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(54) METHOD AND APPARATUS FOR MEASURING DRUM-ENTERING TEMPERATURE OF CLOTHES DRYER, AND CLOTHES DRYER

(57) A method and apparatus for measuring a drum-entering temperature of a clothes dryer, and a clothes dryer. A temperature sensor (23) or a thermostat (53) is disposed at the position of a drum-entering air duct (22) close to a heater (21), so that a warm air temperature can be accurately measured in a timely manner; in combination with a means of providing an air distribution port (24) on the side of the temperature sensor (23) or the thermostat (53), relatively cold air is suctioned into the drum-entering air duct (22) on the basis of negative pressure generated in the drum-entering air duct (22) so as to perform cooling on the surface of the temperature sensor (23) or the thermostat (53), and in combination with a mode of querying a correspondence table of measured values and warm air temperatures, the accuracy of an actual measured value is ensured. Thus, the technical problem in the prior art that the temperature sensor (23) or the thermostat (53) is disposed away from the heater (21) due to the influence caused by a high temperature of the heater (21), resulting in untimely and inaccurate temperature measurement is solved.

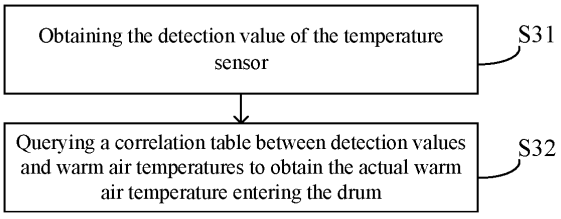

Fig.3

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Description

TECHNICAL FIELD

[0001] The invention belongs to the technical field of clothes drying, and in particular relates to a method, a device for detecting the drum-entering temperature of a clothes dryer and a clothes dryer.

BACKGROUND

[0002] Existing clothes dryers are generally divided into two types: vented and condensing. In vented clothes dryers, air is heated by a heater to generate warm air, which is then blown into the drum through the drum-entering air duct, and then the warm air directly enters the exhaust pipe after passing through the clothes. During the passage through the clothes, the warm air heats and dries the clothes while carrying away moisture. In condensing clothes dryers, the internal air circulates within the drum and ducts. First, clothes to be dried are placed inside the drum, and the warm air generated by the heater is supplied to the drum. The supplied warm air comes into contact with the clothes in the drum and dries them. The high-temperature and high-humidity air generated during clothes drying first passes through a lint filter to remove lint from the air. Then, it enters the condenser through a turbine fan for steam condensation and cooling, turning into low-temperature and low-humidity air entering the rear duct of the machine and is reheated by the heater before entering the drum through the inlet.

[0003] During the clothes drying process, it is necessary to monitor the temperature of the warm air entering the drum. Based on the detected temperature, the dryer determines its operational status. It can promptly detect whether the warm air temperature is insufficient or excessively high, allowing the dryer to make adjustments, such as increasing the heating temperature when the temperature is insufficient or stopping heating when the temperature is excessively high.

[0004] The existing dryers typically use a thermostat or temperature sensor installed on the drum-entering air duct to control the drum-entering temperature into the drum. As shown in Fig. 1, the thermostat or temperature sensor 1 is usually placed in an upper position on the drum-entering air duct 2. It controls the temperature inside the drum by detecting the actual temperature of the drum inlet to ensure that the temperature entering the drum does not exceed the deformation or damage temperature of the corresponding clothing material.

[0005] As shown in Fig. 1, the installation position of the existing temperature sensor or thermostat is limited by the temperature working range of the device and must be placed away from the heater 3. This arrangement often leads to situations where, under full-load drying or poor airflow conditions, the air lingers in the heater for an extended period, causing a rapid increase in temperature. However, due to the distance of the temperature sensor or thermostat installation away from the heater, high-temperature detection may not be timely, resulting in the heater continuing to heat the air. As a result, the temperature of the warm air entering the drum becomes excessively high, potentially damaging the clothing. It may also lead to the abnormal tripping of mechanical thermostats. In dryer design, multiple levels of temperature protection control are often employed for drum-entering temperature control. The temperature sensor or thermostat serves as the first-level electronic control, combined with software control to promptly stop heating when a problem is detected. The second level or higher may involve mechanical controls, some of which are resettable, while others are non-resettable. When non-resettable mechanical thermostats are used and the electronic control delays its judgment due to inadequate detection, it can lead to the tripping of the mechanical thermostat. In the case of a non-resettable mechanical thermostat tripping, users can only resolve the problem by requesting after-sales maintenance. This clearly diminishes the user experience and affects product quality.

SUMMARY

[0006] The objective of the present invention is to propose a method, a device for detecting the drum-entering temperature of a clothes dryer and a clothes dryer. In the present invention, a temperature sensor or thermostat is positioned near the heater in the drum-entering air duct to promptly and accurately detect warm air temperatures. Complemented by the means of opening an air distribution opening on a side of the temperature sensor or thermostat, based on negative pressure generated inside the drum-entering air duct, relatively cooler air is drawn into the drum-entering air duct, effectively cooling the surface of the temperature sensor or thermostat. Furthermore, a method for ensuring the accuracy of the actual detected values involves querying a correlation table between detection values and warm air temperatures. The present invention addresses the problem in the prior art where temperature sensors or thermostats are positioned away from the heater, leading to delayed and inaccurate temperature detection due to the high-temperature influence. The invention is implemented as follows:

One aspect of the present invention provides a method for detecting drum-entering temperature of a clothes dryer drum, wherein the dryer comprising:

a heater; and
a drum-entering air duct, including a warm air inlet and an inner drum inlet; warm air generated by the heater enters the drum-entering air duct through the warm air inlet; the drum-entering air duct communicates with the inner drum through the inner drum inlet, allowing warm air to enter the inner drum through the drum-entering air duct;
characterized in that the clothes dryer further includes:

a temperature sensor installed on the drum-entering air duct and positioned within a set range of the warm air inlet; and
an air distribution opening opened on the drum-entering air duct and located on a side of the temperature sensor;
the method comprises:
obtaining a detection value of the temperature sensor; querying a correlation table between detection values and warm air temperatures to obtain the actual warm air temperature entering the drum.

[0007] Furthermore, the correlation table between detection values and warm air temperatures is obtained and stored within the clothes dryer through the following steps: simulating several sets of exhaust resistances at a set heating temperature; initiating a drying process with simulated exhaust resistances; obtaining actual warm air temperature values inside the drum-entering air duct and detection values of the temperature sensor; and recording the detection values and actual warm air temperature values to create a correlation table between the detection values and the warm air temperatures at various exhaust resistances under the set heating temperature.

[0008] Additionally, the method includes the following steps: determining the heating temperature; detecting the exhaust resistance; querying the correlation between detection values and warm air temperatures under the heating temperature and the exhaust resistance to obtain the actual warm air temperature entering the drum.

[0009] A second aspect of the present invention is to provide a device for detecting the drum-entering temperature of a clothes dryer, and it comprises:

a heater.
a drum-entering air duct, comprising a warm air inlet and an inner drum inlet; warm air generated by the heater enters the drum-entering air duct through the warm air inlet; the drum-entering air duct communicates with the inner drum through the inner drum inlet, allowing warm air to enter the inner drum through the drum-entering air duct;
it further includes:

a temperature sensor installed on the drum-entering air duct and positioned within a set range of the warm air inlet; an air distribution opening opened on the drum-entering air duct and located on a side of the temperature sensor; and
a warm air temperature determination module configured to obtain a detection value of the temperature sensor, and to query a correlation table between detection values and warm air temperatures to obtain the actual warm air temperature entering the drum.

[0010] Furthermore, the device includes a storage module configured to store the correlation table between detection values and warm air temperatures; wherein the correlation table between detection values and warm air temperatures is obtained through the following steps: simulating several sets of exhaust resistances at a set heating temperature; initiating a drying process with simulated exhaust resistances; obtaining actual warm air temperature values inside the drum-entering air duct and detection values of the temperature sensor; and recording the detection values and actual warm air temperature values to create a correlation table between the detection values and the warm air temperatures at various exhaust resistances under the set heating temperature.

[0011] Furthermore, the device includes a query preparation module, which is configured to determine the heating temperature and detect exhaust resistance, enabling the warm air temperature determination module to query the correlation between detection values and warm air temperatures stored in the storage module based on the heating temperature and the exhaust resistance to obtain the actual warm air temperature entering the drum.

[0012] A third aspect of the present invention provides a device for detecting the drum-entering temperature of a clothes dryer, and it comprises:

a heater.
a drying controller that controls the heating temperature of the heater and the on and off operation of the heater;
a drum-entering air duct, comprising a warm air inlet and an inner drum inlet; warm air generated by said heater enters the drum-entering air duct through the warm air inlet; the drum-entering air duct communicates with the inner drum through the inner drum inlet, allowing warm air to enter the inner drum through the drum-entering air duct;
it further includes:

a thermostat installed on the drum-entering air duct and positioned within a set range of the warm air inlet, which is configured to send a signal to the drying controller when a temperature exceeding a limit is detected, causing the drying controller to stop heating;

an air distribution opening opened on the drum-entering air duct and located on a side of the thermostat; and

a warm air temperature determination module configured to obtain a detection value of the temperature sensor, and to query a correlation table between detection values and warm air temperatures to obtain the actual warm air temperature entering the drum.

[0013] Furthermore, the device includes: a storage module used to store the table correlating detected values with warm air temperatures; wherein the table is generated based on the following steps: simulating various sets of exhaust resistances at the set heating temperature; initiating the drying process with simulated exhaust resistances; obtaining the actual warm air temperature within the drum-entering air duct and the detected value of the thermostat during the simulated exhaust resistances; recording the detected values and actual warm air temperatures to create a table correlating detected values with warm air temperatures at various exhaust resistances under the set heating temperature.

[0014] Moreover, the device also includes a query preparation module, which is configured to determine the heating temperature and detect exhaust resistance, enabling the warm air temperature determination module to query the correlation between detection values and warm air temperatures stored in the storage module based on the heating temperature and the exhaust resistance to obtain the actual warm air temperature entering the drum.

[0015] A forth aspect of the present invention provides a clothes dryer, which comprises the dryer drum-entering temperature detection device as described above.

[0016] Compared to the prior art, the advantages and positive effects of the present invention are as follows: in the dryer drum-entering temperature detection method, device, and dryer proposed by the present invention, instead of placing the temperature sensor or thermostat at the uppermost end of the drum-entering air duct, far from the heater, the present invention installs the temperature sensor or thermostat within the set range of the warm air inlet of the drum-entering air duct, bringing it closer to the heater. When the warm air generated by the heater enters the drum-entering air duct through the warm air inlet, it can be immediately detected by the temperature sensor or thermostat. This enables timely control of the heater to stop heating, preventing the warm air temperature inside the drum from becoming excessively high and damaging the clothes, as well as avoiding abnormal interruptions in mechanical thermostats. To address the problem of temperature sensors or thermostats working for extended periods at high temperatures, which can exceed their working limits and reduce their lifespan, the present invention introduces the means of opening the air distribution opening on the side of the drum-entering air duct adjacent to the temperature sensor or thermostat. When the heated warm air enters the drum-entering air duct, it creates negative pressure inside the air distribution opening, causing external air to flow into the drum-entering air duct through the air distribution opening. The relatively cooler air passing over the surface of the temperature sensor or thermostat lowers its surrounding temperature, ensuring that it does not exceed its operating limit. Furthermore, to correct the problem of relatively cooler air affecting temperature sensor or thermostat temperature readings, the present invention corrects actual detected values by querying a table correlating detected values with warm air temperatures. This guarantees that the detected warm air temperature is the actual warm air temperature, resolving the technical problem in the prior art where temperature sensors or thermostats are influenced by high heater temperatures, causing delayed and inaccurate temperature readings.

[0017] Furthermore, the present invention employs the means of simulating various sets of exhaust resistances at the set heating temperature to summarize the corresponding relationship between actual temperature values inside the drum-entering air duct and actual detected values of the temperature sensor or thermostat under different heating temperatures and exhaust resistances. This information is stored in a table correlating detected values with warm air temperatures at various exhaust resistances under the set heating temperature, facilitating accurate measurement of the actual warm air temperature based on queries.

[0018] After reviewing the detailed description of the implementation mode of the present invention in conjunction with the accompanying drawings, other features and advantages of the present invention will become clearer.

DESCRIPTION OF THE DRAWINGS

[0019] To provide a clearer understanding of the technical solutions in the embodiments of the present invention, the following paragraphs briefly introduce the drawings required for the description of the embodiments. It is evident that the drawings presented below represent only some embodiments of the present invention. Ordinary skilled arts in this field can derive additional drawings without requiring creative effort based on these drawings.

Fig.1 is a schematic diagram illustrating the installation of a temperature sensor in the dryer's inlet air duct of the prior art;

Fig.2 is a schematic diagram of a device for detecting the drum-entering temperature of a clothes dryer drum according to the present invention;

Fig.3 is a flowchart of a method for detecting the drum-entering temperature of a clothes dryer drum according to the present invention.

Fig. 4 is an architectural diagram of one implementation of a device for detecting the drum-entering temperature of a clothes dryer drum according to the present invention.

Fig. 5 is an architectural diagram of one implementation of a device for detecting the drum-entering temperature of a clothes dryer drum according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0020] The following paragraphs provide a clear and comprehensive description of the technical solutions in the embodiments of the present invention, in conjunction with the accompanying drawings. It is important to note that the described embodiments are only a portion of the possible implementations of the present invention, and not an exhaustive representation. Based on the embodiments disclosed in this invention, all other implementations that ordinary skilled artisans in this field can derive without inventive effort are considered to fall within the scope of protection of this invention.

[0021] In the description of the present invention, it should be understood that terms such as "center," "upper," "lower," "front," "rear," "left," "right," "vertical," "horizontal," "top," "bottom," "inner," "outer," and the like, indicating directions or positional relationships, are based on the orientation or positional relationships shown in the drawings. These terms are used for the convenience of describing the present invention and simplifying the description, and do not imply that the devices or elements indicated must have specific orientations or be constructed and operated in specific orientations. Therefore, they should not be understood as limiting the scope of the present invention.

[0022] In the description of the present invention, it should be noted that unless otherwise explicitly specified and limited, terms such as "installation," "connection," "attachment" should be broadly interpreted. They can refer to fixed connections, detachable connections, or integral connections, as appropriate. Skilled artisans in this field can understand the specific meanings of these terms in the context of the present invention. In the description of the embodiments above, specific features, structures, materials, or characteristics may be combined in various ways in one or more embodiments or examples, as appropriate.

[0023] The terms "first" and "second" are used for descriptive purposes only and should not be interpreted as indicating or implying relative importance or specifying the quantity of the indicated technical features. Consequently, features designated as "first" and "second" may explicitly or implicitly encompass one or more instances of that feature. In the description of the present invention, unless otherwise stated, the term "multiple" means two or more.

[0024] The present invention aims to provide a method and apparatus for detecting the drum-entering temperature of a clothes dryer drum to address the problem of delayed temperature detection in clothes dryers in the prior art. Specifically, as shown in Fig.2, a device for detecting the drum-entering temperature of a clothes dryer drum of the present invention includes a heater 21, a drum-entering air duct 22, a temperature sensor 23, and an air distribution opening 24.

[0025] The drum-entering air duct 22 comprises a warm air inlet 221 and an inner drum inlet 222. Warm air generated by the heater 21 enters the drum-entering air duct 22 through the warm air inlet 221, and the drum-entering air duct 22 is connected to the inner drum through the inner drum inlet 222. The warm air flows through the drum-entering air duct 22 and enters the inner drum through the inner drum inlet 222, where it is used to dry clothes and remove moisture, which is then expelled directly from the inner drum.

[0026] The temperature sensor 23 is installed on the drum-entering air duct 22 and is positioned within a set range of the warm air inlet 221. The set range is used to limit the distance between the temperature sensor 23 and the heater 21, ensuring that the temperature sensor 23 is close enough to the heater 21 to promptly detect the rise in temperature of the heated warm air.

[0027] Preferably, the temperature sensor 23 and the air distribution opening 24 are installed and positioned on a side of the drum-entering air duct 22 facing the heater 21. This arrangement not only reduces the linear distance between the temperature sensor 21 and the heater 21 but also prevents interference with other tests performed on the clothes dryer. As an example, in internal combustion tests, the side-mounted air distribution opening 24 can prevent smoke from affecting the shell structure that is used for cooling the exterior of the drum-entering air duct when smoke escapes from the air distribution opening.

[0028] The present invention installs the temperature sensor 23 within the set range of the warm air inlet 221 of the drum-entering air duct 22, positioning it close to the heater 21. When warm air generated by the heater 21 enters the drum-entering air duct 22 through the warm air inlet 221, it can be immediately detected by the temperature sensor 23. This enables timely control of the heater 21 to stop heating, avoiding excessively high warm air temperatures inside the

drum, which could damage clothes, and also prevents the mechanical thermostat from malfunctioning.

[0029] Furthermore, if the temperature sensor 23 is positioned in close proximity to the heater 21, there is a risk of it operating at high temperatures for extended periods, potentially exceeding its working temperature limit and reducing its lifespan. To address this problem, the air distribution opening 24 is selectively opened in the drum-entering air duct 22, positioned at a side of the temperature sensor 23. When warm air enters the drum-entering air duct 22 through the warm air inlet 221, it flows through the air distribution opening 24 and generates negative pressure around the air distribution opening 24. This negative pressure causes cold air from the exterior of the drum-entering air duct 22 to enter through the air distribution opening 24 and flow over the surface of the temperature sensor 23, reducing its surrounding temperature and ensuring that it operates within acceptable temperature limits.

[0030] Furthermore, to address the problem of cold air potentially affecting the accuracy of temperature sensing by temperature sensor 23, as shown in Fig.3, the present invention employs the following technical solutions to ensure the accuracy of temperature detection by the temperature sensor.

[0031] Step S31: Obtaining the detection value of the temperature sensor.

[0032] Warm air generated by the heater 21 enters the drum-entering air duct 22 through the warm air inlet 221. The temperature sensor 23 detects the temperature of the warm air. Simultaneously, cold air entering the drum-entering air duct 22 through the air distribution opening 24 cools the temperature sensor 23.

[0033] Step S32: Querying a correlation table between detection values and warm air temperatures to obtain the actual warm air temperature entering the drum.

[0034] In the embodiments of the present invention, prior to the clothes dryer leaving the factory, simulations are conducted to set a heating temperature and several sets of exhaust resistance values under the set heating temperature. This process, as illustrated in Table 1 below, involves initiating the drying process under simulated exhaust resistance, obtaining the actual warm air temperatures inside the drum-entering air duct and detection values of the temperature sensor, recording a correlation between the actual warm air temperatures and the detection values of the temperature sensor, and creating a correlation table between the detection values and the warm air temperatures under different exhaust resistance values and the set heating temperature, shown as below.

Table 1:

Set Heating Temperature 1				.....
	Exhaust Resistance 1	.....	Exhaust Resistance m	.....
detection value 1	T11	.....	T1m	
.....	.....	.....	.....	
detection value n	Tn1		Tnm	

in the Table 1, Tnm denotes the actual warm air temperature at the set heating temperature and a set exhaust resistance m, corresponding to the detection value n.

[0035] This correlation table is stored in the clothes dryer's memory. When the clothes dryer initiates the drying process, it first determines the heating temperature (typically set by the user or a default for the drying process), and then detects the current exhaust resistance of the dryer. Based on the heating temperature and exhaust resistance, the stored correlation table is queried to yield the relationship between the detection value and the warm air temperature for the given heating temperature and exhaust resistance, resulting in the determination of the actual warm air temperature entering the drum.

[0036] The detection of exhaust resistance can be accomplished by measuring the pressure difference between the exhaust duct and the drum-entering air duct or by calculating the temperature difference between these two ducts. Specific methods for detection may vary and can be implemented using technical means in the prior art, without specific limitations imposed by the present invention.

[0037] Above all, the present invention simulates several sets of exhaust resistance under the set heating temperature. Under the set heating temperature and different exhaust resistances, it summarizes the corresponding relationship between the actual temperature values inside the drum-entering air duct and the detection values of temperature sensors or thermostats. This further forms the correlation table between the detection values and the warm air temperatures under different exhaust resistance values and the set heating temperature, which is stored for querying. This enables the clothes dryer to determine the actual warm air temperature based on the query, ensuring the accuracy of the measurement.

[0038] Based on the method for detecting the drum-entering temperature of a clothes dryer drum described above, the present invention further provides a device for detecting the drum-entering temperature of a clothes dryer drum, as shown in Fig.4. The device includes a heater 41, a drum-entering air duct, a temperature sensor 43, an air distribution

opening, a warm air temperature determination module 45, a storage module 46, and a drying controller 47.

[0039] The drum-entering air duct includes a warm air inlet and an inner drum inlet. The warm air generated by the heater 41 enters the drum-entering air duct through the warm air inlet. The drum-entering air duct connects with the inner drum through the inner drum inlet, allowing the warm air to flow from the drum-entering air duct into the inner drum.

[0040] The temperature sensor 43 is installed on the drum-entering air duct and is positioned within the set range of the warm air inlet.

[0041] The air distribution opening is positioned on the drum-entering air duct and is located at a side of the temperature sensor 43.

[0042] The warm air temperature determination module 45 is configured to obtain the detection value from the temperature sensor 43, to query a correlation table between detection values and warm air temperatures stored in the storage module 46 to obtain the actual warm air temperature entering the drum.

[0043] The storage module 46 is used to store the correlation table between detection values and warm air temperatures, wherein the correlation table is obtained through the following steps: simulating a plurality of exhaust resistances under a set heating temperature, initiating a drying process with simulated exhaust resistances, obtaining actual warm air temperatures inside the drum-entering air duct and detection values of the temperature sensor, and recording the detection values and actual warm air temperatures to create the correlation table between the detection values and the actual warm air temperatures under the set heating temperature and different exhaust resistances.

[0044] In some embodiments of the present invention, the device for detecting the drum-entering temperature of a clothes dryer drum further includes a query preparation module 48 used to determine the heating temperature and detect the exhaust resistance, so as to allow the warm air temperature determination module 45 to query the stored correlation between the detection values and the warm air temperatures under different exhaust resistances and the set heating temperature in the storage module 46 to obtain the actual warm air temperature entering the drum.

[0045] The drying controller 47 is connected to the warm air temperature determination module 45 and the heater 41, which is configured to receive the determined actual warm air temperature from the warm air temperature determination module 45, to control the execution of the drying process based on the actual warm air temperature entering the drum and to promptly turn off the heater 41 when the actual warm air temperature entering the drum exceeds a limit.

[0046] Based on the method for detecting the drum-entering temperature of a clothes dryer drum described above, as shown in Fig.5, the present invention also provides a device for detecting the drum-entering temperature of a clothes dryer drum that includes a heater 51, a drum-entering air duct, a thermostat 53, an air distribution opening, a warm air temperature determination module 55, a storage module 56, and a drying controller 57.

[0047] The drying controller 57 controls the heating temperature of the heater 51 and controls the on/off status of the heater 51.

[0048] The drum-entering air duct includes a warm air inlet and an inner drum inlet. The warm air generated by the heater 51 enters the drum-entering air duct through the warm air inlet. The drum-entering air duct connects with the inner drum through the inner drum inlet, allowing the warm air to flow from the drum-entering air duct into the inner drum.

[0049] The thermostat 53 is installed on the drum-entering air duct and is positioned within the set range of the warm air inlet, which is configured to send a signal to the drying controller 57 when the detected temperature exceeds a limit, causing the drying controller 57 to stop heating.

[0050] The air distribution opening is positioned on the drum-entering air duct and is located at a side of the thermostat 53.

[0051] The warm air temperature determination module 55 is configured to obtain the detection value from the thermostat 53, to query a correlation table between detection values and warm air temperatures stored in the storage module 56, and to determine the actual warm air temperature entering the drum.

[0052] The storage module 56 is used to store the correlation table between detection values and warm air temperatures, wherein the correlation table is obtained through the following steps: simulating a plurality of exhaust resistances under a set heating temperature, initiating a drying process with simulated exhaust resistances, obtaining actual warm air temperatures inside the drum-entering air duct and detection values of the temperature sensor, and recording the detection values and actual warm air temperatures to create the correlation table between the detection values and the actual warm air temperatures under different exhaust resistances and the set heating temperature.

[0053] In some embodiments of the present invention, the device for detecting the drum-entering temperature of a clothes dryer drum also includes a query preparation module 58 used to determine the heating temperature and detect the exhaust resistance, so as to allow the warm air temperature determination module 55 to query the stored correlation between detection values and warm air temperatures under different exhaust resistances and the set heating temperature in the storage module 56 to obtain the actual warm air temperature entering the drum.

[0054] The present invention also provides a clothes dryer that utilizes the device for detecting the drum-entering temperature of a clothes dryer drum presented herein. By placing the temperature sensor or the thermostat near the heater inside the drum-entering air duct and employing methods such as opening the air distribution opening at the side of the temperature sensor or the thermostat, the clothes dryer can promptly and accurately detect the warm air temperature

entering the dryer drum. By combining means for air distribution opening at the side of the temperature sensor or the thermostat, based on the negative pressure generated inside the inner drum inlet, relatively cold air is drawn into the inner drum inlet, which cools the surface of the temperature sensor or the thermostat. By combining the query of the correlation table between detection values and warm air temperatures ensures the accuracy of the actual detections. This addresses the technical problem in the prior art where temperature sensors or thermostats are positioned far from the heater, leading to delayed and inaccurate temperature measurements.

[0055] It should be noted that in the specific implementation process, the aforementioned control part can be implemented through hardware processors executing computer instructions stored in the memory in software form. The detailed explanation is omitted here. The programs corresponding to the actions executed by the above-mentioned control can all be stored in a computer-readable storage medium in software form, for the processor to call and execute the operations corresponding to each module.

[0056] The computer-readable storage medium mentioned above can include volatile memory, such as random access memory (RAM); it can also include non-volatile memory, such as read-only memory (ROM), flash memory, hard disk, or solid-state drive (SSD); it can also include a combination of the aforementioned types of memory.

[0057] The processor mentioned above can also refer to multiple processing elements collectively. For example, the processor can be a central processing unit (CPU), as well as other general-purpose processors, digital signal processors, application-specific integrated circuits (ASICs), field-programmable gate arrays (FPGAs), or other programmable logic devices, discrete gates, or transistor logic devices, discrete hardware components, etc. General-purpose processors can be microprocessors or any conventional processors, and they can also be dedicated processors.

[0058] It should be noted that the above description is not a limitation of the present invention, and the present invention is not limited to the examples provided. Changes, modifications, additions, or replacements made by those skilled in the art within the scope of the present invention should also be within the protection scope of the present invention.

Claims

1. A method for detecting the drum-entering temperature of a clothes dryer, wherein the clothes dryer comprises:

a heater; and
a drum-entering air duct, including a warm air inlet and an inner drum inlet; warm air generated by the heater enters the drum-entering air duct through the warm air inlet; the drum-entering air duct communicates with the inner drum through the inner drum inlet, allowing warm air to enter the inner drum through the drum-entering air duct;
characterized in that the clothes dryer further includes:

a temperature sensor installed on the drum-entering air duct and positioned within a set range of the warm air inlet; and
an air distribution opening opened on the drum-entering air duct and located on a side of the temperature sensor;
the method comprises:
obtaining a detection value of the temperature sensor; querying a correlation table between detection values and warm air temperatures to obtain the actual warm air temperature entering the drum.

2. The method for detecting the drum-entering temperature of a clothes dryer according to claim 1, **characterized in that** the correlation table between detection values and warm air temperatures is obtained and stored within the clothes dryer through the following steps:

simulating several sets of exhaust resistances at a set heating temperature;
initiating a drying process with simulated exhaust resistances;
obtaining actual warm air temperature values inside the drum-entering air duct and detection values of the temperature sensor; and
recording the detection values and actual warm air temperature values to create a correlation table between the detection values and the warm air temperatures at various exhaust resistances under the set heating temperature.

3. The method for detecting the drum-entering temperature of a clothes dryer according to claim 2, **characterized by** further comprising:

determining the heating temperature;
detecting the exhaust resistance;
querying the correlation between detection values and warm air temperatures under the heating temperature and the exhaust resistance to obtain the actual warm air temperature entering the drum.

4. A device for detecting the drum-entering temperature of a clothes dryer comprising:

a heater; and
a drum-entering air duct, comprising a warm air inlet and an inner drum inlet; warm air generated by the heater enters the drum-entering air duct through the warm air inlet; the drum-entering air duct communicates with the inner drum through the inner drum inlet, allowing warm air to enter the inner drum through the drum-entering air duct;
characterized in that it further includes:

a temperature sensor installed on the drum-entering air duct and positioned within a set range of the warm air inlet;
an air distribution opening opened on the drum-entering air duct and located on a side of the temperature sensor; and
a warm air temperature determination module configured to obtain a detection value of the temperature sensor, and to query a correlation table between detection values and warm air temperatures to obtain the actual warm air temperature entering the drum.

5. The device for detecting the drum-entering temperature of a clothes dryer according to claim 4, **characterized in that** it further includes:

a storage module configured to store the correlation table between detection values and warm air temperatures; wherein the correlation table between detection values and warm air temperatures is obtained through the following steps:
simulating several sets of exhaust resistances at a set heating temperature;
initiating a drying process with simulated exhaust resistances;
obtaining actual warm air temperature values inside the drum-entering air duct and detection values of the temperature sensor; and
recording the detection values and actual warm air temperature values to create a correlation table between the detection values and the warm air temperatures at various exhaust resistances under the set heating temperature.

6. The device for detecting the drum-entering temperature of a clothes dryer according to claim 5, **characterized in that** it further includes:
a query preparation module, which is configured to determine the heating temperature and detect exhaust resistance, enabling the warm air temperature determination module to query the correlation between detection values and warm air temperatures stored in the storage module based on the heating temperature and the exhaust resistance to obtain the actual warm air temperature entering the drum.

7. A device for detecting the drum-entering temperature of a clothes dryer comprising:

a heater;
a drying controller that controls the heating temperature of the heater and the on and off operation of the heater; and a drum-entering air duct, comprising a warm air inlet and an inner drum inlet; warm air generated by said heater enters the drum-entering air duct through the warm air inlet; the drum-entering air duct communicates with the inner drum through the inner drum inlet, allowing warm air to enter the inner drum through the drum-entering air duct;
characterized in that it further includes:
a thermostat installed on the drum-entering air duct and positioned within a set range of the warm air inlet, which is configured to send a signal to the drying controller when a temperature exceeding a limit is detected, causing the drying controller to stop heating;
an air distribution opening opened on the drum-entering air duct and located on a side of the thermostat; and
a warm air temperature determination module configured to obtain a detection value of the temperature sensor, and to query a correlation table between detection values and warm air temperatures to obtain the actual warm

air temperature entering the drum.

8. The device for detecting the drum-entering temperature of a clothes dryer according to claim 7, **characterized in that** it further includes:

a storage module configured to store the correlation table between detection values and warm air temperatures; wherein the correlation table between detection values and warm air temperatures is obtained through the following steps:
simulating several sets of exhaust resistances at a set heating temperature;
initiating a drying process with simulated exhaust resistances;
obtaining actual warm air temperature values inside the drum-entering air duct and detection values of the temperature sensor; and
recording the detection values and actual warm air temperature values to create a correlation table between the detection values and the warm air temperatures at various exhaust resistances under the set heating temperature.

9. The device for detecting the drum-entering temperature of a clothes dryer according to claim 8, **characterized in that** it further includes:
a query preparation module, which is configured to determine the heating temperature and detect exhaust resistance, enabling the warm air temperature determination module to query the correlation between detection values and warm air temperatures stored in the storage module based on the heating temperature and the exhaust resistance to obtain the actual warm air temperature entering the drum.

10. A clothes dryer, **characterized in that** it comprises the device for detecting the drum-entering temperature of a clothes dryer according to claim 4 or claim 7.

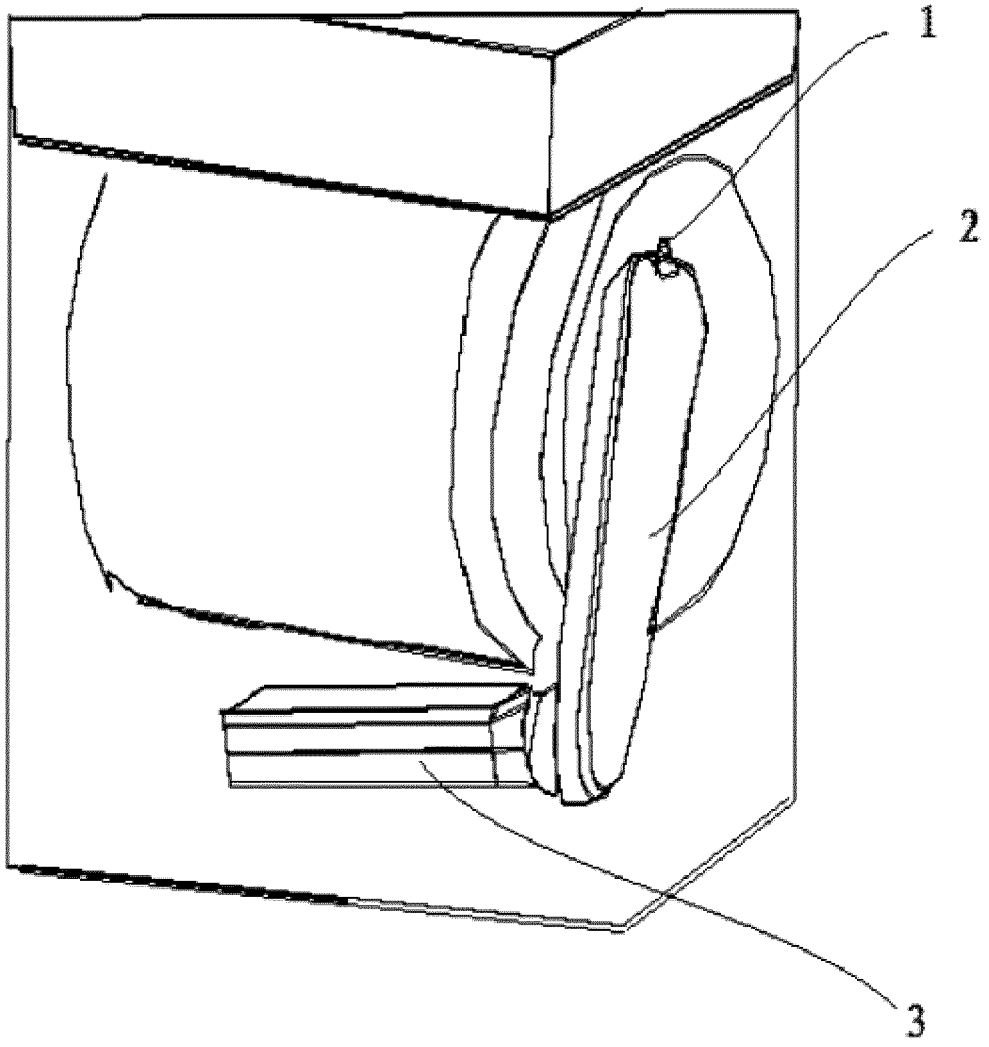

Fig.1

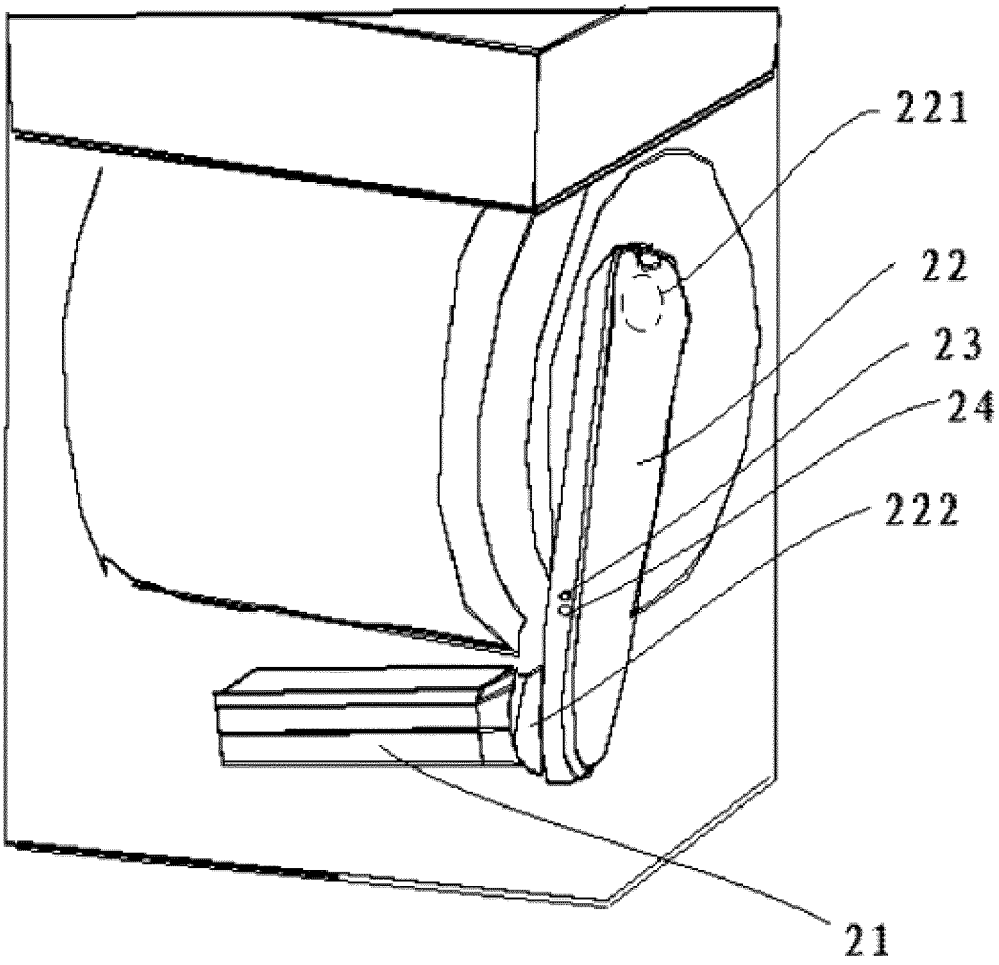
221
22
23
24
222
21

Fig.2

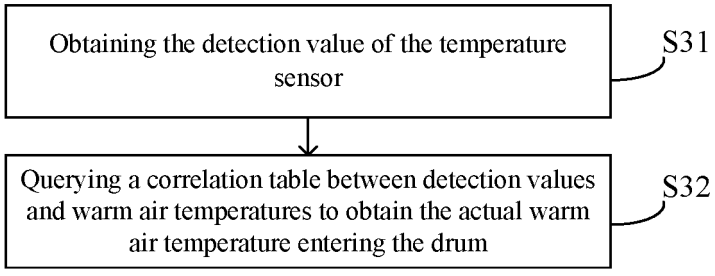
Obtaining the detection value of the temperature sensor
S31
Querying a correlation table between detection values and warm air temperatures to obtain the actual warm air temperature entering the drum
S32

Fig.3

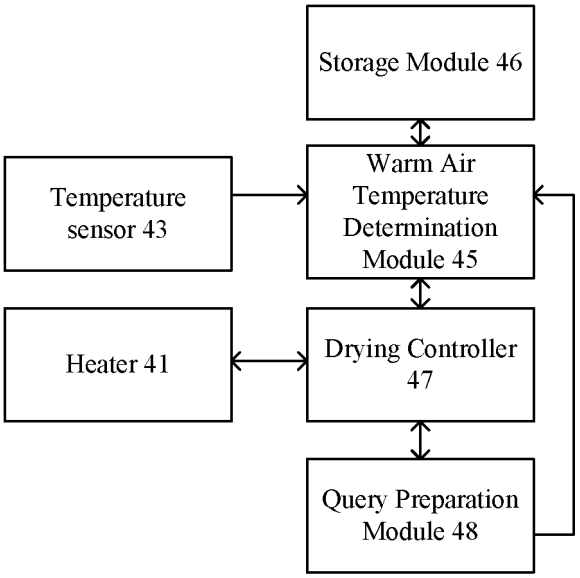
Storage Module 46
Temperature sensor 43
Warm Air Temperature Determination Module 45
Heater 41
Drying Controller 47
Query Preparation Module 48

Fig.4

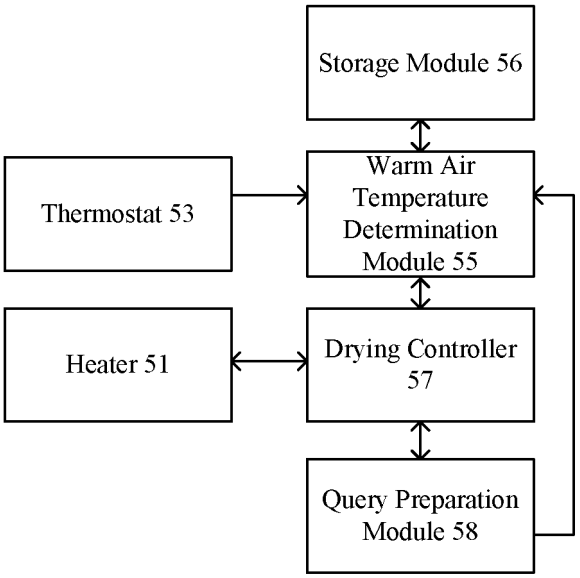
Storage Module 56
Thermostat 53
Warm Air Temperature Determination Module 55
Heater 51
Drying Controller 57
Query Preparation Module 58

Fig.5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/092395

A. CLASSIFICATION OF SUBJECT MATTER

D06F 33/50(2020.01)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, CNTXT, DWPI, SIPOABS, CNKI: 温度, 气温, 传感, 检测, 器, 装置, 配风, 进风, 通风, 引风, 进气, 口, 孔, 风道, 风管, 风路, 气管, 加热, 降温 temperature, thermal, sensor, detector, air, wind, intake, vent, hole, aperture, opening, cool+, reduct+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 101302708 A (TOSHIBA K. K. et al.) 12 November 2008 (2008-11-12) description, pages 20-22, and figures 10-11	1-10
A	CN 104594005 A (TOSHIBA K. K. et al.) 06 May 2015 (2015-05-06) entire document	1-10
A	CN 204959416 U (WUXI LITTLE SWAN CO., LTD.) 13 January 2016 (2016-01-13) entire document	1-10
A	JP 2011072673 A (HITACHI APPLIANCES INC.) 14 April 2011 (2011-04-14) entire document	1-10

☐ 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
01 August 2022	**19 August 2022**
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.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/092395

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 101302708 A	12 November 2008	JP 2008200082 A	04 September 2008
CN 104594005 A	06 May 2015	JP 2015084996 A	07 May 2015
CN 204959416 U	13 January 2016	None	
JP 2011072673 A	14 April 2011	None	

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