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(54) **HEATING CONTROL SYSTEM FOR MULTI-TUB WASHING MACHINE**

(57) The relates to a heating control system of a multi-drum washing machine. The multi-drum washing machine comprises at least two sets of heating devices. The heating control system further comprises at least two detection units which are correspondingly connected with the heating devices, wherein each detection unit is used for detecting heating information of the corresponding heating device and controlling at least one other heating device to be turned on/off according to the heating information. The heating control system of the multi-drum washing machine provided by the disclosure solves the problem that it is difficult to detect heating devices in a multi-drum washing machine, thus increasing the calcu-

lation burden of a processor. The disclosure realizes real-time detection of the heating devices through simple detection circuit hardware connection on a circuit of each heating device, thus reducing the calculation burden of the processor of the multi-drum washing machine. According to the disclosure, the circuits are detected by using connection structures of circuit hardware, thereby saving cost, improving the sensitivity of the detection circuits and prolonging the service life of the processor of the multi-drum washing machine.

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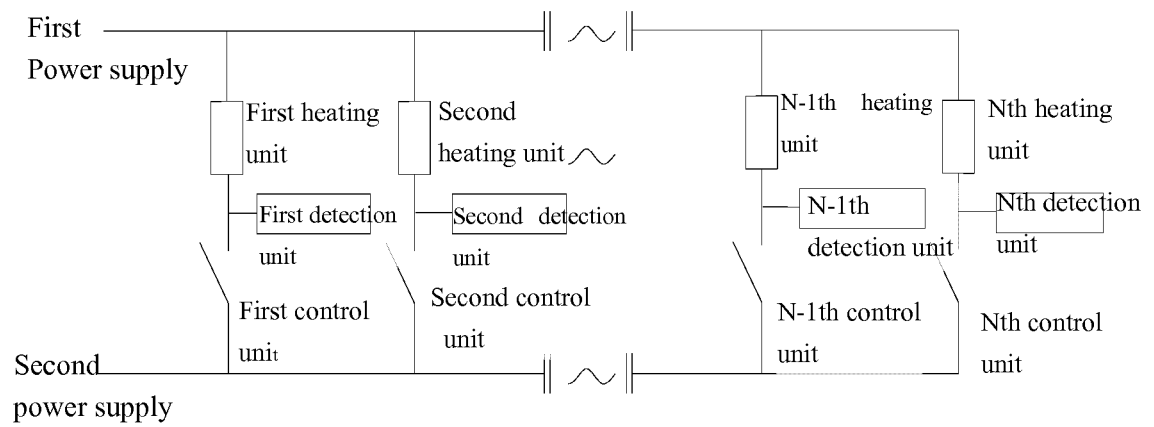


Fig. 1

Description

TECHNICAL FIELD

[0001] The disclosure relates to a multi-drum washing machine, in particular to a heating control system of a multi-drum washing machine.

BACKGROUND

[0002] With the improvement of living quality, people become increasingly aware of the importance of hygiene, especially in the aspect of household laundry washing, more and more people wash clothes separately now. For example, undergarments and outer garments are washed separately, baby clothing and adult clothing are washed separately, clothes with different colors are washed separately, or small-load washing is required when only a few items of clothing need to be washed. These can be done only in batches using an existing washing machine, or multiple washing machines are needed to meet the above requirements. This will not only waste a lot of energy and water, but also occupies large space. A multi-drum washing machine can meet the above needs and solve the problem of large space occupation. However, since each drum is usually equipped with one or two heating pipes, electric potential safety hazards might be caused when improper control is conducted.

[0003] Chinese patent application number of CN201010237876.X discloses a combined washer/dryer system and a control method thereof. The combined washer/dryer system comprises a washer and a dryer. The control method comprises the following steps of: electrically connecting the washer and the dryer, switching on the power supply to start working, detecting the working current of the system through a power management module, and controlling the working current of a heating pipe of the washer or a heating pipe of the dryer according to the working current of the system so as to control the working current within a safe current range. In this way, the use safety of the system is improved. The implementation principle of the control method is simple and the program is easy to control. However, since the power management module is added to control the working current within a safe range, the cost of the whole machine is increased; furthermore, if a detection circuit of the power management module fails, there is a electric potential safety hazard that both heating pipes work with large currents.

[0004] In view of this, the present disclosure is proposed.

SUMMARY

[0005] The technical problem to be solved by the disclosure is to overcome the defects of the prior art, and provide a heating control system of a multi-drum washing

machine. A simple circuit detection unit is arranged on a circuit of a heating device to realize the detection of the heating device, obtain heating information and then control the heating device, thereby improving the operation safety of the multi-drum washing machine.

[0006] In order to achieve the purpose, the disclosure adopts the following technical scheme: a heating control system of a multi-drum washing machine is provided, the multi-drum washing machine comprises at least two sets of heating devices, and the heating control system further comprises at least two detection units which are correspondingly connected with the heating devices, wherein each detection unit is used for detecting heating information of one of the heating devices and at least one other heating device is controlled to be turned on/off according to the heating information.

[0007] Further, a first detection unit, corresponding to a first heating device, in the control system detects heating information of the first heating device, and a second heating device is controlled to be turned on/off according to the heating information of the first heating device; wherein the first heating device and the second heating device are arranged in parallel.

[0008] Further, each heating device comprises at least one heating unit and a control unit corresponding to the heating unit, one end of the heating unit is connected with a first power supply, the other end of the heating unit is connected with the control unit, and the other end of the control unit is connected with a second power supply; wherein the control unit is used for controlling the heating unit to be turned on/off.

[0009] Further, each detection unit is arranged in parallel with the corresponding control unit and is used for detecting electric potential information of at least one end of the control unit.

[0010] Further, each heating unit comprises one or any combination of a heating pipe, a heating wire, a heating rod and an electromagnetic induction heating ring; preferably, the heating unit is a heating pipe.

[0011] Further, each detection unit is a first detection circuit, and an input end of the first detection circuit is arranged between and connected to the corresponding heating unit and the corresponding control unit.

[0012] Further, a connecting relation of each first detection circuit is as follows: one end of a first resistor R is connected with the input end, the other end of the first resistor R is connected with an output end and a capacitor C, and the other end of the capacitor C is grounded.

[0013] Further, each detection unit is a second detection circuit, and the second detection circuit is connected in parallel with the corresponding control unit; wherein one end of the second detection circuit is arranged between the corresponding heating unit and the corresponding control unit, and the other end of the second detection circuit is arranged between the corresponding control unit and the second power supply and forms a closed loop with the corresponding control unit.

[0014] Further, a connecting relation of each second

detection circuit is as follows: the second detection circuit comprises a second resistor R1 and a diode D, and the resistor R1 is connected to the diode D and forms a closed loop with the corresponding control unit; and the second detection circuit further comprises an optical coupler OC, the optical coupler OC is reversely connected with the diode D, a C pole of the optical coupler OC is connected with a third resistor R3 and an external power supply V+, and an E pole of the optical coupler OC is grounded.

[0015] Further, each control unit comprises a knife switch and/or a relay switch.

[0016] After the technical scheme is adopted, compared with the prior art, the disclosure has the following beneficial effects:

1. The heating control system of the multi-drum washing machine provided by the disclosure solves the problem that it is difficult to detect heating devices in a multi-drum washing machine, thus increasing the calculation burden of a processor. The disclosure realizes real-time detection of the heating devices through simple detection circuit hardware connection on a circuit of each heating device, thus reducing the calculation burden of the processor of the multi-drum washing machine; and according to the disclosure, the circuits are detected by using connection structures of circuit hardware, thereby saving cost, reducing the data processing amount of the multi-drum washing machine and prolonging the service life of the processor of the multi-drum washing machine.
2. The detection circuits adopted by the heating control system of the multi-drum washing machine are simple in structure and sensitive in response, and besides, the heating control system of the multi-drum washing machine has better safety and is suitable for production and popularization.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

Fig. 1 is a structural diagram of a heating control system of a multi-drum washing machine according to an embodiment of the present disclosure;
Fig. 2 is a structural diagram of a detection unit according to an embodiment of the present disclosure;
and
Fig. 3 is a structural diagram of a detection unit according to another embodiment of the present disclosure.

[0018] 1. heating unit; 2. control unit; 3. first detection circuit; 4. second detection circuit.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0019] For better understanding of the above objects,

features and advantages of the present disclosure, the present disclosure will be described in further detail below with reference to the accompanying drawings and detailed description.

Embodiment 1

[0020] As shown in Fig. 1-Fig. 3, a heating control system of a multi-drum washing machine is provided, the multi-drum washing machine comprises at least two sets of heating devices, and the heating control system further comprises at least two detection units which are correspondingly connected with the heating devices, wherein each detection unit is used for detecting heating information of the corresponding heating device and controlling at least one other heating device to be turned on/off according to the heating information.

[0021] Specifically, the multi-drum washing machine described in this embodiment can acquire the heating information of the heating devices by respectively detecting the heating devices, and control the operation of the heating devices according to the heating information, so as to avoid potential safety hazards of the multi-drum washing machine caused by excessive power consumption when the plurality of heating devices run at the same time. In this embodiment, when the heating devices work, the detection units are triggered to generate a high level or a low level; and when the heating devices do not work, the detection units are triggered to generate a low level or a high level. The embodiment realizes real-time detection of the heating devices through simple detection circuit hardware connection on a circuit of each heating device, thus reducing the calculation burden of the processor of the multi-drum washing machine; and according to this embodiment, the circuits are detected by using connection structures of circuit hardware, thereby simplifying the judging and processing of the processor so that the accuracy and sensitivity of the detection circuits are improved, reducing the data processing amount of the multi-drum washing machine and prolonging the service life of the processor of the multi-drum washing machine.

[0022] Besides, no extra power management module needs to be added, only the detection units consisting of the simple circuits need to be added in the heating devices to perform detection control on the plurality of sets of heating devices, thereby saving the cost of the multi-drum washing machine, increasing safety and making the heating control system be suitable for production and popularization.

[0023] Further, a first detection unit, corresponding to a first heating device, in the control system detects heating information of the first heating device, and controls a second heating device to be turned on/off according to the heating information of the first heating device; wherein the first heating device and the second heating device are arranged in parallel.

[0024] Specifically, the heating devices in this embod-

iment are correspondingly connected with the detection units. Before the second heating device is turned on, the first heating device needs to be detected to ensure that the first heating device is not in a high-power working state, so that it is ensured that the high-power heating devices in the multi-drum washing machine do not operate at the same time and that the multi-drum washing machine runs safely.

[0025] Further, each heating device comprises at least one heating unit 1 and a control unit 2 corresponding to the heating unit 1, one end of the heating unit 1 is connected with a first power supply, the other end of the heating unit 1 is connected with the control unit 2, and the other end of the control unit 2 is connected with a second power supply; wherein the control unit 2 is used for controlling the heating unit 1 to be turned on/off.

[0026] When one heating device is provided with a plurality of heating units 1, the heating units are arranged in parallel.

[0027] Specifically, in this embodiment, each heating unit 1 and the corresponding control unit 2 are connected in series to form one heating device, and a plurality of heating devices are connected in parallel to form a heating system of the multi-drum washing machine. For example, a first heating unit is connected in series with a first control unit, and the first control unit has an on state and an off state, and controls the heating unit 1 to perform heating and not to perform heating by the two states.

[0028] Meanwhile, the first detection unit also corresponds to the first control unit and the first heating unit, and the first detection unit detects the electric potential information on a circuit where the first heating unit and the first control unit are located, thereby obtaining a heating state of the heating unit 1.

[0029] Further, each detection unit is arranged in parallel with the corresponding control unit 2 and is used for detecting electric potential information of at least one end of the control unit 2.

[0030] Further, each heating unit 1 comprises one or any combination of a heating pipe, a heating wire, a heating rod and an electromagnetic induction heating ring; preferably, the heating unit 1 is a heating pipe.

[0031] Further, each detection unit is a first detection circuit 3, and an input end of the first detection circuit 3 is arranged between and connected with the corresponding heating unit 1 and the corresponding control unit 2.

[0032] Further, a connecting relation of each first detection circuit 3 is as follows: one end of a first resistor R is connected with the input end, the other end of the first resistor R is connected with an output end and a capacitor C, and the other end of the capacitor C is grounded.

[0033] Specifically, in this embodiment, each detection circuit is a non-isolated detection circuit, and the heating information of the heating unit 1 can be detected simply by acquiring a signal of a line between the heating unit 1 and the control unit 2. When the control unit 2 is on or off, the input end of the detection unit inputs an electrical

signal, thereby triggering the capacitor C to discharge or charge, and the output end outputs a high level or a low level. The state of each control unit 2 is obtained, and then the on/off state of other control units 2 is controlled.

[0034] For example, when the first power supply is higher than the second power supply and the control unit 2 is on, the capacitor C is triggered to discharge, and the output end outputs a low level. When the control unit 2 is off, the capacitor C is triggered to charge, and the output end outputs a high level.

[0035] In this embodiment, through the charging and discharging process of the hardware capacitor C, the on/off state of the control unit 2 is obtained, so that other heating units 1 are controlled to be turned on/off according to the on/off state of the control unit 2. According to the embodiment, the heating information of the heating units 1 is detected through a simple hardware connection structure, so that the control of the heating system is realized, the calculation burden of the processor of the multi-drum washing machine is reduced, and electric potential safety hazards caused when the plurality of heating devices work at the same time with large currents due to calculation failure caused by heavy calculation burden of the processor are avoided.

[0036] Further, each control unit 2 comprises a knife switch and/or a relay switch.

[0037] To sum up, the heating control system of the multi-drum washing machine in this embodiment has the following advantages:

1. The heating control system of the multi-drum washing machine provided in this embodiment solves the problem that it is difficult to detect heating devices in a multi-drum washing machine, thus increasing the calculation burden of a processor; the embodiment realizes real-time detection of the heating devices through simple detection circuit hardware connection on a circuit of each heating device, thus reducing the calculation burden of the processor of the multi-drum washing machine; and according to the embodiment, the circuits are detected by using connection structures of circuit hardware, thereby saving cost, reducing the data processing amount of the multi-drum washing machine and prolonging the service life of the processor of the multi-drum washing machine.

2. The detection circuits adopted by the heating control system of the multi-drum washing machine are simple in structure and sensitive in response, and besides, the heating control system of the multi-drum washing machine has better safety and is suitable for production and popularization.

Embodiment 2

[0038] As shown in Fig. 1 and Fig. 3, a heating control system of a multi-drum washing machine is provided, the multi-drum washing machine comprises at least two sets

of heating devices, and the heating control system further comprises at least two detection units which are correspondingly connected with the heating devices, wherein each detection unit is used for detecting heating information of the corresponding heating device and controlling the heating devices to be turned on/off according to the heating information.

[0039] Further, one detection unit in the control system detects heating information of a first heating device, and controls a second heating device to be turned on/off according to the heating information of the first heating device.

[0040] Further, each heating device comprises at least one heating unit 1 and a control unit 2 corresponding to the heating unit 1, one end of the heating unit 1 is connected with a first power supply, the other end of the heating unit 1 is connected with the control unit 2, and the other end of the control unit 2 is connected with a second power supply;

wherein the control unit 2 is used for controlling the heating unit 1 to be turned on/off.

[0041] Further, each detection unit is arranged in parallel with the corresponding control unit 2 and is used for detecting electric potential information of at least one end of the control unit 2.

[0042] Further, each heating unit 1 comprises one or any combination of a heating pipe, a heating wire, a heating rod and an electromagnetic induction heating ring; preferably, the heating unit 1 is a heating pipe.

[0043] Each detection unit is a second detection circuit 4, and the second detection circuit 4 is connected in parallel with the corresponding control unit 2; wherein one end of the second detection circuit 4 is arranged between the corresponding heating unit 1 and the corresponding control unit 2, and the other end of the second detection circuit 4 is arranged between the corresponding control unit 2 and the second power supply; and the second detection circuit and the corresponding control unit 2 form a closed loop.

[0044] Further, a connecting relation of each second detection circuit 4 is as follows: the second detection circuit comprises a second resistor R1 and a diode D, and the resistor R1 and the diode D are connected and form a closed loop with the corresponding control unit 2; and the second detection circuit 4 further comprises an optical coupler OC, the optical coupler OC is reversely connected with the diode D, a C pole of the optical coupler OC is connected with a third resistor R3 and an external power supply V+, and an E pole of the optical coupler OC is grounded.

[0045] Specifically, in this embodiment, the isolated detection circuits are mainly adopted, which can avoid the problem of detection errors in detection information of the detection units due to the interference of a circuit where the heating units 1 and the control units 2 are located. In each second detection circuit 4 of this embodiment, the detection unit is connected in parallel with the control unit 2 to detect the circuit information of two ends

of the control unit 2, and when the control unit 2 is on or off, an output end outputs a high level or a low level. The state of each control unit 2 is obtained, and then the on/off state of other control units 2 is controlled.

[0046] Meanwhile, according to each second detection circuit 4 in this embodiment, through reverse connection of the diode D and the optical coupler OC, specifically, through reverse parallel connection of the diode D and a light emitting diode in the optical coupler OC, the safety of the second detection circuit 4 is improved.

[0047] Moreover, when the first power supply is higher than the second power supply and the control unit 2 is on, the light emitting diode in the optical coupler OC is triggered to emit light, a loop of the second resistor R1 and the light emitting diode is formed, and a C pole and an E pole of a triode are turned on, so that the output end outputs a high level;

and when the control unit 2 is off, the diode D is turned on, forming a loop of the second resistor R1 and the diode D. The C pole and the E pole of the triode of the optical coupler OC are not turned on, and then the output end outputs a low level.

[0048] In this embodiment, the second detection circuits 4 can not only detect the circuits of the heating devices, but also protect the detection circuits and improve the operation safety of the multi-drum washing machine.

[0049] Further, each control unit 2 comprises a knife switch and/or a relay switch.

[0050] The above-mentioned embodiments can be further combined or replaced, and the embodiments are merely preferred embodiments of the present disclosure, and do not limit the concept and scope of the present disclosure. Without departing from the design idea of the present disclosure, various changes and improvements made to the technical scheme of the present disclosure by those skilled in the art belong to the protection scope of the present disclosure.

40 Claims

1. A heating control system of a multi-drum washing machine having at least two sets of heating devices, comprising,
 - at least two detection units which are correspondingly connected with the heating devices, wherein one of the detection units is used for detecting heating information of one of the heating devices, and, at least one other heating device is controlled to be turned on/off according to the heating information.
2. The heating control system of the multi-drum washing machine according to claim 1, wherein a first detection unit, corresponding to a first heating device, in the control system detects heating information of the first heating device, and a second heating device is controlled to be turned on/off according to the heating information of the first heating device;

wherein the first heating device and the second heating device are arranged in parallel.

3. The heating control system of the multi-drum washing machine according to claim 1 or 2, wherein each heating device comprises at least one heating unit and a control unit corresponding to the heating unit, one end of the heating unit is connected with a first power supply, another end of the heating unit is connected with one end of the control unit, and another end of the control unit is connected with a second power supply; wherein the control unit is used for controlling the heating unit to be turned on/off. 5
4. The heating control system of the multi-drum washing machine according to claim 3, wherein the detection unit is arranged in parallel with the control unit and is used for detecting electric potential information of at least one end of the control unit. 10 20
5. The heating control system of the multi-drum washing machine according to claim 3 or 4, wherein the heating unit comprises one or more than one element selected from a group consisting of a heating pipe, a heating wire, a heating rod and an electromagnetic induction heating ring; preferably, the heating unit is a heating pipe. 25
6. The heating control system of the multi-drum washing machine according to any one of claims 3-5, wherein the detection unit is a first detection circuit, and an input end of the first detection circuit is arranged between and connected with the heating unit and the control unit. 30 35
7. The heating control system of the multi-drum washing machine according to claim 6, wherein a connecting relation of the first detection circuit is as follows: one end of a first resistor R is connected with the input end, another end of the first resistor R is connected with an output end and a capacitor C, and another end of the capacitor C is grounded. 40
8. The heating control system of the multi-drum washing machine according to any one of claims 3-5, wherein the detection unit is a second detection circuit, and the second detection circuit is connected in parallel with the control unit; wherein one end of the second detection circuit is arranged between the heating unit and the control unit, and another end of the second detection circuit is arranged between the control unit and the second power supply and, the second detection circuit and the corresponding control unit form a closed loop. 45 50 55
9. The heating control system of the multi-drum wash-

ing machine according to claim 8, wherein a connecting relation of the second detection circuit is as follows: the second detection circuit comprises a second resistor R1 and a diode D, the resistor R1 and the diode D are connected and form a closed loop with the control unit; the second detection circuit further comprises an optical coupler OC, the optical coupler OC is reversely connected with the diode D, a C pole of the optical coupler OC is connected with a third resistor R3 and an external power supply V+, and an E pole of the optical coupler OC is grounded.

10. The heating control system of the multi-drum washing machine according to any one of claims 3-9, wherein the control unit comprises a knife switch and/or a relay switch.

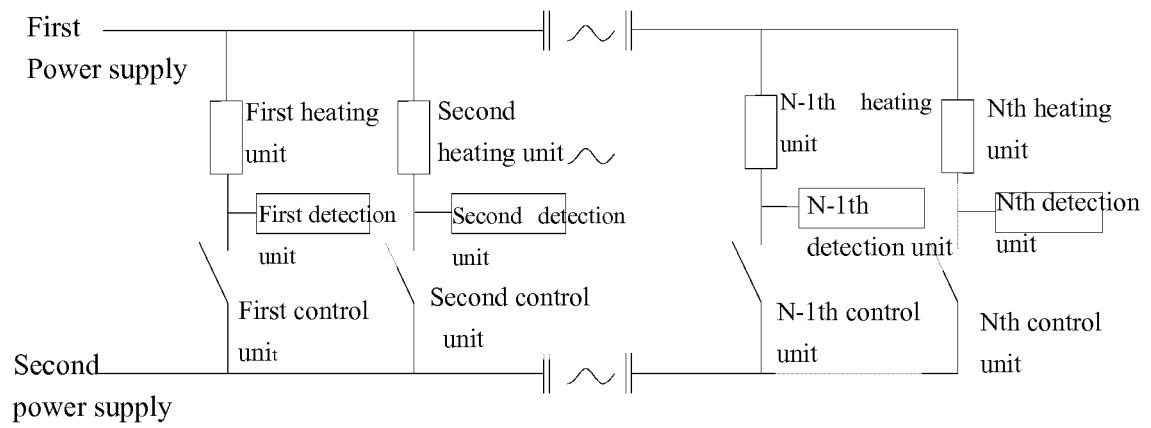


Fig. 1

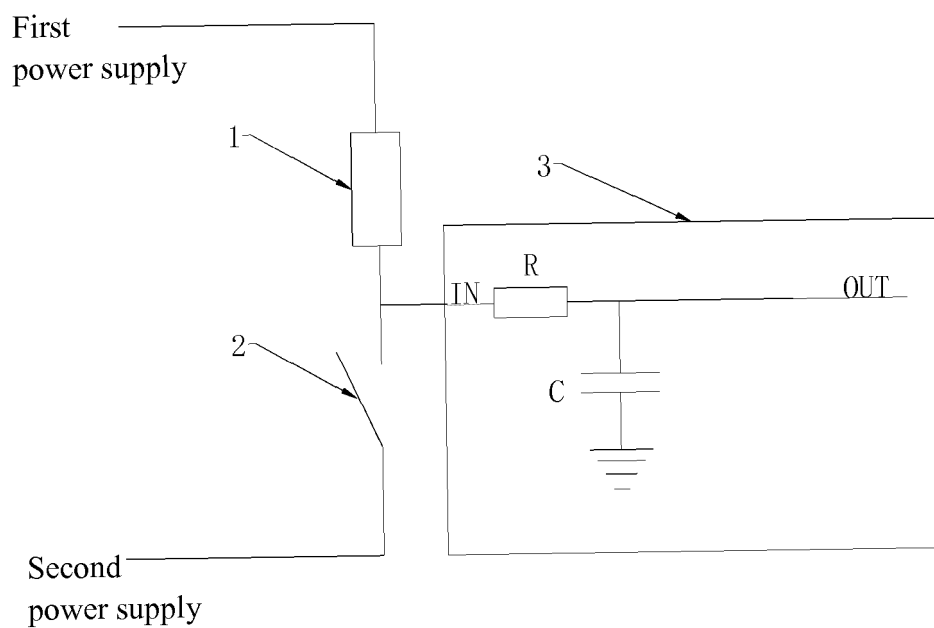


Fig. 2

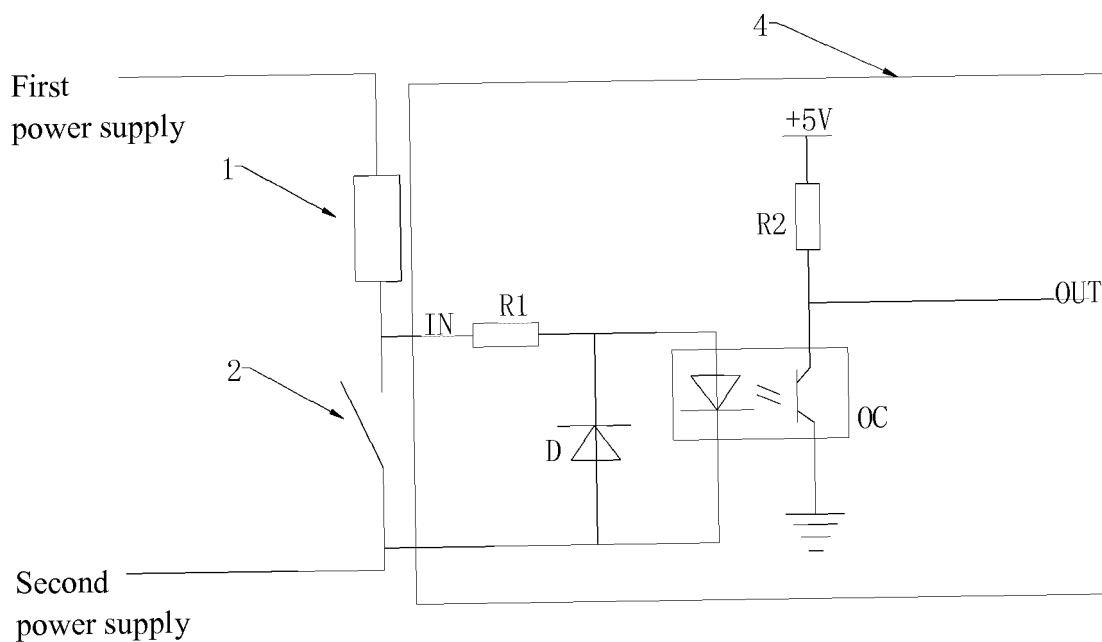


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2017/117632

A. CLASSIFICATION OF SUBJECT MATTER

D06F 31/00 (2006.01) i; D06F 33/02 (2006.01) i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D06F

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)

CNTXT; CNABS; DWPI; SIPOABS, CNKI: 多筒, 多桶, 双筒, 双桶, 多滚筒, 多滚桶, 双滚筒, 双滚桶, 加热, 检测, 两个, 2个, 第一, 第 1, two, double, dual, tub, drum, roller, basket, heat+, detector? measurer? first

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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

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"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

 Date of the actual completion of the international search
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 Date of mailing of the international search report
29 March 2018

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

INTERNATIONAL SEARCH REPORT
 Information on patent family members

 International application No.
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