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(54) CLOTHES DRYER AND CONTROL METHOD THEREFOR

(57) Disclosed are a clothes dryer and a control method therefor. The clothes dryer includes a clothes drying drum (1), where a humidity sensor (2) for detecting a humidity value of clothes is arranged at a clothes throwing port of the clothes drying drum (1); a detection apparatus (3) is further arranged in the clothes drying drum (1); and the detection apparatus (3) is arranged inside the clothes throwing port. The detection apparatus (3) is connected with a controller. The detection apparatus (3) is configured to detect an impedance value of a surrounding environment of the detection apparatus (3) at every interval of a preset time period and transmit the impedance value to the controller. The detection apparatus (3) is arranged in the clothes dryer in the present application, and is configured to detect the impedance value around the detection apparatus (3) at every interval of a preset time period. The controller respectively compares each impedance value with a preset impedance threshold, and judges the amount of clothes in the clothes drying drum (1) according to the number of the impedance values exceeding the preset impedance threshold, thereby adjusting a rotating speed of the clothes drying drum according to the amount of clothes, and solving problems that the clothes are easy to be wrinkled and the clothes drying effect is uneven in the clothes dryer in the existing art in a clothes drying process.

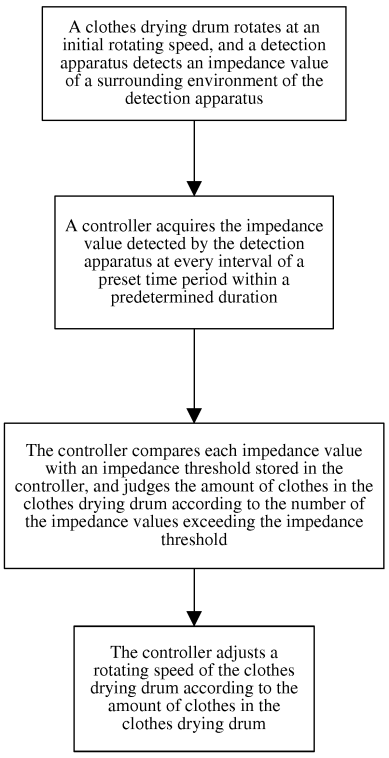

FIG. 2

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Description

TECHNICAL FIELD

[0001] The present application relates to the field of clothes drying devices, for example, relates to a clothes dryer and a control method therefor.

BACKGROUND

[0002] With the development and progress of science and technology, people use clothes dryers more and more frequently. The clothes dryers may refer to electrical appliances for evaporating and drying moisture in washed clothes in time through electric heating. The clothes dryers in relevant technologies easily have the following problems in a use process: on one hand, clothes are wrinkled, i.e., the clothes dried by the clothes dryer are easy to be wrinkled; and on the other hand, drying is uneven, i.e., the clothes dried by the clothes dryer are easy to be dried unevenly.

[0003] Therefore, a market urgently needs a clothes dryer capable of realizing good clothes drying uniformity and making the clothes dried by the clothes dryer not easy to be wrinkled, and a control method of the clothes dryer.

SUMMARY

[0004] Embodiments of the present invention provide a clothes dryer capable of realizing good clothes drying uniformity and making clothes dried by the clothes dryer not easy to be wrinkled.

[0005] Embodiments of the present invention provide the clothes dryer which can adjust a rotating speed of the clothes drying drum according to the amount of clothes in the clothes drying drum so as to solve problems that the clothes dryer dries unevenly and clothes are wrinkled seriously in an existing art.

[0006] Embodiments of the present invention further provide a control method of the clothes dryer. The control method is configured to control the above clothes dryer. The control method is used for controlling the clothes dryer so that a clothes drying effect is better.

[0007] Embodiments of the present invention adopt the following technical solution:

[0008] The clothes dryer includes a clothes drying drum, where a humidity sensor for detecting a humidity value of clothes is arranged at a clothes throwing port of the clothes drying drum; a detection apparatus is further arranged in the clothes drying drum; and the detection apparatus is arranged inside the clothes drying drum;

the detection apparatus is connected with a controller; and the detection apparatus is configured to detect an impedance value of a surrounding environment of the detection apparatus; and

the controller is configured to acquire the impedance value at every interval of a preset time period within a predetermined duration and control a rotating speed of the clothes drying drum according to the impedance value.

[0009] Optionally, the detection apparatus is arranged at an edge of the clothes throwing port of the clothes drying drum.

[0010] Optionally, the detection apparatus is arranged above a horizontal symmetry axis of a plane on which the clothes throwing port is located.

[0011] Optionally, the detection apparatus is arranged within a range of deflecting 60° to left or right from a vertical symmetry axis of the plane on which the clothes throwing port is located.

[0012] Optionally, the detection apparatus is a pair of metal electrodes.

[0013] In addition, embodiments of the present invention further disclose a control method of the clothes dryer, including: detecting, by a detection apparatus after a clothes drying drum is operated at an initial rotating speed, an impedance value of a surrounding environment of the detection apparatus; and acquiring, by a controller, the impedance value at every interval of a preset time period within a predetermined duration; and

comparing, by the controller, each impedance value with an impedance threshold respectively, and judging the amount of clothes in the clothes drying drum according to the number of the impedance values exceeding the impedance threshold; and adjusting a rotating speed of the clothes drying drum according to the amount of clothes in the clothes drying drum.

[0014] Optionally, the controller classifies the amount of clothes in the clothes drying drum into at least three levels; where each level corresponds to a rotating speed.

[0015] Optionally, the controller classifies the amount of clothes in the clothes drying drum into small capacity, medium capacity and large capacity;

the rotating speed of the clothes drying drum is adjusted to a low rotating speed when the controller determines that the amount of clothes in the clothes drying drum is the small capacity;

the rotating speed of the clothes drying drum is adjusted to a medium rotating speed when the controller determines that the amount of clothes in the clothes drying drum is the medium capacity; and

the rotating speed of the clothes drying drum is adjusted to a high rotating speed when the controller determines that the amount of clothes in the clothes drying drum is the large capacity.

[0016] Optionally, the low rotating speed is 40-45 rpm; the medium rotating speed is 50-55 rpm; and the high rotating speed is 60-65 rpm.

[0017] Optionally, the initial rotating speed is 40 rpm.

[0018] Optionally, the preset time period is 0.4s to 0.6s.

[0019] In the present application, the detection apparatus is arranged at the clothes throwing port of the clothes drying drum of the clothes dryer. The detection apparatus is connected with the controller and is configured to detect the impedance value in the surrounding environment. The controller acquires the impedance val-

ue at every interval of the preset time period within a predetermined duration, compares each impedance value with the impedance threshold, and judges the amount of clothes in the clothes drying drum according to the number of the impedance values exceeding the impedance threshold. The controller adjusts the rotating speed of the clothes drying drum according to the amount of clothes in the clothes drying drum, thereby solving problems that clothes are easy to be wrinkled and the clothes drying effect is uneven because of keeping one rotating speed regardless of the amount of clothes in the clothes dryer in the existing art.

[0020] By using the control method of the clothes dryer in the present application, the controller of the clothes dryer can adjust the rotating speed of the clothes drying drum according to the amount of clothes in the clothes drying drum. In the case of more clothes in the clothes drying drum, the rotating speed of the clothes drying drum is increased. In the case of fewer clothes in the clothes drying drum, the rotating speed of the clothes drying drum is reduced in order to achieve uniform clothes drying effect and difficulty to wrinkle clothes.

BRIEF DESCRIPTION OF DRAWINGS

[0021]

Fig. 1 is a schematic structural diagram illustrating a clothes dryer proposed by embodiment I of the present invention;

Fig. 2 is a flow chart illustrating a control method of a clothes dryer proposed by embodiment II of the present invention; and

Fig. 3 is a schematic structural diagram illustrating hardware of a device according to embodiments of the present invention.

[0022] In the figures:

1: Clothes drying drum; 2: Humidity sensor; 3: Detection apparatus.

DETAILED DESCRIPTION

[0023] Technical solutions of embodiments of the present invention will be further described below in combination with drawings and through specific implementation modes.

Embodiment I

[0024] For a clothes dryer in a relevant technology, humidity of clothes is detected by a humidity sensor arranged at a clothes throwing port. In a clothes drying process, with continuous rotation of a clothes drying drum, clothes are in frequent contact with the humidity sensor. Since there is an inverse proportional relationship between the humidity of the clothes and an impedance value of the clothes, the humidity sensor obtains the humidity of the clothes by detecting the impedance value of the clothes. When the humidity of the clothes is high, the impedance value of the clothes detected by the humidity sensor is small. When the humidity of the clothes is low, the impedance value of the clothes detected by the humidity sensor is large. In addition, the clothes dryer in the relevant technology may have a problem of uneven clothes drying since the clothes may be wound in the clothes drying drum, the clothes located outside are dried rapidly, but the clothes wound inside are dried slowly, and the relative humidity is high.

[0025] Moreover, for the clothes dryer in the relevant technology, the amount of clothes in the clothes drying drum may also affect the clothes drying effect. When the amount of to-be-dried clothes placed in the drying drum is relatively large, the dried clothes often have a wrinkle phenomenon. When the amount of the to-be-dried clothes placed in the drying drum is relatively small, the clothes are easily attached to an inner wall of the clothes drying drum, so that the clothes are wrinkled. For example, for the clothes dryer with a rated drying capacity of 8 kg, when more than 6 kg of clothes are placed for drying, particularly when most of the placed clothes are cotton fiber materials, wrinkle marks of the clothes may be apparent and are not easy to be unfolded; and when less than 3 kg of clothes are placed for drying, the clothes are attached to the inner wall of the clothes drying drum in a drying process, and the clothes may also be wrinkled.

[0026] As shown in Fig. 1, the clothes dryer proposed by the present embodiment includes a clothes drying drum 1. A humidity sensor 2 for detecting a humidity value of clothes is arranged at a clothes throwing port 11 of the clothes drying drum 1. The humidity sensor 2 is configured to detect humidity of the clothes in the clothes drying drum 1 and transmit the humidity value to a controller, wherein optionally, the humidity sensor is composed of a pair of metal electrodes.

[0027] A detection apparatus 3 is further arranged in the clothes drying drum 1. The detection apparatus 3 is arranged inside the clothes drying drum 1. Optionally, the detection apparatus 3 may be arranged at an edge of the clothes throwing port of the clothes drying drum 1. As shown in Fig. 1, the detection apparatus 3 is arranged on an inner wall toward the clothes throwing port of the clothes drying drum 1. The clothes can be brought into contact with the detection apparatus 3 during rotation of the clothes drying drum 1. As an optional embodiment, the detection apparatus 3 in the present embodiment is a pair of metal electrodes, optionally a pair of strip metal electrodes.

[0028] In addition, the detection apparatus 3 is electrically connected with the controller. The detection apparatus 3 is configured to continuously detect an impedance value of a surrounding environment of the detection apparatus during the rotation of the clothes drying drum 1.

The controller acquires the impedance value detected by the detection apparatus at every interval of a preset time period within a predetermined duration, wherein both the predetermined duration and the preset time period can be adjusted appropriately according to a volume of the clothes drying drum. Optionally, in the present embodiment, the predetermined duration is 3 min, and the preset time period is 0.4s to 0.6s, optionally 0.4s. Namely, the controller acquires the impedance value in the surrounding environment detected by the detection apparatus 3 every 0.4s; and then, the controller compares all the impedance values acquired within 3 min with an impedance threshold so as to determine the amount of clothes in the clothes drying drum according to comparison results. When the detection apparatus 3 is in contact with the clothes, the impedance value of the clothes is detected. When the detection apparatus 3 is in contact with the air, the impedance value in the air is detected.

[0029] As a feasible implementation mode, the detection apparatus 3 is arranged above a horizontal symmetry axis of a plane on which the clothes throwing port 11 is located. Optionally, the detection apparatus is arranged within a range of deflecting 60° to left or right from a vertical symmetry axis above the horizontal symmetry axis of the plane on which the clothes throwing port 11 is located. When the clothes drying drum 1 is rotated clockwise, the detection apparatus 3 is arranged within the range of deflecting 60° to the left from the vertical symmetry axis above the horizontal symmetry axis of the plane on which the clothes throwing port is located, i.e., arranged within a range of 10 o'clock to 12 o'clock directions, and optionally, arranged at a 10 o'clock position. When the clothes drying drum 1 is rotated counterclockwise, the detection apparatus 3 is arranged within a range of deflecting 60° to the right from the vertical symmetry axis above the horizontal symmetry axis of the plane on which the clothes throwing port is located, i.e., arranged within a range of 2 o'clock to 12 o'clock directions, and optionally, arranged at a 2 o'clock position.

[0030] The detection apparatus 3 is respectively arranged in the range of 10 o'clock to 12 o'clock or in the range of 2 o'clock to 12 o'clock since clothes are subjected to a centrifugal force during the rotation of the clothes drying drum 1, and the detection apparatus arranged in the above two ranges is most likely to be in contact with the clothes. The number of the clothes in the clothes drying drum 1 and the number of contact times of the detection apparatus 3 and the clothes are subjected to positive linear distribution, the detection apparatus is more likely to be in contact with the clothes, and the controller can determine the amount of the clothes in the clothes drying drum relatively accurately according to the impedance values detected by the detection apparatus, thereby reasonably adjusting a rotating speed of the clothes drying drum.

[0031] During implementation, the humidity sensor 2 and the detection apparatus 3 may simultaneously use the same metal electrodes (such as having same materials and/or shapes and the like). During use, the metal electrodes of the humidity sensor 2 are arranged on a lower portion of an edge of the horizontal symmetry axis of the plane on which the clothes throwing port of the clothes drying drum 1 is located. During operation of the clothes dryer, clothes may fall to the bottom of the clothes drying drum 1 under action of gravity. The humidity sensor is arranged on the lower portion of the edge of the horizontal symmetry axis of the plane on which the clothes throwing port is located and can better detect the humidity value of the clothes.

[0032] Certainly, it is possible that only one pair of metal electrodes are arranged in the clothes dryer, and the pair of metal electrodes can simultaneously detect the humidity value of the clothes and the number of times for which the clothes are in contact with and collide with the metal electrodes, i.e., tasks of the humidity sensor and the detection apparatus are simultaneously completed by one pair of metal electrodes. If only one pair of metal electrodes are arranged in the clothes dryer, when the pair of metal electrodes are arranged on the lower portion of the edge of the horizontal symmetry axis of the plane on which the clothes throwing port is located, the metal electrodes are relatively accurate in detection of the humidity of the clothes (executing a function of the humidity sensor), but are not accurate enough to detect the amount of the clothes. If the pair of metal electrodes are placed on an upper portion of the edge of the horizontal symmetry axis of the plane on which the clothes throwing port is located, the accuracy of the metal electrodes for detecting the amount of the clothes (executing a function of the detection apparatus) is improved, but the accuracy for detecting the humidity of the clothes is reduced.

Embodiment II

[0033] The present embodiment proposes a control method of a clothes dryer. After a clothes drying drum is operated at an initial rotating speed, a detection apparatus detects an impedance value in a surrounding environment of the detection apparatus. A controller acquires the impedance value detected by the detection apparatus at every interval of a preset time period within a predetermined duration. The controller respectively compares each impedance value detected in the predetermined duration with an impedance threshold and judges the amount of clothes in the clothes drying drum according to the number of the impedance values exceeding the impedance threshold. The controller adjusts the rotating speed of the clothes drying drum according to the amount of the clothes in the clothes drying drum. As an optional embodiment, the controller classifies the amount of the clothes in the clothes drying drum into at least three levels, and each level corresponds to a rotating speed.

[0034] As an optional embodiment, the controller in the present embodiment classifies the amount of the clothes in the clothes drying drum into three levels, namely, a small capacity level, a medium capacity level and a large

capacity level. The impedance threshold in the present embodiment may be an empirical value obtained by multiple tests, or may also be considered as a preset value satisfying demands of a customer. During actual operation, the impedance threshold is prestored in the controller. When the controller determines that the amount of the clothes in the clothes drying drum 1 is small capacity, the rotating speed of the clothes drying drum 1 is adjusted to a low rotating speed. When the controller determines that the amount of the clothes in the clothes drying drum 1 is medium capacity, the rotating speed of the clothes drying drum 1 is adjusted to a medium rotating speed. When the controller determines that the amount of the clothes in the clothes drying drum 1 is large capacity, the rotating speed of the clothes drying drum 1 is adjusted to a high rotating speed. Optionally, the low rotating speed is 40-45 rpm; the medium rotating speed is 50-55 rpm; the high rotating speed is 60-65 rpm; and the initial rotating speed of the clothes drying drum is 40 rpm.

[0035] A detection principle of using the metal electrodes as the detection apparatus in the present embodiment is as follows: both the clothes and the air can be contacted with the metal electrodes of the detection apparatus during rotation of the clothes drying drum; and optionally, the detection apparatus is composed of two strip metal electrodes. The detection apparatus can respectively detect the impedance value between the electrodes and the clothes or the air by forming a detection circuit with the two strip metal electrodes.

[0036] The controller acquires the impedance value of the detection apparatus at every interval of a preset time period in a predetermined duration. Optionally, the preset time period is 0.4s, and the predetermined duration is 3 min. The controller can actively acquire the impedance value, i.e., the controller transmits an impedance value acquisition instruction to the detection apparatus every 0.4s, and the detection apparatus transmits the acquired impedance value to the controller after receiving the instruction.

[0037] For the clothes having the same material and humidity, when the amount of the clothes in the clothes drying drum is large, a contact area between the clothes and an inner wall of the clothes drying drum is relatively large and the clothes are in contact with the strip metal electrodes as the detection apparatus at a relatively high frequency, i.e., the strip metal electrodes are in frequent contact with the clothes and in less frequent contact with the air. Thus, the frequency of generation of the impedance value by contact between the metal electrodes and the clothes measured by the detection apparatus in the predetermined duration is relatively high, and the controller determines that the number of the impedance values exceeding the impedance threshold in the plurality of impedance values in the predetermined duration is relatively large. When the amount of the clothes is small, the contact area between the clothes and the inner wall of the clothes drying drum is relatively small and the clothes are in contact with the strip metal electrodes as the detection apparatus at a relatively low frequency, i.e., the strip metal electrodes are in less frequent contact with the clothes and are in less frequent contact with the air. Thus, the frequency of generation of the impedance value by contact between the metal electrodes and the clothes measured by the detection apparatus in the predetermined duration is relatively low, and the controller determines that the number of the impedance values exceeding the impedance threshold in the plurality of impedance values in the predetermined duration is relatively small. Similarly, when the amount of the clothes is moderate, the frequency of generation of the impedance value by contact between the metal electrodes and the clothes measured by the detection apparatus in the predetermined duration is also moderate, and the controller determines that the number of the impedance values exceeding the impedance threshold in the plurality of impedance values in the predetermined duration is moderate.

[0038] The large, small or moderate amount of the clothes mentioned above may be the amount of the clothes relative to the volume of the clothes drying drum. For example, if clothes capacity of the clothes drying drum is 8 kg, the amount of the clothes in the clothes drying drum is large when the amount of the clothes exceeds 6 kg, the amount of the clothes in the clothes drying drum is small when the amount of the clothes in the clothes drying drum is less than 3 kg; and the amount of the clothes in the clothes drying drum is moderate when the amount of the clothes in the clothes drying drum is about 4 kg.

[0039] In addition, the large, small or moderate number of impedance values exceeding the impedance threshold measured by the detection apparatus mentioned above may be the amount of the impedance values relative to a preset number. For example, if the preset number is 300, and the detection apparatus detects 450 impedance values (detecting once every 0.4s) in the predetermined duration (3 min), the amount of the clothes of the clothes drying drum is determined to be large capacity when the controller determines that the number of the impedance values exceeding the impedance threshold in the 450 impedance values in the predetermined duration is 380 (greater than the preset number 300); the amount of the clothes of the clothes drying drum is determined to be small capacity when the controller determines that the number of the impedance values exceeding the impedance threshold in the 450 impedance values is 280 (less than the preset number 300); and the amount of the clothes of the clothes drying drum is determined to be medium capacity when the controller determines that the number of the impedance values exceeding the impedance threshold in the 450 impedance values is 300 (equal to the preset number 300).

[0040] The control method of the clothes dryer is described in detail below by optional operation processes: after the clothes dryer is turned on, the clothes drying drum is rotated at an initial rotating speed of 40 rpm.

When the clothes in the clothes drying drum are in contact with the metal electrodes at a corresponding frequency, the detection apparatus continuously detects the impedance value in the surrounding environment in real time, and the controller acquires the impedance value detected by the detection apparatus every 0.4s (the preset time period). Within 3 min (the predetermined duration) after the clothes dryer is turned on to operate (both the preset time period and the predetermined duration can be adjusted according to actual load conditions), the controller keeps acquiring the impedance value once every 0.4s; the controller compares the impedance value acquired every time with the impedance threshold and judges the amount of the clothes in the clothes drying drum according to the number of the impedance values exceeding the impedance threshold within 3 min; and the controller adjusts the rotating speed of the clothes drying drum according to the amount of the clothes in the clothes drying drum. For example, the number of the impedance values measured by the detection apparatus within 3 min is 450 (including the frequency of contact between the detection apparatus and the clothes and the frequency of contact between the detection apparatus and the air), a corresponding relationship between the number of the impedance values exceeding the impedance threshold and clothes capacity of the clothes drying drum is as follows: when the number of the impedance values exceeding the impedance threshold is 380, the controller defines that clothes capacity of the clothes drying drum is large capacity, and the controller adjusts the rotating speed of the clothes drying drum to 60-65 rpm; when the number of the impedance values exceeding the impedance threshold is 280, the controller defines that clothes capacity of the clothes drying drum is medium capacity, and the controller adjusts the rotating speed of the clothes drying drum to 40-45 rpm; when the number of the impedance values exceeding the impedance threshold is 180, the controller defines that clothes capacity of the clothes drying drum is small capacity; and when the number of the impedance values exceeding the impedance threshold is 300, the controller defines that clothes capacity of the clothes drying drum is medium capacity, and the controller adjusts the rotating speed of the clothes drying drum to 50-55 rpm.

[0041] In the control method in the present embodiment, when the volume of the clothes drying drum is determined as small capacity, the clothes drying drum is selected to be operated at the low rotating speed in order to avoid that the clothes are in contact with drying wind unevenly when the rotating speed of the clothes drying drum is too high and the clothes are attached to a drum wall of the clothes drying drum, and also avoid that wrinkles cannot be unfolded when the rotating speed of the clothes drying drum is too high and the clothes are extruded in a circumferential direction. When the amount of the clothes in the clothes drying drum is large capacity, the clothes drying drum is selected to be operated at the high rotating speed in order to prevent the wrinkles from being generated in a large area and also improve the drying uniformity by increasing an angular speed to increase a centrifugal force and unfolding the clothes in the clothes drying drum under action of large centrifugal force. When the amount of the clothes in the clothes drying drum is medium capacity, the clothes drying drum is selected to be operated at the medium rotating speed in order to avoid that the clothes are attached to the drum wall due to high rotating speed by rotating the clothes drying drum at an appropriate angular speed and unfolding the clothes in the drum under action of appropriate centrifugal force, and also avoid that the clothes cannot be unfolded due to lack of full centrifugal force when the rotating speed of the clothes drying drum is too low, and the clothes are rotated in the drum in an agglomeration manner to generate excessive wrinkles.

[0042] By using the control method in the present embodiment, the controller can adjust the rotating speed of the clothes drying drum according to the amount of the clothes in the clothes drying drum. In the case of more clothes in the clothes drying drum, the rotating speed in the clothes drying drum is increased; and in the case of fewer clothes in the clothes drying drum, the rotating speed of the clothes drying drum is relatively low, so as to achieve a good clothes drying effect and achieve that the clothes dried by the clothes dryer are not easy to be wrinkled.

Embodiment III

[0043] Embodiments of the present invention also provide a storage medium. Optionally, in the present embodiment, the above storage medium may be configured to store program codes for performing the following steps:

after a clothes drying drum (1) is operated at an initial rotating speed, a detection apparatus (3) detects an impedance of the surrounding environment of the detection apparatus; and the controller acquires the impedance value at every interval of a preset time period in a predetermined duration;

the controller respectively compares each impedance value with an impedance threshold and judges the amount of clothes in the clothes drying drum (1) according to the number of the impedance values exceeding the impedance threshold; and

the controller adjusts the rotating speed of the clothes drying drum (1) according to the amount of the clothes in the clothes drying drum (1).

[0044] Optionally, in the present embodiment, the above storage medium may include but not limited to: a USB flash disk, a read-only memory (ROM), a random access memory (RAM), a mobile hard disk, a magnetic disc or a compact disc and other non-volatile storage media that can store program codes.

[0045] Optionally, examples in the present embodiment can be referred to the examples described in the above embodiments and preferred embodiments. The

present embodiment is not repeated here.

[0046] Apparently, those skilled in the art should understand that the modules or the steps above can be implemented using universal calculation apparatuses, and can be centralized on a single calculation apparatus or distributed on a network formed by a plurality of calculation apparatuses. Optionally, the modules or the steps can be implemented using program codes capable of being executed by the calculation apparatuses. Therefore, the modules or the steps can be stored in the storage apparatuses and then executed by the calculation apparatuses. Moreover, in some cases, the steps shown or described can be executed in a different sequence from the sequence herein, or respectively manufactured into integrated circuit modules, or a plurality of modules or steps are manufactured into single integrated circuit modules to be implemented. The above only describes embodiments of the present invention and is not intended to limit the present invention.

Embodiment IV

[0047] Fig. 3 is a schematic structural diagram illustrating hardware of a device according to embodiments of the present invention. As shown in Fig. 3, the device includes:

one or more processors 410, and in Fig. 3, one processor 410 is taken as an example; and

a memory 420.

[0048] The device can further include: an input apparatus 430 and an output apparatus 440.

[0049] The processor 410, the memory 420, the input apparatus 430 and the output apparatus 440 in the device can be connected by a bus or in other modes, and connection by the bus is taken as an example in Fig. 3.

[0050] The memory 420 as a computer readable storage medium can be used for storing software programs, computer executable programs and modules. The processor 410 executes various kinds of function applications and data processing of the server by operating the software programs, the instructions and the modules stored in the memory 420, thereby realizing the control method of the clothes dryer in the above method embodiments.

[0051] The memory 420 may include a program storage area and a data storage area, wherein the program storage area may store an operating system and applications required for at least one function; and the data storage area may store data, etc. created according to use of a terminal device. In addition, the memory 420 may include a high-speed random access memory, and may further include a non-transitory memory, for example, at least one disk memory device, a flash memory device or other non-transitory solid-state memory devices. In some embodiments, the memory 420 may selectively include memories remotely arranged relative to the processor 410, wherein the remote memories may be connected to the terminal device by a network. An example of the above network includes but not limited to Internet, Intranet, local area network, mobile communication network and a combination therefor.

[0052] The input apparatus 430 may be configured to receive input digital or character information and generate a key signal input relevant to user settings and functional control of the terminal. The output apparatus 440 may include a display device such as a display screen and the like.

[0053] The one or more modules are stored in the memory 420. When the modules are executed by the one or more processors 410, the following operations are performed:

after the clothes drying drum (1) is operated at an initial rotating speed, the detection apparatus (3) detects an impedance of the surrounding environment of the detection apparatus; and the controller acquires the impedance value at every interval of a preset time period in a predetermined duration;

the controller respectively compares each impedance value with an impedance threshold and judges the amount of clothes in the clothes drying drum (1) according to the number of the impedance values exceeding the impedance threshold; and

the controller adjusts the rotating speed of the clothes drying drum (1) according to the amount of the clothes in the clothes drying drum (1).

Claims

1. A clothes dryer, comprising a clothes drying drum (1), wherein a humidity sensor (2) for detecting a humidity value of clothes is arranged at a clothes throwing port of the clothes drying drum (1); a detection apparatus (3) is further arranged in the clothes drying drum (1); and the detection apparatus (3) is arranged inside the clothes drying drum (1);
the detection apparatus (3) is connected with a controller; and the detection apparatus (3) is configured to detect an impedance value of a surrounding environment of the detection apparatus; and
the controller is configured to acquire the impedance value at every interval of a preset time period within a predetermined duration, and controls a rotating speed of the clothes drying drum according to the impedance value.

2. The clothes dryer according to claim 1, wherein the detection apparatus (3) is arranged at an edge of the clothes throwing port of the clothes drying drum (1).

3. The clothes dryer according to claim 1, wherein the

detection apparatus (3) is arranged above a horizontal symmetry axis of a plane on which the clothes throwing port is located.

4. The clothes dryer according to claim 2, wherein the detection apparatus (3) is arranged within a range of deflecting 60° to left or right from a vertical symmetry axis of the plane on which the clothes throwing port is located.

5. The clothes dryer according to any one of claims 1-4, wherein the detection apparatus (3) is a pair of metal electrodes.

6. A control method of a clothes dryer, comprising: detecting, by a detection apparatus (3) after a clothes drying drum (1) is operated at an initial rotating speed, an impedance value of a surrounding environment of the detection apparatus; and acquiring, by a controller, the impedance value at every interval of a preset time period within a predetermined duration; and
comparing, by the controller, each impedance value with an impedance threshold respectively, and judging the amount of clothes in the clothes drying drum (1) according to the number of the impedance values exceeding the impedance threshold; and adjusting a rotating speed of the clothes drying drum (1) according to the amount of clothes in the clothes drying drum (1).

7. The control method of the clothes dryer according to claim 6, further comprising: classifying, by the controller, the amount of clothes in the clothes drying drum (1) into at least three levels; wherein each level corresponds to a rotating speed.

8. The control method of the clothes dryer according to claim 7, further comprising: classifying, by the controller, the amount of clothes in the clothes drying drum (1) into small capacity, medium capacity and large capacity;
adjusting the rotating speed of the clothes drying drum (1) to a low rotating speed when the controller determines that the amount of clothes in the clothes drying drum (1) is the small capacity;
adjusting the rotating speed of the clothes drying drum (1) to a medium rotating speed when the controller determines that the amount of clothes in the clothes drying drum (1) is the medium capacity; and
adjusting the rotating speed of the clothes drying drum (1) to a high rotating speed when the controller determines that the amount of clothes in the clothes drying drum (1) is the large capacity.

9. The control method of the clothes dryer according to claim 8, wherein the low rotating speed is 40-45 rpm;
the medium rotating speed is 50-55 rpm; and
the high rotating speed is 60-65 rpm.

10. The control method of the clothes dryer according to claim 6, wherein the initial rotating speed is 40 rpm.

11. The control method of the clothes dryer according to any one of claims 6-10, wherein the preset time period is 0.4s to 0.6s.

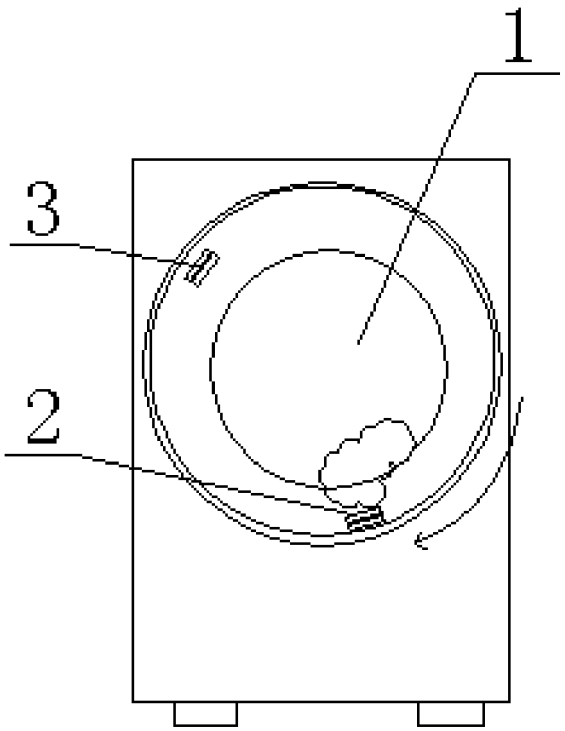

FIG. 1

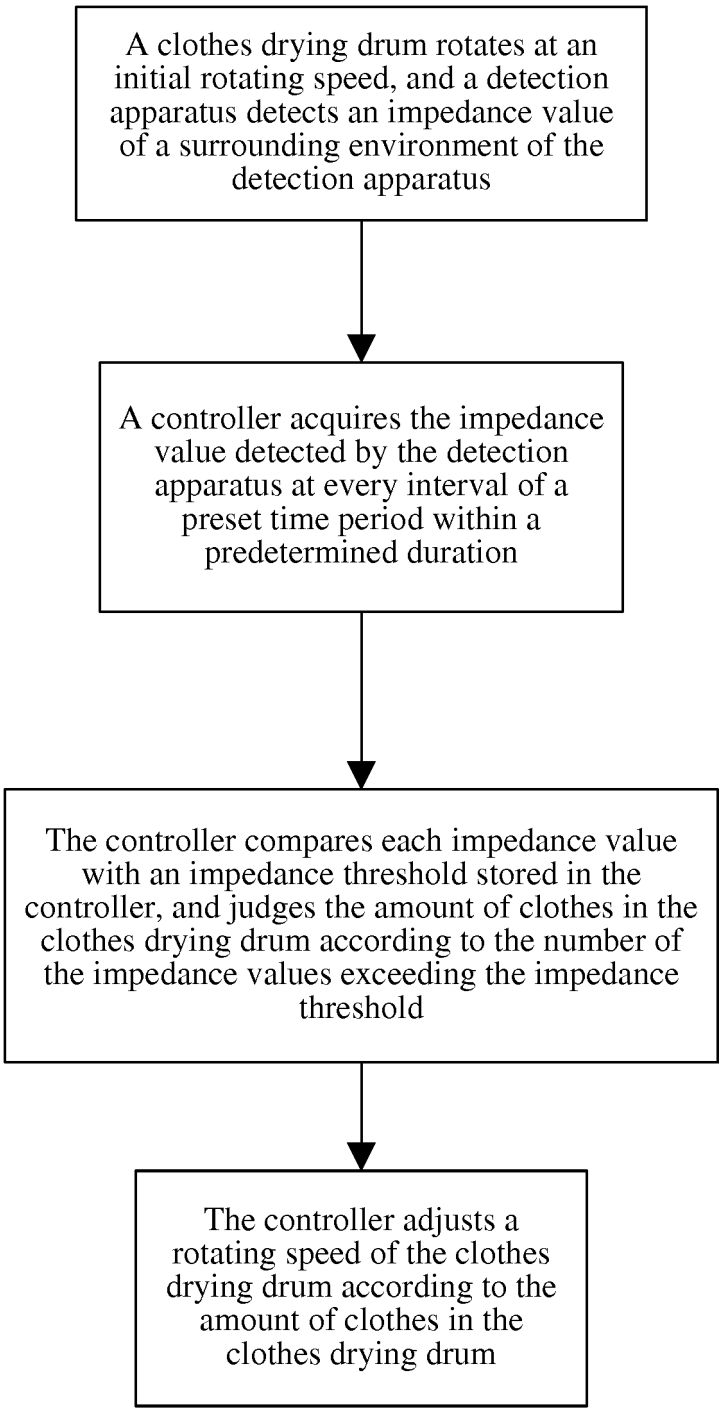
A clothes drying drum rotates at an initial rotating speed, and a detection apparatus detects an impedance value of a surrounding environment of the detection apparatus
A controller acquires the impedance value detected by the detection apparatus at every interval of a preset time period within a predetermined duration
The controller compares each impedance value with an impedance threshold stored in the controller, and judges the amount of clothes in the clothes drying drum according to the number of the impedance values exceeding the impedance threshold
The controller adjusts a rotating speed of the clothes drying drum according to the amount of clothes in the clothes drying drum

FIG. 2

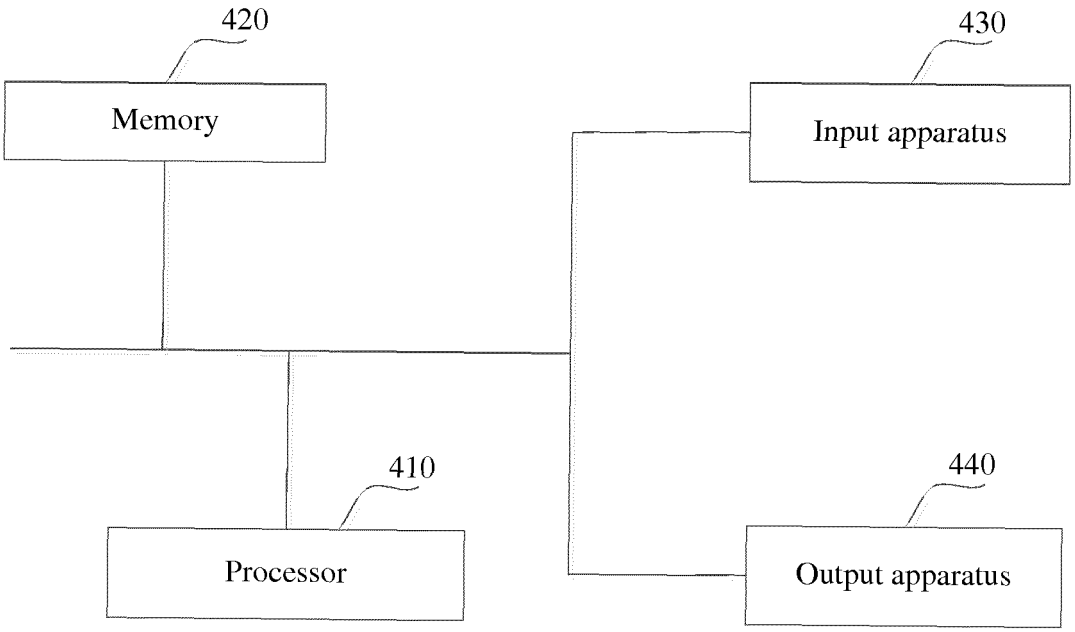
420
Memory
430
Input apparatus
410
Processor
440
Output apparatus

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/077888

A. CLASSIFICATION OF SUBJECT MATTER

D06F 33/02 (2006.01) i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D06F

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

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

CNABS; DWPI; SIPOABS: dry, humidity, aridity, clothes quantity, load, quantity, weight, conductivity, resistivity, resistance, impedance, speed, spin speed

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 101086133 A (NANJING LEJIN PANDA ELECTRICAL APPLIANCE) 12 December 2007 (12.12.2007) the description, pages 4-5	1-11
A	CN 101443507 A (LG ELECTRONICS INC.) 27 May 2009 (27.05.2009) the whole document	1-11
A	GB 782976 A (GEN ELECTRIC) 18 September 1957 (18.09.1957) the whole document	1-11

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
28 May 2016	14 June 2016
Name and mailing address of the ISA State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No. (86-10) 62019451	Authorized officer CHEN, Pengfei Telephone No. (86-10)62084627

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

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2016/077888

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 101086133 A	12 December 2007	None	
CN 101443507 A	27 May 2009	US 2010011614 A1	21 January 2010
		EP 2013405 A2	14 January 2009
		US 8919010 B2	30 December 2014
		WO 2007119974 A3	27 December 2007
		WO 2007119974 A2	25 October 2007
		EP 2013405 A4	09 March 2016
		CN 101443507B	09 November 2011
		KR 100747589 B1	02 August 2007
GB 782976 A	18 September 1957	None	

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