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(54) CLOTHES DRYING CONTROL METHOD AND APPARATUS, AND CLOTHES TREATMENT DEVICE AND STORAGE MEDIUM

(57) Provided in the embodiments of the present application are a clothes drying control method and apparatus, and a clothes treatment device and a storage medium. The method comprises: entering a drying process, and initializing a humidity level of an object to be dried to a first humidity level; controlling a display panel of a clothes treatment device to display a first remaining drying duration, wherein the first remaining drying duration is determined on the basis of a first working duration corresponding to the first humidity level and a first drying duration under the first humidity level; when it is determined that a humidity value of said object reaches a stable condition and the humidity value meets a level updating condition, updating the humidity level to the next humidity level of the current humidity level; and controlling the display panel to display a second remaining drying duration, wherein the second remaining drying duration is determined on the basis of a second working duration corresponding to the next humidity level and a second drying duration under the next humidity level, and the second remaining drying duration is less than the first remaining drying duration.

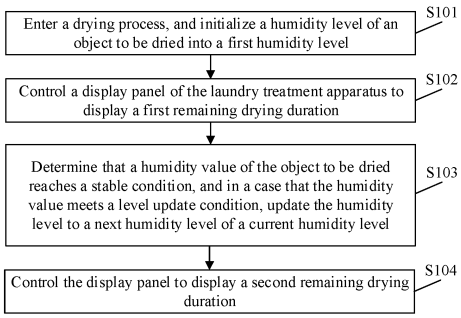

FIG. 1

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is based upon and claims the priority to Chinese Patent Application No. 202011102045.1, filed on October 15, 2020, and entitled "CLOTHES DRYING CONTROL METHOD AND APPARATUS, AND CLOTHES TREATMENT DEVICE AND STORAGE MEDIUM", the contents of which are incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The application relates to the technical field of household appliances, and relates to, but is not limited to, a method for controlling laundry drying, a control device for laundry drying, a laundry treatment apparatus and a storage medium.

BACKGROUND

[0003] A laundry dryer is a clean household appliance that uses electric heating to evaporate and dry the moisture in the washed laundry immediately. The laundry dryer is especially needed when laundry is difficult to dry in winter in the north and in "continuous humid weather" in the south.

[0004] With the popularization of the laundry dryer, people have increasingly high requirements for the performance of a laundry dryer, and the disadvantages of a laundry dryer are exposed more and more. When the laundry to be dried is made of chemical fiber, the laundry dryer easily mistakenly determines that the laundry which has not been dried off yet has been dried off due to the chemical fiber, and a remaining duration displayed on a display panel of the laundry dryer jumps directly to the end, resulting in poor drying effect of the laundry made of chemical fiber and affecting the drying experience of the user.

SUMMARY

[0005] In view of the above, embodiments of the application provide a method for controlling laundry drying, a control device for laundry drying, a laundry treatment apparatus and a storage medium.

[0006] An embodiment of the application provides a method for controlling laundry drying, which is applied to a laundry treatment apparatus. The method includes the following operations.

[0007] A drying process is entered, and a humidity level of an object to be dried is initialized into a first humidity level.

[0008] A display panel of the laundry treatment apparatus is controlled to display a first remaining drying duration, the first remaining drying duration being determined according to a first working duration corresponding to the first humidity level, and a first dried duration (the first dried duration refers to a duration for which the object to be dried has been dried at the first humidity level) at the first humidity level.

[0009] It is determined that a humidity value of the object to be dried reaches a stable condition, and in a case that the humidity value meets a level update condition, the humidity level of the object to be dried is updated to a next humidity level of a current humidity level.

[0010] The display panel is controlled to display a second remaining drying duration, the second remaining drying duration being determined according to a second working duration corresponding to the next humidity level, and a second dried duration (the second dried duration refers to a duration for which the object to be dried has been dried at the next humidity level) at the next humidity level. The second remaining drying duration is less than the first remaining drying duration.

[0011] In some embodiments, the method may further include the following operations.

[0012] A current dried duration (the current dried duration refers to a duration for which the object to be dried has been dried at the current humidity level) at the current humidity level is acquired.

[0013] In a case that the current dried duration reaches a stabilization duration corresponding to the current humidity level, it is determined that the humidity value of the object to be dried reaches the stable condition.

[0014] In some embodiments, the method may further include the following operations.

[0015] A plurality of humidity values detected at the current humidity level are acquired.

[0016] A difference between a maximum humidity value and a minimum humidity value among the plurality of humidity values is calculated.

[0017] In a case that the difference is less than a difference threshold corresponding to the current humidity level, it is determined that the humidity value of the object to be dried reaches the stable condition.

[0018] In some embodiments, the method may further include the following operations.

[0019] The humidity value of the object to be dried is acquired.

[0020] In a case that the humidity value of the object to be dried is less than a humidity value corresponding to the next humidity level, it is determined that the humidity value of the object to be dried meets the level update condition.

[0021] In some embodiments, the method may further include the following operations.

[0022] The humidity value of the object to be dried is acquired.

[0023] In a case that the humidity value of the object to be dried is less than a humidity value corresponding to the next humidity level and a duration for which the humidity value of the object to be dried is maintained to be less than the humidity value corresponding to the next humidity level reaches a maintain duration correspond-

ing to the current humidity level, it is determined that the humidity value of the object to be dried meets the level update condition.

[0024] In some embodiments, the method may further include the following operations.

[0025] In a case that determining that the updated humidity level is a drying humidity level, the drying process is ended, and a heating device of the laundry treatment apparatus is controlled to stop heating.

[0026] A cooling process is entered, and a cooling device of the laundry treatment apparatus is controlled to start working.

[0027] The display panel is controlled to display a remaining cooling duration, the remaining cooling duration being determined according to a preset cooling working duration and a cooled duration (the cooled duration refers to a duration for which the object that has been dried off has been cooled).

[0028] In a case that the remaining cooling duration reaches a preset duration, the cooling device is controlled to stop working.

[0029] In some embodiments, the humidity level of the object to be dried includes the first humidity level, a second humidity level, a third humidity level, a fourth humidity level and a drying humidity level.

[0030] The first working duration corresponding to the first humidity level, the second working duration corresponding to the second humidity level, a third working duration corresponding to the third humidity level, a fourth working duration corresponding to the fourth humidity level and a fifth working duration corresponding to the drying humidity level meet the following requirements: the first working duration corresponding to the first humidity level > the second working duration corresponding to the second humidity level > the third working duration corresponding to the third humidity level > the fourth working duration corresponding to the fourth humidity level > the fifth working duration corresponding to the drying humidity level.

[0031] A humidity value corresponding to the first humidity level, a humidity value corresponding to the second humidity level, a humidity value corresponding to the third humidity level, a humidity value corresponding to the fourth humidity level and a humidity value corresponding to the drying humidity level meet the following requirements: the humidity value corresponding to the first humidity level > the humidity value corresponding to the second humidity level > the humidity value corresponding to the third humidity level > the humidity value corresponding to the fourth humidity level > the humidity value corresponding to the drying humidity level.

[0032] An embodiment of the application provides a control device for laundry drying, which is applied to a laundry treatment apparatus. The control device for laundry drying includes an initialization module, a first control module and an updating module.

[0033] The initialization module is configured to enter a drying process and initialize a humidity level of an object to be dried into a first humidity level.

[0034] The first control module is configured to control a display panel of the laundry treatment apparatus to display a first remaining drying duration, the first remaining drying duration being determined according to a first working duration corresponding to the first humidity level, and a first dried duration (the first dried duration refers to a duration for which the object to be dried has been dried at the first humidity level) at the first humidity level.

[0035] The updating module is configured to determine that a humidity value of the object to be dried reaches a stable condition, and in a case that the humidity value meets a level update condition, to update the humidity level of the object to be dried to a next humidity level of a current humidity level.

[0036] The first control module is further configured to control the display panel to display a second remaining drying duration, the second remaining drying duration being determined according to a second working duration corresponding to the next humidity level, and a second dried duration (the second dried duration refers to a duration for which the object to be dried has been dried at the next humidity level) at the next humidity level. The second remaining drying duration is less than the first remaining drying duration.

[0037] An embodiment of the application provides a laundry treatment apparatus, which includes:

a processor; and

a memory configured to store computer programs executable on the processor.

[0038] Herein, the computer programs, when executed by the processor, perform operations of the method for controlling laundry drying described above.

[0039] An embodiment of the application provides a storage medium having stored thereon computer-executable instructions that are configured to perform operations of the method for controlling laundry drying described above.

[0040] The embodiments of the application provide a method for controlling laundry drying, a control device for laundry drying, a laundry treatment apparatus and a storage medium. The method includes the following operations. After the laundry treatment apparatus enters a drying process, a humidity level of an object to be dried is initialized into a first humidity level. A display panel of the laundry treatment apparatus is controlled to display a first remaining drying duration, the first remaining drying duration being determined according to a first working duration corresponding to the first humidity level, and a first dried duration at the first humidity level. It is determined that the humidity value of the object to be dried reaches a stable condition, and in a case that the humidity value meets the level update condition, the humidity level of the object to be dried is updated to a next humidity level of a current humidity level. The display panel is controlled to display a second remaining drying duration, the

second remaining drying duration being determined according to a second working duration corresponding to the next humidity level, and a second dried duration at the next humidity level. The second remaining drying duration is less than the first remaining drying duration. In this way, after the humidity value of the object to be dried is stable, and in a case that the humidity value meets the level update condition, the remaining drying duration displayed on the display panel is updated according to the humidity level of the object to be dried. Therefore, an error between the acquired humidity value and an actual humidity value of the object to be dried may be reduced, and the remaining drying duration is gradually updated according to the humidity level of the object to be dried, to ensure that the expected drying effect is achieved.

BRIEF DESCRIPTION OF DRAWINGS

[0041] In the drawings (which are not necessarily drawn to scale), like reference numerals may describe similar components in different views. The drawings illustrate generally, by way of example, but not by way of limitation, various embodiments discussed herein.

FIG. 1 is a schematic flowchart of a method for controlling laundry drying according to an embodiment of the application.

FIG. 2 is another schematic flowchart of a method for controlling laundry drying according to an embodiment of the application.

FIG. 3 is yet another schematic flowchart of a method for controlling laundry drying according to an embodiment of the application.

FIG. 4 is a structural schematic diagram of a control device for laundry drying according to an embodiment of the application.

FIG. 5 is a structural schematic diagram of a laundry treatment apparatus according to an embodiment of the application.

DETAILED DESCRIPTION

[0042] In order to make objectives, technical solutions and advantages of the application more clear, the application will be further described in detail below in combination with the drawings, and the described embodiments should not be considered as a limitation to the application. All other embodiments obtained by ordinary skill in the art without creative labor fall within the scope of protection of the application.

[0043] In the following description, the terms "first\second\third" are used only to distinguish similar objects from each other and do not represent a specific order of the objects. It is understood that the terms "first\second\third" may, where permitted, be interchanged with each other in a specific order or in a sequence to enable the embodiments of the application described herein to be implemented in a sequence other than that illustrated or described herein.

[0044] Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the application belongs. The terms used herein are only for the purpose of describing embodiments of the application and are not intended to limit the application.

[0045] In the related art, a laundry treatment apparatus, such as a laundry dryer and a laundry washer-dryer, easily mistakenly determines that laundry which has not been dried off yet has been dried off in a drying process due to chemical fiber of the laundry, and a remaining duration displayed on a display panel of the laundry treatment apparatus jumps directly to the end, resulting in poor drying effect of laundry made of chemical fiber. On this basis, an embodiment of the application provides a method for controlling laundry drying, which is applied to a laundry treatment apparatus. The method according to the embodiment of the application may be implemented by computer programs which perform each of operations in the method for controlling laundry drying according to the embodiment of the application when executed. In some embodiments, the computer programs may be executed by a processor in the laundry treatment apparatus. FIG. 1 is a schematic flowchart of a method for controlling laundry drying according to an embodiment of the application. As shown in FIG. 1, the method for controlling laundry drying includes the following operations.

[0046] At S101, a drying process is entered, and a humidity level of an object to be dried is initialized into a first humidity level.

[0047] The method for controlling laundry drying according to the embodiment of the application is applied to a laundry treatment apparatus, which may be an apparatus with drying function such as the laundry washer-dryer and the laundry dryer. The object to be dried may be a laundry, shoes, a bag, and the like to be washed. In the embodiment of the application, the laundry treatment apparatus is described by taking the laundry washer-dryer as an example, and the object to be dried is described by taking a laundry to be dried as an example. Unless specifically described below, the laundry treatment apparatus refers to the laundry washer-dryer, and the object to be dried refers to the laundry to be dried.

[0048] The working principle of the laundry washer-dryer according to the embodiment of the application is as follows: dry cold air is heated into dry hot air by a heating device; the dry hot air changes into moist hot air after passing through the laundry to be dried; the moist hot air changes into dry cold air and condensed water after passing through a condenser; the condensed water is discharged from a drain pipe; said dry cold air is changed into dry hot air by the heating device again, said dry hot air passes through the laundry to be dried; the operations described above are repeated. In this way, the moisture of the laundry to be dried is taken away, to achieve the purpose of drying the laundry.

[0049] The user places the laundry to be dried into a tub of the laundry washer-dryer and selects a drying procedure, and then presses a "start/pause" button to allow the laundry washer-dryer to enter the drying process. The laundry treatment apparatus controls the heating device thereof to start heating. The first humidity level is a level of a humidity value of the laundry to be dried before the drying process is performed, that is, a level of a humidity value of the laundry to be dried after the laundry to be dried is dehydrated.

[0050] In an embodiment of the application, a humidity level of the laundry to be dried includes a first humidity level, a second humidity level, a third humidity level, a fourth humidity level and a drying humidity level, which are respectively denoted as L0, L1, L2, L3 and L4. The laundry to be dried has a maximum humidity at the first humidity level L0, a greater humidity at the second humidity level L1, a general humidity at the third humidity level L2, a drier humidity (i.e., a lower humidity) at the fourth humidity level L3, and a minimum humidity at the fifth humidity level L4. In a case that the laundry to be dried is at the fifth humidity level L4, the laundry to be dried has been dried off.

[0051] At S102, a display panel of the laundry treatment apparatus is controlled to display a first remaining drying duration.

[0052] Here, the first remaining drying duration is determined according to a first working duration corresponding to the first humidity level, and a first dried duration (the first dried duration refers to a duration for which the object to be dried has been dried at the first humidity level) at the first humidity level. In practice, a difference between the first working duration and the first dried duration may be determined as the first remaining drying duration.

[0053] In an embodiment of the application, the first working duration corresponding to the first humidity level L0, a second working duration corresponding to the second humidity level L1, a third working duration corresponding to the third humidity level L2, a fourth working duration corresponding to the fourth humidity level L3 and a fifth working duration corresponding to the drying humidity level L4 meet the following requirements: the first working duration corresponding to the first humidity level > the second working duration corresponding to the second humidity level > the third working duration corresponding to the third humidity level > the fourth working duration corresponding to the fourth humidity level > the fifth working duration corresponding to the drying humidity level. Here, since the laundry to be dried has been dried off at the drying humidity level, there is no need to continue the drying process. As such, the fifth working duration may be set to be 0.

[0054] In a case that a current humidity level is the first humidity level, a duration required for drying the laundry to be dried is preset as the first working duration. At the first humidity level, the duration required for drying the laundry to be dried is the longest, and the first remaining drying duration displayed on the display panel is counted down from the first working duration.

[0055] For example, the first working duration is 4 hours, and the first remaining drying duration initially displayed on the display panel is "04:00:00". At the first humidity level, the first remaining drying duration begins to decrease with the increase of the first dried duration. That is, the first remaining drying duration displayed on the display panel gradually decreases from "04:00:00" to "03:59:59", "03:59:58", ...

[0056] At S103, it is determined that a humidity value of the object to be dried reaches a stable condition, and in a case that the humidity value meets a level update condition, the humidity level of the object to be dried is updated to a next humidity level of a current humidity level.

[0057] In the related art, since the humidity value of the object to be dried is detected when the humidity value of the object to be dried is uneven, the obtained humidity value is unstable. When the humidity value of the laundry to be dried located in a drier position is detected, the detected humidity value is small. In a case that the humidity level of the laundry to be dried is determined according to the detected humidity value at this time, the humidity level of the laundry to be dried is higher than the actual humidity level of the laundry to be dried. For example, if the actual humidity level of the laundry to be dried is L2, the humidity level of the laundry to be dried may be mistakenly determined as L3 when the humidity value of the laundry to be dried located in a drier position is detected; and the detected humidity value is greater when the humidity value of the laundry to be dried located in a wetter position is detected. In a case that the humidity level of the laundry to be dried is determined according to the detected humidity value of the laundry to be dried located in the wetter portion, the determined humidity level of the laundry to be dried will be lower than the actual humidity level of the laundry to be dried. For example, if the actual humidity level of the laundry to be dried is L2, the humidity level of the laundry to be dried may be mistakenly determined as L1 when the humidity value of the laundry to be dried located in the wetter position is detected. Especially for laundries to be dried made of chemical fiber, the difference of humidity values of the laundries to be dried located in different positions is more significant due to the poor water absorption of the chemical fiber, which leads to a greater probability of mistaken determination.

[0058] In the embodiment of the application, when it is determined that the humidity value of the laundry to be dried reaches the stable condition, that is, when it is ensured that the difference of the moisture of the laundries to be dried located in different positions is not significant, the humidity value of the object to be dried is detected. In this way, the error between the detected humidity value and the actual humidity value of the object to be dried may be reduced, the possibility that the detected humidity value is inconsistent with the actual humidity value may

be reduced, and the accuracy of the detected humidity value may be improved, thereby ensuring that mistaken determination is not occurred when it is determined whether the updated humidity level is reached, and ensuring that the expected drying effect is achieved.

[0059] In the embodiment of the application, when the humidity value of the object to be dried does not reach the stable condition, or when the humidity value of the object to be dried reaches the stable condition, but the humidity value does not meet the level update condition, the drying process is continued at the first humidity level, until the humidity value of the object to be dried reaches the stable condition, and the humidity value meets the level update condition, and then operation S 105 is entered.

[0060] At S 104, the display panel is controlled to display a second remaining drying duration.

[0061] Here, the second remaining drying duration is determined according to a second working duration corresponding to the next humidity level, and a second dried duration (the second dried duration refers to a duration for which the object to be dried has been dried at the next humidity level) at the next humidity level. The second remaining drying duration is less than the first remaining drying duration. In practice, a difference between the second working duration and the second dried duration may be determined as the second remaining drying duration.

[0062] When the laundry to be dried is originally drier, that is, the actual humidity value of the laundry to be dried is small, or when the laundry to be dried is originally wetter but the humidity value of the laundry to be dried reaches the stable condition and the humidity value meets the level update condition after drying for a period of time, the first remaining drying duration displayed on the display panel jumps to the second remaining drying duration, where the second remaining drying duration is less than the first remaining drying duration.

[0063] For example, when the actual humidity value of the laundry to be dried corresponds to the second humidity level, the first remaining drying duration displayed on the display panel is counted down from the first working duration. At this time, the humidity value of the laundry to be dried reaches the stable condition, and the humidity value meets the level update condition, then the first remaining drying duration displayed on the display panel is updated to the second remaining drying duration.

[0064] Taking the second working duration of 3 hours as an example, the first remaining drying duration initially displayed on the display panel is "04:00:00". It takes 2 minutes to determine that the humidity value of the laundry to be dried reaches the stable condition and the humidity value meets the level update condition. At this time, the first remaining drying duration displayed on the display panel is "03:58:00", and the first remaining drying duration displayed on the display panel is updated to the second remaining drying duration, that is, jumping from "03:58:00" to "03:00:00". Then, at the second humidity level, the second remaining drying duration begins to decrease with the increase of the second dried duration, that is, the second remaining drying duration displayed on the display panel gradually decreases from "03:00:00" to "02:59:59", "02:59:58", ...

[0065] As another example, when the actual humidity value of the laundry to be dried corresponds to the first humidity level, the first remaining drying duration displayed on the display panel is counted down from the first working duration, and after working for 0.5 hours, the first remaining drying duration displayed on the display panel is "03:00:00". In a case that the humidity value of the laundry to be dried reaches the stable condition, and the humidity value meets the level update condition, the first remaining drying duration displayed on the display panel is updated to the second remaining drying duration.

[0066] Taking the second working duration of 3 hours as an example, the second remaining drying duration is determined according to the second working duration corresponding to the second humidity level, and the second dried duration (here, the second dried duration refers to a duration for which the laundry to be dried has been dried at the second humidity level) at the second humidity level. At this time, the second dried duration of the laundry washer-dryer at the second humidity level is 0, that is, the first remaining drying duration displayed on the display panel is updated to the second working duration, that is, jumping from "03:30:00" to "03:00:00". Then, at the second humidity level, the second remaining drying duration begins to decrease with the increase of the second dried duration, that is, the second remaining drying duration displayed on the display panel gradually decreases from "03:00:00" to "02:59:59", "02:59:58", ...

[0067] In the method for controlling laundry drying according to the embodiment of the application, after the humidity value of the object to be dried is stable, and when the humidity value meets the level update condition, the remaining drying duration displayed on the display panel is updated gradually according to the humidity level of the object to be dried, to ensure that the expected drying effect is achieved, and avoid the situation that the remaining drying duration displayed on the display panel jumps too fast or even jumps directly to 0 when the detected humidity value is inconsistent with the actual humidity value of the object to be dried.

[0068] In the method for controlling laundry drying according to the embodiment of the application, after the laundry treatment apparatus enters the drying process, the humidity level of the object to be dried is initialized into the first humidity level. The display panel of the laundry treatment apparatus is controlled to display the first remaining drying duration, where the first remaining drying duration is determined according to the first working duration corresponding to the first humidity level, and the first dried duration at the first humidity level. It is determined that the humidity value of the object to be dried reaches the stable condition, and in a case that the humidity value meets the level update condition, the humid-

ity level of the object to be dried is updated to a next humidity level of a current humidity level. The display panel is controlled to display a second remaining drying duration, where the second remaining drying duration is determined according to a second working duration corresponding to the next humidity level, and a second dried duration at the next humidity level. Herein, the second remaining drying duration is less than the first remaining drying duration. In this way, after the humidity value of the object to be dried is stable, and in a case that the humidity value meets the level update condition, the remaining drying duration displayed on the display panel is updated according to the humidity level of the object to be dried, which may not only reduce the error between the acquired humidity value and the actual humidity value of the object to be dried, but also gradually update the remaining drying duration according to the humidity level of the object to be dried, to ensure that the expected drying effect is achieved.

[0069] In some embodiments, after the above operation S103, the method for controlling laundry drying may further include operation S03. At S03, it is determined whether the humidity value of the object to be dried reaches the stable condition.

[0070] In one implementation, the operation S03 may include the following operations.

[0071] At S03a1, a current dried duration (the current dried duration refers to a duration for which the object to be dried has been dried at the current humidity level) at the current humidity level is acquired.

[0072] At S03a2, in a case that the current dried duration reaches a stabilization duration corresponding to the current humidity level, it is determined that the humidity value of the object to be dried reaches the stable condition.

[0073] In this implementation, it is determined whether a current humidity value reaches the stable condition according to the current dried duration at the current humidity level. For example, when the first dried duration at the first humidity level reaches a preset first duration threshold, it is determined that the humidity value of the object to be dried reaches the stable condition.

[0074] Here, the first duration threshold may be set to be any value ranging between 100 and 180 seconds.

[0075] In another implementation, the operation S03 may include the following operations.

[0076] At S03b1, a plurality of humidity values detected at the current humidity level are acquired.

[0077] In actual implementation, the plurality of humidity values acquired may be a plurality of humidity values which are continuously acquired or a plurality of humidity values which are randomly acquired; and the acquisition may be periodic acquisition or random acquisition, which are not limited by the embodiment of the application.

[0078] At S03b2, a difference between a maximum humidity value and a minimum humidity value among the plurality of humidity values is calculated.

[0079] At S03b3, in a case that the difference is less than a difference threshold corresponding to the current humidity level, it is determined that the humidity value of the object to be dried reaches the stable condition.

[0080] In this implementation, it is determined whether the current humidity value reaches the stable condition according to the humidity values detected multiple times. For example, at the first humidity level, the humidity value of the object to be dried is detected 10 times to obtain 10 humidity values. The difference between the maximum humidity value and the minimum humidity value among the 10 humidity values is 50 g/m^3. The difference threshold corresponding to the first humidity level is 100 g/m^3. The difference 50 g/m^3 is less than the difference threshold 100 g/m^3 corresponding to the first humidity level, thus it is determined that the humidity value of the object to be dried reaches the stable condition.

[0081] Here, the difference threshold may be set by the user in combination with the actual situations, and may also be a default value which is set when the laundry washer-dryer leaves the factory, which is not limited by the embodiment of the application.

[0082] In some embodiments, after it is determined that the humidity value of the object to be dried reaches the stable condition in the above operation S03a2 or the above operation S03b3, the method for controlling laundry drying may further include operation S04. At S04, it is determined whether the humidity value of the object to be dried meets the level update condition.

[0083] In one implementation, the above operation S04 may include the following operations.

[0084] At S04a1, the humidity value of the object to be dried is acquired.

[0085] At S04a2, in a case that the humidity value of the object to be dried is less than a humidity value corresponding to the next humidity level, it is determined that the humidity value of the object to be dried meets the level update condition.

[0086] In an embodiment of the application, a humidity value corresponding to the first humidity level L0, a humidity value corresponding to the second humidity level L1, a humidity value corresponding to the third humidity level L2, a humidity value corresponding to the fourth humidity level L3 and a humidity value corresponding to the drying humidity level L4 meet the following requirements: the humidity value corresponding to the first humidity level > the humidity value corresponding to the second humidity level > the humidity value corresponding to the third humidity level > the humidity value corresponding to the fourth humidity level > the humidity value corresponding to the drying humidity level.

[0087] In this implementation, after it is determined that the humidity value of the object to be dried reaches the stable condition, the humidity value of the object to be dried is detected. When the humidity value detected one time is less than the humidity value corresponding to the next humidity level, it is determined that the humidity value of the object to be dried meets the level update condition.

[0088] In another implementation, the above operation S04 may include the following operations.

[0089] At S04b1, the humidity value of the object to be dried is acquired.

[0090] At S04b2, in a case that the humidity value of the object to be dried is less than a humidity value corresponding to the next humidity level and a duration for which the humidity value of the object to be dried is maintained to be less than the humidity value corresponding to the next humidity level reaches a maintain duration corresponding to the current humidity level, it is determined that the humidity value of the object to be dried meets the level update condition.

[0091] In an embodiment of the application, a humidity value corresponding to the first humidity level L0, a humidity value corresponding to the second humidity level L1, a humidity value corresponding to the third humidity level L2, a humidity value corresponding to the fourth humidity level L3 and a humidity value corresponding to the drying humidity level L4 meet the following requirements: the humidity value corresponding to the first humidity level > the humidity value corresponding to the second humidity level > the humidity value corresponding to the third humidity level > the humidity value corresponding to the fourth humidity level > the humidity value corresponding to the drying humidity level.

[0092] In this implementation, after it is determined that the humidity value of the object to be dried reaches the stable condition, the humidity value of the object to be dried is detected. When each of a plurality of humidity values which are detected multiple times in a preset maintain duration is less than the humidity value corresponding to the next humidity level, it is determined that the humidity value of the object to be dried meets the level update condition. Otherwise, when the above requirement is not met, it is determined that the humidity value of the object to be dried does not meet the level update condition.

[0093] Here, the maintain duration may be set to be any value ranging between 20 and 200 seconds.

[0094] In the first implementation, the humidity value of the object to be dried is detected one time. In the second implementation, the humidity value of the object to be dried is detected multiple times in a duration for which the humidity value of the object to be dried is maintained to be less than the humidity value corresponding to the next humidity level. In this way, the second implementation further ensures that when the humidity value of the object to be dried is stable and is maintained to be less than the humidity value corresponding to the next humidity level, the remaining drying duration displayed on the display panel is updated according to the humidity level of the object to be dried. Therefore, compared with the first implementation, the second implementation may further reduce the error between the acquired humidity value and the actual humidity value of the object to be dried, to ensure that the expected drying effect is achieved.

[0095] In some embodiments, after the above operation S105, the method for controlling laundry drying may further include the following operations.

[0096] At S106, in a case that determining that the updated humidity level is a drying humidity level, the drying process is ended, and a heating device of the laundry treatment apparatus is controlled to stop heating.

[0097] In a case that the updated humidity level is the drying humidity level L4, the laundry to be dried has been dried off. At this time, the drying process is ended, and the heating device is controlled to stop heating.

[0098] At S107, a cooling process is entered, and a cooling device of the laundry treatment apparatus is controlled to start working.

[0099] After the heating device stops heating, the temperature of the laundry that has been dried off in the laundry washer-dryer is relatively high. In order to decrease the temperature of the laundry that has been dried off and prevent the higher temperature of the laundry that has been dried off from damaging the skin of the user after the door is opened, the laundry treatment apparatus is controlled to enter the cooling process after the drying process is ended.

[0100] Here, the cooling device may be a fan. Cold air is fed into the tub of the laundry washer-dryer through the fan, and passes through the laundry with the higher temperature that has been dried off to take away the heat. The above operations are repeated to allow the heat of the laundry that has been dried off to be taken away, to achieve the purpose of cooling the laundry that has been dried off.

[0101] At S108, the display panel is controlled to display a remaining cooling duration.

[0102] Here, the remaining cooling duration is determined according to a preset cooling working duration and a cooled duration (the cooled duration refers to a duration for which the object that has been dried off has been cooled).

[0103] In actual implementation, a difference between the preset cooling working duration and the cooled duration is determined as the remaining cooling duration.

[0104] At S109, in a case that the remaining cooling duration reaches a preset duration, the cooling device is controlled to stop working.

[0105] Here, the preset duration may be set to be 0. That is, after the cooling device is controlled to work for a fixed cooling working duration, the cooling process is ended, and the cooling device is controlled to stop working.

[0106] In another implementation, the operation S109 may be replaced with operation S 109'. At S 109', the cooling device is controlled to stop working in a case that the temperature in the laundry treatment apparatus is less than a preset temperature.

[0107] In this implementation, a working duration of the cooling device is non-fixed. When there are fewer laundries that have been dried off, the temperature in the laundry washer-dryer decreases rapidly, to allow the working duration of the cooling device to be shortened

by adopting this implementation. When there are more laundries that have been dried off, the temperature in the laundry washer-dryer decreases slowly, to ensure that the temperature of the laundry that has been dried off will not damage the user after the cooling process is ended by adopting this implementation. The cooling device is controlled to stop working according to the temperature in the tub, which allows the cooling device to be controlled more flexibly, and ensures that the temperature of the laundry that has been dried off will not damage the user.

[0108] FIG. 2 is another schematic flowchart of a method for controlling laundry drying according to an embodiment of the application, which is applied to a laundry treatment apparatus. As shown in FIG. 2, the method for controlling laundry drying according to the embodiment of the application includes the following operations.

[0109] At S201, a drying process is entered, and a heating device of the laundry treatment apparatus is controlled to start heating.

[0110] At S202, a humidity level of an object to be dried is initialized into a first humidity level.

[0111] At S203, a display panel of the laundry treatment apparatus is controlled to display a first remaining drying duration.

[0112] Here, the first remaining drying duration is determined according to a first working duration corresponding to the first humidity level, and a first dried duration (the first dried duration refers to a duration for which the object to be dried has been dried at the first humidity level) at the first humidity level.

[0113] At S204, a current dried duration (the current dried duration refers to a duration for which the object to be dried has been dried at a current humidity level) at a current humidity level is acquired.

[0114] At S205, it is determined whether the current dried duration reaches a stabilization duration corresponding to the current humidity level.

[0115] In a case that the current dried duration reaches the stabilization duration corresponding to the current humidity level, which indicates that a difference of the humidity values of the objects to be dried located in different positions in the laundry treatment apparatus is small, operation S206 is entered. In a case that the current dried duration does not reach the stabilization duration corresponding to the current humidity level, which indicates that a difference of the humidity values of the objects to be dried located in different positions in the laundry treatment apparatus is still greater, the operation S204 is returned to reacquire a new current dried duration.

[0116] In some embodiments, the above operation S204 and the above operation S205 may be replaced with operation S204' to operation S206'.

[0117] At S204', a plurality of humidity values detected at the current humidity level are acquired.

[0118] At S205', a difference between a maximum humidity value and a minimum humidity value among the plurality of humidity values is calculated.

[0119] At S206', it is determined whether the difference is less than a difference threshold corresponding to the current humidity level.

[0120] In a case that the difference is less than the difference threshold corresponding to the current humidity level, which indicates that a difference of the humidity values of the objects to be dried located in different positions in the laundry treatment apparatus is small, the operation S206 is entered. In a case that the difference is greater than or equal to the difference threshold corresponding to the current humidity level, which indicates that a difference of the humidity values of the objects to be dried located in different positions in the laundry treatment apparatus is still greater, the operation S204' is returned to redetect a plurality of humidity values.

[0121] At S206, it is determined that the humidity value of the object to be dried reaches the stable condition.

[0122] The humidity value of the object to be dried is acquired after it is determined that a current humidity value is stable, which may avoid a greater error between the acquired humidity value and the actual humidity value of the object to be dried caused by the instability of humidity value, reduce the possibility that the acquired humidity value is inconsistent with the actual humidity value, and improve the accuracy of the acquired humidity value, thereby ensuring that the expected drying effect is achieved.

[0123] At S207, the humidity value of the object to be dried is acquired.

[0124] The humidity value acquired at this operation is a stable humidity value, that is, the difference between the acquired humidity value and the actual humidity value of the object to be dried is within the error range.

[0125] At S208, it is determined whether the humidity value of the object to be dried is less than a humidity value corresponding to the next humidity level.

[0126] In a case that the humidity value of the object to be dried is less than the humidity value corresponding to the next humidity level, which indicates that the humidity value of the object to be dried has been brought to the humidity value corresponding to the next humidity level, operation S209 is entered. In a case that the humidity value of the object to be dried is greater than or equal to the humidity value corresponding to the next humidity level, the drying is continued, and then the operation S207 is returned to reacquire a new humidity value.

[0127] In some embodiments, after the above operation S208, the method for controlling laundry drying may further include operation S08. At S08, it is determined whether a duration for which the humidity value of the object to be dried is maintained to be less than the humidity value corresponding to the next humidity level reaches a maintain duration corresponding to the current humidity level. In a case that the duration for which the humidity value of the object to be dried is maintained to be less than the humidity value corresponding to the next humidity level reaches the maintain duration corresponding to the current humidity level, which indicates that the

humidity value of the object to be dried has been brought to the humidity value corresponding to the next humidity level, the operation S209 is entered. In a case that the duration for which the humidity value of the object to be dried is maintained to be less than the humidity value corresponding to the next humidity level does not reach the maintain duration corresponding to the current humidity level, the drying is continued, and then the operation S207 is returned to reacquire a new humidity value.

[0128] At S209, it is determined that the humidity value of the object to be dried meets a level update condition.

[0129] At S210, the humidity level of the object to be dried is updated to a next humidity level of the current humidity level.

[0130] At S211, the display panel is controlled to display a second remaining drying duration.

[0131] Here, the second remaining drying duration is determined according to a second working duration corresponding to the next humidity level, and a second dried duration (the second dried duration refers to a duration for which the object to be dried has been dried at the next humidity level) at the next humidity level. Herein, the second remaining drying duration is less than the first remaining drying duration.

[0132] At S212, it is determined whether the updated humidity level is a drying humidity level.

[0133] In a case that the next humidity level is not the drying humidity level, which indicates that the object to be dried has not been dried off, the operation S204 is entered. In a case that the next humidity level is the drying humidity level, which indicates that the object to be dried has been dried off, operation S213 is entered.

[0134] At S213, the drying process is ended, and the heating device of the laundry treatment apparatus is controlled to stop heating.

[0135] At S214, a cooling process is entered, and a cooling device of the laundry treatment apparatus is controlled to start working.

[0136] At S215, the display panel is controlled to display a remaining cooling duration.

[0137] Here, the remaining cooling duration is determined according to a preset cooling working duration and a cooled duration (the cooled duration refers to a duration for which the object that has been dried off has been cooled).

[0138] At S216, it is determined whether the remaining cooling duration reaches a preset duration.

[0139] In a case that the remaining cooling duration reaches the preset duration, which indicates that the temperature of the object that has been dried off has been decreased to a safe value which does not damage the user, operation S217 is entered. In a case that the remaining cooling duration does not reach the preset duration, which indicates that the temperature of object that has been dried off is still higher, the operation S216 is continued.

[0140] In some embodiments, the operation S216 may be replaced with operation S216'. At S216', it is determined whether a temperature in the laundry treatment apparatus is less than a preset temperature.

[0141] In a case that the temperature in the laundry treatment apparatus is less than the preset temperature, which indicates that the temperature of object that has been dried off has been decreased to a safe value which does not damage the user, the operation S217 is entered. In a case that the temperature in the laundry treatment apparatus is greater than or equal to the preset temperature, which indicates that the temperature of object that has been dried off is still higher, the operation S216' is continued.

[0142] At S217, the cooling device is controlled to stop working.

[0143] In the method for controlling laundry drying according to the embodiment of the application, after the laundry treatment apparatus enters the drying process, the heating device of the laundry treatment apparatus is controlled to start heating, and the humidity level of the object to be dried is initialized into the first humidity level. The display panel of the laundry treatment apparatus is controlled to display the first remaining drying duration. The current dried duration at the current humidity level is acquired. In a case that the current dried duration reaches the stabilization duration corresponding to the current humidity level, it is determined that the humidity value of the object to be dried reaches the stable condition. The humidity value of the object to be dried is acquired. In a case that the humidity value of the object to be dried is less than the humidity value corresponding to the next humidity level, and the duration for which the humidity value of the object to be dried is maintained to be less than the humidity value corresponding to the next humidity level reaches a maintain duration corresponding to the current humidity level, it is determined that the humidity value meets a level update condition. At this time, the humidity level of the object to be dried is updated to a next humidity level of the current humidity level, and the display panel is controlled to display the second remaining drying duration. In this way, after the humidity value of the object to be dried is stable, and in a case that the humidity value meets the level update condition, the remaining drying duration displayed on the display panel is updated according to the humidity level of the object to be dried, which may not only reduce the error between the acquired humidity value and the actual humidity value of the object to be dried, but also gradually update the remaining drying duration according to the humidity level of the object to be dried, to ensure that the expected drying effect is achieved. The above operations are repeated until the next humidity level is the drying humidity level. In a case that the next humidity level is the drying humidity level, the heating device is controlled to stop heating, the cooling process is entered, the cooling device of the laundry treatment apparatus is controlled to start working, and the display panel is controlled to display the remaining cooling duration. In a case that the remaining cooling duration reaches the preset dura-

tion, the cooling device is controlled to stop working, which may ensure that the temperature of the laundry that has been dried off has been decreased to the safe value and the laundry that has been dried off does not damage the user when the laundry that has been dried off is taken out.

[0144] Hereinafter, an exemplary application of the embodiment of the application in a practical application scenario will be described.

[0145] At present, with the increasing development of technology, life becomes more convenient and efficient due to the progress of technology, and more and more people begin to realize the importance of the laundry dryer. As the number of users of the laundry dryer increases, the disadvantages of the laundry dryer are exposed more and more.

[0146] In the related art, when the laundries to be dried are few or dry, the laundry dryer determines the humidity level of the laundry to be dried while determining whether the laundry to be dried has been dried off. The laundry dryer mistakenly determines that the laundries which have not been dried off yet have been dried off due to chemical fiber of the laundries to be dried, and the remaining duration displayed on the laundry dryer jumps directly to 0, resulting in poor drying effect of the laundries made of chemical fiber. In addition, the remaining duration displayed on the laundry dryer jumps too fast, resulting in poor use experience.

[0147] In order to solve this problem, an embodiment of the application provides an improved method for drying the laundry made of chemical fiber, which may effectively avoid the occurrence of the above problem and provide the user with a good drying experience.

[0148] FIG. 3 is yet another schematic flowchart of a method for controlling laundry drying according to an embodiment of the application, which is applied to a laundry treatment apparatus, such as a laundry washer-dryer. As shown in FIG. 3, the method for controlling laundry drying according to the embodiment of the application includes the following operations.

[0149] At S301, a drying process is entered.

[0150] At S302, a humidity level is initialized into L0.

[0151] Here, L0 represents a maximum humidity of the load (corresponding to the above object to be dried).

[0152] At S303, an initial timing time T is initialized into 0.

[0153] At S304, it is determined whether the timing time T reaches T1.

[0154] Here, T1 is a first stabilization duration for the humidity value. In a case that T is greater than or equal to T1, which indicates that a humidity value of the laundry to be dried is stable, operation S305 is entered. In a case that T is less than T1, the operation S304 is returned to perform the determination.

[0155] At S305, a humidity value HUM during operation is acquired.

[0156] Here, the HUM represents a current humidity value.

[0157] At S306, it is determined whether the HUM is less than a humidity value corresponding to L1, and whether a duration for which the HUM is maintained to be less than the humidity value corresponding to L1 reaches t1.

[0158] Here, L1 represents a greater humidity of the load. In a case that the HUM is less than the humidity value corresponding to L1, and a duration for which the HUM is maintained to be less than the humidity value corresponding to L1 is greater than or equal to t1, operation S307 is entered. Otherwise, in a case that the above requirements are not met, the operation S305 is returned to reacquire a humidity value.

[0159] At S307, the humidity level is updated to L1.

[0160] At S308, the initial timing time T is initialized into 0.

[0161] At S309, it is determined whether the timing time T reaches T2.

[0162] Here, T2 is a second stabilization duration for the humidity value. In a case that T is larger than or equal to T2, which indicates that the humidity value of the laundry to be dried is stable, operation S310 is entered. In a case that T is less than T2, the operation S309 is returned to perform the determination.

[0163] At S310, the humidity value HUM during operation is acquired.

[0164] At S311, it is determined whether the HUM is less than a humidity value corresponding to L2, and whether a duration for which the HUM is maintained to be less than the humidity value corresponding to L2 reaches t2.

[0165] Here, L2 represents a general humidity of the load. In a case that the HUM is less than the humidity value corresponding to L2, and a duration for which the HUM is maintained to be less than the humidity value corresponding to L2 is larger than or equal to t2, operation S312 is entered. Otherwise, in a case that the above requirements are not met, the operation S310 is returned to reacquire a humidity value.

[0166] At S312, the humidity level is updated to L2.

[0167] At S313, the initial timing time T is initialized to 0.

[0168] At S314, it is determined whether the timing time T reaches T3.

[0169] Here, T3 is a third stabilization duration for the humidity value. In a case that T is greater than or equal to T3, which indicates that the humidity value of the laundry to be dried is stable, operation S315 is entered. In a case that T is less than T3, the operation S314 is returned to perform the determination.

[0170] At S315, the humidity value HUM during operation is acquired.

[0171] At S316, it is determined whether the HUM is less than a humidity value corresponding to L3, and whether a duration for which the HUM is maintained to be less than the humidity value corresponding to L3 reaches t3.

[0172] Here, L3 represents a drier (that is, a lower humidity) of the load. In a case that the HUM is less than

the humidity value corresponding to L3, and a duration for which the HUM is maintained to be less than the humidity value corresponding to L3 is greater than or equal to t3, operation S317 is entered. Otherwise, in a case that the above requirements are not met, the operation S315 is returned to reacquire a humidity value.

[0173] At S317, the humidity level is updated to L3.

[0174] At S318, the initial timing time T is initialized to 0.

[0175] At S319, it is determined whether the timing time T reaches T4.

[0176] Here, T4 is a fourth stabilization duration for the humidity value. In a case that T is greater than or equal to T4, which indicates that the humidity value of the laundry to be dried is stable, operation S320 is entered. In a case that T is less than T4, the operation S319 is returned to perform the determination.

[0177] At S320, the humidity value HUM during operation is acquired.

[0178] At S321, it is determined whether the HUM is less than a humidity value corresponding to L4, and whether a duration for which the HUM is maintained to be less than the humidity value corresponding to L4 reaches t4.

[0179] Here, L4 represents a driest (that is, a minimum humidity) of the load. In a case that the HUM is less than the humidity value corresponding to L4, and a duration for which the HUM is maintained to be less than the humidity value corresponding to L4 is greater than or equal to t4, operation S322 is entered. Otherwise, in a case that the above requirements are not met, the operation S320 is returned to reacquire a humidity value.

[0180] At S322, the humidity level is updated to L4.

[0181] At S323, the drying process is ended.

[0182] Herein, L0 represents the maximum humidity of the load, and L4 represents the minimum humidity of the load. The timing time T is a time for stabilizing the humidity value. T1 to T4 may be set to range from 100 to 180 seconds. t1 to t4 is a time in which the humidity value is maintained, which may be set to range from 20 to 200 seconds. In the related art, the laundry dryer determines the humidity level of the laundry made of chemical fiber while determining whether the laundry made of chemical fiber has been dried off. When the laundries made of chemical fiber are few or dry, the laundry dryer jumps directly to L4 to determine that the laundry made of chemical fiber has been dried off, and the display time also jumps in one step. In the improved embodiment of the application, the humidity level may be determined sequentially according to the order from L1 to L4, and the display time may sequentially jump from more time to less time in four stages. The improved embodiment of the application not only prevents the laundry dryer from mistakenly determining that the laundry made of chemical fiber has been dried off, but also provides the user with a good drying experience. The embodiment of the application may reduce the probability of mistaken determination of the laundry made of chemical fiber and improve the satisfaction of the user's use experience by sequentially determining the humidity level of the laundry made of chemical fiber.

[0183] Based on the above embodiments, an embodiment of the application provides a control device for laundry drying. Modules included in the device and units included in the modules may be implemented by a processor in a computer device, and certainly may also be implemented by a specific logic circuit. In the implementation, the processor may be a central processing unit (CPU), a microprocessor unit (MPU), a digital signal processing (DSP) or a field programmable gate array (FPGA), etc.

[0184] FIG. 4 is a structural schematic diagram of a control device for laundry drying according to an embodiment of the application, which is applied to a laundry treatment apparatus, such as a laundry washer-dryer. As shown in FIG. 4, the control device for laundry drying 400 includes an initialization module 401, a first control module 402 and an updating module 403.

[0185] The initialization module 401 is configured to enter a drying process and initialize a humidity level of an object to be dried into a first humidity level.

[0186] The first control module 402 is configured to control a display panel of the laundry treatment apparatus to display a first remaining drying duration, the first remaining drying duration being determined according to a first working duration corresponding to the first humidity level, and a first dried duration (the first dried duration refers to a duration for which the object to be dried has been dried at the first humidity level) at the first humidity level.

[0187] The updating module 403 is configured to determine that a humidity value of the object to be dried reaches a stable condition, and in a case that the humidity value meets a level update condition, to update the humidity level of the object to be dried to a next humidity level of a current humidity level.

[0188] The first control module 402 is further configured to control the display panel to display a second remaining drying duration, where the second remaining drying duration is determined according to a second working duration corresponding to the next humidity level, and a second dried duration (the second dried duration refers to a duration for which the object to be dried has been dried at the next humidity level) at the next humidity level. The second remaining drying duration is less than the first remaining drying duration.

[0189] In some embodiments, the control device for laundry drying 400 may further include a first acquisition module and a first determining module.

[0190] The first acquisition module is configured to acquire a current dried duration (the current dried duration refers to a duration for which the object to be dried has been dried at the current humidity level) at the current humidity level.

[0191] The first determining module is configured to determine that the humidity value of the object to be dried reaches the stable condition in a case that the current

dried duration reaches a stabilization duration corresponding to the current humidity level.

[0192] In some embodiments, the control device for laundry drying 400 may further include a second acquisition module, a calculation module and a second determining module.

[0193] The second acquisition module is configured to acquire a plurality of humidity values detected at the current humidity level.

[0194] The calculation module is configured to calculate a difference between a maximum humidity value and a minimum humidity value among the plurality of humidity values.

[0195] The second determining module is configured to determine that the humidity value of the object to be dried reaches the stable condition in a case that the difference is less than a difference threshold corresponding to the current humidity level.

[0196] In some embodiments, the control device for laundry drying 400 may further include a third acquisition module and a third determining module.

[0197] The third acquisition module is configured to acquire the humidity value of the object to be dried.

[0198] The third determining module is configured to determine that the humidity value of the object to be dried meets the level update condition in a case that the humidity value of the object to be dried is less than a humidity value corresponding to the next humidity level.

[0199] In some embodiments, the control device for laundry drying 400 may further include a fourth acquisition module and a fourth determining module.

[0200] The fourth acquisition module is configured to acquire the humidity value of the object to be dried.

[0201] The fourth determining module is configured to determine that the humidity value of the object to be dried meets the level update condition in a case that the humidity value of the object to be dried is less than a humidity value corresponding to the next humidity level and a duration for which the humidity value of the object to be dried is maintained to be less than the humidity value corresponding to the next humidity level reaches a maintain duration corresponding to the current humidity level.

[0202] In some embodiments, the control device for laundry drying 400 may further include a second control module, a third control module, a fourth control module and a fifth control module.

[0203] The second control module is configured to end the drying process and control a heating device of the laundry treatment apparatus to stop heating in a case that the updated humidity level is a drying humidity level.

[0204] The third control module is configured to enter a cooling process and control a cooling device of the laundry treatment apparatus to start working.

[0205] The fourth control module is configured to control the display panel to display a remaining cooling duration, where the remaining cooling duration is determined according to a preset cooling working duration and a cooled duration (the cooled duration refers to a duration for which the object that has been dried off has been cooled).

[0206] The fifth control module is configured to control the cooling device to stop working in a case that the remaining cooling duration reaches a preset duration.

[0207] In some embodiments, the humidity level of the object to be dried includes the first humidity level, a second humidity level, a third humidity level, a fourth humidity level and a drying humidity level.

[0208] The first working duration corresponding to the first humidity level, the second working duration corresponding to the second humidity level, a third working duration corresponding to the third humidity level, a fourth working duration corresponding to the fourth humidity level and a fifth working duration corresponding to the drying humidity level meet following requirements: the first working duration corresponding to the first humidity level > the second working duration corresponding to the second humidity level > the third working duration corresponding to the third humidity level > the fourth working duration corresponding to the fourth humidity level > the fifth working duration corresponding to the drying humidity level.

[0209] A humidity value corresponding to the first humidity level, a humidity value corresponding to the second humidity level, a humidity value corresponding to the third humidity level, a humidity value corresponding to the fourth humidity level and a humidity value corresponding to the drying humidity level meet the following requirements: the humidity value corresponding to the first humidity level > the humidity value corresponding to the second humidity level > the humidity value corresponding to the third humidity level > the humidity value corresponding to the fourth humidity level > the humidity value corresponding to the drying humidity level.

[0210] It should be pointed out that the above description of the embodiment of the control device for laundry drying is similar to the above description of the embodiment of the method for controlling laundry drying, and has the same beneficial effect as the above description of the embodiment of the method for controlling laundry drying. Technical details not disclosed in the embodiment of the control device for laundry drying of the application will be understood by those skilled in the art with reference to the description of the embodiment of the method for controlling laundry drying of the application.

[0211] It should be noted that in the embodiment of the application, when being implemented in form of software function module and sold or used as an independent product, the above method for controlling laundry drying may also be stored in a computer-readable storage medium. Based on such an understanding, the technical solutions of the embodiments of the application in essence or parts of the technical solutions of the embodiments of the application which contribute to the conventional art may be embodied in form of software product, and the computer software product is stored in a storage medium, including a plurality of instructions configured

to enable a piece of computer equipment (which may be a personal computer, a server, network equipment or the like) to execute all or part of the method in each embodiment of the application. The abovementioned storage medium includes various media for storing program codes, such as U disk, mobile hard disk, a read only memory (ROM), a magnetic disk or an optical disk. Therefore, embodiments of the application are not limited to any particular combination of hardware and software.

[0212] Accordingly, the embodiment of the application provides a computer-readable storage medium having stored thereon computer programs that, when executed by a processor, perform operations of the method for controlling laundry drying according to the above embodiments.

[0213] The embodiment of the application provides a laundry treatment apparatus, such as a laundry washer-dryer. FIG. 5 is a structural schematic diagram of a laundry treatment apparatus according to an embodiment of the application. Other exemplary structures of the laundry treatment apparatus 500 may be anticipated according to the exemplary structure of the laundry treatment apparatus 500 shown in FIG. 5. Therefore, the structure described herein should not be considered as a limitation, for example, some of the components described below may be omitted, or components not described below may be added to meet the special requirements of certain applications.

[0214] The laundry treatment apparatus 500 shown in FIG. 5 includes a processor 501, at least one communication bus 502, a user interface 503, at least one external communication interface 504 and a memory 505. Herein, the communication bus 502 is configured to implement connection and communication between these components. Herein, the user interface 503 may include a display panel 5031, and the external communication interface 504 may include a standard wired interface and wireless interface. Herein, the processor 501 is configured to execute programs of the method for controlling laundry drying stored in the memory, to perform operations of the method for controlling laundry drying according to the above embodiments.

[0215] The above description of the embodiments of the control device for laundry drying and the storage medium is similar to the above description of the embodiment of the method for controlling laundry drying, and has the same beneficial effect as the above description of the embodiment of the method for controlling laundry drying. Technical details not disclosed in the embodiments of the control device for laundry drying and the storage medium of the application will be understood with reference to the description of the embodiment of the method for controlling laundry drying of the application.

[0216] It is to be understood that "one embodiment/some embodiments" or "an embodiment" mentioned in the whole description means that specific features, structures or characteristics related to the embodiment are included in at least one embodiment of the application. Therefore, "in one embodiment/in some embodiments" or "in an embodiment" used in the whole description does not always refer to the same embodiment. In addition, these specific features, structures or characteristics may be combined in any appropriate manner in one or more embodiments. It is to be understood that in each embodiment of the application, a magnitude of a sequence number of each process does not represent an execution sequence, and the execution sequence of each process should be determined by its function and an internal logic and should not form any limitation to an implementation process of the embodiments of the application. The sequence numbers of the embodiments of the application are adopted for description only and do not represent the advantages and disadvantages of the embodiments.

[0217] It should be noted that herein, the terms "including", "include" or any other variation thereof are intended to encompass non-exclusive inclusion, so that a process, a method, an object or a device that includes a set of elements includes not only those elements but also other elements that are not explicitly listed, or also includes elements inherent to such the process, the method, the object or the device. In the absence of further limitations, an element defined by the phrase "includes a ..." does not preclude the existence of another identical element in the process, the method, the object or the device that includes the element.

[0218] It is to be understood that the device and method disclosed in some embodiments provided by the application may be implemented in other manners. For example, the device embodiment described above is only schematic, and for example, division of the units is only logic function division, and other division manners may be adopted during practical implementation. For example, multiple units or components may be combined or integrated into another system, or some characteristics may be neglected or not executed. In addition, coupling or direct coupling or communication connection between various displayed or discussed components may be indirect coupling or communication connection, implemented through some interfaces, of the devices or the units, and may be electrical and mechanical or adopt other forms.

[0219] The units described as separate parts may or may not be physically separated from each other, and parts displayed as units may or may not be physical units, and may be located in the same place, or may also be distributed to multiple network units. Part or all of the units may be selected to achieve the purpose of the solutions of the embodiments according to practical requirements.

[0220] In addition, the functional units in the embodiments of the application may be integrated into a processing unit, or each functional unit may also serve as a single unit independently, or two or more than two functional units may also be integrated into a unit. The abovementioned integrated unit may be implemented either in the form of hardware or in the form of hardware and software

functional unit.

[0221] Those skilled in the art should know that all or part of the operations of the abovementioned method embodiment may be implemented by instructing related hardware through programs. The abovementioned programs may be stored in a computer-readable storage medium, and the programs are executed to execute the operations of the abovementioned method embodiment. The abovementioned storage medium includes various media for storing program codes, such as U disk, mobile hard disk, ROM, a magnetic disk or an optical disk.

[0222] Or, when being implemented in form of software function module and sold or used as an independent product, the integrated unit of the application may also be stored in a computer-readable storage medium. Based on such an understanding, the technical solutions of the embodiments of the application in essence or parts of the technical solutions of the embodiments of the application which contribute to the conventional art may be embodied in form of software product, and the computer software product is stored in a storage medium, including a plurality of instructions configured to enable a product to execute all or part of the method in each embodiment of the application. The abovementioned storage medium includes various media for storing program codes, such as mobile storage equipment, a ROM, a magnetic disk or an optical disk.

[0223] The above are only the specific embodiments of the application and not intended to limit the scope of protection of the application. Any variations or replacements apparent to those skilled in the art within the technical scope disclosed by the application shall fall within the scope of protection of the application. Therefore, the scope of protection of the application shall be subject to the scope of protection of the claims.

INDUSTRIAL APPLICABILITY

[0224] The embodiments of the application provide a method for controlling laundry drying, a control device for laundry drying, a laundry treatment apparatus and a storage medium. The method includes the following operations. A drying process is entered, and a humidity level of an object to be dried is initialized into a first humidity level. A display panel is controlled to display a first remaining drying duration, the first remaining drying duration being determined according to a first working duration corresponding to the first humidity level, and a first dried duration at the first humidity level. It is determined that a humidity value of the object to be dried reaches a stable condition, and in a case that the humidity value meets a level update condition, the humidity level of the object to be dried is updated to a next humidity level of a current humidity level. The display panel is controlled to display a second remaining drying duration, the second remaining drying duration being determined according to a second working duration corresponding to the next humidity level, and a second dried duration at the next humidity level. In this way, an error between the acquired humidity value and an actual humidity value of the object to be dried may be reduced, and the remaining drying duration is gradually updated according to the humidity level of the object to be dried, to ensure that the expected drying effect is achieved.

Claims

1. A method for controlling laundry drying, applied to a laundry treatment apparatus, comprising: entering a drying process, and initializing a humidity level of an object to be dried into a first humidity level; controlling a display panel of the laundry treatment apparatus to display a first remaining drying duration, the first remaining drying duration being determined according to a first working duration corresponding to the first humidity level, and a first dried duration at the first humidity level; determining that a humidity value of the object to be dried reaches a stable condition, and in a case that the humidity value meets a level update condition, updating the humidity level of the object to be dried to a next humidity level of a current humidity level; and controlling the display panel to display a second remaining drying duration, the second remaining drying duration being determined according to a second working duration corresponding to the next humidity level, and a second dried duration at the next humidity level, wherein the second remaining drying duration is less than the first remaining drying duration.

2. The method of claim 1, further comprising: acquiring a current dried duration at the current humidity level; and in a case that the current dried duration reaches a stabilization duration corresponding to the current humidity level, determining that the humidity value of the object to be dried reaches the stable condition.

3. The method of claim 1, further comprising: acquiring a plurality of humidity values detected at the current humidity level; calculating a difference between a maximum humidity value and a minimum humidity value among the plurality of humidity values; and in a case that the difference is less than a difference threshold corresponding to the current humidity level, determining that the humidity value of the object to be dried reaches the stable condition.

4. The method of claim 1, further comprising: acquiring the humidity value of the object to be dried; and in a case that the humidity value of the object to be dried is less than a humidity value corresponding to the next humidity level, determining that the humidity value of the object to be dried meets the level update condition.

5. The method of claim 1, further comprising: acquiring the humidity value of the object to be dried; and in a case that the humidity value of the object to be dried is less than a humidity value corresponding to the next humidity level and a duration for which the humidity value of the object to be dried is maintained to be less than the humidity value corresponding to the next humidity level reaches a maintain duration corresponding to the current humidity level, determining that the humidity value of the object to be dried meets the level update condition.

6. The method of claim 1, further comprising: in a case that determining that the updated humidity level is a drying humidity level, ending the drying process, and controlling a heating device of the laundry treatment apparatus to stop heating; entering a cooling process, and controlling a cooling device of the laundry treatment apparatus to start working; controlling the display panel to display a remaining cooling duration, the remaining cooling duration being determined according to a preset cooling working duration and a cooled duration; and in a case that the remaining cooling duration reaches a preset duration, controlling the cooling device to stop working.

7. The method of any one of claims 1 to 6, wherein the humidity level of the object to be dried comprises the first humidity level, a second humidity level, a third humidity level, a fourth humidity level and a drying humidity level, the first working duration corresponding to the first humidity level, the second working duration corresponding to the second humidity level, a third working duration corresponding to the third humidity level, a fourth working duration corresponding to the fourth humidity level and a fifth working duration corresponding to the drying humidity level meet following requirements: the first working duration corresponding to the first humidity level > the second working duration corresponding to the second humidity level > the third working duration corresponding to the third humidity level > the fourth working duration corresponding to the fourth humidity level > the fifth working duration corresponding to the drying humidity level, a humidity value corresponding to the first humidity level, a humidity value corresponding to the second humidity level, a humidity value corresponding to the third humidity level, a humidity value corresponding to the fourth humidity level and a humidity value corresponding to the drying humidity level meet following requirements: the humidity value corresponding to the first humidity level > the humidity value corresponding to the second humidity level > the humidity value corresponding to the third humidity level > the humidity value corresponding to the fourth humidity level > the humidity value corresponding to the drying humidity level.

8. A control device for laundry drying, applied to a laundry treatment apparatus, comprising: an initialization module, configured to enter a drying process and initialize a humidity level of an object to be dried into a first humidity level; a first control module, configured to control a display panel of the laundry treatment apparatus to display a first remaining drying duration, the first remaining drying duration being determined according to a first working duration corresponding to the first humidity level, and a first dried duration at the first humidity level; and an updating module, configured to determine that a humidity value of the object to be dried reaches a stable condition, and in a case that the humidity value meets a level update condition, to update the humidity level of the object to be dried to a next humidity level of a current humidity level, wherein the first control module is further configured to control the display panel to display a second remaining drying duration, the second remaining drying duration being determined according to a second working duration corresponding to the next humidity level, and a second dried duration at the next humidity level, wherein the second remaining drying duration is less than the first remaining drying duration.

9. A laundry treatment apparatus, comprising: a processor; and a memory, configured to store computer programs executable on the processor, wherein the computer programs, when executed by the processor, perform operations of the method for controlling laundry drying according to any one of claims 1 to 7.

10. A storage medium having stored thereon computer-executable instructions that are configured to perform operations of the method for controlling laundry drying according to any one of claims 1 to 7.

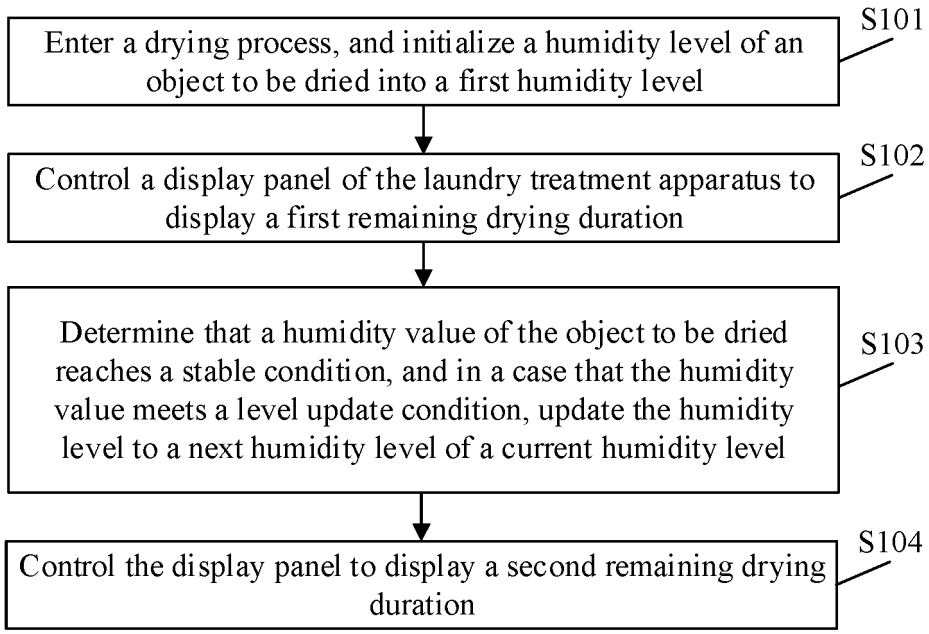
Enter a drying process, and initialize a humidity level of an object to be dried into a first humidity level
S101
Control a display panel of the laundry treatment apparatus to display a first remaining drying duration
S102
Determine that a humidity value of the object to be dried reaches a stable condition, and in a case that the humidity value meets a level update condition, update the humidity level to a next humidity level of a current humidity level
S103
Control the display panel to display a second remaining drying duration
S104

FIG. 1

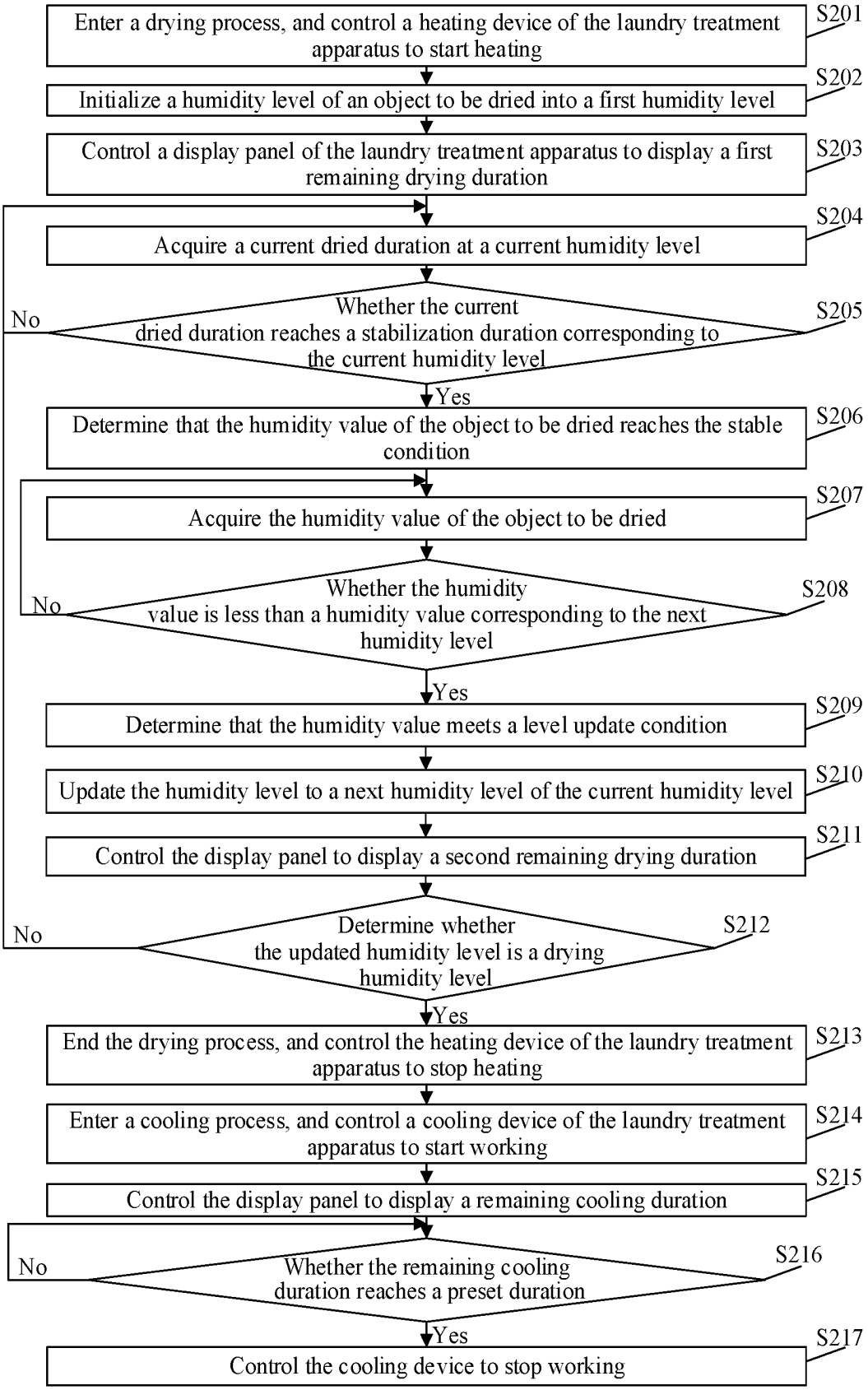
Enter a drying process, and control a heating device of the laundry treatment apparatus to start heating
S201
Initialize a humidity level of an object to be dried into a first humidity level
S202
Control a display panel of the laundry treatment apparatus to display a first remaining drying duration
S203
Acquire a current dried duration at a current humidity level
S204
Whether the current dried duration reaches a stabilization duration corresponding to the current humidity level
S205
No
Yes
Determine that the humidity value of the object to be dried reaches the stable condition
S206
Acquire the humidity value of the object to be dried
S207
Whether the humidity value is less than a humidity value corresponding to the next humidity level
S208
No
Yes
Determine that the humidity value meets a level update condition
S209
Update the humidity level to a next humidity level of the current humidity level
S210
Control the display panel to display a second remaining drying duration
S211
Determine whether the updated humidity level is a drying humidity level
S212
No
Yes
End the drying process, and control the heating device of the laundry treatment apparatus to stop heating
S213
Enter a cooling process, and control a cooling device of the laundry treatment apparatus to start working
S214
Control the display panel to display a remaining cooling duration
S215
Whether the remaining cooling duration reaches a preset duration
S216
No
Yes
Control the cooling device to stop working
S217

FIG. 2

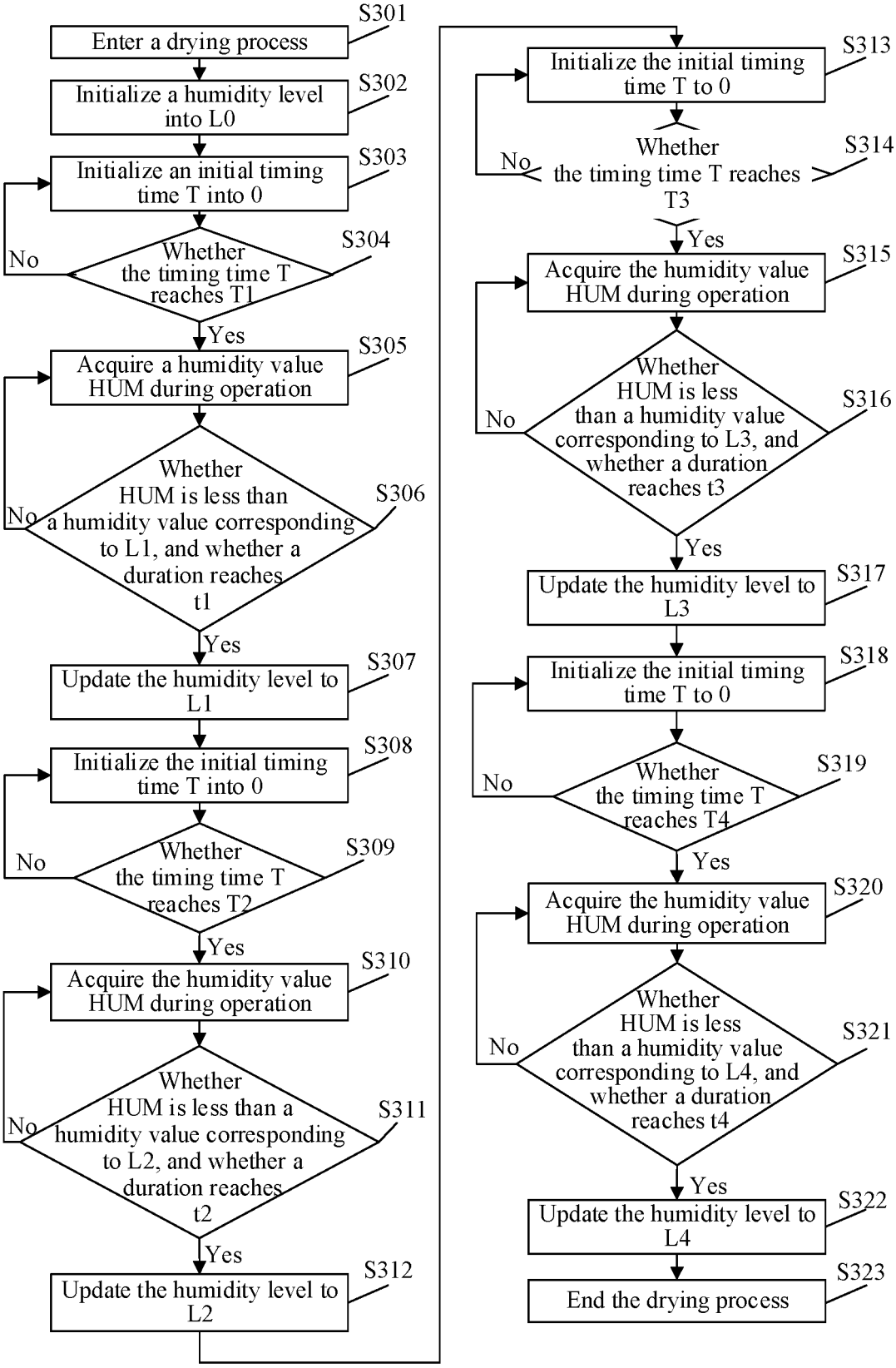
S301
Enter a drying process
S302
Initialize a humidity level into L0
S303
Initialize an initial timing time T into 0
S304
Whether the timing time T reaches T1
No
Yes
S305
Acquire a humidity value HUM during operation
S306
Whether HUM is less than a humidity value corresponding to L1, and whether a duration reaches t1
No
Yes
S307
Update the humidity level to L1
S308
Initialize the initial timing time T into 0
S309
Whether the timing time T reaches T2
No
Yes
S310
Acquire the humidity value HUM during operation
S311
Whether HUM is less than a humidity value corresponding to L2, and whether a duration reaches t2
No
Yes
S312
Update the humidity level to L2
S313
Initialize the initial timing time T to 0
S314
Whether the timing time T reaches T3
No
Yes
S315
Acquire the humidity value HUM during operation
S316
Whether HUM is less than a humidity value corresponding to L3, and whether a duration reaches t3
No
Yes
S317
Update the humidity level to L3
S318
Initialize the initial timing time T to 0
S319
Whether the timing time T reaches T4
No
Yes
S320
Acquire the humidity value HUM during operation
S321
Whether HUM is less than a humidity value corresponding to L4, and whether a duration reaches t4
No
Yes
S322
Update the humidity level to L4
S323
End the drying process

FIG. 3

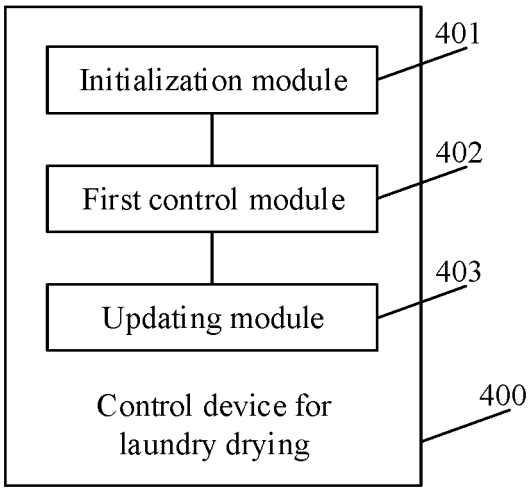
401
Initialization module
402
First control module
403
Updating module
Control device for laundry drying
400

FIG. 4

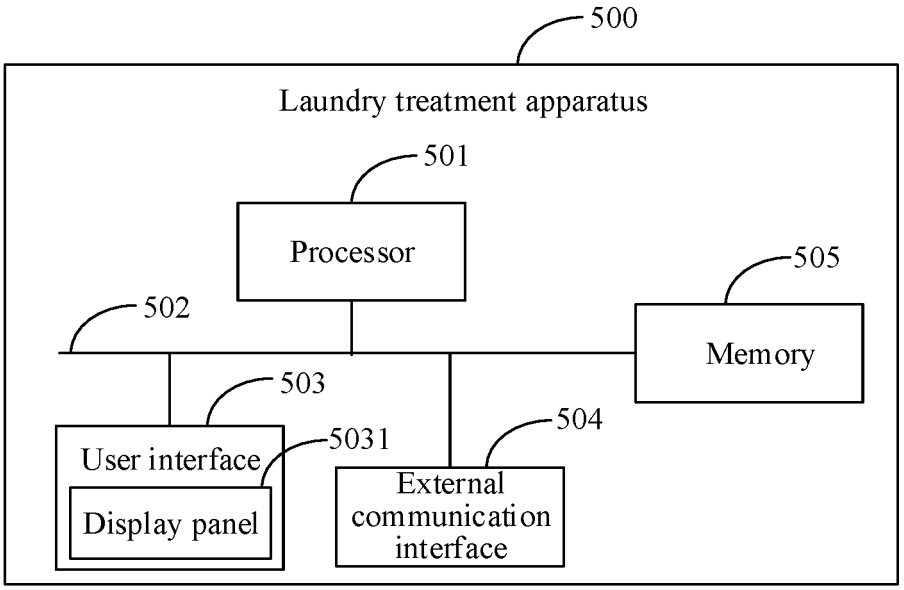
500
Laundry treatment apparatus
501
Processor
505
502
Memory
503
504
User interface
5031
Display panel
External communication interface

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/098439

A. CLASSIFICATION OF SUBJECT MATTER

D06F 58/38(2020.01)i; D06F 58/46(2020.01)i; D06F 103/08(2020.01)n; D06F 103/38(2020.01)n

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

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)

CNPAT, WPI, EPODOC, CNKI: 烘干, 干衣, 干燥, 湿度, 温度, 干燥度, 潮湿, 含水量, 等级, 级别, 时间, 时长, dry+, dried, dryness, aridity, humidity, moisture, humidness, wetness, grade, class, tim+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 112323435 A (WUXI LITTLE SWAN ELECTRICAL APPLIANCE CO., LTD.) 05 February 2021 (2021-02-05) claims 1-10, description, specific embodiments, figures 1-5	1-10
A	CN 104278503 A (HAIER GROUP CORP. et al.) 14 January 2015 (2015-01-14) description, paragraphs 44-85, and figures 1-4	1-10
A	DE 3703671 A1 (BOSCH SIEMENS HAUSGERAETE) 18 August 1988 (1988-08-18) entire document	1-10
A	CN 109539758 A (HUNAN HONGSHENGYUAN OIL TEA TECHNOLOGY CO., LTD.) 29 March 2019 (2019-03-29) entire document	1-10
A	CN 110438780 A (WUXI LITTLE SWAN ELECTRICAL APPLIANCE CO., LTD.) 12 November 2019 (2019-11-12) entire document	1-10
A	CN 110685137 A (HISENSE (SHANDONG) REFRIGERATOR CO., LTD.) 14 January 2020 (2020-01-14) entire document	1-10

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

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed
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"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
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
06 August 2021	**27 August 2021**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088** **China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2021/098439

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 111648106 A (WUXI FEILING ELECTRONIC CO., LTD.) 11 September 2020 (2020-09-11) entire document	1-10
A	CN 109957911 A (WUXI LITTLE SWAN COMPANY LIMITED) 02 July 2019 (2019-07-02) entire document	1-10
A	US 2019330792 A1 (ELECTROLUX APPLIANCES AKTIEBOLAG) 31 October 2019 (2019-10-31) entire document	1-10
A	CN 107849797 A (YOULONG ELECTRICAL IND (SHENZHEN) CO., LTD.) 27 March 2018 (2018-03-27) entire document	1-10

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2021/098439

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	112323435	A	05 February 2021	None			
CN	104278503	A	14 January 2015	CN	104278503	B	07 August 2018
DE	3703671	A1	18 August 1988	DE	3703671	C2	05 January 1995
CN	109539758	A	29 March 2019	None			
CN	110438780	A	12 November 2019	None			
CN	110685137	A	14 January 2020	None			
CN	111648106	A	11 September 2020	None			
CN	109957911	A	02 July 2019	None			
US	2019330792	A1	31 October 2019	CN	110226004	A	10 September 2019
				AU	2016434982	A1	30 May 2019
				EP	3562990	A1	06 November 2019
				BR	112019013090	A2	17 December 2019
				KR	20190096353	A	19 August 2019
				WO	2018121850	A1	05 July 2018
CN	107849797	A	27 March 2018	WO	2017197612	A1	23 November 2017
				CN	107849797	B	26 November 2019

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 202011102045 **[0001]**