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**Yokoyama**

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(54) **ABNORMALITY DETECTION DEVICE**

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**H05K 7/20** (2006.01)

(52) **U.S. Cl.**

CPC ..... **G01N 25/72** (2013.01); **H05K 7/20836** (2013.01)

(58) **Field of Classification Search**

CPC .... G01N 25/72; H05K 7/20836; G01K 7/42; G01K 7/425

USPC ..... 374/4

See application file for complete search history.

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(57) **ABSTRACT**

An estimating unit **51** estimates the upper limit of possible temperatures in a predetermined position of ICT equipment when the quantity of intake air into the ICT equipment is appropriate, based on the result of detection by an operational status detecting unit that detects the operational status of the ICT equipment and the result of detection by an intake-air temperature sensor **62** that detects the temperature of intake air of the ICT equipment. A determining unit **52** determines that an abnormality is occurring when the result of detection by a temperature sensor **63** that detects the temperature in the predetermined position is beyond the upper limit estimated by the estimating unit.

**9 Claims, 5 Drawing Sheets**

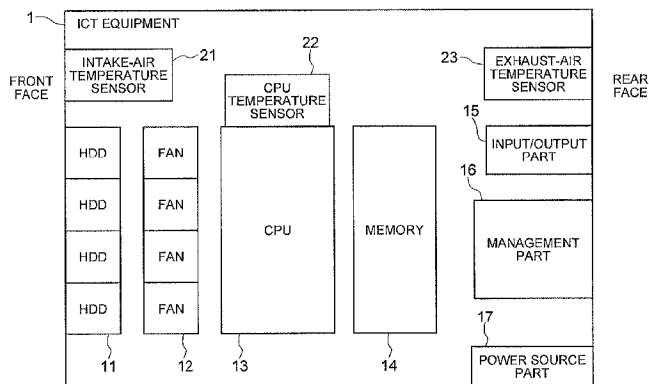


FIG. 1

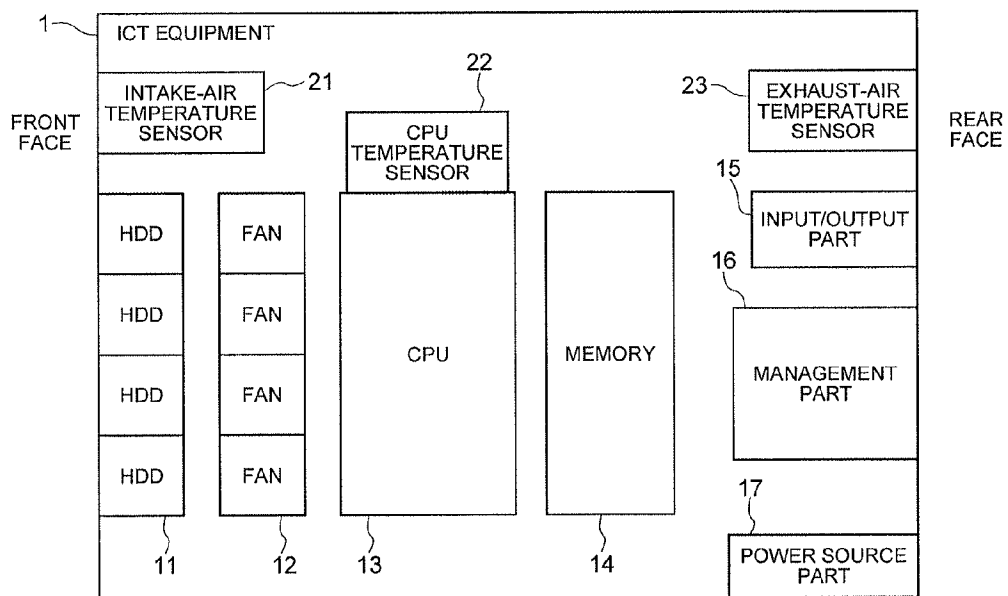


FIG. 2

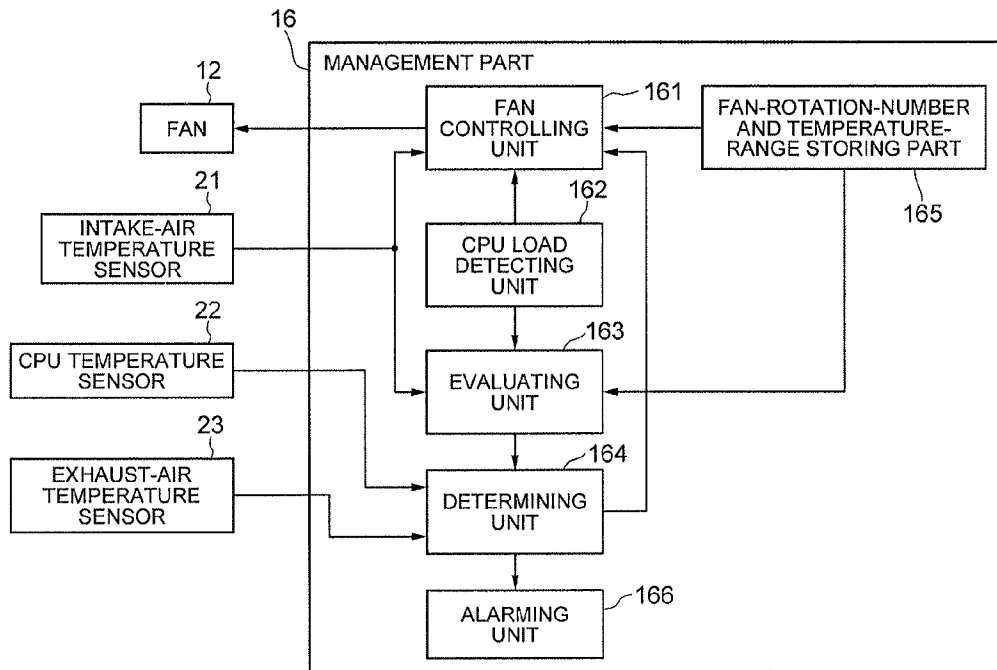


FIG. 3

165 FAN-ROTATION-NUMBER AND TEMPERATURE-RANGE STORING PART

INTAKE-AIR TEMPERATURE	CPU LOAD	FAN ROTATION NUMBER	EXHAUST-AIR TEMPERATURE RANGE	CPU TEMPERATURE RANGE
$Ta1 \leqq Ta < Ta2$	$L1 \leqq L < L2$	R1	$Tb1 \leqq Tb < Tb2$	$Tc1 \leqq Tc < Tc2$
$Ta1 \leqq Ta < Ta2$	$L2 \leqq L < L3$	R2	$Tb2 \leqq Tb < Tb3$	$Tc2 \leqq Tc < Tc3$
⋮	⋮	⋮	⋮	⋮
$Ta1 \leqq Ta < Ta2$	$L10 \leqq L < L11$	R10	$Tb10 \leqq Tb < Tb11$	$Tc10 \leqq Tc < Tc11$
$Ta2 \leqq Ta < Ta3$	$L1 \leqq L < L2$	R1'	$Tb1' \leqq Tb < Tb2'$	$Tc1' \leqq Tc < Tc2'$
$Ta2 \leqq Ta < Ta3$	$L2 \leqq L < L3$	R2'	$Tb2' \leqq Tb < Tb3'$	$Tc2' \leqq Tc < Tc3'$
⋮	⋮	⋮	⋮	⋮
$Ta2 \leqq Ta < Ta3$	$L10 \leqq L < L11$	R10'	$Tb10' \leqq Tb < Tb11'$	$Tc10' \leqq Tc < Tc11'$
⋮	⋮	⋮	⋮	⋮

FIG. 4

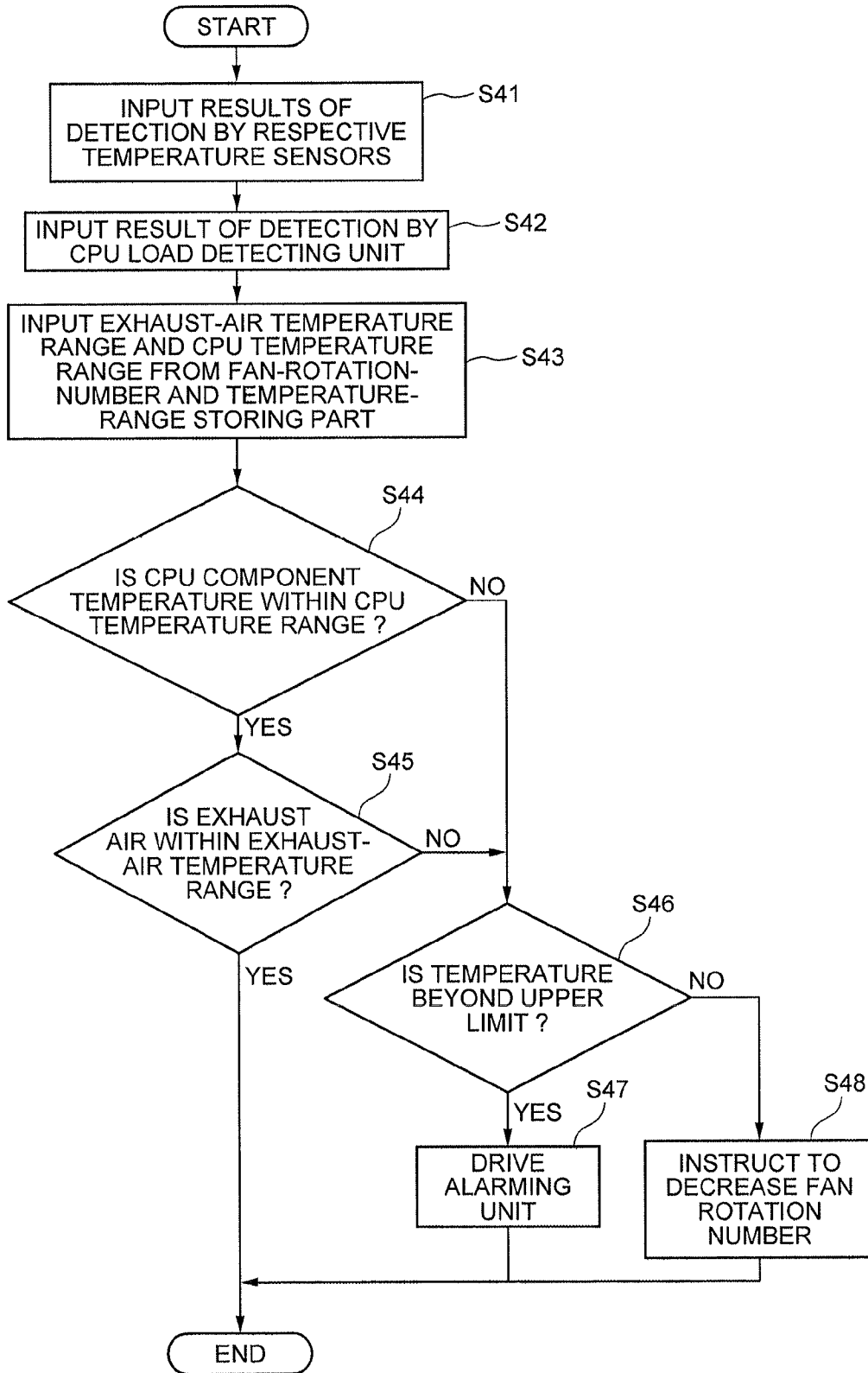
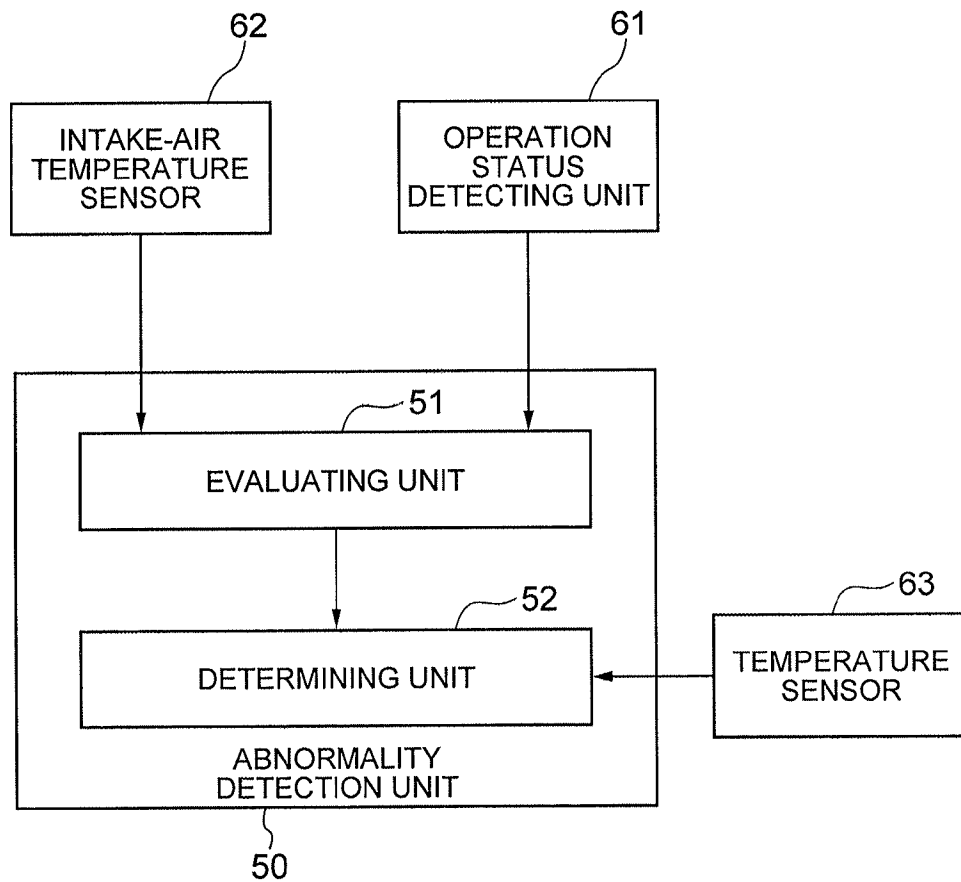


FIG. 5



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**ABNORMALITY DETECTION DEVICE**

## INCORPORATION BY REFERENCE

This application is based upon and claims the benefit of  
 priority from Japanese patent application No. 2012-194793,  
 filed on Sep. 5, 2012, the disclosure of which is incorporated  
 herein in its entirety by reference.

## TECHNICAL FIELD

The present invention relates to an abnormality detection  
 device that detects an abnormality of a cooling function of  
 ICT (Information and Communication Technology) equip-  
 ment such as a server, and also relates to ICT equipment, an  
 abnormality detection method, and a program.

## BACKGROUND ART

ICT equipment such as a server may have a cooling fan  
 within a case thereof so as to prevent the internal tempera-  
 ture of the case from excessively rising due to heat genera-  
 tion by an electronic component such as a CPU. Rotation of  
 the cooling fan allows air to be taken in through an inlet  
 opening formed on the case, and the inside of the case is  
 thereby cooled down. A filter is attached to the inlet opening,  
 so that dust does not enter the case. Even if the cooling fan  
 is attached, however, when the filter is clogged or the  
 cooling fan is down, the quantity of intake air decreases, and  
 the inside of the case cannot be cooled down. In a case where  
 the inside of the case cannot be cooled down, the ICT  
 equipment cannot operate normally.

As a technique for solving such a problem, the following  
 technique is known (e.g., see Patent Document 1). In the  
 technique described in Patent Document 1, firstly, the tem-  
 perature of intake air and the temperature of a CPU are  
 detected, and an allowable temperature defined for the  
 intake-air temperature is obtained. Then, the CPU tempera-  
 ture is compared with the allowable temperature and, when  
 the CPU temperature is beyond the allowable temperature,  
 it is examined whether the number of rotations of the cooling  
 fan is a set number of rotations. It is notified to the user  
 that the filter is clogged when the number of rotations of  
 the cooling fan is the set number of rotations, whereas it  
 is notified to the user that the cooling fan is down when the  
 number of rotations of the cooling fan is not the set number  
 of rotations.

[Patent Document 1] Japanese Unexamined Patent Applica-  
 tion Publication No. JP-A 2006-127283

In a case where the operational status of the ICT equip-  
 ment is constant, it is possible to accurately detect an  
 abnormality such as clogging of the filter by the technique  
 described in Patent Document 1. However, in the technique  
 described in Patent Document 1, the CPU temperature is  
 compared with the allowable temperature defined for the  
 intake-air temperature, and it is thereby determined whether  
 an abnormality such as clogging of the filter is occurring.  
 Therefore, in a case where the operational status of the ICT  
 equipment is not constant, it may be impossible to detect an  
 abnormality such as clogging or, by contrast, it may be  
 determined that an abnormality such as clogging is occur-  
 ring in spite of no abnormality. For example, in the latest  
 ICT equipment, the amount of heat generated by the CPU  
 substantially triples depending on the operational status and  
 this fact is not considered in the technique described in

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Patent Document 1, so that it is impossible to accurately  
 detect an abnormality such as clogging of the filter.

## SUMMARY

Accordingly, an object of the present invention is to  
 provide an abnormality detection device that solves a prob-  
 lem such that it is impossible to accurately detect an abnor-  
 mality of a cooling function, such as clogging of a filter, in  
 a case where the operational status of ICT equipment is not  
 constant.

An abnormality detection device according to the present  
 invention, comprising:

an estimating unit configured to estimate an upper limit of  
 possible temperatures in a predetermined position of ICT  
 equipment when a quantity of intake air into the ICT  
 equipment is appropriate, based on a result of detection by  
 an operational status detecting unit that detects an opera-  
 tional status of the ICT equipment and a result of detection  
 by an intake-air temperature sensor that detects a tempera-  
 ture of intake air of the ICT equipment; and

a determining unit configured to determine that an abnor-  
 mality is occurring when a result of detection by a tempera-  
 ture sensor that detects a temperature in the predetermined  
 position is beyond an upper limit estimated by the estimating  
 unit.

ICT equipment according to the present invention, compris-  
 ing:

an operational status detecting unit configured to detect an  
 operational status of the ICT equipment;

an intake-air temperature sensor configured to detect a  
 temperature of intake air of the ICT equipment;

a temperature sensor configured to detect a temperature in  
 a predetermined position of the ICT equipment;

an estimating unit configured to estimate an upper value  
 of possible temperatures in a predetermined position of the  
 ICT equipment when a quantity of intake air into the ICT  
 equipment is appropriate, based on a result of detection by  
 the operational status detecting unit and a result of detection  
 by the intake-air temperature sensor; and

a determining unit configured to determine that an abnor-  
 mality is occurring when a result of detection by the tem-  
 perature sensor is beyond an upper limit estimated by the  
 estimating unit.

An abnormality detection method according to the present  
 invention, comprising:

by an estimating unit, estimating an upper limit of possi-  
 ble temperatures in a predetermined position of ICT equip-  
 ment when a quantity of intake air into the ICT equipment  
 is appropriate, based on a result of detection by an opera-  
 tional status detecting unit that detects an operational status  
 of the ICT equipment and a result of detection by an  
 intake-air temperature sensor that detects a temperature of  
 intake air of the ICT equipment; and

by a determining unit, determining that an abnormality is  
 occurring when a result of detection by a temperature sensor  
 that detects a temperature in the predetermined position is  
 beyond an upper limit estimated by the estimating unit.

A computer program according to the present invention,  
 comprising instructions for causing a computer to function  
 as:

an estimating unit configured to estimate an upper limit of  
 possible temperatures in a predetermined position of ICT  
 equipment when a quantity of intake air into the ICT  
 equipment is appropriate, based on a result of detection by  
 an operational status detecting unit that detects an opera-  
 tional status of the ICT equipment and a result of detection

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by an intake-air temperature sensor that detects a temperature of intake air of the ICT equipment; and

a determining unit configured to determine that an abnormality is occurring when a result of detection by a temperature sensor that detects a temperature in the predetermined position is beyond an upper limit estimated by the estimating unit.

According to the present invention, even when the operational status of ICT equipment is variable, it is possible to securely detect an abnormality of a cooling function, such as clogging of a filter.

#### BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a block diagram showing an example of the configuration of ICT equipment 1 according to a first exemplary embodiment of the present invention;

FIG. 2 is a block diagram showing an example of the configuration of a management part disclosed in FIG. 1;

FIG. 3 is a view showing an example of the content of a fan-rotation-number and temperature-range storing part disclosed in FIG. 2;

FIG. 4 is a flowchart showing an example of processing by the management part disclosed in FIG. 1; and

FIG. 5 is a block diagram showing an example of the configuration of an abnormality detecting unit according to a second exemplary embodiment of the present invention.

#### EXEMPLARY EMBODIMENT

Next, exemplary embodiments of the present invention will be described in detail with reference to the drawings.

##### First Exemplary Embodiment of the Present Invention

Referring to FIG. 1, ICT equipment 1 according to a first exemplary embodiment of the present invention has, on the front side in a case thereof, a plurality of hard disk drives (HDDs) 11 and an intake-air temperature sensor 21 detecting the temperature of intake air, and in the rear of them, has a plurality of cooling fans (FANs) 12. In the rear of the cooling fans 12, a CPU 13 generating much heat and a CPU temperature sensor 22 detecting the component temperature of the CPU 13 are arranged. Moreover, in the rear of them, a memory 14, an input/output part 15, a management part 16 that is realized by a chip set, a BMC (Base Management Controller) and the like and functions as a control device, a power source part 17, and an exhaust-air temperature sensor 23 detecting the temperature of exhaust air are arranged.

When the cooling fans 12 rotate, air is taken in through an inlet opening (not shown) formed on the front face of the case. The intake air flows toward the rear face of the case and is exhausted through an outlet opening (not shown) formed on the rear face of the case. A filter for excluding dust is attached to the inlet opening.

Referring to FIG. 2, the management part 16 includes a fan controlling unit 161, a CPU load detecting unit 162, an estimating unit 163, a determining unit 164, a fan-rotation-number and temperature-range storing part 165, and an alarming unit 166 such as a buzzer or an LED.

The fan-rotation-number and temperature-range storing unit 165 stores the number of rotations of the fans, the range of intake-air temperatures, and the range of CPU temperatures, in association with a combination of the temperature of intake air and a load on the CPU. FIG. 3 is a view showing an example of the stored content in the fan-rotation-number

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and temperature-range storing part 165. In this exemplary embodiment, in a case where an intake-air temperature  $T_a$  is equal, the upper limits and the lower limits of the exhaust-air temperature range and the CPU temperature range are lower as a CPU load  $L$  is smaller.

For example, the second row in FIG. 3 shows that the number of rotations of the cooling fans 12 is  $R_2$  in a case where the intake-air temperature  $T_a$  is  $T_{a1} \leq T_a < T_{a2}$  and the CPU load  $L$  is  $L_2 \leq L < L_3$ . Also, the second row shows that, in a case where the intake-air temperature  $T_a$  is  $T_{a1} \leq T_a < T_{a2}$  and the CPU load  $L$  is  $L_2 \leq L < L_3$ , the exhaust-air temperature range estimated as a possible range of exhaust-air temperatures  $T_b$  when the intake quantity of air into the case (an air intake quantity per unit time) is  $T_{b2} \leq T_b < T_{b3}$  and the CPU temperature range estimated as a possible range of component temperatures  $T_c$  of the CPU 13 is  $T_{c2} \leq T_c < T_{c3}$ .

The exhaust-air temperature range and the CPU temperature range are determined based on the values of exhaust-air temperatures and CPU temperatures actually measured when the ICT equipment 1 is normally operating (when an abnormality like clogging of the filter is not occurring). In this exemplary embodiment, the fan-rotation-number and temperature-range storing part 165 storing the fan rotation number, the exhaust-air temperature range and the CPU temperature range in association with the combination of the intake-air temperature and the CPU load is employed, but it is not necessarily employed. A fan-rotation-number storing part that stores the fan rotation number in association with the combination of the intake-air temperature and the CPU load, and a temperature-range storing part that stores the exhaust-air temperature range and the CPU temperature range in association with the combination of the intake-air temperature and the CPU load may be employed instead of the fan-rotation-number and temperature-range storing part 165.

The CPU load detecting unit 162 has a function of detecting the load on the CPU 13. In this exemplary embodiment, the use rate of the CPU 13 is detected as the load on the CPU 13. The CPU load detecting unit 162 is used for detecting the operational status of the ICT equipment 1. As far as being capable of detecting the operational status of the ICT equipment 1, another unit such as a power consumption detecting unit that detects the power consumption of the ICT equipment 1 may be used.

The fan controlling unit 161 has a function of: determining the number of rotations of the cooling fans 12, based on the result of detection by the intake-air temperature sensor 21, the result of detection by the CPU load detecting unit 162 and the content of the fan-rotation-number and temperature-range storing part 165; and causing the cooling fans 12 to rotate at the determined number of rotations. To be specific, the fan controlling unit 161 searches the number of rotations stored in association with a combination of the result of detection by the intake-air temperature sensor 21 and the result of detection by the CPU load detecting unit 162, from the fan-rotation-number and temperature-range storing part 165, and causes the cooling fans 12 to rotate at the searched number of rotations.

The estimating unit 163 has a function of calculating an exhaust-air temperature range estimated as a possible range of exhaust-air temperatures when the intake quantity of air into the case per unit time is appropriate, based on the result of detection by the intake-air temperature sensor 21, the result of detection by the CPU load detecting unit 162, and the content of the fan-rotation-number and temperature-range storing part 165. Moreover, the estimating unit 163 has a function of calculating a CPU temperature range

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estimated as a possible range of component temperatures of the CPU 13 when the intake quantity of air into the case per unit time is appropriate, based on the result of detection by the intake-air temperature sensor 21, the result of detection by the CPU load detecting unit 162, and the content of the fan-rotation-number and temperature-range storing part 165. To be specific, the estimating unit 163 has a function of searching an exhaust-air temperature range and a CPU temperature range stored in association with the result of detection by the intake-air temperature sensor 21 and the result of detection by the CPU load detecting unit 162, from the fan-rotation-number and temperature-range storing part 165.

The determining unit 164 has a function of determining whether an abnormality of a cooling function such as clogging of the filter is occurring, based on the CPU temperature range and the exhaust-air temperature range calculated by the estimating unit 163, the result of detection by the CPU temperature sensor 22, and the result of detection by the exhaust-air temperature sensor 23.

The management part 16 can be realized by a CPU (central processing unit), for example, by causing the CPU to read a program, which is recorded on a disk, a semiconductor memory or another recording medium, for making the CPU function as the fan controlling unit 161, the CPU load detecting unit 162, the estimating unit 163 and the determining unit 164. Then, the CPU controls the operation thereof in accordance with the program read thereby to realize the fan controlling unit 161, the CPU load detecting unit 162, the estimating unit 163 and the determining unit 164 thereon.

#### Operation of First Exemplary Embodiment

Next, the operation of this exemplary embodiment will be described in detail.

The management part 16 executes a process shown in a flowchart of FIG. 4 at every given time.

The estimating unit 163 inputs the results of detection by the intake-air temperature sensor 21, the CPU temperature sensor 22 and the exhaust-air temperature sensor 23 at step S41, and then inputs the result of detection by the CPU load detecting unit 162 at step S42. After that, the estimating unit 163 searches an exhaust-air temperature range and a CPU temperature range recorded in association with a combination of the result of detection by the intake-air temperature sensor 21 and the result of detection by the CPU load detecting unit 162, from the fan-rotation-number and temperature-range storing part 165, and passes the search result to the determining unit 164 (step S43).

Upon reception of the search result from the estimating unit 163, the determining unit 164 determines whether the result of detection by the CPU temperature sensor 22 is within the CPU temperature range passed from the estimating unit 163 (step S44).

In a case where the actual component temperature of the CPU 13 detected by the CPU temperature sensor 22 is within the CPU temperature range (Yes at step S44), the determining unit 164 determines whether the result of detection by the exhaust-air temperature sensor 23 is within the exhaust-air temperature range (step S45). In a case where the actual exhaust-air temperature detected by the exhaust-air temperature sensor 23 is within the exhaust-air temperature range (Yes at step S45), the determining unit 164 determines that an abnormality such as clogging of the filter is not occurring, and ends the procedure.

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On the other hand, when the determining unit 164 determines that the result of detection by the CPU temperature sensor 22 is not within the CPU temperature range (the determination result is No) at step S44, the determining unit 164 examines whether the component temperature as the result of detection by the CPU temperature sensor 22 is beyond the upper limit of the CPU temperature range (step S46).

When the component temperature of the CPU 13 is beyond the upper limit of the CPU temperature range (Yes at step S46), the determining unit 164 determines that an abnormality of the cooling function such as clogging of the filter is occurring, and drives the alarming unit 166 (step S47).

On the other hand, when the component temperature of the CPU 13 is not beyond the upper limit of the CPU temperature range (No at step S46), herein, when the component temperature of the CPU 13 is below the lower limit of the CPU temperature range, the determining unit 164 proceeds to step S48. In this case, the determining unit 164 determines that the internal temperature of the ICT equipment 1 will not excessively rise even if the number of rotations of the cooling fans 12 is reduced for the purpose of reduction of the power consumption, and notifies a reduction level A of the number of rotations of the cooling fans 12 to the fan controlling unit 161 (step S48). Consequently, the fan controlling unit 161 decreases the number of rotations of the cooling fans 12 by the notified reduction level A.

The reduction level A can be a value corresponding to a difference between the lower limit of the CPU temperature range and the actual component temperature of the CPU 13 (the result of detection by the CPU temperature sensor 22). To be specific, the reduction level A is set to a larger value as the difference is larger. Moreover, the intake-air temperature and the structure of the ICT equipment 1 may be considered at the time of determination of the reduction level A. The component temperature of the CPU 13 falls below the lower limit of the CPU temperature range, for example, in a case where the cooling fans are installed outside the ICT equipment 1 after the ICT equipment 1 is installed.

Further, when the determining unit 164 determines that the exhaust-air temperature as the result of detection by the exhaust-air temperature sensor 23 is not within the exhaust-air temperature range (the determination result is No) at step S45, the determining unit 164 examines whether the result of detection by the exhaust-air temperature sensor 23 is beyond the upper limit of the exhaust-air temperature range (step S46).

When the exhaust-air temperature detected by the exhaust-air temperature sensor 23 is beyond the upper limit of the exhaust-air temperature range (Yes at step S46), the determining unit 164 determines that an abnormality such as clogging of the filter is occurring, and drives the alarming unit 166 (step S47). On the other hand, when the exhaust-air temperature is not beyond the upper limit of the exhaust-air temperature range (No at step S46), the determining unit 164 determines that the internal temperature of the ICT equipment 1 will not excessively rise even if the number of rotations of the cooling fans 12 is reduced, and notifies a reduction level A of the number of rotations of the cooling fans 12 to the fan controlling unit 161 (step S48). In this case, the reduction level A can be a value corresponding to a difference between the lower limit of the exhaust-air temperature range and the result of detection by the exhaust-air temperature sensor 23.

Effect of First Exemplary Embodiment

According to this exemplary embodiment, even when the operational status of the ICT equipment **1** is variable, it is possible to securely detect an abnormality such as clogging of the filter. This is because a temperature range estimated as a possible range of component temperatures of the CPU **13** and an exhaust-air temperature range estimated as a possible range of exhaust-air temperatures when the intake quantity of air is appropriate are calculated based on the result of detection by the intake-air temperature sensor **21** and the result of detection by the CPU load detecting unit (an operational status detecting unit) **162**.

Further, according to this exemplary embodiment, it is possible to reduce the power consumption of the ICT equipment **1**. This is because the number of rotations of the cooling fans **12** is reduced when the component temperature of the CPU **13** falls below the lower limit of the CPU temperature range or when the exhaust-air temperature falls below the lower limit of the exhaust-air temperature range.

Further, according to this exemplary embodiment, even if the load on the CPU **13** is small and the component temperature of the CPU **13** and the exhaust-air temperature are low, it is possible, when an abnormality such as clogging of the filter occurs, to securely detect that. This is because, as the result of detection by the CPU load detecting unit **162** indicates a lower load, the upper limits of the CPU temperature range and the exhaust-air temperature range are set to lower temperatures.

Second Exemplary Embodiment of the Present Invention

Referring to FIG. **5**, an abnormality detection device **50** according to a second exemplary embodiment of the present invention includes an estimating unit **51** and a determining unit **52**.

The estimating unit calculates the upper limit of temperatures estimated as a possible temperature in a predetermined position of ICT equipment when the intake quantity of air into the ICT equipment is appropriate, based on the result of detection by an operational status detecting unit **61** detecting the operational status of the ICT equipment and the result of detection by an intake-air temperature sensor **62** detecting the intake-air temperature of the ICT equipment. The determining unit **51** determines that an abnormality is occurring when the result of the detection by a temperature sensor **63** detecting the temperature in the predetermined position is beyond the upper limit calculated by the estimating unit **51**.

The abnormality detection device **50** can be realized by a computer, for example, by causing the computer to read a program, which is recorded on a disk, a semiconductor memory or another recording medium, for making the computer function as the abnormality detection device **50**. Then, the computer controls the operation thereof in accordance with the program read thereby to realize the estimating unit **51** and the determining unit **52** thereon.

Effect of Second Exemplary Embodiment

According to this exemplary embodiment, it is possible to securely detect an abnormality such as clogging of the filter even when the operational status of the ICT equipment is variable. This is because the upper limit of temperatures estimated as a possible temperature in a predetermined position of the ICT equipment when the intake quantity of air into the ICT equipment is appropriate is calculated based

on the result of detection by the operational status detecting unit **61** detecting the operational status of the ICT equipment and the result of detection by the intake-air temperature sensor **62** detecting the intake-air temperature of the ICT equipment.

The present invention can be applied to ICT equipment such as a server.

The invention claimed is:

**1.** An abnormality detection device for detecting an abnormality in Information and Communication Technology (ICT) equipment having a cooling fan, the abnormality detection device comprising:

a hardware processor comprising:

an estimating unit configured to estimate an upper limit of possible temperatures in a predetermined position of ICT equipment when a quantity of intake air into the ICT equipment is appropriate, based on a result of detection by an operational status detecting unit that detects an operational status of the ICT equipment and a result of detection by an intake-air temperature sensor that detects an intake air temperature of intake air of the ICT equipment, wherein the operational status of the ICT equipment and the intake air temperature of the ICT equipment determines a rotation speed of the cooling fan; and

a determining unit configured to determine that an abnormality is occurring when a result of detection by a temperature sensor that detects a detected equipment temperature in the predetermined position is beyond the upper limit estimated by the estimating unit.

**2.** The abnormality detection device according to claim **1**, wherein the estimating unit is configured to, in a case where a result of detection by the intake-air temperature sensor is equal, estimate a lower temperature value as the upper limit, as the operational status detected by the operational status detecting unit indicates a lower utilization rate.

**3.** The abnormality detection device according to claim **1**, comprising a temperature range storing part in which the upper limit of the possible temperatures in the predetermined position is recorded in association with each combination of a first utilization rate and a temperature of intake air, and the upper limit of the possible temperatures in the predetermined position is recorded in association with each combination of a second utilization rate that is larger than the first utilization rate and a temperature of intake air,

wherein the estimating unit is configured to search an upper limit that is recorded in association with a temperature of intake air detected by the intake-air temperature sensor and a utilization rate detected by the operational status detecting unit, from the temperature range storing unit.

**4.** The abnormality detection device according to claim **1**, wherein:

the estimating unit is configured to estimate a lower limit of the possible temperatures in the predetermined position when a quantity of intake air into the ICT equipment is appropriate, based on a result of detection by the operational status detecting unit and a result of detection by the intake-air temperature sensor; and the determining unit is configured to instruct a fan controlling unit that controls a number of rotations of cooling fans to reduce a number of rotations of the cooling fans when a result of detection by the temperature sensor is below a lower limit estimated by the estimating means.

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5. The abnormality detection device according to claim 1, wherein the operational status detecting unit is configured to detect a load on a CPU mounted in the ICT equipment as an operational status of the ICT equipment.

6. The abnormality detection device according to claim 1, wherein the operational status detecting unit is configured to detect power consumption of the ICT equipment as an operational status of the ICT equipment.

7. The abnormality detection device according to claim 1, wherein the temperature sensor is configured to detect a temperature of exhaust air.

8. An Information and Communication Technology (ICT) equipment including a cooling fan, comprising:

an operational status detecting unit configured to detect an operational status of the ICT equipment;

an intake-air temperature sensor configured to detect an intake air temperature of intake air of the ICT equipment;

an equipment temperature sensor configured to detect an equipment temperature in a predetermined position of the ICT equipment;

a hardware processor including:

an operational status detecting unit configured to detect an operational status of the ICT equipment;

an estimating unit configured to estimate an upper value limit of possible temperatures in a predetermined position of the ICT equipment when a quantity of intake air into the ICT equipment is appropriate, based on a result of detection by the operational status detecting unit and a result of detection by the intake-air temperature sensor, an operational status of the ICT equipment, and an intake air temperature, wherein the operational status

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of the ICT equipment and the intake air temperature of the ICT equipment determines a rotation speed of the cooling fan; and

a determining unit configured to determine that an abnormality is occurring when a result of detection by the detected equipment temperature sensor is beyond the upper limit estimated by the estimating unit.

9. An abnormality detection method of Information and Communication Technology (ICT) equipment including a cooling fan, the method comprising:

detecting an operational status and an intake air temperature of the ICT equipment;

by an estimating unit, estimating an upper limit of possible temperatures in a predetermined position of the ICT equipment when a quantity of intake air into the ICT equipment is appropriate, based on the detected operational status and the air intake temperature, a result of detection by an operational status detecting unit that detects an operational status of the ICT equipment and a result of detection by an intake-air temperature sensor that detects a temperature of intake air of the ICT equipment;

determining a rotation speed of the cooling fan based on the detected operational status and the air intake temperature; and

by a determining unit, determining that an abnormality is occurring when a result of detection by a detected equipment temperature sensor that detects a temperature in the predetermined position is beyond the upper limit estimated by the estimating unit.

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