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APPLICATION NUMBER: ***13/782,490***
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PATENT NUMBER: ***9651320***
ISSUE DATE: ***May 16, 2017***

UNITED STATES PATENT AND TRADEMARK OFFICE · DEPARTMENT OF COMMERCE

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PTO/AIA/15 (07-12)
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	J-13-0032
First Inventor	Kumiko SUZUKI
Title	ICT EQUIPMENT
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ■ **Fee Transmittal Form.** (PTO/SB/17 or equivalent)
2. ☐ **Applicant claims small entity status.** See 37 CFR 1.27.
3. ■ **Specification.** [*Total Pages* 24] Both the claims and abstract must start on a new page *(For information on the preferred arrangement, see MPEP § 608.01(a))*
4. ■ **Drawing(s).** (*35 U.S.C. 113*) [*Total Sheets* 10]
5. **Inventor's Oath or Declaration.** [*Total Sheets* 2] *(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))*
   a. ■ Newly executed (original or copy)
   b. ☐ A copy from a prior application (37 CFR 1.63(d))
6. ■ **Application Data Sheet.** **See Note below.* See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
7. ☐ **CD-ROM or CD-R.** in duplicate, large table or Computer Program *(Appendix)*
   ☐ Landscape Table on CD
8. **Nucleotide and/or Amino Acid Sequence Submission.** *(if applicable, items a. – c. are required)*
   a. ☐ Computer Readable Form (CRF)
   b. ☐ Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ Paper
   c. ☐ Statements verifying identity of above copies

ADDRESS TO: **Commissioner for Patents**
P.O. Box 1450
Alexandria VA 22313-1450

ACCOMPANYING APPLICATION PARTS

9. ■ **Assignment Papers.** (cover sheet & document(s))
   Name of Assignee NEC Corporation
10. ☐ **37 CFR 3.73(c) Statement.** ■ **Power of Attorney.** *(when there is an assignee)*
11. ☐ **English Translation Document.** *(if applicable)*
12. ■ **Information Disclosure Statement.** (PTO/SB/08 or PTO-1449)
    ■ Copies of citations attached
13. ☐ **Preliminary Amendment.**
14. ☐ **Return Receipt Postcard.** *(MPEP § 503) (Should be specifically itemized)*
15. ☐ **Certified Copy of Priority Document(s).** *(if foreign priority is claimed)*
16. ☐ **Nonpublication Request.** Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
17. ■ **Other:** Priority claimed from JP2012-046673 filed March 2, 2012

***Note:** (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

18. CORRESPONDENCE ADDRESS

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Name					
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City		State		Zip Code	
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Signature	/Kelly G. Hyndman 39,234/	Date	2013-03-01
Name (Print/Type)	Kelly G. Hyndman	Registration No. (Attorney/Agent)	39234

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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FEE TRANSMITTAL

Complete if known	
Application Number	
Filing Date	
First Named Inventor	Kumiko SUZUKI
Examiner Name	
Art Unit	
Practitioner Docket No.	J-13-0032

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 1260

METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): EFT

☐ Deposit Account Deposit Account Number: _____ Deposit Account Name: _____

For the above-identified deposit account, the Director is hereby authorized to (check all that apply):

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the filing fee**

☐ Charge any additional fee(s) or underpayment of fee(s) under 37 CFR 1.16 and 1.17 ☐ Credit any overpayment of fee(s)

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
Application Type	**Fee ($)**	**Small Entity Fee ($)**	**Fee ($)**	**Small Entity Fee ($)**	**Fee ($)**	**Small Entity Fee ($)**	**Fees Paid ($)**
Utility	390	195	620	310	250	125	1260
Design	250	125	120	60	160	80	
Plant	250	125	380	190	200	100	
Reissue	390	195	620	310	760	380	
Provisional	250	125	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	**Fee ($)**	**Small Entity Fee ($)**
Each claim over 20 (including Reissues)	62	31
Each independent claim over 3 (including Reissues)	250	125
Multiple dependent claims	460	230

Total Claims		**Extra Claims**	**Fee ($)**		**Fee Paid ($)**
8	-20 or HP =	_____ x	_____	=	_____

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims		**Extra Claims**	**Fee ($)**		**Fee Paid ($)**
3	-3 or HP =	_____ x	_____	=	_____

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Multiple Dependent Claims

Fee ($)	**Fee Paid ($)**
_____	_____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $320 ($160 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets		**Extra Sheets**		**Number of each additional 50 or fraction thereof**	**Fee ($)**		**Fee Paid ($)**
_____	- 100 =	_____	/ 50 =	_____ (round **up** to a whole number) x	_____	=	_____

4. OTHER FEE(S) **Fees Paid ($)**

Non-English specification, $130 fee (no small entity discount) _____

Non-electronic filing fee under 37 CFR 1.16(t) for a utility application, $400 fee ($200 small entity) _____

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SUBMITTED BY

Signature	/Kelly G. Hyndman 39,234/	Registration No. (Attorney/Agent) 39234	Telephone 202-293-7060
Name (Print/Type)	Kelly G. Hyndman		Date 2013-03-01

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ICT EQUIPMENT

INCORPORATION BY REFERENCE

This application is based upon and claims the benefit of priority from Japanese patent application No. 2012-046673, filed on March 2, 2012, the disclosure of which is incorporated herein in its entirety by reference.

TECHNICAL FIELD

[0001]

The present invention relates to ICT (Information and Communication Technology) equipment such as a server device having a cooling fan, a control device thereof, a temperature controlling method thereof, and a program.

BACKGROUND ART

[0002]

Conventionally, ICT equipment such as a server device is installed in a machine room equipped with air conditioning, and is operated in an environment of an almost constant temperature in most cases. However, in order to reduce investment cost and operating cost of a machine room, attention is focused on a machine room where outside air is taken in, which is used to cool the inside of ICT equipment. A room temperature of a machine room utilizing outside air varies widely, compared with that of a machine room equipped with air conditioning. As such, it is desired that ICT equipment also has a function of controlling the internal

temperature by itself.

[0003]

As ICT equipment having a function of controlling the internal temperature, one disclosed in JP 2011-151131 A (Patent Document 1) has been known, for example. The server device (ICT equipment) disclosed in Patent Document 1 includes a cooling fan, an intake air temperature sensor which detects a temperature of intake air, a component temperature sensor which detects a temperature of an electronic component arranged inside the device, and a controller which controls the number of rotations of the cooling fan. The controller controls the number of rotations of the fan based on the detection result of the intake air temperature sensor and the detection result of the component temperature sensor. More specifically, the controller controls the number of rotations of the cooling fan in such a manner that the number of rotations of the cooling fan becomes higher as the intake air temperature is higher based on the detection result of the intake air temperature sensor, until the detection results of all component temperature sensors become a first threshold or smaller. When the detection results of all component temperature sensors become the first threshold or smaller, the controller controls the number of rotations of the cooling fan in such a manner that the number of rotations of the cooling fan becomes higher as the detection results of the component temperature sensors are higher based on the detection results of the component temperature sensors, until the detection results of all component temperature sensors become a second threshold (first threshold < second threshold).

[0004]

Patent Document 1: JP 2011-151131 A

[0005]

According to the technology disclosed in Patent Document 1, the internal temperature of ICT equipment can be controlled without depending on air conditioning. However, with the technology disclosed in Patent Document 1, there is a possibility that damage or malfunction of electronic components is caused if the intake air temperature drops sharply. As such, with the technology disclosed in Patent Document 1, if the intake air temperature drops sharply, there is a possibility that condensation occurs on the inner wall of the casing of the hard disk drive, which may induce rust so that damage or malfunction of the hard disk drive may be caused. In general, as a casing of a hard disk drive has air tightness of some extent, even if the intake air temperature drops sharply, the internal temperature of the casing of the hard disk drive will not drop sharply. As such, a large temperature difference is caused between the internal temperature of the casing of the hard disk drive and the inner wall temperature of the casing, which may cause condensation. It should be noted that if the temperature changes sharply, there is also a possibility that rust is generated due to condensation on other electronic components so that damage or malfunction of the electronic components may occur.

SUMMARY

[0006]

In view of the above, an exemplary object of the present invention is to provide ICT equipment capable of solving a problem that damage or malfunction may occur in electronic components when an intake air temperature drops sharply.

[0007]

According to an exemplary aspect of the present invention, ICT equipment of the present invention includes

a cooling fan;

a temperature sensor that detects a component temperature of an electronic component included in the ICT equipment;

a declination index value calculation means (unit) for calculating an index value indicating the degree of declination of the component temperature of the electronic component based on a detection result of the temperature sensor; and

a control means (unit) for controlling the number of rotations of the cooling fan in accordance with the index value calculated by the declination index value calculation means.

[0008]

According to another exemplary aspect of the present invention, a control device of the present invention includes

a declination index value calculation means for calculating an index value indicating the degree of declination of a component temperature of an electronic component included in ICT equipment, based on a detection result of a temperature sensor that detects the component temperature of the electronic component, and

a control means for controlling the number of rotations of a cooling fan in accordance with the index value calculated by the declination index value calculation means.

[0009]

According to another exemplary aspect of the present invention, a temperature controlling method of the present invention includes

by a declination index value calculation means, calculating an index value indicating the degree of declination of a component temperature of an electronic component included in ICT equipment, based on a detection result of a temperature sensor that detects the component temperature of the electronic component, and

by a control means, controlling the number of rotations of a cooling fan in accordance with the index value calculated by the declination index value calculation means.

[0010]

According to another exemplary aspect of the present invention, a program of the present invention causes a computer to function as

a declination index value calculation means for calculating an index value indicating the degree of declination of a component temperature of an electronic component included in ICT equipment, based on a detection result of a temperature sensor that detects the component temperature of the electronic component, and

a control means for controlling the number of rotations of a cooling fan in accordance with the index value calculated by the declination index value calculation means.

[0011]

According to the present invention, it is possible to achieve an advantageous effect that damage or malfunction of electronic components can be prevented even if an intake air temperature drops sharply.

BRIEF DESCRIPTION OF DRAWINGS

[0012]

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

Fig. 2 is a diagram showing the airflow in the ICT equipment 1.

Fig. 3 is a block diagram showing an exemplary configuration of a management section 17.

Fig. 4 is an illustration showing the relationship between an intake air temperature recommended range, a component temperature recommended range, and an operation guaranteed temperature range.

Fig. 5 is a table showing an exemplary configuration of a detection result storing section 185.

Fig. 6 is a flowchart showing exemplary processing of a control means 172 in the management section 17.

Fig. 7 is a flowchart showing an example of a method of calculating a declination index value.

Fig. 8 is a flowchart showing another method of calculating a declination index value.

Fig. 9 is a flowchart showing still another method of calculating a declination index value.

Fig. 10 is a block diagram showing an exemplary configuration of ICT equipment 100 according to a second exemplary embodiment of the present invention.

EXEMPLARY ENBODIMENTS

[0013]

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

[0014]

FIRST EXEMPLARY EMBODIMENT

Referring to Fig. 1, ICT equipment 1 according to a first exemplary embodiment of the present invention is configured such that a plurality of hard disk drives (HDD) 11 and a temperature sensor 21, which detects intake air temperature, are arranged on the front side of the casing, and a plurality of cooling fans 12 are arranged behind them. Behind the cooling fans 12, a plurality of CPUs 13 having high heating values, and temperature sensors 22 and 23 which detect component temperatures of the CPUs 13, are arranged. Behind them, a memory 14, a power source 15, an input/output section (I/O section) 16 for network cards or the like, a management section 17 which is realized by a BMC (Base Management Controller) and functions as a controller, and a temperature sensor 24 which detects the component temperature of the I/O section 16, are arranged.

[0015]

The management section 17 has a function of controlling the number of rotations of the cooling fans 12, based on the detection results of the temperature sensors 21 to 24. By rotating the cooling fans 12, outside air is taken from the air intake surface (not shown) provided on the front side of the casing, and the air is discharged from the discharge surface (not shown) provided on the rear side of the casing, through a hard disk drives layout area A → a cooling fans layout area B → a heating components layout area C, as shown in Fig. 2.

[0016]

Referring to Fig. 3, the management section 17 includes a writing means (unit) 171, a control means (unit) 172, a declination index value calculation means (unit) 173, a fan driving section 174, and a storing unit 18 such as a disk unit.

[0017]

The storing unit 18 includes an intake air temperature recommended range storing section 181, a component temperature recommended range storing section 182, an operation guaranteed temperature range storing section 183, a threshold storing section 184, and a detection result storing section 185.

[0018]

In the intake air temperature recommended range storing section 181, a range of intake air temperature in which the ICT equipment 1 can operate stably (intake air temperature recommended range) is stored. When the intake air temperature is out of the intake are temperature recommended range, the failure rate of the operating components becomes worse.

[0019]

In the component temperature recommended range storing section 182, a range of component temperature in which the ICT equipment 1 can operate stably (component temperature recommended range) is stored. In general, a component temperature becomes higher than the intake air temperature because electronic components (such as a CPU) constituting the ICT equipment 1 are heating elements. When the component temperature becomes out of the component temperature recommended range, the failure rate of the electronic components becomes worse.

[0020]

In the operation guaranteed temperature range storing section 183, a temperature range in which the ICT equipment 1 is operable (operation guaranteed temperature range) is stored.

[0021]

Fig. 4 shows examples of an intake air temperature recommended range, a component temperature recommended range, and an operation guaranteed temperature range. As shown in Fig. 4, the lower limit value of the operation guaranteed temperature range is lower than the lower limit values of the intake air temperature recommended range and the component temperature recommended range, and the upper limit value of the operation guaranteed temperature range is higher than the upper limit values of the intake air temperature recommended range and the component temperature recommended range. It should be noted that the values shown in Fig. 4 are just examples, and the temperature relationship may be different depending on ICT equipment.

[0022]

In the threshold storing section 184, a threshold Th with respect to an index value indicating the degree of declination (declination index value) of the component temperature of the ICT equipment 1 is stored. The threshold Th may be a value corresponding to the installation environment of the ICT equipment 1, which can be 5°C/hour, for example.

[0023]

In the detection result storing section 185, detection results of the temperature sensors 21 to 24 for a past certain period of time (one hour in the present embodiment) are stored. Referring to Fig. 5, the detection result storing section 185 has 60 pieces of record regions #1 to #60 for each of the temperature sensors 22 to 24.

[0024]

The writing means 171 in the ICT equipment 1 has a function of writing component temperatures detected by the temperature sensors 22 to 24 into the detection result storing section 185, in accordance with writing instructions which are given periodically (every minute in the present embodiment) by the control means 172, and a function of providing the control means 172 with the intake air temperature detected by the temperature sensor 21 and the component temperatures detected by the temperature sensors 22 to 24. More specifically, the writing means 171 cyclically uses the record regions #1 to #60, assigned to each of the temperature sensors 22 to 24, to write component temperatures detected by the temperature sensors 22 to 24 to thereby store the component temperatures for the past one hour in the detection result storing section 185.

[0025]

The declination index value calculation means 173 has a function of calculating, for each of the temperature sensors 22 to 24, a declination index value indicating the degree of declination of a component temperature detected by each temperature sensor, in accordance with a declination index value calculation instruction given by the control means 172. As a declination index value, the following values (1) to (3) may be used, for example.

[0026]

(1) A quantity of declination of the component temperature of the ICT equipment 1 per unit time.

(2) An average value of the component temperature declination rates of the ICT equipment 1 in a plurality of measurement periods. The component temperature declination

rate is a value calculated by dividing a difference Δt, between a component temperature t1 detected at a time when a measurement period starts and a component temperature t2 detected at a time when the measurement period ends, by the measurement period.

(3) A difference between the highest value of the component temperature of the ICT equipment 1 in a past certain period of time and the current component temperature.

[0027]

The control means 172 has a function of outputting a writing instruction to the writing means 171, and a function of outputting a declination index value calculation instruction to the declination index value calculation means 173. The control means 172 also has a function of determining which of R1 (low speed), R2 (intermediate speed), and R3 (high speed) the number of rotations of the cooling fans 12 should be, based on the detection results of the temperature sensors 21 to 24 provided by the writing means 171, the stored contents in the respective storing sections 181 to 184, and the declination index value calculated by the declination index value calculation means 173, and a function of notifying the fan driving section 174 of the determined number of rotations. It should be noted that the number of rotations has a relationship of $0 < R1 < R2 < R3$.

[0028]

The fan driving section 174 rotates the cooling fans 12 in the number of rotations notified by the control means 172.

[0029]

It should be noted that the management section 17 can be realized by the CPU (central processing unit), and in that case, the management section 17 can be realized in the following

manner. That is, a disk, a semiconductor memory, or another recording medium storing a program for causing the CPU to function as the writing means 171, the control means 172, and the declination index value calculation means 173 is prepared, and the CPU is caused to read the program. The CPU controls the own operation in accordance with the readout program to thereby realize the writing means 171, the control means 172, and the declination index value calculation means 173 on the own CPU.

[0030]

Operation of First Exemplary Embodiment

Next, operation of the present embodiment will be described with reference to the flowchart of Fig. 6.

[0031]

When the ICT equipment 1 is activated, the control means 172 in the management section 17 outputs a writing instruction to the writing means 171 (step S61). Thereby, the writing means 171 writes each of component temperatures detected by the respective temperature sensors 22 to 24 into one of the record regions #1 to #60 (for example, in the record region #1) for the respective temperature sensors 22 to 24, provided in the detection result storing section 185, and provides the control means 172 with the detection results of the temperature sensors 21 to 24.

[0032]

Upon reception of the detection results of the temperature sensors 21 to 24, the control means 172 first determines whether or not the intake air temperature detected by the temperature sensor 21 is within the intake air temperature recommended range stored in the intake air

temperature recommended range storing section 181 (step S62). Then, if the temperature is within the intake air temperature recommended range (Yes at step S62), the control means 172 determines that the number of rotations of the cooling fans 12 to be "R2 (normal)", and notifies the fan driving section 174 of the determined number of rotations (step S66). Then, the control means 172 waits until a certain period (1 minute in the present embodiment) elapses (step S72), and then returns to the processing of step S61. In contrast, if the control means 172 determines that the intake air temperature is out of the intake air temperature recommended range (No at step S62), the control means 172 determines whether all of the component temperatures detected by the temperature sensors 22 to 24 are within the component temperature recommended range stored in the component temperature recommended range storing section 182 (step S63)

[0033]

If all of the component temperatures detected by the temperature sensors 22 to 24 are within the component temperature recommended range (Yes at step S63), the control means 172 determines the number of rotations of the fan to be "R2", and notifies the fan driving section 174 of the determined number of rotations "R2" (step S66). In contrast, if even one of the component temperatures detected by the temperature sensors 22 to 24 is out of the component temperature recommended range (No at step S63), the control means 172 performs the processing of step S64.

[0034]

At step S64, the control section 172 determines whether or not any of the component temperatures detected by the temperature sensors 22 to 24 is lower than the lower limit value of the operation guaranteed temperature range stored in the operation guaranteed temperature range

storing section 183. If there is a component temperature lower than the lower limit value (Yes at step S64), the control means 172 instructs the fan driving section 174 to stop the cooling fans 12 (Step S67). Thereby, the cooling fans 12 are stopped, and the component temperatures increase due to the heating of the electronic components such as the CPUs 13 and the hard disk drives 11. In contrast, if all of the component temperatures detected by the temperature sensors 22 to 24 are not lower than the operation guaranteed temperature range (No at step S64), the control means 172 performs the processing of step S65.

[0035]

At step S65, the control means 172 determines whether or not any of the component temperatures detected by the temperature sensors 22 to 24 exceeds the upper limit value of the operation guaranteed temperature range. If there is a component temperature exceeding the upper limit value (Yes at step S65), the control means 172 determines the number of rotations of the fans to be "R3 (high speed)", and provides the fan driving section 174 with the determined number of rotations of the fans "R3" (step S68). In contrast, if all of the component temperatures detected by the temperature sensors 22 to 24 do not exceed the upper limit value of the operation guaranteed temperature range (No at step S65), the control means 172 outputs a declination index value calculation instruction to the declination index value calculation means 173 (step S69).

[0036]

Thereby, the declination index value calculation means 173 calculates a declination index value indicating the degree of declination of the component temperature, and returns the calculated declination index value to the control means 172.

[0037]

Here, a method of calculating a declination index value will be described. When a declination index value calculation instruction is input from the control means 172, the declination index value calculation means 173 calculates, for each of the temperature sensors 22 to 24, a difference "To-Tn" between a component temperature To which is the oldest temperature stored in the detection result storing section 185 and a component temperature Tn which is the latest temperature stored in the detection result storing section 185, as shown in the flowchart of Fig. 7 (step S71). Then, the declination index value calculation means 173 returns the difference calculated for each of the temperature sensors 22 to 24 to the control means 172, as a declination index value calculated based on the detection result of each of the temperature sensors 22 to 24 (step S72). In the present embodiment, as the detection results of the temperature sensors 22 to 24 are recorded every minute by cyclically using the 60 pieces of record regions provided for each of the temperature sensors 22 to 24, the declination index value calculated as described above is a quantity of declination of the component temperature per unit time (per 1 hour).

[0038]

A method of calculating a declination index value is not limited to the one described above. It is also possible to adopt a method shown in the flowchart of Fig. 8. Referring to Fig. 8, when a declination index value calculation instruction is input, the declination index value calculation means 173 calculates, for each of the temperature sensors 22 to 24, a difference between component temperatures stored in adjacent record regions, to thereby obtain a difference between the oldest component temperature and the second oldest component

temperature, a difference between the second oldest component temperature and the third oldest component temperature, … and a difference between the fifty-ninth oldest component temperature and the latest component temperature (step S81).

[0039]

Next, the declination index value calculation means 173 divides the obtained difference by the detection interval (1 minute in the present embodiment) of the component temperature to calculate a temperature declination rate (step S82). Then, for each of the temperature sensors 22 to 24, the declination index value calculation means 173 obtains an average value of the calculated temperature declination rates (step S83), and returns the obtained average value to the control means 172 as a declination index value obtained from the detection result of each of the temperature sensors 22 to 24 (step S84).

[0040]

Further, it is also possible to adopt a method of calculating a declination index value as shown in the flowchart of Fig. 9. Referring to Fig. 9, when a declination index value calculation instruction is input from the control means 172, the declination index value calculation means 173 calculates, for each of the temperature sensors 22 to 24, a difference between the highest component temperature and the latest component temperature (step S91). Then, the declination index value calculation means 173 returns the difference calculated for each of the temperature sensors 22 to 24 to the control means 172 as a declination index value calculated based on the detection result of each of the temperature sensors 22 to 24 (step S92).

[0041]

It should be noted that a method of calculating a declination index value is not limited to

those described above.

[0042]

When the control means 172 receives declination index values of the respective temperature sensors 22 to 24 from the declination index value calculation means 173, the control means 172 compares them with the threshold Th stored in the threshold storing section 184 (step S70). Then, if at least one of the declination index values of the respective temperature sensors 22 to 24 is not lower than the threshold Th (Yes at step S70), the control section 172 determines that the component temperature is lowered sharply so that condensation may occur. As such, the control means 172 instructs the fan driving section 174 to stop rotation of the cooling fans 12 (step S67). Thereby, the cooling fans 12 are stopped, and a sharp drop in the temperatures of the electronic components such as the casings of the hard disk drives 11 can be prevented, so that occurrence of condensation on the inner walls of the casings can be prevented. In contrast, if the control means 172 determines that all of the declination index values of the temperature sensors 22 to 24 are lower than the threshold Th (No at step S70), the control means 172 instructs the fan driving section 174 to control the number of rotations of the fans to be "R1 (low speed)" (step S71), then waits until a certain period (1 minute) elapses, and returns to the processing of step S61.

[0043]

It should be noted that while the present embodiment is configured such that the cooling fans 12 are stopped if at least one of the declination index values of the temperature sensors 22 to 24 is not lower than the threshold, it is possible to control the number of rotations of the cooling fans 12 to be lower as the declination index value is larger (as the degree of declination of the

component temperature indicated by the declination index value is larger).

[0044]

Effects of First Exemplary Embodiment

According to the present embodiment, it is possible to achieve an advantageous effect that even if the intake air temperature drops sharply, damage or malfunction of the electronic components can be prevented. This is because declination index values indicating the degree of declination of the component temperatures are calculated based on the detection results of the temperature sensors 22 to 24 which detect the component temperatures, and based on the calculated declination index values, the number of rotations of the cooling fans 12 is controlled. By performing such control of the number of rotations of the fans based on the declination index values, even if the intake air temperature drops sharply, a temperature difference between the internal air temperature inside the casing of the hard disk drive and the temperature of the inner wall of the casing, for example, does not become large. As such, it is possible to prevent generation of rust due to condensation, so that damage or malfunction of the hard disk drives can be prevented.

[0045]

SECOND EXEMPLARY EMBODIMENTS

Next, ICT equipment according to a second exemplary embodiment of the present invention will be described.

[0046]

Referring to Fig. 10, ICT equipment 100 according to the present embodiment includes a cooling fan 101, a temperature sensor 102, a declination index value calculation means (unit)

103, and a control means (unit) 104.

[0047]

The temperature sensor 102 detects component temperatures of the hard disk drive, the CPU, and the like installed in the ICT equipment 100.

[0048]

The declination index value calculation means 103 calculates a declination index value indicating the degree of declination of each component temperature based on the detection result of the temperature sensor 102. As a declination index value, a quantity of declination of a component temperature per unit time, a difference between the highest component temperature in a past certain period of time and the current component temperature, or the like may be used.

[0049]

The control means 104 controls the number of rotations of the cooling fan 101 according to the declination index value calculated by the declination index value calculation means 103. More specifically, the control means 104 controls the number of rotations of the fan to be lower as the degree of declination of the component temperature, indicated by the declination index value calculated by the declination index value calculation means 103, is larger.

[0050]

It should be noted that the declination index value calculation means 103 and the control means 104 can be realized by the CPU. In that case, they are realized in the following manner. A disk, a semiconductor memory, or another recording medium storing a program for functioning the CPU as the declination index value calculation means 103 and the control means

104 is prepared, and the CPU is caused to read by the program. The CPU controls the own operation according to the readout program, and realizes the declination index value calculation means 103 and the control means 104 on the own CPU.

[0051]

Effect of Second Exemplary Embodiment

According to the present embodiment, it is possible to achieve an advantageous effect that even if the intake air temperature drops sharply, damage or malfunction of the electronic components can be prevented. This is because declination index values indicating the degree of declination of the component temperatures of the ICT equipment are calculated based on the detection results of the temperature sensor 102 which detects the component temperatures, and based on the calculated declination index values, the number of rotations of the cooling fan 101 is controlled.

CLAIMS

1. ICT equipment comprising:

a cooling fan;

a temperature sensor that detects a component temperature of an electronic component included in the ICT equipment;

a declination index value calculation unit that calculates an index value indicating a degree of declination of the component temperature of the electronic component based on a detection result of the temperature sensor; and

a control unit that controls the number of rotations of the cooling fan in accordance with the index value calculated by the declination index value calculation unit.

2. The ICT equipment according to Claim 1, wherein

the index value is a declined temperature per unit time of the component temperature of the electronic component.

3. The ICT equipment according to Claim 1, wherein

the index value is an average value of declination rates of the component temperature of the electronic component in a plurality of measurement periods.

4. The ICT equipment according to Claim 1, wherein

the index value is a difference between a highest value of the component temperature of

the electronic component in a past certain period and a current component temperature.

5. The ICT equipment according to Claim 1, wherein

the control unit controls the number of rotations of the cooling fan to be lower as the degree of declination of the component temperature of the electronic component, indicated by the index value calculated by the declination index value calculation unit, is larger.

6. The ICT equipment according to Claim 1, wherein

if the index value is not less than a predetermined threshold, the control unit stops the cooling fan.

7. A control device comprising:

a declination index value calculation unit that calculates an index value indicating a degree of declination of a component temperature of an electronic component included in ICT equipment, based on a detection result of a temperature sensor that detects the component temperature of the electronic component; and

a control unit that controls the number of rotations of a cooling fan in accordance with the index value calculated by the declination index value calculation unit.

8. A temperature controlling method comprising:

by a declination index value calculation unit, calculating an index value indicating a degree of declination of a component temperature of an electronic component included in ICT

equipment, based on a detection result of a temperature sensor that detects the component temperature of the electronic component; and

by a control unit, controlling the number of rotations of a cooling fan in accordance with the index value calculated by the declination index value calculation unit.

ABSTRACT

The temperature sensor detects a component temperature of an electronic component included in the ICT equipment. The declination index value calculation means calculates a declination index value indicating the degree of declination of the component temperature of the electronic component, based on the detection result of the temperature sensor. As a declination index value, a declination quantity of the component temperature per unit time or a difference between the highest value of the component temperature in a past certain period and the current component temperature may be used, for example. The control means controls the number of rotations of the cooling fan in accordance with the declination index value calculated by the declination index value calculation means. More specifically, the control means causes the number of rotations of the fan to be lower as the degree of declination of the component temperature indicated by the declination index value is larger.

FIG. 1

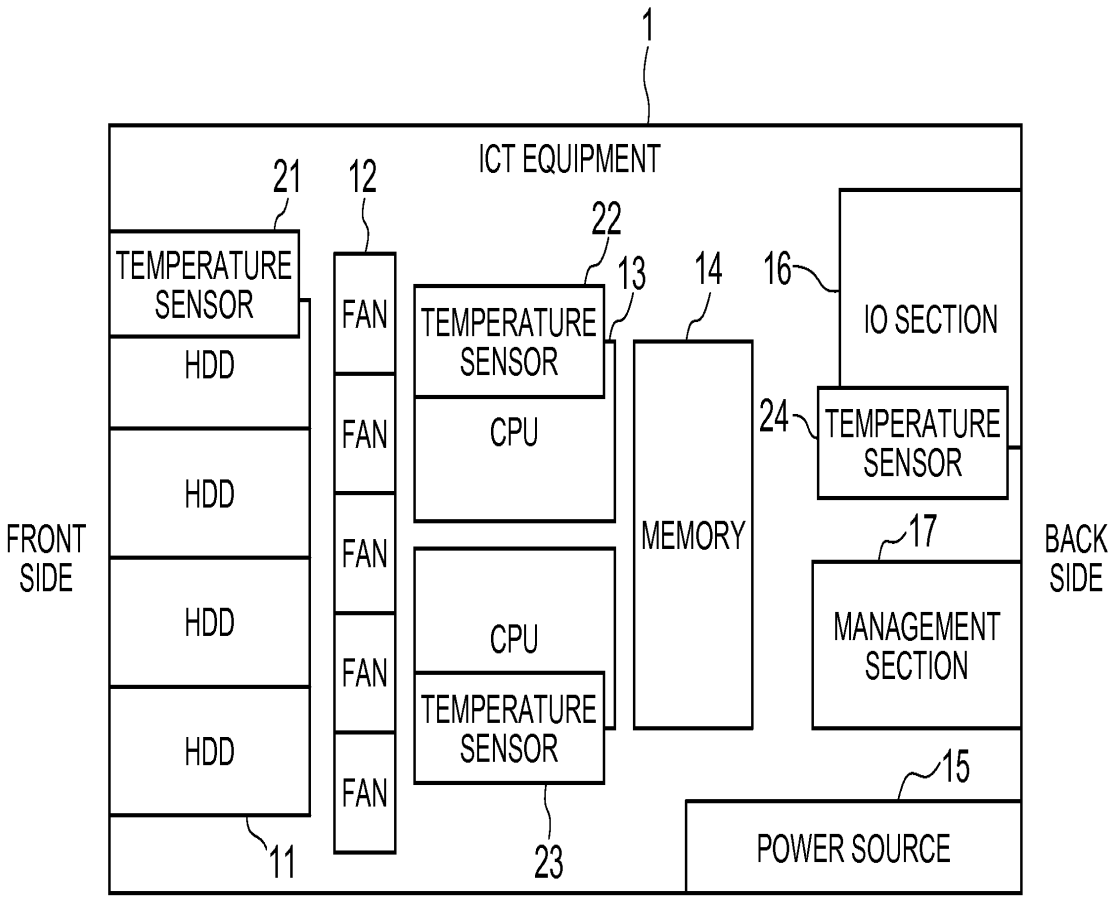

1
ICT EQUIPMENT
21
12
22
13
14
16
TEMPERATURE SENSOR
FAN
TEMPERATURE SENSOR
IO SECTION
HDD
CPU
24
TEMPERATURE SENSOR
HDD
FAN
MEMORY
17
FRONT SIDE
BACK SIDE
HDD
FAN
CPU
MANAGEMENT SECTION
HDD
FAN
TEMPERATURE SENSOR
15
FAN
POWER SOURCE
11
23
10

FIG. 2

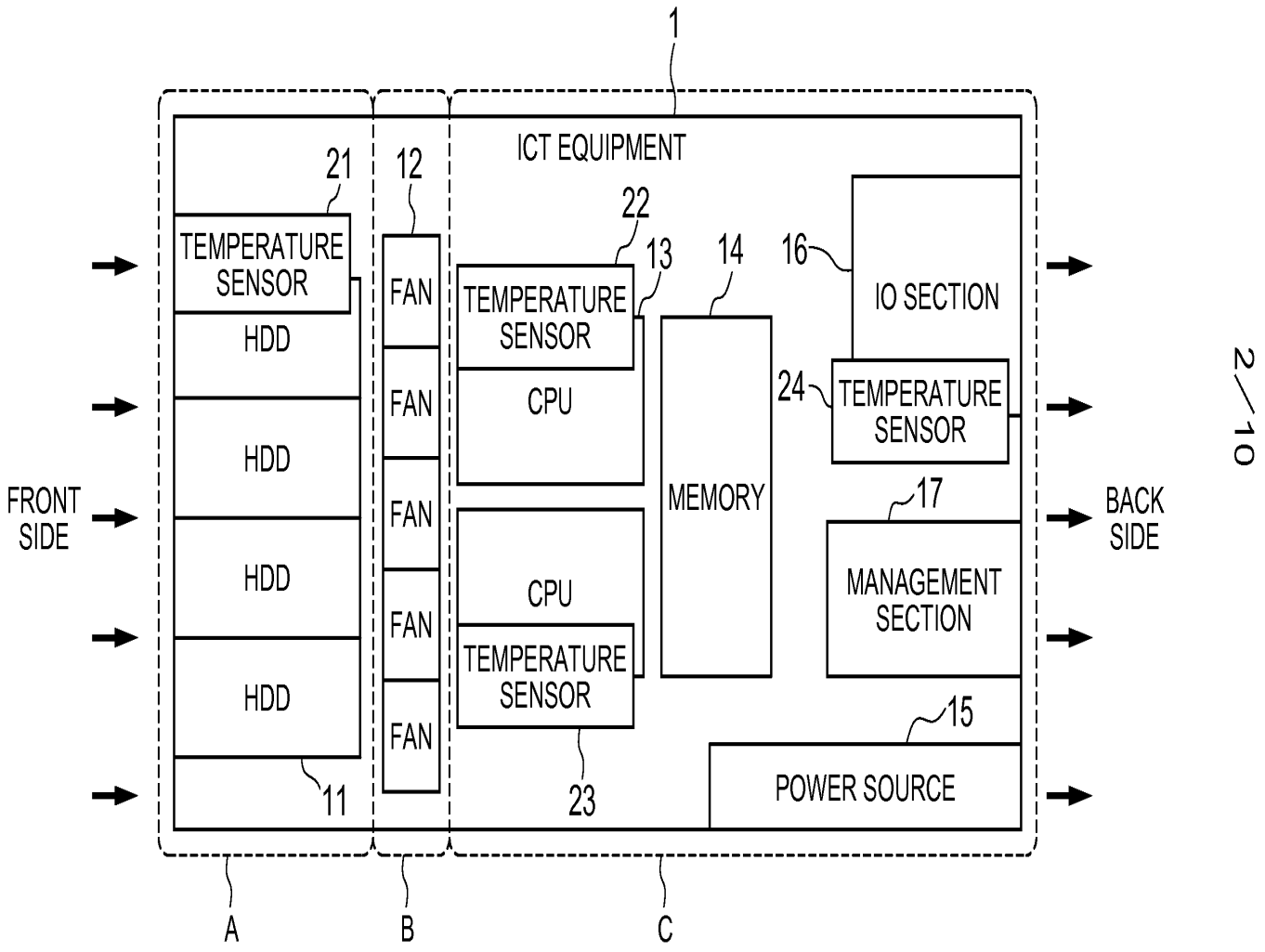
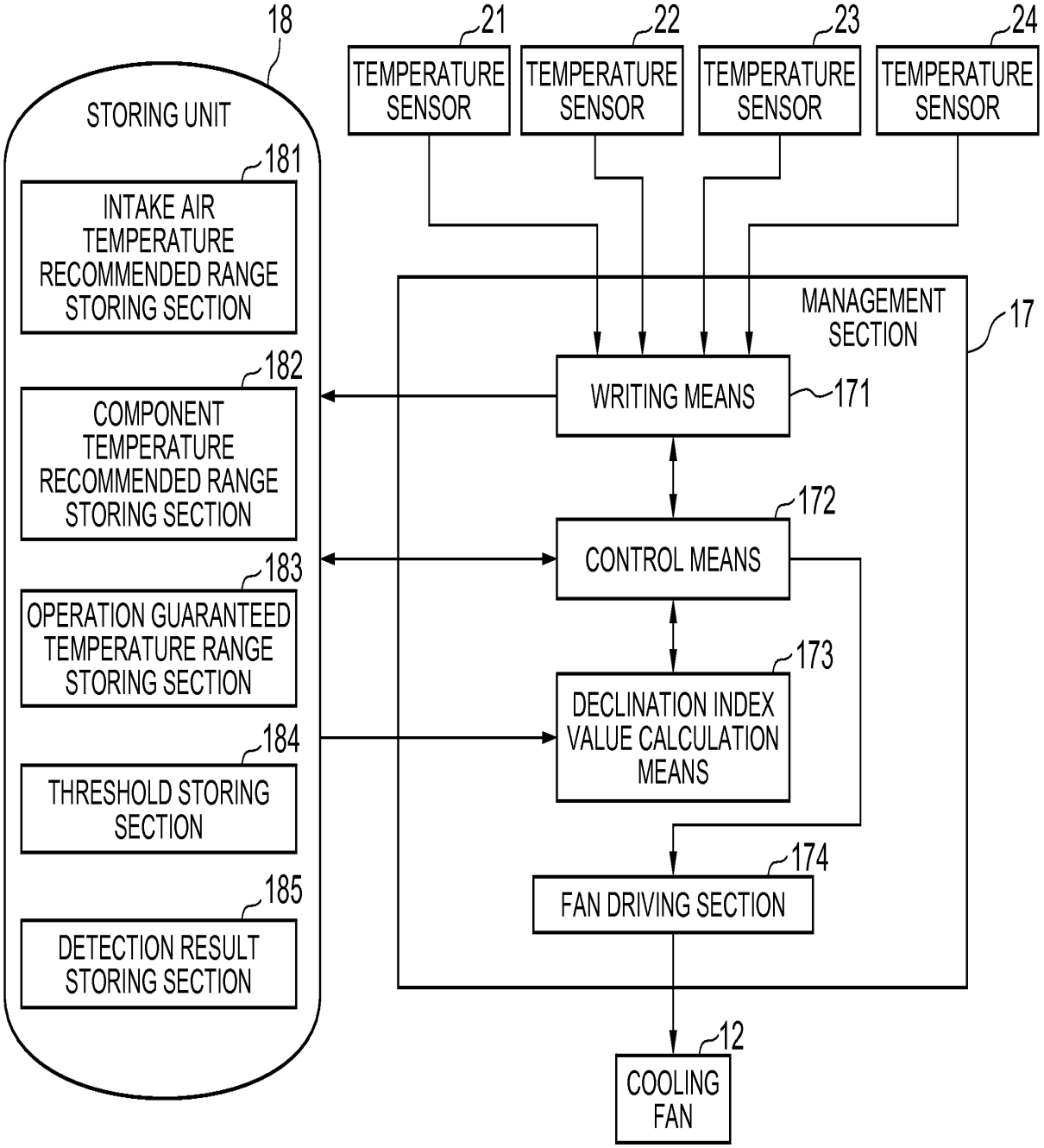

1
ICT EQUIPMENT
21
12
22
13
14
16
TEMPERATURE SENSOR
HDD
HDD
HDD
HDD
FAN
FAN
FAN
FAN
FAN
TEMPERATURE SENSOR
CPU
CPU
TEMPERATURE SENSOR
MEMORY
IO SECTION
24
TEMPERATURE SENSOR
17
MANAGEMENT SECTION
15
POWER SOURCE
FRONT SIDE
BACK SIDE
11
23
A
B
C
2
10

FIG. 3


18
STORING UNIT
181
INTAKE AIR TEMPERATURE RECOMMENDED RANGE STORING SECTION
182
COMPONENT TEMPERATURE RECOMMENDED RANGE STORING SECTION
183
OPERATION GUARANTEED TEMPERATURE RANGE STORING SECTION
184
THRESHOLD STORING SECTION
185
DETECTION RESULT STORING SECTION
21
TEMPERATURE SENSOR
22
TEMPERATURE SENSOR
23
TEMPERATURE SENSOR
24
TEMPERATURE SENSOR
MANAGEMENT SECTION
17
WRITING MEANS
171
CONTROL MEANS
172
DECLINATION INDEX VALUE CALCULATION MEANS
173
FAN DRIVING SECTION
174
12
COOLING FAN

3/10

FIG. 4

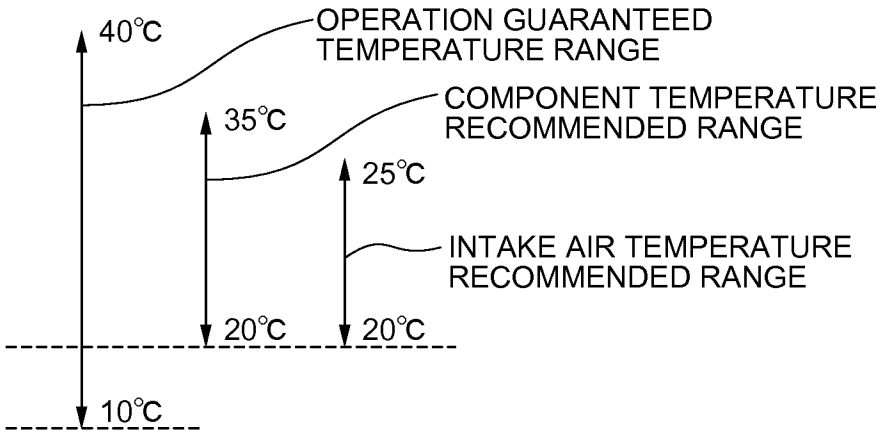

40℃
OPERATION GUARANTEED TEMPERATURE RANGE
35℃
COMPONENT TEMPERATURE RECOMMENDED RANGE
25℃
INTAKE AIR TEMPERATURE RECOMMENDED RANGE
20℃
20℃
10℃

FIG. 5

	#1	#2	#3	・・・	#60
TEMPERATURE SENSOR 22	TA1	TA2	TA3	・・・	TA60
TEMPERATURE SENSOR 23	TB1	TB2	TB3	・・・	TB60
TEMPERATURE SENSOR 24	TC1	TC3	TC3	・・・	TC60

185 DETECTION RESULT STORING SECTION

FIG. 6

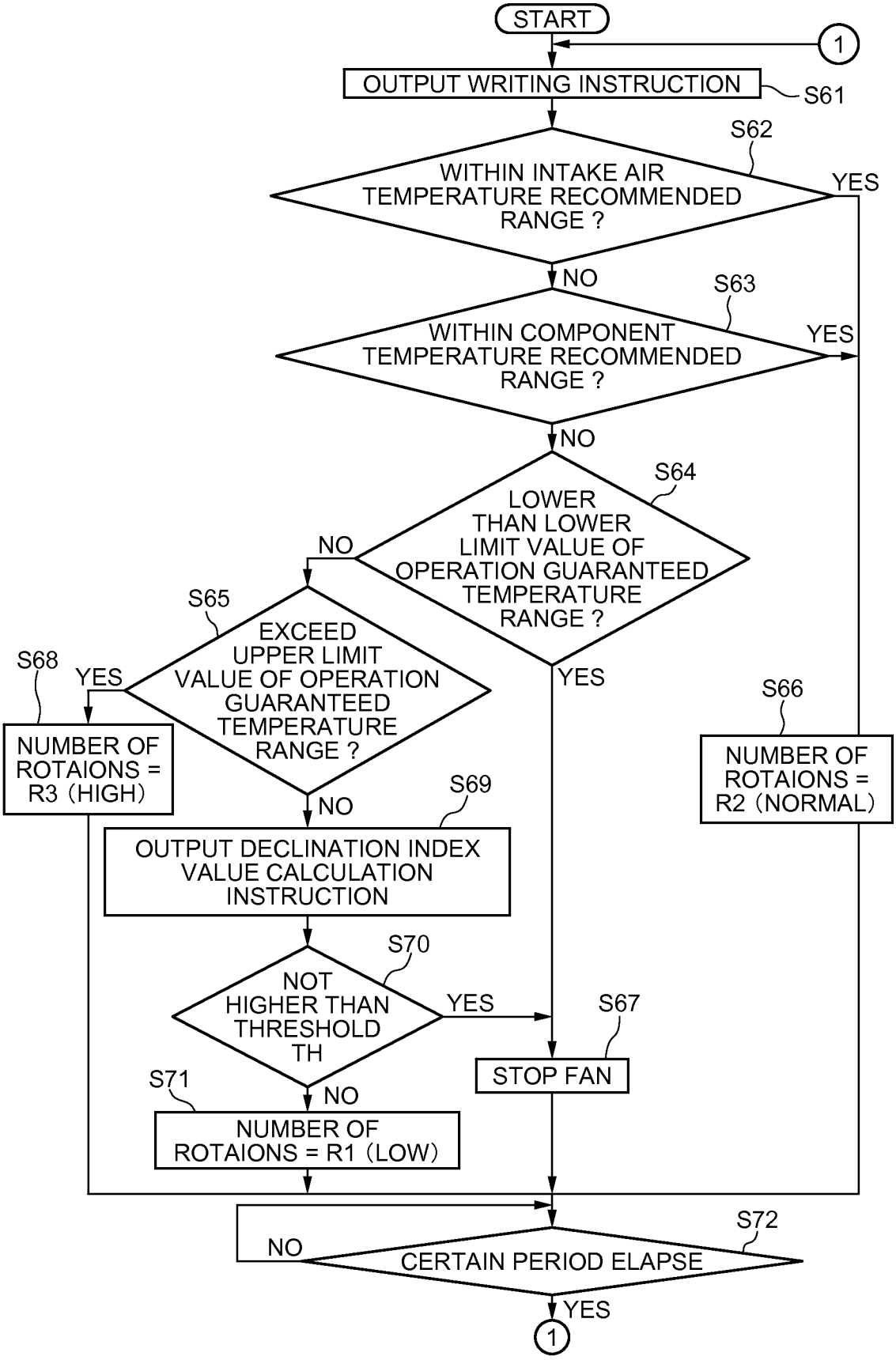

START
1
OUTPUT WRITING INSTRUCTION
S61
S62
WITHIN INTAKE AIR TEMPERATURE RECOMMENDED RANGE ?
YES
NO
S63
WITHIN COMPONENT TEMPERATURE RECOMMENDED RANGE ?
YES
NO
S64
LOWER THAN LOWER LIMIT VALUE OF OPERATION GUARANTEED TEMPERATURE RANGE ?
NO
YES
S65
EXCEED UPPER LIMIT VALUE OF OPERATION GUARANTEED TEMPERATURE RANGE ?
S68
YES
NUMBER OF ROTAIONS = R3 (HIGH)
NO
S69
OUTPUT DECLINATION INDEX VALUE CALCULATION INSTRUCTION
S70
NOT HIGHER THAN THRESHOLD TH
YES
S67
STOP FAN
S71
NO
NUMBER OF ROTAIONS = R1 (LOW)
S66
NUMBER OF ROTAIONS = R2 (NORMAL)
S72
NO
CERTAIN PERIOD ELAPSE
YES
1

FIG. 7

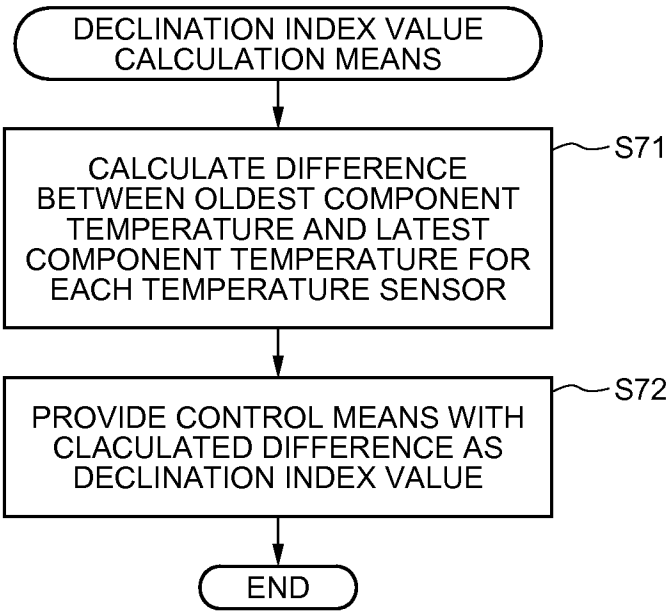

DECLINATION INDEX VALUE CALCULATION MEANS
CALCULATE DIFFERENCE BETWEEN OLDEST COMPONENT TEMPERATURE AND LATEST COMPONENT TEMPERATURE FOR EACH TEMPERATURE SENSOR
S71
PROVIDE CONTROL MEANS WITH CLACULATED DIFFERENCE AS DECLINATION INDEX VALUE
S72
END

FIG. 8

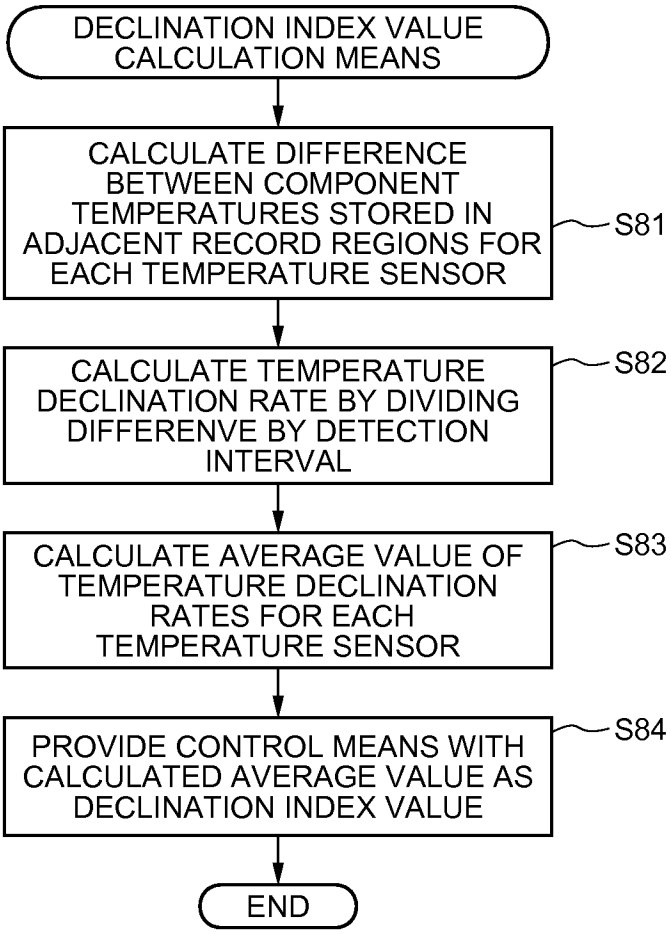

DECLINATION INDEX VALUE CALCULATION MEANS
CALCULATE DIFFERENCE BETWEEN COMPONENT TEMPERATURES STORED IN ADJACENT RECORD REGIONS FOR EACH TEMPERATURE SENSOR
S81
CALCULATE TEMPERATURE DECLINATION RATE BY DIVIDING DIFFERENVE BY DETECTION INTERVAL
S82
CALCULATE AVERAGE VALUE OF TEMPERATURE DECLINATION RATES FOR EACH TEMPERATURE SENSOR
S83
PROVIDE CONTROL MEANS WITH CALCULATED AVERAGE VALUE AS DECLINATION INDEX VALUE
S84
END

FIG. 9

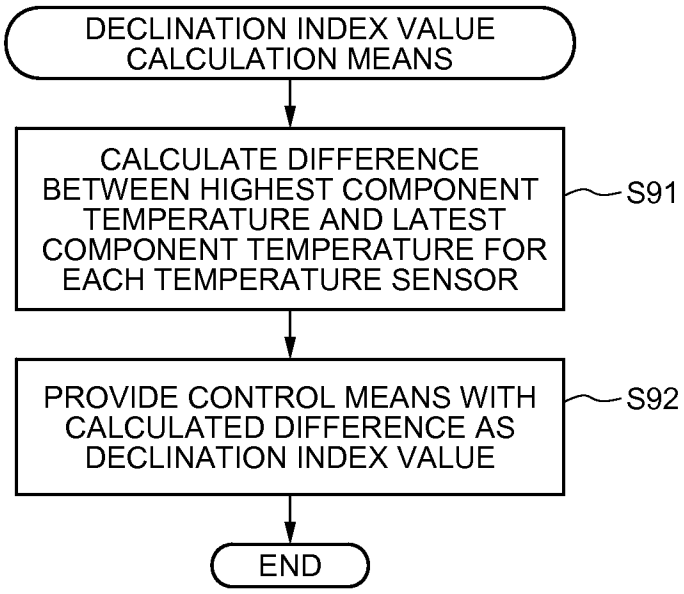
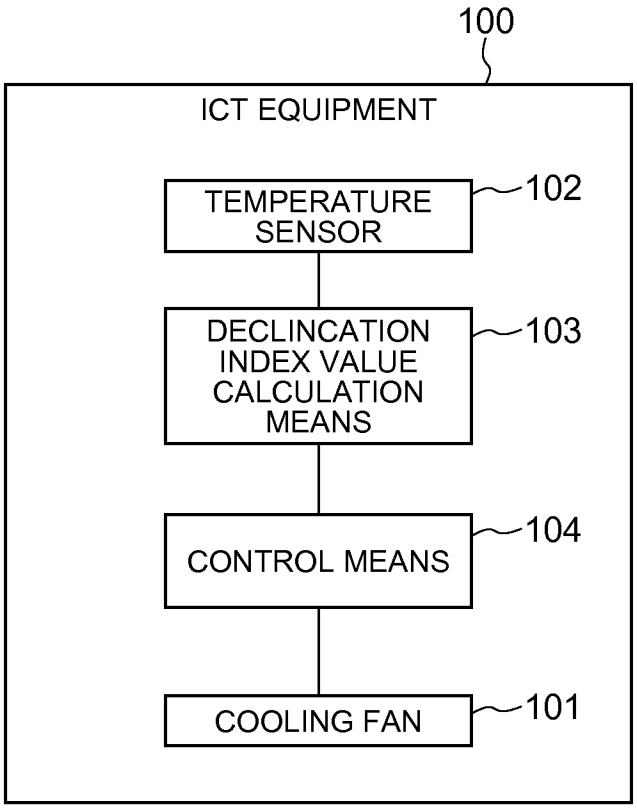

DECLINATION INDEX VALUE CALCULATION MEANS
CALCULATE DIFFERENCE BETWEEN HIGHEST COMPONENT TEMPERATURE AND LATEST COMPONENT TEMPERATURE FOR EACH TEMPERATURE SENSOR
S91
PROVIDE CONTROL MEANS WITH CALCULATED DIFFERENCE AS DECLINATION INDEX VALUE
S92
END

FIG. 10


100
ICT EQUIPMENT
TEMPERATURE SENSOR
102
DECLINCATION INDEX VALUE CALCULATION MEANS
103
CONTROL MEANS
104
COOLING FAN
101

Docket No.:
Before, on, and After Sept 16, 2012

DECLARATION AND POWER OF ATTORNEY FOR UTILITY OR DESIGN PATENT APPLICATION (37 C.F.R. 1.63)

I hereby declare that: Each inventor's residence, mailing address, and citizenship are as stated below next to their name. I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

ICT EQUIPMENT

the application of which:
☒ is attached hereto OR ☐ was filed on _____ as United States Application Number or PCT International Application Number _____
(Confirmation No._____), and was amended on
_____ (if applicable).

I hereby state that the above identified application was made or authorized to be made by me and that I have reviewed and understand the contents of the above identified application, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. 1.56, including for continuation-in-part application(s), material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application(s) which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application(s) having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date	Priority Claimed? Yes	No
2012-046673	Japan	March 2, 2012	☒	☐
			☐	☐

I hereby claim domestic priority under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date

I hereby claim benefit under 35 U.S.C. 120 of any United States application(s) or 365(c) of any PCT international application(s) designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in a listed prior United States or PCT international application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge my duty to disclose any information material to the patentability of this application as defined in 37 C.F.R. 1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Prior U.S. or International Application Number(s)	U.S. or International Filing Date	Status

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Authorization To Permit Access To Application by Participating Offices

☐ If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the above-identified application is filed access to the above-identified patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, or other intellectual property office in which a foreign application claiming priority to the above-identified application is filed to have access to the application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the application-as-filed with respect to: 1) the above-identified patent application-as-filed, 2) any foreign application to which the above-identified application claims priority under 35 USC 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the above-identified patent application, and 3) any U.S. application-as-filed from which benefit is sought in the above-identified patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing the Authorization to Permit Access to Application by Participating Offices.

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POWER OF ATTORNEY: I hereby appoint all attorneys of **SUGHRUE MION, PLLC** who are listed under the USPTO Customer Number shown below as my attorneys to prosecute this application and to transact all business in the United States Patent and Trademark Office connected therewith, recognizing that the specific attorneys listed under that Customer Number may be changed from time to time at the sole discretion of Sughrue Mion, PLLC, and request that all correspondence about the application be addressed to the address filed under the same USPTO Customer Number.

WASHINGTON OFFICE
71799
CUSTOMER NUMBER

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Mailing Address:	

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Inventor's signature	Date
Residence:	Citizenship
Mailing Address:	

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Residence:	Citizenship
Mailing Address:	

DELL - Exhibit 1002 - Page 42

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Mailing Address:	

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Inventor's signature	Date
Residence:	Citizenship
Mailing Address:	

NAME OF ELEVENTH INVENTOR:	
Given Name (first and middle [if any])	Family Name or Surname
Inventor's signature	Date
Residence:	Citizenship
Mailing Address:	

NAME OF TWELFTH INVENTOR:	
Given Name (first and middle [if any])	Family Name or Surname
Inventor's signature	Date
Residence:	Citizenship
Mailing Address:	

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Inventor's signature	Date
Residence:	Citizenship
Mailing Address:	

DELL - Exhibit 1002 - Page 43

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Given Name (first and middle [if any])	Family Name or Surname
Inventor's signature	Date
Residence:	Citizenship
Mailing Address:	
NAME OF FIFTEENTH INVENTOR:	
Given Name (first and middle [if any])	Family Name or Surname
Inventor's signature	Date
Residence:	Citizenship
Mailing Address:	
NAME OF SIXTEENTH INVENTOR:	
Given Name (first and middle [if any])	Family Name or Surname
Inventor's signature	Date
Residence:	Citizenship
Mailing Address:	
NAME OF SEVENTEENTH INVENTOR:	
Given Name (first and middle [if any])	Family Name or Surname
Inventor's signature	Date
Residence:	Citizenship
Mailing Address:	

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SUPPLEMENTAL PRIORITY DATA SHEET

Additional prior foreign applications:

Application Number(s)	Country	Filing Date	Priority Claimed? Yes	No
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
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			☐	☐
			☐	☐
			☐	☐
			☐	☐

Additional provisional applications:

Application Number(s)	Filing Date

Additional U.S. or International applications:

Application Number(s)	Filing Date	Status: patented, pending, abandoned

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PTO/SB/08a (01-09)
Approved for use through 02/28/2009. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	Kumiko SUZUKI
Art Unit	
Examiner Name	
Attorney Docket Number	J-13-0032

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] ¡	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2011151131	JP	A	2011-08-04	SATO YOICHI	Cited in Specification English abstract	☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99**)		
	Application Number	
	Filing Date	
	First Named Inventor	Kumiko SUZUKI
	Art Unit	
	Examiner Name	
	Attorney Docket Number	J-13-0032

	1		☐

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99**)		
	Application Number	
	Filing Date	
	First Named Inventor	Kumiko SUZUKI
	Art Unit	
	Examiner Name	
	Attorney Docket Number	J-13-0032

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Kelly G. Hyndman 39,234/	Date (YYYY-MM-DD)	2013-03-01
Name/Print	Kelly G. Hyndman	Registration Number	39234

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2011-151131
(43)Date of publication of application : 04.08.2011

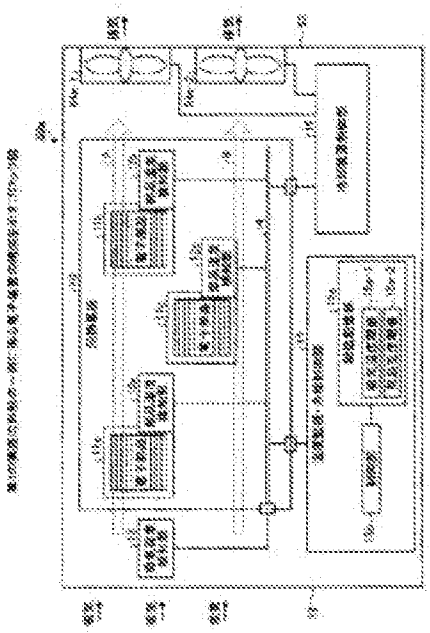
(51)Int.Cl. *H05K 7/20 (2006.01)*
G06F 1/20 (2006.01)

(21)Application number : 2010-010167
(22)Date of filing : 20.01.2010

(71)Applicant : FUJITSU LTD
(72)Inventor : SATO YOICHI

(54) COOLING CONTROLLING APPARATUS, ELECTRONIC APPARATUS, AND COOLING CONTROLLING METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To allow noise and power consumption to be appropriate in the cooling device of a server.
SOLUTION: A control part 15b compares a cooling air intake temperature detected by an intake air temperature detector 13 with an intake temperature threshold 15a-1 and determines a rotation number of each cooling fan 54a-1, 54a-2 based on the comparison result. Further, the control part 15b increases/decreases or keeps the rotation number of each cooling fan 54a-1, 54a-2, which is determined by the control part 15b, based on the results of comparisons between the component temperatures of all electronic components and the component temperature thresholds of respective electronic components.



(19)日本国特許庁(JP)　(12)公開特許公報(A)　(11)特許出願公開番号
特開2011-151131
(P2011-151131A)
(43)公開日　平成23年8月4日(2011.8.4)

(51)Int.Cl.			F I			テーマコード（参考）
H05K	7/20	(2006.01)	H05K	7/20	J	5E322
G06F	1/20	(2006.01)	G06F	1/00	360B	
			G06F	1/00	360D	

審査請求 未請求　請求項の数 8　OL　（全 26 頁）

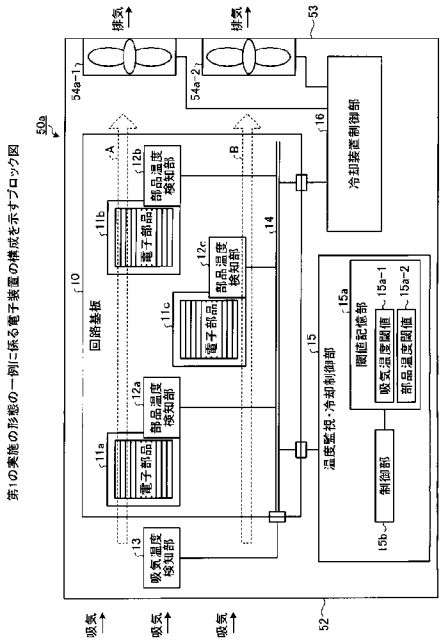
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(22)出願日　平成22年1月20日(2010.1.20)

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神奈川県川崎市中原区上小田中４丁目１番１号　富士通株式会社内

Fターム(参考)　5E322 AA11　AB10　BA01　BB05　BB06

(54)【発明の名称】冷却制御装置、電子装置及び冷却制御方法

(57)【要約】
【課題】サーバ装置の冷却装置の騒音及び消費電力を適正化する。
【解決手段】制御部１５ｂは、吸気温度検知部１３により検知された冷却風の吸気温度と、吸気温度閾値１５ａ－１とを比較する。そして、比較結果に応じて冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数を決定する。さらに、制御部１５ｂは、全ての電子部品の部品温度を各電子部品の部品温度閾値と比較した結果に応じて、制御部１５ｂにより決定された冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数を増減もしくは維持する。
【選択図】図１Ａ



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【特許請求の範囲】
【請求項１】
ファンの回転によって装置内部の空気を装置外部に排気する冷却ファンと、
前記冷却ファンによって吸気された吸気温度を検知する吸気温度検知部と、
装置内部に配設された複数の電子部品の温度をそれぞれ検知する部品温度検知部と、
前記部品温度検知部で検知された各電子部品の温度並びに前記吸気温度検知部により検知された吸気温度に基づいて、前記冷却ファンの回転数を制御する制御部と
を有することを特徴とする冷却制御装置。
【請求項２】
前記冷却制御装置において、
前記吸気温度を判定する吸気温度閾値と、前記複数の電子部品の温度を判定する該電子部品ごとの部品温度閾値とを記憶する閾値記憶部をさらに備え、
前記制御部は、前記吸気温度検知部により検知された前記吸気温度と、前記閾値記憶部に記憶される前記吸気温度閾値とを比較した結果に基づいて前記冷却ファンの回転数を制御するとともに、前記部品温度検知部で検知された各電子部品の温度と、前記閾値記憶部に記憶される該電子部品ごとの前記部品温度閾値とを比較した結果に基づいて前記冷却ファン回転数を所定の変動単位だけさらに増減することを特徴とする請求項１記載の冷却制御装置。
【請求項３】
前記冷却制御装置において、
前記電子部品ごとの部品温度閾値は、前記複数の電子部品ごとに第１の閾値と、前記第１の閾値より大きい第２の閾値とを少なくとも含み、
前記制御部は、前記部品温度検知部で検知された各電子部品の温度と、前記電子部品ごとの前記第１の閾値とをそれぞれ比較し、全ての電子部品の温度が前記第１の閾値以下である場合に、さらに各電子部品の温度と、前記電子部品ごとの前記第２の閾値とを比較し、全ての電子部品の温度が前記第２の閾値以下である場合には、前記吸気温度に基づいて制御した前記冷却ファンの回転数を第１の変動単位αだけ減少させることを特徴とする請求項２記載の冷却制御装置。
【請求項４】
前記冷却制御装置において、
前記電子部品ごとの部品温度閾値は、前記複数の電子部品ごとに前記第２の閾値よりも大きい第３の閾値をさらに含み、
前記制御部は、前記部品温度検知部で検知された各電子部品の温度が前記第２の閾値以下でない場合に、さらに各電子部品の温度と、前記電子部品ごとの前記第３の閾値とを比較し、全ての電子部品の温度が前記第３の閾値以下である場合には、前記冷却ファンの回転数を維持することを特徴とする請求項３記載の冷却制御装置。
【請求項５】
前記冷却制御装置において、
前記電子部品ごとの部品温度閾値は、前記電子部品ごとに前記第３の閾値よりも大きい第４の閾値をさらに含み、
前記制御部は、前記部品温度検知部で検知された各電子部品の温度が前記第３の閾値以下でない場合に、さらに各電子部品の温度と、前記電子部品ごとの前記第４の閾値とを比較し、全ての電子部品の温度が前記第４の閾値以下である場合には、前記冷却ファンの回転数を第２の変動単位βだけ増加させることを特徴とする請求項４記載の冷却制御装置。
【請求項６】
前記冷却制御装において、
前記制御部は、前記複数の電子部品の温度が前記第４の閾値以下でない場合には、前記吸気温度検知部により新たに検知された吸気温度と、前記閾値記憶部に記憶される冷却風温度閾値とを比較した結果に基づいて前記冷却ファンの回転数を再制御することを特徴とする請求項４又は５記載の冷却制御装置。

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【請求項７】
装置内部に排泄された複数の電子部品と、
ファンの回転によって装置内部の空気を装置外部に排気する冷却ファンと、
前記冷却ファンによって吸気された吸気温度を検知する吸気温度検知部と、
前記複数の電子部品の温度をそれぞれ検知する部品温度検知部と、
前記部品温度検知部で検知された各電子部品の温度並びに前記吸気温度検知部により検知された吸気温度に基づいて、前記冷却ファンの回転数を制御する制御部と
を有することを特徴とする電子装置。
【請求項８】
ファンの回転によって装置内部の空気を装置外部に排気する冷却ファンを制御する冷却制御装置が行なう冷却制御方法であって、
装置内部に配設された複数の電子部品の温度をそれぞれ検知する部品温度検知ステップと、
前記冷却ファンによって吸気された吸気温度を検知する吸気温度検知ステップと、
前記部品温度検知ステップで検知された各電子部品の温度並びに前記吸気温度検知ステップにより検知された吸気温度に基づいて、前記冷却ファンの回転数を制御する制御ステップと
を含むことを特徴とする冷却制御方法。
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は、冷却制御装置、電子装置及び冷却制御方法に関する。
【背景技術】
【０００２】
従来、パーソナルコンピュータ等では、マザーボード上に実装されたＣＰＵ（Ｃｅｎｔｒａｌ　Ｐｒｏｃｅｓｓｉｎｇ　Ｕｎｉｔ）等の発熱デバイスの温度を制御部で監視し、このデバイスの温度が目標温度となるようにデバイス専用のファン又はシステム全体を冷却する冷却ファンの回転数が制御される。
【０００３】
図８Ａは、従来のパーソナルコンピュータの構成の一例を示す斜視図であり、図８Ｂは、図８Ａに示したパーソナルコンピュータの構成を示すブロック図である。図８Ａ及び図８Ｂに示すように、このパーソナルコンピュータは、システムボードに搭載された発熱部品であるＣＰＵに対してＣＰＵ専用のファン付ヒートシンクが固着されている。このファン付ヒートシンクには、ＣＰＵ専用の温度センサが設けられている。また、このパーソナルコンピュータの筐体には、筐体外部の外気を吸気しつつ筐体内部の空気を排気するための冷却ファンが設けられている。
【０００４】
そして、温度監視・ファン制御部が、温度センサにＣＰＵの温度を検知させ、当該ＣＰＵの温度が目標温度以下になるようにファン付ヒートシンク及び冷却ファンの回転数を制御することで、最適な冷却を選択して騒音の適正化を図っている。具体的には、図８Ｃに示すように、ＣＰＵの温度が上昇するとファン付ヒートシンク及び冷却ファンの回転数を上げ、ＣＰＵの温度が下降するとファン付ヒートシンク及び冷却ファンの回転数を下げる。これにより、ＣＰＵの温度が目標温度設定範囲に納まるように制御される。このように、パーソナルコンピュータは、発熱部品であるＣＰＵをファン付ヒートシンクで直接的に冷却制御することになる。
【０００５】
これに対して、回路基板上に多数の発熱部品が高密度実装された情報処理装置としてのサーバ装置は、発熱部品に直接ファン付ヒートシンクを設けるのではなく、筐体に設けられた冷却ファンに依存した冷却を行うのが通常である。
【０００６】

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図９Ａは、従来のサーバ装置の構成の一例を示す斜視図であり、図９Ｂは、図９Ａに示したサーバ装置の構成を示すブロック図である。図９Ａ及び図９Ｂに示すように、このサーバ装置は、冷却ファンの故障に伴う運転停止を回避するために冷却ファンが２台並列に設けられている。これらの冷却ファンは、冷却ファンの交換を容易にするために装置外側に面した位置に設けられる。

【０００７】

その反面で、かかるサーバ装置には、パーソナルコンピュータで採用していたファン付ヒートシンクは採用していない。回路基板上に高密度実装された多数の発熱部品の各々にファン付ヒートシンクを固着するのは、スペース、制御及び消費電力の観点から見て現実的ではないからである。

【０００８】

このため、サーバ装置では、筐体内への吸気温度に応じて冷却ファンの回転数が制御される。例えば、図９Ｃに示すように、吸気温度がＬ１［℃］未満である場合には、冷却ファンの回転数が「低速」に制御される。吸気温度がＬ１［℃］以上、かつ、Ｌ２［℃］未満である場合には、冷却ファンの回転数が「中速」に制御される。吸気温度がＬ２［℃］以上かつＬ３［℃］未満である場合には、冷却ファンの回転数が「高速」に制御される。また、吸気温度が想定以上になった場合には、サーバ装置の熱暴走を回避するために装置自体が停止される。

【先行技術文献】

【特許文献】

【０００９】

【特許文献１】特開２００１－４２９５２号公報

【特許文献２】特開２００７－６０８３５号公報

【特許文献３】特許第４１５７５５０号公報

【発明の概要】

【発明が解決しようとする課題】

【００１０】

しかしながら、上記のような従来のサーバ装置によれば、筐体内への吸気温度のみに依存して冷却ファンの回転数を制御していたので、吸気温度が変化しないような場合には、常に冷却ファンの回転数が一定となる。このため、各発熱部品の温度が限界値を超えないように、各発熱部品の最大動作時を想定して冷却ファンの回転数を設定せねばならないため、過剰冷却にならざるを得ないのが実情であった。

【００１１】

このように、各発熱部品の温度が上昇していないのにも係わらず、最大動作時を想定して過剰冷却を行うと、冷却ファンの回転に伴う電力消費の上昇並びに冷却ファンの回転に伴う騒音の問題が生ずる。

【００１２】

以上のことから、サーバ装置内の発熱部品を冷却する場合に、いかにして省電力化及び静音化を図るかと言う点が課題となっていた。なお、かかる課題は、サーバ装置などの情報処理装置のみならず、複数の発熱部品を冷却装置で冷却する各種電子装置に共通して生ずる課題である。

【００１３】

開示技術は、上記に鑑みてなされたものであって、搭載した複数の発熱部品を冷却装置で冷却する場合に、効率的に省電力化及び静音化を図ることができる冷却制御装置、電子装置及び冷却制御方法を提供することを目的とする。

【課題を解決するための手段】

【００１４】

開示技術は、一つの態様において、ファンの回転によって装置内部の空気を装置外部に排気する冷却ファンと、装置内部に配設された複数の電子部品の温度をそれぞれ検知する部品温度検知部とを備える。そして、部品温度検知部で検知された各電子部品の温度に基

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づいて、冷却ファンの回転数を制御する制御部とを備えたことを要件とする。

【発明の効果】

【００１５】

開示技術に係る冷却制御装置、電子装置及び冷却制御方法の一つの態様によれば、サーバ装置等の電子装置における発熱部品の冷却に関して、冷却効果を損ねず、効率的に静音化及び省電力化を図ることができるという効果を奏する。

【図面の簡単な説明】

【００１６】

【図１Ａ】図１Ａは、第１の実施の形態の一例に係る電子装置の構成を示すブロック図である。

【図１Ｂ】図１Ｂは、第１の実施の形態の一例に係る電子装置の構成を示す斜視図である。

【図２】図２は、第２の実施の形態の一例に係るサーバ装置の構成を示すブロック図である。

【図３Ａ】図３Ａは、第２の実施の形態の一例に係る吸気温度閾値を示す図である。

【図３Ｂ】図３Ｂは、第２の実施の形態の一例に係る部品温度閾値を示す図である。

【図４Ａ】図４Ａは、第２の実施の形態の一例に係る冷却ファン制御処理（モード１）手順を示すフローチャートである。

【図４Ｂ】図４Ｂは、第２の実施の形態の一例に係る冷却ファン制御処理（モード２）手順を示すフローチャートである。

【図５】図５は、第２の実施の形態の一例に係る冷却ファン制御処理による吸気温度及びデバイス温度に応じたファン回転数の時間変化を示す図である。

【図６】図６は、第３の実施の形態の一例に係る冷却ファン制御処理（モード２）手順を示すフローチャートである。

【図７】図７は、第３の実施の形態の一例に係る吸気温度に応じたファンの最少回転数を示す図である。

【図８Ａ】図８Ａは、従来のパーソナルコンピュータの構成の一例を示す斜視図である。

【図８Ｂ】図８Ｂは、従来のパーソナルコンピュータの構成を示すブロック図である。

【図８Ｃ】図８Ｃは、従来のパーソナルコンピュータにおけるＣＰＵ温度に応じたファン回転数の制御の時間変化を示す図である。

【図９Ａ】図９Ａは、従来のサーバ装置の構成の一例を示す斜視図である。

【図９Ｂ】図９Ｂは、従来のサーバ装置の構成を示すブロック図である。

【図９Ｃ】図９Ｃは、従来のサーバ装置における吸気温度に応じたファン回転数の制御の時間変化を示す図である。

【発明を実施するための形態】

【００１７】

以下に、開示の技術に係る冷却制御装置、電子装置及び冷却制御方法の実施の形態の一例を図面に基づいて詳細に説明する。なお、以下の実施の形態の一例に示す電子装置は、サーバ装置を例とするが、交換機、ルータ、ＬＡＮスイッチ等の通信装置であってもよい。すなわち、以下の実施の形態の一例により開示技術が限定されるものではない。

【００１８】

（第１の実施の形態の一例）

図１Ａは、第１の実施の形態の一例に係る電子装置の構成を示すブロック図である。また、図１Ｂは、第１の実施の形態の一例に係る電子装置の構成を示す斜視図である。第１の実施の形態の一例に係る電子装置５０ａは、図１Ｂに示すように、例えば直方体形状の筐体５１の内部に回路基板１０、温度監視・冷却制御部１５、冷却装置制御部１６、冷却ファン５４ａ－１及び冷却ファン５４ａ－２を有する。回路基板１０には、動作に応じて発熱する電子部品１１ａ、電子部品１１ｂ、電子部品１１ｃが実装されている。

【００１９】

なお、回路基板は、例えばシステムボードやマザーボードである。電子部品１１ａ、電

子部品１１ｂ、電子部品１１ｃは、動作に応じて発熱する半導体素子である。電子部品１１ａ、電子部品１１ｂ、電子部品１１ｃは、半導体素子に限らず、動作に応じて発熱する電子装置、例えば記憶媒体を有する記憶装置等であってもよい。または、電子部品１１ａ、電子部品１１ｂ、電子部品１１ｃは、動作に応じて発熱する電子部品あるいは電子装置の放熱を促進するヒートシンクやヒートパイプ等の放熱部品であってもよい。

【００２０】

また、電子装置５０ａが有する冷却装置は、冷却ファン５４ａ－１及び冷却ファン５４ａ－２の２つに限られるものではない。また、電子装置５０ａが有する回路基板１０に実装される電子部品は、電子部品１１ａ、電子部品１１ｂ、電子部品１１ｃの３つに限られず、複数であればいずれの個数であってもよい。

【００２１】

図１Ｂに示すように、筐体５１は、前面板５２と、前面板５２に対向する背面板５３とを有する。前面板５２には吸気面が設けられている。また、背面板５３には排気面が設けられている。

【００２２】

冷却ファン５４ａ－１及び冷却ファン５４ａ－２は、筐体５１の内部において、背面板５３に面して配置される。冷却ファン５４ａ－１及び冷却ファン５４ａ－２は、例えば羽根部を有する軸流ファンである。冷却ファン５４ａ－１及び冷却ファン５４ａ－２の羽根部の回転により、前面板５２の吸気面から筐体５１の内部に冷却風が吸気される。

【００２３】

なお、冷却ファン５４ａ－１及び冷却ファン５４ａ－２は、軸流ファンに限らず、ブロアや斜流ファン等、電子装置５０ａの筐体５１内において、適切な方向で付勢して冷却風を吸排気可能な送風機であれば、いずれでもよい。

【００２４】

そして、筐体５１の内部に吸気された冷却風は、流路Ａ及び流路Ｂを経由して回路基板１０に実装された電子部品１１ａ、電子部品１１ｂ及び電子部品１１ｃを冷却する。流路Ａの冷却風は、電子部品１１ａ及び電子部品１１ｂを主に冷却する。また、流路Ｂの冷却風は、電子装置１１ｃを主に冷却する。

【００２５】

そして、電子部品１１ａ、電子部品１１ｂ及び電子部品１１ｃを冷却した冷却風は、冷却ファン５４ａ－１及び冷却ファン５４ａ－２により背面板５３に設けられた排気面を介して筐体５１の外部に排気される。特に、流路Ａの冷却風は、冷却ファン５４ａ－１により背面板５３に設けられた排気面を介して筐体５１の外部に排気される。また、流路Ｂの冷却風は、冷却ファン５４ａ－２により背面板５３に設けられた排気面を介して筐体５１の外部に排気される。

【００２６】

図１Ａに示すように、電子装置５０ａは、回路基板１０、吸気温度検知部１３、温度監視・冷却制御部１５、冷却装置制御部１６、冷却ファン５４ａ－１及び冷却ファン５４ａ－２を有する。

【００２７】

回路基板１０には、回路基板１０に実装された電子部品１１ａに近接して部品温度検知部１２ａが配置される。部品温度検知部１２ａは、電子部品１１ａの温度を検知するサーミスタや半導体温度センサ等の温度センサである。同様に、電子部品１１ｂ、電子部品１１ｃにそれぞれ近接して部品温度検知部１２ｂ、部品温度検知部１２ｃが配置される。部品温度検知部１２ｂ、部品温度検知部１２ｃは、電子部品１１ｂ、電子部品１１ｃの温度をそれぞれ検知する温度センサである。

【００２８】

部品温度検知部１２ａ、部品温度検知部１２ｂ、部品温度検知部１２ｃは、好ましくは冷却風の流路Ａ又は流路Ｂにおける電子部品１１ａ、電子部品１１ｂ、電子部品１１ｃの風下側に配置される。このような各電子部品の配置は、冷却風による各電子部品の冷却後

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の温度をより精密に測定するためである。

【００２９】

吸気温度検知部１３は、筐体５１の前面板５２と、回路基板１０との間に配置される。そして、吸気温度検知部１３は、前面板５２の吸気面から筐体５１の内部に吸気された冷却風の吸気温度を検知する。

【００３０】

そして、部品温度検知部１２ａ、部品温度検知部１２ｂ、部品温度検知部１２ｃ、吸気温度検知部１３は、Ｉ２Ｃ　Ｉ／Ｆ（Inter Integrated-Circuit Interface）等のインターフェース１４を介して温度監視・冷却制御部１５と接続される。部品温度検知部１２ａ、部品温度検知部１２ｂ、部品温度検知部１２ｃは、温度監視・冷却制御部１５に対して、検知したそれぞれの電子部品の温度を通知する。また、吸気温度検知部１３は、温度監視・冷却制御部１５に対して、検知した吸気温度を通知する。

【００３１】

温度監視・冷却制御部１５は、閾値記憶部１５ａ、制御部１５ｂを有する。温度監視・冷却制御部１５は、例えばＲＯＭ（Read Only Memory）等の半導体記憶装置及びＭＰＵ（Micro Processing Unit）等の半導体処理装置を含む。閾値記憶部１５ａは例えばＲＯＭにより実現され、制御部１５ｂは例えばＭＰＵにより実現される。

【００３２】

閾値記憶部１５ａは、吸気温度閾値１５ａ－１、部品温度閾値１５ａ－２を記憶する。吸気温度閾値１５ａ－１は、吸気温度検知部１３により検知された冷却風の吸気温度の高低を判定する閾値である。吸気温度閾値１５ａ－１は、例えば「閾値１」、「閾値１」よりも大の「閾値２」、「閾値２」よりも大の「閾値３」の３つの閾値を含む。

【００３３】

また、部品温度閾値１５ａ－２は、部品温度検知部１２ａ、部品温度検知部１２ｂ、部品温度検知部１２ｃにより検知された電子部品１１ａ、電子部品１１ｂ、電子部品１１ｃそれぞれの部品温度の高低を判定する電子部品ごとの閾値である。部品温度閾値１５ａ－２は、電子部品ごとに例えば「閾値１」、「閾値１」よりも大の「閾値２」、「閾値２」よりも大の「閾値３」、「閾値３」よりも大の「閾値４」の４つの閾値を含む。

【００３４】

なお、吸気温度閾値１５ａ－１が含む閾値の数は、３つに限定されるものではない。また、部品温度閾値１５ａ－２が含む閾値の数は、４つに限定されるものではなく、複数であればいずれでもよい。

【００３５】

制御部１５ｂは、吸気温度検知部１３により検知された冷却風の吸気温度と、吸気温度閾値１５ａ－１とを比較する。そして、制御部１５ｂは、比較結果に応じて冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数を決定する。

【００３６】

例えば、冷却風の吸気温度が吸気温度閾値１５ａ－１の「閾値１」以下である場合には、制御部１５ｂは、冷却ファン５４ａ－１及び冷却装置５４ａ－２のファン回転数を「回転数１［ＲＰＭ（Rotation Per Minutes：回転／分）］」と決定する。また、冷却風の吸気温度が吸気温度閾値１５ａ－１の「閾値１」より大、かつ、「閾値２」以下である場合には、制御部１５ｂは、冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数を「回転数２［ＲＰＭ］」と決定する。また、冷却風の吸気温度が吸気温度閾値１５ａ－１の「閾値２」より大、かつ、「閾値３」以下である場合には、制御部１５ｂは、冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数を「回転数３［ＲＰＭ］」と決定する。なお、「回転数１［ＲＰＭ］」、「回転数２［ＲＰＭ］」、「回転数３［ＲＰＭ］」は、「回転数１［ＲＰＭ］」＜「回転数２［ＲＰＭ］」＜「回転数３［ＲＰＭ］」なる大小関係を有する。

【００３７】

なお、ファン回転数が一定であれば冷却風の風速も一定であり、この場合には、冷却風

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の吸気温度が高ければ高いほど冷却風による電子部品の冷却効果が低減する。しかし、冷却風の吸気温度が高い場合には、冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数を高く決定して冷却風の風速を上げることにより、電子部品の冷却効果の低減を抑制することができる。

【００３８】

そして、制御部１５ｂは、冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数を決定後、ΔＴの時間だけ待機したのち、冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数の「増減制御開始判定」を行なう。「増減制御開始判定」については、後述する。

【００３９】

なお、制御部１５ｂは、冷却風の吸気温度が吸気温度閾値１５ａ－１の「閾値３」より大である場合には、「吸気温度異常警告」を電子装置５０ａの全体動作をつかさどる図示しない制御装置へ通知する。電子装置５０ａの全体動作をつかさどる図示しない制御装置は、「吸気温度異常警告」が通知されると、例えば電子装置５０ａ自体の動作を停止する。

【００４０】

制御部１５ｂは、部品温度検知部１２ａ、部品温度検知部１２ｂ、部品温度検知部１２ｃにより検知された電子部品１１ａ、電子部品１１ｂ、電子部品１１ｃそれぞれの部品温度と、電子部品ごとの部品温度閾値１５ａ－２とを比較する。そして、制御部１５ｂは、比較結果に応じて、制御部１５ｂによって決定された冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数ｒ［ＲＰＭ］から「所定の変動単位」だけファン回転数を増減制御する。

【００４１】

なお、「所定の変動単位」とは、例えば冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファンの最大回転数に対する百分率であるとする。すなわち、制御部１５ｂは、制御部１５ｂによって決定された冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数から、α［％］だけファン回転数を減少させ、又は、β［％］だけファン回転数を増加させる。なお、α、βは、百分率に限らず、回転数であってもよい。

【００４２】

制御部１５ｂは、例えば電子部品１１ａ、電子部品１１ｂ、電子部品１１ｃの全ての部品温度が各電子部品の部品温度閾値１５ａ－２の「閾値１」以下である場合に、制御部１５ｂは、冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数の増減制御を開始する。電子部品１１ａ、電子部品１１ｂ、電子部品１１ｃの全ての部品温度が各電子部品の部品温度閾値１５ａ－２の「閾値１」以下であるか否かの判定が「増減制御開始判定」である。

【００４３】

そして、全ての部品温度が各電子部品の部品温度閾値１５ａ－２の「閾値１」より大きく、かつ、「閾値２」以下である場合には、制御部１５ｂは、冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数をα［％］だけ減少させる。また、全ての部品温度が各電子部品の部品温度閾値１５ａ－２の「閾値２」より大きく、かつ、「閾値３」以下である場合には、制御部１５ｂは、冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数を増減しない。また、全ての部品温度が各電子部品の部品温度閾値１５ａ－２の「閾値３」より大きく、かつ、「閾値４」以下である場合には、制御部１５ｂは、冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数をβ［％］だけ増加させる。以上が、「ファン回転数の増減制御」である。

【００４４】

そして、制御部１５ｂは、冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数を増減後、Δｔの時間だけ待機したのち、冷却装置５４ａ及び冷却装置５４ｂのファン回転数の増減制御を再び繰り返す。

【００４５】

なお、上述のα、βは、α＜βの関係を満たすとしてもよい。すなわち、電子部品の温度上昇は電子装置５０ａ自体の停止に直結する。このため、冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数の増加幅を大きく取ることにより、電子部品の冷却を急速に行なうことができる。一方、電子部品の冷却過剰は、冷却装置の回転による騒音や電力の過剰消費の問題はあるものの、電子装置５０ａ自体の停止まで至ることはない。よって、α＜βのようにファン回転数の変動単位を設定することで、電子装置５０ａの運転の連続性をより高めることができる。

【００４６】

また、上述のΔｔは、ΔＴと比較して微少な時間間隔であってもよい。例えば、ΔＴが３０分である場合には、Δｔは１分であるとしてもよい。このように、ΔｔをΔＴと比較して微少な時間間隔とすることにより、動作状況に応じて時々刻々と変化する電子部品の雄部品温度に応じてファン回転数の「増減制御」をきめ細かく行なうことができる。

【００４７】

制御部１５ｂは、決定した冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数ｒ［ＲＰＭ］を冷却装置制御部１６へ通知する。また、制御部１５ｂは、ファン回転数ｒ［ＲＰＭ］からα［％］だけ減少させたファン回転数ｒ１［ＲＰＭ］、及び、ファン回転数ｒ［ＲＰＭ］からβ［％］だけ増加させたファン回転数ｒ２［ＲＰＭ］を冷却装置制御部１６へ通知する。

【００４８】

冷却装置制御部１６は、制御部１５ｂ又は制御部１５ｂから通知されたファン回転数ｒ［ＲＰＭ］、ファン回転数ｒ１［ＲＰＭ］又はファン回転数ｒ２［ＲＰＭ］に応じた制御パルスを選択して冷却ファン５４ａ－１及び冷却ファン５４ａ－２に供給する。冷却ファン５４ａ－１及び冷却ファン５４ａ－２は、冷却装置制御部１６から供給される制御パルスに応じて羽根部を回転させる。

【００４９】

上述してきたように、第１の実施の形態の一例では、吸気温度に応じて決定された冷却ファン５４ａ－１及び冷却ファン５４ａ－２のファン回転数ｒ［ＲＰＭ］をさらに各電子部品の温度に応じて増減する。このため、冷却効果を損ねず、きめ細かくファン回転数を制御することができる。そして、電子部品の過剰な冷却による冷却装置のファン回転の騒音や電力の過剰消費を適切に回避することができる。また、冷却不足による電子部品の熱暴走防止のための電子装置５０ａの停止を適切に回避することができる。

【００５０】

（第２の実施の形態の一例）

図２は、第２の実施の形態の一例に係るサーバ装置の構成を示すブロック図である。第２の実施の形態の一例では、第１の実施の形態の一例との差異部分についてのみ説明し、同一の構成については説明を省略する。図２に示すように、第２の実施の形態の一例に係るサーバ装置５０ｂは、筐体５１ｂの内部にシステムボード２０、吸気温度センサ２３、温度監視・冷却制御部２５、ファンコントローラデバイス２６、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２を有する。

【００５１】

冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２は、筐体５１ｂの内部において、背面板５３ｂに面して配置される。冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２は、例えば、羽根部を有する軸流ファンである。冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２の羽根部の回転により、前面板５２ｂの吸気面から筐体５１の内部に冷却風が吸気される。

【００５２】

そして、筐体５１ｂ内に吸気された冷却風は、システムボード２０に実装されたデバイス２１ａ、デバイス２１ｂ及びデバイス２１ｃを冷却後、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２により背面板５３ｂの排気面を介して筐体５１ｂ外に排気される。

【００５３】

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システムボード２０には、システムボード２０に実装されたデバイス２１ａに近接して温度センサ２２ａが配置される。なお、デバイスとは、動作に応じて発熱する半導体素子等の電子部品又は電子部品は熱を発する発熱部品である。温度センサ２２ａは、デバイス２１ａの温度を検知する半導体温度センサやサーミスタ等の温度センサである。同様に、デバイス２１ｂ、デバイス２１ｃにそれぞれ近接して温度センサ２２ｂ、温度センサ２２ｂが配置される。温度センサ２２ｂ、温度センサ２２ｃは、デバイス２１ｂ、デバイス２１ｃの温度をそれぞれ検知する温度センサである。

【００５４】

温度センサ２２ａ、温度センサ２２ｂ、温度センサ２２ｃは、好ましくは冷却風の流路におけるデバイス２１ａ、デバイス２１ｂ、デバイス２１ｃの風下側に配置される。これは、冷却風による各デバイスの冷却後の温度をより精密に測定するためである。

【００５５】

吸気温度センサ２３は、筐体５１ｂの前面板５２ｂと、システムボード２０との間に配置される。そして、吸気温度センサ２３は、前面板５２ｂの吸気面から筐体５１ｂの内部に吸気された冷却風の吸気温度を検知する。

【００５６】

そして、温度センサ２２ａ、温度センサ２２ｂ、温度センサ２２ｃ、吸気温度センサ２３は、Ｉ２Ｃ　Ｉ／Ｆ（Inter-Integrated Circuit Interface）２４を介して温度監視・冷却制御部２５と接続される。温度センサ２２ａ、温度センサ２２ｂ、温度センサ２２ｃは、温度監視・冷却制御部２５に対して、検知したそれぞれのデバイスの温度を通知する。また、吸気温度センサ２３は、温度監視・冷却制御部２５に対して、検知した吸気温度を通知する。

【００５７】

温度監視・冷却制御部２５は、閾値記憶部２５ａ、ファン動作量決定部２５ｂ、ファン動作量増減部２５ｃを有する。閾値記憶部２５ａは、吸気温度閾値２５ａ－１、部品温度閾値２５ａ－２を記憶する。吸気温度閾値２５ａ－１は、図３Ａに示すように、「閾値１」として「２５℃」、「閾値２」として「３０℃」、「閾値３」として「３５℃」を含む。図３Ａは、第２の実施の形態の一例に係る吸気温度閾値を示す図である。「閾値１」、「閾値２」、「閾値３」は、その値が「閾値１」＜「閾値２」＜「閾値３」なる大小関係を有する。そして、「閾値１」、「閾値２」、「閾値３」は、サーバ装置５０ｂ全体の発熱特性に応じて予め設定される値である。図３Ａに示す「閾値１」、「閾値２」、「閾値３」の具体的数値は、一例を示すに過ぎない。

【００５８】

また、部品温度閾値２５ａ－２は、図３Ｂに示すように、デバイスごとに「閾値１」、「閾値２」、「閾値３」、「閾値４」を含む。図３Ｂは、第２の実施の形態の一例に係る部品温度閾値を示す図である。図３Ｂに示すように、デバイス２１ａの部品温度閾値は、「閾値１」として「３０℃」、「閾値２」として「５５℃」、「閾値３」として「７０℃」、「閾値４」として「８０℃」を含む。

【００５９】

同様に、デバイス２１ｂの部品温度閾値は、「閾値１」として「３０℃」、「閾値２」として「５５℃」、「閾値３」として「７５℃」、「閾値４」として「８５℃」を含む。また、デバイス２１ｃの部品温度閾値は、「閾値１」として「２０℃」、「閾値２」として「５０℃」、「閾値３」として「６５℃」、「閾値４」として「８５℃」を含む。

【００６０】

デバイスごとの「閾値１」、「閾値２」、「閾値３」、「閾値４」は、その値が「閾値１」＜「閾値２」＜「閾値３」＜「閾値４」なる大小関係を有する。そして、「閾値１」、「閾値２」、「閾値３」、「閾値４」は、各デバイスの発熱特性に応じて予め設定される値である。図３Ｂに示すデバイスごとの「閾値１」、「閾値２」、「閾値３」、「閾値４」の具体的数値は、一例を示すに過ぎない。

【００６１】

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ファン動作量決定部２５ｂは、吸気温度センサ２３により検知された冷却風の吸気温度と、吸気温度閾値２５ａ－１とを比較する。そして、ファン動作量決定部２５ｂは、比較結果に応じて冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数を決定する。

【００６２】

例えば、冷却風の吸気温度が吸気温度閾値２５ａ－１の「閾値１」（「２５℃」）以下である場合には、ファン動作量決定部２５ｂは、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数ｒを「２０００［ＲＰＭ］」と決定する。また、吸気温度が吸気温度閾値２５ａ－１の「閾値１」（「２５℃」）より大、かつ、「閾値２」（「３０℃」）以下である場合には、ファン動作量決定部２５ｂは、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数ｒを「３０００［ＲＰＭ］」と決定する。また、吸気温度が吸気温度閾値２５ａ－１の「閾値２」（「３０℃」）より大、かつ、「閾値３」（「３５℃」）以下である場合には、ファン動作量決定部２５ｂは、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数ｒを「４０００［ＲＰＭ］」と決定する。なお、吸気温度閾値２５ａ－１の「閾値１」、「閾値２」、「閾値３」に応じて決定されるファン回転数ｒの具体的数値は、一例を示すに過ぎない。

【００６３】

そして、ファン動作量決定部２５ｂは、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数を決定後、例えば、ΔＴ＝３０分間だけ待機したのち、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数の「増減制御開始判定」を行なう。

【００６４】

ファン動作量増減部２５ｃは、デバイス２１ａ、デバイス２１ｂ、デバイス２１ｃの全ての部品温度が各電子部品の部品温度閾値２５ａ－２の「閾値１」以下である場合に、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数の増減制御を開始する。デバイス２１ａ、デバイス２１ｂ、デバイス２１ｃの全ての部品温度が各電子部品の部品温度閾値２５ａ－２の「閾値１」以下であるか否かの判定が「増減制御開始判定」である。

【００６５】

そして、全てのデバイスの温度が各デバイスの部品温度閾値２５ａ－２の「閾値１」より大、かつ、「閾値２」以下である場合には、ファン動作量増減部２５ｃは、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数をα＝１［％］だけ減少させる。また、全ての部品温度が各電子部品の部品温度閾値２５ａ－２の「閾値２」より大、かつ、「閾値３」以下である場合には、ファン動作量増減部２５ｃは、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数を増減しない。また、全てのデバイスの温度が各デバイスの部品温度閾値２５ａ－２の「閾値３」より大、かつ、「閾値４」以下である場合には、ファン動作量増減部２５ｃは、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数をβ＝５［％］だけ増加させる。以上が、「ファン回転数の増減制御」である。なお、α＝１［％］及びβ＝５［％］は、サーバ装置５０ｂの全体動作に基づく発熱特性に応じて予め設定される値である。

【００６６】

そして、ファン動作量増減部２５ｃは、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数を増減後、例えば、Δｔ＝１分間だけ待機したのち、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数の増減制御を再び繰り返す。

【００６７】

ファン動作量決定部２５ｂは、決定した冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数ｒ［ＲＰＭ］をファンコントローラデバイス２６へ通知する。ファン動作量増減部２５ｃは、ファン回転数ｒ［ＲＰＭ］からα＝１［％］だけ減少させたファン回転数ｒ１［ＲＰＭ］及びファン回転数ｒ［ＲＰＭ］からβ＝５［％］だけ増加させたファン回転数ｒ２［ＲＰＭ］をファンコントローラデバイス２６へ通知する。

【００６８】

ファンコントローラデバイス２６は、ファン動作量決定部２５ｂ又はファン動作量増減

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部２５ｃから通知されたファン回転数ｒ［ＲＰＭ］、ファン回転数ｒ１［ＲＰＭ］又はファン回転数ｒ２［ＲＰＭ］に応じた制御パルスを選択して冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２に供給する。冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２は、ファンコントローラデバイス２６から供給される制御パルスに応じて羽根部を回転させる。なお、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２は、ファンコントローラデバイス２６に対して、自装置の羽根部の回転速度信号（ＴＡＣＨ）を送信する。ファンコントローラデバイス２６は、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２からの回転速度信号を監視しながら目標とするファン回転数となるように冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２を制御する。

【００６９】

なお、冷却制御装置２０ａは、温度センサ２２ａ、温度センサ２２ｂ、温度センサ２２ｃ、吸気温度センサ２３、Ｉ２Ｃ　Ｉ／Ｆ２４、温度監視・冷却制御部２５、ファンコントローラデバイス２６を含む。

【００７０】

次に、図４Ａ及び図４Ｂを参照して、第２の実施の形態の一例に係る冷却ファン制御処理を説明する。図４Ａは、第２の実施の形態の一例に係る冷却ファン制御処理（モード１）手順を示すフローチャートである。また、図４Ｂは、第２の実施の形態の一例に係る冷却ファン制御処理（モード２）手順を示すフローチャートである。なお、モード１の冷却ファン制御処理とは、冷却風の吸気温度に従って冷却ファンを制御する処理である。また、モード２の冷却ファン制御処理とは、デバイスの部品温度に従って冷却ファンを制御する処理である。冷却ファン制御処理（モード１）及び冷却ファン制御処理（モード２）は、温度監視・冷却制御部２５が行なう。

【００７１】

先ず、ステップＳ１０１では、温度監視・冷却制御部２５のファン動作量決定部２５ｂは、吸気温度センサ２３により検知された冷却風の吸気温度をチェックする。続いて、ステップＳ１０２では、ファン動作量決定部２５ｂは、吸気温度センサ２３により検知された冷却風の吸気温度が吸気温度閾値２５ａ－１の「閾値１」（「２５℃」）以下であるか否かを判定する。

【００７２】

吸気温度センサ２３により検知された冷却風の吸気温度が吸気温度閾値２５ａ－１の「閾値１」（「２５℃」）以下であると判定された場合には（ステップＳ１０２肯定）、ステップＳ１０３へ移る。吸気温度センサ２３により検知された冷却風の吸気温度が吸気温度閾値２５ａ－１の「閾値１」（「２５℃」）以下であると判定されなかった場合には（ステップＳ１０２否定）、ステップＳ１０４へ移る。

【００７３】

ステップＳ１０３では、ファン動作量決定部２５ｂは、ファン回転数ｒを２０００［ＲＰＭ］に決定してファンコントローラデバイス２６に通知する。そして、ファンコントローラデバイス２６は、通知されたファン回転数ｒ＝２０００ＲＰＭとなるように冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２を制御する（以上、ステップＳ１０３）。ステップＳ１０３が終了すると、ステップＳ１０９へ移る。

【００７４】

ステップＳ１０４では、ファン動作量決定部２５ｂは、吸気温度センサ２３により検知された冷却風の吸気温度が吸気温度閾値２５ａ－１の「閾値２」（「３０℃」）以下であるか否かを判定する。

【００７５】

吸気温度センサ２３により検知された冷却風の吸気温度が吸気温度閾値２５ａ－１の「閾値２」（「３０℃」）以下であると判定された場合には（ステップＳ１０４肯定）、ステップＳ１０５へ移る。吸気温度センサ２３により検知された冷却風の吸気温度が吸気温度閾値２５ａ－１の「閾値２」（「３０℃」）以下であると判定されなかった場合には（ステップＳ１０４否定）、ステップＳ１０６へ移る。

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【００７６】
ステップＳ１０５では、ファン動作量決定部２５ｂは、ファン回転数ｒを３０００ＲＰＭに決定してファンコントローラデバイス２６に通知する。そして、ファンコントローラデバイス２６は、通知されたファン回転数ｒ＝３０００ＲＰＭとなるように冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２を制御する（以上、ステップＳ１０５）。ステップＳ１０５が終了すると、ステップＳ１０９へ移る。
【００７７】
ステップＳ１０６では、ファン動作量決定部２５ｂは、吸気温度センサ２３により検知された冷却風の吸気温度が吸気温度閾値２５ａ－１の「閾値３」（「３５℃」）以下であるか否かを判定する。
【００７８】
吸気温度センサ２３により検知された冷却風の吸気温度が吸気温度閾値２５ａ－１の「閾値３」（「３５℃」）以下であると判定された場合には（ステップＳ１０６肯定）、ステップＳ１０７へ移る。吸気温度センサ２３により検知された冷却風の吸気温度が吸気温度閾値２５ａ－１の「閾値３」（「３５℃」）以下であると判定されなかった場合には（ステップＳ１０６否定）、ステップＳ１０８へ移る。
【００７９】
ステップＳ１０７では、ファン動作量決定部２５ｂは、ファン回転数ｒを４０００ＲＰＭに決定してファンコントローラデバイス２６に通知する。そして、ファンコントローラデバイス２６は、通知されたファン回転数ｒ＝４０００ＲＰＭとなるように冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２を制御する（以上、ステップＳ１０７）。ステップＳ１０７が終了すると、ステップＳ１０９へ移る。
【００８０】
一方、ステップＳ１０８では、ファン動作量決定部２５ｂは、冷却風の吸気温度が吸気温度閾値２５ａ－１の「閾値３」より大であるので、「吸気温度異常警告」をサーバ装置５０ｂの全体動作をつかさどる図示しない制御装置へ通知する。ステップＳ１０８が終了すると、ステップＳ１０１へ移る。サーバ装置５０ｂの全体動作をつかさどる図示しない制御装置は、「吸気温度異常警告」が通知されると、例えばサーバ装置５０ｂ自体の動作を停止する。
【００８１】
ステップＳ１０９では、ファン動作量決定部２５ｂは、ステップＳ１０３もしくはステップＳ１０５、ステップＳ１０７が連続している間において第１の時間ΔＴの計時開始からΔＴ＝３０分が経過したか否かを判定する。第１の時間ΔＴの計時開始からΔＴ＝３０分が経過したと判定された場合には（ステップＳ１０９肯定）、ステップＳ１１０へ移る。第１の時間ΔＴの計時開始からΔＴ＝３０分が経過したと判定されなかった場合には（ステップＳ１０９否定）、ステップＳ１０１へ移る。
【００８２】
ステップＳ１１０では、ファン動作量増減部２５ｃは、全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値１」以下であるか否かを判定する。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値１」以下であると判定された場合には（ステップＳ１１０肯定）、図４Ｂのステップ２０１へ移る。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値１」以下であると判定されなかった場合には（ステップＳ１１０否定）、ステップＳ１０１へ移る。
【００８３】
図４Ｂのステップ２０１では、ファン動作量増減部２５ｃは、全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値２」以下であるか否かを判定する。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値２」以下であると判定された場合には（ステップＳ２０１肯定）、ステップＳ２０２へ移る。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値２」以下であると判定されなかった場合には（ステップＳ２０１否定）、ステップＳ２０３へ移る。

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【００８４】
ステップＳ２０２では、ファン動作量増減部２５ｃは、図４Ａのステップ１０３、ステップＳ１０５又はステップＳ１０７の処理で決定されたファン回転数を１％下げる。この処理が終了すると、ステップＳ２０６へ移る。
【００８５】
ステップＳ２０３では、ファン動作量増減部２５ｃは、全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値３」以下であるか否かを判定する。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値３」以下であると判定された場合には（ステップＳ２０３肯定）、ステップＳ１０３、ステップＳ１０５又はステップＳ１０７の処理で決定されたファン回転数を維持する。そして、ステップＳ２０６へ移る。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値３」以下であると判定されなかった場合には（ステップＳ２０３否定）、ステップＳ２０４へ移る。
【００８６】
ステップＳ２０４では、ファン動作量増減部２５ｃは、全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値４」以下であるか否かを判定する。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値４」以下であると判定された場合には（ステップＳ２０４肯定）、ステップＳ２０５へ移る。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値４」以下であると判定されなかった場合には（ステップＳ２０４否定）、図４Ａのステップ１０１へ移る。
【００８７】
ステップＳ２０５では、ファン動作量増減部２５ｃは、図４Ａのステップ１０３、ステップＳ１０５又はステップＳ１０７の処理で決定されたファン回転数を５％上げる。この処理が終了すると、ステップＳ２０６へ移る。
【００８８】
ステップＳ２０６では、ファン動作量増減部２５ｃは、第２の時間Δｔの計時開始からΔｔ＝１分が経過するまで処理を待機する。この処理が終了すると、ステップＳ２０１へ移る。
【００８９】
図５は、第２の実施の形態の一例に係る冷却ファン制御処理による吸気温度及びデバイス温度に応じたファン回転数の時間変化を示す図である。図５では、吸気温度に従う制御（モード１）と部品温度に従う制御（モード２）の吸気温度、ファン回転数、デバイスの温度について、ファン回転数のハッチング部分は、従来よりもファン電力や騒音の低減が得られる領域をあらわしている。なお、図５では、説明を簡単にするため、温度を検知するデバイスは１つを例としている。
【００９０】
図５の（５Ｃ）において、吸気温度に従う制御（モード１）の低速回転（２０００ＲＰＭ）での回転制御の開始後からΔＴ＝３０分時間経過後である時刻ｔ１に、デバイス温度が「閾値１」以下であることが検出される。そして、部品温度に従う制御（モード２）に移行してファン回転数が下げられる。
【００９１】
図５の（５Ｃ）において、Ａ点では、デバイスの動作負荷が増えて発熱量が増加したことに伴う温度上昇が発生する。そして、時刻ｔ２でデバイスの温度上昇が「閾値３」で検出され、ファン回転数が上げられる。その後、時刻ｔ３でデバイスの温度上昇が「閾値４」で検出され、吸気温度に従う制御（モード１）へ復帰する。この時点の冷却風の吸気温度が低温（「閾値１」（「２５℃」）以下）で低速回転域だったため、モード１ではファン回転数は低速回転（２０００ＲＰＭ）と決定される。
【００９２】
図５の（５Ｃ）において、Ｂ点では、デバイスの動作負荷が減って発熱量が低下したことに伴う温度降下が発生した。そして、吸気温度に従う制御（モード１）の低速回転（２０００ＲＰＭ）での回転制御の開始後からΔＴ＝３０分時間経過後である時刻ｔ４に、デ

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バイス温度が「閾値１」以下であることが検出された。そして、部品温度に従う制御（モード２）に移行してファン回転数が下げられた。

【００９３】

図５の（５Ａ）のＣ点及び（５Ｃ）の時刻ｔ５において、冷却風の吸気温度の上昇及びデバイスの温度上昇が発生する。しかし、この段階では、デバイス温度は、「閾値３」、「閾値４」のいずれも超えていないので、ファン回転数は維持される。

【００９４】

そして、図５の（５Ｃ）の時刻ｔ６において、デバイスの温度上昇を「閾値３」で検出したため、ファン回転数が上げられる。さらに、図５の（５Ｃ）の時刻ｔ７において、デバイスの温度上昇が「閾値４」で検出されるため、吸気温度に従う制御（モード１）へ復帰する。この時点の吸気温度は、「閾値１」より大、かつ、「閾値２」以下であるため、モード１ではファン回転数は中速回転（３０００ＲＰＭ）と決定される。

【００９５】

図５の（５Ｃ）において、時刻ｔ８では、デバイスの動作負荷が減って発熱量が低下することに伴う温度降下が発生する。すなわち、モード１の中速回転でΔＴ＝３０分経過後にデバイスの温度が「閾値１」以下であることが検出される。そして、部品温度に従う制御（モード２）に移行し、ファン回転数が下げられる。

【００９６】

図５の（５Ａ）のＤ点及び（５Ｃ）の時刻ｔ９において、冷却風の吸気温度の上昇及びデバイスの温度上昇が発生する。しかし、この段階では、デバイス温度は、「閾値３」、「閾値４」のいずれも超えていないので、ファン回転数は維持される。

【００９７】

そして、図５の（５Ｃ）の時刻ｔ１０において、デバイスの温度上昇が「閾値４」で検出されるため、吸気温度に従う制御（モード１）へ復帰する。この時点の吸気温度が「閾値２」より大、かつ、「閾値３」以下であるため、ファン回転数は中速回転（３０００ＲＰＭ）と決定される。

【００９８】

そして、モード１中に、吸気温度が「閾値１」より大、かつ、「閾値２」以下となるため、ファン回転数は低速回転（２０００ＲＰＭ）と決定される。そして、吸気温度に従う制御（モード１）の低速回転（２０００ＲＰＭ）での回転制御の開始後からΔＴ＝３０分時間経過後である時刻ｔ１３に、デバイス温度が「閾値１」以下であることが検出される。そして、部品温度に従う制御（モード２）に移行し、ファン回転数が下げられる。

【００９９】

上述してきたように、第２の実施の形態の一例では、吸気温度に応じて決定された冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数ｒ［ＲＰＭ］をさらに各デバイスの温度に応じて増減するので、きめ細かくファン回転数を制御することができる。

【０１００】

具体的には、吸気温度に応じて決定された冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数ｒを全てのデバイスの温度がそれぞれの「閾値２」以下である場合にα＝１［％］だけ減少させる。これにより、デバイスの過剰な冷却による冷却ファンのファン回転の騒音や電力の過剰消費を適切に回避することができる。

【０１０１】

また、吸気温度に応じて決定された冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数ｒを温度閾値を超えているデバイスの温度に合わせてβ＝５［％］だけ増加させる。これにより、サーバ装置５０ｂの冷却不足を未然に回避することができる。そして、冷却不足によるデバイスの熱暴走防止のためのサーバ装置５０ｂの停止を適切に回避することができる。

【０１０２】

（第３の実施の形態の一例）

第３の実施の形態の一例では、第２の実施の形態の一例で説明したモード２の冷却ファ

ン制御処理におけるファン回転数の増減制御に際し、冷却風の吸気温度ｘ［℃］に応じて求まる冷却ファンの最少回転数PMW_duty［min］を下回らないように制御する。ここで、冷却ファンの最少回転数値PMW_duty［min］とは、吸気温度がｘ［℃］である場合に、サーバ装置５０ｂのデバイスの冷却に必要とされる冷却ファンの回転数である。なお、冷却風の吸気温度ｘ［℃］として、PMW_duty［min］は、次式で求められる。

【０１０３】

【数１】

$$PMW\,duty(min)=E\cdot x^3+F\cdot x^2+G\cdot x+H$$

但し、ｘは吸気温度、
E,F,G,Hは所定の係数 ･･･(1)

【０１０４】

図６は、第３の実施の形態の一例に係る冷却ファン制御処理（モード２）手順を示すフローチャートである。図６では、図４Ｂに示した第２の実施の形態の一例に係る冷却ファン制御処理（モード２）手順を示すフローチャートと同一のステップには同一のステップ番号を付与している。

【０１０５】

図６のステップＳ２０１では、ファン動作量増減部２５ｃは、全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値２」以下であるか否かを判定する。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値２」以下であると判定された場合には（ステップＳ２０１肯定）、ステップＳ２０１ａへ移る。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値２」以下であると判定されなかった場合には（ステップＳ２０１否定）、ステップＳ２０３へ移る。

【０１０６】

ステップＳ２０１ａでは、ファン動作量増減部２５ｃは、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２の現状の回転数（以下、「現状duty」という）から１％のファン回転数を下げた値が上記（１）式で求められたPMW_duty［min］以上であるか否かを判定する。

【０１０７】

「現状duty」から１％のファン回転数を下げた値が上記（１）式で求められたPMW_duty［min］以上であると判定された場合には（ステップＳ２０１ａ肯定）、ステップＳ２０２へ移る。また、「現状duty」から１％のファン回転数を下げた値が上記（１）式で求められたPMW_duty［min］以上であると判定されなかった場合には（ステップＳ２０１ａ否定）、ステップＳ２０２ａへ移る。

【０１０８】

ステップＳ２０２ａでは、ファン動作量増減部２５ｃは、図４Ａのステップ１０３、ステップＳ１０５又はステップＳ１０７の処理で決定されたファン回転数を１％下げる。また、ステップＳ２０２ａでは、ファン動作量増減部２５ｃは、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２の回転数をPMW_duty［min］にする。これらの処理が終了すると、ステップＳ２０６へ移る。

【０１０９】

ステップＳ２０３では、ファン動作量増減部２５ｃは、全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値３」以下であるか否かを判定する。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値３」以下であると判定された場合には（ステップＳ２０３肯定）、ステップＳ２０３ａへ移る。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値３」以下であると判定されなかった場合には（ステップＳ２０３否定）、ステップＳ２０４へ移る。

【０１１０】

ステップＳ２０３ａでは、ファン動作量増減部２５ｃは、冷却ファン５４ｂ－１及び冷

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却ファン５４ｂ－２の「現状duty」のファン回転数の値が上記（１）式で求められたPMW_duty［min］以上であるか否かを判定する。

【０１１１】

「現状duty」のファン回転数の値が上記（１）式で求められたPMW_duty［min］以上であると判定された場合には（ステップＳ２０３ａ肯定）、ステップＳ２０６へ移る。また、「現状duty」のファン回転数の値が上記（１）式で求められたPMW_duty［min］以上であると判定されなかった場合には（ステップＳ２０３ａ否定）、ステップＳ２０２ａへ移る。

【０１１２】

ステップＳ２０４では、ファン動作量増減部２５ｃは、全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値４」以下であるか否かを判定する。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値４」以下であると判定された場合には（ステップＳ２０４肯定）、ステップＳ２０４ａへ移る。全てのデバイスの温度が部品温度閾値２５ａ－２の各デバイスの「閾値４」以下であると判定されなかった場合には（ステップＳ２０４否定）、図４Ａのステップ１０１へ移る。

【０１１３】

ステップＳ２０４ａでは、ファン動作量増減部２５ｃは、冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２の「現状duty」から５％の回転数を上げたファン回転数の値が上記（１）式で求められたPMW_duty［min］以上であるか否かを判定する。

【０１１４】

「現状duty」から５％の回転数を上げたファン回転数の値が上記（１）式で求められたPMW_duty［min］以上であると判定された場合には（ステップＳ２０４ａ肯定）、ステップＳ２０５へ移る。また、「現状duty」から５％の回転数を上げたファン回転数の値が上記（１）式で求められたPMW_duty［min］以上であると判定されなかった場合には（ステップＳ２０４ａ否定）、ステップＳ２０１へ移る。

【０１１５】

ステップＳ２０５では、ファン動作量増減部２５ｃは、図４Ａのステップ１０３、ステップＳ１０５又はステップＳ１０７の処理で決定されたファン回転数を５％上げる。この処理が終了すると、ステップＳ２０６へ移る。

【０１１６】

ステップＳ２０６では、ファン動作量増減部２５ｃは、第２の時間Δｔの計時開始からΔｔ＝１分が経過するまで処理を待機する。この処理が終了すると、ステップＳ２０１へ移る。

【０１１７】

なお、PMW_duty［min］は、図７に示すように、吸気温度ｘ［℃］に関して単調増加となる。図７は、第３の実施の形態の一例に係る吸気温度に応じたファンの最少回転数を示す図である。図７に示すように、例えば吸気温度ｘ＝３５℃のとき、PMW_duty［min］は、４０００［ＲＰＭ］である。なお、４０００［ＲＰＭ］は、一例を示す数値に過ぎず、PMW_duty［min］は、サーバ装置５０ｂが有するデバイスの発熱特性に応じて決まる。

【０１１８】

第３の実施の形態の一例では、吸気温度ｘ［℃］に応じて決定された冷却ファン５４ｂ－１及び冷却ファン５４ｂ－２のファン回転数ｒ［ＲＰＭ］を吸気温度ｘで決まるファン回転数の最低必要値を下回らないように各デバイスの温度に応じて増減する。よって、サーバ装置５０ｂが有する発熱したデバイスの冷却に必要な最低限のファン回転数を常に確保することができる。

【０１１９】

（他の実施の形態の一例）

以上、開示技術の第１、第２及び第３の実施の形態の一例について説明したが、開示技術はさらに異なる形態で実施されてもよい。複数の電子部品を実装したシステムボード等の回路基板を有するサーバ装置において、近年、電子部品の集積度が向上してきているた

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め、監視を要する発熱エリア又は電子部品を限定することが可能になってきた。このため、電子部品ごとに温度センサを設けて電子部品ごとの温度を監視するというコストを払っても、電子部品ごとに温度を監視してその温度に応じて冷却ファンの回転数を制御することが有意となってきた。

【０１２０】

よって、サーバ装置の回路基板において温度監視を要する発熱部品を含む監視領域を設定する。そして、冗長に構成された冷却ファンそれぞれが形成する冷却風の流路に該当する監視領域ごとの風下に半導体温度センサやサーミスタ等の温度センサを設ける。そして、監視領域ごとに温度センサが検知する温度に応じて該当する冷却風の流路を形成する冷却ファンのファン回転数を制御してもよい。このようにすると、監視領域の温度に応じて冷却ファンごとに、よりきめ細かくファン回転数を制御することができる。

【０１２１】

以上の各実施例を含む実施形態に関し、さらに以下の付記を開示する。

【０１２２】

（付記１）ファンの回転によって装置内部の空気を装置外部に排気する冷却ファンと、

前記冷却ファンによって吸気された吸気温度を検知する吸気温度検知部と、

装置内部に配設された複数の電子部品の温度をそれぞれ検知する部品温度検知部と、

前記部品温度検知部で検知された各電子部品の温度並びに前記吸気温度検知部により検知された吸気温度に基づいて、前記冷却ファンの回転数を制御する制御部と

を有することを特徴とする冷却制御装置。

【０１２３】

（付記２）前記冷却制御装置において、前記吸気温度を判定する吸気温度閾値と、前記複数の電子部品の温度を判定する該電子部品ごとの部品温度閾値とを記憶する閾値記憶部をさらに備え、

前記制御部は、前記吸気温度検知部により検知された前記吸気温度と、前記閾値記憶部に記憶される前記吸気温度閾値とを比較した結果に基づいて前記冷却ファンの回転数を制御するとともに、前記部品温度検知部で検知された各電子部品の温度と、前記閾値記憶部に記憶される該電子部品ごとの前記部品温度閾値とを比較した結果に基づいて前記冷却ファン回転数を所定の変動単位だけさらに増減することを特徴とする付記１記載の冷却制御装置。

【０１２４】

（付記３）前記冷却制御装置において、前記制御部は、前記吸気温度検知部により検知された前記吸気温度と、前記閾値記憶部に記憶される前記吸気温度閾値とを比較した結果に基づいて前記冷却ファンの回転数を制御した後に、第１の時間ΔＴだけ処理を待機することを特徴とする付記２記載の冷却制御装置。

【０１２５】

（付記４）前記冷却制御装置において、前記電子部品ごとの部品温度閾値は、前記複数の電子部品ごとに第１の閾値と、前記第１の閾値より大きい第２の閾値とを少なくとも含み、

前記制御部は、前記部品温度検知部で検知された各電子部品の温度と、前記電子部品ごとの前記第１の閾値とをそれぞれ比較し、全ての電子部品の温度が前記第１の閾値以下である場合に、さらに各電子部品の温度と、前記電子部品ごとの前記第２の閾値とを比較し、全ての電子部品の温度が前記第２の閾値以下である場合には、前記吸気温度に基づいて制御した前記冷却ファンの回転数を第１の変動単位αだけ減少させることを特徴とする付記２又は３記載の冷却制御装置。

【０１２６】

（付記５）前記冷却制御装置において、前記制御部は、前記吸気温度に基づく前記冷却ファンの最少回転数を算出し、前記冷却ファンの回転数から前記第１の変動単位αだけ減少させた回転数が前記冷却ファンの最少回転数以上である場合には、前記冷却ファンの回転数を前記第１の変動単位αだけ減少させ、前記冷却ファンの回転数から前記第１の変動単

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位αだけ減少させた回転数が前記冷却ファンの最少回転数未満である場合には、前記冷却ファンの回転数を前記冷却ファンの最少回転数に制御することを特徴とする付記４記載の冷却制御装置。

【０１２７】

（付記６）前記冷却制御装置において、前記電子部品ごとの部品温度閾値は、前記複数の電子部品ごとに前記第２の閾値よりも大きい第３の閾値をさらに含み、

前記制御部は、前記部品温度検知部で検知された各電子部品の温度が前記第２の閾値以下でない場合に、さらに各電子部品の温度と、前記電子部品ごとの前記第３の閾値とを比較し、全ての電子部品の温度が前記第３の閾値以下である場合には、前記冷却ファンの回転数を維持することを特徴とする付記４又は５記載の冷却制御装置。

【０１２８】

（付記７）前記冷却制御装置において、前記電子部品ごとの部品温度閾値は、前記電子部品ごとに前記第３の閾値よりも大きい第４の閾値をさらに含み、

前記制御部は、前記部品温度検知部で検知された各電子部品の温度が前記第３の閾値以下でない場合に、さらに各電子部品の温度と、前記電子部品ごとの前記第４の閾値とを比較し、全ての電子部品の温度が前記第４の閾値以下である場合には、前記冷却ファンの回転数を第２の変動単位βだけ増加させることを特徴とする付記６記載の冷却制御装置。

【０１２９】

（付記８）前記冷却制御装置において、前記制御部は、前記吸気温度に基づく前記冷却ファンの最少回転数を算出し、前記冷却ファンの回転数から前記第２の変動単位βだけ増加させた回転数が前記冷却ファンの最少回転数以上である場合には、前記冷却ファンの回転数を前記第２の変動単位βだけ増加させ、前記冷却ファンの回転数から前記第２の変動単位βだけ減少させた回転数が前記最少回転数未満である場合には、前記冷却ファンの回転数を増加させないことすることを特徴とする付記７記載の冷却制御装置。

【０１３０】

（付記９）前記冷却制御装置において、前記制御部は、前記冷却ファンの回転数を維持又は前記第１の変動単位αだけ減少もしくは前記第２の変動単位βだけ増減させた後に第２の時間Δｔだけ処理を待機することを特徴とする付記４～８のいずれか一項記載の冷却制御装置。

【０１３１】

（付記１０）前記冷却制御装置において、前記制御部は、前記複数の電子部品の温度が前記第４の閾値以下でない場合には、前記吸気温度検知部により新たに検知された吸気温度と、前記閾値記憶部に記憶される吸気温度閾値とを比較した結果に基づいて前記冷却ファンの回転数を再制御することを特徴とする付記７、８又は９記載の冷却制御装置。

【０１３２】

（付記１１）前記冷却制御装置において、前記第１の時間ΔＴと、前記第２の時間Δｔとは、Δｔ＜ΔＴなる大小関係を有することを特徴とする付記９又は１０記載の冷却制御装置。

【０１３３】

（付記１２）前記第１の変動単位αと、前記第２の変動単位βとは、α＜βなる大小関係を有することを特徴とする付記４～１１のいずれか一項記載の冷却制御装置。

【０１３４】

（付記１３）装置内部に排泄された複数の電子部品と、

ファンの回転によって装置内部の空気を装置外部に排気する冷却ファンと、

前記冷却ファンによって吸気された吸気温度を検知する吸気温度検知部と、

前記複数の電子部品の温度をそれぞれ検知する部品温度検知部と、

前記部品温度検知部で検知された各電子部品の温度並びに前記吸気温度検知部により検知された吸気温度に基づいて、前記冷却ファンの回転数を制御する制御部と

を有することを特徴とする電子装置。

【０１３５】

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（付記１４）前記吸気温度を判定する吸気温度閾値と、前記複数の電子部品の温度を判定する該電子部品ごとの部品温度閾値とを記憶する閾値記憶部をさらに備え、
前記制御部は、前記吸気温度検知部により検知された前記吸気温度と、前記閾値記憶部に記憶される前記吸気温度閾値とを比較した結果に基づいて前記冷却ファンの回転数を制御するとともに、前記部品温度検知部で検知された各電子部品の温度と、前記閾値記憶部に記憶される該電子部品ごとの前記部品温度閾値とを比較した結果に基づいて前記冷却ファン回転数を所定の変動単位だけさらに増減する
をことを特徴とする付記１３記載の電子装置。

【０１３６】

（付記１５）前記電子装置において、前記制御部は、前記吸気温度検知部により検知された前記吸気温度と、前記閾値記憶部に記憶される前記吸気温度閾値とを比較した結果に基づいて前記冷却ファンの回転数を制御した後に、第１の時間ΔＴだけ処理を待機することを特徴とする付記１４記載の電子装置。

【０１３７】

（付記１６）前記電子装置において、前記電子部品ごとの部品温度閾値は、前記複数の電子部品ごとに第１の閾値と、前記第１の閾値より大きい第２の閾値とを少なくとも含み、
前記制御部は、前記部品温度検知部で検知された各電子部品の温度と、前記電子部品ごとの前記第１の閾値とをそれぞれ比較し、全ての電子部品の温度が前記第１の閾値以下である場合に、さらに各電子部品の温度と、前記電子部品ごとの前記第２の閾値とを比較し、全ての電子部品の温度が前記第２の閾値以下である場合には、前記吸気温度に基づいて制御した前記冷却ファンの回転数から第１の変動単位αだけ動作量を減少させることを特徴とする付記１４又は１５記載の電子装置。

【０１３８】

（付記１７）前記電子装置において、前記制御部は、前記吸気温度に基づく前記冷却ファンの最少回転数を算出し、前記冷却ファンの回転数から前記第１の変動単位αだけ減少させた回転数が前記冷却ファンの最少回転数以上である場合には、前記冷却ファンの回転数を前記第１の変動単位αだけ減少させ、前記冷却ファンの回転数から前記第１の変動単位αだけ減少させた回転数が前記冷却ファンの最少回転数未満である場合には、前記冷却ファンの回転数を前記冷却ファンの最少回転数に制御することを特徴とする付記１６記載の電子装置。

【０１３９】

（付記１８）前記電子装置において、前記電子部品ごとの部品温度閾値は、前記複数の電子部品ごとに前記第２の閾値よりも大きい第３の閾値をさらに含み、
前記制御部は、前記部品温度検知部で検知された各電子部品の温度が前記第２の閾値以下でない場合に、さらに各電子部品の温度と、前記電子部品ごとの前記第３の閾値とを比較し、全ての電子部品の温度が前記第３の閾値以下である場合には、前記冷却ファンの回転数を維持することを特徴とする付記１６又は１７記載の電子装置。

【０１４０】

（付記１９）前記電子装置において、前記電子部品ごとの部品温度閾値は、前記電子部品ごとに前記第３の閾値よりも大きい第４の閾値をさらに含み、
前記制御部は、前記部品温度検知部で検知された各電子部品の温度が前記第３の閾値以下でない場合に、さらに各電子部品の温度と、前記電子部品ごとの前記第４の閾値とを比較し、全ての電子部品の温度が前記第４の閾値以下である場合には、前記冷却ファンの回転数を第２の変動単位βだけ増加させることを特徴とする付記１８記載の電子装置。

【０１４１】

（付記２０）前記電子装置において、前記制御部は、前記吸気温度に基づく前記冷却ファンの最少回転数を算出し、前記冷却ファンの回転数から前記第２の変動単位βだけ増加させた回転数が前記冷却ファンの最少回転数以上である場合には、前記冷却ファンの回転数を前記第２の変動単位βだけ増加させ、前記冷却ファンの回転数から前記第２の変動単位βだけ減少させた回転数が前記最少回転数未満である場合には、前記冷却ファンの回転数

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の増加を行なわないことを特徴とする付記１９記載の電子装置。
【０１４２】
（付記２１）前記電子装置において、前記制御部は、前記冷却ファンの回転数を維持又は前記第１の変動単位αだけ減少もしくは前記第２の変動単位βだけ増減させた後に第２の時間Δｔだけ処理を待機することを特徴とする付記１６～２０のいずれか一項記載の電子装置。
【０１４３】
（付記２２）前記電子装置において、前記制御部は、前記複数の電子部品の温度が前記第４の閾値以下でない場合には、前記吸気温度検知部により新たに検知された吸気温度と、前記閾値記憶部に記憶される吸気温度閾値とを比較した結果に基づいて前記冷却ファンの回転数を再制御することを特徴とする付記１９、２０又は２１記載の電子装置。
【０１４４】
（付記２３）ファンの回転によって装置内部の空気を装置外部に排気する冷却ファンを制御する冷却制御装置が行なう冷却制御方法であって、
装置内部に配設された複数の電子部品の温度をそれぞれ検知する部品温度検知ステップと、
前記冷却ファンによって吸気された吸気温度を検知する吸気温度検知ステップと、
前記部品温度検知ステップで検知された各電子部品の温度並びに前記吸気温度検知ステップにより検知された吸気温度に基づいて、前記冷却ファンの回転数を制御する制御ステップと
を含むことを特徴とする冷却制御方法。
【０１４５】
（付記２４）前記制御ステップは、前記吸気温度検知ステップにより検知された前記吸気温度と、閾値記憶部に記憶される吸気温度閾値とを比較した結果に基づいて前記冷却ファンの回転数を制御するとともに、前記部品温度検知ステップで検知された各電子部品の温度と、前記閾値記憶部に記憶される前記電子部品ごとの部品温度閾値とを比較した結果に基づいて前記冷却ファン回転数を所定の変動単位だけさらに増減することを特徴とする付記２３記載の冷却制御方法。
【０１４６】
（付記２５）前記電子部品ごとの部品温度閾値は、前記複数の電子部品ごとに第１の閾値と、前記第１の閾値より大きい第２の閾値とを少なくとも含み、
前記制御ステップは、前記部品温度検知ステップで検知された各電子部品の温度と、前記電子部品ごとの前記第１の閾値とをそれぞれ比較し、全ての電子部品の温度が前記第１の閾値以下である場合に、さらに各電子部品の温度と、前記電子部品ごとの前記第２の閾値とを比較し、全ての電子部品の温度が前記第２の閾値以下である場合には、前記吸気温度に基づいて制御した前記冷却ファンの回転数を第１の変動単位αだけ減少させることを特徴とする付記２４記載の冷却制御方法。
【０１４７】
（付記２６）前記電子部品ごとの部品温度閾値は、前記複数の電子部品ごとに前記第２の閾値よりも大きい第３の閾値をさらに含み、
前記制御ステップは、前記部品温度検知ステップで検知された各電子部品の温度が前記第２の閾値以下でない場合に、さらに各電子部品の温度と、前記電子部品ごとの前記第３の閾値とを比較し、全ての電子部品の温度が前記第３の閾値以下である場合には、前記冷却ファンの回転数を維持することを特徴とする付記２５記載の冷却制御方法。
【０１４８】
（付記２７）前記電子部品ごとの部品温度閾値は、前記電子部品ごとに前記第３の閾値よりも大きい第４の閾値をさらに含み、
前記制御ステップは、前記部品温度検知ステップで検知された各電子部品の温度が前記第３の閾値以下でない場合に、さらに各電子部品の温度と、前記電子部品ごとの前記第４の閾値とを比較し、全ての電子部品の温度が前記第４の閾値以下である場合には、前記冷

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却ファンの回転数を第２の変動単位βだけ増加させることを特徴とする付記２６記載の冷却制御方法。

【０１４９】

（付記２８）前記制御ステップは、前記複数の電子部品の温度が前記第４の閾値以下でない場合には、前記吸気温度検知ステップにより新たに検知された吸気温度と、前記閾値記憶部に記憶される吸気温度閾値とを比較した結果に基づいて前記冷却ファンの回転数を再制御することを特徴とする付記２７記載の冷却制御方法。

【符号の説明】

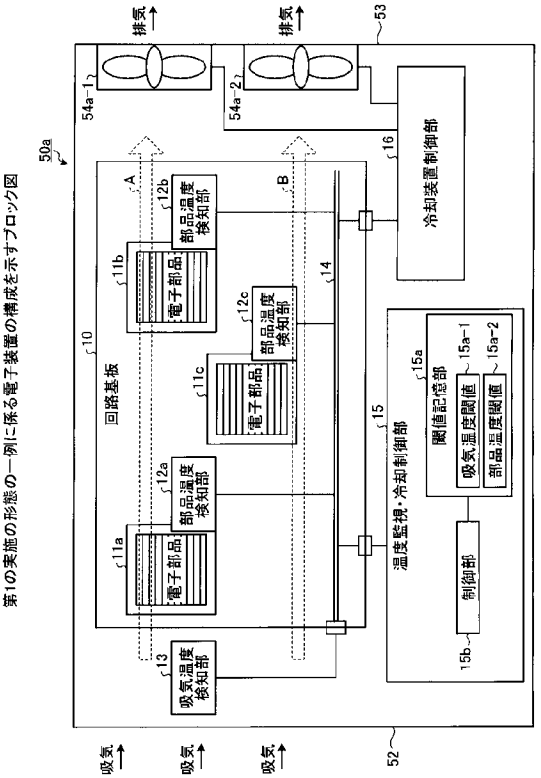
【０１５０】

１０　回路基板
１１ａ、１１ｂ、１１ｃ　電子部品
１２ａ、１２ｂ、１２ｃ　部品温度検知部
１３　吸気温度検知部
１４　インターフェース
１５　温度監視・冷却制御部
１５ａ　閾値記憶部
１５ａ－１　吸気温度閾値
１５ａ－２　部品温度閾値
１５ｂ　制御部
１６　冷却装置制御部
２０　システムボード
２０ａ　冷却制御装置
２１ａ、２１ｂ、２１ｃ　デバイス
２２ａ、２２ｂ、２２ｃ　温度センサ
２３　吸気温度センサ
２５　温度監視・冷却制御部
２５ａ　閾値記憶部
２５ａ－１　吸気温度閾値
２５ａ－２　部品温度閾値
２５ｂ　ファン動作量決定部
２５ｃ　ファン動作量増減部
２６　ファンコントローラデバイス
５０ａ　電子装置
５０ｂ　サーバ装置
５１、５１ｂ　筐体
５２、５２ｂ　前面板
５３、５３ｂ　背面板
５４ａ－１、５４ａ－２、５４ｂ－１、５４ｂ－２　冷却ファン
Ａ、Ｂ　流路

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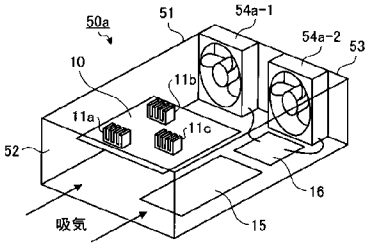
【図１Ａ】

第1の実施の形態の一例に係る電子装置の構成を示すブロック図



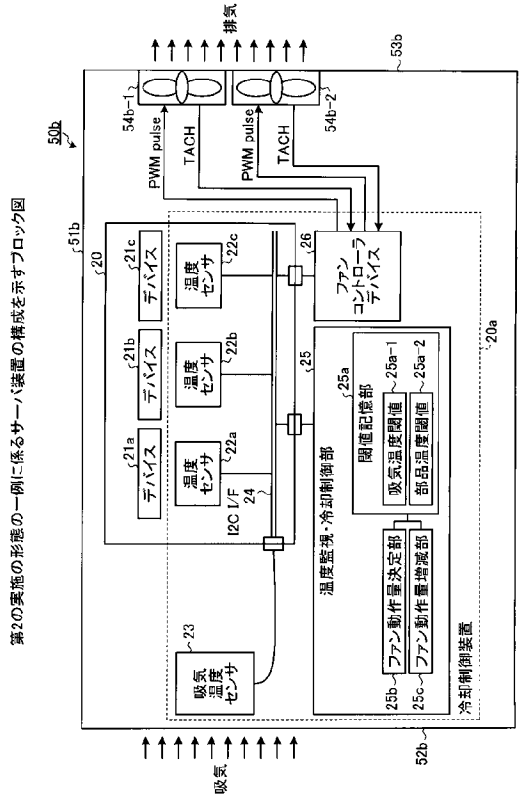
【図１Ｂ】

第1の実施の形態の一例に係る電子装置の構成を示す斜視図



【図２】

第2の実施の形態の一例に係るサーバ装置の構成を示すブロック図



【図３Ａ】

第2の実施の形態の一例に係る吸気温度閾値を示す図

	吸気温度
閾値3	35℃
閾値2	30℃
閾値1	25℃

【図３Ｂ】

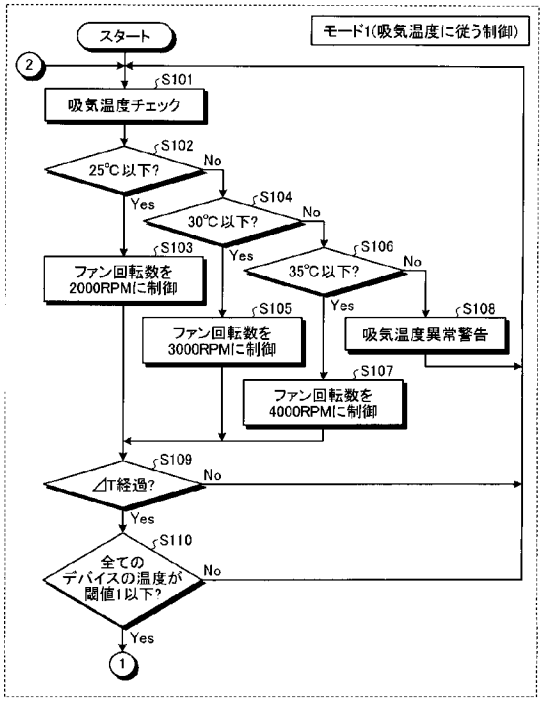
第2の実施の形態の一例に係る部品温度閾値を示す図

	デバイス21a	デバイス21b	デバイス21c
閾値4	80℃	85℃	85℃
閾値3	70℃	75℃	65℃
閾値2	55℃	55℃	50℃
閾値1	30℃	30℃	25℃

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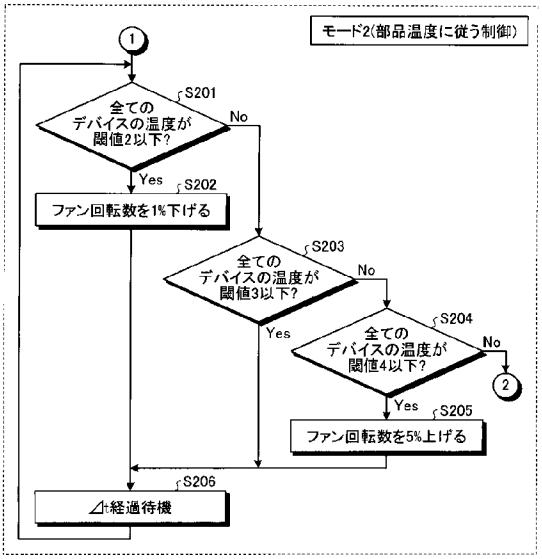
【図４Ａ】

第2の実施の形態の一例に係る
冷却ファン制御処理(モード1)手順を示すフローチャート



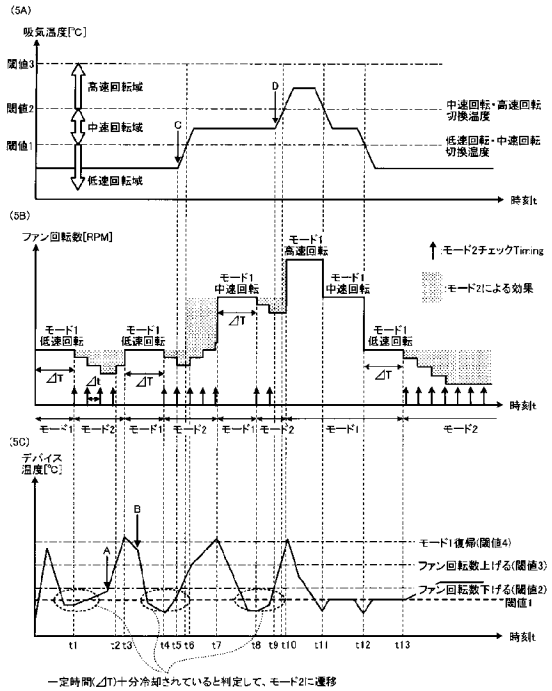
【図４Ｂ】

第2の実施の形態の一例に係る
冷却ファン制御処理(モード2)手順を示すフローチャート



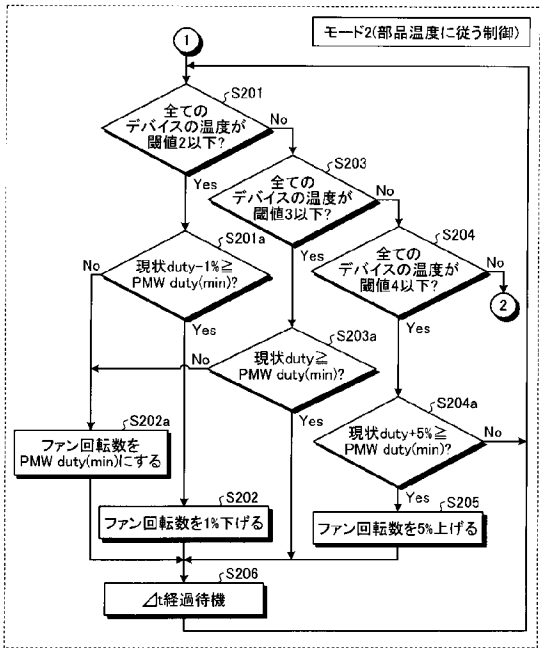
【図５】

第2の実施の形態の一例に係る冷却ファン制御処理による吸気温度及び
デバイス温度に応じたファン回転数の時間変化を示す図



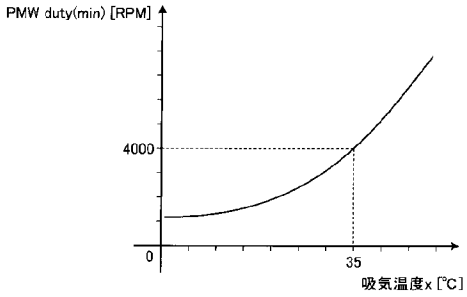
【図６】

第3の実施の形態の一例に係る
冷却ファン制御処理(モード2)手順を示すフローチャート



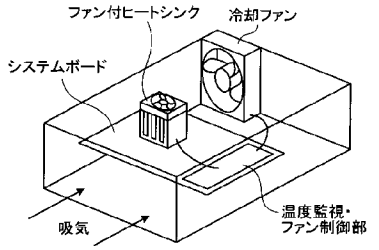
【図７】

第3の実施の形態の一例に係る吸気温度に応じたファン最少回転数を示す図



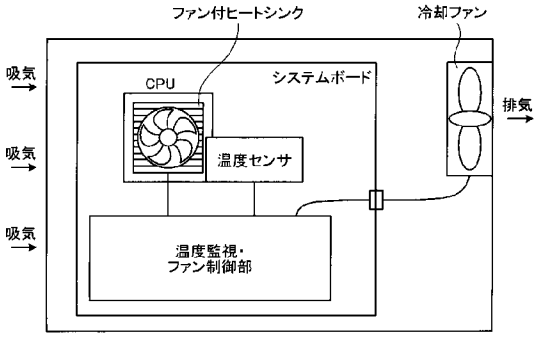
【図８Ａ】

従来のパーソナルコンピュータの構成の一例を示す斜視図



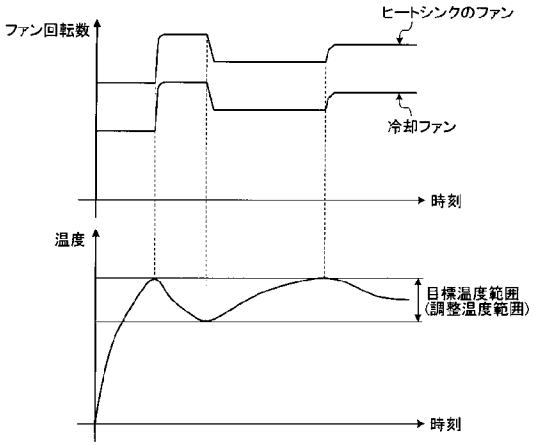
【図８Ｂ】

従来のパーソナルコンピュータの構成を示すブロック図



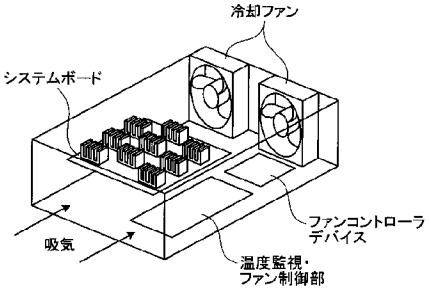
【図８Ｃ】

従来のパーソナルコンピュータにおける
CPU温度に応じたファン回転数の制御の時間変化を示す図

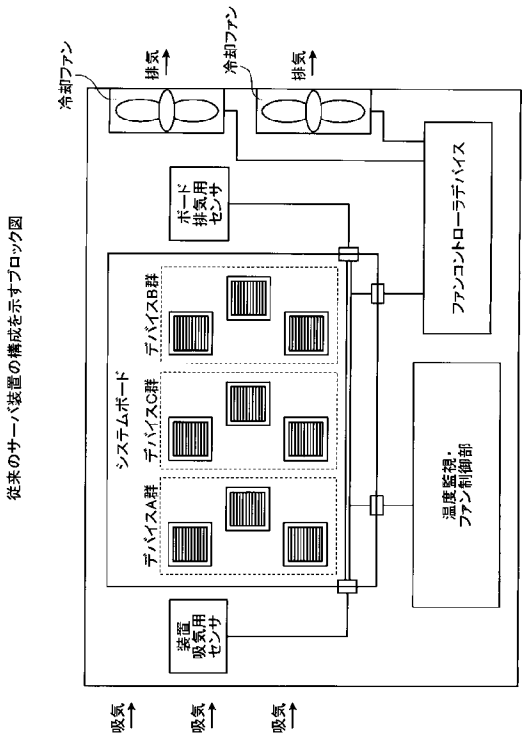


【図９Ａ】

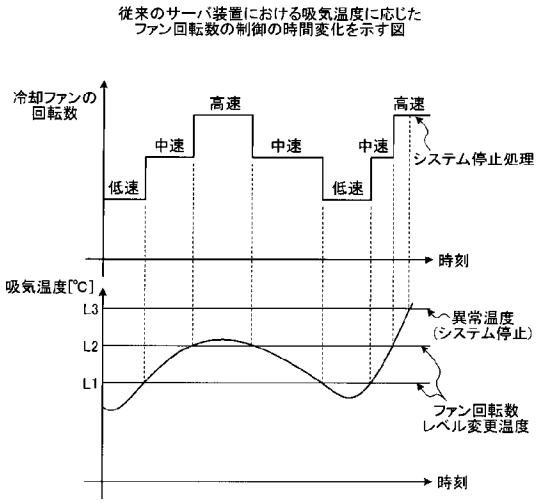
従来のサーバ装置の構成の一例を示す斜視図



【図９Ｂ】


従来のサーバ装置の構成を示すブロック図
冷却ファン
排気
冷却ファン
排気
ボード排気用センサ
ファンコントローラデバイス
システムボード
デバイスB群
デバイスC群
デバイスA群
温度監視・ファン制御部
装置吸気用センサ
吸気
吸気
吸気

【図９Ｃ】


従来のサーバ装置における吸気温度に応じたファン回転数の制御の時間変化を示す図
冷却ファンの回転数
低速
中速
高速
中速
低速
中速
高速
システム停止処理
時刻
吸気温度[℃]
L3
L2
L1
異常温度（システム停止）
ファン回転数レベル変更温度
時刻

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	J-13-0032
	Application Number	
Title of Invention	ICT EQUIPMENT	

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For further information see 37 CFR 1.33(a).

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Application Information:

Title of the Invention	ICT EQUIPMENT		
Attorney Docket Number	J-13-0032	**Small Entity Status Claimed** ☐	
Application Type	Nonprovisional		
Subject Matter	Utility		
Suggested Class (if any)		**Sub Class (if any)**	
Suggested Technology Center (if any)			
Total Number of Drawing Sheets (if any)	10	**Suggested Figure for Publication (if any)**	

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	71799		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

Prior Application Status			Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

PTO/AIA/14 (08-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	J-13-0032
	Application Number	
Title of Invention	ICT EQUIPMENT	

This section allows for the applicant to claim benefit of foreign priority and to identify any prior foreign application for which priority is not claimed. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(a).

Remove

Application Number	Country [i]	Filing Date (YYYY-MM-DD)	Priority Claimed
2012-046673	JP	2012-03-02	(•) Yes ( ) No

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Authorization to Permit Access:

☒ Authorization to Permit Access to the Instant Application by the Participating Offices

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (08-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	J-13-0032
	Application Number	
Title of Invention	ICT EQUIPMENT	

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Remove

◉ Assignee	○ Legal Representative under 35 U.S.C. 117
○ Person to whom the inventor is obligated to assign.	○ Person who shows sufficient proprietary interest

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information:

Address 1			
Address 2			
City		**State/Province**	
Country [i]		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications

Signature	/Kelly G. Hyndman 39,234/			Date (YYYY-MM-DD)	2013-03-01
First Name	Kelly G.	Last Name	Hyndman	Registration Number	39234

Additional Signature may be generated within this form by selecting the Add button. Add

PTO/AIA/14 (08-12)
Approved for use through 01/31/2014. OMB 0651-0032
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	J-13-0032
	Application Number	
Title of Invention	ICT EQUIPMENT	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	ICT EQUIPMENT
First Named Inventor/Applicant Name:	Kumiko SUZUKI
Filer:	Kelly G. Hyndman/Andrew Annis
Attorney Docket Number:	J-13-0032

Filed as Large Entity

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Utility application filing	1011	1	390	390
Utility Search Fee	1111	1	620	620
Utility Examination Fee	1311	1	250	250
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1260**

Electronic Acknowledgement Receipt

EFS ID:	15095676
Application Number:	13782490
International Application Number:	
Confirmation Number:	6072
Title of Invention:	ICT EQUIPMENT
First Named Inventor/Applicant Name:	Kumiko SUZUKI
Customer Number:	71799
Filer:	Kelly G. Hyndman/Andrew Annis
Filer Authorized By:	Kelly G. Hyndman
Attorney Docket Number:	J-13-0032
Receipt Date:	01-MAR-2013
Filing Date:	
Time Stamp:	15:55:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Electronic Funds Transfer
Payment was successfully received in RAM	$1260
RAM confirmation Number	2900
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Transmittal of New Application	Transmittal.pdf	76914 b737829880430 9ad9a319e939df464342d6d8121	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	Fee_Tranmsittal.pdf	164133 2e3b0d3fe4bfcf190a4a07ad8d9e7af5e8c8bd9f	no	2
Warnings:					
Information:					
3		Specification.pdf	194231 22cf1f6f8957d5df0917d8b80884fdc5dfeb0c4b	yes	24

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Specification	1	20
	Claims	21	23
	Abstract	24	24

Warnings:					
Information:					
4	Drawings-only black and white line drawings	Drawings.pdf	53839 ab050f9a83a46979c3e1d0298945359b914d7cf4	no	10
Warnings:					
Information:					
5	Oath or Declaration filed	Declaration.pdf	893904 9219171fd85a1f8552903c2470bf44520ce3cd96	no	6
Warnings:					
Information:					
6	Information Disclosure Statement (IDS) Form (SB08)	IDS_SB_08.pdf	63862 220a33f0d273276fdf6ac8e94b909d00cfefaf07	no	4
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
7	Foreign Reference	JP_2011-151131.pdf	712571 f644fe9e64388e43acaf69b48dda5520ffbba6fb	no	27
Warnings:					
Information:					

8	Application Data Sheet	ADS.pdf	1395602 5e1f3199c2045c552937933d8b13d584c62d0138	no	6
Warnings:					
Information:					
9	Fee Worksheet (SB06)	fee-info.pdf	32987 77cc1a1e729fc9d517ad2cc44d257c17346c34f6	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	3588043	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 13/782,490

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	8 minus 20 =	*			OR	x 80 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	3 minus 3 =	*				x 420 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1600

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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United States Patent and Trademark Office
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
13/782,490	03/01/2013	1721	1260	J-13-0032	8	3

CONFIRMATION NO. 6072

71799
Mr. Jackson Chen
6535 N. STATE HWY 161
IRVING, TX 75039

FILING RECEIPT

OC000000060129572

Date Mailed: 04/04/2013

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Kumiko SUZUKI, Tokyo, JAPAN;

Applicant(s)

Kumiko SUZUKI, Tokyo, JAPAN;

Power of Attorney: The patent practitioners associated with Customer Number 71799

Domestic Applications for which benefit is claimed - None.
A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
JAPAN 2012-046673 03/02/2012

Permission to Access - A proper **Authorization to Permit Access to Application by Participating Offices** (PTO/SB/39 or its equivalent) has been received by the USPTO.

Request to Retrieve - This application either claims priority to one or more applications filed in an intellectual property Office that participates in the Priority Document Exchange (PDX) program or contains a proper **Request to Retrieve Electronic Priority Application(s)** (PTO/SB/38 or its equivalent). Consequently, the USPTO will attempt to electronically retrieve these priority documents.

If Required, Foreign Filing License Granted: 03/28/2013
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 13/782,490**

Projected Publication Date: 09/05/2013

Non-Publication Request: No

Early Publication Request: No

Title

ICT EQUIPMENT

Preliminary Class

430

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications:

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4158).

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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NOT GRANTED

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To: ryoichi.harada@necam.com,,
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 71799

Apr 04, 2013 05:20:31 AM

Dear PAIR Customer:

Mr. Jackson Chen
6535 N. STATE HWY 161
IRVING, TX 75039
UNITED STATES

The following USPTO patent application(s) associated with your Customer Number, 71799 , have new outgoing correspondence. This correspondence is now available for viewing in Private PAIR.

The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

Disclaimer:
The list of documents shown below is provided as a courtesy and is not part of the official file wrapper. The content of the images shown in PAIR is the official record.

Application	Document	Mailroom Date	Attorney Docket No.
13782490	APP.FILE.REC	04/04/2013	J-13-0032

To view your correspondence online or update your email addresses, please visit us anytime at https://sportal.uspto.gov/secure/myportal/privatepair.

If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov with 'e-Office Action' on the subject line or call 1-866-217-9197 during the following hours:

Monday - Friday 6:00 a.m. to 12:00 a.m.

Thank you for prompt attention to this notice,

UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13782490
Filing Date	2013-03-01
First Named Inventor	Kumiko SUZUKI
Art Unit	1721
Examiner Name	
Attorney Docket Number	J-13-0032

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] ¡	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	5-100063	JP	A	1993-04-23	TSUNODA TAKESHI	English Abstract and Cited in JP Office Action	☐
	2	2006-252608	JP	A	2006-09-21	KAMIMORI YUTAKA	English Abstract and Cited in JP Office Action	☐

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NON-PATENT LITERATURE DOCUMENTS

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13782490
Filing Date	2013-03-01
First Named Inventor	Kumiko SUZUKI
Art Unit	1721
Examiner Name	
Attorney Docket Number	J-13-0032

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Japanese Office Action for JP2012-046673 mailed on April 2, 2013.	☒

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(**Not for submission under 37 CFR 1.99)**

Application Number	13782490
Filing Date	2013-03-01
First Named Inventor	Kumiko SUZUKI
Art Unit	1721
Examiner Name	
Attorney Docket Number	J-13-0032

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☒ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Kelly G. Hyndman 39,234/	Date (YYYY-MM-DD)	2013-04-19
Name/Print	Kelly G. Hyndman	Registration Number	39234

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Docket No. J-13-0032

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Kumiko SUZUKI
Application No.: 13/782,490 Art Unit: 1721

Filed: 03-01-2013 Examiner: (not yet assigned)

Confirmation Number: 6072

For: ICT EQUIPMENT

INFORMATION DISCLOSURE STATEMENT WITH CERTIFICATION UNDER 37 C.F.R. § 1.704(d)

I hereby certify that each item of information contained in the co-filed information disclosure statement was first cited in a communication from a foreign patent office in a counterpart application and that this communication was not received by any individual designated in 37 CFR 1.56(c) more than thirty (30) days prior to the filing of the co-filed information disclosure statement.

Respectfully submitted,

/Kelly G. Hyndman 39,234/

Kelly G. Hyndman

Reg. No. 39,234

April 19, 2013

Sughrue Mion, PLLC
2100 Pennsylvania Ave., N.W.
Washington,DC 20037
Telephone: 202-775-7585
Facsimile: 202-293-2483

Concise Explanation of Relevance

- Claims: 1, 2, 5, 7-9
- Cited reference(s): 1
- Remarks

The cited reference 1 discloses the configuration for controlling the rotating speed of a cooling fan even under rapid temperature change, wherein the temperature in the chassis of an apparatus such as a computer (corresponding to "ICT equipment" in the present invention) is monitored with a sensor (corresponding to "detection" in the present invention) and when predetermined change quantity of the temperature (corresponding to "index value indicating the degree of declination of the component temperature" in the present invention) in the chassis is detected, whether the temperature is going up or down, the rotating number of the cooling fan is decreased. (See paragraphs [0009]-[0024] in the cited reference.)

The temperature to be detected is whether component temperature or not, can be determined based on the condition of the ICT equipment by the person having ordinary skill in the art.

- Claims: 6
- Cited reference(s): 1 and 2
- Remarks

According to the disclosure of the cited reference 2, the rotating of the cooling fan is stopped when the temperature of the optical disk becomes under the temperature to stop cooling

(corresponding to the predetermined "threshold" in the present invention), the cooling fan is stopped. (See paragraph [0059])

List of cited reference(s)

1. JP5-100063
2. JP2006-252608

拒絶理由通知書

特許出願の番号	特願２０１２－０４６６７３
起案日	平成２５年　３月２６日
特許庁審査官	奥村　一正　　３５１２　３Ｓ００
特許出願人代理人	馬場　資博（外　１名）　様
適用条文	第２９条第２項

この出願は、次の理由によって拒絶をすべきものです。これについて意見がありましたら、この通知書の発送の日から６０日以内に意見書を提出してください。

理　由

この出願の下記の請求項に係る発明は、その出願前に日本国内又は外国において、頒布された下記の刊行物に記載された発明又は電気通信回線を通じて公衆に利用可能となった発明に基いて、その出願前にその発明の属する技術の分野における通常の知識を有する者が容易に発明をすることができたものであるから、特許法第２９条第２項の規定により特許を受けることができない。

記　　（引用文献等については引用文献等一覧参照）

・請求項１、２、５、７－９
・引用文献等１
・備考
引用文献１には、コンピュータ等（本願発明における「ＩＣＴ機器」に相当。）の筐体内の温度を温度センサーで測定（本願発明における「検出」に相当。）し、筐体内の温度が低くても高くても、ファン筐体内の温度変化が－（本願発明における「下降度合いを示す指標」に相当。）であれば、冷却ファンの回転数を下げるようにして、急激な温度変化の場合でも冷却ファンの回転数を制御する構成が記載されている（公報段落０００９－００２４等参照）。
検出する温度を部品温度とするか否かは、ＩＣＴ機器の都合により当業者が適宜決め得ることである。

・請求項６
・引用文献等１、２
・備考

引用文献２には、光ディスクの温度が冷却終了温度以下（本願発明における「予め定められている閾値以上」に相当。）であれば冷却ファンを停止する構成が記載されている（公報段落００５９等参照）。

＜拒絶の理由を発見しない請求項＞

請求項３、４に係る発明については、現時点では、拒絶の理由を発見しない。拒絶の理由が新たに発見された場合には拒絶の理由が通知される。

引　用　文　献　等　一　覧

１.特開平５－１０００６３号公報
２.特開２００６－２５２６０８号公報

－－－－－－－－－－－－－－－－－－－－－－－－－－－－－－－－－－－－

先行技術文献調査結果の記録

・調査した分野　　ＩＰＣ　Ｈ０５Ｋ　７／２０

この先行技術文献調査結果の記録は、拒絶理由を構成するものではありません。この拒絶理由通知の内容に関するお問い合わせ、または面接のご希望がございましたら、遠慮なく下記までご連絡下さい。

特許審査第二部　搬送組立　奥村一正
ＴＥＬ．０３（３５８１）１１０１　内線３３９１

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-100063
(43)Date of publication of application : 23.04.1993

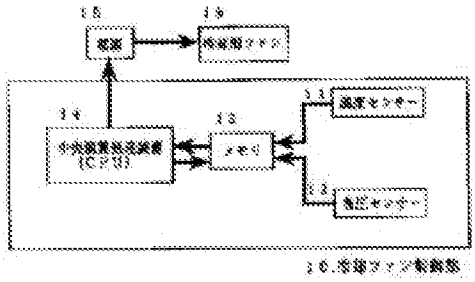
(51)Int.Cl. G12B 15/00

(21)Application number : 03-259996
(22)Date of filing : 08.10.1991

(71)Applicant : MATSUSHITA ELECTRIC IND CO LTD
(72)Inventor : TSUNODA TAKESHI

(54) VARIABLE-ROTATION COOLING FAN

(57)Abstract:
PURPOSE: To determine the proper rotating speed of a cooling fan and cool the inside of a chassis by using the inference method of the fuzzy logic based on the three information data: the temperature and the temperature change in the chassis and the noise of the environment where an apparatus such as a computer is used, fed to a cooling fan rotation controller.
CONSTITUTION: The rotating speed of a cooling fan 16 is automatically controlled when the temperature rises in the chassis of an apparatus such as a computer 14 or when the change quantity of the temperature in the chassis is abruptly increased by the intensive utilization of a hard disk drive and a floppy disk drive in the chassis. The inside of the chassis can be quickly cooled, and a hard disk 7, a floppy disk, and boards in the chassis can be protected from breakage by heat. When the CPU 14 of a controller 10 judges that the environment where the computer 14 is arranged is noisy based on the data inputted into the memory of the cooling fan controller 10 from a sound pressure sensor 12, the CPU 14 judges that the fan 16 does not become noisy for an operator even if it is rotated at a high speed, and the fan 16 is rotated at a high speed.



DELL Exhibit 1002 - Page 102

(19)日本国特許庁（ＪＰ）　(12)**公開特許公報**（Ａ）　(11)特許出願公開番号

特開平5－100063

(43)公開日　平成５年(1993)４月23日

(51)Int.Cl.[5]	識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ｇ１２Ｂ　15/00		6843－2Ｆ		

審査請求　未請求　請求項の数１(全 13 頁)

(21)出願番号　特願平3－259996

(22)出願日　平成３年(1991)10月８日

(71)出願人　000005821
松下電器産業株式会社
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(72)発明者　角田　剛
大阪府門真市大字門真1006番地　松下電器産業株式会社内

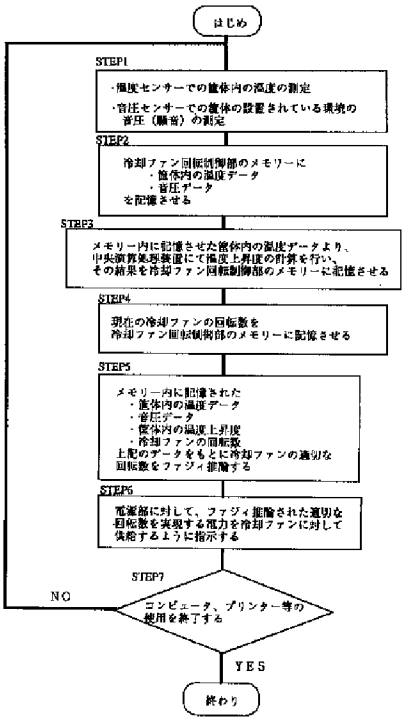
(74)代理人　弁理士　小鍛治　明　（外２名）

(54)【発明の名称】　可変回転冷却用ファン

(57)【要約】

【目的】　コンピュータ、プリンター、音響機器等の機器において、筐体内の温度を適切な冷却ファンの回転を自動的に制御することにより、効率良い冷却効果と風きり音による騒音をコンピュータ等の機器の操作者に感じさせない円滑な冷却ファンの回転制御を行うこと。

【構成】　フロッピーディスク、ハードディスク、基板、電源等の発熱体を有するコンピュータ、プリンター、音響機器等の機器において、機器の筐体部に取付けられた温度センサーや音圧センサーから送られるデータをもとに騒音が大きければ冷却ファンの回転数を上げ、短時間に送風量を大きくし、冷却ファンの回転数を制御する手段を有する構成とする。



DELL - Exhibit 1002 - Page 103

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【特許請求の範囲】

【請求項１】ハードディスク、フロッピーディスク、電源、基板などで構成されるコンピュータ、プリンター、音響機器のアンプ等の機器において、前記の機器筐体内部の温度、温度上昇度、機器の設置されている環境の騒音を感知するセンサーを有し、前記のセンサーによって得られた筐体内の温度、筐体内温度の上昇度、騒音のデータより、適切な冷却用ファンの回転数をファジィ理論に基づいた推論法によって、筐体内の温度変化や機器内の温度コンピュータ等の機器の設置された環境の騒音に従い、回転数を可変制御することを特徴とする可変回転冷却用ファン。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、コンピュータ、プリンター、音響機器のアンプ等の機器内部の電源や基板上の電気部品から発生する熱を前記の機器内部から外部へ放出することを目的として装着されている冷却用ファンに関するものである。

【０００２】

【従来の技術】図１７に従来の冷却用ファンの取付けられた電子計算機（以下、コンピュータとする。）を示す。１はフロッピーディスク・ドライブ、２はハードディスク・ドライブ、３は中央演算処理装置（以下、ＣＰＵとする。）やメモリー等の電気部品が載せられた基板、４はフロッピーディスク・ドライブ１、ハードディスク・ドライブ２、基板３等へ電気を供給する電源、５はコンピュータ筐体内部の熱を筐体外部へ熱を放出する冷却ファンである。６は１から５のフロッピーディスク、ハードディスク、基板、電源、冷却ファンを収納するシャーシであり、７はシャーシ６の蓋をするカバーである。コンピュータを使用する際にコンピュータのスイッチを入れるとコンピュータは始動し、同時に冷却ファン２５も回転を開始する。そして、コンピュータ使用の時間の経過と共にコンピュータ筐体内の温度が高くなる。特にコンピュータ操作者がフロッピーディスク・ドライブ１、ハードディスク・ドライブ２の利用を始め、フロッピーディスク・ドライブ１、ハードディスク・ドライブ２へのアクセスが多くなるにつれ、筐体内の温度が急上昇する。また、基板３上のメモリ、ＣＰＵ等は特に熱を発しやすく、コンピュータの利用時間が長くなるに連れ、筐体内の温度上昇の原因になっている。

【０００３】この筐体内部の温度上昇を抑えるために冷却ファン５により、筐体内部の熱せられた空気を筐体外部へ強制排気する。冷却ファンは通常、一定の回転数で回転し、筐体内部の熱せられた空気を筐体外部へ排出するが、最近では低速回転、高速回転の２つの回転モードを持った冷却ファンもある。２つの回転モードを持った冷却用ファンは筐体内に温度センサーが取付けられ、温度センサーによって感知された温度データがコンピュータ内部のメモリに取り込まれ、ＣＰＵによって事前に設定されたしきい値となる温度と筐体内の温度データと比較する演算を行い、電源に信号を送り、冷却用ファンの回転数を変化させる。つまり、冷却ファンの回転数を変化させることにより、フロッピーディスク・ドライブ、ハードディスク・ドライブのアクセスが多くした場合や長時間コンピュータを使用し、筐体内部が高温になった場合に、温度センサーが筐体の内部が高温になったことを感知し、筐体内部を急速冷却してやることにより、コンピュータの動作不良、電気部品の熱による破壊などを防止することができる。

【０００４】

【発明が解決しようとする課題】しかしながら、上記のような従来のコンピュータ、プリンター、音響機器のアンプ等に取付けられた冷却ファンは、前記のコンピュータ等の機器のスイッチを始動すると同時にスイッチを終了させるまで一定の回転数で回転するが、エアコン等の温度制御装置のない部屋での使用や長時間の使用により、温度は時間の経過に比例して筐体内温度が上昇するために、筐体内部が高温となり、正常な動作を維持することができなくなる。この問題を防止するために送風能力の大きなファンをコンピュータ等の機器に取付け、高速回転させることにより筐体内部の温度上昇を防止することができるが、冷却ファンを常時高速回転させると、ファンを回転させるモーター音と風切り音で機器から生じる騒音が大きくなる。特に最近、一般のオフィスが静かになったために騒音の問題も顕著となっているために、常時高速回転する冷却ファンをコンピュータ等の機器に搭載することが難しい。また、別の手段として、冷却ファンの回転数を上げずに筐体内部から外部へ送り出す風量を増大させるためにファンの径を大きくする方法もあるが、近年、コンピュータ等の機器は小型化の傾向が顕著になっているために、冷却用のファンのコンピュータ内部のスペースを大きく確保することが難しい。

【０００５】また、２つの回転モードを持った冷却ファンは、２つの回転モードを変化させるためにシャーシ６内に取付けられたセンサーによって感知された温度をコンピュータ内のＣＰＵにより、事前に設定された温度をしきい値温度と比較を行い、低速回転、高速回転の回転モードを切り替えている。この際、図１８に示すように高速、低速切り替えの温度のしきい値温度Ｔ０が事前に設定されているとき、センサーが感知するシャーシー内部の温度がしきい値Ｔ０を境界にして、上下に変化すると低速、高速の切り替えスイッチが頻繁に切り替えられ、電源の消費電力が多くなると同時に、電源への負担が大きくなるために寿命を短くする原因にもなる。また、低速、高速と回転数が変化することにより、ファンから生じる騒音も頻繁に低くなったり、高くなったりするためにその騒音の大小が、コンピュータの操作者に不快感を与えるという問題がある。

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【０００６】
【課題を解決するための手段】本発明はこの課題を解決するため、コンピュータ、プリンター、音響機器のアンプ等の筐体内部に温度センサーを設け、コンピュータ等の機器のスイッチが入力されると同時に、筐体内部に取付けられた温度センサーから感知された温度をＣＰＵの冷却ファンの回転制御部に送る。さらに時間の経過に従い、筐体内部の温度を連続的に計測し、筐体内の回転制御部に記憶させる。回転制御部内部に取り込まれた筐体内部の温度から、その温度の変化量を筐体内の温度制御部のＣＰＵで計算し、その演算結果を筐体内の冷却ファン回転制御部メモリー内部に記憶させる。
【０００７】また、同時に音圧センサーを筐体内に設け、コンピュータ等の機器の使用される環境の騒音を測定し、冷却ファン回転制御部に記憶させる。
【０００８】そして、冷却ファン回転制御部に取り込まれた筐体内の温度、筐体内の温度変化、コンピュータ等の機器の使用される環境の騒音の３つの情報データより、ファジィ理論の推論法を用いて、適正な冷却ファンの回転数を決定し、筐体内の冷却を行う。
【０００９】
【作用】本発明は上記した構成により、コンピュータ等の機器の筐体内の温度上昇やシャーシ内のハードディスク・ドライブ、フロッピーディスク・ドライブの集中的な利用で、筐体内部の温度の変化量が急激に大きくなった場合でも自動的に冷却ファンの回転数を制御し、筐体内を速やかに冷却することができ、筐体内のハードディスク、フロッピーディスク、基板などを熱による破壊から守ることができる。特に音圧センサーから冷却ファン回転制御部のメモリー内部へ入力されたデータが冷却ファン回転制御部のＣＰＵがコンピュータの配置されている環境が騒がしいと判断した場合、冷却ファンを高速で回転させてもコンピュータの操作者にとって雑音にならないと判断し、短時間に冷却ファンを高速回転させて短時間に送風量を大きくし、コンピュータ内を急冷却させ、筐体内の電気部品を熱から守る。
【００１０】また、ファジイ理論の推論法に基づき、冷却ファンの回転数を制御するために、コンピュータの操作者に騒音を感じさせないスムーズな制御が可能であり、また、常に適切な風量で冷却ファンを作動させるために効率のよい放熱効果と、筐体内の温度が低い場合、冷却ファンは低速回転で回転するために省電力の効果がある。
【００１１】
【実施例】以下、本発明の一実施例における可変回転冷却用ファンについて説明する。本発明のフローチャートを図１に示し、このフローチャートに従い、説明する。
【００１２】図２に示すように本発明の冷却ファン回転数制御部１０は、コンピュータ、プリンター、音響機器のアンプ等の筐体内の温度を測定するために図３の筐体内に取付けられた温度センサー１１と、コンピュータ等の設置されている環境の音圧を測定する音圧センサー１２と温度センサー１１、音圧センサー１２で測定されたそれぞれのデータを記憶するメモリ１３と、メモリ１３に記憶されたデータをもとに演算を行う中央演算処理装置１４（以下、ＣＰＵとする。）と、ＣＰＵ１４の演算結果に従い、冷却ファンの回転数を制御する電力を供給する電源部１５と、電源１５に接続されたサーボモータを回転動力とする冷却ファン１６によって構成されている。
【００１３】ここで、ファンの制御について詳細に述べる。まず、ＳＴＥＰ１に示すように冷却ファン制御部中の温度センサー１１より、図４のように一定時間の間隔ｔ１で筐体内の温度Ｄ（ｎ）（但し、ｎは１以上の整数とする。）を測定し、ＳＴＥＰ２に示すようにメモリ１３に記憶させる。ここで、メモリ１３に記憶された温度データは図５に示すように格納されている。
【００１４】次にＳＴＥＰ３に示すように温度センサー１１がシャーシ内の温度を測定していくと同時にメモリ１３に記憶されたデータから、温度上昇値Ｅ（ｎ）（但し、ｎは２以上の整数とする。）を中央演算処理装置１４で以下の式に従って計算が行われる。
【００１５】Ｅ（ｎ）＝Ｄ（ｎ）－Ｄ（ｎ－１）
（但し、ｎは２以上の整数とする。）
この計算式で得られた温度上昇値Ｅ（ｎ）は図６に示すようにメモリ１３に格納される。
【００１６】同様に、シャーシに取付けられた音圧センサー１２によって測定される音圧データＦ（ｎ）（但し、ｎは１以上の整数とする。）は、図７に示すように温度センサー３１で測定されるデータと同じ一定時間間隔ｔ１（ｔ１は任意に設定を行う。）で、コンピュータ等の置かれている環境の音圧の測定を行なわれ、前記の音圧センサーで測定された音圧データＦ（ｎ）は図８に示すようにメモリ１３に格納される。さらにＳＴＥＰ４に示すように冷却用ファンの回転数Ｃ（ｎ）（但し、ｎは１以上の整数とする。）は、常に電源１５から冷却用ファンに供給されている電力値によって把握され、冷却用ファンの回転数Ｃ（ｎ）のデータはメモリ１３に記憶される。
【００１７】次に、ＳＴＥＰ５に示すように温度センサー、音圧センサーで感知された筐体内の温度データＤ（ｎ）、温度上昇値データＥ（ｎ）、音圧データＦ（ｎ）、冷却ファン回転数データＣ（ｎ）から、冷却ファンの回転数制御を行う。その制御方法として、本発明ではＣＰＵ１４でファジィ理論の推論法を用い、その演算結果に従い電源１５の電力を制御し、サーボモータの回転数を変化させ、ファンによる筐体内の熱された空気の排気量を調整する。ここで、ファジィ理論の推論法の手順を図９に示す。
【００１８】まず、図１１に示すＳＴＥＰ１１のファジ

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ィルールの作成を行う。ファジィルールは”ＩＦ～ＴＨＥＮ～”の形で書かれ、本発明のファジィルールは以下の通りに設定した。

【００１９】ルール１：ＩＦ　冷却ファンの回転数が低回転　かつ　筐体内の温度が適性温度　かつ　温度変化が“－”
ＴＨＥＮ　冷却ファンの回転数を下げる
ルール２：ＩＦ　冷却ファンの回転数が低回転　かつ　筐体内の温度が低くかつ温度変化が“＋”
ＴＨＥＮ　冷却ファンの回転数を上げる
ルール３：ＩＦ　冷却ファンの回転数が低回転　かつ　筐体内の温度が適性温度かつ　温度変化が“＋”
ＴＨＥＮ　冷却ファンの回転数を上げる
ルール４：ＩＦ　冷却ファンの回転数が低回転　かつ　筐体内の温度が高くかつ温度変化が“－”
ＴＨＥＮ　冷却ファンの回転数を下げる
ルール５：ＩＦ　冷却ファンの回転数が低回転　かつ　筐体内の温度が高くかつ温度変化が“＋”
ＴＨＥＮ　冷却ファンの回転数を上げる
ルール６：ＩＦ　冷却ファンの回転数が標準回転　かつ　筐体内の温度が低くかつ　温度変化が“－”
ＴＨＥＮ　冷却ファンの回転数を下げる
ルール７：ＩＦ　冷却ファンの回転数が標準回転　かつ　筐体内の温度が適性温度　かつ　温度変化が“－”
ＴＨＥＮ　冷却ファンの回転数を下げる
ルール８：ＩＦ　冷却ファンの回転数が標準回転　かつ　筐体内の温度が適性温度　かつ　温度変化が“＋”
ＴＨＥＮ　冷却ファンの回転数を上げる
ルール９：ＩＦ　冷却ファンの回転数が標準回転　かつ　筐体内の温度が高くかつ　温度変化が“＋”
ＴＨＥＮ　冷却ファンの回転数を上げる
ルール１０：ＩＦ　冷却ファンの回転数が高く　かつ　筐体内の温度が低くかつ温度変化が“－”
ＴＨＥＮ　冷却ファンの回転数を下げる
ルール１１：ＩＦ　冷却ファンの回転数が高く　かつ　筐体内の温度が低くかつ温度変化が“＋”　かつ　騒がしい環境下に設置してある
ＴＨＥＮ　冷却ファンの回転数を急速に上げる
ルール１２：ＩＦ　冷却ファンの回転数が高く　かつ　筐体内の温度が適性温度かつ　温度変化が“－”
ＴＨＥＮ　冷却ファンの回転数を下げる
ルール１３：ＩＦ　冷却ファンの回転数が高く　かつ　筐体内の温度が適性温度かつ　温度変化が“＋”　かつ　騒がしい環境下に設置してある
ＴＨＥＮ　冷却ファンの回転数を急速に上げる
ルール１４：ＩＦ　冷却ファンの回転数が高く　かつ　筐体内の温度が高くかつ温度変化が“－”
ＴＨＥＮ　冷却ファンの回転数を下げる
ルール１５：ＩＦ　冷却ファンの回転数が高く　かつ　筐体内の温度が高くかつ温度変化なし　かつ　騒がしい環境下に設置してある
ＴＨＥＮ　冷却ファンの回転数を急速に上げる
ルール１６：ＩＦ　冷却ファンの回転数が高く　かつ　筐体内の温度が高くかつ温度変化が“＋”　かつ　騒がしい環境下に設置してある
ＴＨＥＮ　冷却ファンの回転数を急速に上げる

本発明では１６個のファジィルールを作成したが、ルールの数を減らすと冷却ファンの回転数を制御の推論を行う時間は短くなるが、適性な冷却ファンを制御を実現するためには十分ではない。また、逆にルールの数を増やすと冷却ファンの回転数を制御の推論を行う時間は長くなるが、過剰な冷却ファンを制御となる。よって、本発明の冷却ファンの制御には１６個のファジィルールで推論を行うことで時間も短く、適切な制御を行うことができる。

【００２０】次にＳＴＥＰ１２のメンバーシップ関数の作成について説明する。図１０は冷却ファンの回転数を表すものであり、横軸は冷却ファンの回転数であり、縦軸は冷却ファンの回転の度合いを表すメンバーシップ関数である。図１０のメンバーシップ関数は冷却ファンが例えば、Ｎ（１）（ｒｐｍ）で回転しているとすれば、冷却ファンが低回転しているという判断の適合度はＬＯ（１）、標準の回転数で回転しているという判断の適合度はＳＴ（１）であり、高回転しているという判断の適合度ＨＩ（１）は０である。前記のメンバーシップ関数から読み取ったそれぞれの適合度ＬＯ（１）、ＳＴ（１）、ＨＩ（１）は０から１の範囲にあり、１に近づくにつれ定義した低回転、標準回転、高回転の適合度が高くなることを意味し、逆に０に近づくにつれ、適合度を低くなったことを意味する。

【００２１】冷却ファンの回転数を表すメンバーシップ関数と同様に図１１に筐体内の温度を表すメンバーシップ関数、図１２に筐体内の温度の変化を表すメンバーシップ関数、図１３に筐体の設置されている環境の音圧を表すメンバーシップ関数、図１４に冷却ファンの回転を制御するメンバーシップ関数を作成する。ここで、各メンバーシップ関数について、詳細に説明する。図１１は筐体内が平均温度であることを表すメンバーシップ関数、平均温度よりも低いことを表すメンバーシップ関数、平均温度よりも高いことを表すメンバーシップ関数によって構成されている。図１２は筐体内の温度変化がないことを表すメンバーシップ関数（１に近づくにつれ、温度変化が少なく、０に近づくにつれ、温度変化が大きいことを意味する。）、筐体内の温度が下がっていることを表す（温度変化“－”）メンバーシップ関数（１に近づくにつれ、温度の下降度合いが大きく、０に近づくにつれ、温度の下降度合いが小さいことを意味する。）、筐体内の温度が上がっていることを表す（温度変化“＋”）メンバーシップ関数（１に近づくにつれ、温度の上昇度合いが大きく、０に近づくにつれ、温度の

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上昇度合いが小さいことを意味する。）によって構成されている。図１３は音圧センサーで測定された音圧がコンピュータ、プリンター等の機器が使用されている環境がどのくらい騒がしい環境下にあるかを表すメンバーシップ関数であり、１は近づくにつれ、騒がしい環境に設置され、０に近づくにつれ、静かな環境に設置されていることを意味する。図１４は現在の冷却ファンの回転を下げようとするメンバーシップ関数（１に近づくにつれ、ファンの回転数大きく減少させ、０に近づくにつれ、ファンの回転数少し減少させることを意味する。）、回転を上げようとするメンバーシップ関数（１に近づくにつれ、ファンの回転数を大きく増加させ、０に近づくにつれ、ファンの回転数を少し減少させることを意味する。）で構成されている。メンバーシップ関数はメモリ１３に記憶され、温度センサー、音圧センサーから温度、騒音データが入力されてくると、ＣＰＵ１４により、ファンの回転数をファジィ推論し、冷却ファンの回転数を制御する。

【００２２】次にＳＴＥＰ１３のファジィ推論の推論法について説明する。ここで、冷却ファンの回転数をＤ（２）、温度センサーから入力されてきた筐体内の温度データをＥ（２）、筐体内の温度変化をＦ（２）（Ｆ（２）＝Ｅ（２）－Ｅ（１）の計算式に従って、冷却ファン回転制御部のＣＰＵで計算される。ここで、Ｅ（１）とはＥ（２）の前の時間にメモリ１３に記憶された筐体内の温度データである。）、音圧センサーから入力されるコンピュータ等の設置された環境の騒音をＧ（２）のデータが冷却ファン制御部に入力されたとする。

【００２３】入力されたデータは冷却ファン制御部のＣＰＵで前記に定義した１６のファジィルールに照らし合わせられる。この手順を図１５に示すようにルール１を用いて説明する。

【００２４】ルール１：ＩＦ　冷却ファンの回転数が低回転　かつ　筐体内の温度が適性温度　かつ　温度変化が“－”

ＴＨＥＮ　冷却ファンの回転数を下げる

ルール１に従って、図１０の冷却ファンが低回転であるということを表すメンバーシップ関数に現在の冷却ファンの回転数Ｄ（２）のとき適合度Ｗ（Ｄ（２））を計算する。同様に、図１３の筐体内の温度が適性であることを表すメンバーシップ関数に筐体内の温度Ｅ（２）のときの適合度Ｘ（Ｅ（２））、図１２の筐体内の温度の変化が下降していることを表すメンバーシップ関数に温度変化Ｆ（２）のときの適合度Ｙ（Ｅ（２））、図１３の筐体の置かれている環境の音圧を表すメンバーシップ関数に音圧Ｇ（２）のときの適合度Ｚ（Ｇ（２））を計算する。そして、冷却ファンの回転数が低回転　かつ　筐体内の温度が適性温度　かつ温度変化が“－”の３つの条件を満たす適合度をＷ（Ｄ（２））、Ｘ（Ｅ（２））、Ｙ（Ｆ（２））の最小値とする。図１５の例の場合、前記のＷ（Ｄ（２））、Ｘ（Ｅ（２））、Ｙ（Ｆ（２））の最小値はＸ（Ｅ（２））となる。但し、ルール９、１１、１３、１５、１６は“ＩＦ～　”文中にコンピュータの設置された環境の音圧を表すメンバーシップ関数の適合度も考慮する必要があるので、冷却ファンの回転数、筐体内の温度、筐体内の温度変化、設置された環境の音圧の４つの条件を満たす適合度はＷ（Ｄ（２））、Ｘ（Ｅ（２））、Ｙ（Ｆ（２））、Ｚ（Ｇ（２））の最小値となる。次に前記ルール１の“ＩＦ～　”文の適合度を“ＴＨＥＮ～”文であるファンの回転数を下げることを表すメンバーシップ関数に照らし合わせる。図１５に示すようにＸ（Ｅ（２））から横軸に対して水平線を引き、前記の線で囲まれた黒い範囲の部分が冷却ファンの回転数を変化させる量を表す。前記の手順で残りの２から１６までのルールにＷ（Ｄ（２））、Ｘ（Ｅ（２））、Ｙ（Ｆ（２））、Ｚ（Ｇ（２））を照らし合わせ、冷却ファンの回転数を変化させる量をＣＰＵ１４で計算する。そして、図１６に示すようにルール１から１６で得られた冷却ファンの回転数を変化させる量である図１６に示した黒い範囲の部分を１６個全て重ね合わせ、前記の重ね合わされた面積の重心をＣＰＵ１４で計算する。計算結果が出力された後、ＳＴＥＰ６に示すように、図１６の場合、重心位置は－Ｒ（ｒｐｍ）となり、現在のファンの回転数より－Ｒ（ｒｐｍ）回転を減少させるように電源１５に信号を送り、回転数を減少させる。以上の動作をＳＴＥＰ７のコンピュータの使用を終了するまで繰り返す。

【００２５】最後に実際に筐体内の温度を実測し、ＳＴＥＰ１４に示すように筐体の温度制御が効率よく行われているかを確認する。もし、ファンの制御が効率よく行われない場合、ＳＴＥＰ１２のメンバーシップ関数の調整を行い、ファンの回転数の最適制御が行われるまでＳＴＥＰ１２、１３、１４を繰り返す。

【００２６】

【発明の効果】本発明は、コンピュータ、プリンター、音響機器等の筐体を冷却するための冷却ファンの回転を前記筐体内の温度、温度変化、前記筐体の設置されている環境の騒音を計測し、得られたデータよりファジィ理論の推論法を用い、冷却ファンの回転数の推論を行い、冷却ファンの回転を可変制御する。この方法により、従来、コンピュータ等の機器はスイッチがオンされると同時に冷却ファンは一定の回転数で回転し、機器を使用を始めて筐体内の温度が高くない場合や、数時間使用し筐体内の温度が高くなったときにも冷却ファンは一定の空気を筐体外へ送り出すだけで効率の悪い冷却効果しかなかった。しかし、本発明では筐体内の温度を考慮し、ファンの回転数を決定するために筐体の効率的な放熱が可能となる。また、筐体内の温度が低いときに冷却ファンは低回転で回転するので冷却ファンの風きり音が少なく

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なり、オフィス内の騒音を低くすることができる。

【００２７】また、現在、２段階の回転速度を設定できる冷却ファンが市販されているが、この冷却ファンの回転数の制御は筐体内に取付けられた温度センサーに取付けられ、このセンサーによって感知された温度が事前に設定された温度を越えれば冷却ファンは高速回転し、低ければ低速回転するが、前記冷却ファンでは筐体内の温度が頻繁に事前に設定された温度を越えたり、下回ると高速回転、低速回転を繰り返すために電源への負担が大きくなると共に、ファンの回転数が大きく変化するためにファンの風きり音が機器の操作者に不快感を与える。本発明のファンの回転数を制御する方法ではファンの回転数をなだらかに変化させるために冷却ファンを稼働させる電源への負担を軽くし、さらに冷却ファンの風きり音は少しずつ、変化していくために操作者に不快感を感じさせない。

【００２８】さらに冷却ファン制御部の筐体内の温度、筐体内の温度変化、筐体の設置された環境の音圧、回転数の制御のメンバーシップ関数をコンピュータ、プリンター、音響機器などそれぞれの筐体に合ったメンバーシップ関数を設定してやることにより、容易にそれぞれの筐体にあった効率的な放熱を行う冷却ファンの制御が可能となる。

【図面の簡単な説明】

【図１】本発明の一実施例を示すフローチャート

【図２】冷却ファンの回転制御装置の全体図

【図３】コンピュータ筐体内の各装置の配置図

【図４】温度センサーによって計測された筐体内の温度を表す図

【図５】筐体内の温度データが冷却ファン制御部のメモリーに記憶された図

【図６】筐体内の温度変化データが冷却ファン制御部のメモリーに記憶された図

【図７】音圧センサーによって計測された筐体の置かれている環境の音圧を表す図

【図８】筐体の置かれている環境の音圧データが冷却ファン制御部のメモリーに記憶された図

【図９】ファジィ理論を用いた推論法の過程を表す図

【図１０】冷却ファンの回転数を表すメンバーシップ関数を示すグラフ

【図１１】筐体内の温度を表すメンバーシップ関数を示す図

【図１２】筐体内の温度変化を表すメンバーシップ関数を示す図

【図１３】筐体の設置されている環境の音圧を表すメンバーシップ関数を示すグラフ

【図１４】冷却ファンの回転を制御するメンバーシップ関数を示すグラフ

【図１５】定義されたルール１のメンバーシップ関数に温度センサー、音圧センサーからのデータを適用した図

【図１６】定義された１から１６のルールによって決定されたファンの回転制御量を表す図

【図１７】コンピュータ筐体内の各装置の配置図

【図１８】コンピュータ筐体内の温度変化を表す図と２段階の回転数をもつ冷却ファンの温度変化による回転の変化を表した図

【符号の説明】

１　フロッピーディスク
２　ハードディスク
３　基板
４　電源
５　ファン
６　シャーシ
７　カバー
１０　冷却ファン回転制御部
１１　温度センサー
１２　音圧センサー
１３　メモリー
１４　中央演算処理装置（ＣＰＵ）
１５　電源
１６　冷却ファン

【図５】

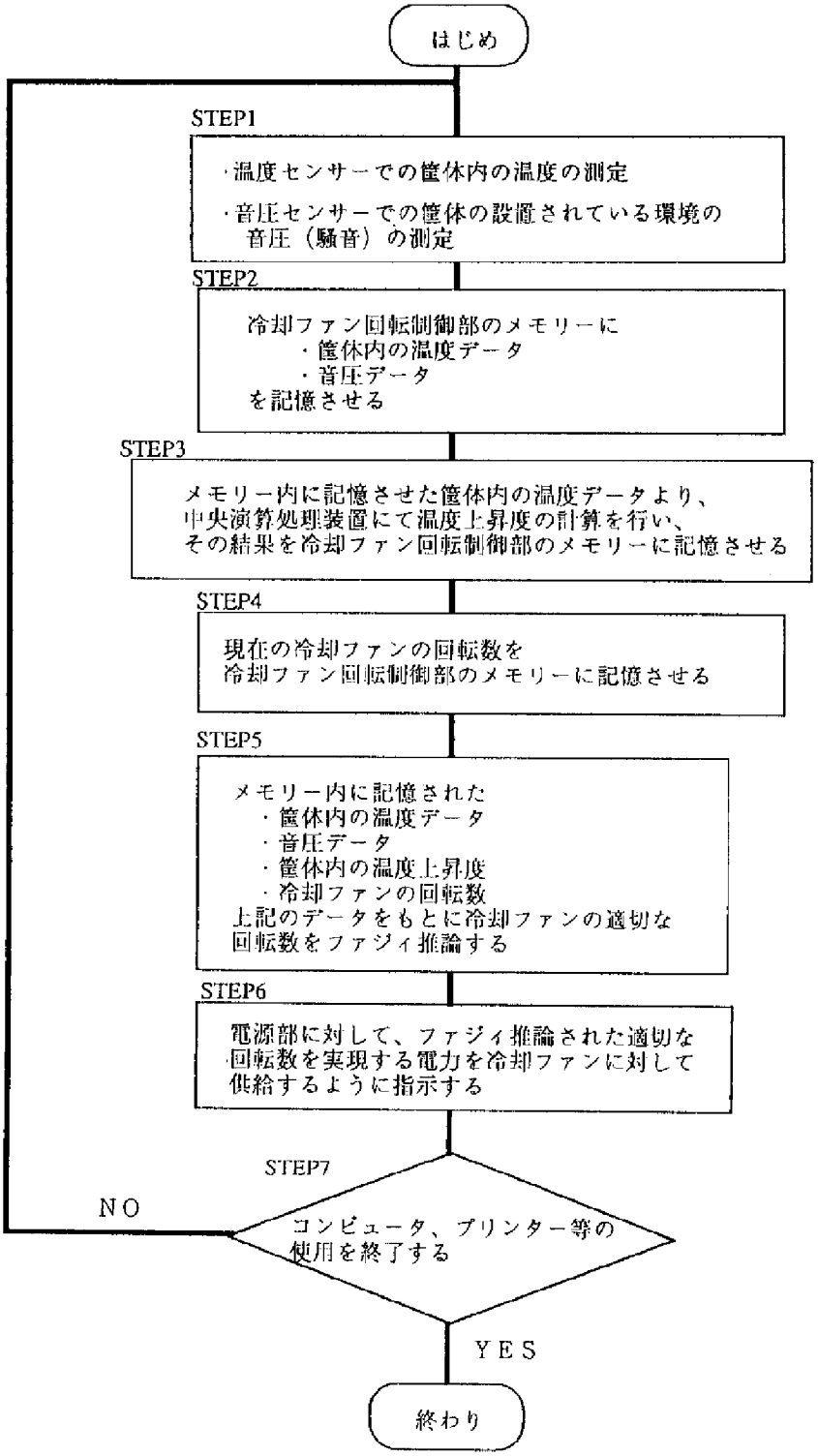
アドレス	データ
０００１	Ｄ（１）
０００２	Ｄ（２）
０００３	Ｄ（３）
０００４	Ｄ（４）
…	…

【図６】

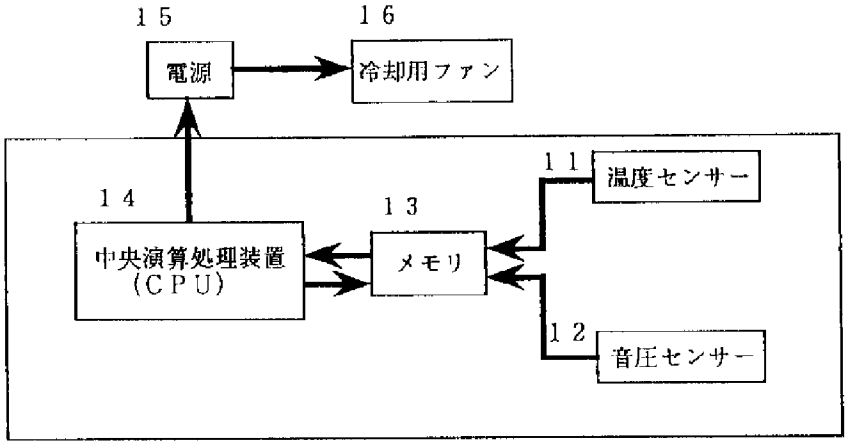
アドレス	データ
０００１	Ｅ（１）
０００２	Ｅ（２）
０００３	Ｅ（３）
０００４	Ｅ（４）

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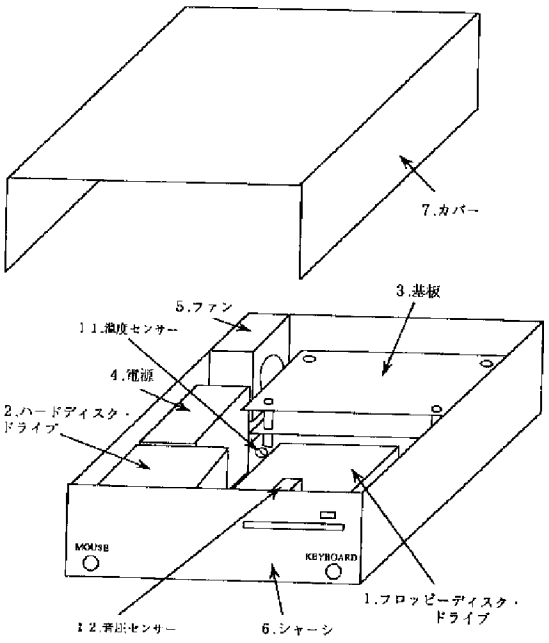
【図１】


はじめ
STEP1
・温度センサーでの筐体内の温度の測定
・音圧センサーでの筐体の設置されている環境の音圧（騒音）の測定
STEP2
冷却ファン回転制御部のメモリーに
・筐体内の温度データ
・音圧データ
を記憶させる
STEP3
メモリー内に記憶させた筐体内の温度データより、中央演算処理装置にて温度上昇度の計算を行い、その結果を冷却ファン回転制御部のメモリーに記憶させる
STEP4
現在の冷却ファンの回転数を冷却ファン回転制御部のメモリーに記憶させる
STEP5
メモリー内に記憶された
・筐体内の温度データ
・音圧データ
・筐体内の温度上昇度
・冷却ファンの回転数
上記のデータをもとに冷却ファンの適切な回転数をファジィ推論する
STEP6
電源部に対して、ファジィ推論された適切な回転数を実現する電力を冷却ファンに対して供給するように指示する
STEP7
コンピュータ、プリンター等の使用を終了する
NO
YES
終わり

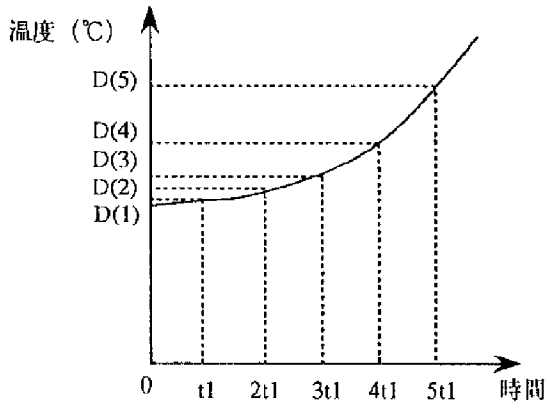
【図２】


１５
１６
電源
冷却用ファン
１１
温度センサー
１４
１３
中央演算処理装置
（ＣＰＵ）
メモリ
１２
音圧センサー
１０.冷却ファン制御部

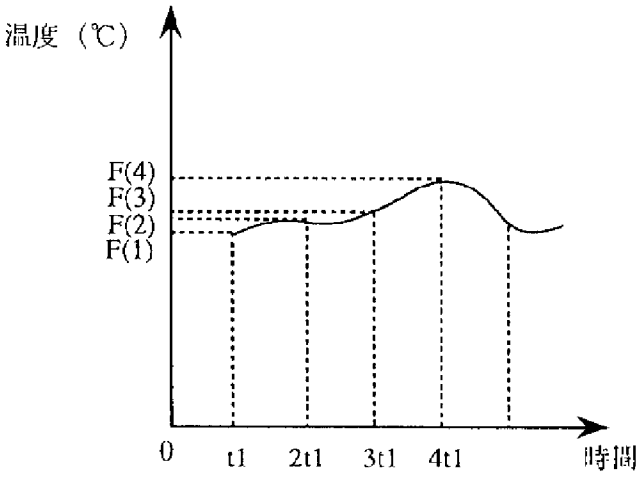
【図３】


7.カバー
3.基板
5.ファン
11.温度センサー
4.電源
2.ハードディスク・ドライブ
MOUSE
KEYBOARD
1.フロッピーディスク・ドライブ
12.音圧センサー
6.シャーシ

【図４】


温度（℃）
D(5)
D(4)
D(3)
D(2)
D(1)
0
t1
2t1
3t1
4t1
5t1
時間

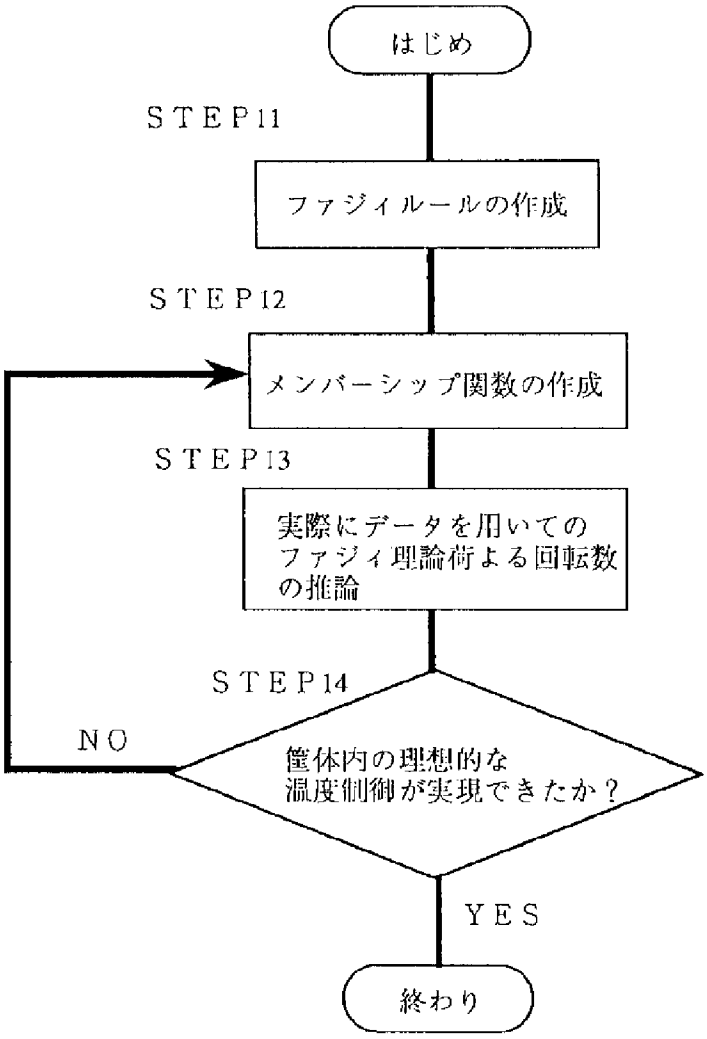
【図７】


温度（℃）
F(4)
F(3)
F(2)
F(1)
0
t1
2t1
3t1
4t1
時間

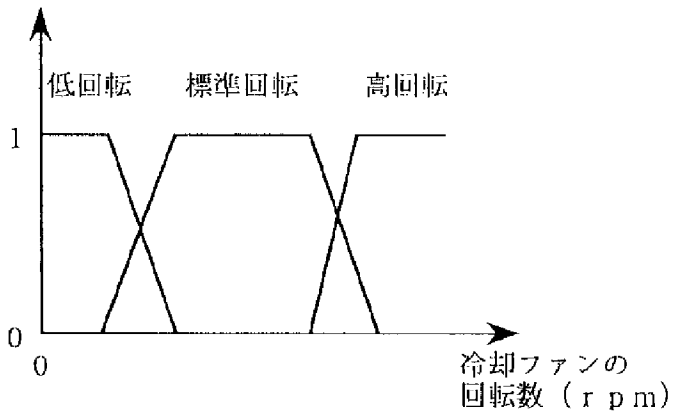
【図８】

アドレス	データ
０００１	Ｆ（１）
０００２	Ｆ（２）
０００３	Ｆ（３）
０００４	Ｆ（４）

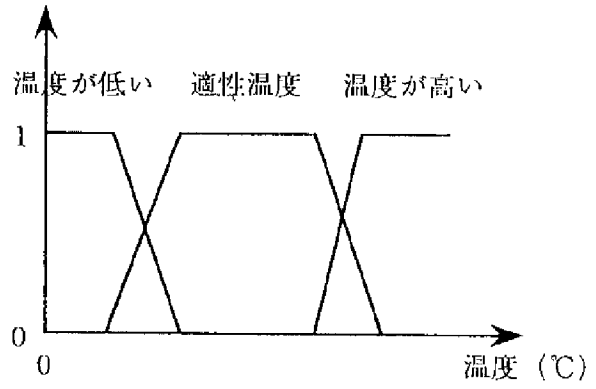
【図９】



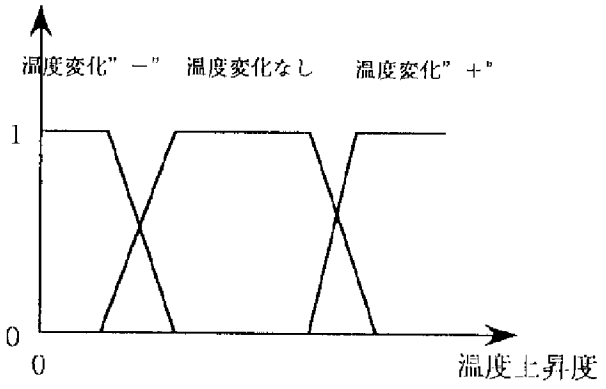
【図１０】



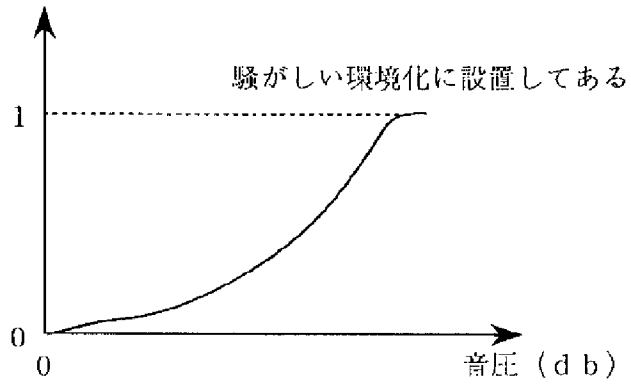
【図１１】



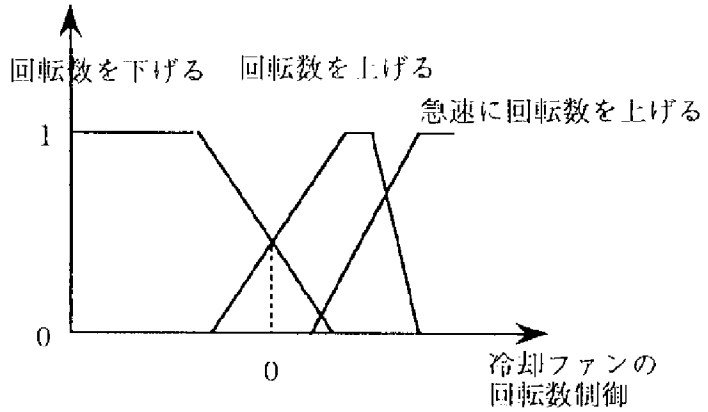
【図１２】



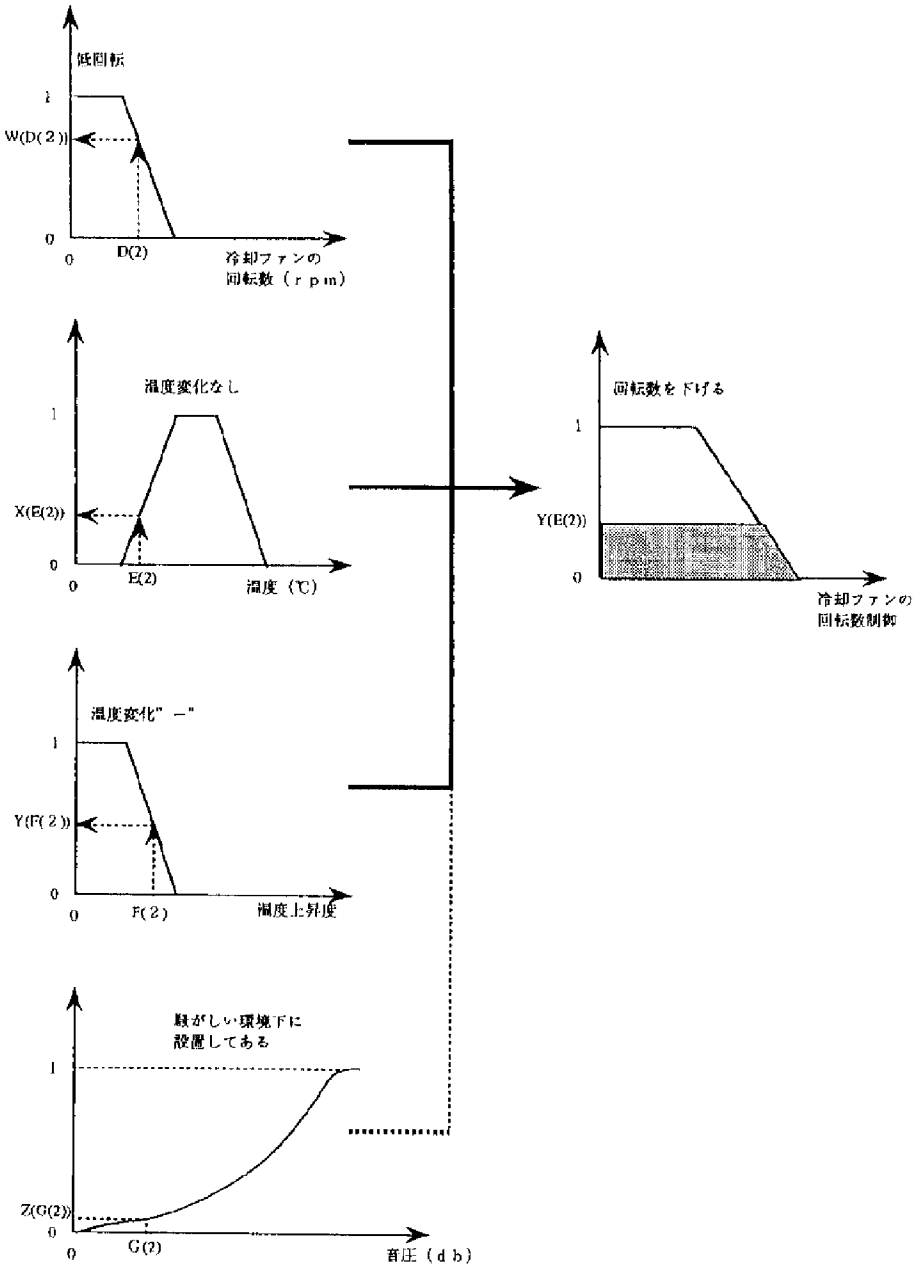
【図１３】



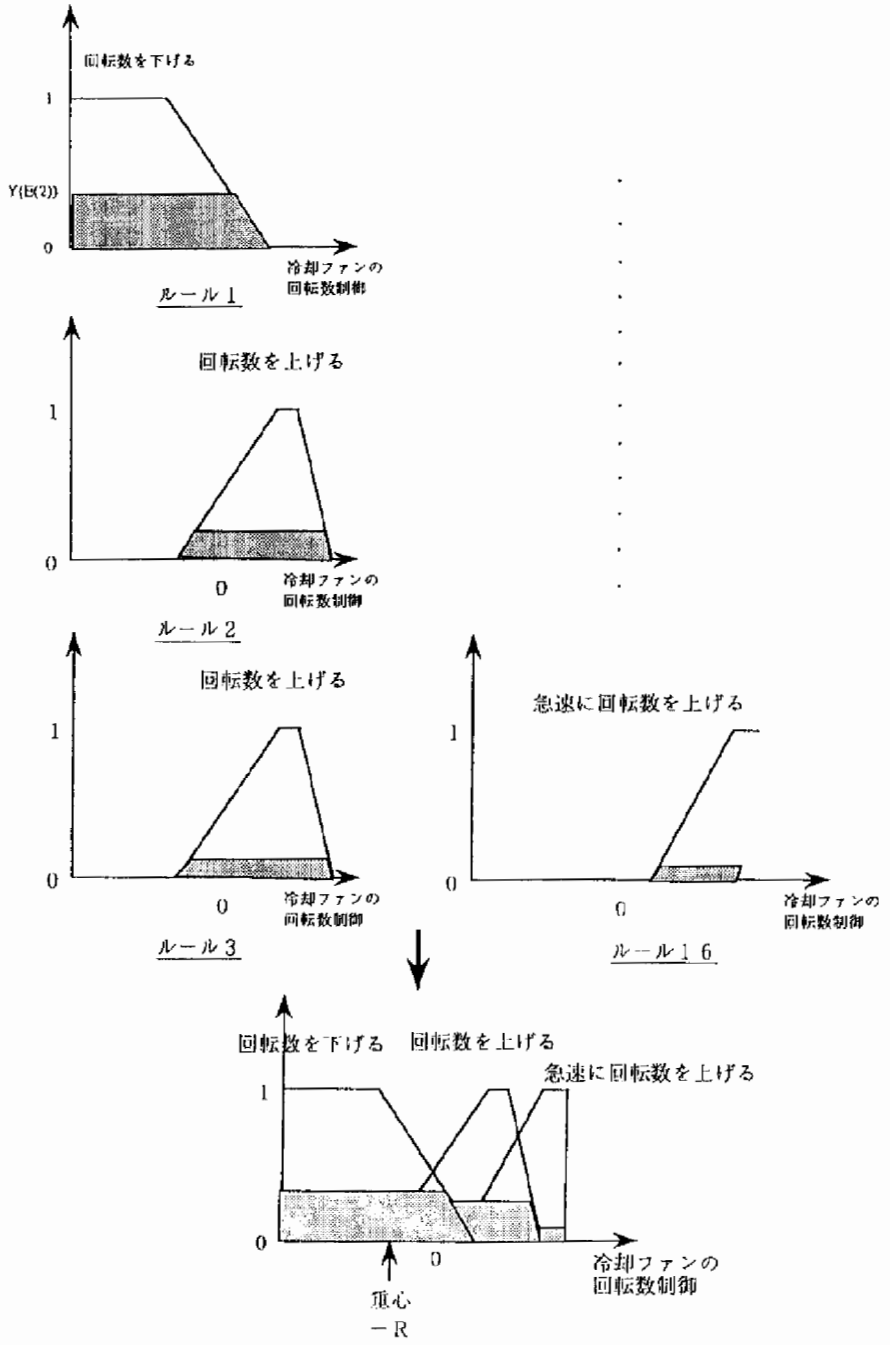
【図１４】



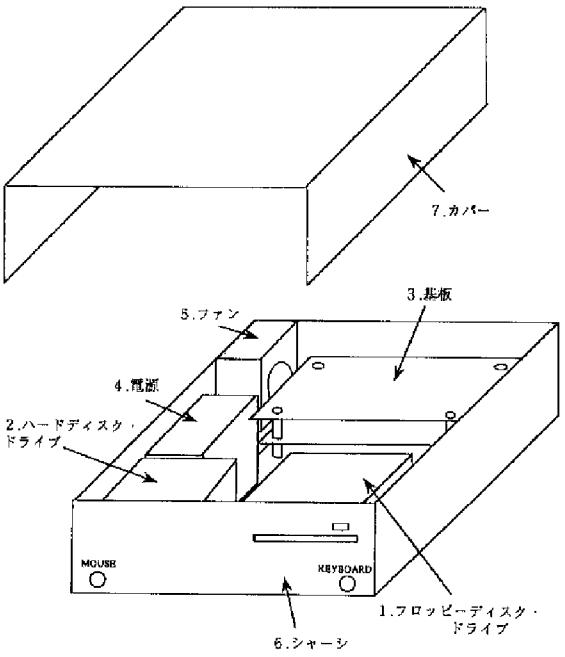
【図１５】


低回転
1
W(D(2))
0
0
D(2)
冷却ファンの
回転数（ｒｐｍ）
温度変化なし
1
X(E(2))
0
0
E(2)
温度（℃）
温度変化"－"
1
Y(F(2))
0
0
F(2)
温度上昇度
騒がしい環境下に
設置してある
1
Z(G(2))
0
0
G(2)
音圧（ｄｂ）
回転数を下げる
1
Y(E(2))
0
冷却ファンの
回転数制御

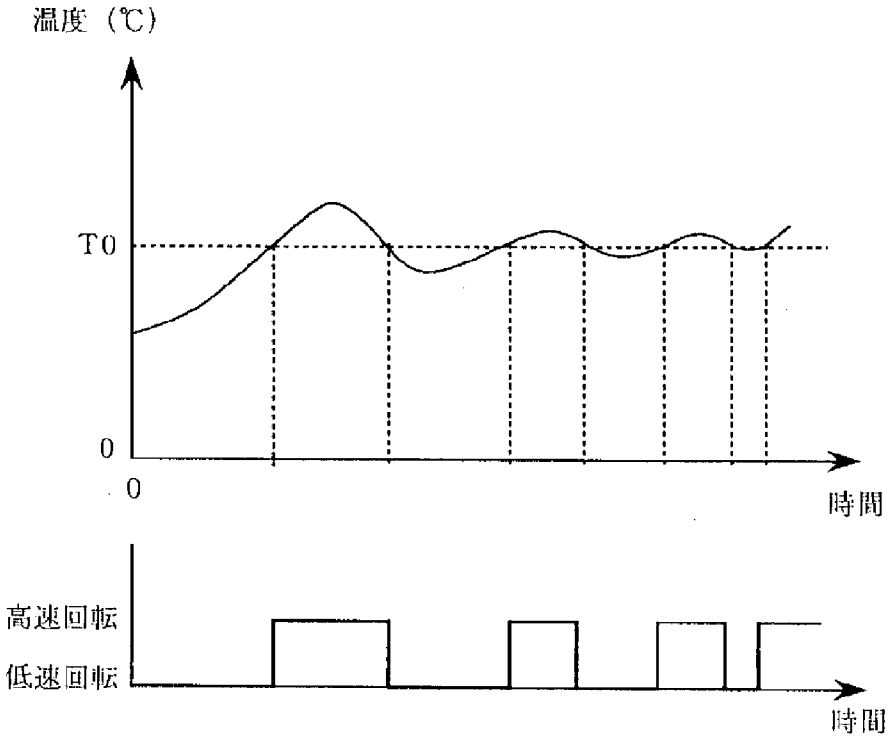
【図１６】


回転数を下げる
1
Y(E(2))
0
冷却ファンの
回転数制御
ルール１
回転数を上げる
1
0
0
冷却ファンの
回転数制御
ルール２
回転数を上げる
1
0
0
冷却ファンの
回転数制御
ルール３
急速に回転数を上げる
1
0
0
冷却ファンの
回転数制御
ルール１６
回転数を下げる
回転数を上げる
急速に回転数を上げる
1
0
0
冷却ファンの
回転数制御
重心
－R

【図１７】


7.カバー
3.基板
5.ファン
4.電源
2.ハードディスク・ドライブ
MOUSE
KEYBOARD
1.フロッピーディスク・ドライブ
6.シャーシ

【図１８】


温度（℃）
T0
0
0
時間
高速回転
低速回転
時間

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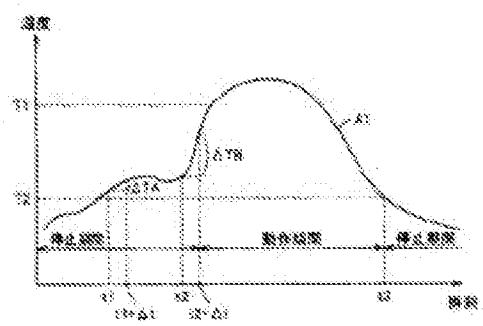
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H05K 7/20 (2006.01)

(21)Application number : 2005-064289
(22)Date of filing : 08.03.2005

(71)Applicant : FUNAI ELECTRIC CO LTD
(72)Inventor : KAMIMORI YUTAKA

(54) COOLING DEVICE OF OPTICAL DISK DRIVE, AND OPTICAL DISK DRIVE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a cooling device of an optical disk drive, by which temperature rise in the optical disk drive is suppressed compared to that in a conventional practice, and to provide the optical disk drive equipped with such a cooling device.
SOLUTION: A control section 16 transmits a signal SON as a 1st instruction, to a cooling fan 10 when a temperature changing rate is a 1st changing rate or larger. The cooling fan 10 starts the operation in accordance with the signal SON. The control section 16 acquires measurement results from a temperature sensor 14 after the signal SON is outputted. When the inside temperature of the optical disk drive 1 becomes a cooling end temperature or lower, a signal SOFF as a 2nd instruction, is sent to the cooling fan 10 by the control section 16. The cooling fan 10 receives the signal SOFF and runs down. Since the cooling operation starts before the inside temperature of the drive becomes high, temperature in the inside of the optical disk drive can be prevented from increasing.



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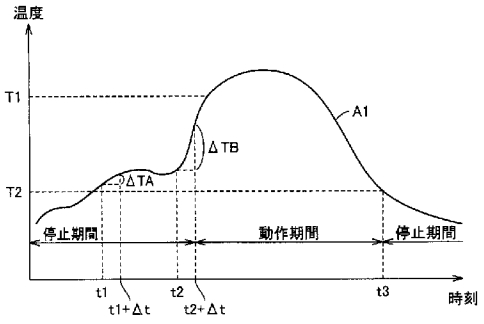
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(54)【発明の名称】光ディスク装置の冷却装置および光ディスク装置

(57)【要約】
【課題】　光ディスク装置内の温度上昇を従来よりも抑えることが可能な光ディスク装置の冷却装置およびこのような冷却装置を備えた光ディスク装置を提供する。
【解決手段】　制御部１６は温度変化率が第１の変化率以上であれば冷却ファン１０に第１の指示である信号ＳＯＮを送る。冷却ファン１０は信号ＳＯＮに応じて動作を開始する。制御部１６は信号ＳＯＮを出力した後も温度センサ１４から測定結果を取得する。制御部１６は光ディスク装置１内部の温度が冷却終了温度以下になれば、冷却ファン１０に第２の指示である信号ＳＯＦＦを送る。冷却ファン１０は信号ＳＯＦＦを受けて停止する。装置内部の温度が高温になる前に冷却が開始されるので、光ディスク装置内部が高温になるのを防ぐことができる。
【選択図】　図２



【特許請求の範囲】
【請求項１】
冷却装置を備える光ディスク装置であって、
前記光ディスク装置は、挿入される光ディスクに対し、再生および記録の少なくとも一方を行なう光ピックアップユニットをさらに備え、
前記冷却装置は、
前記光ピックアップユニットから所定の距離にある場所の温度を測定する温度センサと、
前記温度センサから測定結果を取得する制御部とを含み、
前記制御部は、前記測定結果から前記温度の時間変化率を算出し、前記時間変化率が第１の変化率以上である場合か、前記温度が第１の温度以上である場合かのいずれかの場合には第１の指示を出力し、
前記制御部は、前記第１の指示を出力した後に、前記温度センサから所定の時間ごとに前記測定結果を取得して前記時間変化率を算出し、前記時間変化率と前記第１の変化率よりも小さい第２の変化率とを比較し、
前記制御部は、前記時間変化率が前記第２の変化率以下である場合には、前記温度センサから前記所定の時間ごとに前記測定結果を再度取得して、前記温度が、前記第１の温度よりも低い温度である第２の温度以下になったときに第２の指示を出力し、
前記冷却装置は、前記第１の指示に応じて動作し、前記第２の指示に応じて停止する冷却ファンをさらに含む、光ディスク装置。
【請求項２】
光ディスク装置に備えられる冷却装置であって、
前記光ディスク装置内部における測定場所の温度を測定する温度センサと、
前記温度センサから測定結果を取得して前記測定場所の温度の時間変化率を算出し、前記時間変化率が第１の変化率以上である場合に第１の指示を出力する制御部と、
前記第１の指示に応じて冷却能力を増加させる冷却手段とを備える、光ディスク装置の冷却装置。
【請求項３】
前記制御部は、前記時間変化率が前記第１の変化率よりも小さい場合には、前記測定結果に基づいて、前記測定場所の温度が第１の温度以上であるときに前記第１の指示を出力する、請求項２に記載の光ディスク装置の冷却装置。
【請求項４】
前記制御部は、前記第１の指示を出力した後に、前記温度センサから所定の時間ごとに前記測定結果を取得して、前記測定場所の温度が、前記第１の温度よりも低い第２の温度以下であるときに第２の指示を出力し、
前記冷却手段は、前記第２の指示に応じて前記冷却能力を減少させる、請求項３に記載の光ディスク装置の冷却装置。
【請求項５】
前記制御部は、前記第１の指示を出力した後に、前記温度センサから所定の時間ごとに前記測定結果を取得して前記時間変化率を算出し、前記時間変化率と前記第１の変化率よりも小さい第２の変化率とを比較し、
前記制御部は、前記時間変化率が前記第２の変化率以下である場合には、前記温度センサから前記所定の時間ごとに前記測定結果を再度取得して、前記測定場所の温度が前記第１の温度よりも低い第２の温度以下になったときに第２の指示を出力し、
前記冷却手段は、前記第２の指示に応じて前記冷却能力を減少させる、請求項３に記載の光ディスク装置の冷却装置。
【請求項６】
前記冷却手段は、前記第１の指示に応じて動作し、前記第２の指示に応じて停止する冷却ファンである、請求項４または請求項５に記載の光ディスク装置の冷却装置。
【請求項７】

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前記光ディスク装置は、挿入される光ディスクに対し、再生および記録の少なくとも一方を行なう光ピックアップユニットを備え、

前記測定場所は、前記光ピックアップユニットから所定の距離にある、請求項６に記載の光ディスク装置の冷却装置。

【請求項８】

請求項２から７のいずれか１項に記載の冷却装置を備える、光ディスク装置。

【発明の詳細な説明】

【技術分野】

【０００１】

本発明は光ディスク装置に搭載される冷却装置および冷却装置を搭載する光ディスク装置に関する。

【背景技術】

【０００２】

ＣＤ（Compact Disc）やＤＶＤ(Digital Versatile Disc)等の光ディスクに情報を書き込む光ディスク記録装置や、光ディスクから情報を再生する光ディスク再生装置などの光ディスク装置には、一般的に光ディスク装置内部を冷却するための冷却装置が搭載されている。光ディスク装置にはディスクに情報を読み書きするための半導体レーザを備えたＯＰＵ（光ピックアップユニット）や多くの半導体集積回路などが搭載される。ＯＰＵの動作や半導体集積回路の動作は温度による影響を受けやすいので、これらの回路の温度上昇を抑えるために冷却が行なわれる。

【０００３】

冷却装置には一般的に冷却ファンが用いられる。冷却ファンが動作すると光ディスク装置内部に空気の流れが生じ、ＯＰＵや半導体集積回路に生じた熱が奪われる。

【０００４】

光ディスク装置には、冷却装置として、冷却ファンのほかに温度センサや冷却ファンの動作を制御するための制御回路が含まれる。制御回路は温度センサの測定結果に基づいて冷却ファンを動作させたり、冷却ファンを停止させたりする。

【０００５】

図７は、従来の冷却方法による光ディスク装置内部の温度変化を示す図である。図７を参照して、グラフの横軸は時刻を示し、縦軸は光ディスク装置の温度を示す。曲線Ａ１０は光ディスク装置の温度変化を示す曲線である。

【０００６】

光ディスクから情報を読出したり書き込んだりする場合、モータは高速でディスクを回転させる。よって、モータからの発熱が大きくなる。また、光ディスクに情報を書き込む場合には読出し時よりもレーザの出力が大きくなる。さらに、光ディスクに情報を書き込んだり情報を読出したりするために半導体集積回路が動作する。よって、光ディスクから情報を読み出したり、光ディスクに情報を書き込んだりすると光ディスク装置の温度が上昇する。

【０００７】

時刻ｔ１において光ディスク装置の温度は温度Ｔ１に達する。時刻ｔ１において冷却が開始される。但し、光ディスク装置の温度はすぐには下がらず、時刻ｔ１以後も緩やかに上昇を続ける。光ディスク装置の温度は温度Ｔ２まで上昇し、その後下降する。時刻ｔ２において光ディスク装置の温度が再び温度Ｔ１になると、冷却は終了する。なお、光ディスク装置が十分に冷却されてから冷却を停止するために温度Ｔ２は温度Ｔ１よりも低い場合がある。

【０００８】

従来、冷却装置に関する多くの技術が提案されている。たとえば、特開平１０－６４５９８号公報（特許文献１）では、バッテリに冷却風を送風する冷却ファンを備えたバッテリ冷却装置において、バッテリ温度を検出する温度検出手段と、バッテリ単位時間当りの発熱量を検出する発熱量検出手段と、バッテリ温度およびバッテリ単位時間当りの発熱量

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に基づいてバッテリ温度に応じて要求される送風状態をバッテリ単位時間当り発熱量に応じて調整した調整送風状態が得られるように、冷却ファンを制御する制御手段とを含むことを特徴とするバッテリ冷却装置が開示される。このバッテリ冷却装置は冷却ファンによる電力消費量を低減することを可能にする。

【０００９】

また、特開平５－１４５２５９号公報（特許文献２）では、温度センサと、設定温度を発生させる回路と、温度センサからの出力と設定温度を比較する比較器と、比較器からの出力変化に応じた回転をするファンとを備えることを特徴とする冷却装置が開示される。この冷却装置は消費電力の低減および騒音の低減を行なうことを可能にする。

【００１０】

また、特開２００３－２９８５０号公報（特許文献３）では、装置内部に第１、第２の温度センサと第１、第２の温度センサの検出信号を受けてモータドライバを制御する制御手段を備えることによって冷却ファンの駆動および停止を行なう冷却装置が開示される。この冷却装置では検出温度が設定温度より低下してから設定時間だけファンを継続駆動することによって発熱部品等を確実に冷却することができる。また、この冷却装置ではファンを停止させてから所定時間が経過するまでに検出温度が第２の設定温度以上に上昇すればファンを再駆動することによってファンの駆動および停止の繰返し頻度を従来よりも低減し、電力消費および騒音を低減する。

【特許文献１】特開平１０－６４５９８号公報

【特許文献２】特開平５－１４５２５９号公報

【特許文献３】特開２００３－２９８５０号公報

【発明の開示】

【発明が解決しようとする課題】

【００１１】

図７に示されるように、従来の冷却装置は光ディスク装置の温度のみによって、冷却ファンを駆動するか、あるいは冷却ファンを停止させるかを判断していた。よって、従来の冷却装置では、光ディスク装置の温度が冷却開始温度に達してから冷却ファンを動かすので、光ディスク装置の温度がすぐに下げらなかった。

【００１２】

光ディスク装置の温度が高温になると、たとえば、半導体集積回路の動作が不安定になる、あるいはＯＰＵに備えられる半導体レーザの出力が低下するといった問題が生じる。半導体レーザの出力が低下して光ディスクに情報を正しく記録できないと、光ディスクに記録された情報には多くの誤りが含まれるのでディスクの再生時に再生エラーが生じやすくなる。よって、温度のみによって冷却を行なうか、あるいは冷却を停止するかを判断する従来の冷却装置では、特に、光ディスク装置の温度が上昇するときの温度変化が大きくなっていた。

【００１３】

本発明は上述の課題を解決するものであって、その目的は、光ディスク装置内の温度上昇を従来よりも抑えることが可能な光ディスク装置の冷却装置およびこのような冷却装置を備えた光ディスク装置を提供することである。

【課題を解決するための手段】

【００１４】

本発明は要約すれば、冷却装置を備える光ディスク装置であって、光ディスク装置は、挿入される光ディスクに対し、再生および記録の少なくとも一方を行なう光ピックアップユニットをさらに備える。冷却装置は、光ピックアップユニットから所定の距離にある場所の温度を測定する温度センサと、温度センサから測定結果を取得する制御部とを含む。

【００１５】

制御部は、測定結果から温度の時間変化率を算出し、時間変化率が第１の変化率以上である場合か、温度が第１の温度以上である場合かのいずれかの場合には第１の指示を出力する。

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【００１６】
また、制御部は、第１の指示を出力した後に、温度センサから所定の時間ごとに測定結果を取得して時間変化率を算出し、時間変化率と第１の変化率よりも小さい第２の変化率とを比較する。
【００１７】
また、制御部は、時間変化率が第２の変化率以下である場合には、温度センサから所定の時間ごとに測定結果を再度取得して、温度が、第１の温度よりも低い温度である第２の温度以下になったときに第２の指示を出力する。
【００１８】
冷却装置は、第１の指示に応じて動作し、第２の指示に応じて停止する冷却ファンをさらに含む。
【００１９】
本発明の他の局面に従うと、光ディスク装置に備えられる冷却装置であって、光ディスク装置内部における測定場所の温度を測定する温度センサと、温度センサから測定結果を取得して測定場所の温度の時間変化率を算出し、時間変化率が第１の変化率以上である場合に第１の指示を出力する制御部と、第１の指示に応じて冷却能力を増加させる冷却手段とを備える。
【００２０】
好ましくは、制御部は、時間変化率が第１の変化率よりも小さい場合には、測定結果に基づいて、測定場所の温度が第１の温度以上であるときに第１の指示を出力する。
【００２１】
より好ましくは、制御部は、第１の指示を出力した後に、温度センサから所定の時間ごとに測定結果を取得して、測定場所の温度が、第１の温度よりも低い第２の温度以下であるときに第２の指示を出力し、冷却手段は、第２の指示に応じて冷却能力を減少させる。
【００２２】
より好ましくは、制御部は、第１の指示を出力した後に、温度センサから所定の時間ごとに測定結果を取得して時間変化率を算出し、時間変化率と第１の変化率よりも小さい第２の変化率とを比較する。制御部は、時間変化率が第２の変化率以下である場合には、温度センサから所定の時間ごとに測定結果を再度取得して、測定場所の温度が第１の温度よりも低い第２の温度以下になったときに第２の指示を出力する。冷却手段は、第２の指示に応じて冷却能力を減少させる。
【００２３】
さらに好ましくは、冷却手段は、第１の指示に応じて動作し、第２の指示に応じて停止する冷却ファンである。
【００２４】
さらに好ましくは、光ディスク装置は、挿入される光ディスクに対し、再生および記録の少なくとも一方を行なう光ピックアップユニットを備え、測定場所は、光ピックアップユニットから所定の距離にある。
【００２５】
さらに好ましくは、光ディスク装置は、上述のいずれかの冷却装置を備える光ディスク装置である。
【発明の効果】
【００２６】
本発明の光ディスク装置の冷却装置および本発明の光ディスク装置によれば、光ディスク装置内の温度の変化率に基づいて冷却ファンを動作させるか否かを判定するので、光ディスク装置内部の温度が高くなりすぎる前に冷却を開始することができる。よって、従来よりも光ディスク装置内部の温度上昇を抑えることができる。
【発明を実施するための最良の形態】
【００２７】
以下において、本発明の実施の形態について図面を参照して詳しく説明する。なお、図

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中同一符号は同一または相当部分を示す。

【００２８】

［実施の形態１］

図１は、実施の形態１の光ディスク装置を示す概略ブロック図である。図１を参照して、光ディスク装置１は、たとえば再生専用のＤＶＤプレーヤやＤＶＤレコーダである。光ディスク装置１は、ケース２を備える。ケース２には吸気口２Ａ，および排気口２Ｂが設けられる。吸気口２Ａから排気口２Ｂに向けて空気が流れることにより光ディスク装置１の内部が冷却される。

【００２９】

光ディスク装置１は、さらに、ローダ４、制御基板６、ＡＶ入出力／電源基板８および冷却ファン１０を備える。

【００３０】

ローダ４はディスクＤ１を搬送するための装置である。ローダ４は、挿入される光ディスク（ディスクＤ１）に対して情報の再生や情報の記録の少なくとも一方を行なうための光ピックアップユニット（ＯＰＵ：Optical Pickup Unit）１２を含む。

【００３１】

ＯＰＵ１２は温度センサ１４を含む。温度センサ１４は所定の場所の温度を測定する。具体的には温度センサ１４はＯＰＵ１２の周囲、つまりＯＰＵ１２から所定の距離にある場所の空気の温度を測定する。温度センサ１４は、たとえばサーミスタである。

【００３２】

なお、温度センサ１４はＯＰＵ１２の周囲に設けられることが好ましい。ＯＰＵには半導体レーザ（図示せず）や半導体集積回路（図示せず）が密集しているので、動作時に温度が上昇しやすいためであるとともに半導体レーザや半導体集積回路は温度の影響を受けやすいためである。ただし、温度センサが取り付けられる位置はＯＰＵ１２の周囲に限定されず、たとえば温度センサ１４は制御基板６に設けられてもよい。制御基板６には温度の影響を受けやすい多くの半導体集積回路(図示せず）が搭載されている。温度センサ１４が制御基板６に設けられることにより、制御基板の温度が高くなりすぎる前に冷却を開始することができるので、光ディスク装置１の動作を安定させることができる。

【００３３】

制御基板６は光ディスク装置１全体の動作を制御する。制御基板６は制御部１６を含む。制御部１６は一例を示すとＣＰＵ（Central Processing Unit）である。制御部１６は所定の時間ごとに温度センサ１４から測定結果ＳＮＳを取得して、光ディスク装置１の内部の温度の時間変化率（以下、温度変化率とも称する）を求める。

【００３４】

制御部１６は温度変化率が第１の変化率以上であれば冷却ファン１０に第１の指示である信号ＳＯＮを送る。冷却ファン１０は信号ＳＯＮに応じて動作を開始する。制御部１６は信号ＳＯＮを出力した後も温度センサ１４から測定結果を取得する。制御部１６は光ディスク装置１内部の温度が冷却終了温度以下になれば、冷却ファン１０に第２の指示である信号ＳＯＦＦを送る。冷却ファン１０は信号ＳＯＦＦを受けて停止する。装置内部の温度が高温になる前に冷却が開始されるので、光ディスク装置内部が高温になるのを防ぐことができる。

【００３５】

なお、光ディスク装置１の内部の温度が緩やかに上昇する場合、温度変化率は、制御部１６が信号ＳＯＮを出力するための条件となる変化率よりも小さくなる。この場合、制御部１６は光ディスク装置１内部の温度が、冷却開始温度以上であれば信号ＳＯＮを出力する。温度上昇時の温度変化率が小さいので、冷却ファンが動作すると光ディスク装置１の内部の温度は、温度変化率が大きい場合に比較して短時間で低下し始める。

【００３６】

ここで、冷却開始温度とは制御部１６が信号ＳＯＮ（第１の指示）を出力するための条件である第１の温度である。また、冷却終了温度とは制御部１６が信号ＳＯＦＦ（第２の

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指示）を出力するための条件である第２の温度である。

【００３７】

以上のように、制御部１６は光ディスク装置１の温度上昇時における温度変化率が第１の変化率以上か、光ディスク装置１の温度が冷却開始温度であるかのいずれかであれば冷却ファン１０を動作させる。

【００３８】

ＡＶ入出力／電源基板８は、図示されないテレビ受像機やオーディオ機器などのＡＶ機器に対し、情報の入出力を行なう。ＡＶ入出力／電源基板８は、図示されないＡＶ機器からディスクＤ１に記録するための情報を受けたり、ディスクＤ１から再生された情報を図示されないＡＶ機器に出力したりする。また、ＡＶ入出力／電源基板８は、光ディスク装置１の動作電源電圧を供給する電源部（図示せず）を含む。

【００３９】

冷却ファン１０は、本発明の冷却手段である。本発明の冷却手段は第１の指示を受けて冷却能力を増加させ、第２の指示を受けて冷却能力を減少させる。具体的には冷却ファン１０は、信号ＳＯＮを受けて動作すると吸気口２Ａから排気口２Ｂに向かう空気の流れを生じさせ、信号ＳＯＦＦを受けて停止する。ただし、冷却ファン１０は電源電圧が供給されている間は常時動作し、信号ＳＯＮを受けた場合にファンの回転数を上げ、信号ＳＯＦＦを受けた場合にファンの回転数を下げるという動作を行なってもよい。

【００４０】

また、本発明の冷却手段は冷却ファンに限定されるものではない。光ディスク装置１の内部を冷却し、第１の指示に応じて冷却能力を増加させ、第２の指示に応じて冷却能力を減少させるのであれば、本発明の冷却手段はたとえばペルチェ素子や水冷式のクーラー等でもよい。

【００４１】

なお、図１において本発明に係る冷却装置は冷却ファン１０，温度センサ１４および制御部１６によって構成される。

【００４２】

図２は、図１の光ディスク装置１の温度変化の例を示す模式図である。図２を参照して、曲線Ａ１は光ディスク装置１の温度の時間変化を示す曲線である。縦軸に示される温度Ｔ１，Ｔ２はそれぞれ第１の温度（冷却開始温度）および第２の温度（冷却終了温度）を示す。

【００４３】

時刻ｔ１から時刻ｔ１＋Δｔまでの間の温度変化率（＝ΔＴＡ／Δｔ）は第１の変化率よりも小さい。一方、時刻ｔ２から時刻ｔ２＋Δｔまでの間の温度変化率（＝ΔＴＢ／ΔＴ）は、第１の変化率よりも大きい。よって、時刻ｔ２＋Δｔにおいて冷却ファン１０は動作を開始する。なお、上述のように、本発明の冷却装置は、温度変化率が第１の変化率以上であれば冷却を開始する。よって、冷却開始時の時刻ｔ２＋Δｔにおける温度は温度Ｔ１よりも低い。

【００４４】

時刻ｔ２＋Δｔ以後、光ディスク装置１の温度は一旦上昇して低下する。時刻ｔ３において光ディスク装置１内部の温度は温度Ｔ２に達する。時刻ｔ３以後、冷却ファン１０は停止する。つまり、時刻ｔ２＋Δｔ～時刻ｔ３の期間が冷却ファン１０の動作期間であり、時刻ｔ１以前の期間および時刻ｔ３以後の期間が冷却ファン１０の停止期間である。

【００４５】

なお、温度Ｔ１，Ｔ２の一例として、温度Ｔ１は６０℃、温度Ｔ２は４５℃である。ただし、温度Ｔ１と温度Ｔ２とは同じ温度でもよい。また、第１の変化率は、たとえば１０℃／１分である。

【００４６】

図３は、図１の光ディスク装置１の別の温度変化の例を示す模式図である。図３を参照して、曲線Ａ２は光ディスク装置１の温度の時間変化を示す曲線である。曲線Ａ２におい

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て、温度上昇時の温度変化率は第１の温度変化率よりも低い。この場合、時刻ｔ１において光ディスク装置１内部の温度が冷却開始温度である温度Ｔ１に達すると、制御部１６は冷却ファン１０に信号ＳＯＮを送り、冷却ファン１０は動作を開始する。時刻ｔ１以後、光ディスク装置１が冷却されて、時刻ｔ２において装置内部の温度が冷却終了温度である温度Ｔ２に達すると冷却ファン１０は動作を停止する。

【００４７】

図３に示す曲線Ａ２の場合、冷却ファン１０は時刻ｔ１～時刻ｔ２の間で動作し、時刻ｔ１以前の期間および時刻ｔ２以後の期間は冷却ファン１０は停止している。温度上昇時の温度変化率が第１の温度変化率よりも低いため、冷却ファンが動作してから光ディスク装置１内部の温度が低下し始めるまでの時間は図２の曲線Ａ１よりも短くなる。つまり図２における冷却ファン１０の動作期間（時刻ｔ２＋Δｔ～時刻ｔ３の期間）と比較して、図３における冷却ファン１０の動作期間（時刻ｔ１～時刻ｔ２の期間）は短くなる。

【００４８】

図４は、実施の形態１の冷却装置による処理を示すフローチャートである。図４を参照して、処理が開始されると、ステップＳ１において制御部１６は温度センサ１４から所定の時間毎に測定結果ＳＮＳを取得する。次にステップＳ２において、制御部１６は測定結果ＳＮＳに基づいて温度変化率を算出する。

【００４９】

ステップＳ３において、制御部１６は温度変化率が第１の変化率以上であるか否かを判定する。時間変化率が第１の変化率以上である場合（ステップＳ３においてＹＥＳの場合）、処理はステップＳ４に進む。一方、温度変化率が第１の変化率未満である場合（ステップＳ３においてＮＯの場合）、処理はステップＳ４Ａに進む。

【００５０】

ステップＳ４Ａの処理について説明する。ステップＳ４Ａにおいて制御部１６は内部温度が第１の温度である冷却開始温度（図２，図３における温度Ｔ１）以上であるか否かを判定する。ステップＳ４Ａにおいて内部温度が冷却開始温度以上である場合（ステップＳ４ＡにおいてＹＥＳの場合）、処理はステップＳ４に進む。一方、ステップＳ４Ａにおいて内部温度が冷却開始温度未満である場合（ステップＳ４ＡにおいてＮＯの場合）、処理は再びステップＳ１に戻る。

【００５１】

ステップＳ４において制御部１６は冷却ファン１０に第１の指示である信号ＳＯＮを送り冷却ファン１０を動作させる。ステップＳ５において制御部１６は所定の時間毎に温度センサ１４から測定結果ＳＮＳを取得する。ステップＳ６において制御部１６は測定結果ＳＮＳに基づき、光ディスク装置１の内部温度が第２の温度である冷却終了温度（図２，図３における温度Ｔ２）以下であるか否かを判定する。

【００５２】

ステップＳ６において内部温度が冷却終了温度以下である場合（ステップＳ６においてＹＥＳの場合）、処理はステップＳ７に進む。一方、ステップＳ６において内部温度が冷却終了温度より高い場合（ステップＳ６においてＮＯの場合）、処理は再びステップＳ５に戻る。

【００５３】

ステップＳ７において制御部１６は冷却ファン１０に第２の指示である信号ＳＯＦＦを送り冷却ファン１０を停止させる。ステップＳ７の処理が終了すると、処理は再びステップＳ１に戻る。

【００５４】

以上のように実施の形態１によれば、光ディスク装置内部の温度の温度変化率が所定値以上であれば冷却ファンが動作することにより、装置内部の温度が高くなりすぎる前に冷却を開始することができるので、装置内部の温度の上昇を抑えることが可能になる。

【００５５】

［実施の形態２］

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実施の形態２では、冷却ファンの動作を開始させた後も継続して光ディスク装置の温度の変化率が算出される点で実施の形態１と相違する。

【００５６】

なお、実施の形態２の光ディスク装置の構成は図１の光ディスク装置１の構成と同様であるので、実施の形態２の構成に関する以後の説明は繰返さない。

【００５７】

実施の形態１では、冷却ファンを動作させた後における装置内部の温度が冷却終了温度以下であれば冷却ファンは停止する。しかし、光ディスク装置が始動したすぐ後に光ディスクに情報の書き込みが行なわれる場合、半導体集積回路の処理やＯＰＵの処理によって装置内部の温度は急に上昇する。よって、冷却ファンを動作させた後の温度が冷却終了温度以下であっても、冷却ファンを停止すれば光ディスク装置の温度が急に上昇する可能性がある。このような場合に、冷却ファンを再起動させても光ディスク装置の冷却が間に合わず、温度が高くなりすぎる可能性がある。

【００５８】

一方、冷却ファンを動作させた後に光ディスク装置の温度変化率が小さくなった場合、そのときの温度が冷却終了温度以下であれば、冷却ファンが停止しても光ディスク装置の温度は冷却終了温度から下がり続けるか、冷却終了温度からわずかに上昇するかのいずれかである。このような状態で冷却ファンが動作し続けると、冷却ファンによる冷却効果が発揮されず、電力が無駄に消費される。

【００５９】

実施の形態２では、冷却ファンの動作を開始させた後も制御部は光ディスク装置の温度の変化率を算出し、その温度変化率を第１の温度変化率よりも低い第２の温度変化率と比較する。実施の形態２では、光ディスク装置の温度の変化率が第２の温度変化率以下であれば、制御部は光ディスク装置の温度が冷却終了温度以下であるか否かを判定し、光ディスク装置の温度が冷却終了温度以下であれば冷却ファンを停止する。

【００６０】

よって、実施の形態２では、光ディスク装置の温度が冷却終了温度以下であっても、第２の温度変化率以上の変化率で光ディスク装置の温度が上昇し続ける場合には、冷却ファンが動作し続けるので、光ディスク装置の温度が急に上昇することを抑えることができる。また、光ディスク装置の温度の変化率が第２の温度変化率よりも低く、かつ、そのときの温度が冷却停止以下の温度であれば冷却ファンが停止するので、冷却ファンの無駄な動作を防ぐことができ、消費電力が低減される。

【００６１】

図５は、実施の形態２の光ディスク装置の温度変化の例を示す模式図である。図５を参照して、曲線Ａ３１は、実施の形態１の光ディスク装置の温度変化を示し、曲線Ａ３２は実施の形態２の光ディスク装置の温度変化を示す。また、パターンＡ，パターンＢは実施の形態１，２のそれぞれの場合における冷却ファンの動作パターンを示す。

【００６２】

時刻ｔ１から時刻ｔ２までの期間において装置内部の温度は上昇する。時刻ｔ１から時刻ｔ２までの温度変化率が所定の値以上であるので実施の形態１，２では共に時刻ｔ２において冷却ファンが動作する。

【００６３】

次に時刻ｔ３においてＣＰＵにより装置内部の温度が測定される。時刻ｔ３における装置内部の温度は温度Ｔ２以下である。すなわち、装置内部の温度は第２の温度である冷却終了温度以下である。

【００６４】

曲線Ａ３１およびパターンＡに示されるように、実施の形態１では装置内部の温度が温度Ｔ２以下であれば冷却ファンは停止するので、時刻ｔ３において冷却ファンは停止する。しかし、曲線Ａ３１に示すように、時刻ｔ３以後、装置内部の温度は上昇し続け、時刻ｔ４では装置の温度は温度Ｔ２を上回る。

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【００６５】
しかし、実施の形態１の場合、冷却ファンが動作するための条件は装置内部の温度が第１の温度である温度Ｔ１になるか、上昇時の温度変化率が第１の変化率以上になるかのいずれかである。上記のいずれかの条件を満たしたときに冷却ファンが動作した場合、光ディスク装置の温度が温度Ｔ２まで下がる時間が長くなる可能性がある。
【００６６】
これに対し、曲線Ａ３２およびパターンＢに示されるように、実施の形態２では時刻ｔ３における光ディスク装置の温度が冷却終了温度である温度Ｔ２以下であっても時刻ｔ２～時刻ｔ３における温度変化率が第２の変化率以上であるので冷却ファンは動作し続ける。時刻ｔ３～時刻ｔ４における温度変化率（＝ΔＴＣ／Δｔ）は第２の温度変化率以下であり、時刻ｔ４における光ディスク装置の温度は温度Ｔ２よりも低い。よって、実施の形態２では時刻ｔ４において冷却ファンが停止する。
【００６７】
図６は、実施の形態２の冷却装置による処理を示すフローチャートである。図４，図６を参照して、図６のフローチャートにおいてステップＳ１～Ｓ４，Ｓ４Ａ，Ｓ６、Ｓ７の各ステップにおける処理は、図４のフローチャートの対応するステップと同様である。図６のフローチャートは、ステップＳ４とステップＳ７との間にステップＳ４１～ステップＳ４３およびステップＳ６Ａが含まれる点で図４のフローチャートと異なる。以下、図６のフローチャートについて詳細を説明する。
【００６８】
処理が開始されるとステップＳ１において制御部１６は温度センサ１４から所定の時間毎に測定結果ＳＮＳを取得する。次にステップＳ２において、制御部１６は測定結果ＳＮＳに基づいて温度変化率を算出する。
【００６９】
ステップＳ３において、制御部１６は温度変化率が第１の変化率以上であるか否かを判定する。温度変化率が第１の変化率以上である場合（ステップＳ３においてＹＥＳの場合）、処理はステップＳ４に進む。一方、温度変化率が第１の変化率未満である場合（ステップＳ３においてＮＯの場合）、処理はステップＳ４Ａに進む。実施の形態１と同様に、第１の変化率は、たとえば１０℃／１分に設定される。
【００７０】
ステップＳ４Ａにおいて制御部１６は内部温度が第１の温度である冷却開始温度（図２，図３における温度Ｔ１）以上であるか否かを判定する。ステップＳ４Ａにおいて内部温度が冷却開始温度以上である場合（ステップＳ４ＡにおいてＹＥＳの場合）、処理はステップＳ４に進む。一方、ステップＳ４Ａにおいて内部温度が冷却開始温度未満である場合（ステップＳ４ＡにおいてＮＯの場合）、処理は再びステップＳ１に戻る。
【００７１】
ステップＳ４において制御部１６は冷却ファン１０に第１の指示である信号ＳＯＮを送り冷却ファン１０を動作させる。次にステップＳ４１において、制御部１６は温度センサ１４から測定結果ＳＮＳを取得する。
【００７２】
ステップＳ４２において制御部１６は温度変化率を算出する。次にステップＳ４３において、制御部１６は温度変化率と第２の変化率とを比較し、温度変化率が第２の変化率以下であるか否かを判定する。ステップＳ４３において温度変化率が第２の変化率以下である場合（ステップＳ４３においてＹＥＳの場合）、処理は後述するステップＳ６に進む。一方、ステップＳ４３において温度変化率が第２の変化率よりも小さい場合（ステップＳ４３においてＮＯの場合）、処理は再びステップＳ４１に戻る。なお、第２の変化率は、たとえば２～３℃／１分に設定される。
【００７３】
ステップＳ６において、制御部１６は光ディスク装置１の内部温度が第２の温度である冷却終了温度（図２，図３，図５における温度Ｔ２）以下であるか否かを判定する。ステ

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ップＳ６において内部温度が冷却終了温度以下である場合（ステップＳ６においてＹＥＳの場合）、ステップＳ７において制御部１６は冷却ファン１０に第２の指示である信号ＳＯＦＦを送り、冷却ファン１０を停止させる。一方、ステップＳ６において内部温度が冷却終了温度よりも高い場合（ステップＳ６においてＮＯの場合）、処理はステップＳ６Ａに進む。

【００７４】

ステップＳ６Ａにおいて制御部１６は温度センサ１４から測定結果ＳＮＳを取得する。ステップＳ６Ａにおいて制御部１６が測定結果ＳＮＳを取得すると処理は再びステップＳ６に戻る。

【００７５】

以上のように実施の形態２によれば、冷却ファンの動作を開始した後の温度変化率が所定の値以下であり、かつ光ディスク装置内部の温度が冷却終了温度以下である場合に冷却ファンを停止させるので、装置内部の温度上昇を抑えることができるとともに、装置内部の温度が低いにも関わらず冷却ファンを動作させ続けることによる無駄な電力消費を防ぐことができる。

【００７６】

今回開示された実施の形態はすべての点で例示であって制限的なものではないと考えられるべきである。本発明の範囲は上記した説明ではなくて特許請求の範囲によって示され、特許請求の範囲と均等の意味および範囲内でのすべての変更が含まれることが意図される。

【図面の簡単な説明】

【００７７】

【図１】実施の形態１の光ディスク装置を示す概略ブロック図である。
【図２】図１の光ディスク装置１の温度変化の例を示す模式図である。
【図３】図１の光ディスク装置１の別の温度変化の例を示す模式図である。
【図４】実施の形態１の冷却装置による処理を示すフローチャートである。
【図５】実施の形態２の光ディスク装置の温度変化の例を示す模式図である。
【図６】実施の形態２の冷却装置による処理を示すフローチャートである。
【図７】従来の冷却方法による光ディスク装置内部の温度変化を示す図である。

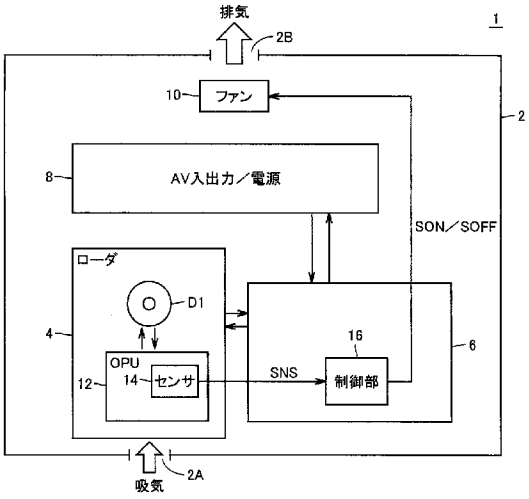
【符号の説明】

【００７８】

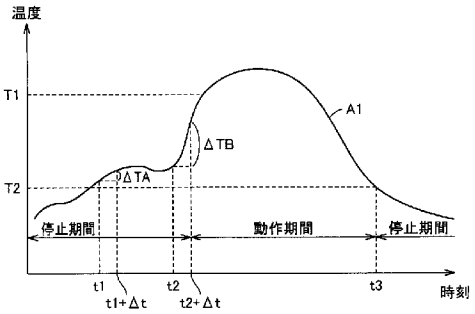
１　光ディスク装置、２　ケース、２Ａ　吸気口、２Ｂ　排気口、４　ローダ、６　制御基板、８　ＡＶ入出力／電源基板、１０　冷却ファン、１２　ＯＰＵ、１４　温度センサ、１６　制御部、Ａ１，Ａ２，Ａ１０，Ａ３１，Ａ３２　曲線、Ｄ１　ディスク、Ｓ１～Ｓ７，Ｓ４１～Ｓ４３，Ｓ４Ａ　ステップ。

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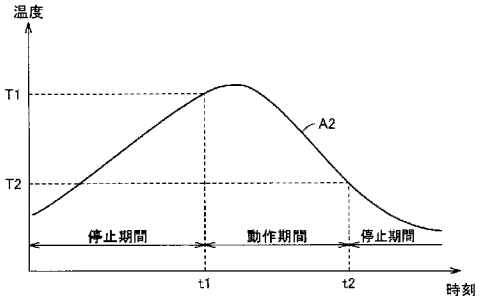
【図１】


排気
1
2B
10
ファン
2
8
AV入出力／電源
SON／SOFF
ローダ
D1
4
16
6
OPU
12
14
センサ
SNS
制御部
2A
吸気

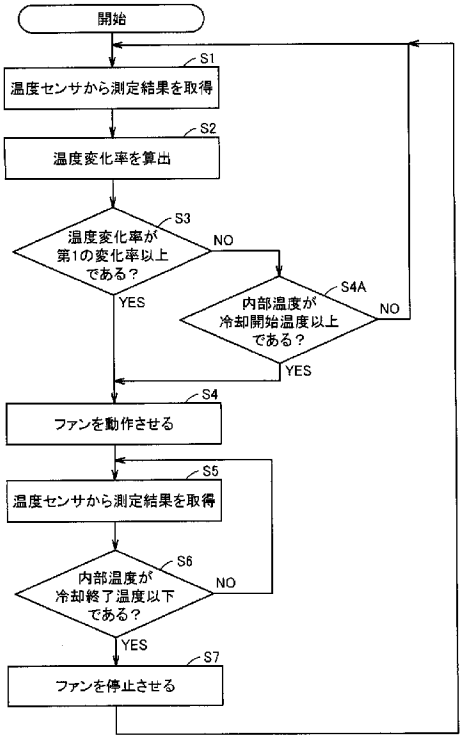
【図２】


温度
T1
A1
ΔTB
ΔTA
T2
停止期間
動作期間
停止期間
t1
t1+Δt
t2
t2+Δt
t3
時刻

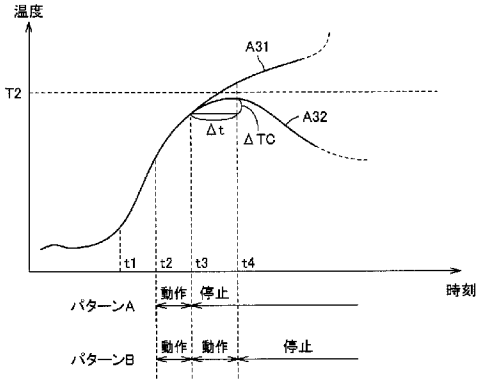
【図３】


温度
T1
A2
T2
停止期間
動作期間
停止期間
t1
t2
時刻

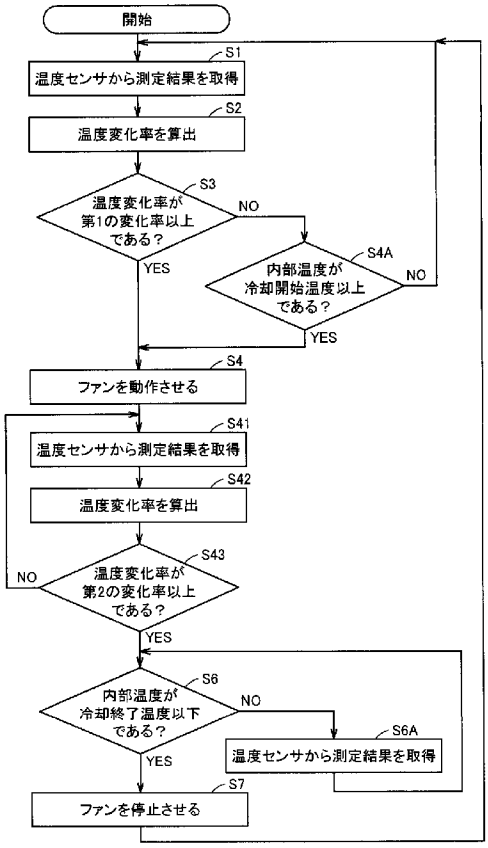
【図４】


開始
S1
温度センサから測定結果を取得
S2
温度変化率を算出
S3
温度変化率が第1の変化率以上である？
NO
YES
S4A
内部温度が冷却開始温度以上である？
NO
YES
S4
ファンを動作させる
S5
温度センサから測定結果を取得
S6
内部温度が冷却終了温度以下である？
NO
YES
S7
ファンを停止させる

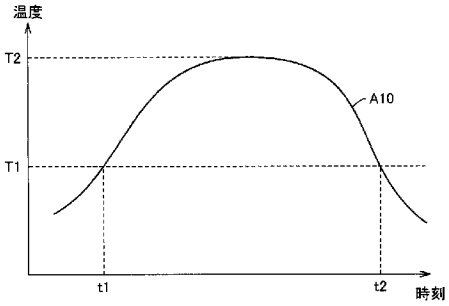
【図５】


温度
A31
T2
Δt
ΔTC
A32
t1
t2
t3
t4
時刻
パターンA
動作
停止
パターンB
動作
動作
停止

【図６】


開始
S1
温度センサから測定結果を取得
S2
温度変化率を算出
S3
温度変化率が第1の変化率以上である？
NO
YES
S4A
内部温度が冷却開始温度以上である？
NO
YES
S4
ファンを動作させる
S41
温度センサから測定結果を取得
S42
温度変化率を算出
S43
温度変化率が第2の変化率以上である？
NO
YES
S6
内部温度が冷却終了温度以下である？
NO
YES
S6A
温度センサから測定結果を取得
S7
ファンを停止させる

【図７】


温度
T2
T1
A10
t1
t2
時刻

フロントページの続き

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Ｆターム(参考) 5E322 AB10 BA01 BB06

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Customer Number:	71799
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出願年月日 Date of Application:	２０１２年　３月　２日
出願番号 Application Number:	特願２０１２－０４６６７３
パリ条約による外国への出願に用いる優先権の主張の基礎となる出願の国コードと出願番号 The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is	ＪＰ２０１２－０４６６７３
出願人 Applicant(s):	日本電気株式会社

２０１３年１０月　４日

特許庁長官
Commissioner,
Japan Patent Office　羽藤秀雄

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【書類名】明細書
【発明の名称】ＩＣＴ機器
【技術分野】
【０００１】
本発明は、冷却用ファンを備えたサーバ装置などのＩＣＴ（Information and Communication Technology）機器、その制御装置、その温度制御方法、および、プログラムに関する。
【背景技術】
【０００２】
従来、サーバ装置などのＩＣＴ機器は、空調設備を備えたマシンルームに設置され、ある程度一定の温度環境で運用されることが多かった。しかし、近年、マシンルームへの投資コストや運用コストを削減するために、外気を取り込み、外気によってＩＣＴ機器内部を冷却するマシンルームへの注目が高まっている。外気を利用したマシンルームは空調設備を備えたマシンルームに比較して室内温度の変化が大きいため、ＩＣＴ機器自身にも内部温度をコントロールする機能を持たせることが望ましい。
【０００３】
内部温度のコントロール機能を持ったＩＣＴ機器としては、次のようなものが知られている（例えば、特許文献１参照）。この特許文献１に記載されているサーバ装置（ＩＣＴ機器）は、冷却ファンと、吸気温度を検出する吸気温度センサと、装置内部の電子部品の温度を検出する部品温度センサと、冷却ファンの回転数を制御する制御部とから構成されている。そして、制御部は、吸気温度センサの検出結果と、部品温度センサの検出結果とに基づいて、ファンの回転数を制御する。より具体的には、制御部は、全ての部品温度センサの検出結果が第１の閾値以下となるまでは、吸気温度センサの検出結果に基づいて、吸気温度が高いときほど、冷却ファンの回転数が高くなるように冷却ファンの回転数を制御する。そして、全ての部品温度センサの検出結果が第１の閾値以下となったら、全ての部品温度センサの検出結果が第２の閾値（第１の閾値＜第２の閾値）となるまでは、部品温度センサの検出結果に基づいて、部品温度センサの検出結果が高いときほど、冷却ファンの回転数が高くなるように、冷却ファンの回転数を制御する。
【先行技術文献】
【特許文献】
【０００４】
【特許文献１】特開２０１１－１５１１３１号公報
【発明の概要】
【発明が解決しようとする課題】
【０００５】
上述した特許文献１に記載されている技術によれば、空調設備を頼らずにＩＣＴ機器内部の温度をコントロールすることができる。しかしながら、特許文献１に記載されている技術では、吸気温度が急激に低下した場合、電子部品の破損や誤動作が発生する恐れがある。つまり、特許文献１に記載されている技術では、吸気温度が急激に低下した場合、例えば、ハードディスクドライブの筐体内壁に結露が発生し、サビを誘発する可能性があるため、ハードディスクドライブの破損や誤動作が発生する恐れがある。一般に、ハードディスクドライブの筐体は、ある程度機密性が保たれているため、吸気温度が急激に低下してもハードディスクドライブの筐体内の内気温度は急激には下がらず、ハードディスクドライブの筐体の内気温度と上記筐体の内壁温度との間に大きな温度差が生じるので、結露が発生する恐れがある。なお、急激な温度変化が発生した場合は、他の電子部品にも結露によるサビが発生し、電子部品の破損や誤動作が発生する恐れがある。
【０００６】
［発明の目的］
そこで、本発明の目的は、吸気温度が急激に低下した場合に電子部品が破損したり、誤動作する恐れがあるという課題を解決したＩＣＴ機器を提供することにある。

【課題を解決するための手段】
【０００７】
本発明にかかるＩＣＴ機器は、
冷却用ファンを備えたＩＣＴ機器であって、
前記ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサと、
該温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出する下降指標値算出手段と、
該下降指標値算出手段で算出された指標値に応じて前記冷却用ファンの回転数を制御する制御手段とを備える。
【０００８】
本発明にかかる制御装置は、
ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出する下降指標値算出手段と、
該下降指標値算出手段で算出された指標値に応じて冷却用ファンの回転数を制御する制御手段とを備える。
【０００９】
本発明にかかる温度制御方法は、
下降指標値算出手段が、ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出し、
制御手段が、前記下降指標値算出手段で算出された指標値に応じて冷却用ファンの回転数を制御する。
【００１０】
本発明にかかるプログラムは、
コンピュータを、
ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出する下降指標値算出手段、
該下降指標値算出手段で算出された指標値に応じて冷却用ファンの回転数を制御する制御手段として機能させる。
【発明の効果】
【００１１】
本発明によれば、吸気温度が急激に低下した場合であっても、電子部品の破損や誤動作が発生しないようにすることができるという効果を得ることができる。
【図面の簡単な説明】
【００１２】
【図１】本発明の第１の実施の形態にかかるＩＣＴ機器１の構成例を示すブロック図である。
【図２】ＩＣＴ機器１における空気の流れを示す図である。
【図３】マネージメント部１７の構成例を示すブロック図である。
【図４】吸気温度推奨範囲、部品温度推奨範囲、及び、動作保証温度範囲の関係を示した図である。
【図５】検出結果記憶部１８５の構成例を示した図である。
【図６】マネージメント部１７内の制御手段１７２の処理例を示すフローチャートである。
【図７】下降指標値の算出方法の１例を示すフローチャートである。
【図８】下降指標値の他の算出方法を示すフローチャートである。
【図９】下降指標値の更に他の算出方法を示すフローチャートである。
【図１０】本発明の第２の実施の形態にかかるＩＣＴ機器１００の構成例を示すブロ

ック図である。
【発明を実施するための形態】
【００１３】
次に、図面を参照して本発明の実施の形態について詳細に説明する。
【００１４】
［本発明の第１の実施の形態］
図１を参照すると、本発明の第１の実施の形態にかかるＩＣＴ機器１は、筐体の前面側に複数のハードディスクドライブ（ＨＤＤ）１１と、吸気温度を検出する温度センサ２１とが配置され、その後方には複数の冷却用ファン１２が配置されている。冷却用ファン１２の後方には、発熱量が多い複数のＣＰＵ１３と、ＣＰＵ１３の部品温度を検出する温度センサ２２，２３が配置されている。更に、その後方には、メモリ１４、電源部１５、ネットワークカードなどの入出力部（ＩＯ部）１６、ＢＭＣ（Base Management Controller）により実現され、制御装置として機能するマネージメント部１７、及び、入出力部１６の部品温度を検出する温度センサ２４が配置されている。
【００１５】
マネージメント部１７は、温度センサ２１～２４の検出結果に基づいて、冷却用ファン１２の回転数を制御する機能を有する。冷却用ファン１２を回転させることにより、図２に示すように、筐体前面に設けられた吸気面（図示せず）から外気が吸気され、ハードディスクドライブ配置エリアＡ→冷却用ファン配置エリアＢ→発熱部品配置エリアＣを介して、筐体背面に設けられた排気面（図示せず）から排気される。
【００１６】
図３を参照すると、マネージメント部１７は、記録手段１７１と、制御手段１７２と、下降指標値算出手段１７３と、ファン駆動部１７４と、ディスク装置などの記憶装置１８とを備えている。
【００１７】
記憶装置１８には、吸気温度推奨範囲記憶部１８１と、部品温度推奨範囲記憶部１８２と、動作保証温度範囲記憶部１８３と、閾値記憶部１８４と、検出結果記憶部１８５とが設けられている。
【００１８】
吸気温度推奨範囲記憶部１８１には、ＩＣＴ機器１を安定して動作させることができる吸気温度の範囲（吸気温度推奨範囲）が記録される。吸気温度が吸気温度推奨範囲外となった場合は、可動部品の故障率が悪化する。
【００１９】
部品温度推奨範囲記憶部１８２には、ＩＣＴ機器１を安定して動作させることができる部品温度の範囲（部品温度推奨範囲）が記録される。一般的に、部品温度はＩＣＴ機器１を構成する電子部品（ＣＰＵなど）が発熱体となるため、吸気温度よりも高くなる。また、部品温度が部品温度推奨範囲外となった場合は、電子部品の故障率が悪化する。
【００２０】
動作保証温度範囲記憶部１８３には、ＩＣＴ機器１が動作可能な温度範囲（動作保証温度範囲）が記録される。
【００２１】
図４に吸気温度推奨範囲、部品温度推奨範囲、及び、動作保証温度範囲の一例を示す。同図に示すように、吸気温度推奨範囲および部品温度推奨範囲の下限値に比較して動作保証温度範囲の下限値が低くなっており、また、吸気温度推奨範囲及び部品温度推奨範囲の上限値に比較して動作保証温度範囲の上限値が高くなっている。なお、図４はあくまで一例であり、ＩＣＴ機器によっては温度関係が異なる場合がある。
【００２２】
閾値記憶部１８４には、ＩＣＴ機器１の部品温度の下降度合いを示す指標値（下降指標値）に対する閾値Ｔｈが記録される。閾値Ｔｈは、ＩＣＴ機器１の設置環境などに応じた値にすればよく、例えば、５℃／時間とすることができる。

【００２３】
検出結果記憶部１８５には、過去一定期間分（本実施の形態では、１時間分とする）の温度センサ２１～２４の検出結果が記録される。図５を参照すると、検出結果記憶部１８５には、温度センサ２２～２４毎に６０個の記録領域＃１～＃６０が設けられている。
【００２４】
ＩＣＴ機器１内の記録手段１７１は、制御手段１７２から周期的（本実施の形態では、１分毎とする）に加えられる記録指示に従って、温度センサ２２～２４によって検出された部品温度を検出結果記憶部１８５に記録する機能や、温度センサ２１で検出された吸気温度、及び、温度センサ２２～２４によって検出された部品温度を制御手段１７２に渡す機能を有する。より具体的には、記録手段１７１は各温度センサ２２～２４に割り当てられている６０個の記録領域＃１～＃６０を循環的に使用して温度センサ２２～２４によって検出された部品温度を記録することにより、過去１時間分の部品温度を検出結果記憶部１８５に記録する。
【００２５】
下降指標値算出手段１７３は、制御手段１７２から加えられる下降指標値算出指示に従って、温度センサ２２～２４毎に、その温度センサによって検出された部品温度の下降度合いを示す下降指標値を算出する機能を有する。なお、下降指標値としては、例えば、下記の（１）～（３）に示す値を使用することができる。
【００２６】
（１）単位時間当たりのＩＣＴ機器１の部品温度の下降量。
（２）複数の測定期間におけるＩＣＴ機器１の部品温度下降率の平均値。部品温度下降率とは、測定期間の開始時点に検出した部品温度ｔ１と終了時点に検出した部品温度ｔ２との差分Δｔを、測定期間で除算した値である。
（３）過去一定期間におけるＩＣＴ機器１の部品温度の最高値と現時点の部品温度との差分。
【００２７】
制御手段１７２は、記録手段１７１に対して記録指示を出力する機能や、下降指標値算出手段１７３に対して下降指標値算出指示を出力する機能や、記録手段１７１から渡された各温度センサ２１～２４の検出結果、各記憶部１８１～１８４の記憶内容、および、下降指標値算出手段１７３によって算出された下降指標値に基づいて、冷却用ファン１２の回転数をＲ１（低速），Ｒ２（中速），Ｒ３（高速）、０（停止）の内の何れにするかを決定する機能や、決定した回転数をファン駆動部１７４に通知する機能を有する。なお、各回転数は０＜Ｒ１＜Ｒ２＜Ｒ３の関係を有する。
【００２８】
ファン駆動部１７４は、制御手段１７２から通知された回転数で冷却用ファン１２を回転させる。
【００２９】
なお、マネージメント部１７は、ＣＰＵ（中央処理装置）で実現可能であり、その場合には、例えば、次のようにする。ＣＰＵを記録手段１７１、制御手段１７２、及び、下降指標値算出手段１７３として機能させるためのプログラムを記録したディスク、半導体メモリ、その他の記録媒体を用意し、ＣＰＵに上記プログラムを読み取らせる。ＣＰＵは、読み取ったプログラムに従って自身の動作を制御することにより、自ＣＰＵ上に記録手段１７１、制御手段１７２、及び、下降指標値算出手段１７３を実現する。
【００３０】
［第１の実施の形態の動作］
次に、図６のフローチャートを参照して本実施の形態の動作について説明する。
【００３１】
ＩＣＴ機器１が起動されると、マネージメント部１７内の制御手段１７２は、記録手段１７１に対して記録指示を出力する（ステップＳ６１）。これにより、記録手段１７１は、温度センサ２２～２４によって検出された部品温度を、検出結果記憶部１８５上に設け

られている温度センサ２２～２４毎の記録領域＃１～＃６０の内の１つ（例えば、記録領域＃１）にすると共に、各温度センサ２１～２４の検出結果を制御手段１７２に渡す。

【００３２】

制御手段１７２は、各温度センサ２１～２４の検出結果が渡されると、先ず、温度センサ２１によって検出された吸気温度が、吸気温度推奨範囲記憶部１８１に記録されている吸気温度推奨範囲内か否かを判定する（ステップＳ６２）。そして、吸気温度推奨温度範囲内である場合（ステップＳ６２がＹｅｓ）は、冷却用ファン１２の回転数を「Ｒ２（通常）」と決定し、決定した回転数をファン駆動部１７４に通知する（ステップＳ６６）。その後、制御手段１７２は一定時間（本実施の形態では、1分）が経過するのを待ち（ステップＳ７２）、その後、ステップＳ６１に処理に戻る。これに対して、吸気温度推奨範囲外であると判定した場合（ステップＳ６２がＮｏ）は、温度センサ２２～２４によって検出された部品温度が全て部品温度推奨範囲記憶部１８２に記録されている部品温度推奨範囲内か否かを判定する（ステップＳ６３）。

【００３３】

そして、温度センサ２２～２４によって検出された部品温度が全て部品温度推奨範囲内である場合（ステップＳ６３がＹｅｓ）は、ファン回転数を「Ｒ２」にすると決定し、決定したファン回転数「Ｒ２」をファン駆動部１７４に通知する（ステップＳ６６）。これに対して、温度センサ２２～２４によって検出された部品温度の中に１個でも部品温度推奨範囲外のものがあった場合（ステップＳ６３がＮｏ）は、ステップＳ６４の処理を行う。

【００３４】

ステップＳ６４では、温度センサ２２～２４によって検出された部品温度の中に、動作保証温度範囲記憶部１８３に記録されている動作保証温度範囲の下限値を下回っているものがあるか否かを判定する。そして、下限値を下回っているものが存在する場合（ステップＳ６４がＹｅｓ）は、制御手段１７２はファン駆動部１７４に対して冷却用ファン１２を停止させることを指示する（ステップＳ６７）。これにより、冷却用ファン１２が停止し、ＣＰＵ１３、ハードディスクドライブ１１等の電子部品の発熱により、部品温度が上昇する。これに対して、温度センサ２２～２４によって検出された全ての部品温度が、動作保証温度範囲の下限値以上であった場合（ステップＳ６４がＮｏ）は、ステップＳ６５の処理を行う。

【００３５】

ステップＳ６５では、温度センサ２２～２４によって検出された部品温度の中に、動作保証温度範囲の上限値を上回っているものがあるか否かを判定する。そして、上限値を上回っているものが存在する場合（ステップＳ６５Ｙｅｓ）は、制御手段１７２はファン回転数を「Ｒ３（高速）」にすると決定し、決定したファン回転数「Ｒ３」をファン駆動部１７４に渡す（ステップＳ６８）。これに対して、温度センサ２２～２４によって検出された部品温度が全て動作保証温度範囲の上限値以下であった場合（ステップＳ６５がＮｏ）は、下降指標値算出手段１７３に対して下降指標値算出指示を出力する（ステップＳ６９）。

【００３６】

これにより、下降指標値算出手段１７３は、部品温度の下降度合いを示す下降指標値を算出し、算出した下降指標値を制御手段１７２に返す。

【００３７】

ここで、下降指標値の算出方法について説明する。下降指標値算出手段１７３は、制御手段１７２から下降指標値算出指示が入力されると、図７のフローチャートに示すように、各温度センサ２２～２４毎に、検出結果記憶部１８５に記録されている最も記録時期が古い部品温度Toと最も記録時期が新しい部品温度Tnとの差分「To―Tn」を求める（ステップＳ７１）。その後、各温度センサ２２～２４毎に求めた差分を、それぞれ温度センサ２２～２４の検出結果に基づいて算出した下降指標値として制御手段１７２に返す（ステップＳ７２）。本実施の形態では、温度センサ２２～２４毎に設けられた６０個の記憶

領域を循環的に使用して、1分間隔で温度センサ２２～２４の検出結果を記録するようにしているので、上記したようにして算出した下降指標値は、単位時間当たり（１時間当たり）の部品温度の下降量となる。

【００３８】

下降指標値の算出方法は、これに限られるものではなく、図８のフローチャートに示す方法を採用することもできる。図８を参照すると、下降指標値算出手段１７３は、下降指標値算出指示が入力されると、温度センサ２２～２４毎に、隣接する記憶領域に記録されている部品温度の差分を求めることにより、記録時期が第１番目に古い部品温度と第２番目に古い部品温度との差分、記録時期が第２番目に古い部品温度と第３番目に古い部品温度との差分、・・・、記録時期が第５９番目に古い部品温度と記録時期が最も新しい部品温度との差分を求める（ステップＳ８１）。

【００３９】

次に、求めた差分を部品温度の検出間隔（本実施の形態では１分）で除算することにより、温度下降率を求める（ステップＳ８２）。その後、温度センサ２２～２４毎に、求めた温度下降率の平均値を求め（ステップＳ８３）、求めた平均値を温度センサ２２～２４の検出結果による下降指標値として制御手段１７２に返す（ステップＳ８４）。

【００４０】

更に、図９のフローチャートに示すような、下降指標値の算出方法を採用することもできる。図９を参照すると、下降指標値算出手段１７３は、制御手段１７２から下降指標値算出指示が入力されると、温度センサ２２～２４毎に、記録されている最も高い部品温度と、記録時期が最も新しい部品温度との差分を求める（ステップＳ９１）。そして、各温度センサ２２～２４毎に求めた差分を、温度センサ２２～２４の検出結果に基づいて算出した下降指標値として制御手段１７２に返す（ステップＳ９２）。

【００４１】

なお、下降指標値の算出方法は、上記した方法に限られるものではない。

【００４２】

制御手段１７２は、下降指標値算出手段１７３から各温度センサ２２～２４についての下降指標値が渡されると、それらと閾値記憶部１８４に記録されている閾値Ｔｈとを比較する（ステップＳ７０）。そして、各温度センサ２２～２４についての下降指標値の内の少なくとも１つが閾値Ｔｈ以上の場合（ステップＳ７０がＹｅｓ）は、ＩＣＴ機器１の部品温度が急激に低下しており、結露が発生する恐れがあると判断し、ファン駆動部１７４に対して冷却用ファン１２の回転停止を指示する（ステップＳ６７）。これにより、冷却用ファン１２が停止し、ハードディスクデバイス１１の筐体などの電子部品の急激な温度低下を防止することができるので、上記筐体内壁などに、結露が発生しないようにすることができる。これに対して、温度センサ２２～２４についての下降指標値が全て閾値未満であると判定した場合（ステップＳ７０がＮｏ）は、ファン駆動部１７４に対してファン回転数を「Ｒ１（低速）」にすることを指示し（ステップＳ７１）、その後、一定時間（１分）が経過するのを待って、ステップＳ６１の処理に戻る。

【００４３】

なお、本実施の形態では、各温度センサ２２～２４についての下降指標値の内の少なくとも1個が閾値以上である場合は、冷却用ファン１２を停止させるようにしたが、下降指標値が大きい場合ほど（下降指標値によって示される部品温度の低下度合いが大きい場合ほど）、冷却用ファン１２の回転数を低下させるような制御を行っても良い。

【００４４】

［第１の実施の形態の効果］

本実施の形態によれば、吸気温度が急激に低下した場合であっても、電子部品の破損や誤動作が発生しないようにすることができるという効果を得ることができる。その理由は、部品温度を検出する温度センサ２２～２４の検出結果に基づいて、部品温度の下降度合いを示す下降指標値を算出し、この算出した下降指標値に基づいて冷却用ファン１２の回転数を制御するようにしているからである。このような下降指標値に基づいたファン回転

数の制御を行うことにより、吸気温度が急激に低下しても、例えば、ハードディスクドライブの筐体内部の内気温度と、上記筐体内壁の温度との温度差を大きくすることがなくなるので、結露によるサビの発生を防ぐことができ、その結果、ハードディスクドライブの破損や誤動作を防止することができる。

【００４５】

［本発明の第２の実施の形態］

次に、本発明の第２の実施の形態にかかるＩＣＴ機器について説明する。

【００４６】

図１０を参照すると、本実施の形態にかかるＩＣＴ機器１００は、冷却用ファン１０１と、温度センサ１０２と、下降指標値算出手段１０３と、制御手段１０４とを備えている。

【００４７】

温度センサ１０２は、ＩＣＴ機器１００に搭載されているハードディスクデバイスやＣＰＵなどの部品温度を検出する。

【００４８】

下降指標値算出手段１０３は、温度センサ１０２の検出結果に基づいて、部品温度の下降度合いを示す下降指標値を算出する。下降指標値としては、例えば、単位時間当たりに部品温度の低下量や、過去一定期間における部品温度の最高値と現時点の部品温度の差分などを使用することができる。

【００４９】

制御手段１０４は、下降指標値算出手段１０３が算出した下降指標値に応じて冷却用ファン１０１の回転数を制御する。より具体的には、制御手段１０４は、下降指標値算出手段１０３で算出された下降指標値によって示される、部品温度の低下度合いが大きい場合ほど、ファンの回転数を低下させる。

【００５０】

なお、下降指標値算出手段１０３及び制御手段１０４は、ＣＰＵによって実現可能であり、その場合は例えば次のようにする。ＣＰＵを下降指標値算出手段１０３及び制御手段１０４として機能させるためのプログラムを記録したディスク、半導体メモリ、その他の記録媒体を用意し、ＣＰＵに上記プログラムを読み取らせる。ＣＰＵは、読み取ったプログラムに従って自身の動作を制御し、自ＣＰＵ上に下降指標値算出手段１０３及び制御手段１０４を実現する。

【００５１】

［第２の実施の形態に効果］

本実施の形態によれば、吸気温度が急激に低下した場合であっても、電子部品の破損や誤動作が発生しないようにすることができるという効果を得ることができる。その理由は、部品温度を検出する温度センサ１０２の検出結果に基づいて、ＩＣＴ機器１の部品温度の下降度合いを示す下降指標値を算出し、この算出した下降指標値に基づいて冷却用ファン１０１の回転数を制御するようにしているからである。

【符号の説明】

【００５２】

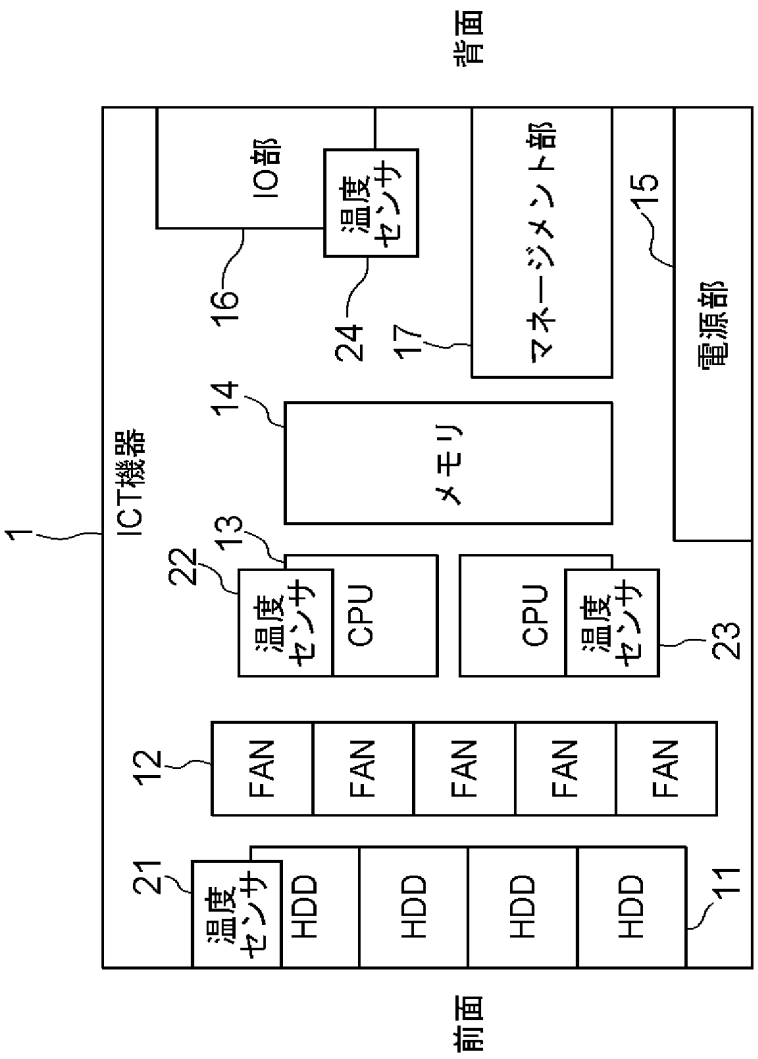
１　　ＩＣＴ機器
１１　　ハードディスクドライブ
１２　　冷却用ファン
１３　　ＣＰＵ
１４　　メモリ
１５　　電源部
１６　　入出力部
１７　　マネージメント部
２１～２４　温度センサ
１００　ＩＣＴ機器

１０１　冷却用ファン
１０２　温度センサ
１０３　下降指標値算出手段
１０４　制御手段
１７１　記録手段
１７２　制御手段
１７３　下降指標値算出手段
１７４　ファン駆動部
１８１　吸気温度推奨範囲記憶部
１８２　部品温度推奨範囲記憶部
１８３　動作保証温度範囲記憶部
１８４　閾値記憶部
１８５　検出結果記憶部

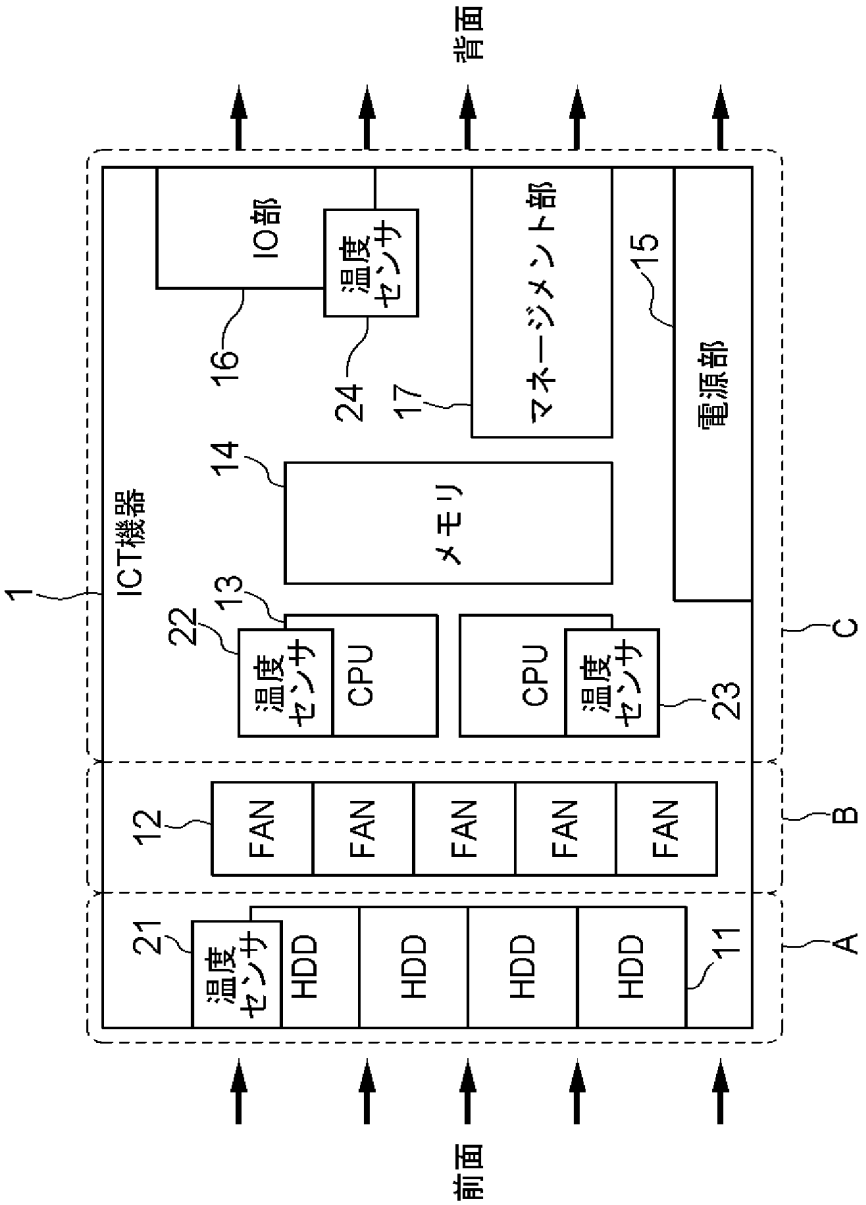
【書類名】特許請求の範囲
【請求項１】
冷却用ファンを備えたＩＣＴ機器であって、
前記ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサと、
該温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出する下降指標値算出手段と、
該下降指標値算出手段で算出された指標値に応じて前記冷却用ファンの回転数を制御する制御手段とを備えたことを特徴とするＩＣＴ機器。
【請求項２】
請求項１記載のＩＣＴ機器において、
前記指標値は、前記電子部品の部品温度の単位時間当たりの下降温度であることを特徴とするＩＣＴ機器。
【請求項３】
請求項１記載のＩＣＴ機器において、
前記指標値は、複数の測定期間における前記電子部品の部品温度の下降率の平均値であることを特徴とするＩＣＴ機器。
【請求項４】
請求項１記載のＩＣＴ機器において、
前記指標値は、過去一定期間における前記電子部品の部品温度の最高値と現時点の部品温度との差分であることを特徴とするＩＣＴ機器。
【請求項５】
請求項１乃至４の何れか１項に記載のＩＣＴ機器において、
前記制御手段は、前記下降指標値算出手段で算出された指標値によって示される前記電子部品の部品温度の低下の度合いが大きい場合ほど、前記冷却用ファンの回転数を低下させることを特徴とするＩＣＴ機器。
【請求項６】
請求項１乃至４の何れか１項に記載のＩＣＴ機器において、
前記制御手段は、前記指標値が予め定められている閾値以上の場合は、前記冷却用ファンを停止させることを特徴とするＩＣＴ機器。
【請求項７】
ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出する下降指標値算出手段と、
該下降指標値算出手段で算出された指標値に応じて冷却用ファンの回転数を制御する制御手段とを備えたことを特徴とする制御装置。
【請求項８】
下降指標値算出手段が、ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出し、
制御手段が、前記下降指標値算出手段で算出された指標値に応じて冷却用ファンの回転数を制御することを特徴とする温度制御方法。
【請求項９】
コンピュータを、
ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出する下降指標値算出手段、
該下降指標値算出手段で算出された指標値に応じて冷却用ファンの回転数を制御する制御手段として機能させるためのプログラム。

【書類名】要約書
【要約】
【課題】冷却用ファンを備えたICT機器において、吸気温度が急激に低下した場合であっても、電子部品の破損や誤動作が発生しないようにする。
【解決手段】温度センサ102は、ICT機器100に搭載された電子部品の部品温度を検出する。下降指標値算出手段103は、温度センサ102の検出結果に基づいて、電子部品の部品温度の下降度合いを示す下降指標値を算出する。下降指標値としては、例えば、単位時間当たりに部品温度の低下量や、過去一定期間における部品温度の最高値と現時点の部品温度の差分などを使用することができる。制御手段104は、下降指標値算出手段103が算出した下降指標値に応じて冷却用ファン101の回転数を制御する。より具体的には、制御手段104は、下降指標値算出手段103で算出された下降指標値によって示される、部品温度の低下度合いが大きい場合ほど、ファンの回転数を低下させる。
【選択図】図１０

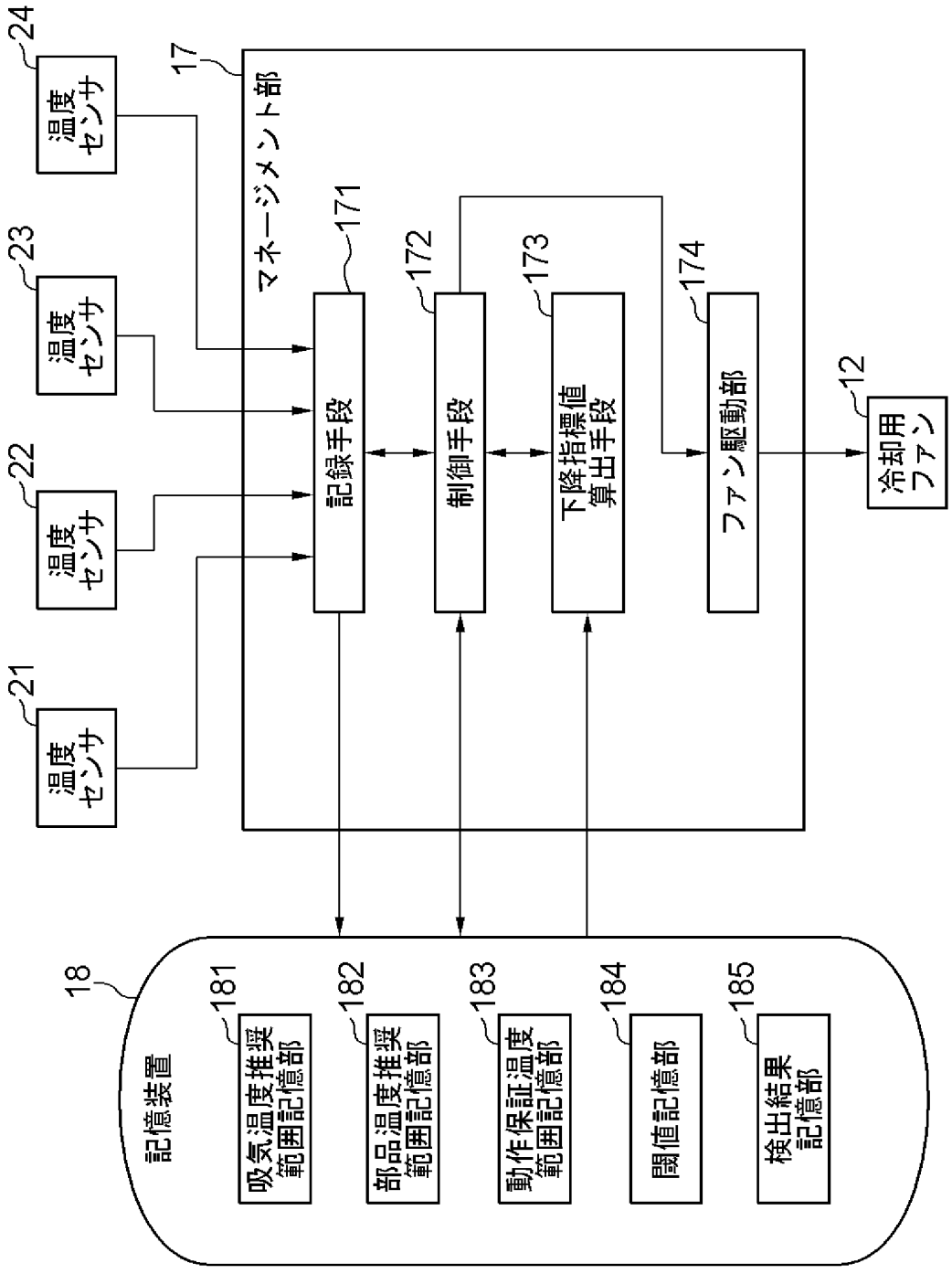
【書類名】図面
【図１】


背面
IO部
温度センサ
16
24
17
マネージメント部
15
電源部
14
メモリ
1
ICT機器
13
22
温度センサ
CPU
CPU
温度センサ
23
12
FAN
FAN
FAN
FAN
FAN
21
温度センサ
HDD
HDD
HDD
HDD
11
前面

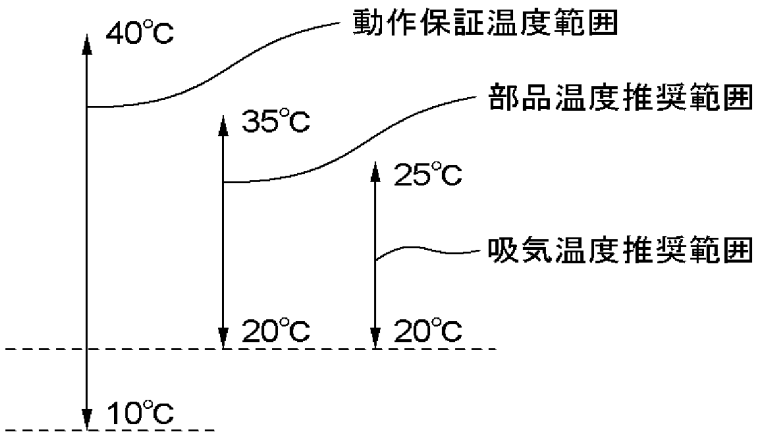
【図２】


背面
IO部
温度センサ
マネージメント部
電源部
16
24
17
15
14
メモリ
1
ICT機器
22
13
温度センサ
CPU
CPU
温度センサ
23
C
12
FAN
FAN
FAN
FAN
FAN
B
21
温度センサ
HDD
HDD
HDD
HDD
11
A
前面

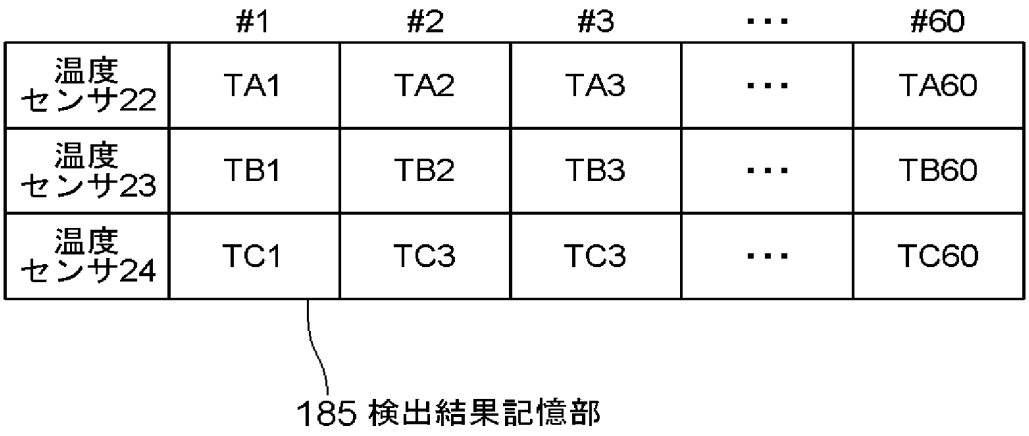
【図３】


24
温度センサ
23
温度センサ
22
温度センサ
21
温度センサ
17
マネージメント部
171
記録手段
172
制御手段
173
下降指標値算出手段
174
ファン駆動部
12
冷却用ファン
18
記憶装置
181
吸気温度推奨範囲記憶部
182
部品温度推奨範囲記憶部
183
動作保証温度範囲記憶部
184
閾値記憶部
185
検出結果記憶部

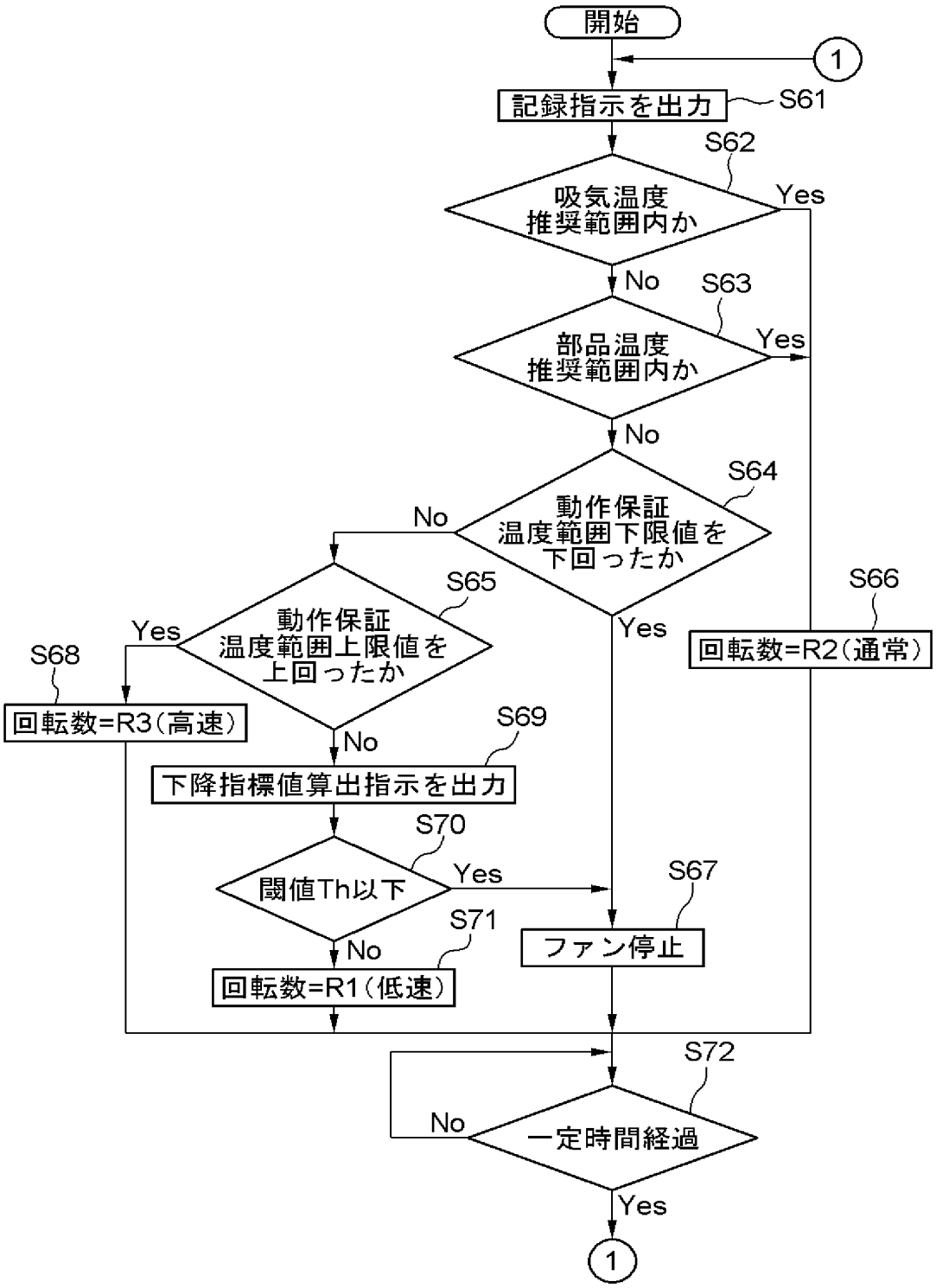
【図４】



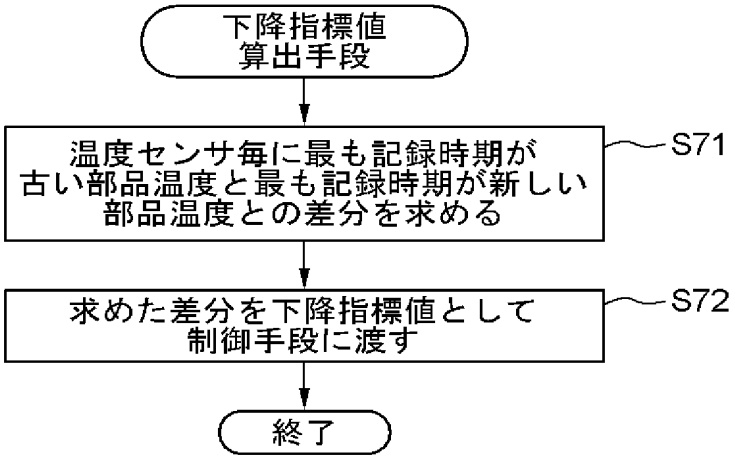
【図５】


#1
#2
#3
・・・
#60
温度センサ22
TA1
TA2
TA3
・・・
TA60
温度センサ23
TB1
TB2
TB3
・・・
TB60
温度センサ24
TC1
TC3
TC3
・・・
TC60
185 検出結果記憶部

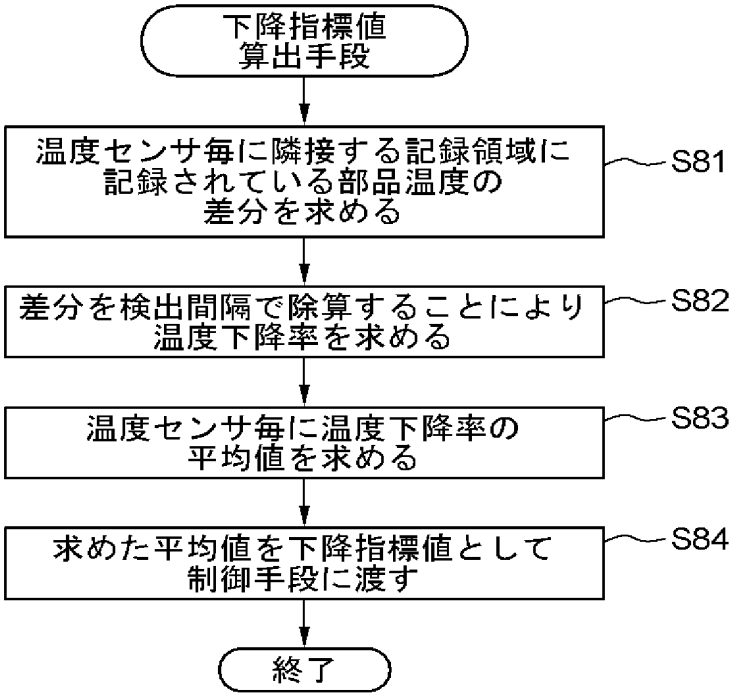
【図６】


開始
1
記録指示を出力
S61
S62
吸気温度
推奨範囲内か
Yes
No
S63
部品温度
推奨範囲内か
Yes
No
S64
動作保証
温度範囲下限値を
下回ったか
No
Yes
S65
動作保証
温度範囲上限値を
上回ったか
Yes
S66
回転数=R2（通常）
S68
回転数=R3（高速）
No
S69
下降指標値算出指示を出力
S70
閾値Th以下
Yes
S67
ファン停止
S71
No
回転数=R1（低速）
S72
No
一定時間経過
Yes
1

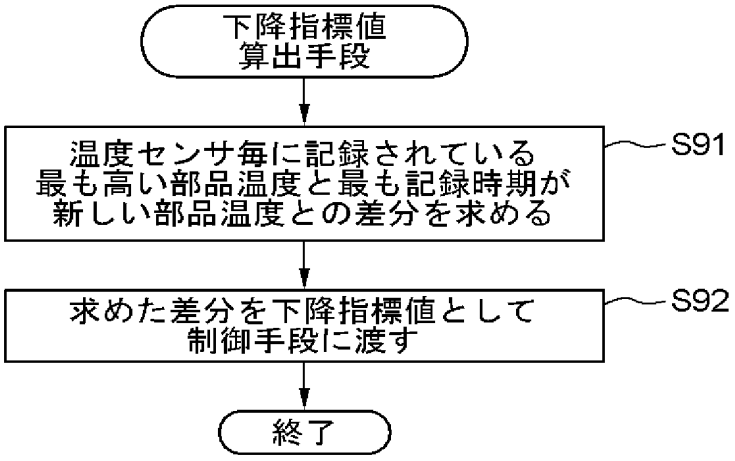
【図７】


下降指標値
算出手段
温度センサ毎に最も記録時期が
古い部品温度と最も記録時期が新しい
部品温度との差分を求める
S71
求めた差分を下降指標値として
制御手段に渡す
S72
終了

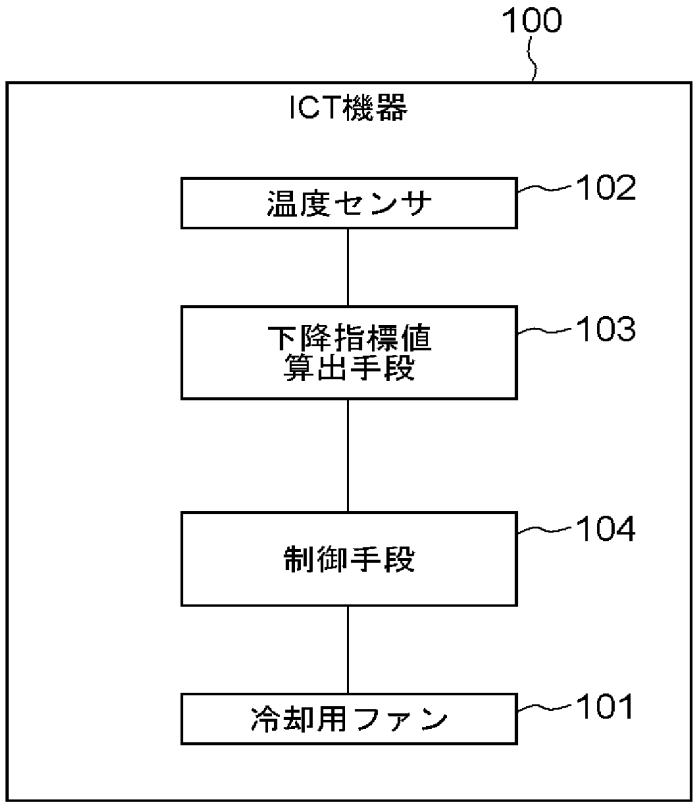
【図８】


下降指標値
算出手段
温度センサ毎に隣接する記録領域に
記録されている部品温度の
差分を求める
S81
差分を検出間隔で除算することにより
温度下降率を求める
S82
温度センサ毎に温度下降率の
平均値を求める
S83
求めた平均値を下降指標値として
制御手段に渡す
S84
終了

【図９】


下降指標値
算出手段
温度センサ毎に記録されている
最も高い部品温度と最も記録時期が
新しい部品温度との差分を求める
S91
求めた差分を下降指標値として
制御手段に渡す
S92
終了

【図１０】



【書類名】　　手続補正書
【整理番号】　　6600000208
【あて先】　　特許庁長官殿
【事件の表示】
　【出願番号】　　特願2012－ 46673
【補正をする者】
　【識別番号】　　000004237
　【氏名又は名称】　日本電気株式会社
【代理人】
　【識別番号】　　100124811
　【弁理士】
　【氏名又は名称】　馬場　資博
【補正により増加する請求項の数】　1
【手続補正1】
　【補正対象書類名】　特許請求の範囲
　【補正対象項目名】　全文
　【補正方法】　　変更
　【補正の内容】
　　【書類名】特許請求の範囲
　　【請求項１】
　冷却用ファンを備えたＩＣＴ機器であって、
　前記ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサと、
　該温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出する下降指標値算出手段と、
　該下降指標値算出手段で算出された指標値に応じて前記冷却用ファンの回転数を制御する制御手段とを備え、
　前記指標値は、複数の測定期間における前記電子部品の部品温度の下降率の平均値であることを特徴とするＩＣＴ機器。
　　【請求項２】
　冷却用ファンを備えたＩＣＴ機器であって、
　前記ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサと、
　該温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出する下降指標値算出手段と、
　該下降指標値算出手段で算出された指標値に応じて前記冷却用ファンの回転数を制御する制御手段とを備え、
　前記指標値は、過去一定期間における前記電子部品の部品温度の最高値と現時点の部品温度との差分であることを特徴とするＩＣＴ機器。
　　【請求項３】
　請求項１または２記載のＩＣＴ機器において、
　前記制御手段は、前記下降指標値算出手段で算出された指標値によって示される前記電子部品の部品温度の低下の度合いが大きい場合ほど、前記冷却用ファンの回転数を低下させることを特徴とするＩＣＴ機器。
　　【請求項４】
　請求項１または２記載のＩＣＴ機器において、
　前記制御手段は、前記指標値が予め定められている閾値以上の場合は、前記冷却用ファンを停止させることを特徴とするＩＣＴ機器。
　　【請求項５】
　ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出する下降指標値算出手段と、

該下降指標値算出手段で算出された指標値に応じて冷却用ファンの回転数を制御する制御手段とを備えた制御装置であって、
前記指標値は、複数の測定期間における前記電子部品の部品温度の下降率の平均値であることを特徴とする制御装置。
【請求項６】
ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出する下降指標値算出手段と、
該下降指標値算出手段で算出された指標値に応じて冷却用ファンの回転数を制御する制御手段とを備えた制御装置であって、
前記指標値は、過去一定期間における前記電子部品の部品温度の最高値と現時点の部品温度との差分であることを特徴とする制御装置
【請求項７】
下降指標値算出手段が、ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出し、
制御手段が、前記下降指標値算出手段で算出された指標値に応じて冷却用ファンの回転数を制御する温度制御方法であって、
前記指標値は、複数の測定期間における前記電子部品の部品温度の下降率の平均値であることを特徴とする温度制御方法。
【請求項８】
下降指標値算出手段が、ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出し、
制御手段が、前記下降指標値算出手段で算出された指標値に応じて冷却用ファンの回転数を制御する温度制御方法であって、
前記指標値は、過去一定期間における前記電子部品の部品温度の最高値と現時点の部品温度との差分であることを特徴とする温度制御方法。
【請求項９】
コンピュータを、
ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出する下降指標値算出手段、
該下降指標値算出手段で算出された指標値に応じて冷却用ファンの回転数を制御する制御手段として機能させるためのプログラムであって、
前記指標値は、複数の測定期間における前記電子部品の部品温度の下降率の平均値であるプログラム。
【請求項１０】
コンピュータを、
ＩＣＴ機器に搭載されている電子部品の部品温度を検出する温度センサの検出結果に基づいて、前記電子部品の部品温度の下降度合いを示す指標値を算出する下降指標値算出手段、
該下降指標値算出手段で算出された指標値に応じて冷却用ファンの回転数を制御する制御手段として機能させるためのプログラムであって、
前記指標値は、過去一定期間における前記電子部品の部品温度の最高値と現時点の部品温度との差分であるプログラム。
【手数料の表示】
【振替番号】　00001122
【納付金額】　4,000円

出願人履歴

０００００４２３７

19900829

新規登録

東京都港区芝五丁目７番１号

日本電気株式会社

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/782,490	03/01/2013	Kumiko SUZUKI	J-13-0032	6072

71799 7590 12/10/2015

Mr. Ryoichi Harada
2100 Pennsylvania Ave., NW
SUITE 560
Washington, DC 20037-3213

EXAMINER	
JARRETT, RYAN A	

ART UNIT	PAPER NUMBER
2121	

NOTIFICATION DATE	DELIVERY MODE
12/10/2015	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

necipca@necam.com
Yuki.Kandathil@necam.com
Ayano.Reid@necam.com

Office Action Summary	Application No. 13/782,490	Applicant(s) SUZUKI, KUMIKO	
	Examiner RYAN JARRETT	Art Unit 2121	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03/01/13*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-8* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-8* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *03/01/13* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☒ All b)☐ Some** c)☐ None of the:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *03/01/13, 04/19/13*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Drawings

The drawings are objected to because Fig. 6 #70 ("NOT HIGHER") conflicts with paragraph [0042] line 5 ("not lower"). In Fig. 6 #70, it appears that "NOT HIGHER" should be replaced with either "NOT LOWER" or simply "HIGHER". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5 and 7-9 are rejected under pre-AIA 35 U.S.C. 102b as being anticipated by Takeshi JP 05-100063.

Takeshi discloses:

1. ICT equipment comprising:

a cooling fan (e.g., Fig. 2 #16);

a temperature sensor that detects a component temperature of an electronic component included in the ICT equipment (e.g., Figs. 2-3 #11);

a declination index value calculation unit that calculates an index value indicating a degree of declination of the component temperature of the electronic component based on a detection result of the temperature sensor (e.g., Fig. 2 #14, [0009]-[0024]); and

a control unit that controls the number of rotations of the cooling fan in accordance with the index value calculated by the declination index value calculation unit (e.g., Fig. 2 #14, [0009]-[0024]).

2. The ICT equipment according to Claim 1, wherein

the index value is a declined temperature per unit time of the component temperature of the electronic component (e.g., [0009]-[0024]).

3. The ICT equipment according to Claim 1, wherein

the index value is an average value of declination rates of the component temperature of the electronic component in a plurality of measurement periods (e.g., [0009]-[0024]).

4. The ICT equipment according to Claim 1, wherein

the index value is a difference between a highest value of the component temperature of the electronic component in a past certain period and a current component temperature (e.g., [0009]-[0024]).

5. The ICT equipment according to Claim 1, wherein

the control unit controls the number of rotations of the cooling fan to be lower as the degree of declination of the component temperature of the electronic component, indicated by the index value calculated by the declination index value calculation unit, is larger (e.g., [0009]-[0024]).

7. A control device comprising:

a declination index value calculation unit (e.g., Fig. 2 #14) that calculates an index value indicating a degree of declination of a component temperature of an electronic component included in ICT equipment, based on a detection result of a temperature sensor that detects the component temperature of the electronic component (e.g., [0009]-[0024]); and

a control unit (e.g., Fig. 2 #14) that controls the number of rotations of a cooling fan in accordance with the index value calculated by the declination index value calculation unit (e.g., Fig. 2 #14, [0009]-[0024]).

8. A temperature controlling method comprising:

by a declination index value calculation unit (e.g., Fig. 2 #14), calculating an index value indicating a degree of declination of a component temperature of an electronic component

included in ICT equipment, based on a detection result of a temperature sensor that detects the component temperature of the electronic component (e.g., [0009]-[0024]); and

by a control unit (e.g., Fig. 2 #14), controlling the number of rotations of a cooling fan in accordance with the index value calculated by the declination index value calculation unit (e.g., [0009]-[0024]).

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 6 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of Yutaka JP 2006-252608.

Takeshi does not explicitly disclose the features of claim 6.

Yutaka (in combination with Takeshi) discloses:

6. The ICT equipment according to Claim 1, wherein

if the index value is not less than a predetermined threshold, the control unit stops the cooling fan (e.g., [0059]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Takeshi with Yutaka since all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded

predictable results to one of ordinary skill in the art at the time of the invention. See KSR v. Teleflex, 127 S.Ct. 1727 (2007).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RYAN JARRETT whose telephone number is (571)272-3742. The examiner can normally be reached on 9:30-6:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Lo can be reached on (571) 272-9774. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RYAN JARRETT/
Primary Examiner, Art Unit 2121

12/07/15

Notice of References Cited	Application/Control No. 13/782,490	Applicant(s)/Patent Under Reexamination SUZUKI, KUMIKO	
	Examiner RYAN JARRETT	Art Unit 2121	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
	A	US-				
	B	US-				
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

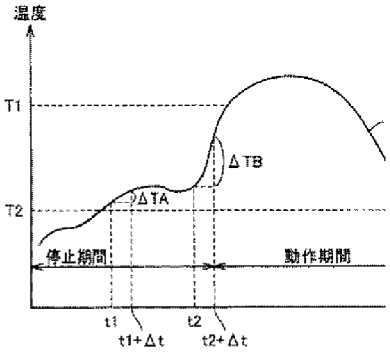
*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	Machine translation of JP 05-100063 (published 04/23/93)
	V	Machine translation of JP 2006-252608
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[JP,2006-252608,A]

Drawing selection

Representative drawing



FULL CONTENTS CLAIM + DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

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FULL CONTENTS

[Claim(s)]

[Claim 1]

It is an optical disk unit provided with a cooling system,
The aforementioned optical disk unit is further provided with an optical pickup unit which performs at least 1 side of playback and record to an optical disc inserted,
The aforementioned cooling system,
A temperature sensor which measures temperature of a place which is in a predetermined distance from the aforementioned optical pickup unit,
A control part which obtains a measurement result from the aforementioned temperature sensor is included,
The aforementioned control part computes a rate of a temporal change of the aforementioned temperature from the aforementioned measurement result, and, in [either a case

where the aforementioned rate of a temporal change is beyond a first rate of change or in case the aforementioned temperature is beyond a first temperature], it outputs a first instruction,
After the aforementioned control part outputs said first instruction, it computes the aforementioned rate of a temporal change by obtaining the aforementioned measurement result from the aforementioned temperature sensor for every predetermined time, and compares the aforementioned rate of a temporal change with a second rate of change smaller than said first rate of change,
The aforementioned control part outputs a second instruction, when the aforementioned rate of a temporal change is below said second rate of change, the aforementioned measurement result is again obtained from the aforementioned temperature sensor for every aforementioned predetermined time and the aforementioned temperature turns into below a second temperature that is a temperature lower than said first temperature,
An optical disk unit which the aforementioned cooling system operates according to said first instruction, and further contains a cooling fan which stops according to said second instruction.
[Claim 2]
It is a cooling system with which an optical disk unit is equipped,
A temperature sensor which measures temperature of a measuring place in an inside of the aforementioned optical disk unit,
A control part which computes a rate of a temporal change of temperature of the aforementioned measuring place by obtaining a measurement result from the aforementioned temperature sensor, and outputs a first instruction when the aforementioned rate of a temporal change is beyond a first rate of change,
A cooling system of an optical disk unit provided with a cooling method to which refrigeration capacity is made to increase according to said first instruction.
[Claim 3]
A cooling system of the optical disk unit according to claim 2 which outputs said first instruction based on the

aforementioned measurement result when temperature of the aforementioned measuring place is beyond a first temperature when the aforementioned rate of a temporal change of the aforementioned control part is smaller than said first rate of change.

[Claim 4]

After it outputs said first instruction, the aforementioned control part obtains the aforementioned measurement result from the aforementioned temperature sensor for every predetermined time, and when temperature of the aforementioned measuring place is below a second temperature lower than said first temperature, it outputs a second instruction,

A cooling system of the optical disk unit according to claim 3 with which the aforementioned cooling method decreases the aforementioned refrigeration capacity according to said second instruction.

[Claim 5]

After the aforementioned control part outputs said first instruction, it computes the aforementioned rate of a temporal change by obtaining the aforementioned measurement result from the aforementioned temperature sensor for every predetermined time, and compares the aforementioned rate of a temporal change with a second rate of change smaller than said first rate of change,

The aforementioned control part outputs a second instruction, when the aforementioned rate of a temporal change is below said second rate of change, the aforementioned measurement result is again obtained from the aforementioned temperature sensor for every aforementioned predetermined time and temperature of the aforementioned measuring place turns into below a second temperature lower than said first temperature,

A cooling system of the optical disk unit according to claim 3 with which the aforementioned cooling method decreases the aforementioned refrigeration capacity according to said second instruction.

[Claim 6]

A cooling system of the optical disk unit according to claim 4 or 5 which is a cooling fan which the aforementioned cooling method operates according to said first instruction, and stops according to said second instruction.

[Claim 7]
The aforementioned optical disk unit is provided with an optical pickup unit which performs at least 1 side of playback and record to an optical disc inserted,
A cooling system of the optical disk unit according to claim 6 which has the aforementioned measuring place in a predetermined distance from the aforementioned optical pickup unit.
[Claim 8]
An optical disk unit which equips any 1 item of 7 with a cooling system of a description from Claim 2.

[Detailed Description of the Invention]
[Field of the Invention]
[0001]
The present invention relates to the optical disk unit which mounts the cooling system mounted on an optical disk unit, and a cooling system.
[Background of the Invention]
[0002]
The optical disk recording device which writes information in optical discs, such as CD (Compact Disc) and DVD (Digital Versatile Disc), The cooling system for generally cooling the inside of an optical disk unit is mounted on optical disk units, such as an optical disk reproducing device which plays information from an optical disc. OPU (optical pickup unit) which equipped the disk with the semiconductor laser for reading and writing information, many semiconductor integrated circuits, etc. are mounted on an optical disk unit. Since operation of OPU and operation of a semiconductor integrated circuit tend to be subject to the influence by temperature, cooling is performed in order to suppress the temperature rise of these circuits.
[0003]
A cooling fan is generally used for a cooling system. The heat which the flow of air arose inside the optical disk unit when the cooling fan operated, and arose in OPU or a semiconductor integrated circuit is taken.
[0004]
The control circuit for controlling the operation of a

temperature sensor or a cooling fan other than a cooling fan is included in an optical disk unit as a cooling system. A control circuit operates a cooling fan based on the measurement result of a temperature sensor, or stops a cooling fan.

[0005]

Fig.7 is the figure showing the temperature change inside the optical disk unit by the conventional cooling method. With reference to Fig.7, the horizontal axis of a graph shows time and a vertical axis shows the temperature of an optical disk unit. The curve A10 is a curve which shows the temperature change of an optical disk unit.

[0006]

When reading information from an optical disc or writing in, a motor rotates a disk at high speed. Therefore, generation of heat from a motor enlarges. In writing information in an optical disc, it reads and the output of laser enlarges rather than the time. In order to write information in an optical disc or to read information, the semiconductor integrated circuit operates. Therefore, if information is read from an optical disc or information is written in an optical disc, the temperature of an optical disk unit will rise.

[0007]

In the time t1, the temperature of an optical disk unit reaches the temperature T1. Cooling is started in the time t1. However, the temperature of an optical disk unit does not immediately fall, but time t1 or later continues a rise gently. The temperature of an optical disk unit rises to the temperature T2, and descends after that. Cooling will be ended if the temperature of an optical disk unit turns into the temperature T1 again in the time t2. After an optical disk unit is cooled sufficiently, in order to stop cooling, the temperature T2 may be lower than the temperature T1.

[0008]

Conventionally, much art about a cooling system is proposed. For example. [JP,H10-64598,A (Patent document 1)] In the battery cooling device provided with the cooling fan which ventilates a battery in cooling wind, The temperature detecting means which detects battery temperature, and the heating value detecting means which detects the calorific value per battery unit time, So that the adjustment air blasting state where the air blasting state demanded according to battery

temperature based on battery temperature and the calorific value per battery unit time was adjusted according to calorific value per battery unit time may be acquired. A battery cooling device containing the control means which controls a cooling fan is disclosed. This battery cooling device makes it possible to reduce the power consumption by a cooling fan.

[0009]

In JP,H5-145259,A (Patent document 2), a cooling system provided with a temperature sensor, the circuit which generates preset temperature, the comparator which measures the output and preset temperature from a temperature sensor, and the fan which carries out rotation according to the output change from a comparator is disclosed. This cooling system makes it possible to perform reduction of power consumption, and reduction of noise.

[0010]

In JP,2003-29850,A (Patent document 3), the cooling system which performs a drive and a stop of a cooling fan is disclosed by having a control means which controls Motor Driver in response to the detecting signal of the 1st, a second temperature sensor, and the 1st and a second temperature sensor inside a device. In this cooling system, after detection temperature is deteriorated from preset temperature, when only a set period carries out the continuous drive of the fan, a heating component etc. can be cooled reliably. In this cooling system, if detection temperature rises more than second preset temperature after stopping a fan before predetermined time passes, by re-driving a fan, the drive of a fan and the repetition frequency of a stop will be reduced conventionally, and power consumption and noise will be reduced.

[Patent document 1] JP,H10-64598,A

[Patent document 2] JP,H5-145259,A

[Patent document 3] JP,2003-29850,A

[Description of the Invention]

[Problem to be solved by the invention]

[0011]

As shown in Fig.7, it was judged whether the conventional cooling system drives a cooling fan only with the temperature of an optical disk unit, or a cooling fan would be stopped. therefore, since the cooling fan was moved in the conventional cooling system after the temperature of the optical disk unit

reached cooling starting temperature, the temperature of an optical disk unit did not have lowering immediately.
[0012]
If the temperature of an optical disk unit becomes an elevated temperature, the problem that operation of a semiconductor integrated circuit becomes unstable, or the output of the semiconductor laser with which OPU is equipped is deteriorated for example, will arise. Since many errors are contained in the information recorded on the optical disc if the output of a semiconductor laser is deteriorated and information cannot be correctly recorded on an optical disc, it becomes easy to produce a reproduction error at the time of playback of a disk. Therefore, especially in the conventional cooling system which judges whether it cools only with temperature, or cooling is stopped, the temperature change in case the temperature of an optical disk unit rises was enlarging.
[0013]
The present invention solves above-mentioned problem and the purpose is to provide the optical disk unit provided with the cooling system and such a cooling system of the optical disk unit which can suppress the temperature rise in an optical disk unit conventionally.
[Means for solving problem]
[0014]
If the present invention is summarized, it will be an optical disk unit provided with a cooling system, and an optical disk unit will further be provided with the optical pickup unit which performs at least 1 side of playback and record to the optical disc inserted. A cooling system is provided with the following.
A temperature sensor which measures temperature of a place which is in a predetermined distance from an optical pickup unit.
A control part which obtains a measurement result from a temperature sensor.

[0015]
A control part computes the rate of a temporal change of temperature from a measurement result, and, in [either the case where the rate of a temporal change is beyond a first rate of change or in case temperature is beyond a first temperature], outputs a first instruction.

[0016]
After a control part outputs a first instruction, it computes the rate of a temporal change by obtaining a measurement result from a temperature sensor for every predetermined time, and compares the rate of a temporal change with a second rate of change smaller than a first rate of change.
[0017]
A control part outputs a second instruction, when the rate of a temporal change is below a second rate of change, a measurement result is again obtained from a temperature sensor for every predetermined time and temperature turns into below a second temperature that is a temperature lower than a first temperature.
[0018]
The cooling system operates according to a first instruction, and further contains the cooling fan which stops according to a second instruction.
[0019]
The temperature sensor which will be a cooling system with which an optical disk unit is equipped, and will measure the temperature of the measuring place in the inside of an optical disk unit if other aspects of affairs of the present invention are followed, The rate of a temporal change of the temperature of a measuring place is computed by obtaining a measurement result from a temperature sensor, and it has a control part which outputs a first instruction when the rate of a temporal change is beyond a first rate of change, and a cooling method to which refrigeration capacity is made to increase according to a first instruction.
[0020]
Preferably, based on a measurement result, when the rate of a temporal change is smaller than a first rate of change, a control part outputs a first instruction, when the temperature of a measuring place is beyond a first temperature.
[0021]
More preferably, after a control part outputs a first instruction, a measurement result is obtained from a temperature sensor for every predetermined time, when the temperature of a measuring place is below a second temperature lower than a first temperature, a second instruction is outputted, and, as for a cooling method, refrigeration capacity is decreased according

to a second instruction.
[0022]
More preferably, after a control part outputs a first instruction, it computes the rate of a temporal change by obtaining a measurement result from a temperature sensor for every predetermined time, and compares the rate of a temporal change with a second rate of change smaller than a first rate of change. A control part outputs a second instruction, when the rate of a temporal change is below a second rate of change, a measurement result is again obtained from a temperature sensor for every predetermined time and the temperature of a measuring place turns into below a second temperature lower than a first temperature. A cooling method decreases refrigeration capacity according to a second instruction.
[0023]
Still more preferably a cooling method is a cooling fan which operates according to a first instruction and stops according to a second instruction.
[0024]
Still more preferably, an optical disk unit is provided with the optical pickup unit which performs at least 1 side of playback and record to the optical disc inserted, and a measuring place is in a predetermined distance from an optical pickup unit.
[0025]
Still more preferably an optical disk unit is an optical disk unit provided with one of above-mentioned cooling systems.
[Effect of the Invention]
[0026]
Since it judges whether a cooling fan is operated based on the rate of change in the temperature in an optical disk unit according to the cooling system of the optical disk unit of the present invention, and the optical disk unit of the present invention, cooling can be started before the temperature inside an optical disk unit becomes high too much. Therefore, the temperature rise inside an optical disk unit can be suppressed conventionally.
[Best Mode of Carrying Out the Invention]
[0027]
Below, with reference to Drawings, it describes in detail about an embodiment of the invention. The identical codes in the figure show a same or considerable portion.

[0028]
[Embodiment 1]
Fig.1 is a schematic block diagram showing the optical disk unit of embodiment 1. With reference to Fig.1, the optical disk unit 1 is the DVD player and DVD recorder only for reproduction, for example. The optical disk unit 1 is provided with the case 2. The inlet port 2A and exhaust-port 2B are provided by the case 2. When air flows towards exhaust-port 2B from the inlet port 2A, the inside of the optical disk unit 1 is cooled.
[0029]
The optical disk unit 1 is further provided with the loader 4, the control board 6, the AV input and output / power source substrate 8, and the cooling fan 10.
[0030]
The loader 4 is a device for conveying the disk D1. The loader 4 contains the optical pickup unit (OPU:Optical Pickup Unit) 12 for performing playback of information, and at least 1 side of record of information to the optical disc (disk D1) inserted.
[0031]
OPU12 contains the temperature sensor 14. The temperature sensor 14 measures the temperature of a predetermined place. Specifically, the temperature sensor 14 measures the temperature around OPU12 (i.e., the air of the place which is in a predetermined distance from OPU12). The temperature sensor 14 is a thermistor, for example.
[0032]
As for the temperature sensor 14, providing around OPU12 is preferable. Since OPU is crowded with a semiconductor laser (not shown) or semiconductor integrated circuits (not shown), it is for a semiconductor laser and a semiconductor integrated circuit tending to be subject to the influence of temperature, while being for temperature to rise easily at the time of operation. However, the position to which a temperature sensor is attached may not be limited to the circumference of OPU12, for example, the temperature sensor 14 may be provided by the control board 6. Many semiconductor integrated circuits (not shown) which are easy to be subject to the influence of temperature are mounted on the control board 6. Since cooling can be started before the temperature of a control board becomes high too much, when the temperature sensor 14 is provided by the control board 6, operation of the optical disk

unit 1 can be stabilized.
[0033]
The control board 6 controls operation of the optical disk unit 1 whole. The control board 6 contains the control part 16. When the control part 16 shows an example, it is CPU (Central Processing Unit). The control part 16 obtains the measurement result SNS from the temperature sensor 14 for every predetermined time, and asks for the rate of a temporal change of the temperature inside the optical disk unit 1 (it is also hereafter called temperature change rates).
[0034]
The control part 16 will send the signal SON which is a first instruction to the cooling fan 10, if temperature change rates are beyond a first rate of change. The cooling fan 10 starts operation according to the signal SON. The control part 16 obtains a measurement result from the temperature sensor 14, even after outputting the signal SON. The control part 16 will send the signal SOFF which is a second instruction to the cooling fan 10, if the temperature of optical disk unit 1 inside turns into below cooling finishing temperature. The cooling fan 10 stops in response to the signal SOFF. Since cooling is started before the temperature inside a device becomes an elevated temperature, it can prevent the inside of an optical disk unit becoming an elevated temperature.
[0035]
When the temperature inside the optical disk unit 1 rises gently, temperature change rates become smaller than the rate of change used as conditions for the control part 16 to output the signal SON. In this case, the control part 16 will output the signal SON, if the temperature of optical disk unit 1 inside is more than cooling starting temperature. Since the temperature change rates at the time of temperature rise are small, if the cooling fan operates, the temperature inside the optical disk unit 1 will begin to be deteriorated for a short time as compared with the case where temperature change rates are large.
[0036]
Here, cooling starting temperature is a first temperature that is conditions for the control part 16 to output the signal SON (first instruction). Cooling finishing temperature is a second temperature which is conditions for the control part 16 to

output the signal SOFF (second instruction).
[0037]
As mentioned above, the control part 16 will operate the cooling fan 10, if the temperature change rates at the time of the temperature rise of the optical disk unit 1 are that either whose temperature of beyond a first rate of change and the optical disk unit 1 is cooling starting temperature.
[0038]
AV input and output / power source substrate 8 outputs and inputs information to AV equipment, such as a television set which is not illustrated and audio equipment. AV input and output / power source substrate 8 receives the information for recording on the disk D1 from the AV equipment which is not illustrated, or outputs it to the AV equipment which does not have the information played from the disk D1 illustrated. AV input and output / power source substrate 8 contains the power supply section (not shown) which supplies the operation power voltage of the optical disk unit 1.
[0039]
The cooling fan 10 is a cooling method of the present invention. The cooling method of the present invention makes refrigeration capacity increase in response to a first instruction, and decreases refrigeration capacity in response to a second instruction. Specifically, if the cooling fan 10 operates in response to the signal SON, it will produce the flow of the air which goes to exhaust-port 2B from the inlet port 2A, and will stop in response to the signal SOFF. However, the cooling fan 10 raises the rotational speed of a fan, when it always operates and the signal SON is received, while power supply voltage was supplied, and when the signal SOFF is received, it may perform operation of lowering the rotational speed of a fan.
[0040]
The cooling method of the present invention is not limited to a cooling fan. As long as cool the inside of the optical disk unit 1, it makes refrigeration capacity increase according to a first instruction and it decreases refrigeration capacity according to a second instruction, a Peltier device, the air conditioner of a water cooling type, etc. may be sufficient as the cooling method of the present invention.
[0041]
The cooling system applied to the present invention in Fig.1 is

constituted by the cooling fan 10, the temperature sensor 14, and the control part 16.
[0042]
Fig.2 is a mimetic diagram showing the example of the temperature change of the optical disk unit 1 of Fig.1. It is a curve the curve A1 indicates the temporal change of the temperature of the optical disk unit 1 to be with reference to Fig.2. The temperature T1 and T2 shown in a vertical axis shows a first temperature (cooling starting temperature) and second temperature (cooling finishing temperature), respectively.
[0043]
The temperature change rates (=deltaTA/deltat) of a before [from the time t1 / time t1+deltat] are smaller than a first rate of change. On the other hand, the temperature change rates (=deltaTB/deltaT) of a before [from the time t2 / time t2+deltat] are larger than a first rate of change. Therefore, in time t2+deltat, the cooling fan 10 starts operation. As mentioned above, the cooling system of the present invention will start cooling, if temperature change rates are beyond a first rate of change. Therefore, the temperature in time t2+deltat at the time of a cooling start is lower than the temperature T1.
[0044]
After time t2+deltat, the temperature of the optical disk unit 1 once rises, and is deteriorated. In the time t3, the temperature of optical disk unit 1 inside reaches the temperature T2. The cooling fan 10 stops after time t3. That is, the period of time t2+deltat − the time t3 is an operation period of the cooling fan 10, and the period after period [before the time t1] and time t3 is a stop period of the cooling fan 10.
[0045]
As an example of the temperature T1 and T2, the temperature T1 is 60 degrees C, and the temperature T2 is 45 degrees C. However, the same temperature may be sufficient as the temperature T1 and the temperature T2. First rates of change are 10 degrees C/1 minute, for example.
[0046]
Fig.3 is a mimetic diagram showing the example of another temperature change of the optical disk unit 1 of Fig.1. It is a curve the curve A2 indicates the temporal change of the temperature of the optical disk unit 1 to be with reference to

Fig.3. In the curve A2, the temperature change rates at the time of temperature rise are lower than first temperature change rates. In this case, if the temperature of optical disk unit 1 inside reaches the temperature T1 which is cooling starting temperature in the time t1, the control part 16 will send the signal SON to the cooling fan 10, and the cooling fan 10 will start operation. After time t1, the optical disk unit 1 is cooled, and if the temperature inside a device reaches the temperature T2 which is cooling finishing temperature in the time t2, the cooling fan 10 will suspend operation.

[0047]

In the case of the curve A2 shown in Fig.3, the cooling fan 10 operated between the time t1 – the time t2, and has suspended the cooling fan 10 during the period after period [before the time t1], and time t2. Since the temperature change rates at the time of temperature rise are lower than first temperature change rates, time after the cooling fan operates until the temperature of optical disk unit 1 inside begins to be deteriorated becomes shorter than the curve A1 of Fig.2. That is, as compared with the operation period (time t2+deltat – period of the time t3) of the cooling fan 10 in Fig.2, the operation period (period of the time t1 – the time t2) of the cooling fan 10 in Fig.3 becomes short.

[0048]

Fig.4 is a flow chart which shows processing by the cooling system of embodiment 1. If processing is started with reference to Fig.4, in Step S1, the control part 16 will obtain the measurement result SNS from the temperature sensor 14 for every predetermined time. Next, in Step S2, the control part 16 computes temperature change rates based on the measurement result SNS.

[0049]

In Step S3, the control part 16 judges whether temperature change rates are beyond a first rate of change. When the rate of a temporal change is beyond a first rate of change (in the case [Setting to Step S3.] of YES), processing proceeds to step S4. On the other hand, when temperature change rates are less than a first rate of change (in the case [Setting to Step S3.] of NO), processing proceeds to step S4A.

[0050]

It describes about processing of step S4A. In step S4A, it is

judged whether the control part 16 is more than the cooling starting temperature (temperature T1 in Fig.2 and Fig.3) whose degree of internal temperature is a first temperature. When the degree of internal temperature is more than cooling starting temperature in step S4A (in the case [Setting to step S4A.] of YES), processing proceeds to step S4. On the other hand, when the degree of internal temperature is less than cooling starting temperature in step S4A (in the case [Setting to step S4A.] of NO), processing returns to Step S1 again.

[0051]

In step S4, the control part 16 sends the signal SON which is a first instruction to the cooling fan 10, and operates the cooling fan 10. In Step S5, the control part 16 obtains the measurement result SNS from the temperature sensor 14 for every predetermined time. In Step S6, the control part 16 judges whether it is below the cooling finishing temperature (temperature T2 in Fig.2 and Fig.3) whose degree of internal temperature of the optical disk unit 1 is a second temperature based on the measurement result SNS.

[0052]

When the degree of internal temperature is below cooling finishing temperature in Step S6 (in the case [Setting to Step S6.] of YES), processing proceeds to Step S7. On the other hand, when the degree of internal temperature is higher than cooling finishing temperature in Step S6 (in the case [Setting to Step S6.] of NO), processing returns to Step S5 again.

[0053]

In Step S7, the control part 16 sends the signal SOFF which is a second instruction to the cooling fan 10, and stops the cooling fan 10. After processing of Step S7 is completed, processing returns to Step S1 again.

[0054]

Since cooling can be started according to embodiment 1 as mentioned above before the temperature inside a device will become high too much when the cooling fan operates if the temperature change rates of the temperature inside an optical disk unit are beyond a predetermined value, it becomes possible to suppress the rise of the temperature inside a device.

[0055]

[Embodiment 2]

In embodiment 2, it is different from embodiment 1 in that the rate of change in the temperature of an optical disk unit is continuously computed even after making operation of a cooling fan start.

[0056]

Since the composition of the optical disk unit of embodiment 2 is the same as the composition of the optical disk unit 1 of Fig.1, the description after being related with the composition of embodiment 2 is not repeated.

[0057]

In embodiment 1, if the temperature inside the device after operating a cooling fan is below cooling finishing temperature, a cooling fan will stop. However, when the writing of information is performed to an optical disc just after an optical disk unit starts, the temperature inside a device rises suddenly by processing of a semiconductor integrated circuit or processing of OPU. Therefore, even if the temperature after operating a cooling fan is below cooling finishing temperature, if a cooling fan is suspended, the temperature of an optical disk unit may rise suddenly. In such a case, even if it reboots a cooling fan, cooling of an optical disk unit does not meet the deadline, but temperature may become high too much.

[0058]

When the temperature change rates of an optical disk unit become small after operating a cooling fan and the temperature at that time is below cooling finishing temperature on the other hand, even if a cooling fan stops, it is whether the temperature of an optical disk unit continue falling from cooling finishing temperature, or to go up slightly from cooling finishing temperature. If the cooling fan continues operating in such the state, the chilling effect by a cooling fan will not be exerted, but electric power will be consumed vainly.

[0059]

By embodiment 2, even after making operation of a cooling fan start, a control part computes the rate of change in the temperature of an optical disk unit, and compares the temperature change rates with second temperature change rates lower than first temperature change rates. In embodiment 2, if the rate of change in the temperature of an optical disk unit is below second temperature change rates, a control part will judge whether the temperature of an optical disk unit is

below cooling finishing temperature, and if the temperature of an optical disk unit is below cooling finishing temperature, a cooling fan will be suspended.

[0060]

Therefore, in embodiment 2, since the cooling fan continues operating when the temperature of an optical disk unit continues rising with the rate of change beyond second temperature change rates even if the temperature of an optical disk unit is below cooling finishing temperature, it can suppress that the temperature of an optical disk unit rises suddenly. The rate of change in the temperature of an optical disk unit is lower than second temperature change rates, and since a cooling fan will stop if the temperature at that time is the temperature below a cooling shut down, useless operation of a cooling fan can be prevented and power consumption is reduced.

[0061]

Fig.5 is a mimetic diagram showing the example of the temperature change of the optical disk unit of embodiment 2. With reference to Fig.5, the curve A31 shows the temperature change of the optical disk unit of embodiment 1, and the curve A32 shows the temperature change of the optical disk unit of embodiment 2. The pattern A and the pattern B show the operation pattern of embodiment 1 and the cooling fan in [each] 2.

[0062]

The temperature inside a device rises in the period from the time t1 to the time t2. Since the temperature change rates from the time t1 to the time t2 are more than a predetermined value, in both embodiment 1 and 2, the cooling fan operates in the time t2.

[0063]

Next, the temperature inside a device is measured by CPU in the time t3. The temperature inside the device in the time t3 is less than temperature T2. That is, the temperature inside a device is below the cooling finishing temperature which is a second temperature.

[0064]

Since a cooling fan will stop if the temperature inside a device is less than temperature T2 in embodiment 1 as shown in the curve A31 and the pattern A, a cooling fan stops in the time t3.

However, as shown in the curve A31, after time t3, the temperature inside a device continues rising and the temperature of a device exceeds the temperature T2 at the time t4.

[0065]

However, in the case of embodiment 1, conditions for the cooling fan to operate are whether the temperature inside a device turns into the temperature T1 which is a first temperature, or the temperature change rates at the time of a rise become beyond a first rate of change. When one of the above-mentioned conditions is fulfilled and the cooling fan operates, time for the temperature of an optical disk unit to fall to the temperature T2 may become long.

[0066]

On the other hand, by embodiment 2, as shown in the curve A32 and the pattern B, since the temperature change rates in the time t2 - the time t3 are beyond a second rate of change even if the temperature of the optical disk unit in the time t3 is less than temperature T2 that is cooling finishing temperature, the cooling fan continues operating. The temperature change rates (=deltaTC/deltat) in the time t3 - the time t4 are below second temperature change rates, and are lower than the temperature T2. [of the temperature of the optical disk unit in the time t4] Therefore, in embodiment 2, a cooling fan stops in the time t4.

[0067]

Fig.6 is a flow chart which shows processing by the cooling system of embodiment 2. The processing in each step of Step S1 - S4, S4A, S6, and S7 is [in / with reference to Fig.4 and Fig.6 / the flow chart of Fig.6] the same as that of the step to which the flow chart of Fig.4 corresponds. The flow chart of Fig.6 differs from the flow chart of Fig.4 in that Step S41 - Step S43, and Step S6A are contained between step S4 and Step S7. Hereinafter, details are described about the flow chart of Fig.6.

[0068]

If processing is started, in Step S1, the control part 16 will obtain the measurement result SNS from the temperature sensor 14 for every predetermined time. Next, in Step S2, the control part 16 computes temperature change rates based on the measurement result SNS.

[0069]
In Step S3, the control part 16 judges whether temperature change rates are beyond a first rate of change. When temperature change rates are beyond a first rate of change (in the case [Setting to Step S3.] of YES), processing proceeds to step S4. On the other hand, when temperature change rates are less than a first rate of change (in the case [Setting to Step S3.] of NO), processing proceeds to step S4A. A first rate of change is set up in 10 degrees C/1 minute like embodiment 1, for example.
[0070]
In step S4A, it is judged whether the control part 16 is more than the cooling starting temperature (temperature T1 in Fig.2 and Fig.3) whose degree of internal temperature is a first temperature. When the degree of internal temperature is more than cooling starting temperature in step S4A (in the case [Setting to step S4A.] of YES), processing proceeds to step S4. On the other hand, when the degree of internal temperature is less than cooling starting temperature in step S4A (in the case [Setting to step S4A.] of NO), processing returns to Step S1 again.
[0071]
In step S4, the control part 16 sends the signal SON which is a first instruction to the cooling fan 10, and operates the cooling fan 10. Next, in Step S41, the control part 16 obtains the measurement result SNS from the temperature sensor 14.
[0072]
In Step S42, the control part 16 computes temperature change rates. Next, in Step S43, the control part 16 compares temperature change rates with a second rate of change, and it is judged whether temperature change rates are below a second rate of change. When temperature change rates are below a second rate of change in Step S43 (in the case [Setting to Step S43.] of YES), processing proceeds to Step S6 mentioned below. On the other hand, when temperature change rates are smaller than a second rate of change in Step S43 (in the case [Setting to Step S43.] of NO), processing returns to Step S41 again. A second rate of change is set up in 2-3 degrees C/1 minute, for example.
[0073]
In Step S6, it is judged whether the control part 16 is below the

cooling finishing temperature (temperature T2 in Fig.2, Fig.3, and Fig.5) whose degree of internal temperature of the optical disk unit 1 is a second temperature. When the degree of internal temperature is below cooling finishing temperature in Step S6 (in the case [Setting to Step S6.] of YES), in Step S7, the control part 16 sends the signal SOFF which is a second instruction to the cooling fan 10, and stops the cooling fan 10. On the other hand, when the degree of internal temperature is higher than cooling finishing temperature in Step S6 (in the case [Setting to Step S6.] of NO), processing proceeds to Step S6A.

[0074]

In Step S6A, the control part 16 obtains the measurement result SNS from the temperature sensor 14. If the control part 16 obtains the measurement result SNS in Step S6A, processing will return to Step S6 again.

[0075]

Since a cooling fan is stopped according to embodiment 2 as mentioned above when temperature change rates after starting operation of a cooling fan are below a predetermined value and the temperature inside an optical disk unit is below cooling finishing temperature, While being able to suppress the temperature rise inside a device, although the temperature inside a device is low, the useless power consumption by continuing operating a cooling fan can be prevented.

[0076]

With all the points, the embodiment disclosed this time is illustration and should be considered not to be restrictive. The range of the present invention is shown by the above-mentioned not a description but Claims, and it is meant that Claims, an equivalent meaning, and all the change in within the limits are included.

[Brief Description of the Drawings]

[0077]

[Drawing 1]It is a schematic block diagram showing the optical disk unit of embodiment 1.

[Drawing 2]It is a mimetic diagram showing the example of the temperature change of the optical disk unit 1 of Fig.1.

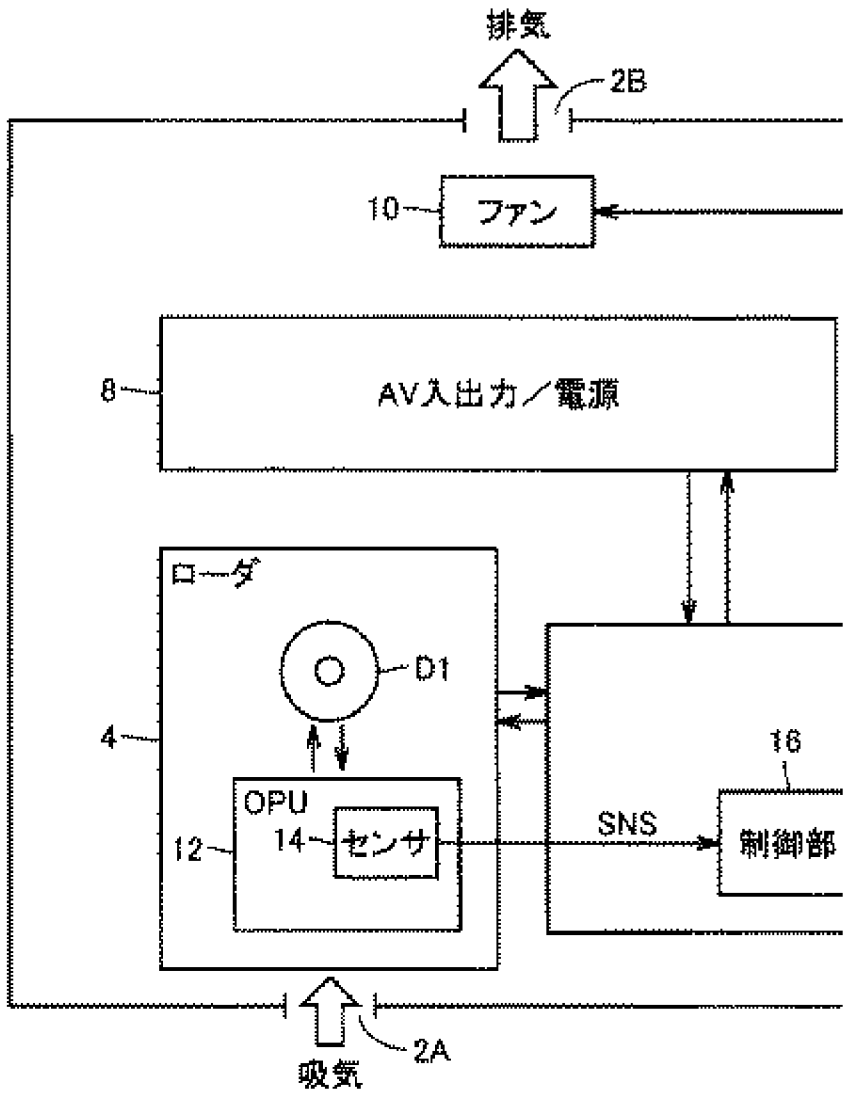
[Drawing 3]It is a mimetic diagram showing the example of another temperature change of the optical disk unit 1 of Fig.1.

[Drawing 4]It is a flow chart which shows processing by the

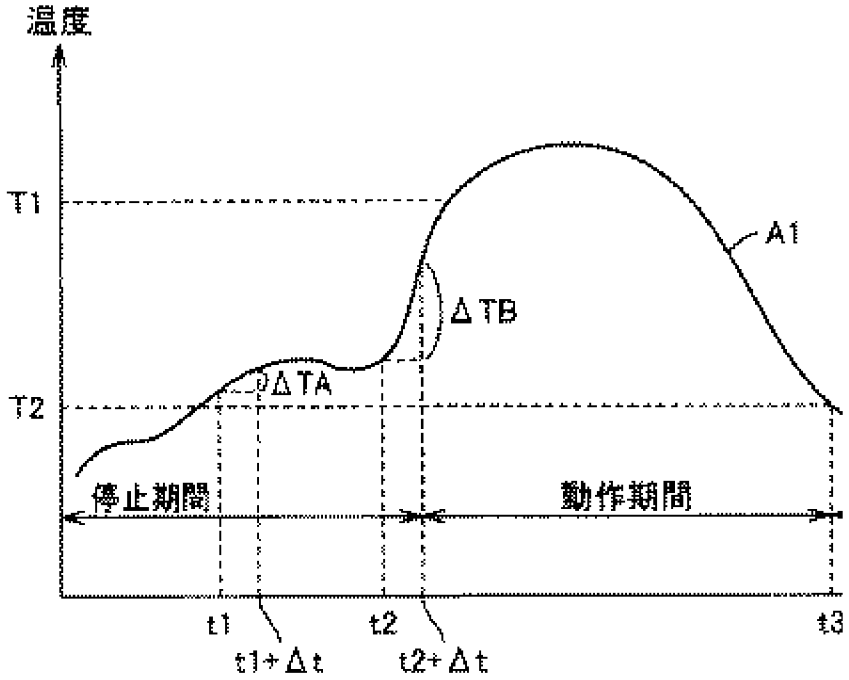
cooling system of embodiment 1.
[Drawing 5]It is a mimetic diagram showing the example of the temperature change of the optical disk unit of embodiment 2.
[Drawing 6]It is a flow chart which shows processing by the cooling system of embodiment 2.
[Drawing 7]It is the figure showing the temperature change inside the optical disk unit by the conventional cooling method.
[Explanations of letters or numerals]
[0078]
1 Optical disk unit and 2 [Loader,] Case and 2A Inlet port and 2B Exhaust port and 4 6 A control board, 8 AV input and output / power source substrate, 10 cooling fans, 12 OPU, 14 temperature sensors, and 16 [Step.] A control part, and A1, A2, A10, A31 and A32 A curve and D1 A disk, S1-S7, S41-S43, and S4A

[Brief Description of the Drawings]
[0077]
[Drawing 1]It is a schematic block diagram showing the optical disk unit of embodiment 1.
[Drawing 2]It is a mimetic diagram showing the example of the temperature change of the optical disk unit 1 of Fig.1.
[Drawing 3]It is a mimetic diagram showing the example of another temperature change of the optical disk unit 1 of Fig.1.
[Drawing 4]It is a flow chart which shows processing by the cooling system of embodiment 1.
[Drawing 5]It is a mimetic diagram showing the example of the temperature change of the optical disk unit of embodiment 2.
[Drawing 6]It is a flow chart which shows processing by the cooling system of embodiment 2.
[Drawing 7]It is the figure showing the temperature change inside the optical disk unit by the conventional cooling method.

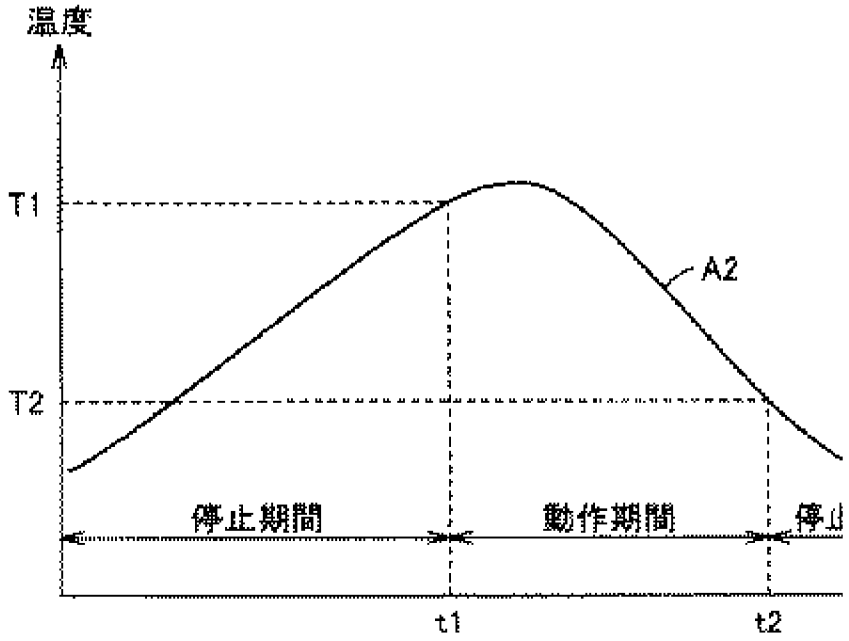
[Drawing 1]



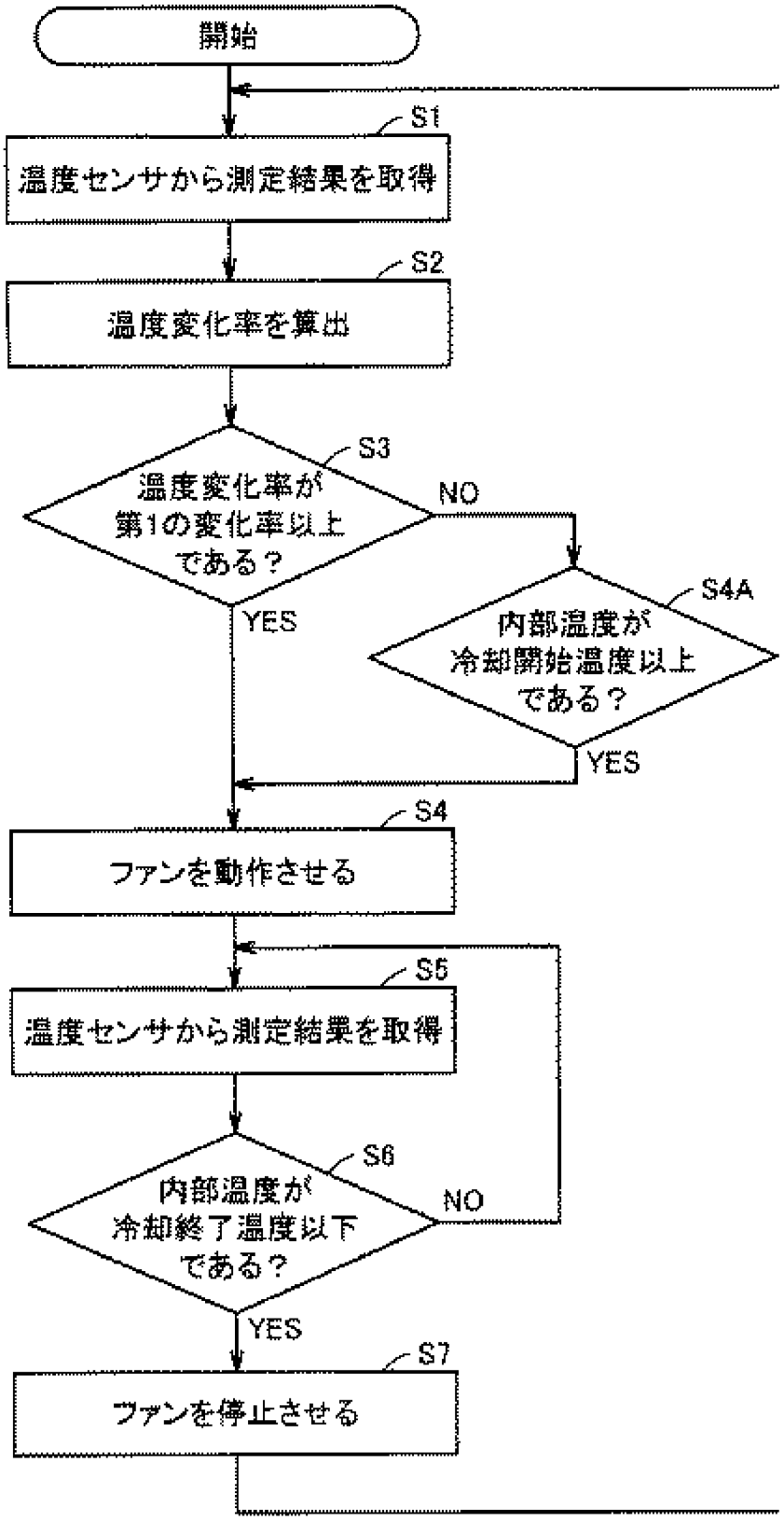
[Drawing 2]


温度
T1
T2
A1
ΔTB
ΔTA
停止期間
動作期間
t1
t2
t3
t1+Δt
t2+Δt

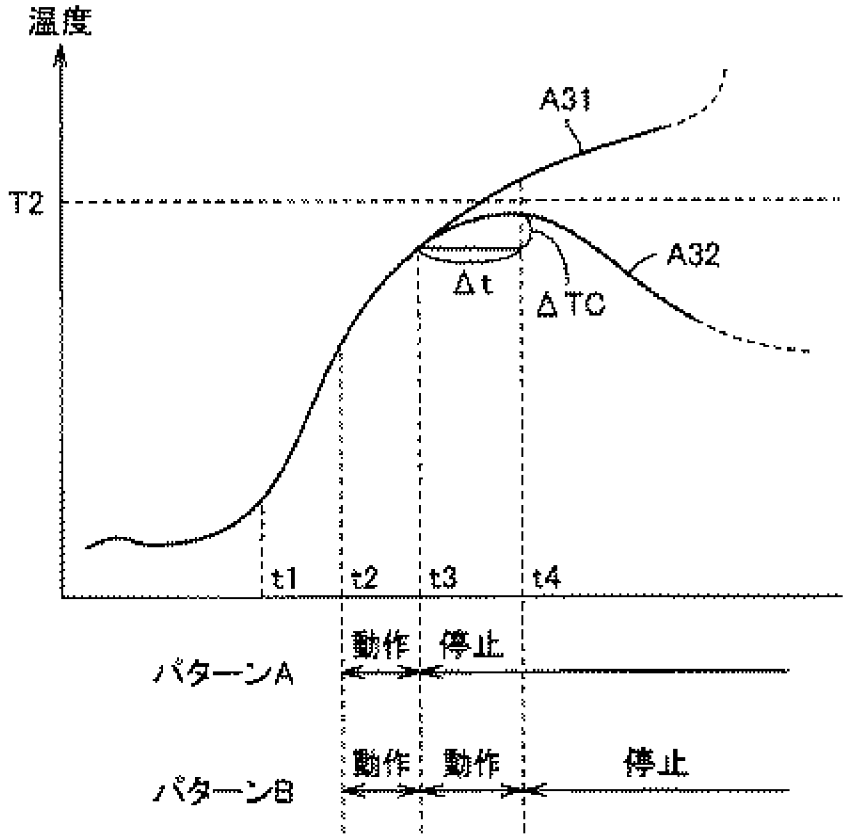
[Drawing 3]


温度
T1
T2
A2
停止期間
動作期間
t1
t2

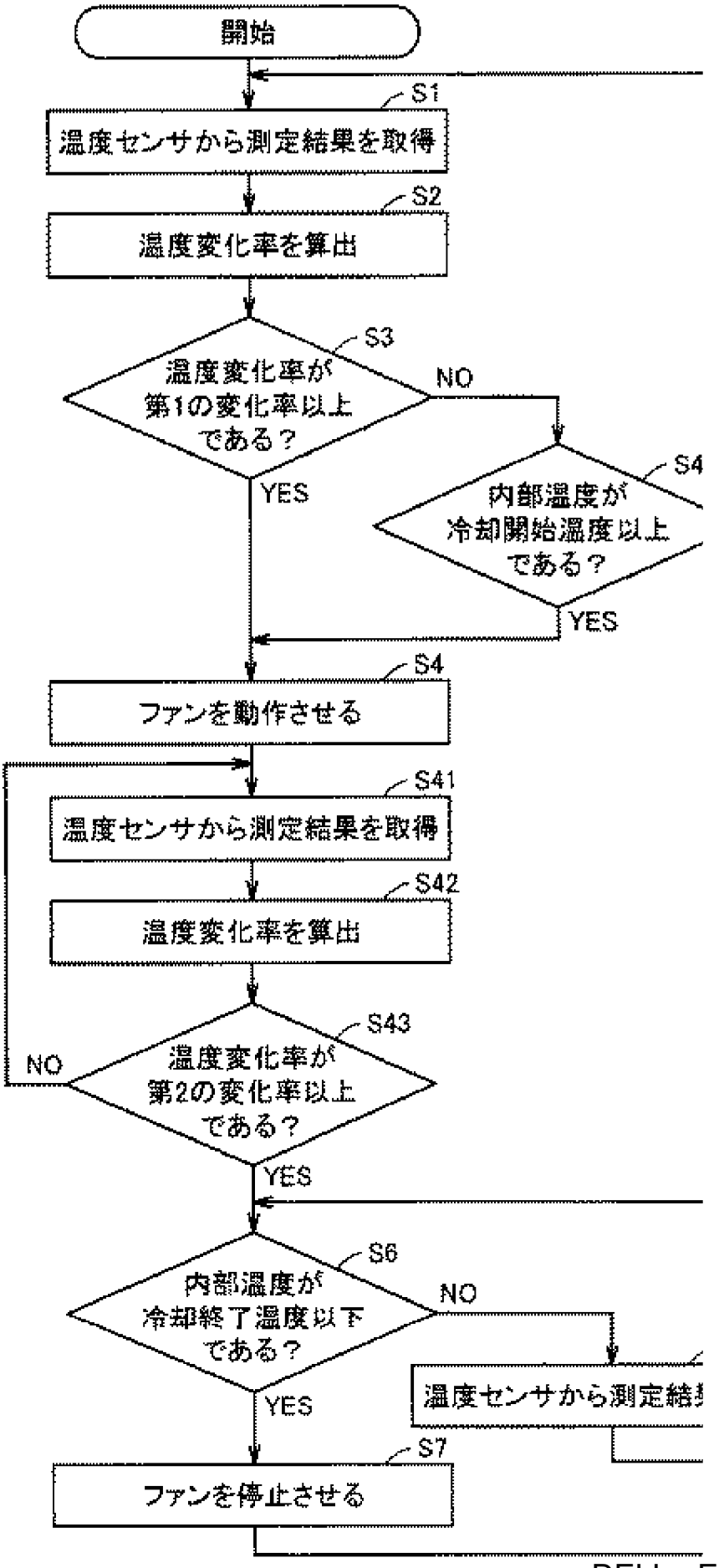
[Drawing 4]


開始
S1
温度センサから測定結果を取得
S2
温度変化率を算出
S3
温度変化率が
第1の変化率以上
である？
NO
YES
S4A
内部温度が
冷却開始温度以上
である？
YES
S4
ファンを動作させる
S5
温度センサから測定結果を取得
S6
内部温度が
冷却終了温度以下
である？
NO
YES
S7
ファンを停止させる

[Drawing 5]



[Drawing 6]


開始
S1
温度センサから測定結果を取得
S2
温度変化率を算出
S3
温度変化率が
第1の変化率以上
である？
NO
YES
S4
内部温度が
冷却開始温度以上
である？
YES
S4
ファンを動作させる
S41
温度センサから測定結果を取得
S42
温度変化率を算出
S43
温度変化率が
第2の変化率以上
である？
NO
YES
S6
内部温度が
冷却終了温度以下
である？
NO
YES
S7
ファンを停止させる

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13782490	SUZUKI, KUMIKO
	Examiner	Art Unit
	RYAN JARRETT	2121

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor Search (EAST)		
(F28F27/00 or G06F1/206).cpc.		
EAST (USPAT,PGPUB,EPO,JPO,DWI,IBM_TDB)	12/04/15	RAJ

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

	/RYAN JARRETT/ Primary Examiner.Art Unit 2121

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
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EAST Search History (Interference)

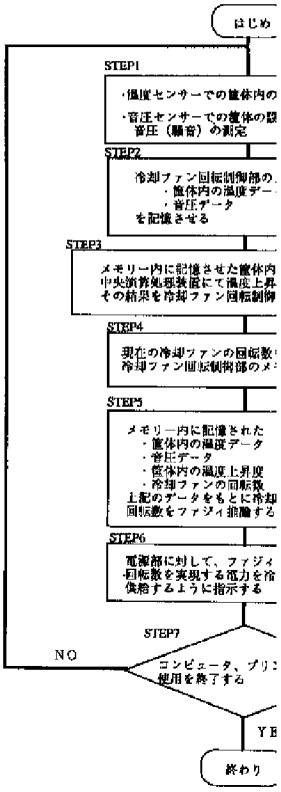
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12/ 7/ 2015 1:02:04 PM
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[JP,05-100063,A(1993)]

Drawing selection

Representative drawing



FULL CONTENTS CLAIM + DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION OPERATION EXAMPLE TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

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Notes:
1. Untranslatable words are replaced with asterisks (****).
2. Texts in the figures are not translated and shown as it is.

Translated: 13:46:26 JST 12/05/2015
Dictionary: Last updated 11/26/2015 / Priority:

FULL CONTENTS

[Claim(s)]

[Claim 1]In apparatus which comprises a hard disk, a floppy disk, a power supply, a substrate, etc., such as amplifier of a computer, a printer, and audio equipment, It has a sensor which detects noise of environment where temperature inside the aforementioned apparatus cabinet, the degree of temperature rise, and apparatus are installed, With the reasoning method based on fuzzy theory, [rotational speed of a fan for cooling more suitable than temperature in a housing obtained by the aforementioned sensor, the degree of rise of the degree of housing internal temperature, and data of noise] A fan for variable rotation cooling characterized by carrying out variable control of the rotational speed according to noise of environment where apparatus, such as a temperature change in a housing and a temperature computer in apparatus, was installed.

[Detailed Description of the Invention]
[0001]
[Industrial Application]The present invention relates to the fan for cooling with which it is equipped for the purpose of emitting to outside the heat which occurs from the power supply inside apparatus, such as amplifier of a computer, a printer, and audio equipment, or the electrical part on a substrate from the aforementioned inside of apparatus.
[0002]
[Description of the Prior Art]The electronic computer (it is hereafter considered as a computer.) with which the conventional fan for cooling was attached to Fig.17 is shown. 1 is a floppy disk drive and 2 is a hard disk drive. 3 is the substrate on which electrical parts, such as a central processing unit (hereafter referred to as CPU.) and a memory, were placed, 4 is a power supply which supplies the electrical and electric equipment to the floppy disk drive 1, the hard disk drive 2, the substrate 3, etc., and 5 is a cooling fan which emits heat for the heat inside a computer case body chassis to housing outside. 6 is the floppy disk of 1 to 5, a hard disk, a substrate, a power supply, and a chassis that stores a cooling fan, and 7 is covering which covers with the lid of the chassis 6. If a computer is switched on when using a computer, a computer will be put into operation and the cooling fan 25 will also start rotation simultaneously. And the temperature in a computer case body chassis becomes high with the lapse of time of computer use. The temperature in a housing rises abruptly as especially a computer operation person begins use of the floppy disk drive 1 and the hard disk drive 2 and access to the floppy disk drive 1 and the hard disk drive 2 increases. The memory on the substrate 3, especially CPU, etc. tend to emit heat, and the utilization time of a computer takes them for becoming long, and they cause temperature rise in a housing.
[0003]In order to suppress the temperature rise inside this housing, with the cooling fan 5, forced exhaust of the heated air inside a housing is carried out to housing outside. Although a cooling fan usually rotates at fixed rotational speed and the heated air inside a housing is discharged to housing outside, these days, there is also a cooling fan with two rotation modes, a low speed rotary and a high velocity revolution. As for the fan for cooling with two rotation modes, a thermo sensor is attached in a housing, The temperature data perceived by the thermo sensor is incorporated into the memory inside a computer, the operation in comparison with the temperature used as the threshold value set up a priori by CPU and the temperature data in a housing is performed, a

signal is sent to a power supply, and the rotational speed of the fan for cooling are changed. By changing the rotational speed of a cooling fan, that is, a floppy disk drive, [by perceiving that the inside whose thermo sensor is a housing became an elevated temperature when a computer was used the case where access of a hard disk drive makes / many / it, and for a long time and the inside of a housing became an elevated temperature, and cooling the inside of a housing quickly] Destruction by the malfunction of a computer and the heat of an electrical part, etc. can be prevented.

[0004]

[Problem to be solved by the invention]However, the cooling fan attached to the amplifier of the above conventional computers, a printer, and audio equipment, etc. rotates at fixed rotational speed until it terminates a switch at the same time it puts the switch of apparatus, such as the aforementioned computer, into operation, but. Since the degree of housing internal temperature rises in proportion to a lapse of time, the inside of a housing serves as an elevated temperature, and it becomes impossible for temperature to maintain normal operation by use and prolonged use in the room without temperature controllers, such as an air-conditioner. In order to prevent this problem, can attach the big fan of blowing capacity to apparatus, such as a computer, and can prevent the temperature rise inside a housing by carrying out a high velocity revolution, but. When the high velocity revolution of the cooling fan is always carried out, the motor sound which rotates a fan, and the noise which arises from apparatus in a whizzing sound enlarge. Since the general office became quiet especially recently and the problem of noise is also remarkable, it is difficult to mount the cooling fan which always carries out a high velocity revolution on apparatus, such as a computer. In order to increase the air capacity sent out from the inside of a housing to outside as another means without raising the rotational speed of a cooling fan, there is also a method of enlarging the path of a fan, but. In recent years, since the tendency of the miniaturization is remarkable, it is difficult for apparatus, such as a computer, to secure the space inside the computer of the fan for cooling largely.

[0005][the cooling fan with two rotation modes] In order to change two rotation modes, the rotation mode of the low speed rotary and the high velocity revolution is switched measuring with threshold value temperature the temperature set up a priori by CPU in a computer in the temperature perceived by the sensor attached in the chassis 6. Under the present circumstances, as shown in Fig.18, when a high speed and the threshold value temperature T0 of the temperature of a low-

speed change are set up a priori, In order that the burden on a power supply may enlarge, it also becomes a cause which shortens a life, at the same time a low speed and a high-speed changeover switch will be switched frequently and the power consumption of a power supply will increase, if the temperature inside the chassis which a sensor detects changes up and down bordering on the threshold value T0. When a low speed, a high speed, and rotational speed change, since the noise which arises from a fan also becomes low frequently or it becomes high, there is a problem that the size of the noise gives the operator of a computer displeasure.

[0006]

[Means for solving problem]In order that the present invention may solve this problem, a thermo sensor is provided inside housings, such as amplifier of a computer, a printer, and audio equipment, The temperature perceived from the thermo sensor attached to the inside of a housing is sent to the roll control part of the cooling fan of CPU at the same time the switch of apparatus, such as a computer, is input. The temperature inside a housing is measured continuously and the roll control part in a housing is made to memorize according to a lapse of time furthermore. The variation of temperature to the temperature inside the housing incorporated into the inside of a roll control part is calculated by CPU of the temperature control part in a housing, and the result of an operation is made to memorize inside the cooling-fan roll control part memory in a housing.

[0007]A sound pressure sensor is simultaneously provided in a housing, the noise of the environment where apparatus, such as a computer, is used is measured, and a cooling-fan roll control part is made to memorize.

[0008]And from three information data of the noise of the environment where apparatus, such as temperature in the housing incorporated into the cooling-fan roll control part, a temperature change in a housing, and a computer, is used, using the method of reasoning fuzzy theory, the rotational speed of a proper cooling fan are determined and cooling in a housing is performed.

[0009]

[Function]By the above-mentioned composition, the present invention is intensive use of the temperature rise in the housing of apparatus, such as a computer, the hard disk drive in a chassis, and a floppy disk drive, Even when the variation of the temperature inside a housing enlarges rapidly, the rotational speed of a cooling fan can be controlled automatically, the inside of a housing can be cooled promptly, and the

hard disk in a housing, a floppy disk, a substrate, etc. can be protected from destruction by heat. When the data especially input into the inside of a memory of the cooling-fan roll control part from the sound pressure sensor judges that the environment where the computer is arranged for CPU of the cooling-fan roll control part is noisy, Even if it rotates a cooling fan at high speed, for the operator of a computer, it judges that it does not become noise, and the high velocity revolution of the cooling fan is carried out for a short time, blast weight is enlarged for a short time, quick cooling of the inside of a computer is carried out, and the electrical part in a housing is protected from heat.

[0010]In order to control the rotational speed of a cooling fan based on the method of reasoning a fuzzy theory, In order to operate a cooling fan with always suitable air capacity so that the smooth control for which the operator of a computer is not made to sense noise is possible, when an efficient radiation effect and the temperature in a housing are low, in order that a cooling fan may rotate by a low speed rotary, there is an effect of power saving.

[0011]

[Working example]Hereinafter, it describes about the fan for variable rotation cooling in one working example of the present invention. The flow chart of the present invention is shown in Fig.1, and it describes according to this flow chart.

[0012]As shown in Fig.2, [the cooling-fan revolving-speed-control part 10 of the present invention] The thermo sensor 11 attached in the housing of Fig.3 in order to measure the temperature in housings, such as amplifier of a computer, a printer, and audio equipment, The memory 13 which memorizes each data measured with the sound pressure sensor 12, and the thermo sensor 11 and the sound pressure sensor 12 which measure the sound pressure of the environment where the computer etc. are installed, The central processing unit 14 (hereafter referred to as CPU.) which calculates based on the data memorized by the memory 13, It is constituted by the cooling fan 16 which makes rotational power the power supply section 15 which supplies the electric power which controls the rotational speed of a cooling fan, and the servo motor connected to the power supply 15 according to the result of an operation of CPU14.

[0013]Here, control of a fan is described in detail. First, as shown in STEP1, the temperature D (n) (however, n is taken as one or more integers.) in a housing is measured at intervals of [t1] a definite period of time like [thermo sensor / 11 / in a cooling fan control part] Fig.4, and the memory 13 is made to memorize, as shown in STEP2. Here, the

temperature data memorized by the memory 13 is stored as shown in Fig.5.
[0014]Next, as shown in STEP3, while the thermo sensor 11 measures the temperature in a chassis, from the data memorized by the memory 13, calculation is performed by the central processing unit 14 according to the following formulas in the temperature rise value E (n) (however, n is taken as an integer greater than or equal to 2.).
[0015]E(n)=D(n)-D(n-1)
(However, n is taken as an integer greater than or equal to 2.)
The temperature rise value E (n) acquired in this formula is stored in the memory 13 as shown in Fig.6.
[0016][sound-pressure-data F (n) (however, n is taken as one or more integers.) which similarly is measured by the sound pressure sensor 12 attached to the chassis] It is the same certain time interval t1 (t1 sets up arbitrarily.) as the data measured with the thermo sensor 31 as shown in Fig.7, Sound-pressure-data F (n) which the sound pressure of the environment where the computer etc. are placed was measured and was measured with the aforementioned sound pressure sensor is stored in the memory 13 as shown in Fig.8. As furthermore shown in STEP4, the rotational speed C (n) (however, n is taken as one or more integers.) of the fan for cooling are grasped with the power value always supplied to the fan for cooling from the power supply 15, and the data of rotational-speed [of the fan for cooling] C (n) is memorized by the memory 13.
[0017]Next, revolving speed control of a cooling fan is performed from temperature data [in the housing perceived with the thermo sensor and the sound pressure sensor as shown in STEP5] D (n), temperature rise value data E (n), sound-pressure-data F (n), and cooling-fan rotational-frequency-data C (n). In the present invention, according to the result of an operation, the electric power of the power supply 15 is controlled by CPU14, using the method of reasoning fuzzy theory as the control method, the rotational speed of a servo motor are changed, and the displacement of the heated air in the housing by a fan is adjusted. Here, the procedure of the method of reasoning fuzzy theory is shown in Fig.9.
[0018]First, the fuzzy rule of STEP11 shown in Fig.11 is created. The fuzzy rule was written in the form of "IF-THEN-" and set up the fuzzy rule of the present invention as follows.
[0019]The rotational speed of a Rule 1:IF cooling fan The low rotation . and -- the temperature in a housing -- appropriate temperature -- and -- the rotational speed of the rule 2:IF cooling fan with which a temperature change lowers the rotational speed of "-" THEN cooling

fan -- low rotation and -- The temperature in a housing is low and there is. [a temperature change] [the rotational speed of "+" THEN cooling fan] The rotational speed of the rule 3:IF cooling fan to raise The low rotation . and -- the temperature in a housing -- appropriate temperature -- and -- the rotational speed of the rule 4:IF cooling fan with which a temperature change raises the rotational speed of "+" THEN cooling fan -- low rotation and -- The temperature in a housing is high and there is. [a temperature change] [the rotational speed of "-" THEN cooling fan] The rotational speed of the rule 5:IF cooling fan to lower The low rotation . and -- the rotational speed of the rule 6:IF cooling fan with which the temperature in a housing is high and a temperature change raises the rotational speed of "+" THEN cooling fan -- normal rotation and -- the temperature in a housing -- low -- and -- . [a temperature change] [the rotational speed of "-" THEN cooling fan] the rotational speed of the rule 7:IF cooling fan to lower -- normal rotation and -- the temperature in a housing -- appropriate temperature and -- the rotational speed of the rule 8:IF cooling fan with which a temperature change lowers the rotational speed of "-" THEN cooling fan -- normal rotation and -- the temperature in a housing -- appropriate temperature and -- . [a temperature change] ["+" THEN] . [the rotational speed of a cooling fan] The rotational speed of the rule 9:IF cooling fan to raise The normal rotation . and the temperature in a housing -- high -- and -- . [a temperature change] ["+" THEN] . [the rotational speed of a cooling fan] The rotational speed of the rule 10:IF cooling fan to raise highly . and -- the rotational speed of the rule 11:IF cooling fan with which the temperature in a housing is low and a temperature change lowers the rotational speed of "-" THEN cooling fan -- high -- and the temperature in a housing -- low -- and a temperature change -- "+" -- and -- It installs under noisy environment and there is. . [the rotational speed of a certain THEN cooling fan] The rotational speed of the rule 12:IF cooling fan raised quickly highly . and the temperature in a housing -- appropriate temperature -- and -- the rotational speed of the rule 13:IF cooling fan with which a temperature change lowers the rotational speed of "-" THEN cooling fan -- high -- and -- the temperature in a housing -- appropriate temperature -- and -- a temperature change -- "+" -- and -- It installs under noisy environment and there is. . [the rotational speed of a certain THEN cooling fan] The rotational speed of the rule 14:IF cooling fan raised quickly highly . and -- the rotational speed of the rule 15:IF cooling fan with which the temperature in a housing is high and a temperature change lowers the rotational speed of "-" THEN

cooling fan -- high -- and -- The temperature in a housing has no temperature change highly. and -- it has installed under noisy environment. [THEN cooling fan] the rotational speed of the rule 16:IF cooling fan which raises the number of ****** quickly -- high -- and -- the temperature in a housing -- high -- and a temperature change -- "+" -- and -- Although 16 fuzzy rules were created in the present invention which raises quickly the rotational speed of the THEN cooling fan currently installed under noisy environment, If the number of rules is reduced, time to reason control of the rotational speed of a cooling fan is not sufficient in order to realize control for a fitness cooling fan, although it becomes short. If the number of rules is increased conversely, time to reason control of the rotational speed of a cooling fan will become long, but an excessive cooling fan is is controlled. Therefore, time is also short by reasoning by 16 fuzzy rules for control of the cooling fan of the present invention, and it can perform suitable control.

[0020]Next, it describes about creation of the membership function of STEP12. Fig.10 expresses the rotational speed of a cooling fan, a horizontal axis is rotational speed of a cooling fan, and a vertical axis is a membership function showing the degree of rotation of a cooling fan. Supposing the cooling fan is rotating at N (1) and (rpm), [the membership function of Fig.10] The goodness of fit of judgment that the goodness of fit of judgment that the cooling fan is carrying out low rotation is rotating at the rotational speed of LO (1) and a standard is ST (1), and goodness-of-fit HI (1) of judgment of carrying out the high rotational is 0. It means having become low about goodness of fit as each goodness of fit LO (1), ST (1), and HI (1) read in the aforementioned membership function is in the range of 0 to 1, it means that the goodness of fit of the low rotation, the normal rotation, and the high rotational which were defined as 1 was approached becomes high and 0 is approached conversely.

[0021]The membership function showing the rotational speed of a cooling fan, and the membership function with which the temperature in a housing is similarly expressed to Fig.11, The membership function with which change of the temperature in a housing is expressed to Fig.12, the membership function showing the sound pressure of the environment where the housing is installed in Fig.13, and the membership function which controls rotation of a cooling fan to Fig.14 are created. Here, it describes in detail about each membership function. Fig.11 is constituted by the membership function showing the inside of a housing being the mean temperature, the membership function showing being

lower than the mean temperature, and the membership function showing being higher than the mean temperature. The membership function showing Fig.12 not having a temperature change in a housing (as 1 is approached) a temperature change means a large thing as there are few temperature changes and they approach 0. The membership function showing the temperature in a housing having fallen (temperature change "−") (as 1 is approached) the downward degree of temperature means a small thing as the downward degree of temperature approaches 0 largely. It is constituted by the membership function (the rising degree of temperature means a small thing as 1 is approached and the rising degree of temperature approaches 0 largely.) showing the temperature in a housing going up (temperature change "+"). The sound pressure by which Fig.13 was measured with the sound pressure sensor is a membership function showing whether it is under environment where the environment where apparatus, such as a computer and a printer, is used is how much noisy, It means that 1 is installed in noisy environment as it approaches, and it is installed in quiet environment as it approaches 0. The membership function which is going to lower rotation of the cooling fan of the present [Fig.14] (as 1 is approached) the rotational speed of a fan -- as it is made to decrease greatly and 0 is approached -- the rotational speed of a fan -- it means making it decrease a few. It comprises a membership function (it means making the rotational speed of a fan increase largely as 1 is approached, and decreasing a little rotational speed of a fan as 0 is approached.) which is going to raise rotation. A membership function is memorized by the memory 13, if temperature and noise data are input from a thermo sensor and a sound pressure sensor, will carry out the fuzzy reasoning of the rotational speed of a fan, and will control the rotational speed of a cooling fan by CPU14.

[0022]Next, it describes about the method of reasoning the fuzzy reasoning of STEP13. Here, it is F (2) (according to the formula of F(2) =E(2)−E (1), calculated by CPU of a cooling−fan roll control part.) about the temperature change in E (2) and a housing in the temperature data in the housing into which the rotational speed of a cooling fan have been input from D (2) and a thermo sensor. Here, E (1) is temperature data in the housing memorized by the memory 13 at the time in front of E (2). Suppose that the noise of the environment where the computer etc. which are input from a sound pressure sensor were installed was input into the data of G (2) by the cooling fan control part.

[0023]The input data can be tested by comparison to the fuzzy rule of 16 which CPU of the cooling fan control part defined above. This

procedure is described using the rule 1, as shown in Fig.15.
[0024]the rotational speed of a Rule 1:IF cooling fan -- low rotation and -- the temperature in a housing -- appropriate temperature -- and -- a temperature change -- "-" -- according to the rule 1 which lowers the rotational speed of a THEN cooling fan, The goodness of fit W (D (2)) is calculated at the time of rotational-speed [of the present cooling fan] D (2) to the membership function with which the cooling fan of Fig.10 expresses that it is low rotation. To the membership function by which similarly it denotes that the temperature in the housing of Fig.13 is fitness, the goodness of fit X (E (2)) at the time of temperature [in a housing] E (2), The goodness of fit Z (G (2)) at the time of sound pressure G (2) is calculated to the membership function which expresses the sound pressure of the environment where the goodness of fit Y (E (2)) at the time of temperature-change F (2) and the housing of Fig.13 are placed with the membership function showing change of the temperature in the housing of Fig.12 descending. and the rotational speed of a cooling fan -- low rotation and -- the temperature in a housing -- appropriate temperature And a temperature change makes goodness of fit which fulfills three conditions of "-" the minimum of W (D (2)), X (E (2)), and Y (F (2)). In the case of the example of Fig.15, the minimum of the aforementioned W (D (2)), X (E (2)), and Y (F (2)) is set to X (E (2)). However, since the rules 9, 11, 13, 15, and 16 also need to take into consideration the goodness of fit of the membership function showing the sound pressure of the environment where the computer was installed into "IF-" sentence, The goodness of fit which fulfills four conditions, the rotational speed of a cooling fan, the temperature in a housing, the temperature change in a housing, and the sound pressure of the installed environment, serves as the minimum of W (D (2)), X (E (2)), Y (F (2)), and Z (G (2)). Next, it checks to the membership function showing lowering the rotational speed of the fan which is a "THEN-" sentence about the goodness of fit of "IF-" sentence. [of the aforementioned rule 1] As shown in Fig.15, the horizon is pulled from X (E (2)) to a horizontal axis, and the portion of the black range surrounded by the aforementioned line expresses the quantity to which the rotational speed of a cooling fan are changed. W (D (2)), X (E (2)), Y (F (2)), and Z (G (2)) are tested by comparison by the rules from the 2 [remaining] to 16 in the aforementioned procedure, and the quantity to which the rotational speed of a cooling fan are changed is calculated by CPU14. And as shown in Fig.16, 16 portions of the black range shown in the Fig.16 which is the quantity to which the rotational speed of the cooling fan obtained with the rules 1-16 are changed are piled up

altogether, and the piled-up aforementioned centroids of areas are calculated by CPU14. After a calculation result is outputted, as shown in STEP6, in the case of Fig.16, a centroid position is set to -R (rpm), it sends a signal to the power supply 15 so that -R (rpm) rotation may be decreased from the rotational speed of the present fan, and decreases rotational speed. The above operation is repeated until it ends use of the computer of STEP7.

[0025]Finally temperature in a housing is actually surveyed and it is checked whether as shown in STEP14, temperature control of the housing is performed efficiently. When control of a fan is not performed efficiently, the membership function of STEP12 is adjusted, and STEP 12, 13, and 14 is repeated until optimum control of the rotational speed of a fan is performed.

[0026]

[Effect of the Invention]The present invention is the temperature in the aforementioned housing about rotation of the cooling fan for cooling housings, such as a computer, a printer, and audio equipment. From the data obtained by measuring the noise of the environment where the temperature change and the aforementioned housing are installed, using the method of reasoning fuzzy theory, the rotational speed of a cooling fan are reasoned and variable control of the rotation of a cooling fan is carried out. By this method, conventionally, apparatus, such as a computer, rotates a cooling fan at fixed rotational speed, while it switches on, Also when apparatus was used by beginning use for several hours when the temperature in a housing is not high, and the temperature in a housing became high, the cooling fan had only the inefficient chilling effect only by sending out fixed air out of a housing. However, in the present invention, in consideration of the temperature in a housing, in order to determine the rotational speed of a fan, efficient heat dissipation of a housing is attained. When the temperature in a housing is low, since a cooling fan rotates by low rotation, its sound decreases with the wind of a cooling fan, and it can make noise in an office low.

[0027]Although the cooling fan which can set up two steps of revolving speed is marketed now, Control of the rotational speed of this cooling fan is attached to the thermo sensor attached in the housing, if the temperature perceived by this sensor exceeds the temperature set up a priori, will carry out the high velocity revolution of the cooling fan, if low, will carry out a low speed rotary, but. In the aforementioned cooling fan, if the temperature in a housing exceeds the temperature set up a priori frequently or is less, in order to repeat a high velocity revolution and a

low speed rotary, the burden on a power supply enlarges, and in order that the rotational speed of a fan may change largely, a sound gives the operator of apparatus displeasure with the wind of a fan. In order to change the rotational speed of a fan gently-sloping, the burden on the power supply which works a cooling fan is made light, and a sound does not make an operator sense displeasure little by little further by the method of controlling the rotational speed of the fan of the present invention with the wind of a cooling fan, in order to change.
[0028]The sound pressure of the environment where the temperature in the housing of a cooling fan control part, the temperature change in a housing, and the housing were furthermore installed, It becomes controllable [the cooling fan which performs efficient heat dissipation which suited each housing easily] by setting up the membership function which suited each housing, such as a computer, a printer, and audio equipment, in the membership function of control of rotational speed.

[Brief Description of the Drawings]
[Drawing 1]The flow chart which shows one working example of the present invention
[Drawing 2]General drawing of the roll control device of a cooling fan
[Drawing 3]The plot plan of each device in a computer case body chassis
[Drawing 4]The figure showing the temperature in the housing measured by the thermo sensor
[Drawing 5]The figure with which the temperature data in a housing was memorized by the memory of the cooling fan control part
[Drawing 6]The figure with which the temperature-change data in a housing was memorized by the memory of the cooling fan control part
[Drawing 7]The figure showing the sound pressure of the environment where the housing measured by the sound pressure sensor is placed
[Drawing 8]The figure with which the sound pressure data of the environment where the housing is placed was memorized by the memory of the cooling fan control part
[Drawing 9]The figure showing the process of the reasoning method using fuzzy theory
[Drawing 10]The graph which shows the membership function showing the rotational speed of a cooling fan
[Drawing 11]The figure showing the membership function showing the temperature in a housing

[Drawing 12]The figure showing the membership function showing the temperature change in a housing
[Drawing 13]The graph which shows the membership function showing the sound pressure of the environment where the housing is installed
[Drawing 14]The graph which shows the membership function which controls rotation of a cooling fan
[Drawing 15]The figure which applied a thermo sensor and the data from a sound pressure sensor to the membership function of the defined rule 1
[Drawing 16]The figure showing the amount of roll controls of the fan determined by the rule of 1 to defined 16
[Drawing 17]The plot plan of each device in a computer case body chassis
[Drawing 18]The figure showing change of rotation by the temperature change of the figure showing the temperature change in a computer case body chassis, and a cooling fan with two steps of rotational speed
[Explanations of letters or numerals]
1 Floppy disk
2 Hard disk
3 Substrate
4 Power supply
5 Fan
6 Chassis
7 Covering
10 Cooling-fan roll control part
11 Thermo sensor
12 Sound pressure sensor
13 Memory
14 Central processing unit (CPU)
15 Power supply
16 Cooling fan

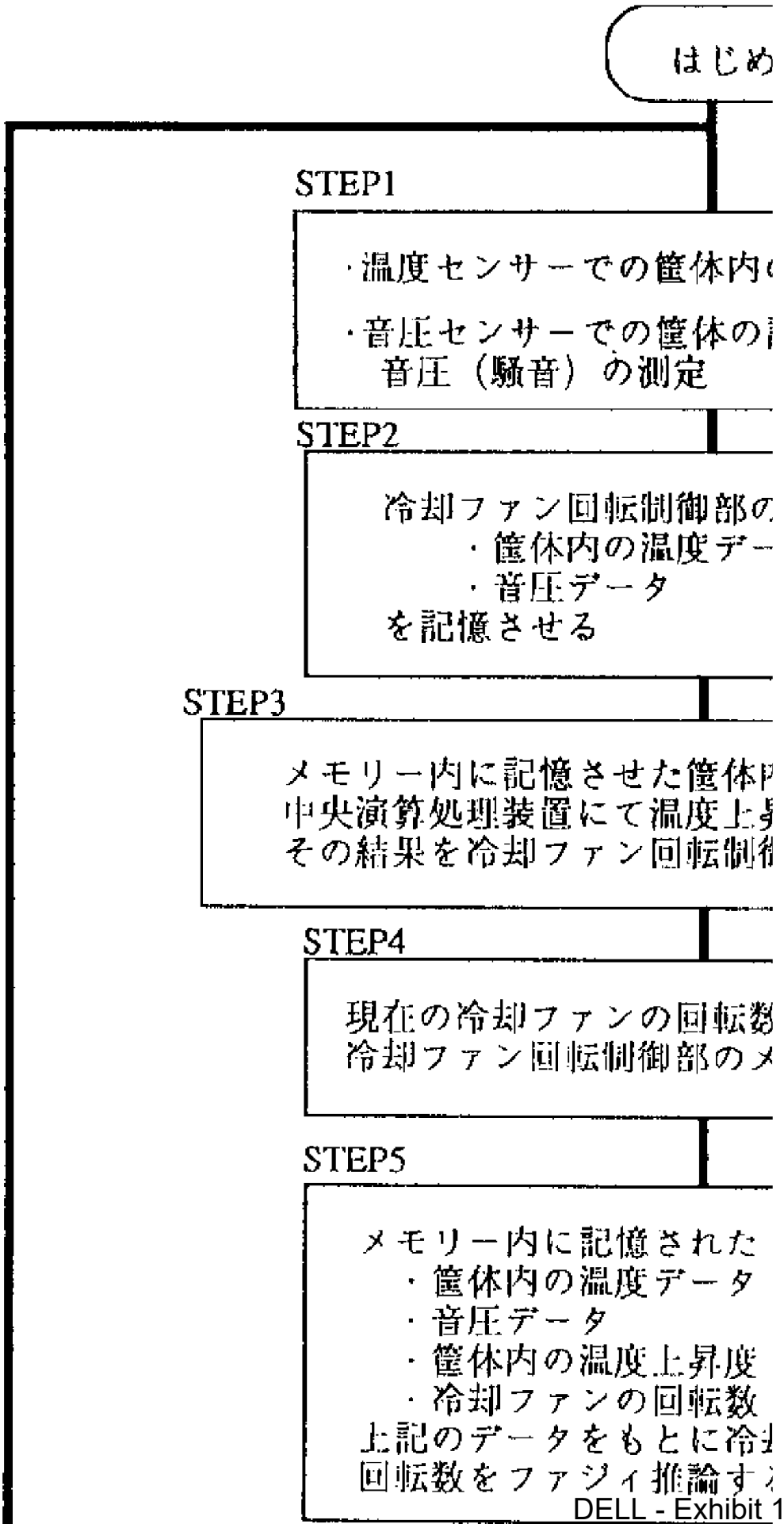
[Drawing 5]

アドレス	データ
0001	D（1）
0002	D（2）
0003	D（3）
0004	D（4）
…	…

[Drawing 6]

アドレス	データ
0001	E（1）
0002	E（2）
0003	E（3）
0004	E（4）

[Drawing 1]



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Dear PAIR Customer:

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13782490	CTNF	12/10/2015	J-13-0032
	892	12/10/2015	J-13-0032

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Courtesy Reminder for
Application Serial No: 13/782,490

Attorney Docket No: J-13-0032
Customer Number: 71799
Date of Electronic Notification: 12/10/2015

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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Docket No: Q225716
Kumiko SUZUKI	
Appln. No.: 13/782,490	Group Art Unit: 2121
Confirmation No.: 6072	Examiner: JARRETT, RYAN A
Filed: March 1, 2013	
For: ICT EQUIPMENT	

AMENDMENT UNDER 37 C.F.R. § 1.111

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action dated December 10, 2015, please amend the above-identified application as follows on the accompanying pages.

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AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Currently Amended) ICT equipment having an electronic component, the ICT equipment comprising:

a cooling fan;

a temperature sensor that detects a component temperature of [[an]]the electronic component included in the ICT equipment; and

a microprocessor including:

a declination index value calculation unit that calculates an index value indicating a degree of declination of the component temperature of the electronic component based on a detection result of the temperature sensor; and

a control unit that controls the number of rotations of the cooling fan in accordance with the index value calculated by the declination index value calculation unit.

2. (Original) The ICT equipment according to Claim 1, wherein

the index value is a declined temperature per unit time of the component temperature of the electronic component.

3. (Original) The ICT equipment according to Claim 1, wherein

the index value is an average value of declination rates of the component temperature of the electronic component in a plurality of measurement periods.

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4. (Original) The ICT equipment according to Claim 1, wherein

the index value is a difference between a highest value of the component temperature of the electronic component in a past certain period and a current component temperature.

5. (Original) The ICT equipment according to Claim 1, wherein

the control unit controls the number of rotations of the cooling fan to be lower as the degree of declination of the component temperature of the electronic component, indicated by the index value calculated by the declination index value calculation unit, is larger.

6.(Original) The ICT equipment according to Claim 1, wherein

if the index value is not less than a predetermined threshold, the control unit stops the cooling fan.

7. (Currently Amended) A control device for ICT equipment having a cooling fan, electronic component, and a temperature sensor for detecting a temperature of the electronic component, the control device comprising:

a microprocessor including:

a declination index value calculation unit that calculates an index value indicating a degree of declination of a component temperature of [[an]]the electronic component included in ICT equipment, based on a detection result of a temperature sensor that detects the component temperature of the electronic component; and

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a control unit that controls the number of rotations of a cooling fan in accordance with the index value calculated by the declination index value calculation unit.

8. (Original) A temperature controlling method comprising:

by a declination index value calculation unit, calculating an index value indicating a degree of declination of a component temperature of an electronic component included in ICT equipment, based on a detection result of a temperature sensor that detects the component temperature of the electronic component; and

by a control unit, controlling the number of rotations of a cooling fan in accordance with the index value calculated by the declination index value calculation unit.

AMENDMENTS TO THE DRAWINGS

Replacement drawing for FIG. 6 is being submitted. No new matter added.

Attachment: One (1) Replacement sheet

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REMARKS

Status of the Application

Claims 1-8 are pending.

The drawings filed March 1, 2013 are objected to by the Examiner.

Claims 1 and 7 have been amended to clarify the claimed invention.

Drawings

The drawings are objected to because Fig. 6 S70 ("NOT HIGHER") conflicts with paragraph [0042] line 5 ("not lower"). Applicant has submitted a replacement sheet together with this Amendment as the Examiner suggested, and requests that the objection be withdrawn. No new matter is introduced.

Claim Rejections Under 35 U.S.C. §102

Claims 1-5 and 7-8 are rejected under pre-AIA 35 U.S.C. § 102(b) as allegedly being anticipated by Takeshi, JP 05-100063.

Applicant respectfully traverses for at least the following reasons. In particular, Takeshi fails to disclose each and every one of the claimed features as recited in the claims. Specifically, regarding independent claims 1, 7, and 8, Takeshi fails to disclose at least, *inter alia* (emphasis added):

* * *

a declination index value calculation unit **that calculates an index value indicating a degree of declination of the component temperature of the electronic component based on a detection result of the temperature sensor**; and

* * *

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The Examiner asserts on page 3 of the Office Action (and page 4 in regards to claims 7 and 8) that Fig 2 of Takeshi, and paragraphs [0009]-[0024] disclose the above-emphasized features. However, paragraphs [0014] and [0015] of Takeshi states:

> Next, as shown in STEP3, while the thermo sensor 11 measures the temperature in a chassis, from the data memorized by the memory 13, calculation is performed by the central processing unit 14 according to the following formulas in the **temperature rise value** E(n) (however, n is taken as an integer greater than or equal to 2.).
>
> E(n)=D(n)-D(n-1)
>
> (However, n is taken as an integer greater than or equal to 2.)
>
> **The temperature rise value** E(n) acquired in this formula is stored in the memory 13 as shown in Fig.6.

In other words, Takeshi at most calculates the value in which the temperature in a chassis **rises**, not "an index value indicating a degree of **declination**" as recited in the claims.

Similarly, Takeshi fails to disclose at least, *inter alia* (emphasis added):

> * * *
>
> a control unit that controls the number of rotations of a cooling fan **in accordance with the index value calculated by the declination index value calculation unit**.

For similar reasons above-mentioned, Takeshi fails to disclose calculating an index value indicating a degree of declination. Moreover, paragraph [0017] specifically states:

> Next, revolving speed control of a cooling fan is performed from temperature data [in the housing perceived with the thermo sensor and the sound pressure sensor as shown in STEP5] D(n), **temperature rise value data** E(n), sound-pressure-data F(n), and cooling-fan- rotational-frequency-data C(n).

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Therefore, not only does Takeshi fail to disclose controlling "the number of rotations of a cooling fan in accordance with the index value" as recited by the claims, Takeshi at most suggests the exact opposite by using temperature rise value data.

Accordingly, Takeshi fails to disclose each and every one of the claimed features of the claims. Applicant respectfully requests that these rejections be withdrawn.

Claim Rejections Under 35 U.S.C. §103

Claim 6 is rejected under pre-AIA 35 U.S.C. 103(a) as allegedly being unpatentable over Takeshi in view of Yutaka, JP 2006-252608.

For similar reasons aforementioned, Takeshi fails to disclose or suggest all of the features of the claims. Furthermore, Yutaka fails to make up for Takeshi's deficiencies. Specifically, paragraph [0059] of Yutaka states (emphasis added):

> … if the rate of change in the temperature of an optical disk unit is below second temperature change rates, a control part will judge whether the temperature of an optical disk unit is below cooling finish temperature, and if the temperature of an optical disk unit is below cooling finishing temperature, a cooling fan will be suspended.

In other words, Yutaka, like Takeshi, at most discloses stopping a fan when the temperature is below a cooling finishing temperature. Yutaka does not disclose or suggest calculating "an index value indicating a degree of declination" and controlling fan speed in accordance to the index value calculated as recited in the claims.

Accordingly, the cited references, even if combined as proposed in the Office Action, fail to disclose or suggest all of the claimed features of the claims. Therefore, allowance of claims 1, 7 and 8, and all claims dependent therefrom is warranted for at least these reasons.

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Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/J. Warren Lytle, Jr./
J. Warren Lytle, Jr.
Registration No. 39,283

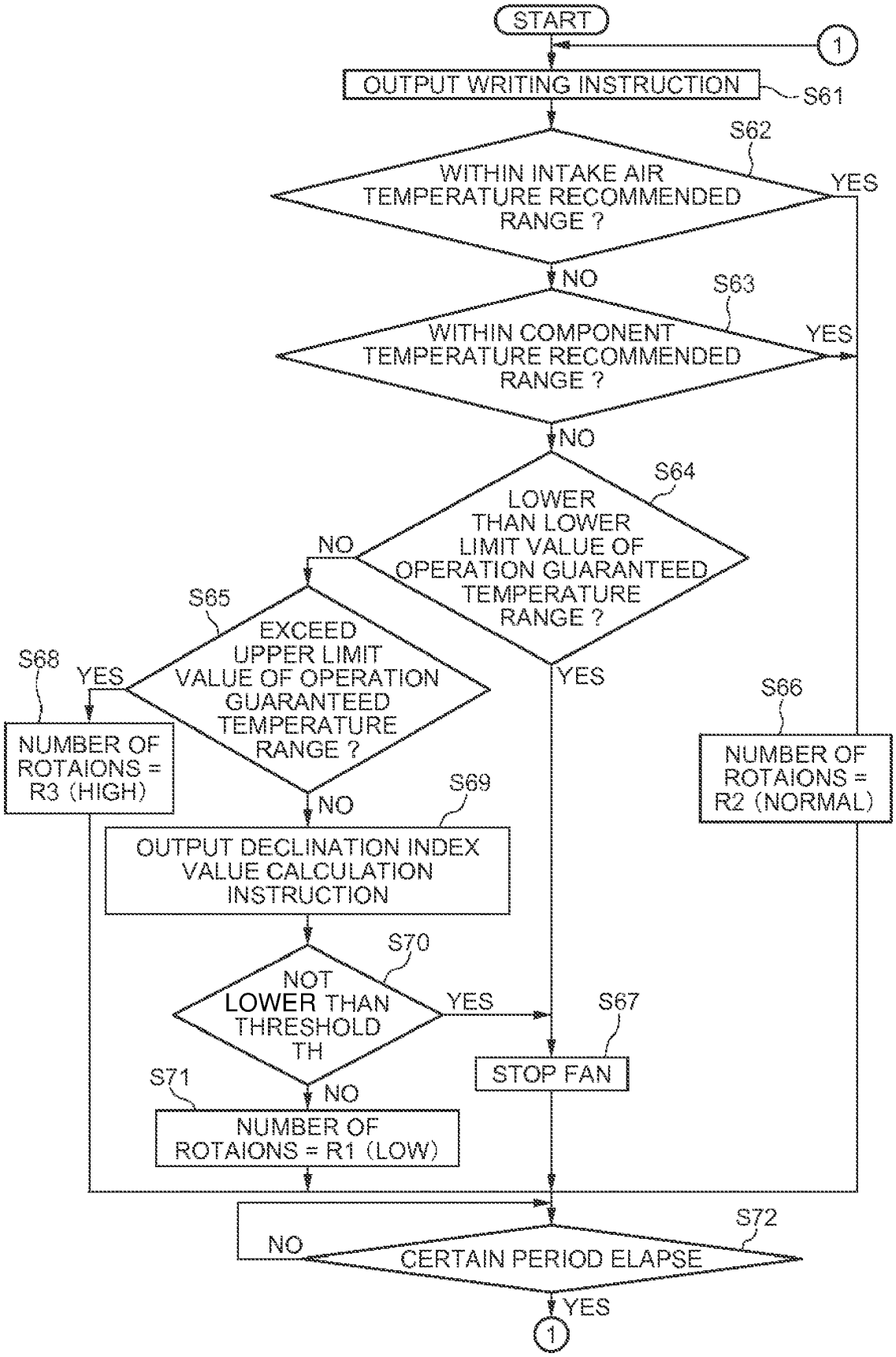
SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

WASHINGTON DC SUGHRUE/164545
71799
CUSTOMER NUMBER

Date: March 10, 2016

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FIG. 6


START
1
OUTPUT WRITING INSTRUCTION
S61
S62
WITHIN INTAKE AIR TEMPERATURE RECOMMENDED RANGE ?
YES
NO
S63
WITHIN COMPONENT TEMPERATURE RECOMMENDED RANGE ?
YES
NO
S64
LOWER THAN LOWER LIMIT VALUE OF OPERATION GUARANTEED TEMPERATURE RANGE ?
NO
YES
S65
EXCEED UPPER LIMIT VALUE OF OPERATION GUARANTEED TEMPERATURE RANGE ?
S68
YES
NUMBER OF ROTAIONS = R3 (HIGH)
NO
S69
OUTPUT DECLINATION INDEX VALUE CALCULATION INSTRUCTION
S70
NOT LOWER THAN THRESHOLD TH
YES
S67
STOP FAN
S71
NO
NUMBER OF ROTAIONS = R1 (LOW)
S66
NUMBER OF ROTAIONS = R2 (NORMAL)
S72
NO
CERTAIN PERIOD ELAPSE
YES
1

Electronic Acknowledgement Receipt

EFS ID:	25164090
Application Number:	13782490
International Application Number:	
Confirmation Number:	6072
Title of Invention:	ICT EQUIPMENT
First Named Inventor/Applicant Name:	Kumiko SUZUKI
Customer Number:	71799
Filer:	J. Lytle/Fatimah Wilson
Filer Authorized By:	J. Lytle
Attorney Docket Number:	J-13-0032
Receipt Date:	10-MAR-2016
Filing Date:	01-MAR-2013
Time Stamp:	16:58:22
Application Type:	Utility under 35 USC 111(a)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Q225716Amendment111asfiled.pdf	46346 5b70615b27304db88cd6b3017b04e7a6fcdf69a3	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	4
	Drawings-only black and white line drawings	5	5
	Applicant Arguments/Remarks Made in an Amendment	6	9

Warnings:					
Information:					
2	Drawings-only black and white line drawings	Q225716replacementsheet.pdf	80269 3203475c00710c1ee0151377a942dfe45875cc93	no	1
Warnings:					
Information:					
		Total Files Size (in bytes):	126615		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/782,490	Filing Date 03/01/2013	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **03/10/2016**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 8	Minus	** 20	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $420 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/YUVANNA CHAPHIV/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/782,490	03/01/2013	Kumiko SUZUKI	J-13-0032	6072

71799 7590 03/29/2016

Mr. Ryoichi Harada
2100 Pennsylvania Ave., NW
SUITE 560
Washington, DC 20037-3213

EXAMINER	
JARRETT, RYAN A	

ART UNIT	PAPER NUMBER
2121	

NOTIFICATION DATE	DELIVERY MODE
03/29/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

necipca@necam.com
Yuki.Kandathil@necam.com
Ayano.Reid@necam.com

Office Action Summary	Application No. 13/782,490	Applicant(s) SUZUKI, KUMIKO	
	Examiner RYAN JARRETT	Art Unit 2121	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03/10/16*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-8* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-8* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *03/10/16* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☒ All b)☐ Some** c)☐ None of the:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *03/01/13, 04/19/13*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Drawings

The drawings were received on 03/10/16. These drawings are accepted.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of pre-AIA 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5 and 7-8 are rejected under pre-AIA 35 U.S.C. 102b as being anticipated by Takeshi JP 05-100063.

Takeshi discloses:

1. ICT equipment having an electronic component, the ICT equipment comprising:

a cooling fan (e.g., Fig. 2 #16);

a temperature sensor that detects a component temperature of the electronic component included in the ICT equipment (e.g., Figs. 2-3 #11); and

a microprocessor including:

a declination index value calculation unit that calculates an index value indicating a degree of declination of the component temperature of the electronic component based on a detection result of the temperature sensor (e.g., Fig. 2 #14, [0009]-[0024]); and

a control unit that controls the number of rotations of the cooling fan in accordance with the index value calculated by the declination index value calculation unit (e.g., Fig. 2 #14, [0009]-[0024]).

2. The ICT equipment according to Claim 1, wherein

the index value is a declined temperature per unit time of the component temperature of the electronic component (e.g., [0009]-[0024]).

3. The ICT equipment according to Claim 1, wherein

the index value is an average value of declination rates of the component temperature of the electronic component in a plurality of measurement periods (e.g., [0009]-[0024]).

4. The ICT equipment according to Claim 1, wherein

the index value is a difference between a highest value of the component temperature of the electronic component in a past certain period and a current component temperature (e.g., [0009]-[0024]).

5. The ICT equipment according to Claim 1, wherein

the control unit controls the number of rotations of the cooling fan to be lower as the degree of declination of the component temperature of the electronic component, indicated by the index value calculated by the declination index value calculation unit, is larger (e.g., [0009]-[0024]).

7. A control device for ICT equipment having a cooling fan, electronic component, and a temperature sensor for detecting a temperature of the electronic component, the control device comprising:

a microprocessor;

a declination index value calculation unit (e.g., Fig. 2 #14) that calculates an index value indicating a degree of declination of a component temperature of the electronic component included in ICT equipment, based on a detection result of a temperature sensor that detects the component temperature of the electronic component (e.g., [0009]-[0024]); and

a control unit (e.g., Fig. 2 #14) that controls the number of rotations of a cooling fan in accordance with the index value calculated by the declination index value calculation unit (e.g., Fig. 2 #14, [0009]-[0024]).

8. A temperature controlling method comprising:

by a declination index value calculation unit (e.g., Fig. 2 #14), calculating an index value indicating a degree of declination of a component temperature of an electronic component included in ICT equipment, based on a detection result of a temperature sensor that detects the component temperature of the electronic component (e.g., [0009]-[0024]); and

by a control unit (e.g., Fig. 2 #14), controlling the number of rotations of a cooling fan in accordance with the index value calculated by the declination index value calculation unit (e.g., [0009]-[0024]).

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 6 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Takeshi in view of Yutaka JP 2006-252608.

Takeshi does not explicitly disclose the features of claim 6.

Yutaka (in combination with Takeshi) discloses:

6. The ICT equipment according to Claim 1, wherein

if the index value is not less than a predetermined threshold, the control unit stops the cooling fan (e.g., [0059]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Takeshi with Yutaka since all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination would have yielded predictable results to one of ordinary skill in the art at the time of the invention. See KSR v. Teleflex, 127 S.Ct. 1727 (2007).

Response to Arguments

Applicant's arguments filed 03/10/16 have been fully considered but they are not persuasive. Applicant argues that Takeshi at most calculates the value in which the temperature

in a chassis rises, not "an index value indicating a degree of declination" as recited in the claims. However, the temperature rise value E(n)=D(n)-D(n-1) of Takeshi accounts for both rises in temperature and declines in temperature. In other words, if the temperature rise value E(n) is negative (i.e., D(n) is less than D(n-1)), then this is equivalent to a temperature decline or declination. Takeshi also mentions "the temperature in a housing having fallen (temperature change "-")" in paragraph [0021].

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RYAN JARRETT whose telephone number is (571)272-3742. The examiner can normally be reached on 9:30-6:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Lo can be reached on (571) 272-9774. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RYAN JARRETT/
Primary Examiner, Art Unit 2121

03/24/16

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	13782490
Filing Date	2013-03-01
First Named Inventor	Kumiko SUZUKI
Art Unit	1721
Examiner Name	
Attorney Docket Number	J-13-0032

U.S.PATENTS

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] ¡	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	5-100063	JP	A	1993-04-23	TSUNODA TAKESHI	English Abstract and Cited in JP Office Action	☐
	2	2006-252608	JP	A	2006-09-21	KAMIMORI YUTAKA	English Abstract and Cited in JP Office Action	☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /RJ/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Examiner Name	
Attorney Docket Number	J-13-0032

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	Japanese Office Action for JP2012-046673 mailed on April 2, 2013.	☒

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/Ryan Jarrett/	Date Considered	03/24/2016

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /RJ/

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Art Unit	1721
Examiner Name	
Attorney Docket Number	J-13-0032

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☒ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Kelly G. Hyndman 39,234/	Date (YYYY-MM-DD)	2013-04-19
Name/Print	Kelly G. Hyndman	Registration Number	39234

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /RJ/

PTO/SB/08a (01-09)
Approved for use through 02/28/2009. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Attorney Docket Number	J-13-0032

U.S.PATENTS

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U.S.PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

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FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] ¡	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	2011151131	JP	A	2011-08-04	SATO YOICHI	Cited in Specification English abstract	☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /RJ/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	
	Filing Date	
	First Named Inventor	Kumiko SUZUKI
	Art Unit	
	Examiner Name	
	Attorney Docket Number	J-13-0032

	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/Ryan Jarrett/	Date Considered	03/24/2016

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /RJ/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(**Not for submission under 37 CFR 1.99)**

Application Number	
Filing Date	
First Named Inventor	Kumiko SUZUKI
Art Unit	
Examiner Name	
Attorney Docket Number	J-13-0032

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ Fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ None

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Kelly G. Hyndman 39,234/	Date (YYYY-MM-DD)	2013-03-01
Name/Print	Kelly G. Hyndman	Registration Number	39234

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

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To: necipca@necam.com,Yuki.Kandathil@necam.com,Ayano.Reid@necam.com
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 71799

Mar 29, 2016 05:28:58 AM

Dear PAIR Customer:

Mr. Ryoichi Harada
2100 Pennsylvania Ave., NW
SUITE 560
Washington, DC 20037-3213
UNITED STATES

The following USPTO patent application(s) associated with your Customer Number, 71799 , have new outgoing correspondence. This correspondence is now available for viewing in Private PAIR.

The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

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Application	Document	Mailroom Date	Attorney Docket No.
13782490	CTFR	03/29/2016	J-13-0032
	1449	03/29/2016	J-13-0032
	1449	03/29/2016	J-13-0032

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Monday - Friday 6:00 a.m. to 12:00 a.m.

Thank you for prompt attention to this notice,

UNITED STATES PATENT AND TRADEMARK OFFICE

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Mr. Ryoichi Harada
2100 Pennsylvania Ave., NW
SUITE 560
Washington, DC 20037-3213

Courtesy Reminder for
Application Serial No: 13/782,490

Attorney Docket No: J-13-0032
Customer Number: 71799
Date of Electronic Notification: 03/29/2016

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:

necipca@necam.com
Yuki.Kandathil@necam.com
Ayano.Reid@necam.com

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AMENDMENT UNDER 37 C.F.R. § 1.116
EXPEDITED PROCEDURE
GROUP 2121
PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Docket No: Q225716
Kumiko SUZUKI	
Appln. No.: 13/782,490	Group Art Unit: 2121
Confirmation No.: 6072	Examiner: JARRETT, RYAN A
Filed: March 1, 2013	
For: ICT EQUIPMENT	

AMENDMENT UNDER 37 C.F.R. § 1.116

MAIL STOP AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action dated March 29, 2016, please amend the above-identified application as follows on the accompanying pages.

TABLE OF CONTENTS

AMENDMENTS TO THE CLAIMS 2

REMARKS 5

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Currently Amended) ICT equipment having an electronic component, the ICT equipment comprising:

a cooling fan;

a temperature sensor that detects a component temperature of the electronic component included in the ICT equipment and a temperature of an intake air; and

a microprocessor including:

a declination index value calculation unit that calculates an index value indicating a degree of declination of the component temperature of the electronic component based on a detection result of the temperature sensor; and

a control unit that controls the number of rotations of the cooling fan based on ~~in accordance with~~ the index value calculated by the declination index value calculation unit and the temperature of the intake air by the temperature sensor.

2. (Original) The ICT equipment according to Claim 1, wherein

the index value is a declined temperature per unit time of the component temperature of the electronic component.

3. (Original) The ICT equipment according to Claim 1, wherein

DELL - Exhibit 1002 - Page 249

the index value is an average value of declination rates of the component temperature of the electronic component in a plurality of measurement periods.

4. (Original) The ICT equipment according to Claim 1, wherein

the index value is a difference between a highest value of the component temperature of the electronic component in a past certain period and a current component temperature.

5. (Original) The ICT equipment according to Claim 1, wherein

the control unit controls the number of rotations of the cooling fan to be lower as the degree of declination of the component temperature of the electronic component, indicated by the index value calculated by the declination index value calculation unit, is larger.

6.(Original) The ICT equipment according to Claim 1, wherein

if the index value is not less than a predetermined threshold, the control unit stops the cooling fan.

7. (Currently Amended) A control device for ICT equipment having a cooling fan, electronic component, and a temperature sensor for detecting a temperature of the electronic component and a temperature of an intake air, the control device comprising:

a microprocessor including:

a declination index value calculation unit that calculates an index value indicating a degree of declination of a component temperature of the electronic component included in ICT

DELL - Exhibit 1002 - Page 250

equipment, based on a detection result of a temperature sensor that detects the component temperature of the electronic component; and

a control unit that controls the number of rotations of a cooling fan based on~~in accordance with~~ the index value calculated by the declination index value calculation unit and the temperature of the intake air by the temperature sensor.

8. (Currently Amended) A temperature controlling method comprising:

by a declination index value calculation unit, calculating an index value indicating a degree of declination of a component temperature of an electronic component included in ICT equipment, based on a detection result of a temperature sensor that detects the component temperature of the electronic component and a temperature of an intake air; and

by a control unit, controlling the number of rotations of a cooling fan based on~~in accordance with~~ the index value calculated by the declination index value calculation unit and the temperature of the intake air by the temperature sensor.

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REMARKS

Status of the Application

Claims 1-8, all the pending claims, are currently rejected.

Claims 1, 7, and 8 are amended. No new matter has been added.

Claim Rejections - 35 USC § 102

Claims 1-5 and 7-8 are rejected under pre-AIA 35 U.S.C. § 102(b) as being anticipated by Takeshi JP 05-100063. Applicant respectfully traverses and requests reconsideration.

Claim 1

Applicant respectfully submits that Takeshi fails to anticipate each and every element of claim 1.

Claim 1 recites (emphasis added):

> ICT equipment having an electronic component, the ICT equipment comprising:
> a cooling fan;
> a temperature sensor that detects a component temperature of the electronic component included in the ICT equipment and a temperature of an intake air; and
> a microprocessor including:
> **a declination index value calculation unit that calculates an index value indicating a degree of declination of the component temperature of the electronic component based on a detection result of the temperature sensor**; and
> a control unit that **controls the number of rotations of the cooling fan based on the index value calculated by the declination index value calculation unit and the temperature of the intake air by the temperature sensor**.

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No consideration of declination to protect against decrease in temperature

Applicant respectfully submits that Takeshi fails to disclose "a control unit that controls the number of rotations of the cooling fan based on the index value calculated by the declination index value calculation unit and the temperature of the intake air by the temperature sensor."

On pages 2 and 3 of the Office Action, the Examiner alleges that Takeshi anticipates each and every element of claim 1. Specifically, the Examiner looks to paragraphs [0009]-[0024] of Takeshi to allege disclosure of the control unit. Furthermore, on pages 5 and 6 of the Office Action, the Examiner alleges that the temperature rise value of Takeshi accounts for both rises and declines in temperature. Applicant respectfully requests reconsideration.

Applicant respectfully submits that Takeshi aims to protect a substrate and the like from being **damaged by heat** (paragraph [0009]). Takeshi, at most, discloses that a cooling fan is rotated at low speeds only for **saving power** by restricting unnecessary operation (paragraph [0010]). The focus on heat damage is clear as the “degree of increase of temperature in a housing” is used as data for determination at Step 5 of FIG. 1 in the exemplary embodiment of Takeshi.

On the other hand, the present application has, as a characteristic element, a configuration to calculate "a degree of declination" and control a cooling fan on the basis of the calculated degree of declination. Applicant respectfully submits that this element is not disclosed or implied by Takeshi at all. Moreover, Takeshi does not recognize an issue of the damage or malfunction of an electronic component due to **sudden decrease of temperature,** and hence, it is impossible to easily derive the present claim 1 from Takeshi. Further, the secondary reference of Yutaka merely exhibits a case of stopping a cooling fan, and does not disclose or remedy the deficiency of Takeshi.

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No control unit that controls based on the index value and the temperature

Applicant respectfully submits that Takeshi merely aims to protect a substrate from being damaged by **heat** caused by **increase** of temperature in a housing or sudden change of temperature inside a housing. Applicant respectfully submits that Yutaka merely aims to control a fan based on a change rate of temperature in an optical disk.

On the other hand, to solve the problem that damage or malfunction of electronic components is caused if the intake air temperature drops sharply, the present application controls a fan on the basis of "a degree of declination" and "a temperature of an intake air."

Accordingly, Applicant respectfully submits that this point is not disclosed or implied by Takeshi and Yutaka at all. Moreover, Takeshi and Yutaka do not recognize an issue of the damage or malfunction of an electronic component **due to sudden decrease of temperature**, and hence, it is impossible to easily derive a configuration of the present application that controls a fan on the basis of “a degree of declination” and “a temperature of an intake air” from Takeshi and Yutaka.

Accordingly, Applicant respectfully submits that Takeshi fails to anticipate each and every element of claim 1.

Independent Claims

Regarding dependent claims 7 and 8, Applicant respectfully submits that the claims are patentable for at least similar reasons as claim 1.

Dependent Claims

Regarding dependent claims 2-6, Applicant respectfully submits that the claims are patentable due at least to their dependencies.

Thus, Applicant respectfully requests that the rejection be withdrawn.

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Claim Rejections - 35 USC § 103

Claim 6 is rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Takeshi in view of Yutaka JP 2006-252608. Applicant respectfully traverses and requests reconsideration.

Regarding dependent claim 6, Applicant respectfully submits that the claim is patentable due at least to its dependency.

Thus, Applicant respectfully requests that the rejection be withdrawn.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/Allard C Chu/

Allard C Chu
Registration No. 69,587

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

WASHINGTON DC SUGHRUE/164545

71799

CUSTOMER NUMBER

Date: June 29, 2016

DELL - Exhibit 1002 - Page 255

Electronic Acknowledgement Receipt

EFS ID:	26210098
Application Number:	13782490
International Application Number:	
Confirmation Number:	6072
Title of Invention:	ICT EQUIPMENT
First Named Inventor/Applicant Name:	Kumiko SUZUKI
Customer Number:	71799
Filer:	Ebenesar Davidson Thomas/Mohammed Yasin
Filer Authorized By:	Ebenesar Davidson Thomas
Attorney Docket Number:	J-13-0032
Receipt Date:	29-JUN-2016
Filing Date:	01-MAR-2013
Time Stamp:	14:06:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Q225716Amendment116.pdf	42748 89ad104e85619165e3db887b362981ea8c6403ef	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response After Final Action	1	1
	Claims	2	4
	Applicant Arguments/Remarks Made in an Amendment	5	8
Warnings:			
Information:			
	Total Files Size (in bytes):	42748	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/782,490	Filing Date 03/01/2013	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **06/29/2016**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 8	Minus	** 20	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $420 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

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LIE
CHARLENE /. HERBERT

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/782,490	03/01/2013	Kumiko SUZUKI	J-13-0032	6072

71799 7590 07/20/2016

Mr. Ryoichi Harada
2100 Pennsylvania Ave., NW
SUITE 560
Washington, DC 20037-3213

EXAMINER
JARRETT, RYAN A

ART UNIT	PAPER NUMBER
2121	

NOTIFICATION DATE	DELIVERY MODE
07/20/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

necipca@necam.com
Yuki.Kandathil@necam.com
Ayano.Reid@necam.com

Advisory Action Before the Filing of an Appeal Brief	**Application No.** 13/782,490	**Applicant(s)** SUZUKI, KUMIKO	
	Examiner RYAN JARRETT	**Art Unit** 2121	**AIA (First Inventor to File) Status** No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 29 June 2016 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance;

(2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:

a) ☒ The period for reply expires *3* months from the mailing date of the final rejection.

b) ☐ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.

Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANT'S FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);
   b) ☐ They raise the issue of new matter (see NOTE below);
   c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: *See Continuation Sheet*. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).

5. ☐ Applicant's reply has overcome the following rejection(s): _____.

6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

7. ☐ For purposes of appeal, the proposed amendment(s): (a) ☐ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

9. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).

10. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).

11. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

12. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because:

_____.

13. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____

14. ☐ Other: _____.

STATUS OF CLAIMS

15. The status of the claim(s) is (or will be) as follows:

Claim(s) allowed: .
Claim(s) objected to: .
Claim(s) rejected: 1-8.
Claim(s) withdrawn from consideration: .

/RYAN JARRETT/
Primary Examiner, Art Unit 2121

Continuation of 3. NOTE: Claims 1, 7, and 8 recite new features that would require further search and/or consideration.

DELL - Exhibit 1002 - Page 261

AMENDMENT UNDER 37 C.F.R. § 1.116
EXPEDITED PROCEDURE
GROUP 2121
PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Docket No: Q225716
Kumiko SUZUKI	
Appln. No.: 13/782,490	Group Art Unit: 2121
Confirmation No.: 6072	Examiner: JARRETT, RYAN A
Filed: March 1, 2013	
For: ICT EQUIPMENT	

AMENDMENT UNDER 37 C.F.R. § 1.116

MAIL STOP AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action dated March 29, 2016, please amend the above-identified application as follows on the accompanying pages.

TABLE OF CONTENTS

AMENDMENTS TO THE CLAIMS 2

REMARKS 5

DO NOT ENTER: /RJ/

07/11/2016

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/782,490	03/01/2013	Kumiko SUZUKI	J-13-0032	6072

71799 7590 07/22/2016

Mr. Ryoichi Harada
2100 Pennsylvania Ave., NW
SUITE 560
Washington, DC 20037-3213

EXAMINER
JARRETT, RYAN A

ART UNIT	PAPER NUMBER
2121	

NOTIFICATION DATE	DELIVERY MODE
07/22/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

necipca@necam.com
kanako.miyazawa@necam.com

Applicant-Initiated Interview Summary	Application No.	Applicant(s)	
	13/782,490	SUZUKI, KUMIKO	
	Examiner	Art Unit	
	RYAN JARRETT	2121	

All participants (applicant, applicant's representative, PTO personnel):

(1) *RYAN JARRETT*. (3)_____.

(2) *Allard Chu*. (4)_____.

Date of Interview: *29 June 2016*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☐ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1,7 and 8*.

Identification of prior art discussed: _____.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Examiner noted that further consideration would be required to determine if the amendment (filed 06/29/16) distinguished over the prior art of record. And if it did, then further search would be required. Examiner assured Applicant that if a further rejection is mailed that it would not be made Final.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/RYAN JARRETT/ Primary Examiner, Art Unit 2121	

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

To: necipca@necam.com,kanako.miyazawa@necam.com,
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 71799

Jul 20, 2016 05:47:17 AM

Dear PAIR Customer:

Mr. Ryoichi Harada
2100 Pennsylvania Ave., NW
SUITE 560
Washington, DC 20037-3213
UNITED STATES

The following USPTO patent application(s) associated with your Customer Number, 71799 , have new outgoing correspondence. This correspondence is now available for viewing in Private PAIR.

The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

Disclaimer:
The list of documents shown below is provided as a courtesy and is not part of the official file wrapper. The content of the images shown in PAIR is the official record.

Application	Document	Mailroom Date	Attorney Docket No.
13782490	CTAV	07/20/2016	J-13-0032

To view your correspondence online or update your email addresses, please visit us anytime at https://sportal.uspto.gov/secure/myportal/privatepair.

If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov with 'e-Office Action' on the subject line or call 1-866-217-9197 during the following hours:

Monday - Friday 6:00 a.m. to 12:00 a.m.

Thank you for prompt attention to this notice,

UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

To: necipca@necam.com,kanako.miyazawa@necam.com,
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 71799

Jul 22, 2016 05:41:54 AM

Dear PAIR Customer:

Mr. Ryoichi Harada
2100 Pennsylvania Ave., NW
SUITE 560
Washington, DC 20037-3213
UNITED STATES

The following USPTO patent application(s) associated with your Customer Number, 71799 , have new outgoing correspondence. This correspondence is now available for viewing in Private PAIR.

The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

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Application	Document	Mailroom Date	Attorney Docket No.
13782490	INTV.SUM.APP	07/22/2016	J-13-0032

To view your correspondence online or update your email addresses, please visit us anytime at https://sportal.uspto.gov/secure/myportal/privatepair.

If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov with 'e-Office Action' on the subject line or call 1-866-217-9197 during the following hours:

Monday - Friday 6:00 a.m. to 12:00 a.m.

Thank you for prompt attention to this notice,

UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION INFORMATION RETRIEVAL SYSTEM

REQUEST FOR CONTINUED EXAMINATION (RCE) TRANSMITTAL

Application Number	13/782,490	Filing Date	March 1, 2013	Confirmation Number	6072	Docket Number	Q225716
First Named Inventor	Kumiko SUZUKI		Examiner Name	JARRETT, RYAN A		Art Unit	2121
Title	ICT EQUIPMENT						

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments attached with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☑ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____
- ☐ Other _____

☐ Do NOT consider the amendment(s)/reply under 37 CFR 1.116 previously filed on _____

☐ Attached

- ☐ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/Declaration(s)
- ☐ Other _____

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other _____

FEES

The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.

☑ Payment by credit card.

☑ The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

CORRESPONDENCE ADDRESS

Direct all correspondence to the address for SUGHRUE MION, PLLC filed under the Customer Number listed below:

WASHINGTON DC
SUGHRUE/164545

71799

CUSTOMER NUMBER

SIGNATURE OF REGISTERED U.S. PATENT PRACTITIONER

Signature /J. Warren Lytle, Jr./ Date July 28, 2016

Name J. Warren Lytle, Jr. Registration No. 39,283

PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)

Docket Number Q225716 Confirmation Number 6072			
Application Number	13/782,490	Filed	March 1, 2013
For	ICT EQUIPMENT		
Art Unit	2121	Examiner	JARRETT, RYAN A

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above-identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	Micro Entity Fee	
☑	One month (37 CFR 1.17(a)(1))	$200.00	$100.00	$50.00	$200.00
☐	Two month (37 CFR 1.17(a)(2))	$600.00	$300.00	$150.00	
☐	Three month (37 CFR 1.17(a)(3))	$1400.00	$700.00	$350.00	
☐	Four month (37 CFR 1.17(a)(4))	$2200.00	$1100.00	$550.00	
☐	Five month (37 CFR 1.17(a)(5))	$3000.00	$1500.00	$750.00	

☐ Previous Payment Amount Date Submitted

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29.
Form PTO/SB/15A or B or equivalent must either be attached or have been submitted previously.

☐ A check in the amount of the fee is attached.

☑ Payment by credit card.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees, **except for the Issue Fee and the Publication Fee**, or credit any overpayment, to Deposit Account Number 19-4880.

☑ Payment made via EFS-Web.

I am the
☐ applicant/inventor.
☐ assignee of record of the entire interest. See 37 CFR 3.71.
37 CFR 3.73(b) statement is attached (Form PTO/SB/96).
☑ attorney or agent of record. Registration Number 39,283
☐ attorney or agent under 37 CFR 1.34. Registration number

WASHINGTON DC
SUGHRUE/164545
71799
CUSTOMER NUMBER

/J. Warren Lytle, Jr./	July 28, 2016
Signature	Date
J. Warren Lytle, Jr.	202.293.7060
Typed or printed name	Telephone Number

Note: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Submit multiple forms if more than one signature is required, see below*.

☑ *Total of 1 form is submitted.

Electronic Patent Application Fee Transmittal

Application Number:	13782490
Filing Date:	01-Mar-2013
Title of Invention:	ICT EQUIPMENT
First Named Inventor/Applicant Name:	Kumiko SUZUKI
Filer:	J. Lytle/Andrew Annis
Attorney Docket Number:	J-13-0032

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	1251	1	200	200
Miscellaneous:				
Request for Continued Examination	1801	1	1200	1200
		Total in USD ($)		**1400**

Electronic Acknowledgement Receipt

EFS ID:	26487445
Application Number:	13782490
International Application Number:	
Confirmation Number:	6072
Title of Invention:	ICT EQUIPMENT
First Named Inventor/Applicant Name:	Kumiko SUZUKI
Customer Number:	71799
Filer:	J. Lytle/Andrew Annis
Filer Authorized By:	J. Lytle
Attorney Docket Number:	J-13-0032
Receipt Date:	28-JUL-2016
Filing Date:	01-MAR-2013
Time Stamp:	17:26:51
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$1400
RAM confirmation Number	4360
Deposit Account	194880
Authorized User	SUGHRUE MION, PLLC

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 CFR 1.17 (Patent application and reexamination processing fees)

Charge any Additional Fees required under 37 CFR 1.19 (Document supply fees)

Charge any Additional Fees required under 37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	Q225716RCE.pdf	32866 efd38baedbc8c9d5a258f21d8a34f53f170ccbca	no	1
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2	Extension of Time	Q225716EOT.pdf	28359 cad72cd797a48f23d4280cbdd9177935088f5886	no	1
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	32255 bec35834d602536c2e4d10eaffaace513de82d0e	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	93480		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/782,490	03/01/2013	Kumiko SUZUKI	J-13-0032	6072

71799 7590 08/16/2016

Mr. Ryoichi Harada
2100 Pennsylvania Ave., NW
SUITE 560
Washington, DC 20037-3213

EXAMINER	
JARRETT, RYAN A	

ART UNIT	PAPER NUMBER
2121	

NOTIFICATION DATE	DELIVERY MODE
08/16/2016	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

necipca@necam.com
kanako.miyazawa@necam.com

Office Action Summary	Application No. 13/782,490	Applicant(s) SUZUKI, KUMIKO	
	Examiner RYAN JARRETT	Art Unit 2121	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07/28/16*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-8* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-8* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☒ All b)☐ Some** c)☐ None of the:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 06/29/16 has been entered.

Claim Objections

Claims 1, 7, and 8 are objected to because of the following informalities:

The term "ICT" recited in claims 1, 7, and 8 should be defined as "Information and Communication Technology" at least once in the claims.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112(a):

> (a) IN GENERAL.—The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor or joint inventor of carrying out the invention.

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-8 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

Per claims 1, 7, and 8, it is unclear if the temperature of the electronic component and the temperature of the intake air are detected by the same temperature sensor or different temperature sensors. The claims imply that it is the same sensor. However, there is no support in the specification for this interpretation. Per Fig. 1 and paragraph [0034] of the specification, they are different sensors, i.e., temperature sensor 21 detects the intake air temperature and temperature sensors 22-24 detect component temperatures. Therefore, the claims should be amended to clarify that they are different sensors.

Claims 1, 7, and 8 recite an "index value" calculated based on a detection result of the "temperature sensor". This implies that the index value is calculated based on the temperature of the intake air, since the claims recite that the temperature sensor detects the temperature of the intake air. However, this does not appear to be supported by the specification. The specification only appears to support the index value being calculated based on the temperature of the electronic component. Similar to above, the claims should be amended to clarify this point.

Claims 2-6 depend from claim 1 and incorporate the same deficiencies.

Response to Arguments

Applicant's arguments filed 06/29/16 have been fully considered but they are only partially persuasive. The reasons for allowance have been indicated below.

Allowable Subject Matter

Claims 1-8 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), 1st paragraph, set forth in this Office action. The claims should be amended to clarify that the air intake temperature and electronic component temperature are detected by different sensors.

The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record fails to teach or fairly suggest "a control unit that controls the number of rotations of the cooling fan based on the index value calculated by the declination index value calculation unit and the temperature of the intake air", as recited in claims 1, 7, and 8, in combination with the remaining features and elements of the claimed invention.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RYAN JARRETT whose telephone number is (571)272-3742. The examiner can normally be reached on 9:30-6:00 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Lo can be reached on (571) 272-9774. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RYAN JARRETT/
Primary Examiner, Art Unit 2121

08/11/16

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	292	"intake air temperature" and ("component temperature" or "device temperature") and (@ad or @pd or @rlad or @prad or @ptad)<="20120302"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 14:23
L2	36	"intake air temperature" and ("component temperature" or "device temperature") and ((rate or index or degree) near (declin$6 or decreas$5 or drop)) and (@ad or @pd or @rlad or @prad or @ptad)<="20120302"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 14:23
L3	17	L2 and fan	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 14:23
L4	62	(intake near2 temperature) and ("component temperature" or "device temperature") and ((rate or index or degree) near (declin$6 or decreas$5 or drop)) and (@ad or @pd or @rlad or @prad or @ptad)<="20120302"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 14:23
L5	25	L4 and fan	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 14:23
L6	8	L5 not L3	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 14:23
L7	119	SUZUKI-KUMIKO	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 14:23
L8	2	(F28F27/00 or G06F1/206).cpc. and "declination index" and (@ad or @pd or @rlad or @prad or @ptad)<="20120302"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 14:23
L9	2	(F28F27/00 or G06F1/206).cpc. and declination and (@ad or @pd or @rlad or @prad or @ptad)<="20120302"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 14:23
L10	127	(F28F27/00 or G06F1/206).cpc. and ((declin$7 or decreas$5) near3 temperature) same (fan near4 (speed or	US-PGPUB; USPAT; EPO; JPO;	OR	ON	2016/08/11 14:23

		rate or velocity or rotat$5) near4 (low$4 or reduc$5 or decreas$5)) and (@ad or @pd or @rlad or @prad or @ptad) <="20120302"	DERWENT; IBM_TDB			
L11	5	"declination index" and (@ad or @pd or @rlad or @prad or @ptad)<="20120302"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 14:23
L12	167	((declin$7 or decreas$5) near temperature) same (fan near (speed or rate or velocity or rotat$5) near (low$4 or reduc$5 or decreas$5)) and (@ad or @pd or @rlad or @prad or @ptad) <="20120302"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 14:23
L13	6	(L7 or L8 or L9 or L10 or L11 or L12) and (@pd>="20151201")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/08/11 14:23

EAST Search History (Interference)

< This search history is empty>

8/ 11/ 2016 2:26:14 PM
C:\ Users\ rjarrett\ Documents\ EAST\ Workspaces\ 13782490.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13782490	SUZUKI, KUMIKO
	Examiner	Art Unit
	RYAN JARRETT	2121

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor Search (EAST)		
(F28F27/00 or G06F1/206).cpc.		
EAST (USPAT,PGPUB,EPO,JPO,DWI,IBM_TDB)	12/04/15	RAJ
updated above		
EAST (USPAT,PGPUB,EPO,JPO,DWI,IBM_TDB)	08/11/16	RAJ

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

	/RYAN JARRETT/ Primary Examiner.Art Unit 2121

To: necipca@necam.com,kanako.miyazawa@necam.com,
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 71799

Aug 16, 2016 05:33:57 AM

Dear PAIR Customer:

Mr. Ryoichi Harada
2100 Pennsylvania Ave., NW
SUITE 560
Washington, DC 20037-3213
UNITED STATES

The following USPTO patent application(s) associated with your Customer Number, 71799 , have new outgoing correspondence. This correspondence is now available for viewing in Private PAIR.

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Courtesy Reminder for
Application Serial No: 13/782,490

Attorney Docket No: J-13-0032
Customer Number: 71799
Date of Electronic Notification: 08/16/2016

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:

necipca@necam.com
kanako.miyazawa@necam.com

To view your correspondence online or update your email addresses, please visit us anytime at **https://sportal.uspto.gov/secure/myportal/privatepair.** If you have any questions, please email the Electronic Business Center (EBC) at EBC@uspto.gov or call 1-866-217-9197.

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Docket No: Q225716
Kumiko SUZUKI	
Appln. No.: 13/782,490	Group Art Unit: 2121
Confirmation No.: 6072	Examiner: JARRETT, RYAN A
Filed: March 1, 2013	
For: ICT EQUIPMENT	

AMENDMENT UNDER 37 C.F.R. § 1.111

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action dated August 16, 2016, please amend the above-identified application as follows on the accompanying pages.

TABLE OF CONTENTS

AMENDMENTS TO THE CLAIMS 2

REMARKS 5

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (Currently Amended) ICT (Information and Communication Technology) equipment having an electronic component, the ICT equipment comprising:

a cooling fan;

a first temperature sensor that detects a component temperature of the electronic component included in the ICT equipment;

a second temperature sensor that detects [[and]] a temperature of an intake air; and

a microprocessor including:

a declination index value calculation unit that calculates an index value indicating a degree of declination of the component temperature of the electronic component based on a detection result of the first temperature sensor; and

a control unit that controls the number of rotations of the cooling fan based on the index value calculated by the declination index value calculation unit and the temperature of the intake air by the second temperature sensor.

2. (Original) The ICT equipment according to Claim 1, wherein

the index value is a declined temperature per unit time of the component temperature of the electronic component.

DELL - Exhibit 1002 - Page 292

3. (Original) The ICT equipment according to Claim 1, wherein

the index value is an average value of declination rates of the component temperature of the electronic component in a plurality of measurement periods.

4. (Original) The ICT equipment according to Claim 1, wherein

the index value is a difference between a highest value of the component temperature of the electronic component in a past certain period and a current component temperature.

5. (Original) The ICT equipment according to Claim 1, wherein

the control unit controls the number of rotations of the cooling fan to be lower as the degree of declination of the component temperature of the electronic component, indicated by the index value calculated by the declination index value calculation unit, is larger.

6.(Original) The ICT equipment according to Claim 1, wherein

if the index value is not less than a predetermined threshold, the control unit stops the cooling fan.

7. (Currently Amended) A control device for ICT (Information and Communication Technology) equipment having a cooling fan, electronic component, [[and]] a first temperature sensor for detecting a temperature of the electronic component, and a second temperature sensor that detects a temperature of an intake air, the control device comprising:

a microprocessor including:

DELL - Exhibit 1002 - Page 293

a declination index value calculation unit that calculates an index value indicating a degree of declination of a component temperature of the electronic component included in ICT equipment, based on a detection result of [[a]]the first temperature sensor that detects the component temperature of the electronic component; and

a control unit that controls the number of rotations of a cooling fan based on the index value calculated by the declination index value calculation unit and the temperature of the intake air by the second temperature sensor.

8. (Currently Amended) A temperature controlling method comprising:

by a declination index value calculation unit, calculating an index value indicating a degree of declination of a component temperature of an electronic component included in ICT (Information and Communication Technology) equipment, based on a detection result of a first temperature sensor that detects the component temperature of the electronic component and a second temperature sensor that detects a temperature of an intake air; and

by a control unit, controlling the number of rotations of a cooling fan based on the index value calculated by the declination index value calculation unit and the temperature of the intake air by the second temperature sensor.

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REMARKS

Status of the Application

Claims 1-8, all the pending claims, are currently rejected.

Claims 1, 7, and 8 are amended. No new matter has been added.

Allowable Subject Matter

Claims 1-8 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-A IA), 1st paragraph, set forth in this Office action. Applicant thanks the Examiner for indication of allowable subject matter. With this Amendment, Applicant has amended independent claims 1, 7, and 8, and respectfully submits that the rejections have been overcome.

Claim Objections

Claims 1, 7, and 8 are objected to because of informalities. With this Amendment, Applicant has amended the claims to recite "Information and Communication Technology" as suggested and respectfully submits that the objections have been overcome.

Claim Rejections - 35 U.S.C. § 112

Claims 1-8 are rejected under 35 U.S.C. 112(a) or 35 U S.C. .112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. With this Amendment, Applicant has amended independent claims 1, 7, and 8, and respectfully submits that the rejections have been overcome.

DELL - Exhibit 1002 - Page 295

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/Allard C Chu/

Allard C Chu
Registration No. 69,587

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

WASHINGTON DC SUGHRUE/164545

71799
CUSTOMER NUMBER

Date: November 16, 2016

DELL - Exhibit 1002 - Page 296

Electronic Acknowledgement Receipt

EFS ID:	27532290
Application Number:	13782490
International Application Number:	
Confirmation Number:	6072
Title of Invention:	ICT EQUIPMENT
First Named Inventor/Applicant Name:	Kumiko SUZUKI
Customer Number:	71799
Filer:	J. Lytle/Sarah Iyere
Filer Authorized By:	J. Lytle
Attorney Docket Number:	J-13-0032
Receipt Date:	16-NOV-2016
Filing Date:	01-MAR-2013
Time Stamp:	15:53:52
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Q225716Amendment111.pdf	36691 d96e3738cb646901832c7e473aacd3f62217ad7c	yes	6

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	4
	Applicant Arguments/Remarks Made in an Amendment	5	6
Warnings:			
Information:			
	Total Files Size (in bytes):	36691	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 13/782,490	Filing Date 03/01/2013	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	11/16/2016	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 8	Minus	** 20	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
LYNNELL JOHNSON

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

71799 7590 01/26/2017

Mr. Jiro Hashimoto
2100 Pennsylvania Ave., NW
SUITE 801
Washington, DC 20037-3213

EXAMINER
JARRETT, RYAN A

ART UNIT	PAPER NUMBER
2125	

DATE MAILED: 01/26/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/782,490	03/01/2013	Kumiko SUZUKI	J-13-0032	6072

TITLE OF INVENTION: ICT EQUIPMENT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	04/26/2017

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

DELL - Exhibit 1002 - Page 300

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

71799 7590 01/26/2017
Mr. Jiro Hashimoto
2100 Pennsylvania Ave., NW
SUITE 801
Washington, DC 20037-3213

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/782,490	03/01/2013	Kumiko SUZUKI	J-13-0032	6072

TITLE OF INVENTION: ICT EQUIPMENT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	04/26/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
JARRETT, RYAN A	2125	700-300000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

DELL - Exhibit 1002 - Page 301

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/782,490	03/01/2013	Kumiko SUZUKI	J-13-0032	6072

71799 7590 01/26/2017

Mr. Jiro Hashimoto
2100 Pennsylvania Ave., NW
SUITE 801
Washington, DC 20037-3213

EXAMINER	
JARRETT, RYAN A	

ART UNIT	PAPER NUMBER
2125	

DATE MAILED: 01/26/2017

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

DELL - Exhibit 1002 - Page 302

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 13/782,490	Applicant(s) SUZUKI, KUMIKO	
	Examiner RYAN JARRETT	Art Unit 2125	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *amendment filed 11/16/16*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1-8*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☒ All b) ☐ Some *c) ☐ None of the:
   1. ☒ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/RYAN JARRETT/
Primary Examiner, Art Unit 2125

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13782490	SUZUKI, KUMIKO
	Examiner	Art Unit
	RYAN JARRETT	2121

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
Inventor Search (EAST)		
(F28F27/00 or G06F1/206).cpc.		
EAST (USPAT,PGPUB,EPO,JPO,DWI,IBM_TDB)	12/04/15	RAJ
updated above		
EAST (USPAT,PGPUB,EPO,JPO,DWI,IBM_TDB)	08/11/16	RAJ
updated above	01/19/17	RAJ

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	text search of USPAT,PGPUB claims	01/19/17	RAJ

	/RYAN JARRETT/ Primary Examiner.Art Unit 2121

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 6072

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
13/782,490	03/01/2013	700	2125	J-13-0032

APPLICANTS

INVENTORS

Kumiko SUZUKI, Tokyo, JAPAN;

**** CONTINUING DATA ***************************

**** FOREIGN APPLICATIONS ***************************

JAPAN 2012-046673 03/02/2012

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

03/28/2013

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☑ Yes ☐ No	☑ Yes ☐ No	/RYAN A JARRETT/ Examiner's Signature	☐ Initials	JAPAN	10	8	3

ADDRESS

Mr. Jiro Hashimoto
2100 Pennsylvania Ave., NW
SUITE 801
Washington, DC 20037-3213
UNITED STATES

TITLE

ICT EQUIPMENT

FILING FEE RECEIVED		
1260	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	36	"intake air temperature" and ("component temperature" or "device temperature") and ((rate or index or degree) near (declin$6 or decreas$5 or drop)) and (@ad or @pd or @rlad or @prad or @ptad) <="20120302"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/01/19 22:48
L2	17	L1 and fan	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/01/19 22:48
L3	62	(intake near2 temperature) and ("component temperature" or "device temperature") and ((rate or index or degree) near (declin$6 or decreas$5 or drop)) and (@ad or @pd or @rlad or @prad or @ptad)<="20120302"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/01/19 22:48
L4	25	L3 and fan	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/01/19 22:48
L5	126	SUZUKI-KUMIKO	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/01/19 22:48
L6	2	(F28F27/00 or G06F1/206).cpc. and "declination index" and (@ad or @pd or @rlad or @prad or @ptad)<="20120302"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/01/19 22:48
L7	2	(F28F27/00 or G06F1/206).cpc. and declination and (@ad or @pd or @rlad or @prad or @ptad)<="20120302"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/01/19 22:48
L8	127	(F28F27/00 or G06F1/206).cpc. and ((declin$7 or decreas$5) near3 temperature) same (fan near4 (speed or rate or velocity or rotat$5) near4 (low$4 or reduc$5 or decreas$5)) and (@ad or @pd or @rlad or @prad or @ptad) <="20120302"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/01/19 22:48
L9	5	"declination index" and (@ad or @pd or @rlad or @prad or @ptad)<="20120302"	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/01/19 22:48
L10	168	((declin$7 or decreas$5) near	US-PGPUB;	OR	ON	2017/01/19

DELL - Exhibit 1002 - Page 307

		temperature) same (fan near (speed or rate or velocity or rotat$5) near (low$4 or reduc$5 or decreas$5)) and (@ad or @pd or @rlad or @prad or @ptad) <="20120302"	USPAT; EPO; JPO; DERWENT; IBM_TDB			22:48
L11	2	(L2 or L4 or L5 or L6 or L7 or L8 or L9 or L10) and (@pd>="20160810")	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2017/01/19 22:48

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L12	75	((declin$7 or decreas$5) near3 temperature) same (fan near2 (speed or rate or velocity or rotat$5) near2 (low$4 or reduc$5 or decreas$5)).clm.	US-PGPUB; USPAT	OR	ON	2017/01/19 22:54
L13	56	((declin$7 or decreas$5) near2 temperature) same (fan near2 (speed or rate or velocity or rotat$5) near2 (low$4 or reduc$5 or decreas$5)).clm.	US-PGPUB; USPAT	OR	ON	2017/01/19 22:54
L14	38	((declin$7 or decreas$5) near2 temperature) same (fan near (speed or rate or velocity or rotat$5) near2 (low$4 or reduc$5 or decreas$5)).clm.	US-PGPUB; USPAT	OR	ON	2017/01/19 22:54

1/19/2017 11:24:48 PM
C:\Users\rjarrett\Documents\EAST\Workspaces\13782490.wsp

DELL - Exhibit 1002 - Page 308

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13782490	SUZUKI, KUMIKO
	Examiner	**Art Unit**
	RYAN JARRETT	2125

CPC						
Symbol					**Type**	**Version**
F28F		27	/	00	F	2013-01-01
G06F		1	/	206	I	2013-01-01
			/			
			/			
			/			
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			/			
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			/			
			/			
			/			

CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
			/					
			/					

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	8	
/RYAN JARRETT/ Primary Examiner.Art Unit 2125	01/19/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13782490	SUZUKI, KUMIKO
	Examiner	**Art Unit**
	RYAN JARRETT	2125

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
		F	2	8	F	27 / 00 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	8	
/RYAN JARRETT/ Primary Examiner.Art Unit 2125	01/19/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	13782490	SUZUKI, KUMIKO
	Examiner	**Art Unit**
	RYAN JARRETT	2125

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	8	
/RYAN JARRETT/ Primary Examiner.Art Unit 2125	01/19/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

To: necipca@necam.com,reiko.sasaki@necam.com,jiro.hashimoto@necam.com
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 71799

Jan 26, 2017 03:51:43 AM

Dear PAIR Customer:

Mr. Jiro Hashimoto
2100 Pennsylvania Ave., NW
SUITE 801
Washington, DC 20037-3213
UNITED STATES

The following USPTO patent application(s) associated with your Customer Number, 71799 , have new outgoing correspondence. This correspondence is now available for viewing in Private PAIR.

The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

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Application	Document	Mailroom Date	Attorney Docket No.
13782490	NOA	01/26/2017	J-13-0032

To view your correspondence online or update your email addresses, please visit us anytime at https://sportal.uspto.gov/secure/myportal/privatepair.

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Mr. Jiro Hashimoto
2100 Pennsylvania Ave., NW
SUITE 801
Washington, DC 20037-3213

Courtesy Reminder for
Application Serial No: 13/782,490

Attorney Docket No: J-13-0032
Customer Number: 71799
Date of Electronic Notification: 01/26/2017

This is a courtesy reminder that new correspondence is available for this application. If you have not done so already, please review the correspondence. The official date of notification of the outgoing correspondence will be indicated on the form PTOL-90 accompanying the correspondence.

An email notification regarding the correspondence was sent to the following email address(es) associated with your customer number:

necipca@necam.com
reiko.sasaki@necam.com
jiro.hashimoto@necam.com

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PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

71799 7590 01/26/2017

Mr. Jiro Hashimoto
2100 Pennsylvania Ave., NW
SUITE 801
Washington, DC 20037-3213

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/782,490	03/01/2013	Kumiko SUZUKI	J-13-0032	6072

TITLE OF INVENTION: ICT EQUIPMENT

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	04/26/2017

EXAMINER	ART UNIT	CLASS-SUBCLASS
JARRETT, RYAN A	2125	700-300000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: NEC CORPORATION

(B) RESIDENCE: (CITY and STATE OR COUNTRY): TOKYO, JAPAN

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

☒ Issue Fee

☒ Publication Fee (No small entity discount permitted)

☐ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

☐ A check is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number (EFT) (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

☐ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

☐ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature / Carl J Pellegrini / Date April 5, 2017

Typed or printed name Carl J Pellegrini Registration No. 40766

PTOL-85 Part B (10-13) Approved for use through 10/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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Electronic Patent Application Fee Transmittal

Application Number:	13782490
Filing Date:	01-Mar-2013
Title of Invention:	ICT EQUIPMENT
First Named Inventor/Applicant Name:	Kumiko SUZUKI
Filer:	Carl Joseph Pellegrini/Deanna Thomas
Attorney Docket Number:	J-13-0032

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**960**

Electronic Acknowledgement Receipt

EFS ID:	28914247
Application Number:	13782490
International Application Number:	
Confirmation Number:	6072
Title of Invention:	ICT EQUIPMENT
First Named Inventor/Applicant Name:	Kumiko SUZUKI
Customer Number:	71799
Filer:	Carl Joseph Pellegrini/Deanna Thomas
Filer Authorized By:	Carl Joseph Pellegrini
Attorney Docket Number:	J-13-0032
Receipt Date:	13-APR-2017
Filing Date:	01-MAR-2013
Time Stamp:	10:17:48
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	EFT
Payment was successfully received in RAM	$960
RAM confirmation Number	041317INTEFSW10175500
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	J-13-0032_IssueFee_PTOL-85.pdf	152722 430be0e330c84622e35cce830750e71da682337c	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30487 1ffbf0ec59254cbb24b639a8721580a471ec622d	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	183209		

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National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

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Alexandria, Virginia 22313-1450
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
13/782,490	05/16/2017	9651320	J-13-0032	6072

71799 7590 04/26/2017

Mr. Jiro Hashimoto
2100 Pennsylvania Ave., NW
SUITE 801
Washington, DC 20037-3213

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 817 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Kumiko SUZUKI, Tokyo, JAPAN;

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To: necipca@necam.com,reiko.sasaki@necam.com,jiro.hashimoto@necam.com
From: PAIR_eOfficeAction@uspto.gov
Cc: PAIR_eOfficeAction@uspto.gov
Subject: Private PAIR Correspondence Notification for Customer Number 71799

Apr 28, 2017 04:07:26 AM

Dear PAIR Customer:

Mr. Jiro Hashimoto
2100 Pennsylvania Ave., NW
SUITE 801
Washington, DC 20037-3213
UNITED STATES

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Application	Document	Mailroom Date	Attorney Docket No.
13782490	ISSUE.NTF	04/26/2017	J-13-0032

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