Abnormal temperature detector for electronic apparatus

Detektor für abnormale Temperaturen in elektronischen Apparaten
Détecteur d’une température abnormale pour appareils électromécaniques

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Description

Background of the Invention

The present invention relates to an abnormal temperature detector for an electronic apparatus. Electronic equipment such as a data processor is designed such that a plurality of wiring boards having IC elements mounted thereon are housed in a rack. The IC elements are cooled by forced convection of air using cooling fans to prevent a rise in temperature of each element and to maintain reliability.

In order to prevent a breakdown of such an apparatus, which is caused by a rise in temperature of the IC elements upon failure of the cooling fans or the like, the following method is employed. A detector is used to detect an atmospheric temperature near the rack. Upon detection of a temperature higher than a predetermined temperature, the detector sends a signal to a power supply circuit to stop the supply of power to the apparatus, thus protecting it.

Fig. 3 shows a conventional abnormal temperature detector.

Referring to Fig. 3, reference numeral 101 denotes a rack for housing wiring boards having IC elements mounted thereon; 102, a cooling fan; 103, a thermostat designed to open a contact at a preset temperature or more; 104, an abnormality detector; and 105, a power supply controller.

When a temperature near the rack 101 is increased to the preset temperature or more upon failure of the cooling fans 102 or the like, the contacts of the thermostats 103 are opened. The abnormality detector 104 detects this state and outputs a signal to the power supply controller 105 to stop the supply of power to the apparatus.

According to the above-described conventional abnormal temperature detector for electronic equipment, however, when the contacts are opened upon failure of the thermostats, or cables for connecting the thermostats to the power supply controller are disconnected, an abnormal temperature is erroneously detected to cause the power supply controller 105 to stop the supply of power to the apparatus.

Summary of the Invention

It is a principal object of the present invention to provide an abnormal temperature detector for an electronic apparatus, which can improve the reliability of the electronic apparatus.

It is another object of the present invention to provide an abnormal temperature detector for an electronic apparatus, which is free from operation errors caused by a breakdown of a temperature detecting means.

It is still another object of the present invention to provide an abnormal temperature detector for an electronic apparatus, which is free from operation errors caused by disconnection of a wiring system.

In order to achieve the above objects, there is provided an abnormal temperature detector for electronic apparatus having a rack in which a plurality of wiring boards having IC elements mounted thereon are housed, the detector comprising:

- a first set of temperature detecting means to be disposed at respective detection points on or near a rack and connected in series with each other to abnormality detecting means, the temperature detecting means responding to an excessive temperature by breaking the continuity of said series connection and the abnormality detecting means detecting said break;
- power supply control means for interrupting a power supply to the apparatus in response to an abnormality detecting output from said abnormality detecting means; and characterised by
- a second set of said temperature detecting means each of which is to be disposed at a respective said detection point in a pair with a temperature detecting means of the first set, the second set of temperature detecting means being connected in series with each other to the abnormality detecting means, the two series-connected sets of temperature detecting means being connected to the abnormality detecting means in separate parallel circuits whereby the abnormality detecting means produces an abnormality detecting output in response to an excessive temperature at a said detection point only in response to both temperature detecting means at said detection point breaking the continuity of their respective series connections.

Brief Description of the Drawings

Figs. 1 and 2 are block diagrams respectively showing the first and second embodiments of the present invention; and

Fig. 3 is a block diagram showing a conventional abnormal temperature detector.

Description of the Preferred Embodiments

The present invention will be described below with reference to the accompanying drawings.

Fig. 1 shows the first embodiment of the present invention.

Referring to Fig. 1, reference numeral 1 denotes a rack for housing a plurality of wiring boards having IC elements mounted thereon; 2, a cooling fan; 3, a thermostat which is arranged near the rack 1 and opens a contact at a preset temperature or more.

The thermostats 3 are arranged in pairs at the re-
spective detection points. One thermostat of each ther-
mostat pair at the respective detection points are con-
ected in series, forming a first set. The other ther-
mostats of each pair also are connected in series to form a
second set. The two series-connected sets of thermo-
stats 3 are independently connected to an abnormality
detector 4 through cables 6 of independent, parallel wir-
ing systems. Reference numeral 5 denotes a power sup-
ply controller. Upon reception of a detection output from
the abnormality detector 4, the power supply controller
5 stops the supply of power to the apparatus.

Assume that the two thermostats of a given pair
function properly. In this case, if a temperature near the
rack is lower than the preset temperature, the contacts
of the two thermostats are closed.

When a temperature near the rack is increased to
the preset temperature or more upon failure of the cool-
ing fans 2 or the like, the contacts of the two thermostats
are opened. The abnormality detector 4 detects this state
and supplies a detection output to the power supply con-
troller 5, thus stopping the supply of power to the appa-

ratus.

Assume that one of the thermostats is broken down
and presents an open circuit at a temperature lower than
the preset temperature.

In this arrangement, upon detection of an open state
of the contact of a given thermostat 3 in one wiring sys-
tem, the abnormality detector 4 drives an alarm circuit 7
to generate an alarm to inform a failure. The abnormality
detector 4 supplies an output to a power supply controller
5 to stop the supply of power to the apparatus only when
it detects that the contacts of given thermostats 3 in each
of the two sets are open.

With this operation, even if the cable 6 between the
thermostats 3 and the abnormality detector 4 is discon-
ected, and if the disconnection occurs in only one of the
wiring systems, the abnormality detector 4 does not de-
tect a contact open state at any detection point. There-
fore, the supply of power is not erroneously interrupted.

Fig. 2 shows a second embodiment of the present
invention.

The second embodiment is the same as the first em-
bodyment except that the two terminals of one of the two
thermostats at each detection point are connected to
those of the other thermostat. With this arrangement,
only when the two thermostats 3 at one detection point
are simultaneously opened, the supply of power to the
apparatus is stopped by an output from an abnormality
detector 4. Therefore, even if one of each of thermostat
pairs at different detection points fails, the power supply
is not erroneously interrupted. In each embodiment de-
scribed above, the abnormality detector 4 and the power
supply controller 5 may be integrated into one circuit.

According to the present invention, the abnormal
temperature detector for an electronic apparatus is de-
signed to prevent erroneous interruption of the supply of
power to the apparatus upon failure of a thermostat for
detecting abnormality or disconnection of a wiring sys-
tem of a circuit. The present invention can be effectively
applied especially to a system required to process a
large amount of data and to be operated without inter-
ruption, such as a large data processor.

As has been described above, according to the
present invention, since a plurality of temperature detect-
ing means, which open contacts at a preset temperature
or more, are arranged at each detection point, a power
supply is not erroneously interrupted upon failure of
some of the temperature detecting means or disconnec-
tion of a wiring system. Therefore, the overall apparatus
can be improved in reliability.

Claims

1. An abnormal temperature detector for electronic
apparatus having a rack in which a plurality of wiring
boards having IC elements mounted thereon are
housed, the detector comprising:

- a first set of temperature detecting means (3) to
be disposed at respective detection points on or
near a rack and connected in series with each
other to abnormality detecting means (4), the
temperature detecting means responding to an
excessive temperature by breaking the contin-
uity of said series connection and the abnormality
detecting means detecting said break;

- power supply control means (5) for interrupting
a power supply to the apparatus in response to
an abnormality detection output from said
abnormality detecting means; and character-
ised by

- a second set of said temperature detecting
means (3) each of which is to be disposed at a
respective said detection point in a pair with a
temperature detecting means of the first set, the
second set of temperature detecting means
being connected in series with each other to the
abnormality detecting means, the two
series-connected sets of temperature detecting
means being connected to the abnormality
detecting means in separate parallel circuits
whereby the abnormality detecting means pro-
duces an abnormality detection output in
response to an excessive temperature at a said
detection point only in response to both temper-
ature detecting means at said detection point
breaking the continuity of their respective series
connections.

2. A detector according to Claim 1, wherein the termi-
nals of each temperature detecting means at a said
detection point are connected to the corresponding
terminals of the other temperature detecting means
3. A detector according to Claim 1 or Claim 2, wherein each of said temperature detecting means includes one contact which is opened at a temperature greater than or equal to a preset temperature.

4. A detector according to Claim 1, further comprising alarm means (7) for generating an alarm, said abnormality detecting means driving said alarm means upon detecting the break of continuity in only one of said parallel circuits.

5. A detector according to any one of the preceding claims, wherein said rack in which said plurality of wiring boards are housed is forcibly cooled by cooling fans.

Patentansprüche

1. Detektor für anomale Temperaturen für ein elektro

isches Gerät, das ein Gestell aufweist, in dem eine Vielzahl von Verdrahtungsplatinen mit daran ange

brachten IC-Elementen untergebracht sind, welcher Detektor aufweist:

2. Detektorspunkt nur dann angibt, wenn beide Temperaturfühlermittel an dem Detektionspunkt die Kontinuität ihrer entsprechenden Reihenverbindungen unterbrechen.

3. Detektor nach Anspruch 1, bei dem die Anschlüsse jedes Temperaturfühlermittels an einem Detektionspunkt mit den entsprechenden Anschlüssen des anderen Temperaturfühlermittels an dem Punkt verbunden sind.

4. Detektor nach Anspruch 1 oder 2, bei dem jedes der Temperaturfühlermittel einen Kontakt aufweist, der bei einer Temperatur geöffnet wird, der größer ist als oder gleich wie eine vorgewählte Temperatur.

5. Detektor nach einem der vorangehenden Ansprüche, bei dem das Gestell, in der die Vielzahl von Verdrahtungsplatinen untergebracht ist, durch Kühlen

vitiolierten zwangsgekühlt wird.

Reivendications

1. Détecteur de température anormale pour appareil électronique ayant une baie dans laquelle sont logées plusieurs cartes de circuits sur lesquelles sont montés des circuits intégrés, le détecteur comprenant :

un premier jeu de moyens de détection de la température (3) destinés à être disposés en des points de détection respectifs situés sur une baie ou à proximité de cette baie, et connecter en série entre eux à des moyens de détection d'anomalie (4), les moyens de détection de température répondant à une température excessive en rompant la continuité de ladite connexion en série et des moyens de détection d'anomalie qui détectent ladite rupture ;

des moyens de commande de l'alimentation (5) destinés à interrompre la transmission de l'alimentation à l'appareil en réponse à une sortie de détection d'anomalie émise par lesdits moyens de détection d'anomalie ; et caractérisé par

un deuxième jeu desdits moyens de détection de température (3) dont chacun est destiné à être disposé en un desdits points de détection, qui lui correspond respectivement, en formant
une paire avec un moyen de détection de température du premier jeu, le deuxième jeu de moyens de détection de température étant connectés en série entre eux aux moyens de détection d'anomalie, les deux jeux de moyens de détection de température connectés en série étant connectés aux moyens de détection d'anomalie dans des circuits parallèles séparés, de sorte que les moyens de détection d'anomalie produisent une sortie de détection d'anomalie en réponse à une température excessive audit point de détection uniquement en réponse à la rupture de la continuité des connexions séries respectives des deux moyens de détection de température auxdits points de détection.

2. DéTECTEUR selon la revendication 1, dans lequel les bornes de chaque moyen détecteur de température à un desdits points de détection sont connectées aux bornes correspondantes de l'autre moyen détecteur de température situé à ce point.

3. DéTECTEUR selon la revendication 1 ou la revendication 2, dans lequel chacun des moyens détecteurs de température comprend un contact qui s'ouvre à une température supérieure ou égale à une température prédéterminée.

4. DéTECTEUR selon la revendication 1, comprenant en outre des moyens d'alarme (7) destinés à générer une alarme, lesdits moyens détecteurs d'anomalie attaquant lesdits moyens d'alarme en réponse à la détection d'une rupture de continuité dans seulement l'un desdits circuits parallèles.

5. DéTECTEUR selon une quelconque des revendications précédentes, dans lequel ladite baie dans laquelle ladite pluralité de circuits imprimés sont logés est refroidie de force par des ventilateurs de refroidissement.
FIG. 3

POWER SUPPLY CONTROLLER

ABNORMALITY DETECTOR

COOLING FAN 102

THERMOSTAT 103

RACK 101

102

104

105