2011) claim 1	9-12
PX	CN 104342875 A (HAIER GROUP TECH R & D CENT et al.) 11 February 2015 (11.02.2015) description, paragraphs [0023] to [0055]	1
A	CN 1255565 A (SAMSUNG ELECTRONICS CO LTD) 07 June 2000 (07.06.2000) the whole document	1-12
A	JP 2010088650 A (PANASONIC CORP.) 22 April 2010 (22.04.2010) the whole document	1-12

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

* Special categories of cited documents:

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"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)

"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

"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

"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

"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

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 December 2015	24 December 2015
Name and mailing address of the ISA 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 LIU, Jing Telephone No. (86-10) 62084545

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2015/090057

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Form PCT/ISA /210 (patent family annex) (July 2009)