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(54) **CLOTHES WASHING METHOD, CLOTHES PROCESSING DEVICE AND CONTROL APPERATUS THEREOF**

(57) Embodiments of the present application provide a clothes washing method, a clothes processing device and a control apparatus comprising a storage medium. The clothes washing method includes: detecting mass of a load put in a clothes processing device; determining whether the mass of the load is greater than a first threshold; if yes, executing a first heating washing mode; and if not, executing a second heating washing mode. Different heating washing modes are selected according to the mass of the load, to efficiently complete the washing process.

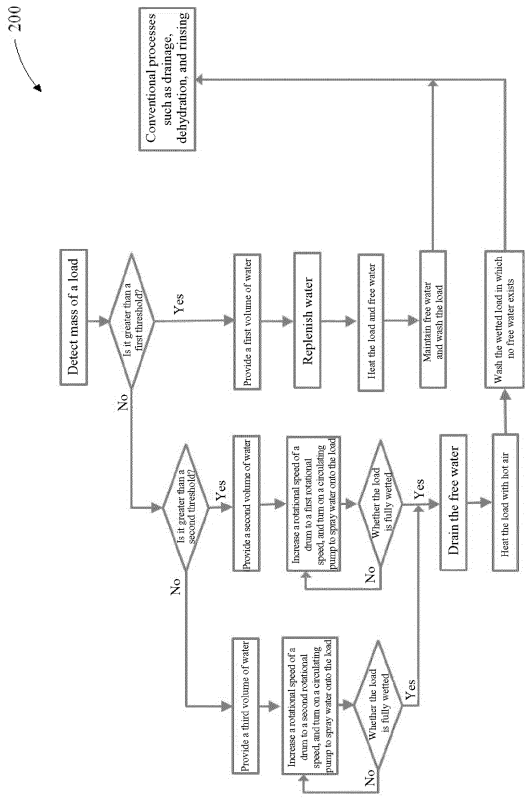

Fig. 2

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Description

[0001] The present invention relates to the field of electric appliances, and in particular, to a clothes washing method, a clothes processing device and a control apparatus.

[0002] The washing procedure of a clothes processing device generally adopts a conventional washing heating mode, in which a washing heating tube arranged between a drum and a tub is used for heating enough water to transfer heat to a load to achieve the purpose of heating the load.

[0003] However, such a single washing heating mode cannot be adapted to different application scenarios of the clothes processing device, and thus has lower efficiency in aspects such as heating energy consumption and washing time.

[0004] An objective of embodiments of the present invention is to provide an improved clothes washing method, a clothes processing device and a control apparatus comprising a storage medium.

[0005] The embodiments of the present invention provide a clothes washing method, including: detecting mass of a load put in a clothes processing device; and determining whether the mass of the load is greater than a first threshold; if yes, executing a first heating washing mode; and if not, executing a second heating washing mode.

[0006] Optionally, a ratio of the first threshold to a rated capacity of the clothes processing device is within a range of greater than or equal to 30% and less than or equal to 60%.

[0007] Optionally, the first threshold is within a range of greater than or equal to 3 kg and less than or equal to 6 kg.

[0008] Optionally, the clothes processing device includes a rotatable drum configured to accommodate the load and a tub sleeved outside the drum; the first heating washing mode is a mode in which the load and free water are heated by means of a washing heating tube in water in a state where the free water is provided in the tub and the load is in contact with the free water, and then washing is carried out; and the second heating washing mode is a mode in which the wetted load is heated with hot air in a state where no free water is provided in the tub, and then washing is carried out.

[0009] Optionally, the executing a first heating washing mode includes the following steps: providing a first volume of water to the clothes processing device, replenishing water until the load is completely wetted and free water in contact with the load is provided in the tub; heating the free water by means of the washing heating tube so as to heat the load; and maintaining a certain amount of the free water to wash the load.

[0010] Optionally, the executing a second heating washing mode includes the following steps: supplying water to the tub and the drum and fully wetting the load, and then draining the free water in the tub; heating the wetted load with the hot air; and then washing the load.

[0011] The embodiments of the present invention may further provide another clothes washing method step, including that the step of supplying water to the tub and the drum and fully wetting the load, especially used for wetting the load for the second heating washing mode, comprises: providing a certain volume of water to a clothes processing device; increasing a rotational speed of a drum to a set rotational speed; turning on a circulating pump to spray water onto a load in the clothes processing device to wet the load; determining whether the load is fully wetted, and if not, replenishing water and repeating the spraying step until the load is completely wetted. This method step of supplying water may be used either within the first heating mode or within the second heating mode but preferably, this method step of supplying water is used within the second heating mode which will be run if the second heating mode is determined (in case the mass of the load is less than or equal to the first threshold).

[0012] Further, the certain volume of water and/or the set rotational speed may also depend on the mass of load.

[0013] Optionally, the supplying water to the tub and the drum and fully wetting the load may further includes: the certain volume of water is set as a second volume of water and the set rotational speed is set as a first rotational speed to form a load ring, turning on a circulating pump to spray water onto the load ring to wet the load, determining whether the load is fully wetted, and if not, replenishing water and repeating the spraying and determining steps until the load is completely wetted. This method step of supplying water may also be called as a first sub-mode in the following.

[0014] Optionally, the first rotational speed is a minimum rotational speed that maintains the load in a centrifugal state.

[0015] Optionally, the first rotational speed is within a range of greater than or equal to 130 r/min and less than or equal to 600 r/min.

[0016] Optionally, the executing a second heating washing mode includes determining whether the mass of the load is less than or equal to a second threshold, and if yes, executing a sub-mode (also called as a second-sub-mode in the following), where the second threshold is less than the first threshold. If the mass of the load is greater than the second threshold, and preferably less than or equal to the first threshold, the above mentioned first sub-mode will be executed.

[0017] Optionally, a ratio of the second threshold to a rated capacity of the clothes processing device is within a range of greater than or equal to 10% and less than or equal to 30%.

[0018] Optionally, the second threshold is within a range of greater than or equal to 1 kg and less than or equal to 3 kg.

[0019] Optionally, the executing the sub-mode (second sub-mode) includes: providing a third volume of wa-

ter to the clothes processing device; increasing the rotational speed of the drum to a second rotational speed that is less than a centrifugal rotational speed; turning on the circulating pump to spray water onto the load to wet the load; determining whether the load is fully wetted; if not, replenishing water and repeating the spraying and determining steps until the load is completely wetted; turning on a draining pump to drain free water; opening the air heating tube to heat air; turning on the fan to make the heated air flow to form hot air, and make the hot air pass through and heat the load; and washing the load.

[0020] Optionally, the second rotational speed is within a range of less than or equal to 50 r/min.

[0021] Optionally, the draining the free water in the tub comprises turning on a draining pump to drain free water.

[0022] Optionally, the heating the wetted load with the hot air includes opening an air heating tube to heat air, and turning on a fan to make the heated air flow to form hot air, and make the hot air pass through and heat the load.

[0023] The embodiments of the present invention further provide a readable storage medium, which is in particular a non-volatile storage medium or a non-transient storage medium, having at least one program instruction stored thereon, where steps of the clothes washing method are executed when running the program instruction.

[0024] The embodiments of the present invention further provide a clothes processing device, including a drum configured to accommodate a load and a tub sleeved outside the drum and in fluid communication with the drum, and further including: a washing heating tube, located at the bottom of the tub and adapted to heat free water in the tub; a circulating pump, adapted to circularly spray water from the bottom of the tub onto the load; an air heating tube, adapted to heat air; a fan, adapted to make the heated air flow to form hot air, and make the hot air pass through and heat the load; and the control apparatus, including the readable storage medium and a processor, where the at least one program instruction stored in the readable storage medium is executable on the processor, and steps of the clothes washing method are executed when the processor runs the program instruction.

[0025] Optionally, the clothes processing device is a drum washing machine.

[0026] The embodiments of the present invention may further provide other clothes washing method steps, as far not mentioned above, whereby the other method steps may be combined with any of the before mentioned method options.

[0027] Optionally, the other method steps include: providing a certain volume of water to a clothes processing device; increasing a rotational speed of a drum to a set rotational speed; turning on a circulating pump to spray water onto a load in the clothes processing device to wet the load; determining whether the load is fully wetted, and if not, replenishing water and repeating the spraying step until the load is completely wetted; turning on a draining pump to drain free water; opening an air heating tube to heat air; turning on a fan to make the heated air flow to form hot air, and make the hot air pass through and heat the load; and washing the load.

[0028] Optionally, the other method steps include: detecting mass of a load before providing a certain volume of water to a clothes processing device; and determining whether the mass of the load is greater than a threshold, if yes, executing a first sub-mode, and if not, executing a second sub-mode.

[0029] Optionally, a ratio of the threshold to a rated capacity of the clothes processing device is within a range of greater than or equal to 10% and less than or equal to 30%.

[0030] Optionally, the threshold is within a range of greater than or equal to 1 kg and less than or equal to 3 kg.

[0031] Optionally, the executing the first sub-mode includes: providing the second volume of water to the clothes processing device; increasing the rotational speed of the drum to a first rotational speed to form a load ring; turning on the circulating pump to spray water onto the load ring to wet the load; determining whether the load is fully wetted; if not, replenishing water and repeating the spraying and determining steps until the load is completely wetted; turning on the draining pump to drain free water; opening the air heating tube to heat air; turning on the fan to make the heated air flow to form hot air, and make the hot air pass through and heat the load; and washing the load.

[0032] Optionally, the first rotational speed is a minimum rotational speed that enables the load to reach and maintain in a centrifugal state.

[0033] Optionally, the first rotational speed is within a range of greater than or equal to 130 r/min and less than or equal to 600 r/min.

[0034] Optionally, the executing the second sub-mode includes: providing the third volume of water to the clothes processing device; increasing the rotational speed of the drum to a second rotational speed that is less than a centrifugal rotational speed; turning on the circulating pump to spray water onto the load to wet the load; determining whether the load is fully wetted; if not, replenishing water and repeating the spraying and determining steps until the load is completely wetted; turning on the draining pump to drain free water; opening the air heating tube to heat air; turning on the fan to make the heated air flow to form hot air, and make the hot air pass through and heat the load; and washing the load.

[0035] Optionally, the second rotational speed is within a range of less than or equal to 50 r/min.

[0036] The embodiments of the present invention further provide another readable storage medium, which is in particular a non-volatile storage medium or a non-transient storage medium, having at least one program instruction stored thereon, where steps of the other clothes washing method steps are executed when running the program instruction.

[0037] The embodiments of the present invention fur-

ther provide another clothes processing device, including a drum configured to accommodate a load and a tub sleeved outside the drum and in fluid communication with the drum, and further including: a circulating pump, adapted to circularly spray water from the bottom of the tub onto the load; an air heating tube, adapted to heat air; a fan, adapted to make the heated air flow to form hot air, and make the hot air pass through and heat the load; and the control apparatus, including readable storage medium and a processor, where the at least one program instruction stored in the readable storage medium running on the processor, and steps of the other clothes washing method steps are executed when the processor runs the computer instruction.

[0038] Optionally, the other clothes processing device is a drum washing machine.

[0039] Compared with the prior art, the technical solutions of the embodiments of the present invention have the following beneficial effects. For example, different heating washing modes are selected according to the mass of the load, which may complete the washing process efficiently. Moreover, by using a steam thermal washing mode, the wet and hot load may be fully contacted and beaten with the drum of the clothes processing device, thereby efficiently completing the heating washing process.

FIG. 1 is an overall flowchart of a clothes washing method according to an embodiment of the present invention, where a first heating washing mode or a second heating washing mode is selectively executed in the method;

FIG. 2 is a detailed flowchart of a clothes washing method according to an embodiment of the present invention, where the second heating washing mode includes a sub-mode;

FIG. 3 is a schematic diagram of a clothes processing device according to an embodiment of the present invention;

FIG. 4 is a flowchart of a clothes washing method using a steam thermal washing mode according to an embodiment of the present invention; and

FIG. 5 is a schematic diagram of another clothes processing device according to an embodiment of the present invention.

[0040] To make the objectives, features, and beneficial effects of the embodiments of the present invention more comprehensible, the specific embodiments of the present invention are described in detail with reference to the accompanying drawings.

[0041] FIG. 1 is an overall flowchart of a clothes washing method 100 according to an embodiment of the present invention, and FIG. 2 is a detailed flowchart 200 of a clothes washing method according to an embodiment of the present invention, where a second heating washing mode includes a sub-mode.

[0042] The method 100 includes: detecting mass of a load put in a clothes processing device (S110); determining whether the mass of the load is greater than a first threshold (S120); if yes, executing a first heating washing mode (S130); and if not, executing a second heating washing mode (S140). The clothes processing device may include a rotatable drum configured to accommodate the load and a tub sleeved outside the drum.

[0043] In execution of step S110, mass of a load put in a clothes processing device is detected. Detecting the mass of the load is a conventional measure in the art. For example, the mass of the load is calculated by detecting a signal of a motor (e.g., a signal of electric energy consumed to drive the load).

[0044] In execution of step S120, whether the mass of the load is greater than a first threshold is determined. In one embodiment, the first threshold is within a range of greater than or equal to 3 kg and less than or equal to 6 kg. In another embodiment, a ratio of the first threshold to a rated capacity of the clothes processing device is within a range of greater than or equal to 30% and less than or equal to 60%, where the rated capacity is a maximum mass of dry clothes that may be washed by the clothes processing device.

[0045] In execution of step S130, a first heating washing mode is executed. The first heating washing mode may be a conventional heating washing mode, that is, a load and free water are heated by means of a washing heating tube in water in a state where free water is provided in a tub and the load is in contact with the free water, and then washing is carried out. The free water is water freely flowing in the drum or the tub of the clothes processing device.

[0046] In execution of step S140, a second heating washing mode is executed. The second heating washing mode may be a steam thermal washing mode, that is, the wetted load is heated with hot air in a state where no free water is provided in the tub, and then washing is carried out.

[0047] In the technical solutions of the embodiments of the present invention, the first heating washing mode or the second heating washing mode can be selectively executed according to comparison between the detected mass of the load and the first threshold, where the first heating washing mode may be a conventional washing heating mode, and the second heating washing mode may be a steam thermal washing mode. For example, it is automatically switched to the steam thermal heating mode of higher heating efficiency when the detected mass of the load is less than or equal to the first threshold, that is, the hot air only heats the fully wetted load, without heating excess free water, and a state without free water in the subsequent washing process is maintained, so that the wet and hot load is fully contacted and beaten with the drum, thereby completing the heating washing proc-

ess more efficiency. In a case where the detected mass of the load is greater than the first threshold, the conventional washing heating mode is still used, thereby ensuring the washing effect. These two heating washing modes are automatically switched according to the mass of the load, so that a more efficient mode is always adopted for washing, which not only improves the washing performance, but also saves energy consumption and time.

[0048] The conventional washing heating mode has a simple mechanical structure design, mature technology and a simple control program, and it is a washing mode commonly used in almost all drum washing machines. However, when a small amount of load (for example, a load whose washing mass is less than or equal to the first threshold) needs to be washed, if the conventional washing heating mode is used, in a case where the temperature is heated to a high temperature (for example, 80°C or more), the energy consumption for heating is higher and the washing time is longer; and if the steam thermal washing mode described in the embodiment of the present invention is adopted, the higher the temperature (for example, 80°C or more) is, the more energy consumption saved is, and the washing time may be saved.

[0049] For a washing scene of 3 kg of standard cotton load and an ultra-high temperature of 90°C, it is found through experiment that compared with the conventional heating washing mode, the steam thermal washing mode improves the washing performance (clean ratio) by 5%, in addition to saving 30% of washing energy consumption and 12% of washing time.

[0050] For each mass of load, the same existing design such as drainage, dehydration, and rinsing may be adopted after the washing process, and a drying stage may be included as well.

[0051] The executing the first heating washing mode S130 may include providing a first volume of water to the clothes processing device. The first volume of water may be obtained on the basis of the mass of the load, for example, 7 L, for rinsing washing powder or laundry detergent.

[0052] The executing the first heating washing mode S130 may include replenishing water. For example, water is replenished by means of the conventional pressure value or water level control method until the load is completely wetted, and free water in contact with the load is provided in the tub. The conventional pressure value control method controls a pressure value within a range, for example, of 300-900 Pa (Pascal). The water level control method is a method adopted in most of the conventional washing procedures at present, that is, the pressure value in a drum is fixed (for example, maintained at 300 Pa), and the water level (e.g., 10 cm) in the drum is always unchanged. After the water level drops due to water absorption of the load, a water inlet valve automatically opens to replenish water, so that the water level does not drop, which ensures that there is always water available for the load to absorb; the water level does not drop when the load is completely wetted and no longer absorbs water after a certain period of time, and the water inlet valve does not open to replenish water.

[0053] The executing the first heating washing mode S130 may include: maintaining a certain amount of the free water, and heating the free water by means of the washing heating tube to heat the load.

[0054] The executing the first heating washing mode S130 may further include washing the load. In the washing process, a certain amount of free water is always maintained by means of water level control.

[0055] The executing a second heating washing mode S140 may include supplying water to the tub and the drum and fully wetting the load. For example, a second volume of water is provided to the clothes processing device. The second volume of water may be obtained based on the mass of the load, for example, 4-5 L, for rinsing washing powder or laundry detergent.

[0056] The executing the second heating washing mode S140 may include increasing a rotational speed of the drum to a first rotational speed to form a load ring, and turning on a circulating pump to spray water onto the load ring to wet the load. The first rotational speed is a minimum rotational speed that maintains the load in a centrifugal state, where the first rotational speed should not be too high, so that as little water as possible in the load is thrown out, that is, as much water as possible is maintained in the load. In one embodiment, the first rotational speed is within a range of greater than or equal to 130 r/min and less than or equal to 600 r/min. The formation of the load ring enables the load that is located in a load pile and close to a rear wall of the drum to be fully wetted.

[0057] The executing the second heating washing mode S140 may include determining whether the load is fully wetted, and if not, replenishing water and repeating the spraying and determining steps until the load is completely wetted. For example, water replenishing is controlled in a mode of determining whether the load is fully wetted by detecting a pressure value, until the load is completely wetted.

[0058] The executing the second heating washing mode S140 may include draining the free water in the tub after the load is completely wetted.

[0059] The executing the second heating washing mode S140 may include heating the wetted load with hot air. In one embodiment, an air heating tube is opened to heat air, a fan is turned on to make the heated air flow to form hot air, and make the hot air pass through and heat the load. The air heating tube may be located in a drying channel of the clothes processing device.

[0060] The executing a second heating washing mode S140 may further include washing the load. In the washing process, water replenishing is stopped, and the wetted load is always washed.

[0061] In some embodiment, the executing a second heating washing mode S140 includes determining

whether the mass of the load is less than or equal to a second threshold, and if yes, executing a sub-mode, where the second threshold is less than the first threshold. In one embodiment, the second threshold is within a range of greater than or equal to 1 kg and less than or equal to 3 kg. In another embodiment, a ratio of the second threshold to a rated capacity of the clothes processing device is within a range of greater than or equal to 10% and less than or equal to 30%, where the rated capacity is a maximum mass of dry clothes that can be washed by the clothes processing device.

[0062] The executing the sub-mode, in particular the second sub-mode, may include providing a third volume of water to the clothes processing device. The third volume of water may be obtained on the basis of the mass of load, for example 4 L, for rinsing washing powder or laundry detergent.

[0063] The executing the sub-mode, in particular the second sub-mode, may include increasing the rotational speed of the drum to a second rotational speed that is less than a centrifugal rotational speed, and turning on the circulating pump to spray water onto the load to wet the load. The rotational speed is a minimum rotational speed that maintains the load in a centrifugal state. In one embodiment, the second rotational speed is within a range of less than or equal to 50 r/min.

[0064] The executing the sub-mode, in particular the first and/or second sub-mode, may include determining whether the load is fully wetted, and if not, replenishing water and repeating the spraying and determining steps until the load is completely wetted. For example, water replenishing is controlled in a mode of determining whether the load is fully wetted by detecting a pressure value, until the load is completely wetted.

[0065] The executing the sub-mode, in particular the first and/or second sub-mode, may include turning on a draining pump to drain free water in the tub after the load is completely wetted. The free water is water freely flowing in the drum or the tub of the clothes processing device.

[0066] The executing the sub-mode, in particular the first and/or second sub-mode, may further include opening the air heating tube to heat air; turning on the fan to make the heated air flow to form hot air, and make the hot air pass through and heat the load; and washing the load.

[0067] The second threshold is further provided on the basis of the first threshold, so that the sub-mode, in particular the second sub-mode, is executed when the mass of the load is less than the second threshold, thereby saving energy consumption and time more efficiently.

[0068] The embodiments of the present invention further disclose a readable storage medium or a control apparatus comprising the readable storage medium, which is a non-volatile storage medium or a non-transient storage medium, having a program instruction stored thereon, where steps of the method as shown in FIG. 1 and FIG. 2 are executed when running the program instruction.

[0069] The embodiments of the present invention further disclose a clothes processing device 300, as shown in FIG. 3, including, in a housing 301, a drum 303 configured to accommodate a load 302 and a tub 304 sleeved outside the drum 303 and in fluid communication with the drum 303; a washing heating tube 305 located at the bottom of the tub 304 and adapted to heat free water in the tub 304; a circulating pump 306 adapted to circularly spray water (for example, by means of a water circulating channel 307) from the bottom of the tub 304 onto the load 302; an air heating tube 308 located in a drying channel 309 and adapted to heat air; and a fan 310 adapted to make the heated air flow to form hot air and make the hot air pass through and heat the load 302.

[0070] The clothes processing device 300 further includes a control apparatus 311, including the readable storage medium and a processor, where the readable storage medium stores a program instruction running on the processor, and steps of the method as shown in FIG. 1 and FIG. 2 are executed when the processor runs the program instruction.

[0071] The clothes processing device 300 may further include a pressure sensor 312, a material box 313, and a draining pump 316. The pressure sensor 312 is provided at the bottom of the tub 304 for detecting pressure of the free water. The material box 313 is adapted to provide washing powder or laundry detergent. A water supply tube 314 supplies water to the material box 313. A water inlet valve 315 is provided on the water supply tube 314. The draining pump 316 is connected to a draining channel 317 for draining the free water.

[0072] In some embodiments, the clothes processing device 300 may be a drum washing machine.

[0073] FIG. 4 is a flowchart of a clothes washing method 400 using a steam thermal washing mode according to an embodiment of the present invention.

[0074] The method 400 includes: providing a certain volume of water to a clothes processing device (S410); increasing a rotational speed of a drum to a set rotational speed (S420); turning on a circulating pump to spray water onto a load in the clothes processing device to wet the load (S430); determining whether the load is fully wetted (S440); if not, replenishing water and repeating step S430 until the load is completely wetted; if yes, turning on a draining pump to drain free water (S450); opening an air heating tube to heat air (S460); turning on a fan to make the heated air flow to form hot air, and make the hot air pass through and heat the load (S470); and washing the load (S480).

[0075] The technical solution of the embodiment of the present invention may be based on a steam thermal washing mode. When clothes are washed in this mode, the hot air only heats the fully wetted load, without heating excess free water, and a state without free water in the subsequent washing process is maintained, so that the wet and hot load is fully contacted and beaten with the drum, thereby completing the heating washing process more efficiency. Moreover, when the steam thermal

washing mode described in the embodiment of the present invention is adopted, the higher the temperature (for example, 80°C or more) is, the more energy consumption saved is, and the washing time may be saved.

[0076] The mass of the load is detected before providing a certain volume of water to a clothes processing device S410, and whether the mass of the load is greater than a threshold, in particular is greater than the second threshold, is determined, if yes, a first sub-mode is executed, and if not, a second sub-mode is executed. In one embodiment, the threshold is within a range of greater than or equal to 1 kg and less than or equal to 3 kg. In another embodiment, a ratio of the threshold to a rated capacity of the clothes processing device is within a range of greater than or equal to 10% and less than or equal to 30%, where the rated capacity is a maximum mass of dry clothes that can be washed by the clothes processing device. Detecting the mass of the load is a conventional measure in the art. For example, the mass of the load is calculated by detecting a signal of a motor (e.g., a signal of electric energy consumed to drive the load).

[0077] The technical solution of the embodiment of the present invention selectively executes the first sub-mode or the second sub-mode according to the comparison of the detected mass of the load and the threshold, so as to save energy consumption and time more efficiently.

[0078] For each mass of load, the same existing design such as drainage, dehydration, and rinsing may be adopted after the washing process, and a drying stage may be included as well.

[0079] The executing the first sub-mode may include providing a second volume of water to the clothes processing device. The second volume of water may be obtained on the basis of the mass of the load, for example, 5 L, for rinsing washing powder or laundry detergent.

[0080] The executing the first sub-mode may include increasing a rotational speed of the drum to a first rotational speed to form a load ring, and turning on a circulating pump to spray water onto the load ring to wet the load. The first rotational speed is a minimum rotational speed that enables the load to reach and maintain in a centrifugal state to form a load ring, where the first rotational speed should not be too high, so that as little water as possible in the load is thrown out, that is, as much water as possible is maintained in the load. In one embodiment, the first rotational speed is within a range of greater than or equal to 130 r/min and less than or equal to 600 r/min. The formation of the load ring enables the load that is located in a load pile and close to a rear wall of the drum to be fully wetted.

[0081] The executing the first sub-mode may include determining whether the load is fully wetted, and if not, replenishing water and repeating the spraying and determining steps until the load is completely wetted. For example, water replenishing is controlled in a mode of determining whether the load is fully wetted by detecting a pressure value, until the load is completely wetted.

[0082] The executing the first sub-mode may include draining free water after the load is completely wetted, for example, turning on a draining pump to drain free water in the tub.

[0083] The executing the first sub-mode may include opening the air heating tube to heat air; and turning on the fan to make the heated air flow to form hot air, and make the hot air pass through and heat the load. The air heating tube may be located in a drying channel of the clothes processing device.

[0084] The executing the first sub-mode may further include washing the load. In the washing process, water replenishing is stopped, and the wetted load is always washed.

[0085] The executing the second sub-mode may include providing a third volume of water to the clothes processing device. The third volume of water may be obtained on the basis of the mass of load, for example 4 L, for rinsing washing powder or laundry detergent.

[0086] The executing a second sub-mode includes increasing the rotational speed of the drum to a second rotational speed that is less than a centrifugal rotational speed, and turning on the circulating pump to spray water onto the load to wet the load. The rotational speed is a minimum rotational speed that maintains the load in a centrifugal state. In one embodiment, the second rotational speed is within a range of less than or equal to 50 r/mi. Since the mass of the load in the second sub-mode is relatively small, a problem that water cannot reach the load wrapped inside usually does not occur, and thus the formation of the load ring is not required.

[0087] The executing a second sub-mode includes determining whether the load is fully wetted, and if not, replenishing water and repeating the spraying and determining steps until the load is completely wetted. For example, water replenishing is controlled in a mode of determining whether the load is fully wetted by detecting a pressure value, until the load is completely wetted.

[0088] The executing a second sub-mode includes turning on the draining pump to drain free water, for example, turning on the draining pump to drain free water in the tub.

[0089] The executing a second sub-mode includes opening the air heating tube to heat air; and turning on the fan to make the heated air flow to form hot air, and make the hot air pass through and heat the load. The air heating tube may be located in a drying channel of the clothes processing device.

[0090] The executing the second sub-mode may further include washing the load. In the washing process, water replenishing is stopped, and the wetted load is always washed.

[0091] The embodiments of the present invention further disclose another readable storage medium or a control apparatus comprising the readable storage medium, which is a non-volatile storage medium or a non-transient storage medium, having a program instruction stored thereon, where steps of the method as shown in FIG. 4 are executed when running the program instruction.

[0092] The embodiments of the present invention further disclose another clothes processing device 500, as shown in FIG. 5, including, in a housing 501, a drum 503 configured to accommodate a load 502 and a tub 504 sleeved outside the drum 503 and in fluid communication with the drum 503; a washing heating tube 505 located at the bottom of the tub 504 and adapted to heat free water in the tub 504; a circulating pump 506 adapted to circularly spray water (for example, by means of a water circulating channel 507) from the bottom of the tub 504 onto the load 502; an air heating tube 508 located in a drying channel 509 and adapted to heat air; and a fan 510 adapted to make the heated airflow to form hot air and make the hot air pass through and heat the load 502.

[0093] The clothes processing device 500 further includes a control apparatus 511, including the readable storage medium and a processor, where the readable storage medium stores a program instruction running on the processor, and steps of the method as shown in FIG. 4 are executed when the processor runs the program instruction.

[0094] The clothes processing device 500 may further include a pressure sensor 512, a material box 513, and a draining pump 516. The pressure sensor 512 is provided at the bottom of the tub 504 for detecting pressure of the free water. The material box 513 is adapted to provide washing powder or laundry detergent. A water supply tube 514 supplies water to the material box 513. A water inlet valve 514 is provided on the water supply tube 515. The draining pump 516 is connected to a draining channel 517 for draining the free water.

[0095] In some embodiments, the clothes processing device 500 may be a drum washing machine.

[0096] Although specific implementations have been described above, the implementations are not intended to limit the scope of the present invention, even if only one implementation is described with respect to specific features. The feature examples provided in the present invention are intended to be illustrative rather than limiting, unless otherwise stated. In a specific implementation, technical features of one or more dependent claims and technical features of independent claims are combined according to actual requirements and in a feasible technology. Technical features from corresponding independent claims may be combined by any suitable manner rather than only by a specific combination exemplified in the claims.

[0097] Although the present invention is disclosed above, the present invention is not limited thereto. A person skilled in the art can make various changes and modifications without departing from the spirit and the scope of the present invention. Therefore, the protection scope of the present invention should be subject to the scope defined by the claims.

Claims

1. A clothes washing method (100, 200, 400), **characterized by** comprising:
   detecting mass of a load put in a clothes processing device (300, 500) (S110); and determining whether the mass of the load is greater than a first threshold (S120); if yes, executing a first heating washing mode (S130); and if not, executing a second heating washing mode (S140).

2. The method (100, 200, 400) according to claim 1, **characterized in that** a ratio of the first threshold to a rated capacity of the clothes processing device (300, 500) is within a range of greater than or equal to 30% and less than or equal to 60%, in particular the first threshold is within a range of greater than or equal to 3 kg and less than or equal to 6 kg.

3. The method (100, 200, 400) according to claim 1 or 2, **characterized in that** the clothes processing device (300, 500) comprises a rotatable drum (303, 503) configured to accommodate a load (302, 502) and a tub (304, 504) sleeved outside the drum (303, 503); the first heating washing mode is a mode in which the load (302, 502) and free water are heated by means of a washing heating tube (305, 505) in water in a state where the free water is provided in the tub (304, 504) and the load (302, 502) is in contact with the free water, and then washing is carried out; and the second heating washing mode is a mode in which the wetted load (302, 502) is heated with hot air in a state where no free water is provided in the tub (304, 504), and then washing is carried out.

4. The method (100, 200, 400) according to claim 3, **characterized in that** the executing the first heating washing mode (S130) comprises the following steps:
   providing a first volume of water to the clothes processing device (300, 500), replenishing water until the load (302, 502) is completely wetted and free water in contact with the load (302, 502) is provided in the tub (304, 504); heating the free water by means of the washing heating tube (305, 505) so as to heat the load (302, 502); and maintaining a certain amount of the free water to wash the load (302, 502).

5. The method (100, 200, 400) according to claim 3 or 4, **characterized in that** the executing the second heating washing mode (S140) comprises the following steps:
   supplying water to the tub (304, 504) and the drum (303, 503) and fully wetting the load (302, 502), and then draining the free water in the tub (304, 504); heating the wetted load (302, 502) with the hot air; and then washing the load (302, 502).

6. The method (100, 200, 400) according to claim 5,

characterized in that the step of supplying water to the tub (304, 504) and the drum (303, 503) and fully wetting the load (302, 502) comprises:

providing a certain volume of water to a clothes processing device (300, 500) (S410); and increasing a rotational speed of a drum (303, 503) to a set rotational speed (S420);
turning on a circulating pump (306, 506) to spray water onto a load (302, 502) in the clothes processing device (300, 500) to wet the load (302, 502) (S430);
determining whether the load (302, 502) is fully wetted (S440), and if not, replenishing water and repeating the spraying step (S430) until the load (302, 502) is completely wetted.

7. The method (100, 200, 400) according to claim 6, **characterized in that** the certain volume of water is set as a second volume of water and the set rotational speed is set as a first rotational speed to form a load ring, turning on a circulating pump (306, 506) to spray water onto the load ring to wet the load (302, 502), determining whether the load (302, 502) is fully wetted, and if not, replenishing water and repeating the spraying and determining steps until the load (302, 502) is completely wetted.

8. The method (100, 200, 400) according to claim 6 or 7, **characterized in that** the first rotational speed is a minimum rotational speed that maintains the load (302, 502) in a centrifugal state, in particular the first rotational speed is within a range of greater than or equal to 130 r/min and less than or equal to 600 r/min.

9. The method (100, 200, 400) according to claims 6, **characterized in that** the executing the second heating washing mode (S140) comprises determining whether the mass of the load is less than or equal to a second threshold before the supplying water to the tub (304, 504) and the drum (303, 503) is executed, and if yes, executing a sub-mode, wherein the second threshold is less than the first threshold.

10. The method (100, 200, 400) according to claim 9, **characterized in that** a ratio of the second threshold to a rated capacity of the clothes processing device (300, 500) is within a range of greater than or equal to 10% and less than or equal to 30%, in particular the second threshold is within a range of greater than or equal to 1 kg and less than or equal to 3 kg.

11. The method (100, 200, 400) according to claim 9 or 10, **characterized in that** the executing the sub-mode comprises: setting the certain volume of water as a third volume of water to the clothes processing device (300, 500) and setting the rotational speed of the drum (303, 503) to a second rotational speed that is less than a centrifugal rotational speed, in particular the second rotational speed is within a range of less than or equal to 50 r/min.

12. The method (100, 200, 400) according to any of claims 1 to 11, **characterized in that** the method (100, 200, 400) further comprises: draining the free water in the tub (304, 504) comprises turning on a draining pump (316, 516) to drain free water.

13. The method (100, 200, 400) according to any one of claim 1 to 12 **characterized in that** the method (100, 200, 400) further comprises: heating the wetted load (302, 502) with the hot air comprises opening an air heating tube (308, 508) to heat air, and turning on a fan (310, 510) to make the heated air flow to form hot air, and make the hot air pass through and heat the load (302, 502).

14. A control apparatus (311, 511) comprising a readable storage medium, which is in particular a non-volatile storage medium or a non-transient storage medium, having at least one program instruction stored thereon, **characterized in that** steps of the method (100, 200, 400) according to any one of claims 1 to 13 are executed when running the program instruction.

15. A clothes processing device (300, 500), in particular a drum washing machine, comprising a drum (303, 503) configured to accommodate a load (302, 502) and a tub (304, 504) sleeved outside the drum (303, 503) and in fluid communication with the drum (303, 503), **characterized by** further comprising:

a washing heating tube (305, 505), located at the bottom of the tub (304, 504) and adapted to heat free water in the tub (304, 504);
a circulating pump (306, 506), adapted to circularly spray water from the bottom of the tub (304, 504) onto the load (302, 502);
an air heating tube (308, 508), adapted to heat air;
a fan (310, 510), adapted to make the heated air flow to form hot air, and make the hot air pass through and heat the load (302, 502); and
a control apparatus (311, 511) according to claim 14 and comprising a processor, wherein the at least one program instruction stored in the readable storage medium is executable on the processor, and steps of the method (100, 200, 400) according to any one of claims 1 to 13 are executed when the processor runs the program instruction.

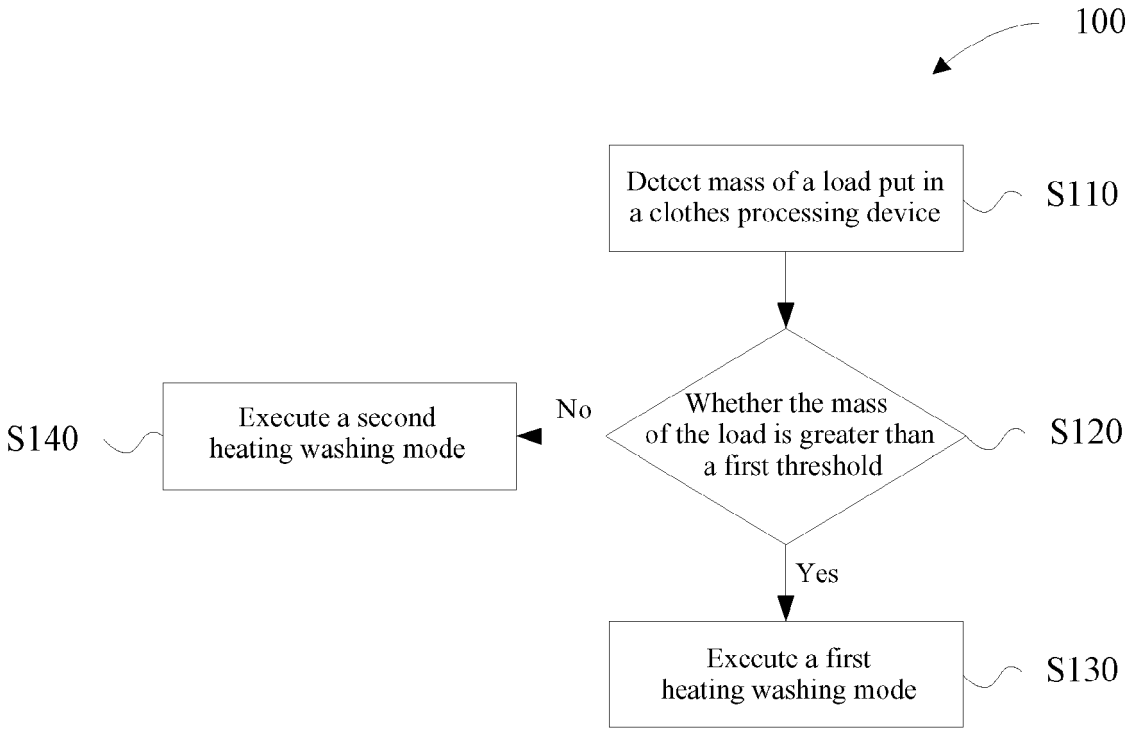
100
Detect mass of a load put in a clothes processing device
S110
Whether the mass of the load is greater than a first threshold
S120
No
Execute a second heating washing mode
S140
Yes
Execute a first heating washing mode
S130

Fig. 1

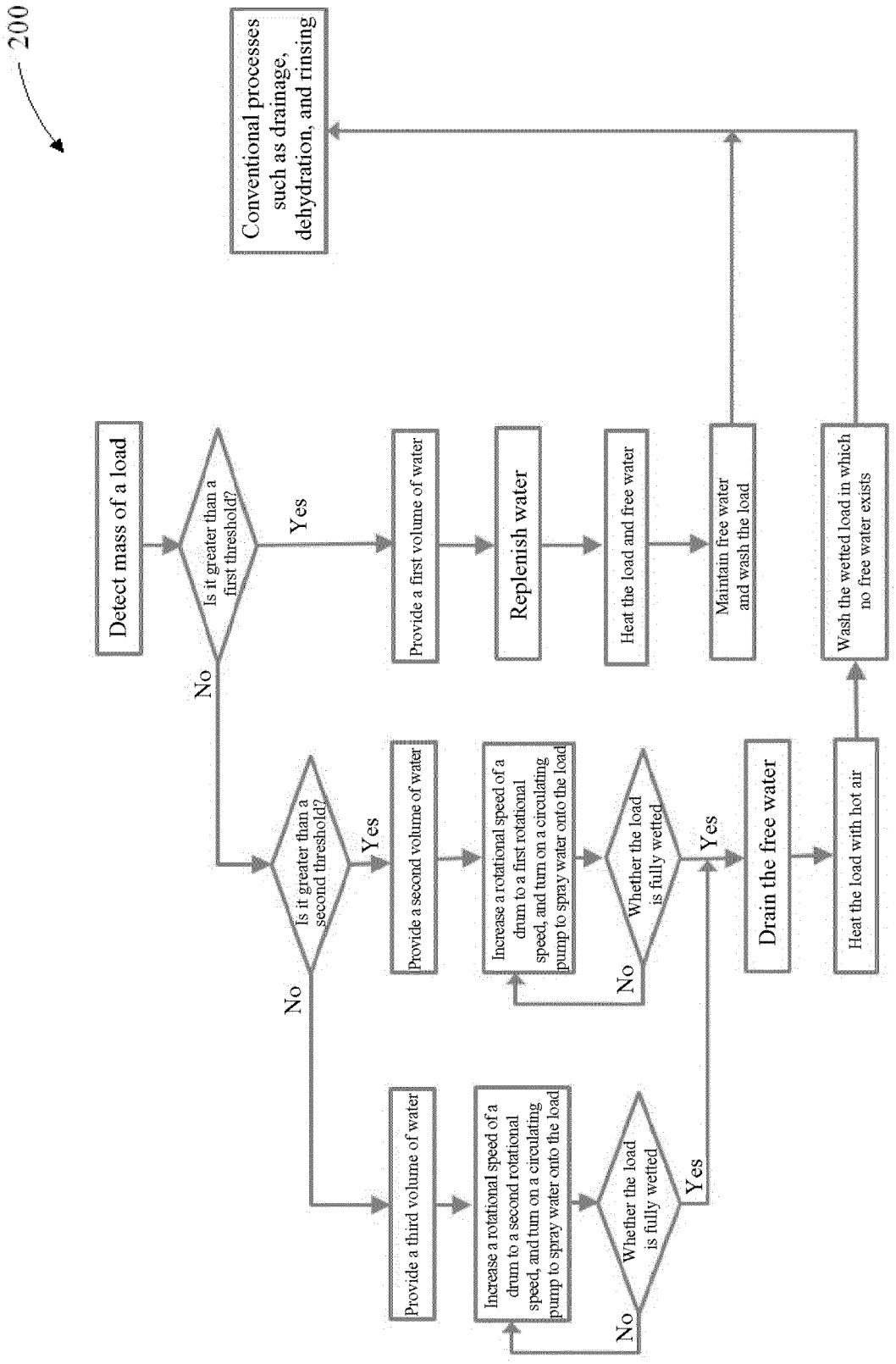
200
Conventional processes such as drainage, dehydration, and rinsing
Detect mass of a load
Is it greater than a first threshold?
Yes
No
Provide a first volume of water
Replenish water
Heat the load and free water
Maintain free water and wash the load
Wash the wetted load in which no free water exists
Is it greater than a second threshold?
Yes
No
Provide a second volume of water
Increase a rotational speed of a drum to a first rotational speed, and turn on a circulating pump to spray water onto the load
Whether the load is fully wetted
Yes
No
Drain the free water
Heat the load with hot air
Provide a third volume of water
Increase a rotational speed of a drum to a second rotational speed, and turn on a circulating pump to spray water onto the load
Whether the load is fully wetted
Yes
No

Fig. 2

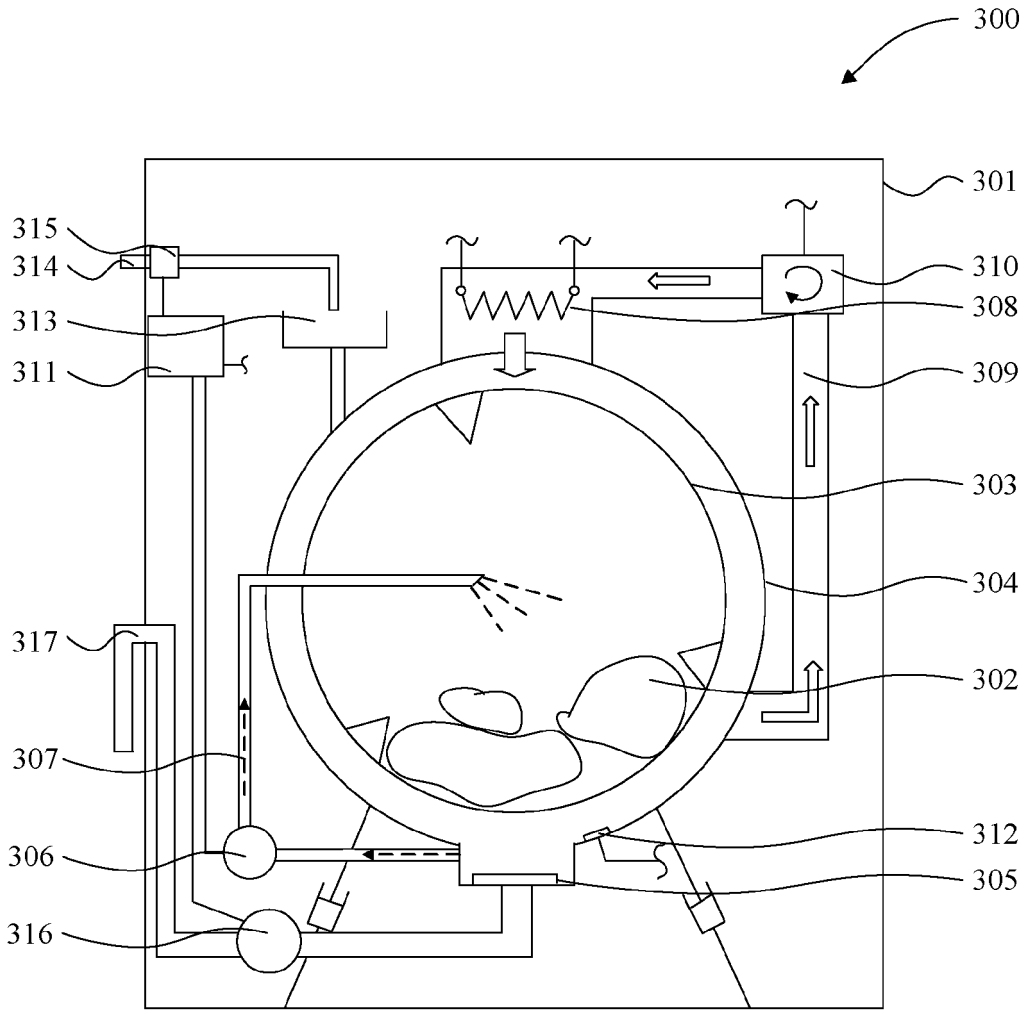
300
301
315
314
313
311
310
308
309
303
304
317
302
307
312
306
305
316

Fig. 3

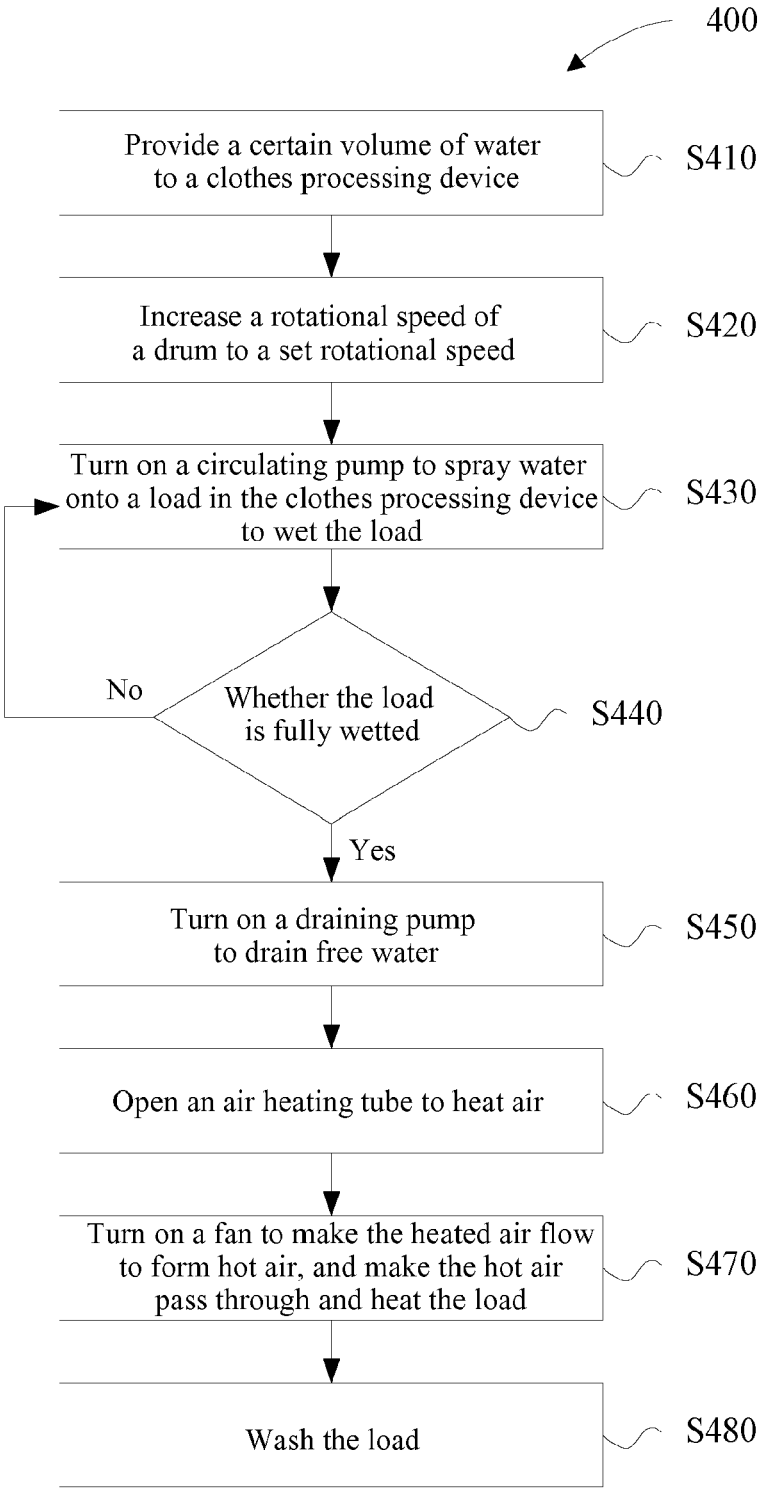
400
Provide a certain volume of water to a clothes processing device
S410
Increase a rotational speed of a drum to a set rotational speed
S420
Turn on a circulating pump to spray water onto a load in the clothes processing device to wet the load
S430
Whether the load is fully wetted
S440
No
Yes
Turn on a draining pump to drain free water
S450
Open an air heating tube to heat air
S460
Turn on a fan to make the heated air flow to form hot air, and make the hot air pass through and heat the load
S470
Wash the load
S480

Fig. 4

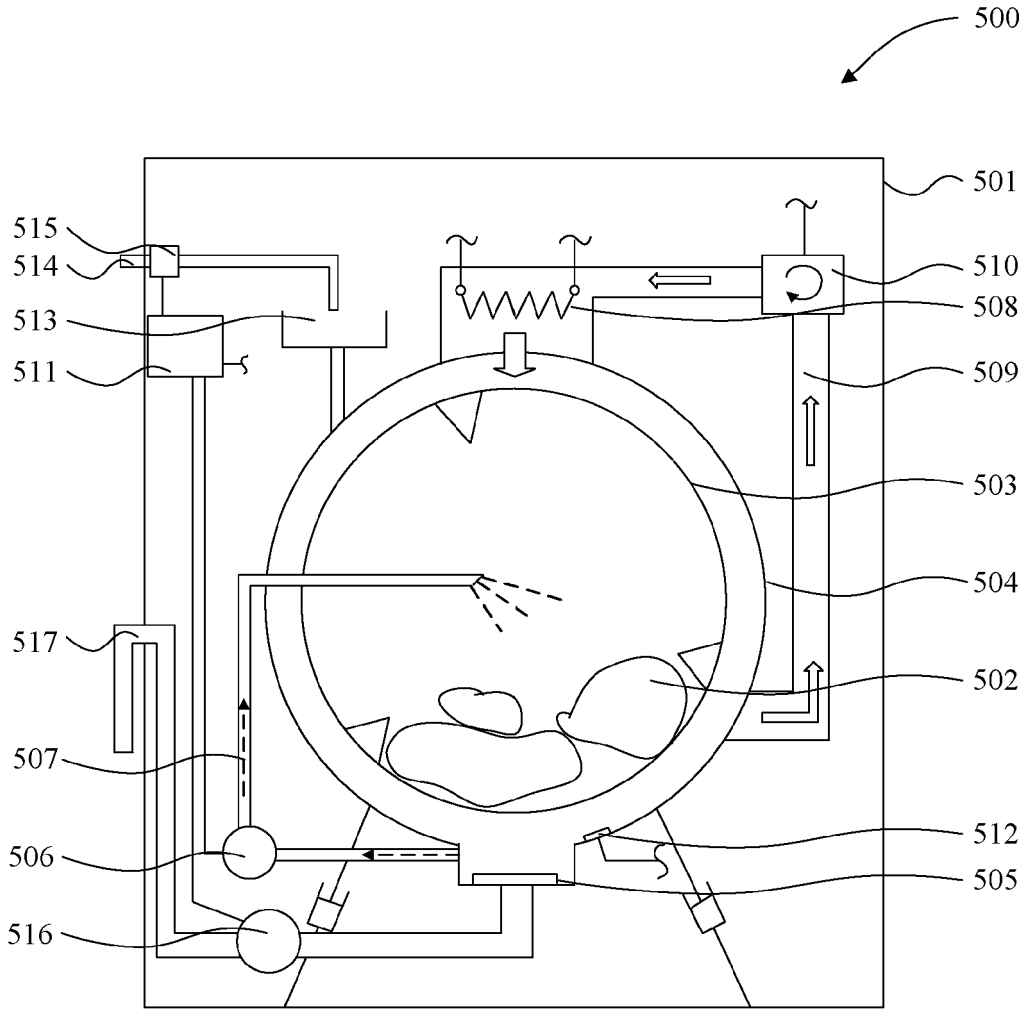
500
501
515
514
513
511
510
508
509
503
504
517
502
507
512
506
505
516

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 21 16 1222

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 June 2021	Sangiorgi, Massimo

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