

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DELL TECHNOLOGIES INC. AND DELL INC.,
Petitioners

v.

CLOUD BYTE LLC,
Patent Owner

Case IPR2025-01288
Patent No. 9,651,320

PETITION FOR *INTER PARTES* REVIEW

TABLE OF CONTENTS

List of Exhibits.....	vii
Mandatory Notices Under 37 C.F.R. § 42.8	ix
Real Party-in-Interest (37 C.F.R. § 42.8(b)(1)).....	ix
Related Matters (37 C.F.R. § 42.8(b)(2)).....	ix
Lead and Back-Up Counsel (37 C.F.R. § 42.8(b)(3)).....	ix
Service Information (37 C.F.R. § 42.8(b)(4))	ix
I. INTRODUCTION	1
II. GROUNDS FOR STANDING	2
III. IDENTIFICATION OF CHALLENGE	2
IV. THE CHALLENGED PATENT	3
A. Patent Specification.....	3
B. Prosecution History	5
C. Patent Claims.....	7
D. Person of Ordinary Skill in the Art.....	8
V. CLAIM CONSTRUCTION	8
A. “declination index value calculation unit”	9
B. “control unit”	10
VI. PRIOR ART REFERENCES	11
A. Sato (EX1005).....	11
B. Nakamura (EX1007)	16
C. Jin (EX1009)	21
VII. THE COMBINATION OF SATO AND NAKAMURA RENDERS THE CHALLENGED CLAIMS OBVIOUS (GROUND 1).....	27
A. Motivation to Combine Sato and Nakamura.....	27
B. Claim 1	31
1. [1pre] ICT (information and Communication Technology) equipment having an electronic component, the ICT equipment comprising:	31

2.	[1a] a cooling fan;	33
3.	[1b] a first temperature sensor that detects a component temperature of the electronic component included in the ICT equipment;	35
4.	[1c] a second temperature sensor that detects a temperature of an intake air; and	37
5.	[1d] a microprocessor including:	39
6.	[1e] 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	42
7.	[1f] 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.....	44
C.	Claim 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.	49
D.	Claim 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.....	55
E.	Claim 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.....	58
F.	Claim 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.	60

G.	Claim 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.....	63
H.	Claim 7	65
1.	A control device for ICT (Information and Communication technology) equipment having a cooling fan, electronic component, a first temperature sensor for detecting a temperature of the electronic component, and a second temperature sensor that detects a tmperature of an intake air, the control device comprising:	65
2.	a microprocessor including:	65
3.	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 the first temperature sensor tha detects the component temperature of the electronic component; and.....	66
4.	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.....	66
I.	Claim 8	67
1.	A temperature controlling method comprising:	67
2.	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.....	67
3.	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.....	69
VIII.	THE COMBINATION OF SATO, NAKAMURA, AND JIN RENDERS CLAIMS 3 OBVIOUS (GROUND 2)	69
A.	Motivation to Combine Sato-Nakamura with Jin	70
B.	Claim 3	73
IX.	DISCRETIONARY DENIAL IS NOT WARRANTED.....	76
X.	CONCLUSION.....	77

TABLE OF AUTHORITIES

FEDERAL CASES

<i>KSR Int’l Co. v. Teleflex Inc.</i> , 550 U.S. 398 (2007).....	<i>passim</i>
<i>Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.</i> , 868 F.3d 1013 (Fed Cir. 2017)	8
<i>Sanofi-Aventis Deutschland GmbH v. Mylan Pharms. Inc.</i> , 66 F.4th 1373 (Fed. Cir. 2023)	16, 21, 26
<i>Williamson v. Citrix Online, LLC</i> , 792 F.3d 1339 (Fed. Cir. 2015)	9, 10

FEDERAL STATUTES

35 U.S.C.	
§ 102.....	<i>passim</i>
§ 103.....	2

FEDERAL RULES AND REGULATIONS

37 C.F.R. § 42.100(b)	7
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LIST OF EXHIBITS

Exhibit	Description
1001	U.S. Patent No. 9,651,320 (the “’320 Patent”)
1002	Prosecution history of U.S. Application No. 13/782,490, which led to the issuance of the ’320 Patent
1003	Declaration of Himanshu Pokharna, Ph.D. in Support of <i>Inter Partes</i> Review of U.S. Patent No. 9,651,320
1004	<i>Curriculum vitae</i> for Himanshu Pokharna, Ph.D.
1005	U.S. Patent Application Publication No. 2011/0176275 (“Sato”)
1006	Japanese Patent Application JP 2011-151131A
1007	Translation of Japanese Patent No. JP4511444B2 (“Nakamura”)
1008	Certificate of Translation of JP4511444B2
1009	Korean Patent Application Publication No. KR20100028353A (“Jin”)
1010	Certificate of Translation of KR20100028353A
1011	Electronic Failure Analysis Handbook by Perry L. Martin, Chapter 1 (McGraw-Hill 1999)
1012	Complaint for Patent Infringement
1013	Cloud Byte’s Preliminary Infringement Contentions with attached Exhibit 9
1014	U.S. District Court – Judicial Caseload Profiles (March 2025)
1015	Assignment (U.S. Patent No. 9,651,320)
1016	Lex Machina (U.S. Patent No. 9,651,320)
1017	Cloud Byte’s Disclosure of Proposed Claim Constructions and Extrinsic Evidence with attached Exhibit A

Exhibit	Description
1018	Declaration of Victoria C. Huang

MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

Real Party-in-Interest (37 C.F.R. § 42.8(b)(1))

The real parties-in-interest are petitioners Dell Technologies Inc. and Dell Inc. (“Petitioners”). No unnamed entity is funding, controlling, or directing this petition or has the ability to control or direct this petition or Petitioners’ participation in any resulting *inter partes* review. Petitioners understand based on public information that the challenged patent, U.S. Patent No. 9,651,320 (the “’320 Patent”), is owned by Cloud Byte LLC (“Patent Owner”).

Related Matters (37 C.F.R. § 42.8(b)(2))

Petitioners are aware of the following district court lawsuit involving the ’320 Patent: *Cloud Byte LLC v. Dell Technologies Inc. and Dell Inc.*, Case No. 2:24-cv-00637-JRG (E.D. Tex.).

Lead and Back-Up Counsel (37 C.F.R. § 42.8(b)(3))

Petitioners appoint James L. Day (Reg. No. 72,681) of Farella Braun + Martel LLP as lead counsel and appoint the following attorneys as back-up counsel: Daniel Callaway (Reg. No. 74,267) and Winston Liaw (Reg. No. 78,766) of Farella Braun + Martel LLP.

Service Information (37 C.F.R. § 42.8(b)(4))

Service of any documents to lead and back-up counsel can be made via hand-delivery to Farella Braun + Martel LLP, One Bush Street, Suite 900, San Francisco, California, 94104. Petitioners consent to electronic service to the

following email addresses: jday@fbm.com, dcallaway@fbm.com,
wliaw@fbm.com, and calendar@fbm.com.

I. INTRODUCTION

Dell Technologies Inc. and Dell Inc. (“Petitioners”) respectfully request *inter partes* review of claims 1-8 (the “challenged claims”) of U.S. Patent No. 9,651,320 (the “’320 Patent”) owned by Cloud Byte LLC (“Patent Owner”).

The ’320 Patent claims Information and Communication Technology (ICT) equipment with a cooling system that uses intake air temperature and internal component temperature to manage the speed of cooling fans. Such equipment was well-known, and prior art references such as U.S. Patent Application Publication No. 2011/0176275 (“Sato”) disclose nearly all the elements of the claims in the ’320 Patent. During prosecution, the applicant argued that the claimed invention is different because it uses a “declination index value” (i.e., the rate of temperature decrease) to manage fan speed rather than relying on the increasing temperature as in the prior art. While Sato does not disclose such an index value, prior art Japanese Patent No. 4511444 (“Nakamura”) does. Indeed, Nakamura discloses a temperature control program employing several different methods for determining the declination index value of internal components in an electronic device. And because a person of ordinary skill in the art would have been motivated to implement Nakamura’s temperature control program in Sato’s ICT equipment—and could have easily done so—the combination of Sato and Nakamura discloses and renders obvious the challenged claims.

In addition, prior art Korean Patent Publication 10-2010-0028353 (“Jin”) discloses the specific index value recited in dependent claim 3. Thus, combining Jin’s teachings with Sato-Nakamura discloses claim 3. And because a person of ordinary skill in the art would have—and could have—implemented Jin’s teachings in the Sato-Nakamura combination, the claim is rendered obvious for this additional reason.

Because this petition demonstrates a reasonable likelihood Petitioners will prevail on at least one—and indeed all—of the challenged claims, *inter partes* review should be instituted and the challenged claims canceled as unpatentable.

II. GROUNDS FOR STANDING

Petitioners certify that the ’320 Patent is available for *inter partes* review. Petitioners are not barred or estopped from requesting this review.

III. IDENTIFICATION OF CHALLENGE

Petitioners request *inter partes* review of the challenged claims and further request that the challenged claims be canceled as unpatentable for being obvious under 35 U.S.C. § 103¹ based on the following grounds:

¹ The pre-AIA version of Sections 102, 103, and 112 apply.

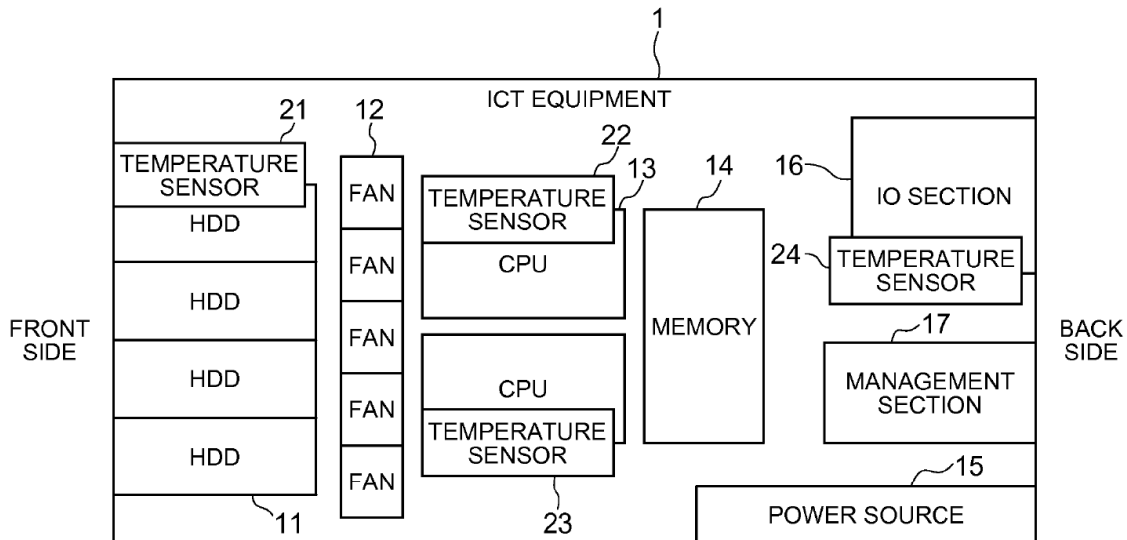
Grounds	Claims	Prior Art
1	1-8	Sato (EX1005) and Nakamura (EX1007)
2	3	Sato, Nakamura, and Jin (EX1009)

Petitioners’ proposed construction of terms, the evidence relied upon, and the bases for unpatentability are below. A List of Exhibits is above.

IV. THE CHALLENGED PATENT

A. Patent Specification

The ’320 Patent is entitled “ICT Equipment.” EX1001, 1. The patent relates to “ICT (Information and Communication Technology) equipment such as a server device having a cooling fan, a control device thereof, and a program.” *Id.*, 1:12-15. Figure 1 “is a block diagram showing an exemplary configuration of ICT equipment 1 according to a first exemplary embodiment....” *Id.*, 3:13-15.



’320 Patent, Fig. 1

As illustrated, “ICT equipment 1” includes “a plurality of hard disk drives (HDD) 11 and a temperature sensor 21, which detects intake air temperature,” and “a plurality of cooling fans 12....” *Id.*, 3:46-51. “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.” *Id.*, 3:52-55. Additionally, ICT equipment 1 includes a “management section 17 [that] 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.” *Id.*, 3:61-63.

The patent describes “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....” EX1001, 5:9-15. The patent provides three examples for calculating the declination index value: “(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. ... (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.” *Id.*, 5:15-29.

The index value is only used in certain conditions. The controller “first determines whether or not the intake air temperature detected by the temperature sensor 21 is within the intake air temperature recommended range....” EX1001,

6:7-13. If it is not, the controller “determines whether all of the component temperatures detected by the temperature sensors 22 to 24 are within the component temperature recommended range....” *Id.*, 6:21-28. If any of the components are outside the temperature range but nevertheless within “the operation guaranteed temperature range,” the controller “calculates a declination index value indicating the degree of declination of the component temperature....” *Id.*, 6:39-7:7. The index value is then used to adjust fan speed. *Id.*, 8:3-26, Fig. 6.

B. Prosecution History

The '320 Patent issued from Application No. 13/782,490, filed March 1, 2013. EX1002, 2-87.

On December 10, 2015, the examiner rejected all application claims. EX1002, 161-167. Claims 1-5 and 7-8 were rejected as anticipated by Japanese Patent Application Publication No. 05-100063 (“Takeshi”). EX1002, 163. Claim 6 was rejected as obvious over Takeshi combined with Japanese Patent Application Publication No. 06-252608 (“Yutaka”). *Id.*, 165.

In response, the applicant argued that the cited art did not disclose calculating “a declination index value.” EX1002, 222-224. For instance, the applicant argued that Takeshi does not disclose “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....” *Id.*, 222 (emphasis in original).

The applicant also argued 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.” *Id.*, 223 (emphasis in original). The applicant further argued that Takeshi not only fails to disclose “controlling ‘the number of rotations of a cooling fan in accordance with the index value’ as recited by the claims,” but that “Takeshi at most suggests the exact opposite by using temperature rise value data.” *Id.*, 224. The applicant similarly argued that “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.” *Id.*, 224.

On March 29, 2016, the examiner again rejected the application claims based on Takashi alone (claims 1-5 and 7-8) or combined with Yutaka (claim 6). EX1002, 231-235. In response, the applicant amended the claims to require that the “number of rotations of the cooling fan” is based on both the declination index value and the intake air temperature. *Id.*, 249-251. The applicant argued that the cited art has “[n]o control unit that controls based on the index value and the temperature.” *Id.*, 254 (emphasis in original). The applicant argued that unlike the cited art, “the present application controls a fan on the basis of ‘a degree of declination’ and ‘a temperature of an intake air.’” *Id.*

Following a round of clarifying amendments, the examiner allowed the application claims. EX1002, 275-277, 292. A Notice of Allowance issued on January 26, 2017. *Id.*, 300. The '320 Patent issued on May 16, 2017. EX1001, 1.

C. Patent Claims

The '320 Patent contains eight claims, including three independent claims 1, 7, and 8. Claim 1 reads as follows:

[1pre] ICT (information and Communication Technology) equipment having an electronic component, the ICT equipment comprising:

[1a] a cooling fan;

[1b] a first temperature sensor that detects a component temperature of the electronic component included in the ICT equipment;

[1c] a second temperature sensor that detects a temperature of an intake air; and

[1d] a microprocessor including:

[1e] 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

[1f] 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.

Dependent claims 2-6 depend from claim 1. The language for all challenged

claims is provided in the attached Claim Appendix.

D. Person of Ordinary Skill in the Art

A person of ordinary skill in the art (“POSITA”) would have had (i) an undergraduate degree (or equivalent) in mechanical engineering, electrical engineering, computer engineering, computer science, or a comparable subject and two to three years of work experience in the design and architecture of thermal management systems of electronic devices, or (ii) an advanced degree (or equivalent) in the same or comparable subjects and one year of post-graduate research or work experience in the design and architecture of thermal management systems of electronic devices. EX1003, ¶62. A POSITA would have been familiar with the thermal management technology used in electronic devices, such as servers and storage devices. *Id.*

V. CLAIM CONSTRUCTION

The claims of the ’320 Patent should be construed under the *Phillips* standard. 37 C.F.R. § 42.100(b). The Board need only construe claims when necessary to resolve the underlying controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed Cir. 2017). Petitioners believe that no express constructions are necessary to determine the prior art discloses the limitations of the challenged claims but address the

following terms for clarity.²

A. “declination index value calculation unit”

Claim 1 recites “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.” EX1001, 9:53-57; *see also id.*, 10:32-38 (similar limitation in claim 7), 10:44-52 (similar limitation in claim 8). Petitioners construe the term “declination index value calculation unit” based on its plain meaning and not as a means-plus-function limitation under Section 112 ¶6. There is a presumption against such treatment because the term does not recite a “means for” performing a function. *See Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1349 (Fed. Cir. 2015). The limitation was not construed as a means-plus-function term during prosecution. EX1002, 163-166, 222-225, 232-236, 252-255, 276-278, 295-296. And Patent Owner does not contend that it is a means-plus-function limitation. EX1013, 9, 41-51; EX1017, 6-9.

However, should the Board conclude that it is a means-plus-function term, Petitioners would identify the function in claim 1 as “calculat[ing] an index value

² Petitioners reserve the right to present other claim construction arguments in the related district court litigation.

indicating a degree of declination of the component temperature of the electronic component based on a detection result of the first temperature sensor”³ and the corresponding structure is “CPU 13” configured to calculate the “declination index value” in the specification (EX1001, 5:17-29) and equivalents. The prior art cited herein meets this alternative construction. See Sections VII.B.6, VII.H.3, and VII.I.2, below; EX1003, ¶76.

B. “control unit”

Claim 1 recites “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.” EX1001, 9:58-10:3; *see also id.*, 10:38-42 (similar limitation in claim 7), 10:53-57 (similar limitation in claim 8). The recited “control unit” is not a means-plus-function limitation. There is a presumption against such treatment because it does not recite “means for” performing a function. See *Williamson*, 792 F.3d at 1349. It was not construed as means-plus-function during prosecution. EX1002, 163-166, 222-225, 232-236, 252-255, 276-278, 295-296. And Patent Owner does not contend it is a means-plus-function limitation. EX1013, 9, 51-61; EX1017, 6-

³ The functions recited in claims 7 and 8 are similar but not identical and would track equivalent language in those claims.

9.

However, should the Board conclude “control unit” is a means-plus-function term, Petitioners would identify the claimed function in claim 1⁴ as “control[ing] 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” (EX1001, 9:58-10:3) and the corresponding structure is “CPU 13” configured to implement the “the control means 172” in “the management section 17” identified in the specification (EX1001, 5:45-47) and equivalents. The prior art cited herein meets this alternative construction. *See* Sections VII.B.7, VII.H.4, and VII.I.3, below; EX1003, ¶79.

VI. PRIOR ART REFERENCES

The '320 Patent issued from an application filed March 1, 2013, claiming priority to a Japanese patent application filed March 2, 2012.⁵

A. Sato (EX1005)

Sato is a U.S. patent application publication entitled “Cooling Controlling Apparatus, Electronic Apparatus, and Cooling Controlling Method.” Sato was

⁴ The corresponding functions recited in claims 7 and 8 are nearly identical and would track equivalent language in those claims.

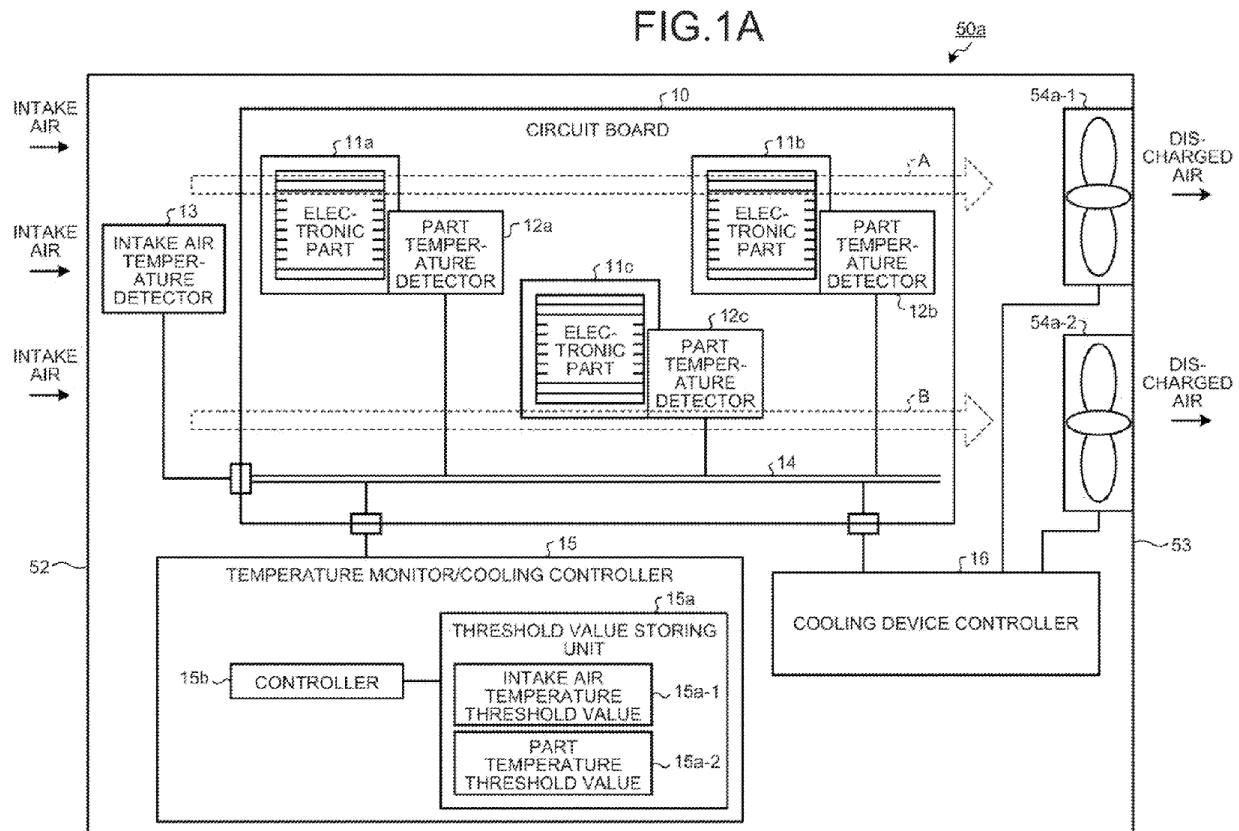
⁵ Patent Owner does not assert an earlier priority date. EX1013, 10-11.

filed January 12, 2011, claiming priority to an earlier-filed Japanese patent application, and was published July 21, 2011. EX1005, 1. Sato constitutes prior art under Section 102(a) and (e) (pre-AIA). Sato was not cited during prosecution but a Japanese application to which Sato claims priority is cited in the specification of the '320 Patent. EX1001, 1:31-33; EX1003, ¶¶81-82. The priority document was never discussed or relied on for a rejection during prosecution. *Id.*; EX1002.

Sato discloses a “cooling controlling apparatus that cools an electronic apparatus” that includes cooling fans. EX1005, [0013]. “[A]n intake air temperature detector...detects a temperature of air taken into the electronic apparatus” and a “part temperature detector...detects a temperature of an electronic part arranged inside the electronic apparatus....” *Id.* A fan controller “controls a rotation number of the cooling fan based on the detected temperature of the electronic part and the detected intake air temperature.” *Id.*

Sato describes several embodiments using a “server installation” as an example and states the disclosed technique can be used in other types of electronic devices as well. EX1005, [0032]; *see also id.*, [0012].

Figure 1A illustrates “a configuration of an electronic apparatus according to a first embodiment.” EX1005, [0033]. As illustrated, electronic parts 11a, 11b, and 11c each have an associated part temperature detector 12a, 12b, and 12c (i.e., each a “sensor which detects a temperature of the electronic part”). *Id.*, [0042].



Sato, Fig. 1A

Sato’s apparatus also includes an “intake air temperature detector 13” that “detects a temperature of intake air of the cooling air taken in the inside of the housing 51 via the intake air surface of the front plate 52.” *Id.*, [0044].

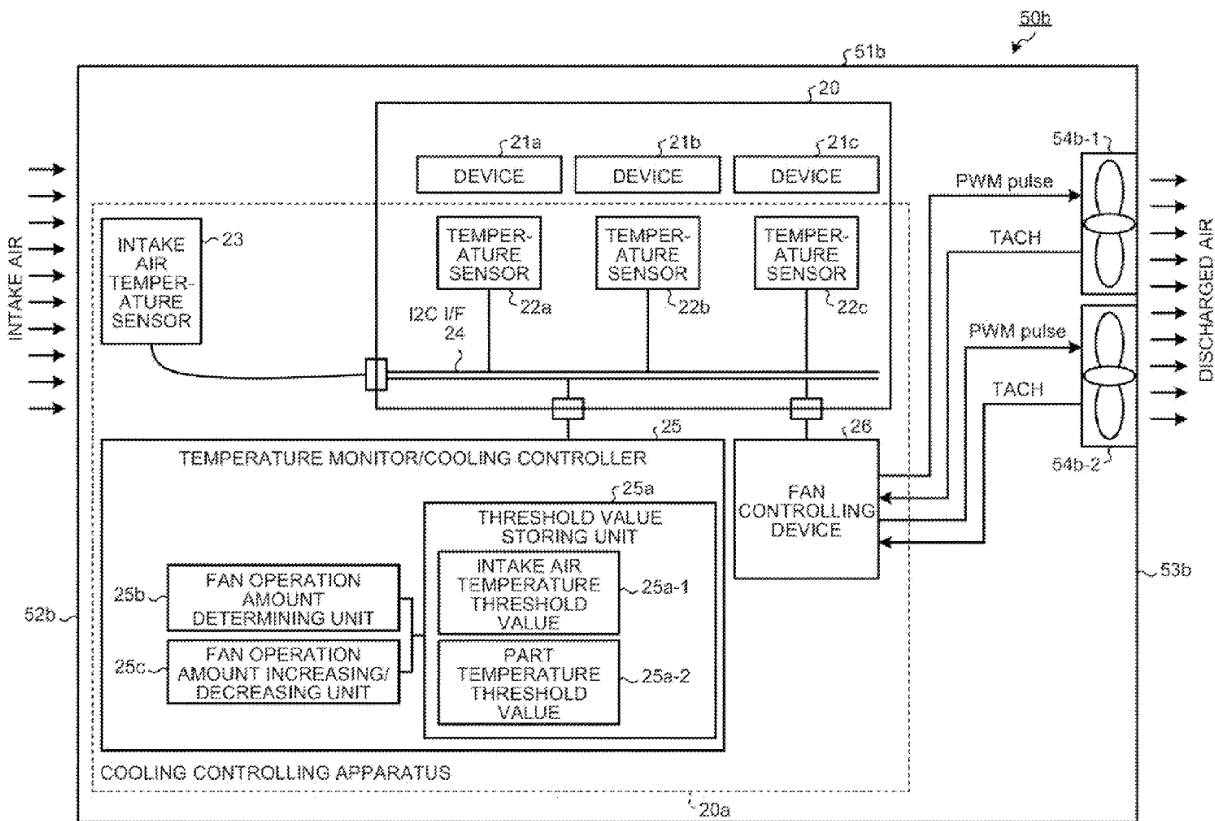
The temperatures detected by the part temperature detectors and the intake air temperature detector are provided to “the temperature monitoring/cooling controller 15.” EX1005, [0045]. Controller 15b “compares the intake air temperature of the cooling air detected by the intake air temperature detector 13” to certain threshold values. *Id.*, [0046], [0050]. Based on the comparison, “the controller 15b determines the number of rotation of the cooling fans 54a-1 and

54a-2....” *Id.*, [0051]. After a waiting period, controller 15b compares the temperatures of the electronic parts to certain threshold values and, based on the comparison, adjusts the fan speed. *Id.*, [0053], [0057]-[0058]. After another waiting time period, controller 15b repeats the process of using the intake air temperature to set the fan speed and then further adjusts it based on the electronic part temperatures. *Id.*, [0059].

Thus, in Sato’s fan control technique, the cooling fan speed is “determined based on the intake air temperature” and “is further increased/decreased according to a temperature of each electronic part in the first embodiment.” EX1005, [0064]. Using Sato’s technique, “noise of a fan rotation of a cooling device and an excessive electric power consumption caused by an excessive cooling of an electronic part can be avoided appropriately.” *Id.*, [0064].

Figure 2 illustrates Sato’s second embodiment employing a similar cooling technique. Like the first embodiment, it is “a server installation 50b” including “an intake air temperature sensor 23, a temperature monitoring/cooling controller 25, a fan controlling device 26, and cooling fans 54b-1 and 54b-2.” EX1005, [0065].

FIG.2



Sato, Fig. 2

As illustrated, several “devices” (i.e., electronic parts generating heat) are mounted on system board 20. *Id.*, [0067]-[0068]. Each device 21a, 21b, 21c has an associated “temperature sensor” 22a, 22b, 22c. *Id.*, [0068]. “The temperature sensors 22a to 22c notify detected temperatures of the devices respectively to the temperature monitor/cooling controller 25.” *Id.*, [0071]. Additionally, “the intake air temperature sensor 23...notifies a detected intake air temperature to the temperature monitor/cooling controller 25.” *Id.*, [0070]-[0071].

In Sato’s apparatus, a “fan operation amount determining unit 25b compares

an intake air temperature of the cooling air detected by the intake air temperature sensor 23 to the intake air temperature value 25a-1.” EX1005, [0076]. “The fan operation amount determining unit 25b then determines the number of rotation of the cooling fans 54b-1 and 54b-2 depending on a result of the comparison.” *Id.*, [0076]. After a waiting period, the “fan operation amount determining unit 25b then performs” adjustments to fan speed based on a comparison of device temperatures to certain threshold values. *Id.*, [0078]-[0080]. Thus, as in the first embodiment, the fan control technique of the second embodiment sets the fan speed based on “intake air temperature” and then adjusts it based on component temperatures. *Id.*, [0085]-[0103], Fig. 4; EX1003, ¶90.

Sato is analogous art to the ’320 Patent because it is in the same field of endeavor (i.e., electronic devices, such as computers) and addresses the same problem of cooling components within device enclosures. EX1003, ¶99; EX1005, Abstract, [0013], [0032], [0034]; EX1001, Abstract, 1:6-10; *see also Sanofi-Aventis Deutschland GmbH v. Mylan Pharms. Inc.*, 66 F.4th 1373, 1377 (Fed. Cir. 2023).

B. Nakamura (EX1007)

Nakamura is a translation of Japanese Patent No. JP4511444B2 entitled “Electronic device enclosure interior cooling system, cooling method and electronic device.” EX1007, 1. Petitioners provide a declaration certifying that

Nakamura is a true and accurate translation of Japanese Patent No. JP451144B2, which is also provided. EX1008. Nakamura was filed October 26, 2005, and published on July 28, 2010. EX1007, 1. Nakamura constitutes prior art under Section 102(a) and (b) (pre-AIA). Nakamura was not cited during prosecution.

Nakamura describes “a control scheme for a cooling fan for evacuating generated heat from the interior of an electronic device enclosure....” EX1007, [0001]. Nakamura explains that “the amount of heat generated by internal electrical components varies depending on the operational state.” *Id.*, [0003]. “For example, in the case of a CPU, heat generation increases during high-load processing when executing application software, while during low-load processing, heat generation decreases.” *Id.* Thus, “computer systems are provided with mechanisms to control cooling fan rotational speed according to the interior temperature of the enclosure.” *Id.*

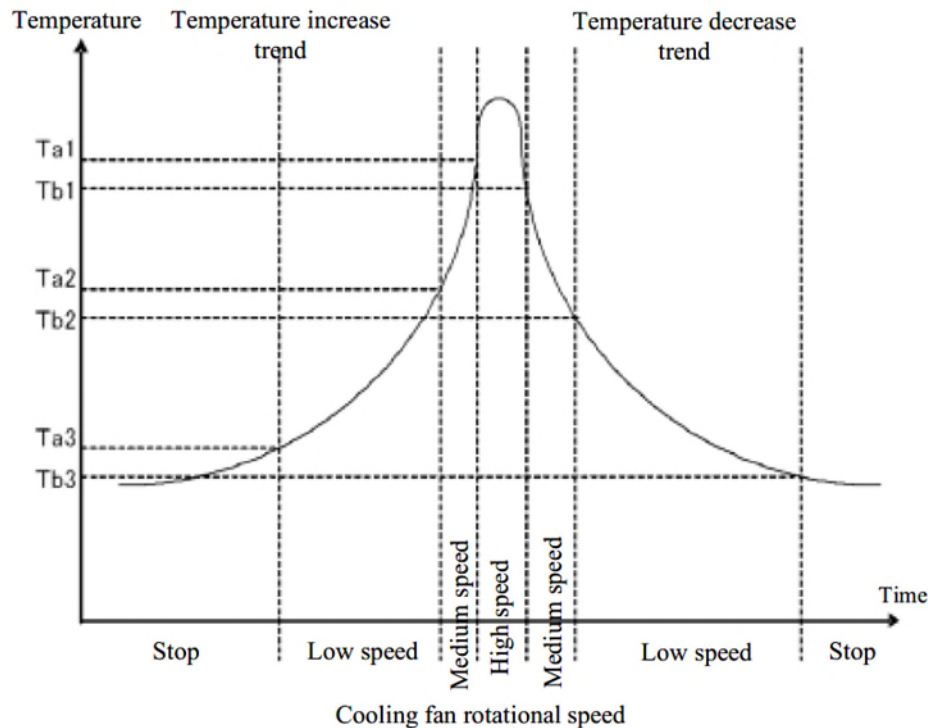
Nakamura explains that “[w]hen the amount of heat generated in the interior of the enclosure becomes nearly equal to the amount of heat evacuated to the exterior and the interior of the enclosure approaches thermal equilibrium, the interior temperature of the enclosure can no longer decrease readily and so the rate of temperature decrease stagnates.” EX1007, [0007]. “[I]f the rate of decrease of the interior temperature of the enclosure becomes stagnated at a temperature value higher than the set temperature” at which the fan is turned off, “the cooling fan

continues to rotate without stopping” even though the fan is no longer reducing the internal temperature (i.e., it has stagnated). *Id.*, [0008]. Nakamura states that “[t]his phenomenon is likely to occur when switching a computer from a high-load state to a temporary standby state, and since the cooling fans continue to rotate even after their work is finished,” the fans cause more noise and use more power than necessary. *Id.* Nakamura discloses providing “a cooling system that can detect the state where the rate of temperature decrease has stagnated before the interior temperature of the enclosure reaches the set temperature value for transitioning from low speed rotation to stop, and can stop the rotation of the cooling fan, reducing both user discomfort from noise and power consumption.” *Id.*, [0009].

Nakamura’s process uses “interior temperature,” which is “measured by means of a temperature sensor installed in the interior space of the enclosure, a temperature sensor embedded in the CPU, a temperature sensor attached to the board, etc.” EX1007, [0011]. In particular, in Nakamura’s Figure 2, “[m]ultiple temperature sensors 58...are mounted on the boards of, or in the vicinity of, the CPU 22, video subsystem 34, hard disk drive 44, power supply unit (not illustrated), etc.” *Id.*, [0028]. “[T]he temperatures measured by these various temperature sensors [are] referred to as the interior temperature of the enclosure” by Nakamura. *Id.*, [0028].

A “cooling fan drive circuit generates and supplies voltage at a frequency corresponding to the speed signal received from the environment system controller 56 to the cooling fan 14, changing the speed of or stopping the cooling fan 14.” EX1007, [0029]. Nakamura’s Figure 3 “shows the relationship between the interior temperature of the enclosure and the operation of the cooling fan 14.” *Id.*, [0031].

[FIG. 3]



Nakamura, Fig. 3

As illustrated, fan speed is changed at predetermined threshold values, shown on the Y-axis by values Ta1, Ta2, and Ta3 (increasing temperature) and values Tb1, Tb2, and Tb3 (decreasing temperature). *Id.*, [0031]. Thus, for example, “[w]hen

the interior temperature of the enclosure has a decreasing trend, the set temperature values include set temperature value Tb1 for transitioning from high speed rotation to medium speed rotation, set temperature Tb2 for transitioning from medium speed rotation to low speed rotation, and set temperature value Tb3 for transitioning from low speed rotation to stop.” *Id.*

Nakamura describes the particular case “where processing that places a large load on the CPU 22 terminates and the CPU transitions to an idle state.” EX1007, [0032]. Because “CPU 22 transitions from a state of high heat generation to a state of low heat generation,” cooling fan 14 initially operates at high-speed but switches to medium and then low-speed as the interior temperature decreases. *Id.* “When the rotational speed of the cooling fan 14 decreases to low speed rotation, since the amount of heat evacuated to the exterior of the enclosure 12 decreases, the rate of temperature decrease also becomes more gradual,” as shown in Figure 3. *Id.* Nakamura explains that “[i]f the interior temperature of the enclosure 12 continues to decrease in the same manner and falls below Tb3, the cooling fan 14 will stop.” *Id.* This situation is illustrated in Figure 3. But, “[i]f the interior temperature of the enclosure 12 stagnates at a temperature value slightly about Tb3, the cooling fan 14 will continue to rotate without stopping.” *Id.*

In Nakamura, “the state where the rate of decrease of the interior temperature of the enclosure 12 has stagnated is appropriately detected, and the

cooling fan 14 is stopped.” EX1007, [0033]. Nakamura describes “several methods for determining a state where the rate of decrease in the interior temperature of the enclosure has stagnated.” *Id.*, [0013]. It “can be determined on the basis of the difference between the current sampling temperature value and multiple past sampling temperature values.” *Id.*; *see also, id.*, [0034]-[0037], Fig. 4. It “can also be determined based on amount of change in difference, by calculating the difference between temperature values measured at each sampling cycle.” *Id.*, [0013]; *see also, id.*, [0038], Fig. 6. It can also be determined when the temperature remains within a “predetermined set temperature range for a predetermine period of time or longer.” *Id.*, [0013]; *see also, id.*, [0039], Fig. 7.

Nakamura is analogous art to the '320 Patent because it is in the same field of endeavor (i.e., electronic devices, such as computers) and addresses the same problem of cooling components within electronic device enclosures. EX1003, ¶119; EX1007, [0001], [0003], [0017]; EX1001, Abstract, 1:6-10; *see also Sanofi-Aventis*, 66 F.4th at 1377.

C. Jin (EX1009)

Jin is a translation of Korean Patent Publication No. 10-2010-0028353 (or KR20100028353) entitled “Projector and a method of controlling the projector.” EX1009, 1. Petitioners provide a declaration certifying that Jin is a true and accurate translation of Korean Patent Publication No. KR20100028353, which is

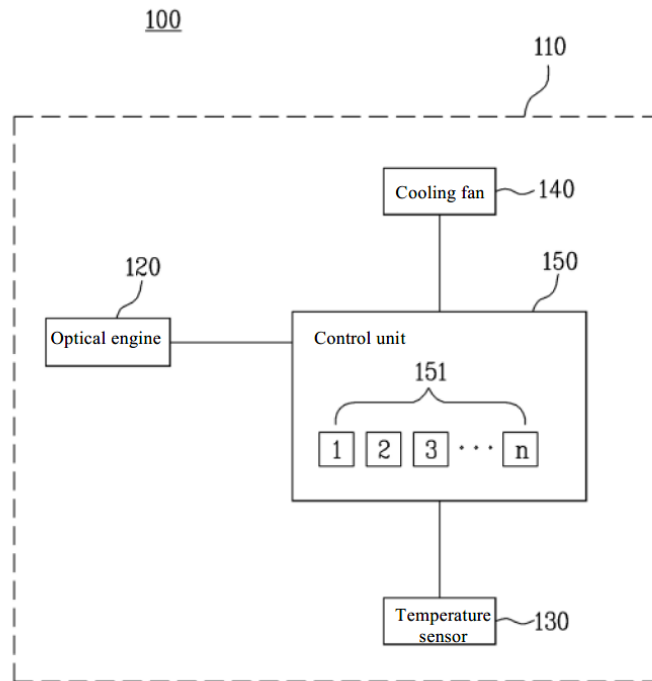
also provided. EX1010. Jin was filed September 4, 2008, and published March 12, 2010. EX1009, 1. Jin constitutes prior art under Section 102(a) and (b) (pre-AIA). Jin was not cited during prosecution.

Jin states that in prior art projectors, “[t]he lamp used as a light source is mounted inside the projector housing and generates a large amount of heat.” EX1009, [0003]. “In addition to the lamp, the substrate equipped with various circuit components and the composite-based components that convert the image signals to images and synthesize them to light supplied by the lamp also have a significant amount of heat.” *Id.* “Thus, the projector is provided with a cooling fan, temperature sensor, etc., inside it, and the speed of the cooling fan increases or decreases depending on the temperature inside the projector to cool it down.” *Id.*, [0004].

Jin describes an invention that “can effectively control the rotation speed of a fan by predicting temperature changes inside the projector.” EX1009, 1 (Summary). Because “the temperature change inside the projector can be predicted in advance, the temperature inside the projector can be effectively reduced, and noise generated by the cooling fan provided inside the projector can be minimized.” *Id.*, 1 (Summary).

Figure 1 is a “schematic illustration of a projector according to the present invention” that includes “a housing (110) forming an outer shape; wherein an

optical engine (120) that converts an input image signal into projection light and projects it; at least one temperature sensor (130) mounted inside the housing (110); a cooling fan (140) mounted inside the housing (110); and a control unit (150) that controls the cooling fan (140) using the temperature measured by the temperature sensor (130) and has a plurality of memory buffers (151) capable of storing the temperature measured by the temperature sensor (130).” EX1009, [0030].



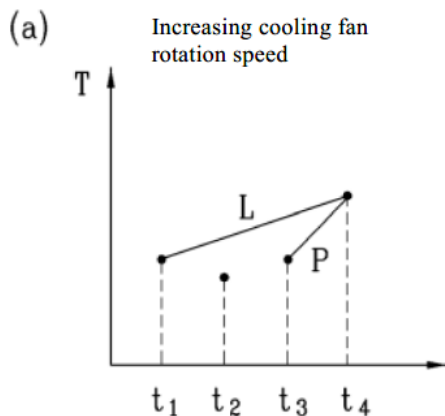
Jin, Fig. 1

Jin explains that, “[b]y providing a plurality of memory buffers (151) in the control unit (150) to store the temperature inside the projector housing (110) at predetermined time intervals, the temperature within the projector housing (110) can be predicted and the rotation speed of the cooling fan (14) can be controlled by

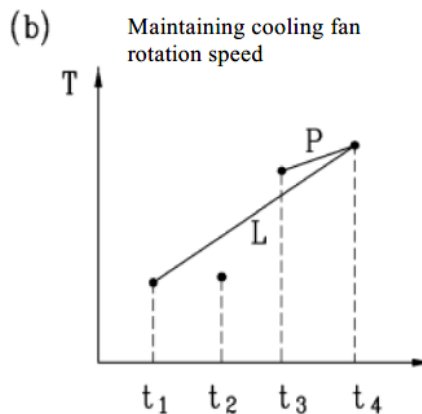
the method” described by Jin. EX1009, [0039]. Thus, “the temperature may be measured and stored at predetermine time intervals.” *Id.*, [0047]. Then “[t]he temperature inside the projector is predicted based on the calculated temperature change rate by calculating the temperature change rate of at least two or more using the temperature stored in the memory buffer (151).” *Id.*, [0040].

Jin describes a method with a “change rate calculation step (S200),” regarding Figure 2, used “to predict the future temperature changes by comparing the overall temperature changes with the recent temperature changes.” EX1009, [0052]-[0053]. Jin compares “the rate of change of temperature...that can determine the trend of overall temperature change inside the projector” (referred to as “L”) “with the rate of change of temperature...that can determine the trend of recent temperature change inside the projector” (referred to as “P”). *Id.*, [0061].

For example, in Figure 5(a), the trend of overall temperature change (L) increases modestly while the trend of recent temperature change (P) increases more steeply. Here, Jin would predict further increase in temperature and increase the cooling fan speed. EX1003, ¶125.



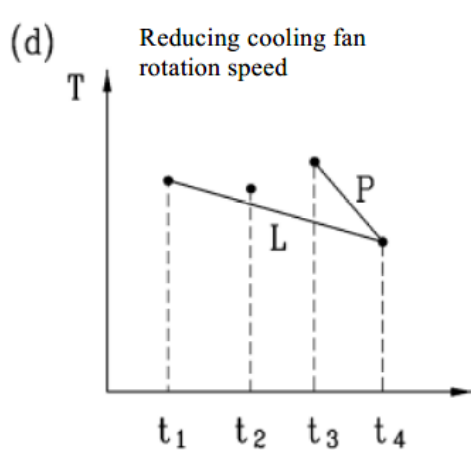
Jin, Fig. 5(a)



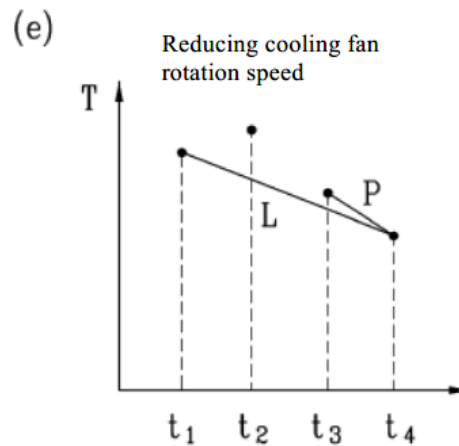
Jin, Fig. 5(b)

In Figure 5(b), the trend of overall temperature change (L) increases steeply while the trend of recent temperature change (P) increases more slowly. Here, Jin would predict slowing of temperature increase and maintain the cooling fan speed. *Id.*, ¶125; EX1009, [0076]-[0085], [0091].

Jin's temperature-control method also applies when temperature is declining. EX1009, [0072], [0075]. For example, in Figures 5(d) and 5(e), the trend of overall temperature change (L) is cooling and the trend of recent temperature change (P) is cooling even more quickly.



Jin, Fig. 5(d)



Jin, Fig. 5(e)

Jin states that “[i]n cases of (d) and (e), the temperature decrease is occurring at a sufficient rate with reference to the overall first temperature change rate (L) and second temperature change rate (P) inside the projector, so it can be determined that the speed of the cooling fan (140) can be reduced.” *Id.*, [0092].

Jin is analogous to the ’320 Patent because it is in the same field of endeavor (i.e., electronic devices). EX1009, 1 (Summary); EX1001, Abstract, 1:6-10; *see also Sanofi-Aventis*, 66 F.4th at 1377. While Jin discloses a projector and the ’320 Patent a computer, these devices are in the same field because they similarly involve an enclosure containing heat-generating electronic components, cooling fans, temperature sensors, and fan controllers. EX1003, ¶127; EX1009, [0002]-[0004], [0029]-[0039]; EX1001, 1 (Abstract). Further, both Jin and the ’320 Patent address the same problem of managing the temperature of electronic components within a device enclosure. EX1003, ¶127; *see also Sanofi-Aventis*, 66 F.4th at

1377. Indeed, they address the same problem in a similar manner by using temperature readings from sensors to adjust the speed of cooling fans in the enclosure. EX1009, 1 (Summary), [0036]-[0039], [0043]-[0052], [0075], [0087], [0090]; EX1001, 3:61-63.

VII. THE COMBINATION OF SATO AND NAKAMURA RENDERS THE CHALLENGED CLAIMS OBVIOUS (GROUND 1)

Sato discloses a cooling system for an electronic device, such as a server computer, that is highly similar to the cooling system recited in the challenged claims. Sato’s server includes cooling fans, temperature sensors for electronic components, an intake-air temperature sensor, and (like the ’320 Patent) Sato uses a microprocessor to control fan speed based on intake-air temperature and component temperature. Sato does not disclose calculating an *index value indicating a degree of declination of the component temperature* as recited in claim 1 (limitation 1e), but Nakamura does.⁶ Nakamura teaches a fan control program that calculates the recited *index value* and uses it—with component temperature—to control fan speed. Thus, the combination of Sato with the teachings of Nakamura discloses, and renders obvious, the challenged claims.

A. Motivation to Combine Sato and Nakamura

A POSITA implementing Sato’s server would have naturally considered

⁶ For ease of review, claim language is presented in italics.

Nakamura because both are directed to techniques for controlling the speed of cooling fans used to cool components in an electronic device. EX1005, [0013]; EX1007, [0001]. Both employ internal sensors indicating component (e.g., CPU) temperatures and use those temperature readings to adjust fan speed. EX1003, ¶131; EX1005, [0013]; EX1007, [0003], [0011]. Indeed, Sato discloses the same type of sensors, fans, and controller that Nakamura’s temperature control program utilizes. EX1003, ¶¶131-132; EX1005, [0033], [0044], [0065], [0070]-[0071]; EX1007, [0019], [0027]-[0030]. And both disclose techniques to reduce unnecessary fan operation. EX1003, ¶133. Sato states unnecessary use of cooling fans leads to “a problem in noise and excessive electric power consumption associated with the rotation of the cooling device....” EX1005, [0060]. Sato’s fan control is intended to reduce excess noise and power consumption. *Id.*, [0011], [0012], [0064], [0104], [0115], Fig. 5. Nakamura’s temperature control program is also intended to reduce excess fan noise and power consumption in then-existing electronic devices (like Sato’s server). EX1007, [0004], [0009], [0017].⁷

⁷ Nakamura discloses an embodiment as “notebook personal computer system 10” but does not limit the invention to notebook computers. EX1003, ¶140. Indeed, Nakamura expressly states that the disclosed invention is not limited to computer systems at all but “is broadly applicable to electronic

Implementing Nakamura’s temperature control program in Sato’s server would have furthered Sato’s goal of reducing excess fan operation. EX1003, ¶135. For instance, while Sato does not disclose stopping the cooling fans, Nakamura discloses stopping them when the internal component temperature reaches a particular low threshold. *Id.* In Nakamura, “[w]hen a computer transitions to a low-load state after being operated in a high-load state,” the interior temperature drop causes the fan to switch from high, to medium, to low speed. EX1007, [0006]. “The rotation of the cooling fan stops when the measured temperature reaches the set temperature value 509.” *Id.*; *see also id.*, [0031], Fig. 3. Modifying Sato to stop the fan when appropriate, as taught by Nakamura, would improve Sato’s fan control technique. EX1003, ¶135. A POSITA would have recognized this modification would enhance Sato’s fan control by further limiting unnecessary fan operation (more than Sato alone) thereby reducing noise and power consumption. *Id.*, ¶136.

In addition, Nakamura’s temperature control program stops the fan even

devices in which heat evacuation is performed from the interior of the enclosure by means of a cooling fan.” EX1007, [0045]. Nakamura’s reference to a notebook computer would not have dissuaded a POSITA from implementing Nakamura’s cooling program in Sato’s server. EX1003, ¶140.

though the internal component temperature is above the lowest threshold when the program determines that the rate of temperature decrease has “stagnated.”

EX1003, ¶136. Nakamura “provide[s] a cooling system that can detect the state where the rate of temperature decrease has stagnated before the interior temperature of the enclosure reaches the set temperature value for transitioning from low speed rotation to stop, and can stop the rotation of the cooling fan, reducing both user discomfort from noise and power consumption.” EX1007, [0009]. Again, because Sato does not contemplate stopping the fans even when internal component temperatures stagnate, a POSITA would have recognized that Nakamura’s temperature control program enhances Sato by further limiting unnecessary fan operation (more than in Sato alone) thereby reducing noise and power consumption. EX1003, ¶136.⁸

A POSITA could have modified Sato’s server based on Nakamura’s teachings without undue experimentation and with a reasonable expectation of success. EX1003, ¶138. Sato describes temperature control functionality executed

⁸ Additionally, a POSITA would have recognized other benefits from determining the rate of temperature decline, as in Nakamura, such as detecting and mitigating condensation in the device enclosure. EX1003, ¶137; EX1011, 24 (“Rapid cooling of equipment can cause condensation.”).

by “a semiconductor processing device such as a micro processing unit (MPU).” EX1005, [0046]; EX1003, ¶138. Similarly, Nakamura describes a temperature control program “executed by the processor of the environment system controller 56.” EX1007, [0030]. To implement Nakamura’s disclosed fan control technique, “only the temperature control program used in conventional systems needs to be modified.” *Id.* It would have been within a POSITA’s skill to modify Sato’s fan control programming to implement Nakamura’s fan control functionality. EX1003, ¶138.

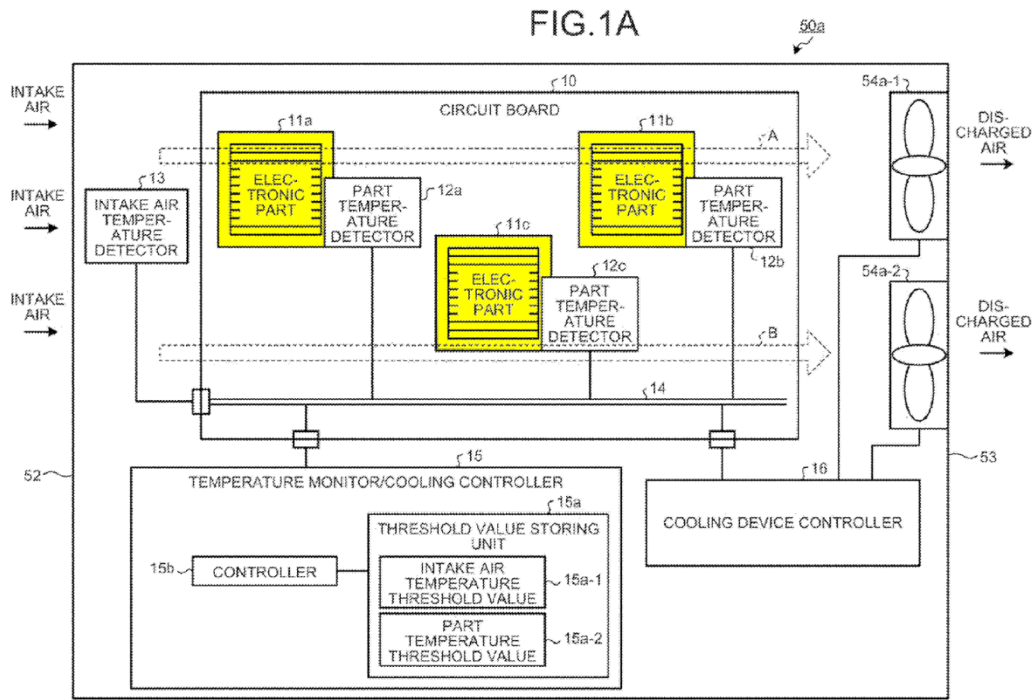
Modifying Sato based on Nakamura would have involved no more than use of prior art elements according to known methods to yield predictable results. EX1003, ¶139; *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007).

B. Claim 1

1. [1pre] ICT (information and Communication Technology) equipment having an electronic component, the ICT equipment comprising:

To the extent the preamble is limiting, Sato discloses *ICT...equipment having an electronic component* as recited. Each embodiment in Sato is a “server installation” (i.e., a server computer). EX1005, [0032]; EX1003, ¶142. And the ’320 Patent states that “ICT equipment” can be a “server device.” EX1001, 1:19-22. Thus, each of Sato’s embodiments constitutes *ICT...equipment*. EX1003, ¶142.

Sato’s first embodiment, illustrated in Figure 1A, shows “a configuration of an electronic apparatus according to a first embodiment” including “circuit board 10” incorporating “electronic parts” 11a, 11b, and 11c. EX1005, [0033], [0042]; *see also id.*, [0034], Fig. 1B. “The electronic parts 11a to 11c are semiconductor elements which generate heat according to operations.” *Id.*, [0034].



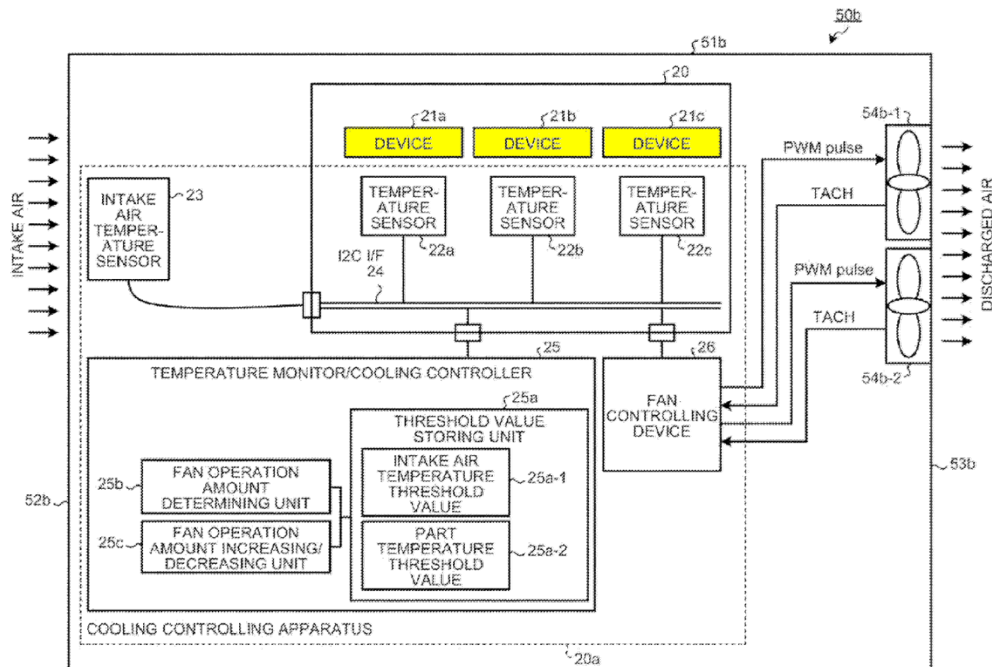
Sato, Fig. 1A (highlighted)

In Sato’s first embodiment, “electronic apparatus 50a” constitutes *ICT...equipment* and each of “electronic parts” 11a, 11b, and 11c is *an electronic component*. EX1003, ¶143.

Sato’s Figure 2 illustrates “a server installation according to a second embodiment.” EX1005, [0065]. “[I]nside housing 51b...devices 21a to 21c [are]

mounted on the system board 20....” *Id.*, [0067]. In this second embodiment, “the ‘device’ represents an electronic part such as a semiconductor element which generates heat according to an operation....” *Id.*, [0068].

FIG.2

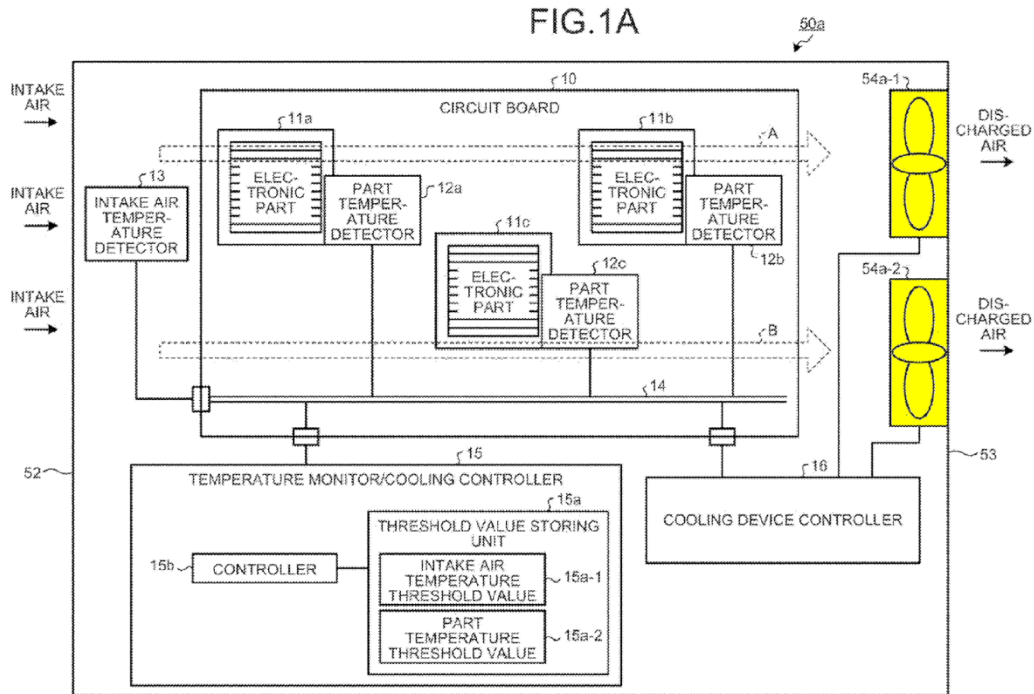


Sato, Fig. 2 (highlighted)

In Sato’s second embodiment, “server installation 50b” constitutes *ICT...equipment* and each of “devices 21a to 21c” is *an electronic component*. EX1003, ¶146.

2. [1a] a cooling fan;

Sato discloses this limitation. EX1003, ¶¶151-155. In Sato’s first embodiment, electronic apparatus 50a includes “cooling fans 54a-1 and 54a-2.” EX1005, [0041]; *see also id.*, Fig. 1B.

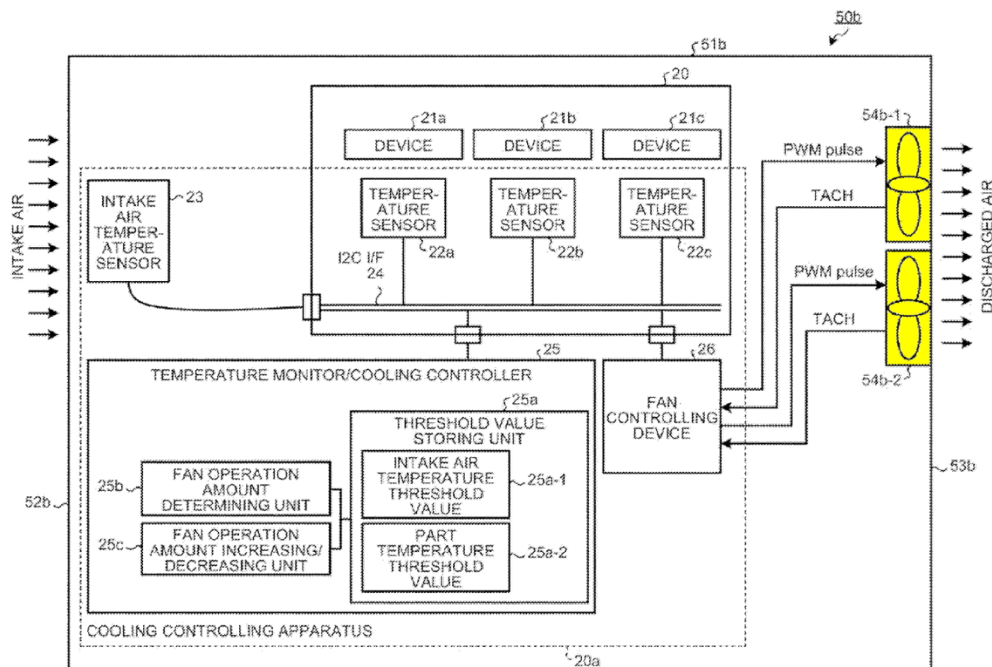


Sato, Fig. 1A (highlighted)

Each of cooling fans 54a-1 and 54a-2 constitutes a claimed *cooling fan*. EX1003, ¶151.

In Sato’s second embodiment, server installation 50b includes “cooling fans 54b-1 and 54b-2.” EX1005, [0065].

FIG.2



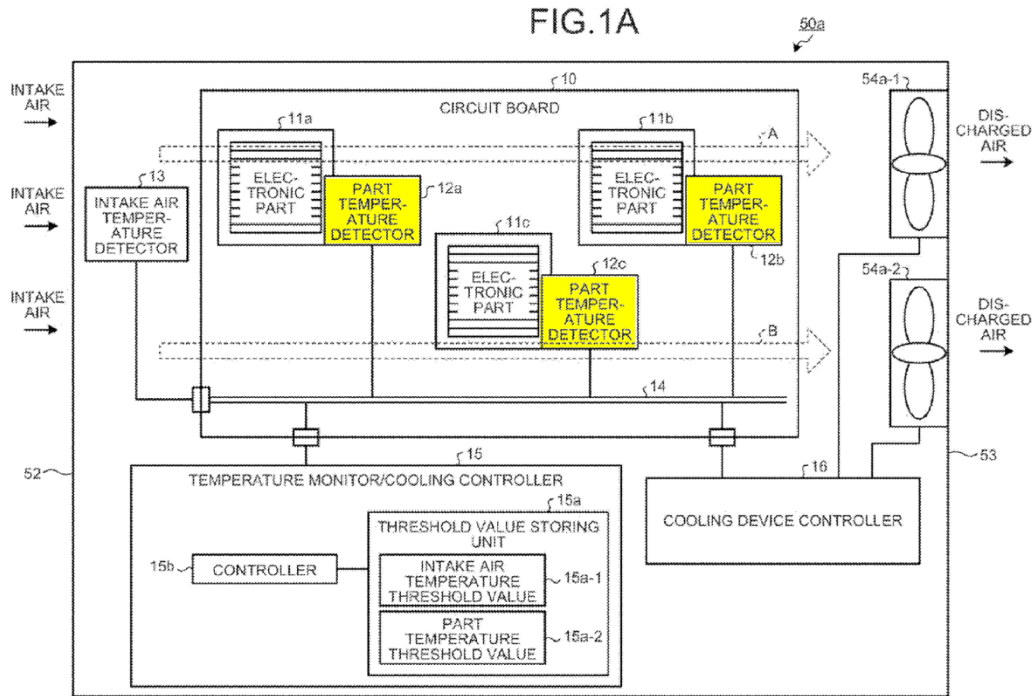
Sato, Fig. 2 (highlighted)

Each of cooling fans 54b-1 and 54b-2 constitutes a claimed *cooling fan*. EX1003, ¶153.

3. **[1b] a first temperature sensor that detects a component temperature of the electronic component included in the ICT equipment;**

Sato discloses this limitation. EX1003, ¶¶156-159. In Sato’s first embodiment, electronic apparatus 50a includes “a part temperature detector 12a adjacent to the electronic part 11a mounted on the circuit board 10....” EX1005, [0042]. “The part temperature detector 12a is a temperature sensor...which detects a temperature of the electronic part 11a.” *Id.* “Similarly, part temperature detectors 12b and 12c respectively [are] adjacent to the electronic parts 11b and

11c” and “are temperature sensors which detect temperatures of the electronic parts 11b and 11c, respectively.” *Id.*



Sato, Fig. 1A (highlighted)

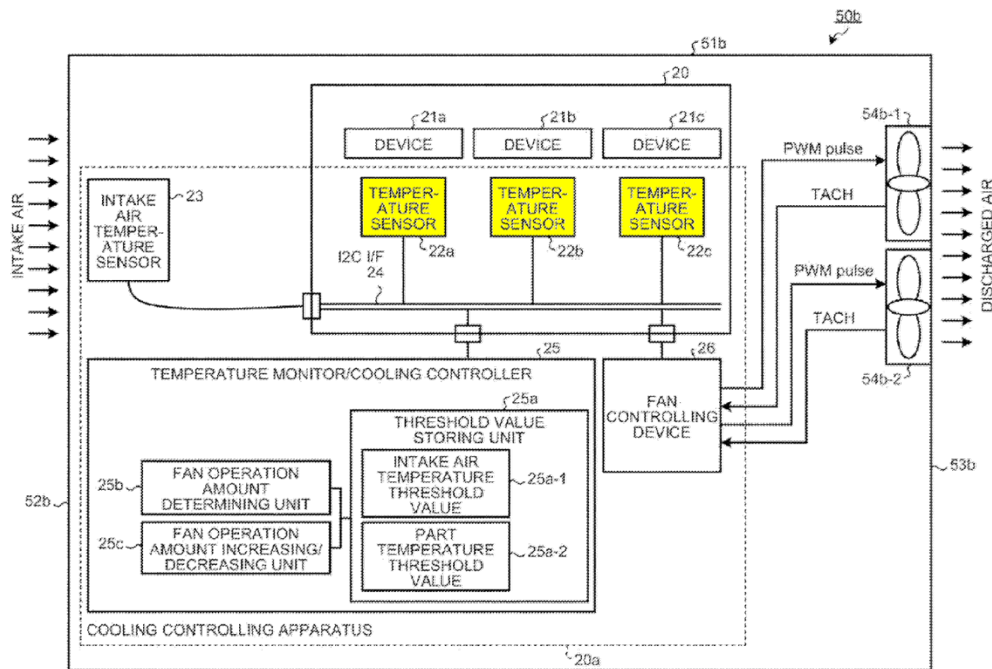
Each part temperature detector detects *a component temperature of the electronic component* (electronic part 11a, 11b, or 11c) *included in the ICT equipment*.

EX1003, ¶157. Thus, each part temperature detector constitutes *a first temperature sensor that detects a component temperature of the electronic component included in the ICT equipment*. *Id.*

In Sato’s second embodiment, server installation 50b includes “temperature sensors” 22a, 22b, and 22c. EX1005, [0068]. The temperature sensors 22a, 22b, and 22c are arranged adjacent to, and detect the temperature of, devices 21a, 21b,

and 21c, respectively. *Id.*

FIG.2

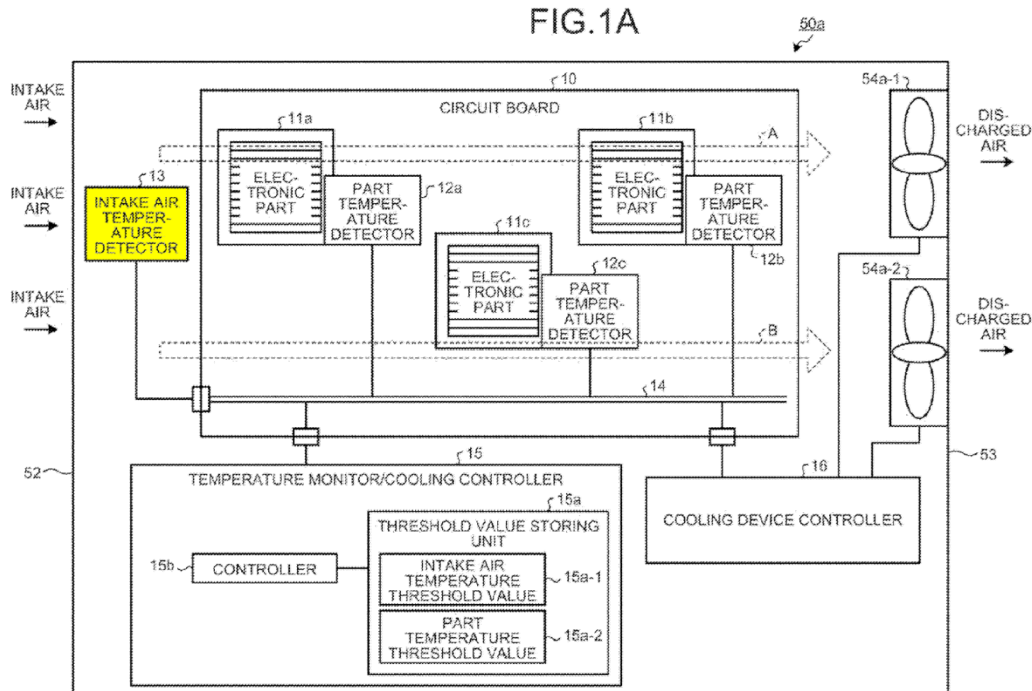


Sato, Fig. 2 (highlighted)

Each temperature sensor constitutes *a first temperature sensor that detects a component temperature of the electronic component included in the ICT equipment.* EX1003, ¶158.

4. [1c] a second temperature sensor that detects a temperature of an intake air; and

Sato discloses this limitation. EX1003, ¶¶160-161. In Sato’s first embodiment, electronic apparatus 50a includes an “intake air temperature detector 13” that “detects a temperature of intake air of the cooling air taken in the inside of the housing 51....” EX1005, [0044].

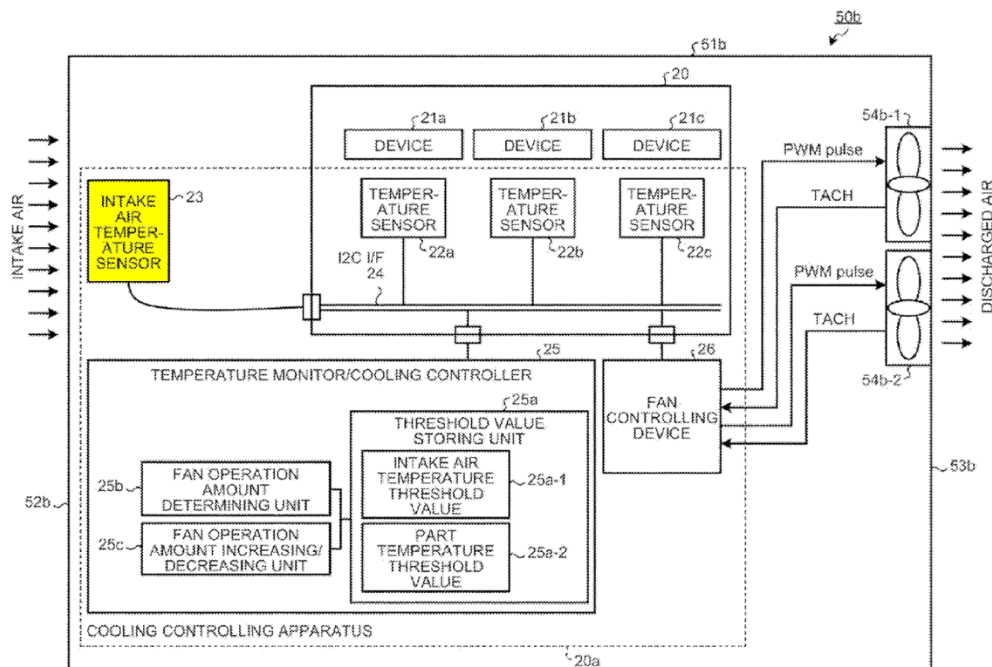


Sato, Fig. 1A (highlighted)

Sato’s intake air temperature detector 13 constitutes *a second temperature sensor that detects a temperature of an intake air*. EX1003, ¶160.

In Sato’s second embodiment, server installation 50b includes “an intake air temperature sensor 23,” which “detects the temperature of intake air of the cooling air taken in the inside of the housing 51b....” EX1005, [0065], [0070].

FIG.2

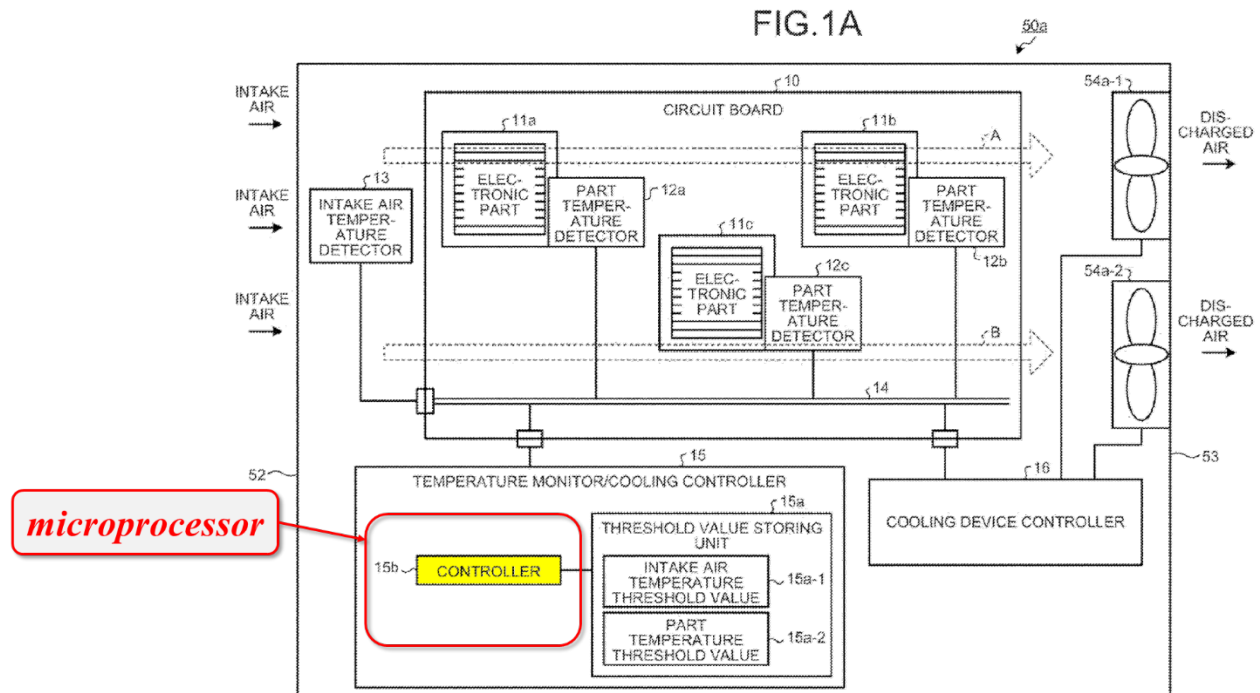


Sato, Fig. 2 (highlighted)

Sato’s intake air temperature sensor 23 constitutes *a second temperature sensor that detects a temperature of an intake air*. EX1003, ¶161.

5. [1d] a microprocessor including:

Sato discloses *a microprocessor*. EX1003, ¶¶162-164. In Sato’s first embodiment, electronic apparatus 50a has a “temperature monitor/cooling controller 15” including “a threshold value storing unit 15a and a controller 15b.” EX1005, [0046]. Controller 15b is “realized by” a “semiconductor processing device such as a micro processing unit (MPU).” *Id.*

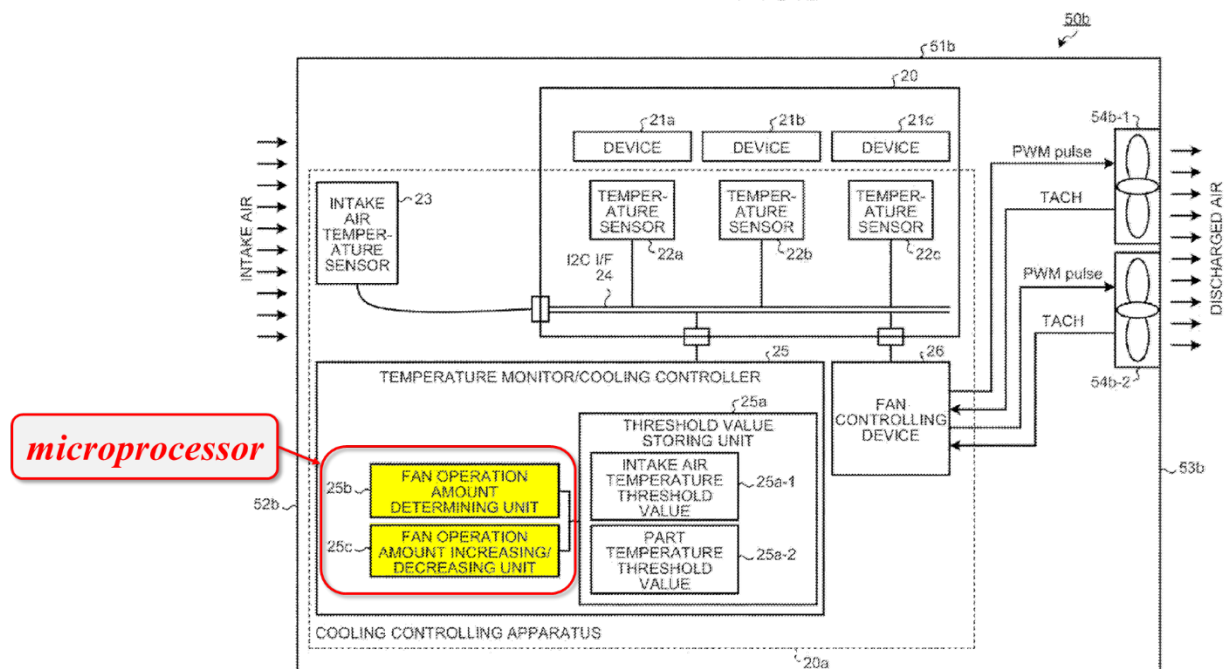


Sato, Fig. 1A (annotated)

Sato’s controller 15b is control logic executed on (i.e., “realized by”) the claimed *microprocessor*. EX1003, ¶162.

In Sato’s second embodiment, server installation 50b includes “a temperature monitor/cooling controller 25,” which includes “a threshold value storing unit 25a, a fan operation amount determining unit 25b, and a fan operation amount increasing/decreasing unit 25c.” EX1005, [0065], [0072].

FIG.2



Sato, Fig. 2 (annotated)

Sato does not explicitly identify the microprocessor unit (MPU) of the second embodiment, but a POSITA would understand that the fan operation amount determining unit 25b and the fan operation amount increasing/decreasing unit 25c are “realized by” a “semiconductor processing device such as a micro processing unit (MPU)” like controller 15b in the first embodiment. EX1003, ¶164; EX1005, [0046]. The two fan operation units 25b and 25c perform essentially the same fan control functions as controller 15b. EX1003, ¶164; EX1005, [0050], [0057]-[0059], [0076]-[0081]. Further, the functions performed by fan operation units 25b and 25c are the type of logical determinations and calculations most commonly performed by a microprocessor. EX1003, ¶164. Finally, Sato states that the

disclosure focuses on differences between the first and second embodiment (EX1005, [0065]) but does not suggest any difference in the way fan operation units 25b and 25c are implemented compared to controller 15b. EX1003, ¶164. Thus, a POSITA would know that fan operation units 25b and 25c are executed by *a microprocessor* as claimed. *Id.*

In addition, the combination of Sato and Nakamura discloses *a microprocessor including* the following two limitations as discussed below for 1e and 1f. EX1003, ¶167.

6. **[1e] 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**

The combination of Sato and Nakamura discloses this limitation. EX1003, ¶¶168-174.

In Nakamura, the “main components of the cooling system” are “implemented by means of a temperature control program stored in the ROM of the environment system controller 56 and executed by the processor....” EX1007, [0030]. The “temperature control program” is *a declination index value calculation unit* because it determines the “rate of temperature decrease” of components in enclosure 12. EX1003, ¶169. Nakamura describes three methods for calculating the rate of temperature decrease to determine if the rate has slowed

sufficiently to indicate stagnation. EX1007, [0034]-[0039], Fig. 4, 6, 7.

Nakamura’s “rate of temperature decrease” is based on temperature sensors 58, which are mounted near, or embedded in, electronic components like the CPU, hard disk drive, or power supply. EX1007, [0011], [0028]. Thus, Nakamura’s “rate of temperature decrease” calculated by the temperature control program constitutes the claimed *index value* because it *indicat[es] a degree of declination of the component temperature of the electronic component*. EX1003, ¶170.

In addition, Nakamura discloses calculating the “rate of temperature decrease” as more specifically described in dependent claims 2, 3, and 4, each of which recites a particular way to calculate the *index value*. See Sections VII.C-VII.E, below. For these further reasons, Nakamura discloses the *index value* of limitation 1e. EX1003, ¶171.

Sato combined with Nakamura discloses calculating the *index value...based on a detection result of the first temperature sensor*. EX1003, ¶174. In Sato’s server modified to include Nakamura’s temperature control program, component temperatures would be provided by Sato’s “part temperature detectors” 12a, 12b, 12c or “temperature sensors” 22a, 22b, 22c, any one of which is a *first temperature sensor*. See Section VII.B.3, above. Thus, the Sato-Nakamura combination discloses determining an *index value* (“rate of temperature decrease”) indicating a *degree of declination of the component temperature of the electronic component*

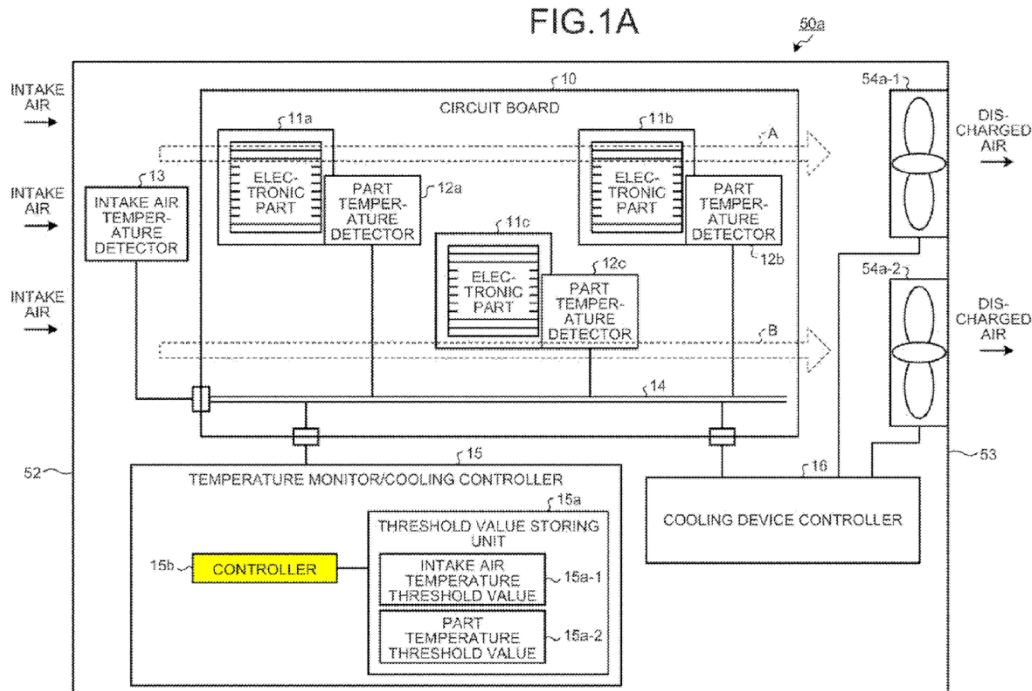
that is *based on a detection result of the first temperature sensor*. EX1003, ¶174.⁹

7. **[1f] 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.**

The combination of Sato and Nakamura discloses this limitation. EX1003, ¶¶176-183.

In Sato’s first embodiment, electronic apparatus 50a has a “temperature monitor/cooling controller 15” including “controller 15b,” which is executed by the claimed *microprocessor*. EX1005, [0046].

⁹ The combination of Sato and Nakamura also discloses limitation 1e should it be construed as a means-plus-function limitation. See Section V.A, above. Sato’s MPU configured to perform the functions described in this section is equivalent to the ’320 Patent’s CPU 13 configured to calculate the “declination index value” in the specification (EX1001, 5:17-29). EX1003, ¶175.

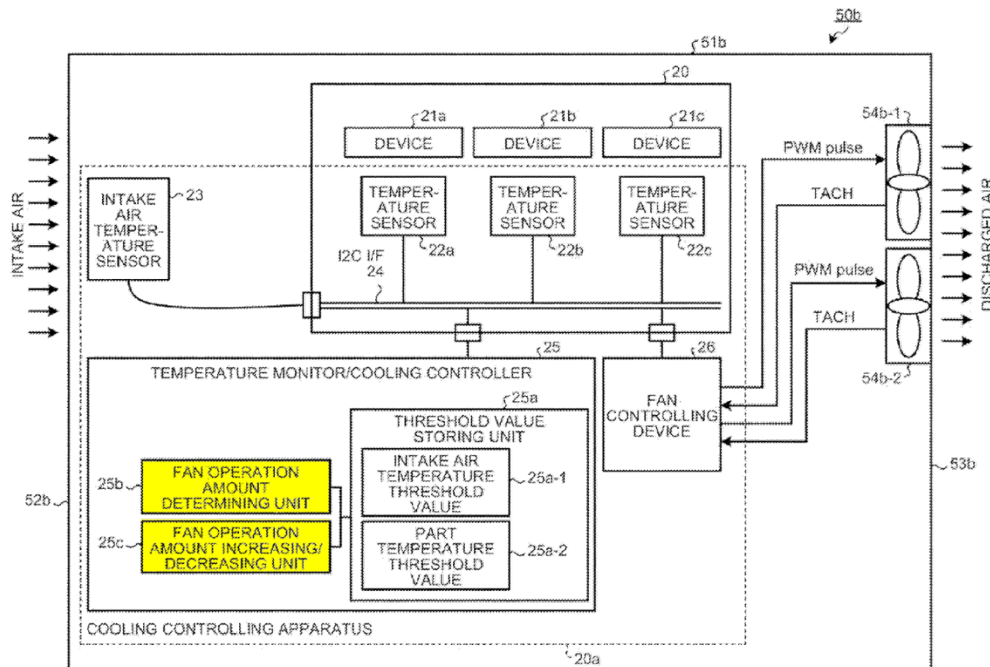


Sato, Fig. 1A (highlighted)

Sato’s controller 15b constitutes the claimed *control unit*. EX1003, ¶177. It *controls the number of rotations of the cooling fan*. EX1005, [0050] (“The controller 15b then determines the number of rotation of the cooling fans 54a-1 and 54a-2....”), [0051] (“the controller 15b determines the number of rotation of the cooling fans 54a-1 and 54a2”).

In Sato’s second embodiment, server installation 50b has a “temperature monitor/cooling controller 25” including “a fan operation amount determining unit 25b, and a fan operation amount increasing/decreasing unit 25c” executed by the claimed *microprocessor*. EX1005, [0072].

FIG.2



Sato, Fig. 2 (highlighted)

Together, Sato’s fan operation units 25b and 25c constitute the claimed *control unit*. EX1003, ¶179. They *control[] the number of rotations of the cooling fan*. EX1005, [0076] (“fan operation amount determining unit 25b then determines the number of rotation of the cooling fans 54b-1 and 54b-2...”), [0077] (same), [0080] (“fan operation amount increasing/decreasing unit 25c decreases the number of rotation of the cooling fans 54b-1 and 54b-2”), [0080] (“the fan operation amount increasing/decreasing unit 25c increases the number of rotation of the cooling fans 54b-1 and 54b-2”).

In both Sato’s first and second embodiments, the *control unit controls the number of rotations of the cooling fan[s]* based on: (1) the temperature of

components (“electronic parts” or “devices”) and (2) *the temperature of the intake air by the second temperature sensor*. EX1003, ¶180. Indeed, Sato expressly claims “a fan controller that controls a rotation number of the cooling fan based on the detected temperature of the electronic part and the detected intake air temperature.” EX1005, 25 (claim 1). In Sato’s first embodiment, controller 15b sets the fan speed at high, medium, or low based on the intake air temperature (*id.*, [0050]) and further adjusts the fan speed based on electronic part temperature (*id.*, [0057]). In the second embodiment, fan operation amount determining unit 25b sets the fan speed at high, medium, or low based on the intake air temperature (*id.*, [0076]) and fan operation amount increasing/decreasing unit 25c further adjusts the fan speed based on device temperature (*id.*, [0080]).¹⁰

When modified to incorporate Nakamura’s teachings, Sato’s control unit would have the added capability to control fan speed based on: (1) *the index value calculated by the declination index value calculation unit* (as in Nakamura’s

¹⁰ The ’320 Patent itself acknowledges that the “ICT equipment” disclosed in Sato’s foreign priority document includes a “controller” that “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.” EX1001, 1:40-43.

temperature control program) and (2) *the temperature of the intake air by the second temperature sensor*. EX1003, ¶182. As discussed above, Sato’s server would be enhanced by the added functionality provided by Nakamura’s temperature control program. For instance, the modified server would set fan speed based on intake air temperature and adjust (or stop) it based on the “rate of temperature decrease” (*index value*) determined using Sato’s “part temperature detectors” 11a, 11b, 11c or “temperature sensors” 22a, 22b, 22c (*second temperature sensor*). *Id.* Thus, Sato-Nakamura discloses this limitation.

Indeed, the ’320 Patent describes a fan-control technique that similarly assesses the intake air temperature first, then the component temperature, and only if both are outside specified temperature ranges is a *declination index value* determined and used to modify fan speed. EX1001, 6:7-7:7, 8:3-24, Fig. 6. Thus, the Sato-Nakamura combination’s sequence of first using the *temperature of intake air* to set fan speed and then using a *declination index value* to adjust it is entirely consistent with the ’320 Patent’s disclosed technique for controlling fan speed *based on the index value calculated by the declination index value calculation unit and the temperature of the intake air*. EX1003, ¶183. The Sato-Nakamura

combination discloses this limitation in the same way the '320 Patent does.¹¹

C. Claim 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.

Sato-Nakamura discloses claim 1. *See* Section VII.B, above. Nakamura also discloses an *index value* as in claim 2. EX1003, ¶¶185-197.

In particular, Nakamura describes determining the rate of temperature where sensor 58 provides component temperatures at predetermined time intervals.

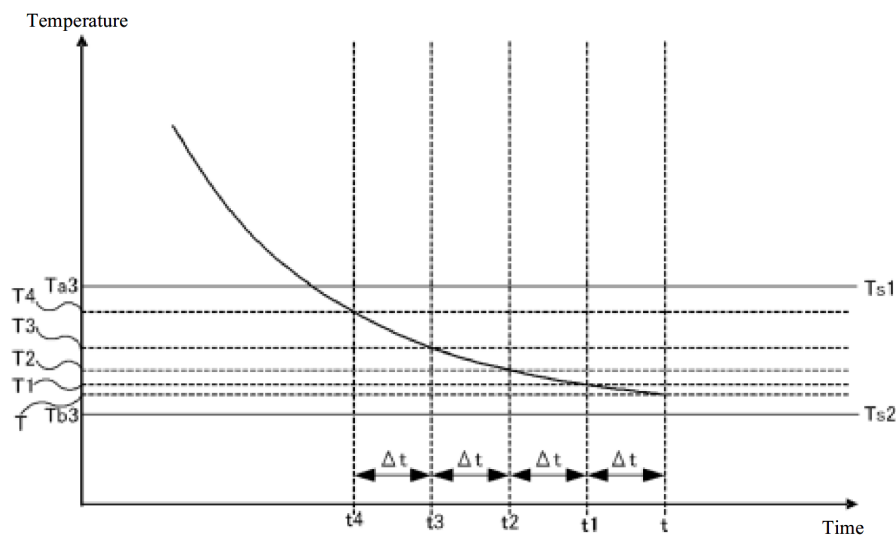
EX1007, [0034]. Sensors 58 are mounted near, or embedded in, *electronic component[s]* like the CPU, hard disk, or power supply. EX1007, [0011], [0028]. Thus, each sampled temperature provided by sensor 58 constitutes *the component temperature of the electronic component*. EX1003, ¶186.

Nakamura's Figure 4 illustrates a "first detection method" for determining whether the rate of temperature decrease (*index value*) has stagnated. EX1007,

¹¹ The combination of Sato and Nakamura also discloses limitation 1f should it be construed as a means-plus-function limitation. *See* Section V.B, above. Sato's MPU configured to perform the functions described in this section is equivalent to the '320 Patent's CPU 13 configured to implement the "the control means 172" in "the management section 17" identified in the specification (EX1001, 5:45-47). EX1003, ¶184.

[0034]. “[T]he interior temperature of the enclosure 12 is sampled at fixed sampling intervals Δt ” based on temperature readings from temperature sensors 58. *Id.*, [0034]; *see also id.*, [0036] (“[W]hen the interior temperature of the enclosure 12 is within the set temperature range between T_{s1} and T_{s2} , the environment system controller 56 processes signals from the temperature sensor 58 at a sampling interval Δt .”). Each sampled temperature reading is a *component temperature of [an] electronic component*. EX1003, ¶187.

[FIG. 4]



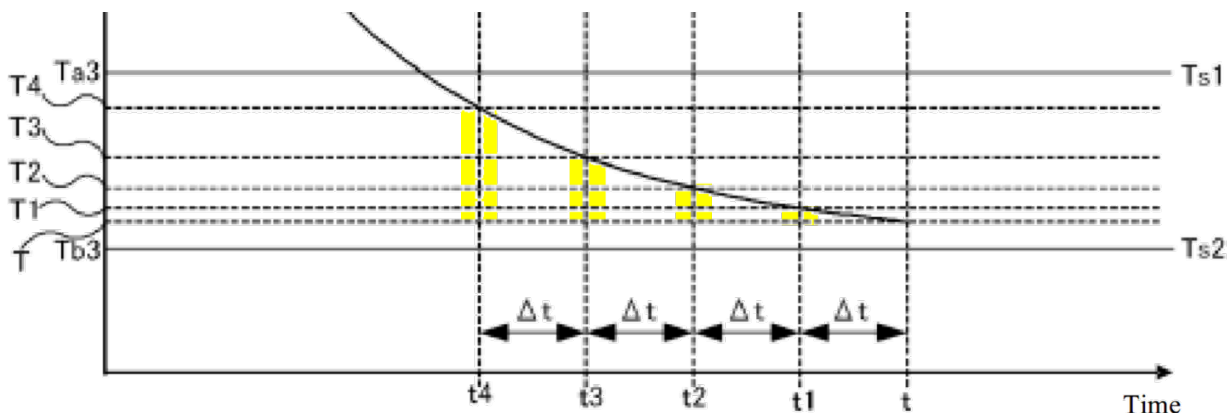
Nakamura, Fig. 4

In Figure 4, the current time is indicated by t on the x-axis and the concurrent temperature is indicated by T on the y-axis. EX1007, [0036]. The “past sampling times” are indicated by t_1 , t_2 , t_3 , and t_4 , with concurrent temperatures T_1 , T_2 , T_3 , and T_4 , respectively. *Id.*

Nakamura’s first detection method uses the difference in temperature at each

sampling time compared to the current temperature to determine whether the rate of temperature decrease has stagnated. EX1007, [0037]. As Nakamura explains, “[w]hen the rate of temperature decrease stagnates, the difference between the current temperature value T and the temperature values at each sampling time gradually becomes smaller.” *Id.* “For example, the temperature difference ($T_3 - T$) between current time t and time t_3 becomes smaller than the temperature difference ($T_4 - T$) between the current time t and time T_4 .” *Id.* Thus, to determine the rate of decrease, Nakamura calculates $T_4 - T$, $T_3 - T$, $T_2 - T$, and $T_1 - T$. EX1003, ¶189.

The following partial view of Figure 4 illustrates Nakamura’s first detection method to determine the rate of temperate decrease over time. EX1003, ¶190.



Nakamura, Fig. 4 (partial, highlighted)

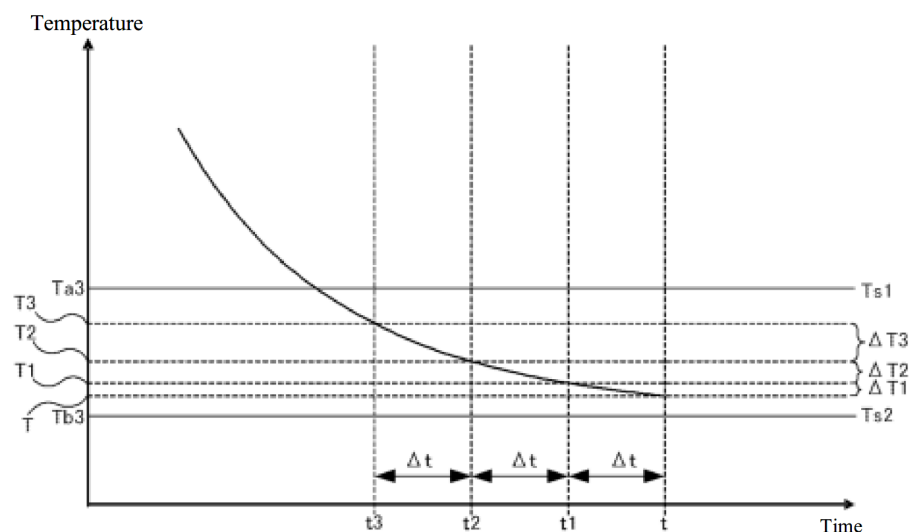
As illustrated, Nakamura determines the rate of temperature decrease by calculating the difference in temperature over time compared to the current temperature. EX1007, [0037]; EX1003, ¶190.

Nakamura’s temperature control program can be configured to determine that the rate of temperature decrease has stagnated by calculating the temperature difference “between current time t and the previous sampling time t_1 ” to determine if it is at or below a predetermined value. EX1007, [0037]. In other words, the program determines an *index value* by calculating T_1 minus T , which is *a declined temperature (from T_1 to T) per unit time (from t_1 to t) of the component temperature of the electronic component*. EX1003, ¶191.

Alternatively, Nakamura’s temperature control program can be configured to determine that the rate of temperature decrease has stagnated by calculating “the difference between the current temperature value T and three past temperature values (T_1-T , T_2-T , T_3-T)” to determine if “all [are] at or below a predetermined value.” EX1007, [0037]. Expanding on Nakamura’s prior example, the program determines an *index value* by calculating *declined temperature[s]* (T_1-T , T_2-T , T_3-T) *per unit time* (Δt). EX1003, ¶192.

Nakamura further discloses a “second detection method” as illustrated in Figure 6. EX1007, [0038].

[FIG. 6]

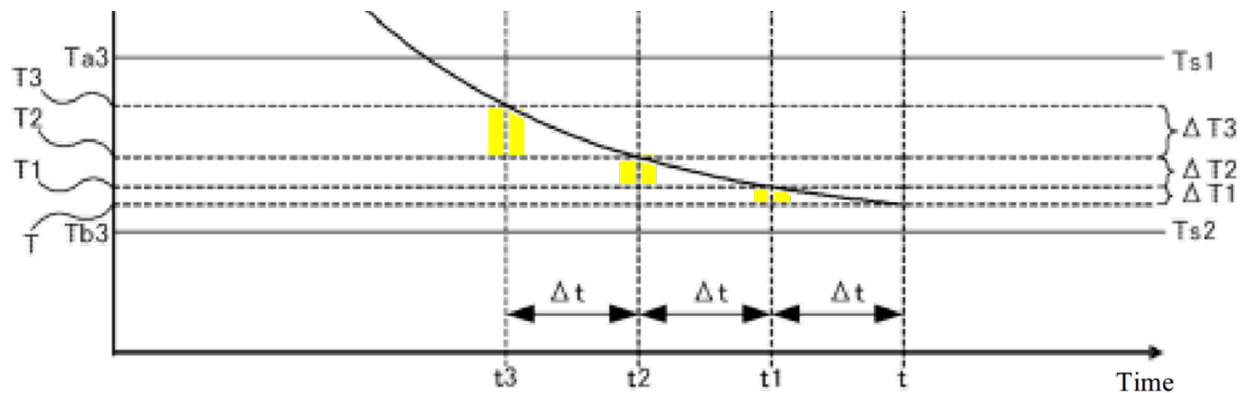


Nakamura, Fig. 6

Unlike the first detection method, the second compares temperatures from one sampling time to the next. *Id.* The relevant temperature differences for this method are “ $\Delta T_1 = T - T_1$, $\Delta T_2 = T_1 - T_2$, $\Delta T_3 = T_2 - T_3$” *Id.* “[A]s the rate of temperature decrease stagnates, the temperature differences become smaller in the order ΔT_3 , ΔT_2 , ΔT_1 .” *Id.*

The following partial view of Figure 6 illustrates the second detection method calculations to determine the rate of temperate decrease over time.

EX1003, ¶194.



Nakamura, Fig. 6 (partial, highlighted)

As illustrated, Nakamura determines the rate of temperature decrease by calculating temperature differences between successive sampling intervals. *Id.*, ¶195; EX1007, [0038]. In this example, the program calculates “ $\Delta T1 = T - T1$, $\Delta T2 = T1 - T2$, $\Delta T3 = T2 - T3$,” each of which is *a declined temperature* ($T - T1$, $T1 - T2$, $T2 - T3$) *per unit time* (Δt) *of the component temperature of the electronic component* (i.e., an *index value*). EX1003, ¶195.

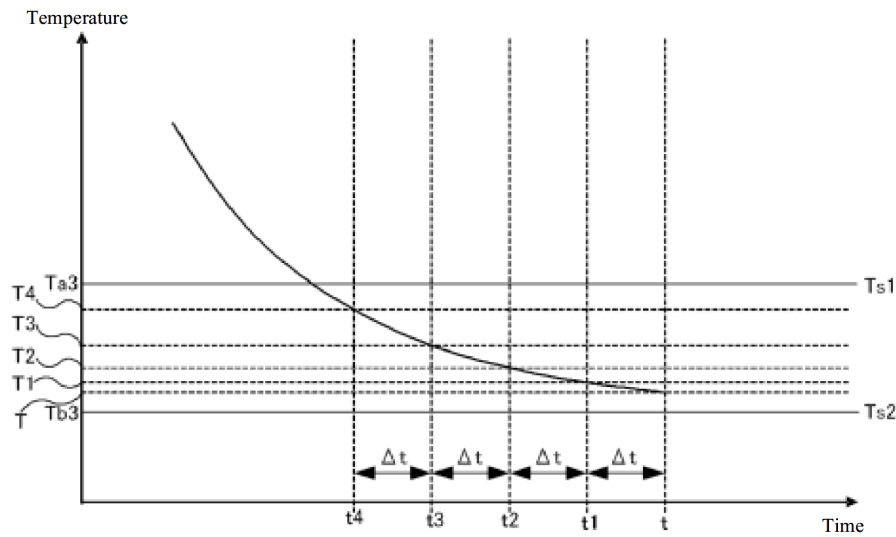
Thus, in multiple ways, Nakamura discloses an *index value that is a declined temperature per unit time of the component temperature of the electronic component* as in claim 2. EX1003, ¶196. In addition to Nakamura’s disclosures, a POSITA would know that there are a finite number of identified, predictable techniques to determine the rate of temperature decline using temperature sensors in electronic equipment. *Id.*, ¶197. It would have been obvious to try the technique of claim 2. *Id.*; *KSR*, 550 U.S. at 421.

D. Claim 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.

Sato-Nakamura discloses claim 1. *See* Section VII.B, above. Nakamura also discloses an *index value* as in claim 3. EX1003, ¶¶198-205.

Nakamura describes a temperature control program that calculates the “rate of temperature decrease” (*index value*) to determine when internal component temperature has stagnated. EX1007, [0010]. In Nakamura, temperature stagnation “refers to a state where, when the cooling fan 14 is in a low speed rotation state..., the interior temperature of the enclosure 12 is slightly higher than Tb3, and the change over time is minimal.” *Id.*, [0033]. Nakamura discloses several “detection methods” to determine when temperature has stagnated (i.e., when “change over time is minimal”). *Id.*, [0033]-[0039]. Among them, Nakamura describes sampling the temperature “at fixed sampling intervals Δt ” (*a plurality of measurement periods*). *Id.*, [0034], Fig. 4.

[FIG. 4]



Nakamura, Fig. 4

Then the rate of temperature decrease can be determined by calculating the temperature difference “between current time t and the previous sampling time t_1 .” *Id.*, [0037].

In Nakamura’s Figure 4 example, the temperature-control program determines whether “the change over time is minimal” by calculating T_1 minus T over the period Δt (i.e., time t_1 to t). EX1003, ¶199.¹² While Nakamura does not

¹² Nakamura refers repeatedly to the “rate” of temperature decrease, which means the change in temperature over a period of time. EX1003, ¶203. A POSITA would know that Nakamura’s program would not determine a “rate” if it merely

refer to this as an “average,” a POSITA would recognize that the difference in sampled temperatures from (T_1 to T) over a fixed time period (Δt) is an *average value of* the rate of temperature decline during that period. *Id.*, ¶201.¹³ Thus, Nakamura uses the average rate of temperature decline to determine whether “the change over time is minimal.” *Id.*

Nakamura also teaches determining the rate of temperature decrease “on the basis of the difference between the current sampling temperature value and multiple sampling temperature values.” EX1007, [0013]. For instance, the temperature control program can determine “the difference between the current temperature value T and three past temperature values (T_1-T , T_2-T , T_3-T).” EX1007, [0037]. A POSITA would recognize that this means determining the

determined the difference between two temperatures (T_1 and T) without regard to a time period (t_1 to t). *Id.*

¹³ The '320 Patent itself describes calculating the “average value” of the declination rate by “dividing a difference Δt , between a component temperature t_1 detected at a time when the measurement period starts and a component temperature t_2 detected at a time when the measurement period ends, by the measurement period.” EX1001, 5:21-26. This is the same calculation described by Nakamura. EX1003, ¶202.

average rate of temperature change between t_1 and t (as explicitly stated in Nakamura) as well as the average rate of change for multiple other temperature readings (e.g., $T_2 - T$ over the period t_2 to t , $T_3 - T$ over the period t_3 to t , etc.).

EX1003, ¶204. In this way, Nakamura suggests and renders obvious to a POSITA determining an *index value* that is based on *an average value of declination rates of the component temperature of the electronic component in a plurality of measurement periods*. *Id.*

In addition to Nakamura's disclosures, a POSITA would know that there are a finite number of identified, predictable techniques to determine the rate of temperature decline using temperature sensors in electronic equipment. EX1003, ¶205. It would have been obvious to try the technique of claim 3. *Id.*; KSR, 550 U.S. at 421.

E. Claim 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.

Sato-Nakamura discloses claim 1. *See* Section VII.B, above. Nakamura also discloses an *index value* as recited in claim 4. EX1003, ¶¶206-209.

Nakamura determines the rate of temperature decrease using temperature readings from sensor 58 at predetermined intervals. EX1007, [0034]. Each sampled temperature provided by Nakamura's sensor 58 constitutes *the component temperature of the electronic component* as explained for 1e. *See* Section VII.B.6,

above; EX1007, [0011], [0028]; EX1003, ¶207.

According to Nakamura’s first detection method, the temperature control program can be configured to determine the rate of temperature decrease has stagnated by calculating the temperature difference “between current time t and the previous sampling time t_1 ” ($T_1 - T$) to determine if it is at or below a predetermined value. EX1007, [0037]; EX1003, ¶208. This calculation is performed when temperature readings are on a “decreasing trend,” so the temperature T_1 at time t_1 is necessarily the highest sampled temperature in the period from t_1 to t . EX1007, [0035]; EX1003, ¶208. Thus, Nakamura’s program determines an *index value* by calculating *a difference between a highest value of the component temperature of the electronic component (T_1) in a past certain period (t_1 to t) and a current component temperature (T)* as in claim 4. EX1003, ¶208.

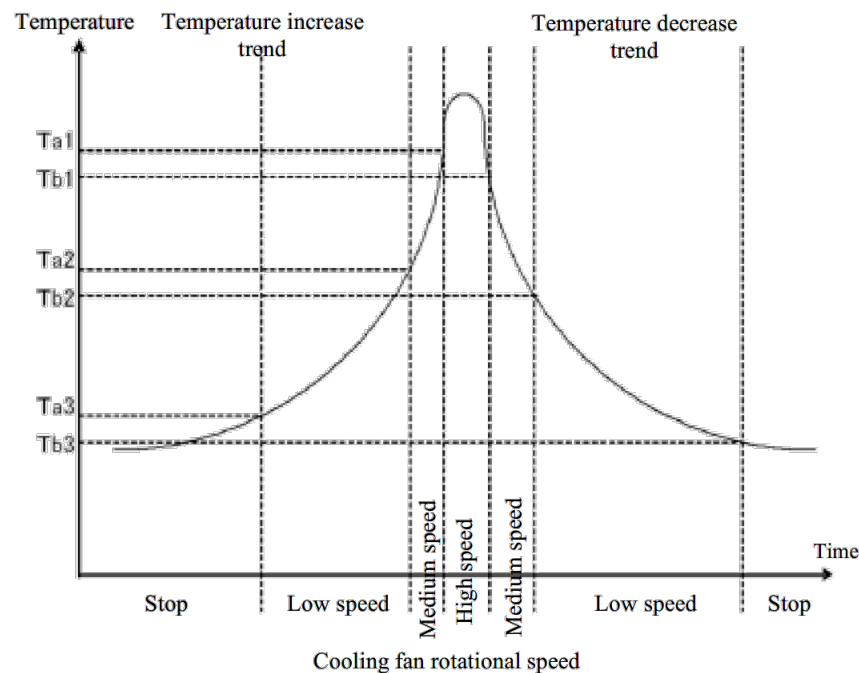
In addition to Nakamura’s disclosures, a POSITA would know that there are a finite number of identified, predictable techniques to determine the rate of temperature decline using temperature sensors in electronic equipment. EX1003, ¶209. It would have been obvious to try the technique of claim 4. *Id.*; KSR, 550 U.S. at 421.

- F. Claim 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.**

Sato-Nakamura discloses claim 1. *See* Section VII.B, above. Nakamura also discloses claim 5. EX1003, ¶¶210-215.

Nakamura’s Figure 3 “shows the relationship between the interior temperature of the enclosure and the operation of the cooling fan 14.” EX1007, [0031].

[FIG. 3]

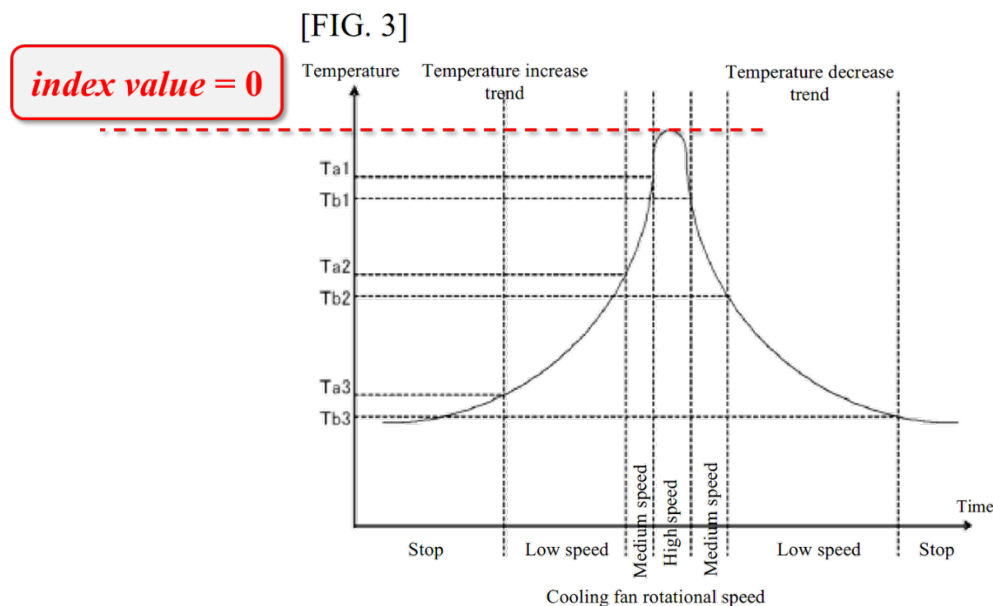


Nakamura, Fig. 3

As illustrated, Nakamura’s environment control system controller, including the temperature control program, increases fan speed at certain threshold temperatures

when “temperature sensor 58 has an increasing trend” and reduces fan speed at different threshold temperatures when the temperature “has a decreasing trend.” *Id.*; see also *id.*, [0012] (separate thresholds for increasing and decreasing trends avoids “the phenomenon of cooling fan chattering”). A POSITA would recognize that Nakamura’s temperature control program necessarily determines the increasing or decreasing trend of internal component temperatures over time, so that the program uses the correct threshold values to switch fan speed. EX1003, ¶212.

In Nakamura’s Figure 3, when the temperature reaches a peak value, the rate of temperature decrease (*index value*) is zero (i.e., the temperature is not decreasing at all). EX1003, ¶213.

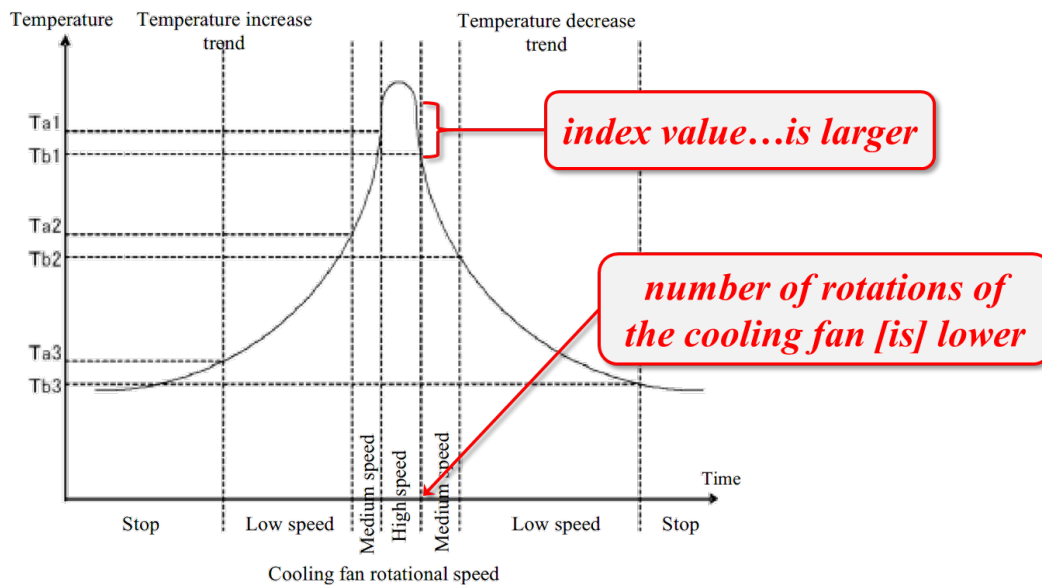


Nakamura, Fig. 3 (annotated)

The figure shows the temperature peaking and immediately falling although a POSITA would know that in practice the temperature can remain at a high level with little or no temperature decrease (i.e., *index value* equal to zero) for some time, for example, if the CPU is in high-load processing. *Id.*

As Nakamura explains, when the CPU transitions from high-load to low-load processing “heat generation declines.” EX1007, [0003]; *see also id.*, [0006], Fig. 11. As Figure 3 illustrates, the rate of temperature decrease (*index value*) quickly changes from zero to a much larger value. EX1003, ¶214. As the declining temperature falls past threshold Tb1 at a steep decline (*the degree of declination of the component temperature of the electronic component...is larger*), Nakamura’s fan controller switches the fan speed from high to medium speed (*the control unit controls the number of rotations of the cooling fan to be lower*). *Id.*

[FIG. 3]



Nakamura, Fig. 3 (annotated)

Thus, Nakamura discloses the additional limitation of claim 5. *Id.*, ¶215.

G. Claim 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.

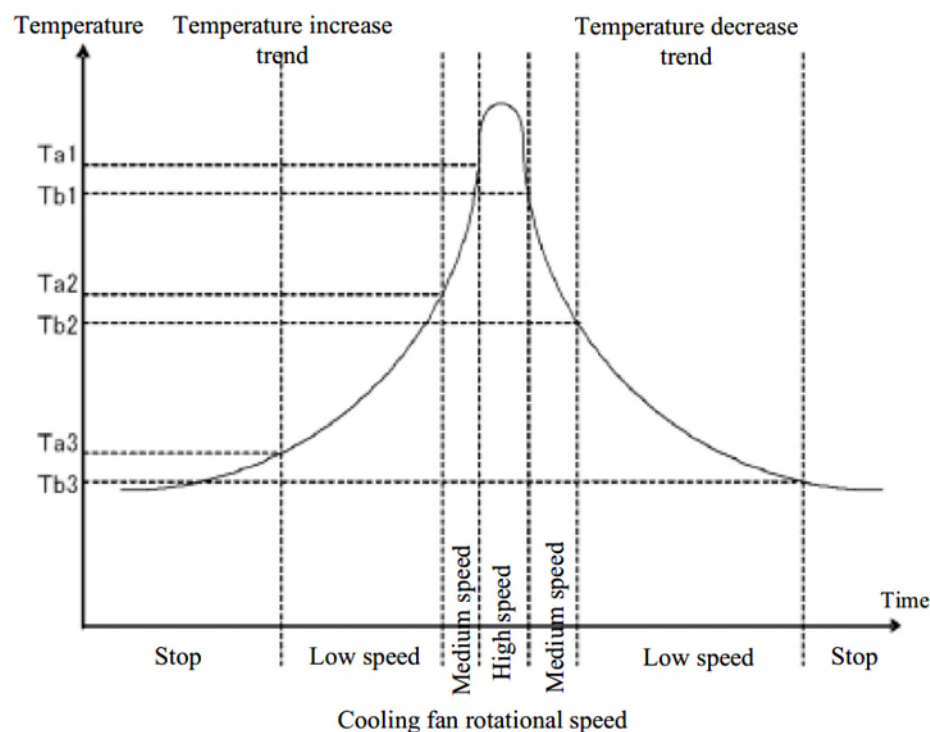
Sato-Nakamura discloses claim 1. *See* Section VII.B, above. Nakamura also discloses the limitation of claim 6. EX1003, ¶¶216-218. As discussed for 1e, Nakamura’s temperature control program determines the rate of temperature decrease (*index value*). *See* Section VII.B.6, above. For example, Nakamura’s program can be configured to calculate the temperature difference “between current time t and the previous sampling time t_1 ” over time Δt and determine that the temperature has stagnated if it “is at or below a predetermined value.” EX1007, [0037]. If the temperature decrease has stagnated, the cooling fans 14 are

stopped. *Id.*, [0038].

Nakamura describes another circumstance in which cooling fans 14 are stopped even though the temperature has not stagnated (i.e., *if the index value is not less than a predetermined threshold*). EX1007, [0035]; EX1003, ¶218.

Nakamura's Figure 3 provides an example.

[FIG. 3]



Nakamura, Fig. 3

On the right side, the temperature declines to threshold Tb3 causing the cooling fans 14 to stop even though the rate of temperature decrease has not stagnated (i.e., *the rate of temperature decrease is not less than a predetermined threshold*).

EX1007, [0035]; EX1003, ¶218. In this circumstance, the *control unit stops the*

cooling fan even though the temperature has not stagnated (i.e., *if the index value is not less than a predetermined threshold*). EX1003, ¶218.

H. Claim 7

- 1. A control device for ICT (Information and Communication technology) equipment having a cooling fan, electronic component, 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:**

Sato discloses the preamble of claim 7 for reasons discussed for claim 1.

Sato describes embodiments of a “server installation” constituting *ICT (Information and Communication technology) equipment*. See Section VII.B.1, above. Sato’s embodiments have *a cooling fan* as discussed for 1a (see Section VII.B.2, above) and *electronic component[s]* as discussed for 1pre (see Section VII.B.1, above). Sato discloses *a first temperature sensor for detecting a temperature of the electronic component* as discussed for 1b. See Section VII.B.3, above. And Sato discloses *a second temperature sensor that detects a temperature of an intake air* as discussed for 1c. See Section VII.B.4, above. Sato discloses a *control device* as discussed for 1d-1f. See Sections VII.B.5-VII.B.7, above. Thus, to the extent the preamble is limiting, Sato discloses it. EX1003, ¶219.

- 2. a microprocessor including:**

The Sato-Nakamura combination discloses this limitation for the reasons discussed for 1d. See Section VII.B.5, above.

3. **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 the first temperature sensor that detects the component temperature of the electronic component; and**

This limitation is substantially the same as 1e and disclosed for the same reasons. *See* Section VII.B.6, above.¹⁴ The additional language in this limitation, as compared to the corresponding limitation in claim 1, is recited in 1b and disclosed for the reasons discussed for that limitation. *See* Section VII.B.3, above. EX1003, ¶221.

4. **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.**

This limitation is nearly identical to 1f and disclosed for the same reasons.

¹⁴ The combination of Sato and Nakamura also discloses this limitation should it be construed as a means-plus-function limitation. *See* Section V.A, above. Sato's MPU configured to perform the functions described for this limitation is equivalent to the '320 Patent's CPU 13 configured to calculate the "declination index value" in the specification (EX1001, 5:17-29). EX1003, ¶222.

See Section VII.B.7, above; EX1003, ¶223.¹⁵

I. Claim 8

1. A temperature controlling method comprising:

The Sato-Nakamura combination discloses a *temperature controlling method* as discussed for 1e and 1f. EX1003, ¶225; EX1005, [0002]; EX1007, [0009]; Sections VII.B.6-VII.B.7, above.

2. 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

The Sato-Nakamura combination discloses this limitation. EX1003, ¶¶226-229. Nakamura discloses a *declination index value calculation unit* that calculates an *index value indicating a degree of declination of a component*

¹⁵ The combination of Sato and Nakamura also discloses this limitation should it be construed as a means-plus-function limitation. See Section V.B, above. Sato’s MPU configured to perform the functions described for this limitation is equivalent to the ’320 Patent’s CPU 13 configured to implement the “the control means 172” in “the management section 17” identified in the specification (EX1001, 5:45-47). EX1003, ¶224.

temperature...based on a detection result of a first temperature of the electronic component as described for 1e. See Section VII.B.6, above. Nakamura also discloses the specific *index value[s]* recited in dependent claims 2, 3, and 4. See Sections VII.C-VII.E, above. As discussed in the context of claims 1-4, Nakamura discloses calculating a claimed *index value* when the temperature control program is determining if the internal component temperature is “stagnating.” *Id.*; EX1007, [0036]-[0040]. As Nakamura explains, the temperature stagnates when the rate of temperature decrease becomes small while the cooling fans are operating at low speed. *Id.* In Sato-Nakamura, the fan controller would set the fans at low speed based on the intake air temperature as disclosed in Sato. EX1005, [0064]. Thus, in Sato combined with Nakamura, the *index values* described for 1e and claims 2, 3, and 4 are calculated *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* as recited in this limitation. EX1003, ¶229.¹⁶

¹⁶ The combination of Sato and Nakamura also discloses this limitation should it be construed as a means-plus-function limitation. See Section V.A, above. Sato’s MPU configured to perform the functions described for this limitation is

3. **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.**

This limitation is nearly identical to 1f and disclosed for the same reasons.

See Section VII.B.7, above; EX1003, ¶231.¹⁷

VIII. THE COMBINATION OF SATO, NAKAMURA, AND JIN RENDERS CLAIMS 3 OBVIOUS (GROUND 2)

As discussed for Ground 1, Sato discloses a cooling system for an electronic device, such as a server, that is highly similar to the cooling system recited in the challenged claims, and Nakamura discloses multiple methods for determining an *index value*. As detailed below, Jin discloses determining an *index value* that is an *average value of declination rates* based on temperature-sensor readings in a

equivalent to the '320 Patent's CPU 13 configured to calculate the “declination index value” in the specification (EX1001, 5:17-29). EX1003, ¶230.

¹⁷ The combination of Sato and Nakamura also discloses this limitation should it be construed as a means-plus-function limitation. See Section V.B, above. Sato's MPU configured to perform the functions described for this limitation is equivalent to the '320 Patent's CPU 13 configured to implement the “the control means 172” in “the management section 17” identified in the specification (EX1001, 5:45-47). EX1003, ¶232.

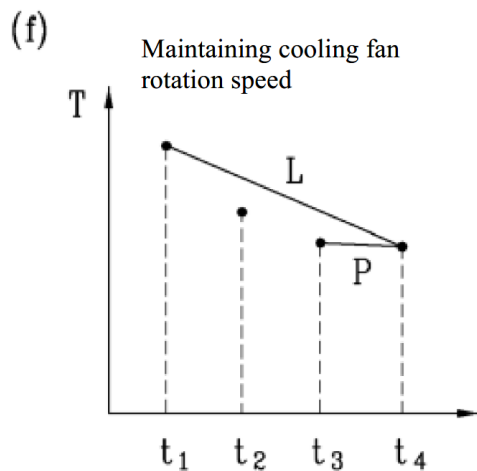
plurality of measurement periods as recited in claim 3 (and as described in the '320 Patent). Thus, the combination of Sato's server embodiments with the teachings of Nakamura and Jin discloses, and renders obvious, claim 3.

A. Motivation to Combine Sato-Nakamura with Jin

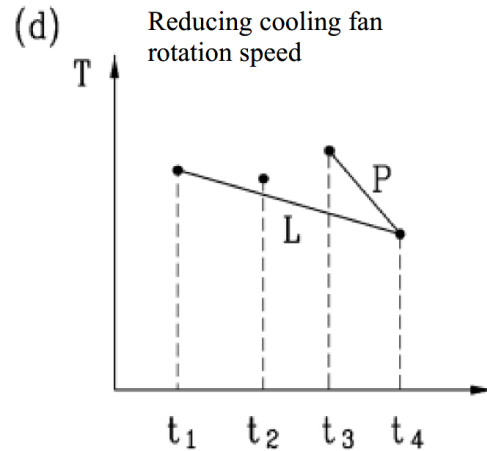
Nakamura discloses several techniques for calculating the rate of temperature decrease to determine when internal component temperature is “stagnating” and acknowledges that others exist. EX1007, [0033]. Jin discloses another method of calculating the rate of temperature decrease and predicting whether the temperature decrease is slowing (e.g., stagnating). EX1009, [0043]-[0052], [0072]. A POSITA would be motivated to implement Jin's temperature change prediction technique as an additional method of detecting stagnation in Nakamura's temperature control program as implemented in Sato's server. EX1003, ¶234.

A POSITA would recognize the benefit of using Jin's technique to evaluate both the trend in overall temperature change (i.e., over a relatively longer period) and also the trend in recent temperature change to predict whether the internal component temperature of Sato's server is stagnating. EX1003, ¶235. For example, Jin's Figure 5(f) shows an example where the trend in overall temperature change (L) is decreasing but the trend in recent temperature change (P) is slowing (i.e., the rate of decrease is becoming smaller). *Id.* Nakamura's

temperature control program, employing Jin's method, would use the temperature data in Figure 5(f) to determine that the temperature is stagnating. *Id.*



Jin, Fig. 5(f)



Jin, Fig. 5(d)

In contrast, Jin's Figure 5(d) shows the trend in overall temperature change (L) decreasing and the trend in recent temperature change (P) decreasing even more.

Id., ¶236. Nakamura's temperature control program, employing Jin's method, would use the temperature data in Figure 5(d) to determine that the temperature is not stagnating. *Id.*

A POSITA would be motivated to implement Jin's method in Nakamura's temperature control program because it uses the same sampling of temperature data but analyzes both long-term and short-term trends. A POSITA would recognize that this approach provides more accurate predictions of temperature stagnation than a technique based on the rate of change over one time period (as in one of Nakamura's techniques). EX1003, ¶237.

Further, Jin’s technique is intended to use the fan more efficiently and to reduce noise. EX1009, 1 (Summary), [0028] (“the temperature inside the projector can be effectively reduced, and noise generated by the cooling fan provided inside the projector can be minimized”). Both Sato and Nakamura also seek to reduce fan noise. EX1005, [0005], [0011], [0012], [0060], [0104], [0115]; EX1007, [0004], [0009], [0010], [0017]. This further benefit is stated in the references themselves and would motivate a POSITA to implement Jin’s method in the Sato-Nakamura combination. EX1003, ¶238.

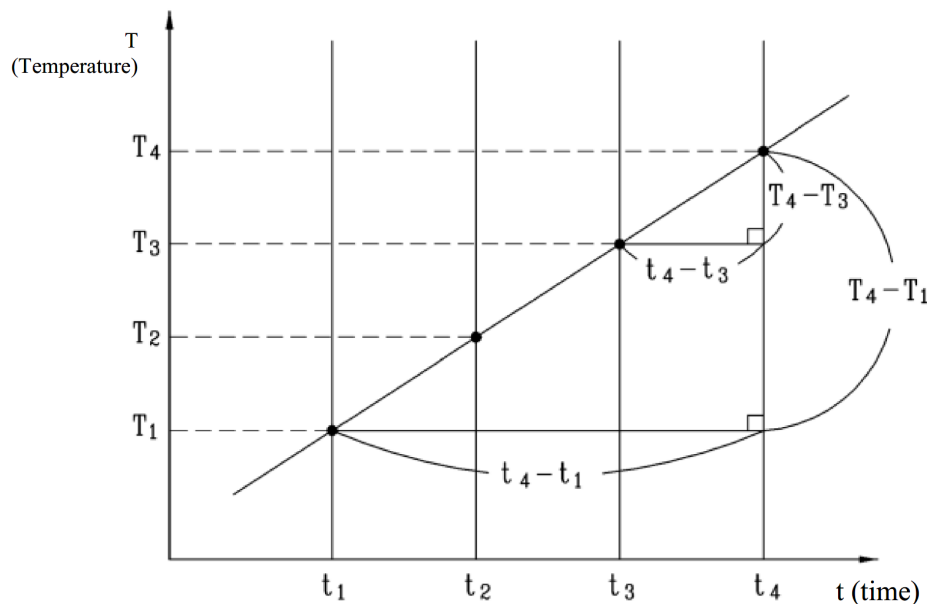
A POSITA could have modified Nakamura’s temperature control program to incorporate Jin’s method with a reasonable expectation of success. EX1003, ¶239. Indeed, given the similarities between Nakamura and Jin (e.g., both sample temperatures at predetermined times to evaluate the rate of change), such a modification would have required only basic programming changes. *Id.* It would have been well within a POSITA’s capabilities to modify Nakamura’s temperature control program to include Jin’s functionality (to be implemented in Sato’s server). *Id.*

Indeed, modifying Sato-Nakamura to implement Jin’s method would have involved no more than use of prior art elements according to known methods to yield predictable results. EX1003, ¶239; *KSR*, 550 U.S. at 416.

B. Claim 3

Sato-Nakamura discloses claim 1. *See* Section VII.B, above. Jin teaches calculating an *index value that is an average value of declination rates of the component temperature of the electronic component in a plurality of measurement periods* as in claim 3. EX1003, ¶240. In particular, Jin describes controlling a cooling fan using the average rate of temperature change over two different time periods (*a plurality of measurement periods*). *Id.*

Jin's Figure 3 illustrates temperatures measured at different times. EX1009, [0056]. As in Nakamura (and the '320 Patent), Jin uses a sensor to record temperature readings at predetermined intervals. Jin uses similar notation: sampling times are denoted t_1 , t_2 , t_3 , t_4 and sampled temperatures are T_1 , T_2 , T_3 , T_4 . *Id.*, [0053].

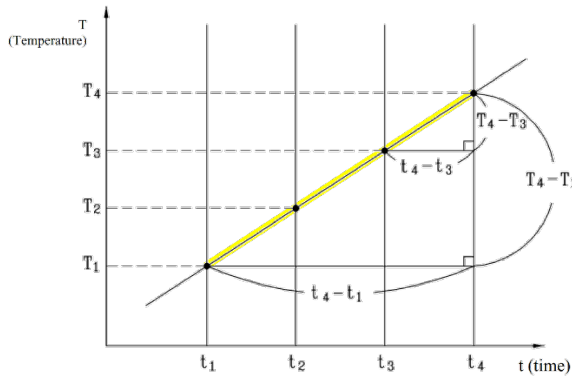


Jin, Fig. 3

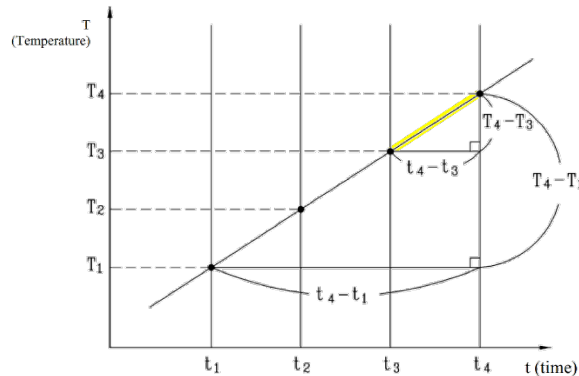
Jin explains the “rate of change in temperature between any two timepoints of t_1 at the measurement timepoint, t_3 at the measurement timepoint, and t_4 at the measurement timepoint can be determined by the slope of the graph” in Figure 3. *Id.*, [0059].

In Jin’s temperature control technique, two average rates of temperature change are calculated. Jin determines the average rate of temperature change over a recent time period from t_3 to t_4 , which is “calculated as $\{T_4 - T_3\} / \{t_4 - t_3\}$.” EX1009, [0059]. Jin also determines the average rate of temperature change over a longer period from t_1 to t_4 , which “can be calculated as $\{T_4 - T_1\} / \{t_4 - t_1\}$.” *Id.* These calculations mirror the ’320 Patent’s description for calculating “[a]n average value of the component temperature declination rates...in a plurality of measurement periods,” i.e., “by dividing a difference Δt , between a component temperature t_1 detected at a time when a measurement period starts and a component temperature t_2 detected at a time when the measurement period ends, by the measurement period.” EX1001, 5:19-26; EX1003, ¶242.

Jin illustrates the two rate calculations in Figure 3 as highlighted below.



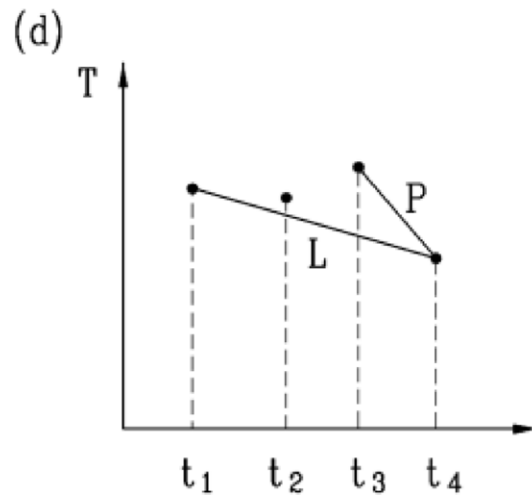
Jin, Fig. 3 (highlighted)



Jin, Fig. 3 (highlighted)

The average rate of change over a longer period (t_1 to t_4) is highlighted on the left and the average rate of change over a recent period (t_3 to t_4) is highlighted on the right. EX1003, ¶243. In Figure 3, the temperature is increasing but Jin also discloses calculating the two averages when temperatures are declining. EX1009, [0072], [0087]. Thus, Jin's calculations include *an average value of declination rates...in a plurality of measurement periods* as in claim 3. EX1003, ¶244.

The two rates of temperature change illustrated in Figure 3 are the same, but Jin recognizes that in practice they would often be different and the differences between a longer term temperature trend and a more recent trend can be used to predict future temperature. EX1003, ¶245. For example, Jin's Figure 5(d) below shows the overall average rate of temperature decline (labeled L) and the recent average rate of decline (labeled P). EX1009, [0061], [0092].



Jin, Fig. 5(d)

Jin calculates a “prediction variable (A)” based on an equation using L (trend in overall temperature change), P (trend in recent temperature change), and a parameter K that is determined experimentally. *Id.*, [0082]-[0088]. The prediction variable is used to control the fan speed. *Id.* Thus, Jin’s prediction variable—when implemented in Sato-Nakamura—constitutes the claimed *index value* of claim 3 because it is *an average value of declination rates of the component temperature of the electronic component in a plurality of measurement periods*.

EX1003, ¶247.

IX. DISCRETIONARY DENIAL IS NOT WARRANTED

Pursuant to the Interim Processes for PTAB Workload Management Memorandum (March 26, 2025), discretionary denial issues (if any) will be raised in a separate brief by Patent Owner. If Patent Owner files such a brief, Petitioners

will respond in an opposition brief as provided in the Interim Processes for PTAB Workload Management Memorandum.

X. CONCLUSION

The Board should institute review and cancel the challenged claims of the '320 Patent.

Respectfully submitted,

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CLAIM APPENDIX

[1pre] ICT (information and Communication Technology) equipment having an electronic component, the ICT equipment comprising:

[1a] a cooling fan;

[1b] a first temperature sensor that detects a component temperature of the electronic component included in the ICT equipment;

[1c] a second temperature sensor that detects a temperature of an intake air; and

[1d] a microprocessor including:

[1e] 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

[1f] 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. 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 for ICT (Information and Communication
technology) equipment having a cooling fan, electronic component, 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:
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 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. 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.

CERTIFICATE OF COMPLIANCE

This petition complies with the 14,000 word-count limit under 37 C.F.R. § 42.24(a)(1)(i). The petition contains 12,504 words, excluding the parts exempted by 37 C.F.R. § 42.24(a)(1) (i.e., table of contents, table of authorities, mandatory notices under § 42.8, certificate of service, word count certificate, and appendix of exhibits), as determined by the word count feature of Microsoft Word, which was used to prepare this petition.

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CERTIFICATE OF SERVICE

I hereby certify that on July 14, 2025, I caused a complete and entire copy of this Petition for *Inter Partes* Review and all supporting exhibits to be served by express mail, or means at least as fast and reliable as express mail, on the following correspondence address identified using the USPTO Patent Center:

71799-NEC-IPC (Sughrue Mion PLLC)
c/o Alan Kasper, William Mandir, or Mark Boland
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Washington, DC 20006

In addition, courtesy copies were sent by electronic means to the Patent Owner's litigation counsel at the following addresses:

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