

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

THERMALTAKE TECHNOLOGY CO., LTD. and
THERMALTAKE INC. (a.k.a. THERMALTAKE USA)

Petitioners,

v.

LIAN LI INDUSTRIAL CO., LTD., and CHEN, CHIEN-HAO,

Patent Owners.

IPR2024-01230
U.S. Patent No. 10,690,336

**DECLARATION OF DR. ANDREW WOLFE
IN SUPPORT OF PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,690,336**

I, Andrew Wolfe, declare as follows:

1. I have been retained by Pillsbury, Winthrop, Shaw, Pittman, LLP, counsel for Petitioners Thermaltake Tech. Co., Ltd. and Thermaltake Inc. (collectively, “Thermaltake”), to analyze and offer my expert opinions in support of Thermaltake’s Petition for *Inter Partes* Review of Claims 1-5 of U.S. Patent No. 10,690,336 (“the ’336 Patent”). I am being compensated for my work on this matter at my standard hourly billing rate. My compensation does not depend in any way on my opinion or the outcome of this matter.

1. Introduction

1.1. Education, Experience, and Qualifications

2. I am the founder and sole employee of Wolfe Consulting. Through Wolfe Consulting, I provide technical and business analytics to businesses on processor technology, computer systems, consumer electronics, software, design tools, data security, cryptography, and intellectual property issues. I have more than thirty-five years of experience developing products, researching, consulting, and teaching in those fields. During that time, I have worked as a computer architect, computer system designer, and as an executive in the PC and electronics business. I have also taught at some of the world’s leading institutions in those fields, including Stanford University, Princeton University, Carnegie Mellon University, and Santa Clara University.

3. In 1985, I earned the B.S.E.E. degree in Electrical Engineering and Computer Science from the Johns Hopkins University. In 1987, I received the M.S. degree in Electrical and Computer Engineering from Carnegie Mellon University and in 1992, I received the Ph.D. degree in Computer Engineering from Carnegie Mellon University. My doctoral dissertation proposed a new approach for the architecture of a computer processor. During my doctoral research, I designed and built custom computer systems including rack-based multi-board computers that required substantial airflow. I designed and built the 12-fan cooling system for at least one of these computers, which is briefly described in a 1988 paper.

4. I have more than 35 years of experience as a computer architect, computer system designer, personal computer graphics designer, educator, and executive in the electronics industry.

5. I have extensive experience in the design, development, and analysis of computing devices including PCs. In the mid-late 1980s, I worked as part of the development team for the Linus Write-Top, which is commonly acknowledged to be the first commercial tablet computer. In 1997, I was hired to run the research efforts at S3, Inc. At the time S3 produced the 3D graphics hardware and driver software for more than half of new PCs, worldwide. I managed S3's display

technology group, and led the development of components for laptop computers including the IBM Thinkpad and for desktop computers as well. Each of these components required thermal analysis and a range of cooling solutions.

6. In these roles, I managed relationships with numerous laptop computer companies including IBM, Toshiba, and Compaq as well as key software providers such as Microsoft.

7. I have consulted, formally and informally, for a number of fabless semiconductor companies. In particular, I have served on the technology advisory boards for two media processor design companies: BOPS, Inc., where I chaired the board, and Siroyan Ltd., where I served in a similar role; for three networking chip companies: Intellon, Inc., Comsilica, Inc., and Entridia, Inc.; and for one 3D game accelerator company, Ageria, Inc.

8. I have also served as a technology advisor to Motorola and to several venture capital funds in the U.S. and Europe. Since 2012, I have been a director at Turtle Beach Corporation, providing guidance in its development of consumer electronic products primarily related to video gaming. Many of these products include decorative RGB lighting.

9. From 1991 through 1997, I served on the Faculty of Princeton University as an Assistant Professor of Electrical Engineering. At Princeton, I

taught undergraduate and graduate-level courses in Computer Architecture, Advanced Computer Architecture, Display Technology, and Microprocessor Systems, and I conducted sponsored research in the area of computer systems and related topics. From 1999 through 2002, I taught a Computer Architecture course to both undergraduate and graduate students at Stanford University multiple times as a Consulting Professor. At Princeton, I received several teaching awards, both from students and from the School of Engineering. I have also taught advanced microprocessor architecture to industry professionals in IEEE and ACM sponsored seminars. I am currently a lecturer at Santa Clara University teaching courses on Microprocessor Systems, Advanced Logic Design, Real-Time Computing, and Mechatronics. Among other things, I teach about the operation and use of RGB lighting components.

10. I have published more than fifty peer-reviewed papers in computer architecture and computer systems. I have also chaired IEEE and ACM conferences in microarchitecture and integrated circuit design and served as an associate editor for IEEE and ACM journals. I served on the IEEE Computer Society Awards committee. I am an IEEE Fellow and an IEEE Computer Society Distinguished Contributor. I am a named inventor on at least fifty-seven U.S. patents and thirty-seven foreign patents.

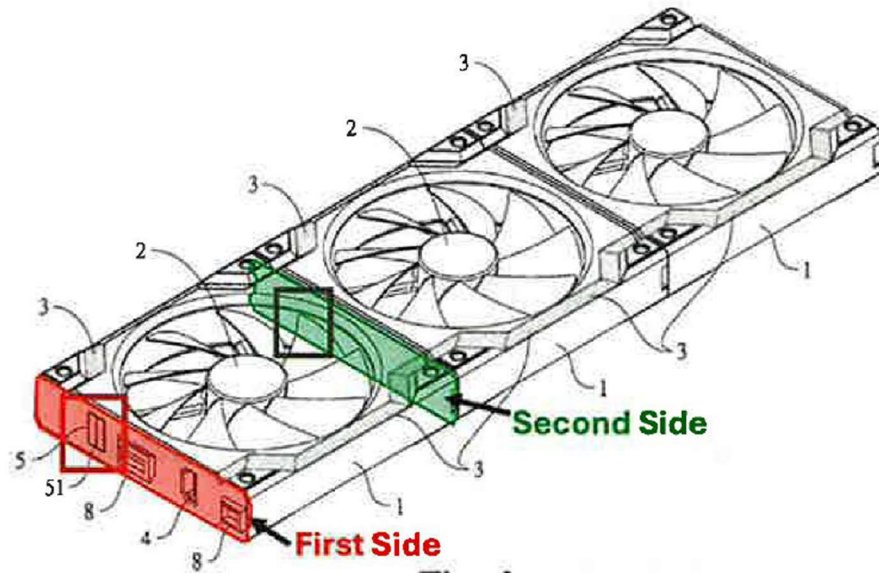
11. I have been the invited keynote speaker at the ACM/IEEE International Symposium on Microarchitecture and at the International Conference on Multimedia. I have also been invited to speak on various aspects of technology or the PC industry at numerous industry events including the Intel Developer's Forum, Microsoft Windows Hardware Engineering Conference, Microprocessor Forum, Embedded Systems Conference, Comdex, and Consumer Electronics Show as well as at the Harvard Business School and the University Illinois Law School. I have been interviewed on subjects related to technology and the electronics industry by publications such as the Wall Street Journal, New York Times, LA Times, Time, Newsweek, Forbes, and Fortune as well as CNN, NPR, and the BBC. I have also spoken at dozens of universities including MIT, Stanford, University of Texas, Carnegie Mellon, UCLA, University of Michigan, Rice University, and Duke University.

12. A more detailed description of my educational and professional background, qualifications, achievements, and publications in the past 30+ years is set forth in my *curriculum vitae*, included as Exhibit 1005.

2. Summary of Opinions on the '336 Patent

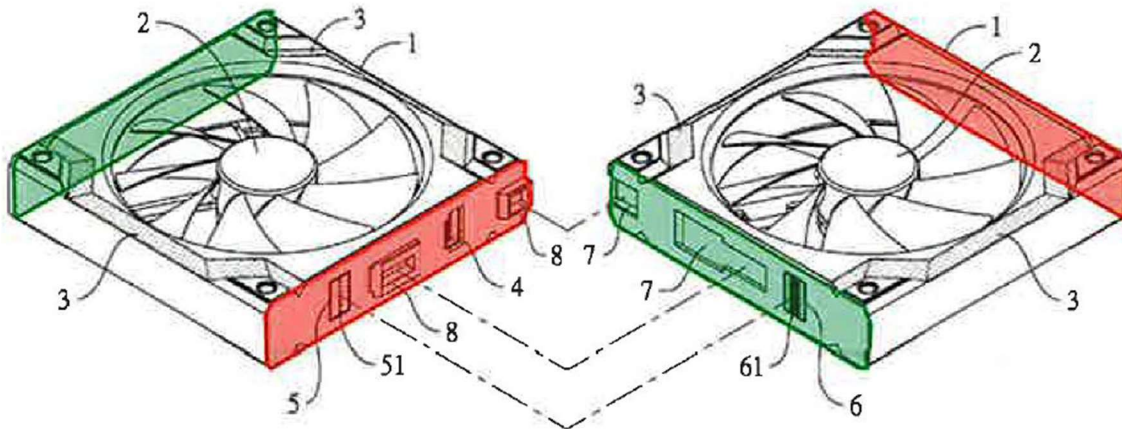
2.1. Overview of the '336 Patent

13. The '336 Patent teaches an illumination fan for a computer, which includes a body and a fan in center of the body, an illumination area on at least two sides of the fan at the top of the body, a power socket and a first connector on one side of the body, and a second connector on another side of the body. Ex[1001] at Abstract. Figure 3 below shows three fans connected, with the connectors on opposite sides of the fans.¹



¹ Throughout, I have added emphasis and annotations unless otherwise specified.

14. Figure 2 shows two separate fans when they are disconnected from each other:



15. The '336 Patent teaches that the power socket is electrically connected with the first connector, the second connector, the fan, and the illumination area. The illumination fan is connectable, both electrically and mechanically, with another illumination fan. As a result of the electrically connected fans, the fan and the illumination area of the fans are driven into rotation and illumination.

The power socket is electrically connected with the first connector, the second connector, the fan and the illumination area. Ex[1001] at Abstract; 1:60-62.

When the power socket is supplied with power, the fan and the illumination area of the body is respectively driven into rotation and illumination, and when the first connector of the body is connected with a second connector of a body of another illumination fan, a fan and an illumination area of the body of another illumination fan is respectively driven into rotation and illumination. Ex[1001] at Abstract; 1:62-2:2.

The illumination fan connectable with at least one illumination fan for a computer of the present invention includes a body 1, a fan 2 disposed in the center of the body 1, an illumination area 3 disposed on at least two sides of the fan at the top of the body 1, a power socket 4 and a first connector 5 disposed on one side of the body 1, and a second connector 6 disposed on another side of the body 1. The power socket 4 is electrically connected with the first connector 5, the second connector 6, the fan 2 and the illumination area 3. Ex[1001] at 2:61-3:3.

If at least two bodies 1 are joined together to form multiple sets of fans (as shown in FIGS. 2 and 3), the first connector 5 is provided with an electrically conductive terminal 51, and the second connector 6 is provided with an electrically conductive contact face 61 to be electrically connected with the electrically conductive terminal 51, so that when the first connector 5 of a body 1 is connected to the second connector 6 of another body 1, the fan 2 of the another body 1 can be driven into rotation and the illumination area 3 can be illuminated. The illumination areas 3 of the two bodies 1 may form a continuous illumination area 3. Furthermore, a groove 7 is provided at one side of the body 1, while an engaging block 8 is provided on the other side, such that the groove 7 of one body 1 can be mated with the engaging block 8 of the other body 1, allowing the two bodies 1 to be combined together. Ex[1001] at 3:7-22.

As a result, once assembled, two fans that could be independently used can be joined together, and power can be supplied by connecting the power socket of one of the bodies with a power supply of a computer to simultaneously drive the fans of the two bodies into rotation and the illumination areas into illumination. Ex[1001] at 3:29-39.

2.2. Priority Date for the '336 Patent

16. I have reviewed the File History of the '336 Patent. The Challenged Claims prosecuted in U.S. Serial App. No. 16/403,867 (“the '867 Application”), and purports to claim foreign priority to Taiwanese Patent Application No.

107217659 U (“TW659” or “Taiwanese Patent Application”), filed on December 26, 2018. Ex[1003]. The effective filing date for the claims of the ’336 Patent is no earlier than December 26, 2018.

17. In my opinion, as explained below, Claim 5 of the ’336 Patent is not entitled to the December 26, 2018 priority date of the Taiwanese Patent Application, and the effective filing date for Claim 5 is no earlier than May 6, 2019 (the filing date of the ’867 Application). In any event, all of the prior art I rely upon for my invalidity opinions predates December 26, 2018.

18. As described in the ’336 Patent, “FIG. 4 is a schematic diagram depicting two bodies before being assembled in accordance with another embodiment of the present invention. FIG. 5 is a schematic diagram depicting two bodies after being assembled in accordance with another embodiment of the present invention.” Ex[1001] at 2:47-52.

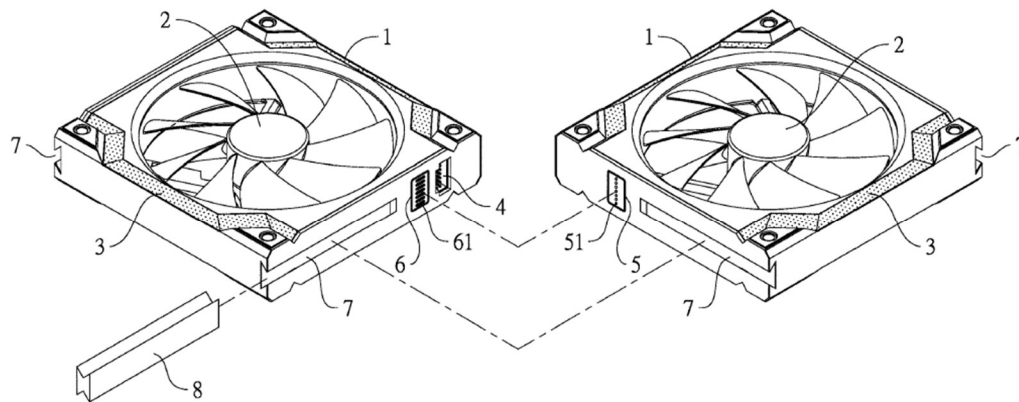


Fig. 4

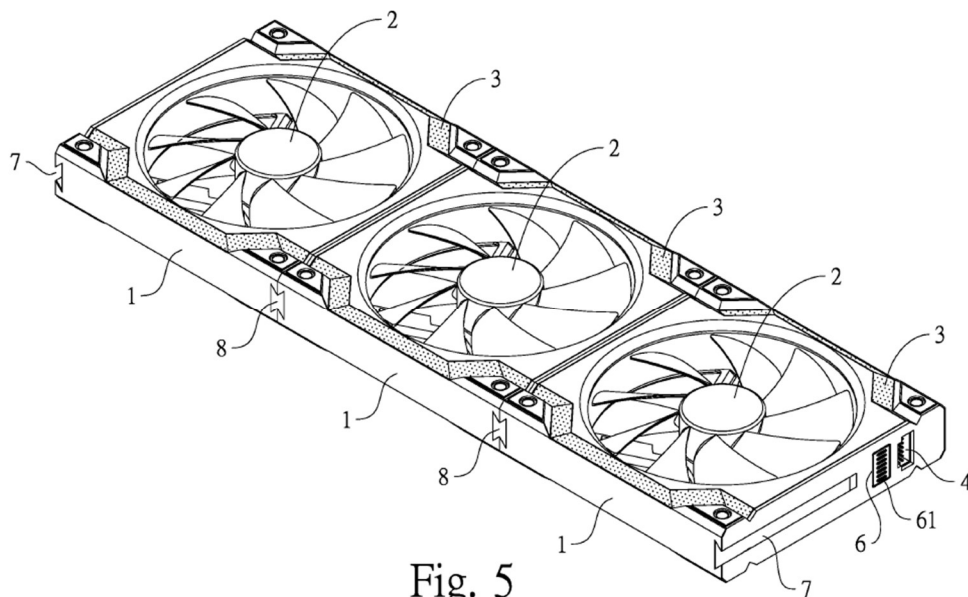


Fig. 5

19. The '336 Patent discloses that, “[w]ith regards to combining two bodies 1, another approach is shown in FIGS. 4 and 5, wherein grooves 7 are provided on two sides of a body 1, and an engaging block 8 is used to simultaneously engage with the grooves 7 on one side of each of two bodies 1, allowing the two bodies 1 to be combined together.” Ex[1001] at 3:23-28

(emphasis added). This language is mirrored by the language of Claim 5, reciting in relevant part, “wherein a groove is provided on two sides of the body of the illumination fan, and the body of the illumination fan is connected with the body of another illumination fan by respectively engaging an engaging block with one of the grooves on the sides of the body of the illumination fan and one of the grooves on the sides of the body of another illumination fan,” which appears to be directed to these features as shown in Figures 4 and 5. *Id.*, Claim 5. (Emphasis added).

That is, the embodiment illustrated in Figures 4 and 5, and recited in Claim 5, use a separate and distinct engaging block 8, i.e., an engaging block 8 that is a separate structure from the illumination fan or its housing. The engaging block 8 (shaded in blue, below) is shown and described as being configured to engage, on one of the sides of the block 8, a groove on one side of one fan (shaded in yellow below) and to engage, on another side of the block 8, another groove on one side of another fan (shaded in green):

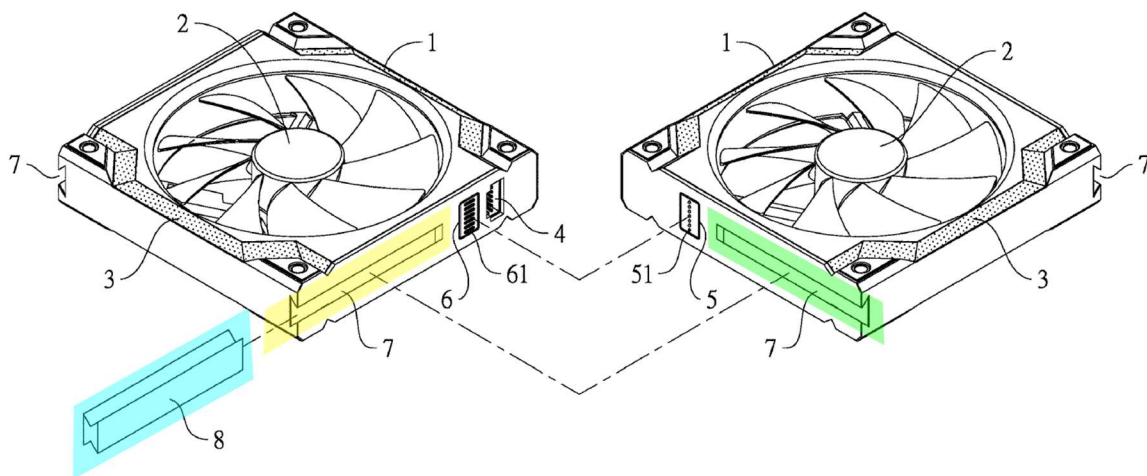


Fig. 4

20. This arrangement is in contrast to the embodiment illustrated in Fig. 2 of the '336 Patent, where adjacent fans are directly connected. This embodiment includes an arrangement wherein “a groove 7 is provided at one side of the body 1, while an engaging block 8 is provided on the other side, such that the groove 7 of one body 1 can be mated with the engaging block 8 of the other body 1, allowing the two bodies 1 to be combined together.” Ex[1001] at 3:18-22. The text and figures of the Taiwanese priority document are consistent with this direct connection approach as shown, for example, in Figures 1 and 2 which are substantially identical to Figures 1 and 2 of the '336 Patent. *Compare* Ex[1001] and Ex[1003].

21. I conclude that engaging block element is not adequately disclosed in the Taiwanese Patent Application.

2.3. Prosecution History of the '336 Patent

22. The Applicant filed applications in Taiwan, Korea, and Germany, which correspond to the '867 application. No Information Disclosure Statement(s) ("IDS") were submitted to the U.S. Patent and Trademark Office at the time of filing or at any time during prosecution. Ex[1002].

23. The first office action issued by the examiner was a Notice of Allowance dated April 13, 2020, allowing all of the pending claims as filed in the '867 application on May 6, 2019. The Notice of Allowance cited seven prior art references but none of the five claims were rejected. In the Reasons for Allowance, the examiner recites the entirety of Claim 1, as filed. Ex[1002].

The following is an examiner's statement of reasons for allowance:
Claim 1 recites an illumination fan connectable with another illumination fan including a power socket and a first connector on one side of a body of an illumination fan, and a second connector on another side of the body of the illumination fan, and when the first connector of the body of the illumination fan is connected with a second connector of a body of the other illumination fan, a fan and an illumination area of the body of the other illumination fan are respectively driven into rotation and illumination.
Claims 2-5 depend on claim 1.

3. Legal Bases of Opinions

3.1. Level of Ordinary Skill in the Art

24. I have been informed that both the '336 Patent and the prior art are to be understood from the perspective of a hypothetical "Person of Ordinary Skill in

the Art” at the time of the purported inventions claimed in the ’336 Patent (“POSITA”). The ’336 Patent claims priority to a Taiwanese patent application filed on December 26, 2018. I have been asked to treat this date as the time of the purported inventions claimed in the ’336 Patent for purposes of this proceeding.

25. I understand that the factors that may be considered to determine the level of ordinary skill in the art include: (a) the type of problems encountered in the art; (b) prior art solutions to those problems; (c) the complexity or sophistication of the technology in the art; (d) the education level and experience of active workers in the field of art; and (e) the pace of change, development, and innovation in the field of art. I have been informed that not every factor would be present in every case, and that a review of the prior art would shed light on factors (a), (b), (c), and (e). I have also been informed that a POSITA is further presumed to have been aware of all relevant prior art.

26. As discussed in further detail below, the ’366 Patent is directed to an illumination fan connectable with at least one illumination fan for a computer that is structurally simple and particularly suited to desktop users. The claims incorporate common elements including a fan and lights. The relevant prior art relates to fans, lights, and physical connections between them. I am familiar with

the state of the art in this field at the time of the purported inventions claimed in the '366 Patent.

27. In my opinion, a POSITA would have had a bachelor's degree (or equivalent) in electrical engineering, mechanical engineering, or a comparable subject, and would be generally familiar with the state of cooling and lighting technology for electronic devices. A POSITA could have acquired similar skills and knowledge by other means.

28. In view of my educational background and my decades of academic and professional experience (as discussed above), I was a person of more than the ordinary level of skill in the art in the early 2018 timeframe. My opinions expressed in this declaration were formed, however, from the perspective of a person of ordinary skill in the art as of December 26, 2018. I was, and am, well acquainted with the level of knowledge of a POSITA under this definition. As noted above, I have worked with many individuals during my time in the industry and taught many who would have met the definition of a POSITA. Thus, I am comfortable applying this viewpoint in assessing the '336 Patent and the state of the art in the relevant timeframe, including the prior art references I discuss below.

29. I have also considered whether my opinions expressed in this declaration would change if the level of ordinary skill in the art was varied by a

few years or varied somewhat with respect to subject matter. My opinions would not change in light of such minor variations.

3.2. Claim Interpretation

30. I have been informed that patent claims are to be interpreted from the perspective of a hypothetical “Person of Ordinary Skill in the Art” at the time of the purported inventions claimed in the patent (“POSITA”). I have also been informed that the words of a patent claim are generally given their ordinary and customary meaning to a POSITA in view of the context of the claims and the intrinsic evidence, *i.e.*, the patent specification and the prosecution history of the ’336 Patent. I have read and analyzed the claims of the ’336 Patent from this perspective.

31. I have been further informed that extrinsic evidence, *e.g.*, prior art publications and expert testimony, may be considered to understand a patent claim, but cannot be used to contradict an interpretation thereof which is unambiguous in view of the intrinsic evidence.

3.3. Obviousness

32. As discussed above, the ’336 Patent claims priority to a Taiwan patent application filed on December 26, 2018, and I have been asked to treat this date as the time of the purported inventions claimed in the ’336 Patent.

33. I have been informed that a claimed invention is obvious — and thus unpatentable — if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious to a POSITA at the time of the claimed invention.

34. I have also been informed that the determination of whether a claimed invention is obvious in view of the prior art cannot rely on hindsight, *i.e.*, using the patent claim as a roadmap or template to select components from the prior art to reconstruct the claimed invention.

35. I have been informed that a POSITA is presumed to have been aware of all relevant prior art. I have also been informed that a POSITA is someone of ordinary creativity in the field who is presumed to have understood and considered design needs and/or market forces which would have motivated or prompted them to seek variations of a product having utility in their field.

36. I have been informed that the determination of whether a claimed invention was obvious in view of the prior art is a legal question which involves an objective analysis of these factual factors:

- The scope and content of the prior art;
- The differences between the prior art and the claimed invention;

- The level of ordinary skill in the pertinent art; and
- Any secondary consideration(s) having a nexus to the claimed invention, for example: [i] its commercial success (or the lack thereof), [ii] whether the claimed invention satisfied a long felt but unmet need, [iii] unexpected results achieved by the claimed invention, or [iv] skepticism or failure by others.

37. I have also been informed that the above factors define an expansive and flexible framework to determine whether a claimed invention would have been obvious in view of the prior art. For example:

38. When a prior art reference was available in one field, design incentives and other market forces could prompt variations of the reference by a POSITA, either in the same field or a different field. If the POSITA could implement a predictable variation that meets the elements of a patent claim, then the claimed invention was obvious.

39. Likewise, if a technique had been used to improve one device in the prior art, and a POSITA would recognize that the technique could also be used to improve similar devices in the same way, using that technique was obvious unless its actual application was beyond the capability of the POSITA.

40. The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. If an invention is no more than the predictable use of prior art elements according to their established functions, the combination was obvious unless its implementation was beyond the capability of the POSITA.

41. To determine whether there was an apparent reason to combine elements known in the prior art as claimed, it is often necessary to examine the interrelated teachings of multiple prior art references, the effects of demands known to the field or present in the market, and the background knowledge of a POSITA. This determination is not a rigid test. Rather, it must consider the inferences and creative steps that a POSITA would employ, because the POSA is not an automaton.

42. Common sense teaches that familiar items may have obvious uses beyond their primary purposes, and in many cases a POSITA would be able to fit the teachings of multiple patents together like pieces of a puzzle.

43. A motivation to combine the teachings of multiple prior art references may be suggested in one or more of the references, or found in the nature of the problem to be solved, in the trends or direction of the field and/or market, or come from the common sense and ordinary skill of the POSITA.

44. When there was a design need or market pressure to solve a problem and there were a finite number of identified, predictable solutions, a POSITA would have good reason to pursue the known options within his or her technical grasp. If this would have led to reasonably anticipated success, it was likely the product not of innovation but of ordinary skill and common sense, in which case the fact that a combination of known elements was obvious to try would show that the claimed invention was obvious.

45. Certain aspects of the purported inventions claimed in the '366 Patent, for example, fans and fasteners, pertain to the mechanical arts. I have been informed that the mechanical arts have long been recognized as a predictable art, one where the combination of elements known in the prior art typically yields predictable results.

3.4. Burden of Proof

46. I have been informed that a petitioner must demonstrate unpatentability by a preponderance of the evidence. I understand preponderance means more likely than not in this context.

4. Overview of the '336 Patent

4.1. '336 claims

The following claims appear in the '336 patent:

1pre	An illumination fan connectable with at least one illumination fan for a computer, comprising:
1a	a body, provided with a fan in center of the body,
1b	an illumination area on at least two sides of the fan at top of the body,
1c	a power socket and a first connector on one side of the body, and a second connector on another side of the body,
1d	wherein the power socket is electrically connected with the first connector, the second connector, the fan and the illumination area, such that when the power socket on the one side of the body is supplied with power, the fan and the illumination area of the body are respectively driven into rotation and illumination, and when the first connector of the body is connected with a second connector of a body of another illumination fan, a fan and an illumination area of the body of another illumination fan are respectively driven into rotation and illumination.
2pre	The illumination fan connectable with at least one illumination fan for a computer of claim 1,
2a	wherein an electrically conductive terminal is provided in the first connector, and an electrically conductive contact surface is provided in the second connector for being electrically connected with the electrically conductive terminal,
2b	such that when the first connector of the body of the illumination fan is connected with the second connector of the body of another illumination fan, the fan and the illumination area of the body of another illumination fan are respectively driven into rotation and illumination.
3pre	The illumination fan connectable with at least one illumination fan for a computer of claim 1,
3a	wherein when the body of the illumination fan is connected with the body of another illumination fan, the illumination areas of the two bodies form a continuous illumination area.
4pre	The illumination fan connectable with at least one illumination fan for a computer of claim 1,

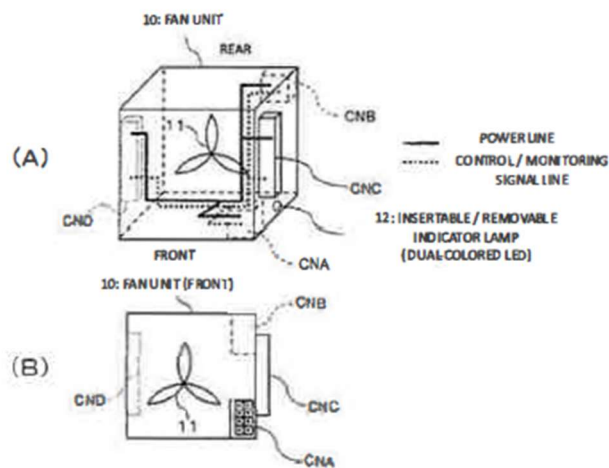
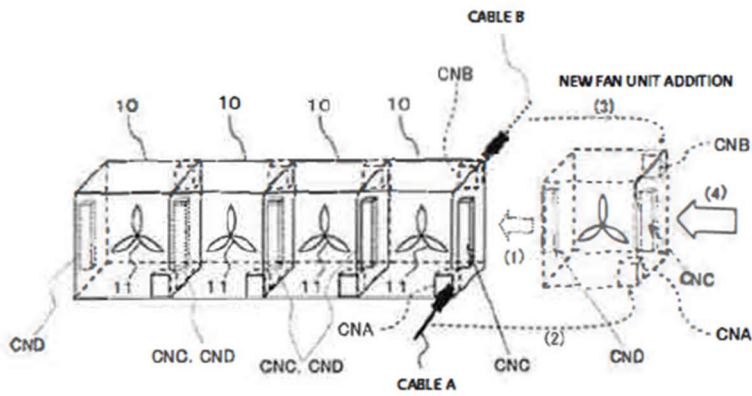
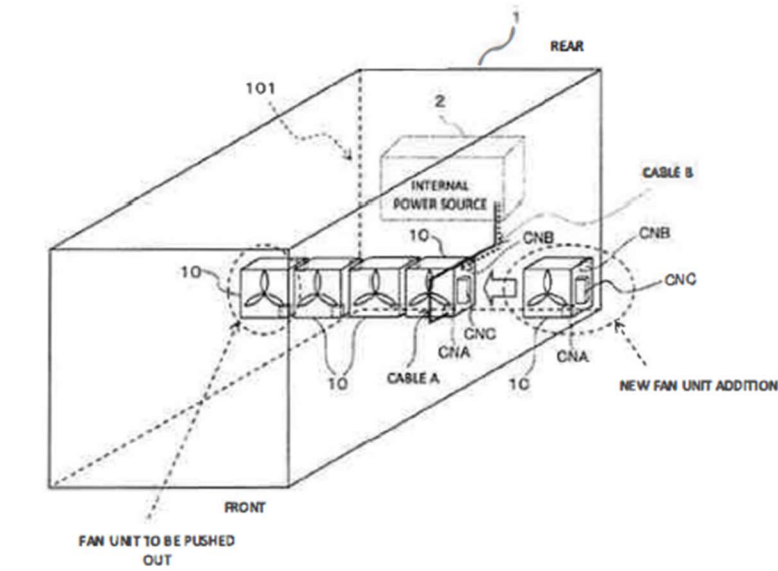
4a	wherein a groove is provided on one side of the body of the illumination fan, while an engaging block is provided on another side thereof to be engaged into the groove, such that when the groove of the body of the illumination fan is engaged with the engaging block of the body of another illumination fan, the body of the illumination fan is connected with the body of another illumination fan.
5pre	The illumination fan connectable with at least one illumination fan for a computer of claim 1,
5a	wherein a groove is provided on two sides of the body of the illumination fan, and the body of the illumination fan is connected with the body of another illumination fan by respectively engaging an engaging block with one of the grooves on the sides of the body of the illumination fan and one of the grooves on the sides of the body of another illumination fan.

5. Overview of Prior Art References

5.1. JP2018041147A (“Tsuji”)

47. JP2018041147A (“Tsuji”) is a published Japanese patent filed on September 5, 2016, published on March 15, 2018, and issued on May 27, 2020. A certified translation is provided as Ex[1007]. Its title has been translated as “electronic device, cooling fan controller, cooling fan control program, and cooling fan controlling method.”

48. Tsuji discloses plural fan units connected in series for cooling an electronic apparatus. Each fan unit has a control unit that gives an address for identifying the fan unit. *See* below Ex[1007] at FIGS. 5, 6, 7A and 7B.



49. In some embodiments, each fan unit 10 includes a cooling fan 11 that is rotationally driven by a motor. Two adjacent fan units propagate the pulse signal from one end side to the other end side, and supply power from one side (CNC) to the other end side (CND). Ex[1007] at FIGS. 5-11, [0031]. Each fan unit 10 is connected to two or more power cables (cables A and B) that can supply power to a fan unit when the own fan unit is disposed on one end side of the plurality of fan units 10. Power supply connectors CNA and CNB are provided. Ex[1007] at FIGS. 5-7, [0031]. A connector CNC (male) capable of active connection of the power supply and the control signal / monitoring signal is provided on the right side as viewed from the front of each fan unit 10. A connector CND (female) capable of active connection of a power supply and a control signal / monitoring signal is positioned on and recessed from the left side as viewed from the front of each fan unit 10. Two adjacent fan units are connected so that power can be supplied and control signals / monitoring signals can be propagated by fitting the connector CNC of one fan unit I/O to the connector CND of the other fan unit.

5.2. US Patent 10,082,286 (“Huang”)

50. United States Patent 10,082,286 (“Huang”) was filed on January 24, 2018, and issued on September 25, 2018. Its title is “cooling fan with light-emitting effect.”

51. Huang is directed to a cooling fan that has a light-emitting effect, including light emitting elements and a light guide plate with a plurality of light guide strips. Ex[1008] at Abstract. It further includes a light diffuser connected to the light guide strips. *Id.* The fan blade assembly is mounted in a frame body such that light passes through the diffuser to form diffused light. *Id.*

5.3. US Patent Application 2008/0124234 (“Echazarreta”)

52. United States Patent Application 2008/0124234 (“Echazarreta”) was filed on November 2, 2006, and published on May 29, 2008. Its title is “fan tray assembly shaped venturi.”

53. Echazarreta is directed to a fan tray assembly that has a component that includes a front wall, a back wall, two side walls, an inner wall defining a Venturi, and a motor housing suspended within the Venturi by one or more structural members. Ex[1009] at Abstract. It further includes modular fan tray units, according to another embodiment. *Id.* at Fig. 12. Each fan tray of a modular unit includes at least one rail on one side, and a complementary-shaped opening into which the side rail of another fan tray can be slid, thus forming a multi-fan tray. *Id.* at [0070]-[0071]. By these structural mechanisms, a fan tray assembly including any number of desired fans, arranged in a number of patterns, can be easily assembled by an end user or system administrator. *See id.*

5.4. US Patent Application 2008/0279694 (“Chou”)

54. United States Patent Application 2008/0279694 (“Chou”) was filed on February 7, 2008, and published on November 13, 2008. Its title is “fan and fan assembly.”

55. Chou is directed to a fan and a fan assembly, with a circuit board arranged therein. The fan of Chou is provided in a fan frame that has at least two sliding rails or grooves in corners thereof for receiving a connecting member. Ex[1010] at Fig. 2, [0022]. The connecting member is a cover that is detachably disposed on the fan frame. Two fans may be connected in series together via a common connector member sliding into aligned rails or grooves to form a fan assembly. Ex[1009], Fig. 4, [0025]-[0026].

5.5. US Patent Application 2015/0233391 (“Liu”)

56. United States Patent Application 2015/0233391 (“Liu”) was filed on February 18, 2014, and published on August 20, 2015. Its title is “fan serial connection structure.”

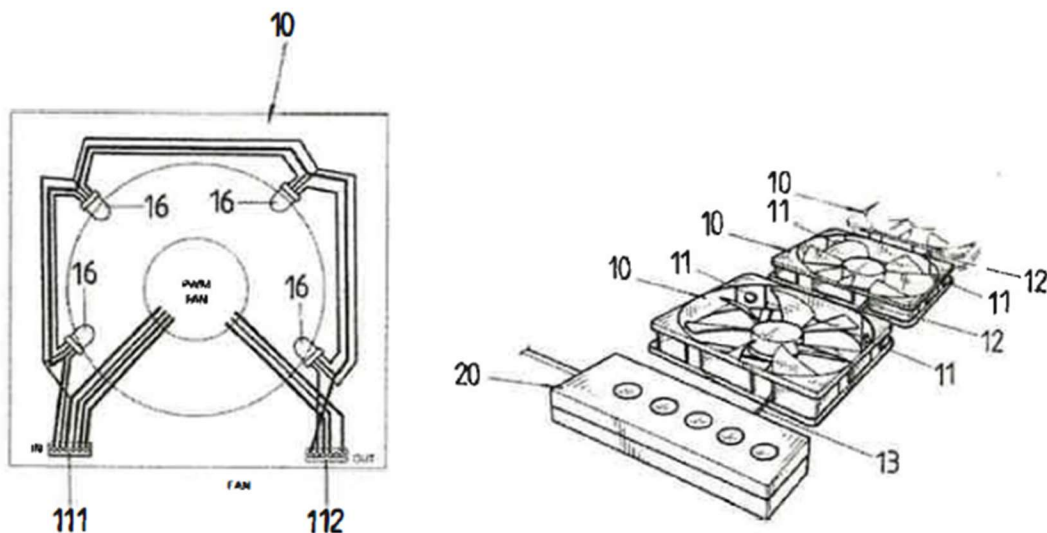
57. Liu is directed to a connection structure for a fan-series assembly that has a first fan and a second fan. Each fan module may have multiple connection sections or grooves on two sides. Liu also teaches that an assembling member is formed with assembling sections, which may be used to connect with one of the

grooves on the sides of the body of one fan and one of the grooves on the sides of the body of another fan. Ex[1011] at [0033], [0035] and Figures 4A, 4B. The faces of the fans may be connected by means of a slide rail.

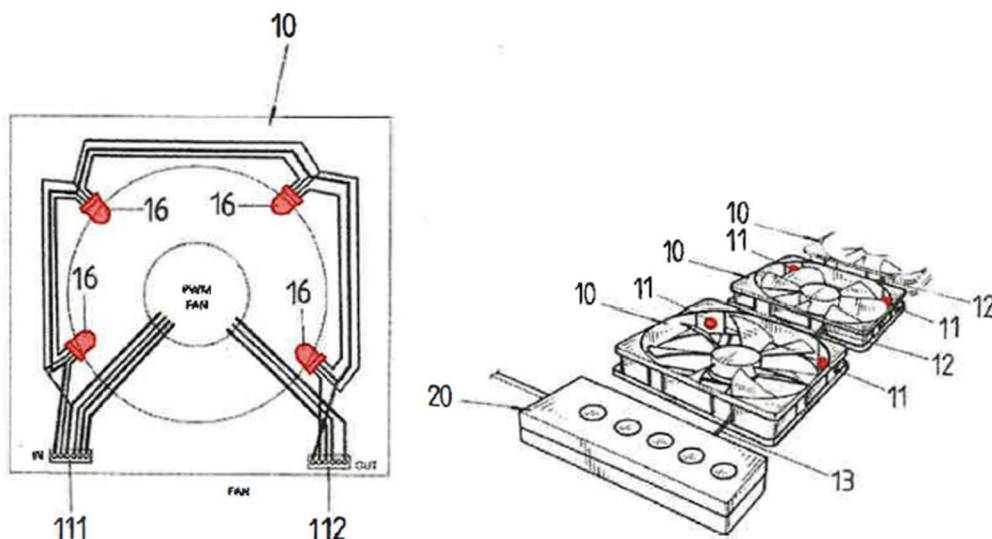
5.6. US Patent Application 2017/0314777 (“Lai”)

58. United States Patent Application 2017/0314777 (“Lai”) was filed on April 16, 2016, and published on November 2, 2017. Its title is “multiLED fan controller apparatus.”

59. Lai is directed to an LED fan controller device that connects multiple LED fans. Ex[1012] at [0003]. Lai's LED fans 10 are linked to one another using a single transmission line, using a single input 111 and a single output 112 in each LED fan 10. *Id.* at [0011]-[0012], FIGS. 2-3:



60. The LED fans 10 also include multiple LED lights 16, located on the sides of the fan:



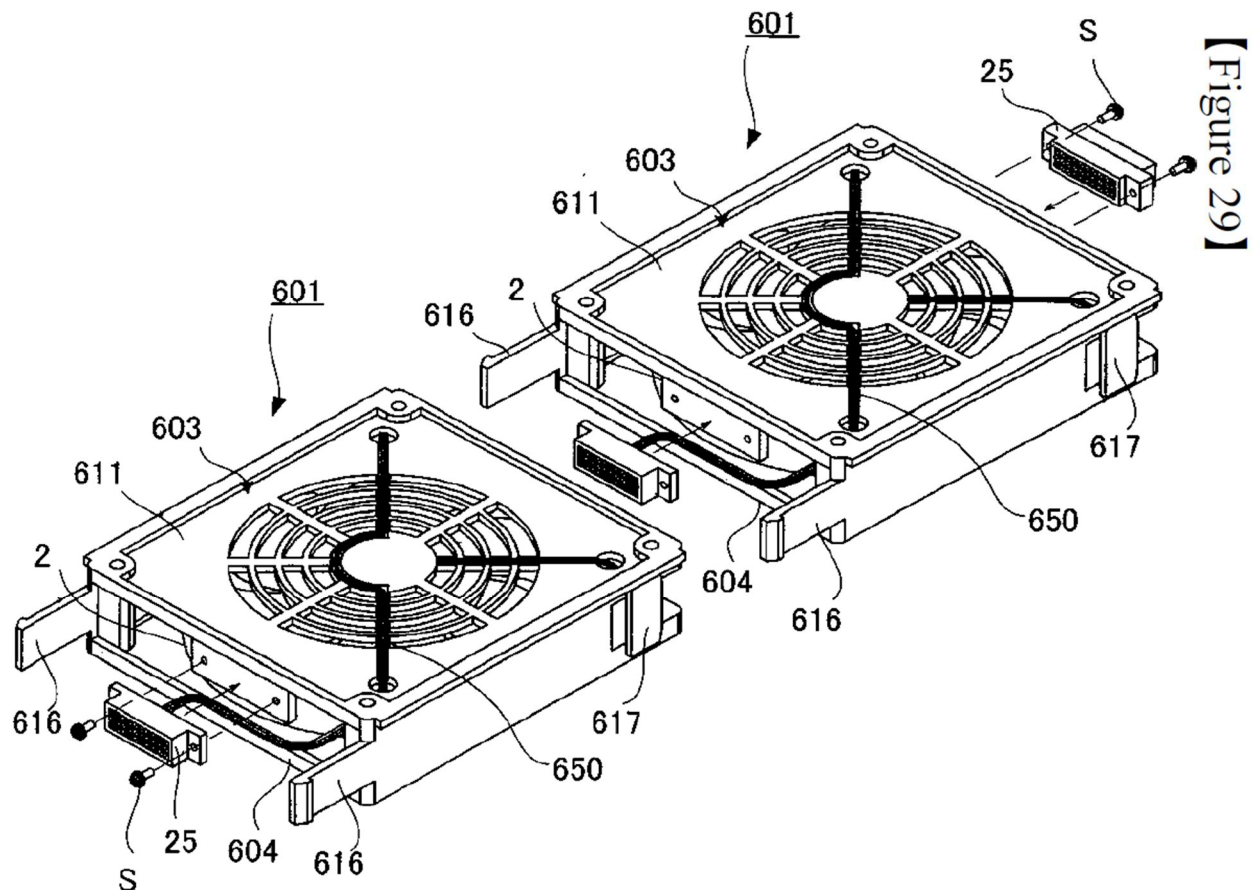
61. Therefore, Lai discloses illuminated cooling fans that are daisy-chained (connected in series) and that transmit both power and control signals for the lighting and fan motors via single connections between each fan.

5.7. Japanese Patent Application 2005051085 (“Hasegawa”)

62. United States Patent Application 2005051085 (“Hasegawa”) was filed on July 30, 2003, and published on February 24, 2005. Its title is “air cooling fan unit.” A certified translation is provided as Ex[1014].

63. Hasegawa discloses “[p]lural air-cooling Fan Units 601 ... coupled ... to configure a large air-cooling fan unit,” wherein the air-cooling Fan Units “cool[]

down electronics.” Ex[1014] at [0001], [0114]. Hasegawa further discloses each Fan Unit 601 as having Connectors 25 on opposite sides of the Fan Unit 601 body:

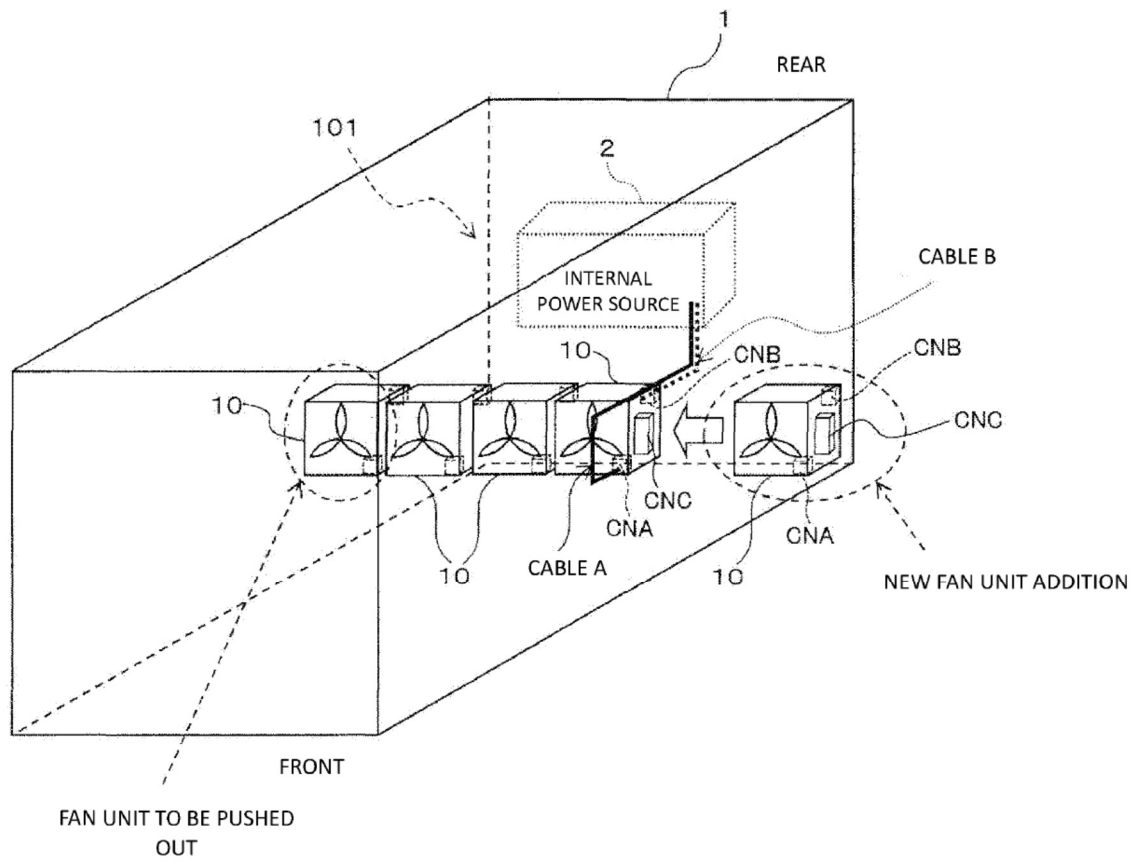


6. Ground 1 - JP2018041147A (“Tsuji”) in view of US10082286 (“Huang”) renders claims 1-3 obvious.

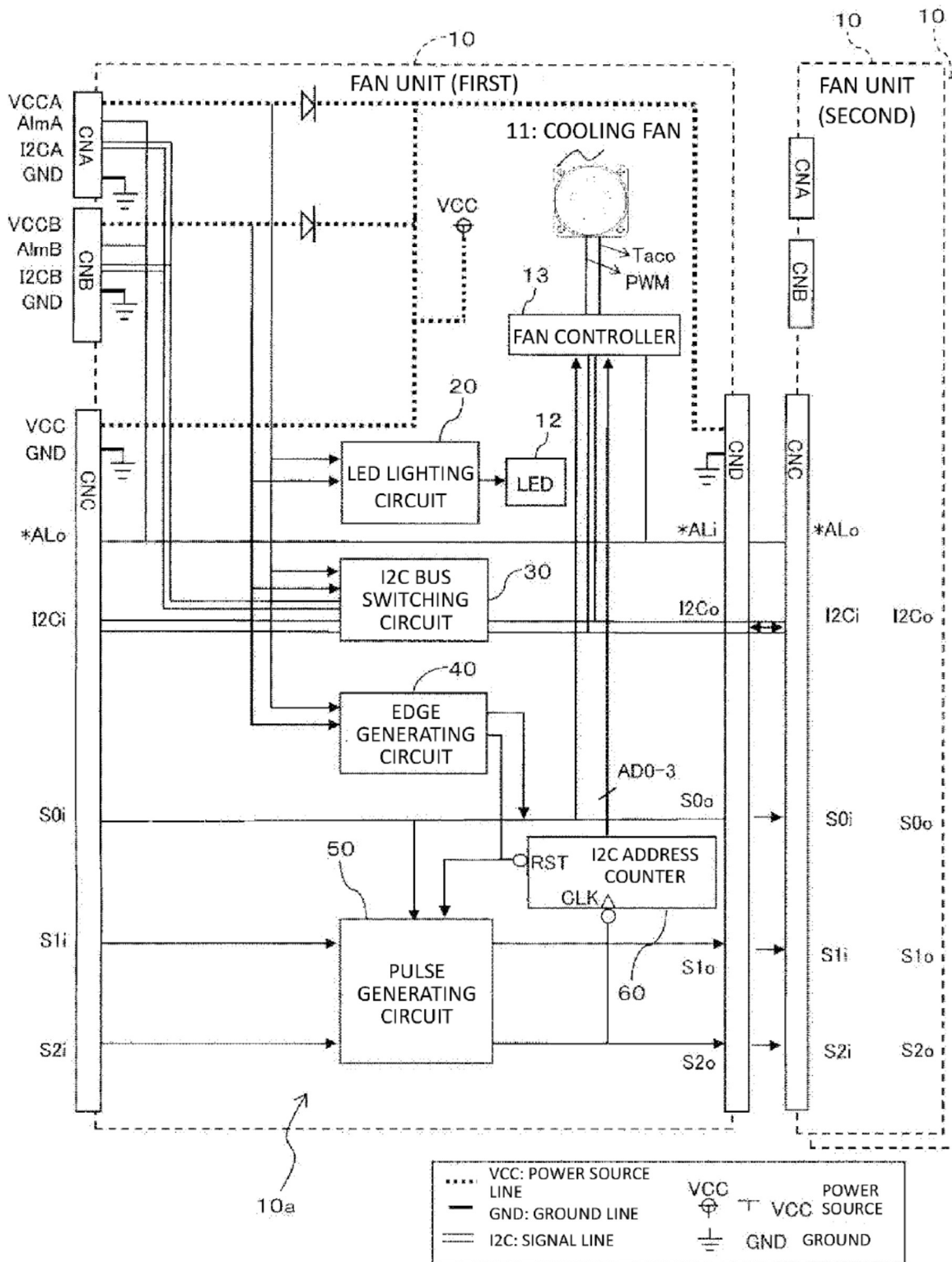
6.1. 1pre - An illumination fan connectable with at least one illumination fan for a computer, comprising:

64. To the extent that the preamble is limiting, Tsuji discloses at least one illumination fan for a computer. Tsuji claim 1 discloses “a plurality of fan units that cools the serially-connected electronic apparatus.” In presenting the problem

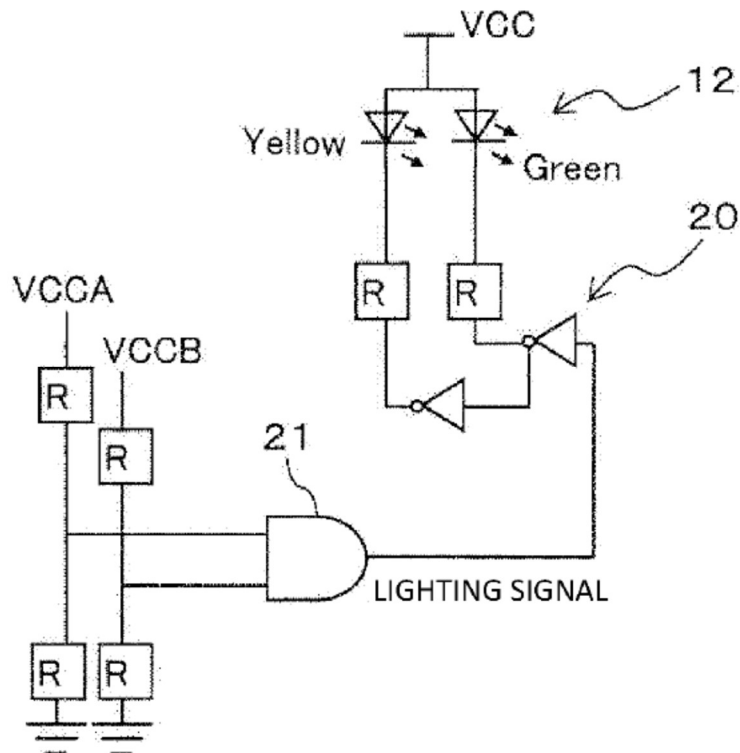
to be solved, Tsuji discloses “In cooling fans conventionally used in large-scale backbone servers, an ability to perform hot maintenance and swapping while maintaining a system operational state (energized state) is desirable. Accordingly, a fan unit that includes a cooling fan is often arranged on the front side or the rear side of a chassis that forms a server casing.” Ex[1007] at [0002]. Tsuji explains that “FIG. 5 is a schematic perspective view of a connection structure of a server and fan units to which a technology according to the present embodiment is applied.” Ex[1007] at [0012]. A POSITA would understand the disclosed server to be a computer. Tsuji also discloses illumination within the disclosed fan. “FIG. 14 is a block diagram showing a configuration of each fan unit according to the present embodiment. FIG. 15 is a block diagram showing a detailed configuration of a Light Emitting Diode (LED) lighting [*sic*, lighting] circuit shown in FIG. 14.” Ex[1007] at [0012]. Each exemplary fan unit includes a fan 11 and illumination 12.



Ex[1007] at Figure 5



Ex[1007] at Figure 14



Ex[1007] at Figure 15

65. Huang discloses a similar illumination fan in a computer.

“A cooling fan having a light-emitting effect comprises a frame body, a light-emitting assembly and a fan blade assembly, wherein the frame body has a base and an upper cover” Ex[1008] at Abstract.

“FIG. 1 is a stereoscopic schematic drawing of a first embodiment of the present invention.” Ex[1008] at 3:33-34.

“A fan used in a computer is mainly used to discharge the thermal energy released by the operation of a host computer to the outside. The conventional host computer is often placed in a corner because of its monotony. In order to increase the visibility of the host computer, there are many transparent or light-emitting cases available in the market that can render the host computer different light changes, a variety of cooling fans, heat-conducting water drains and the like

which can emit different light changes are provided in the host computer so as to enhance the visibility of the host computer through different light changes.” Ex[1008] at 1:12-22.

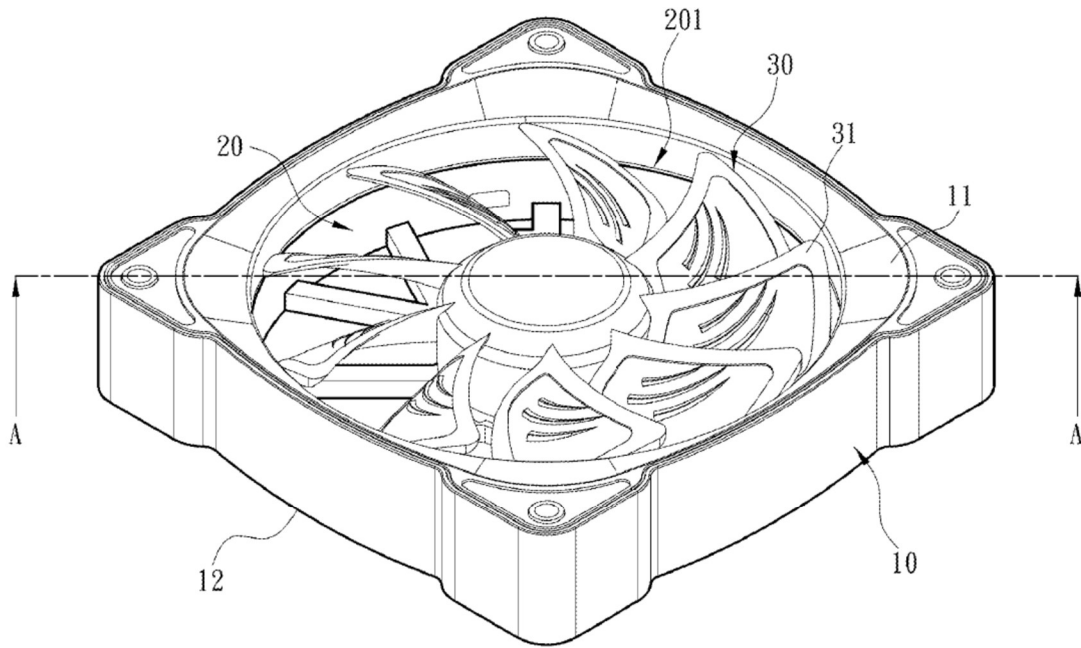
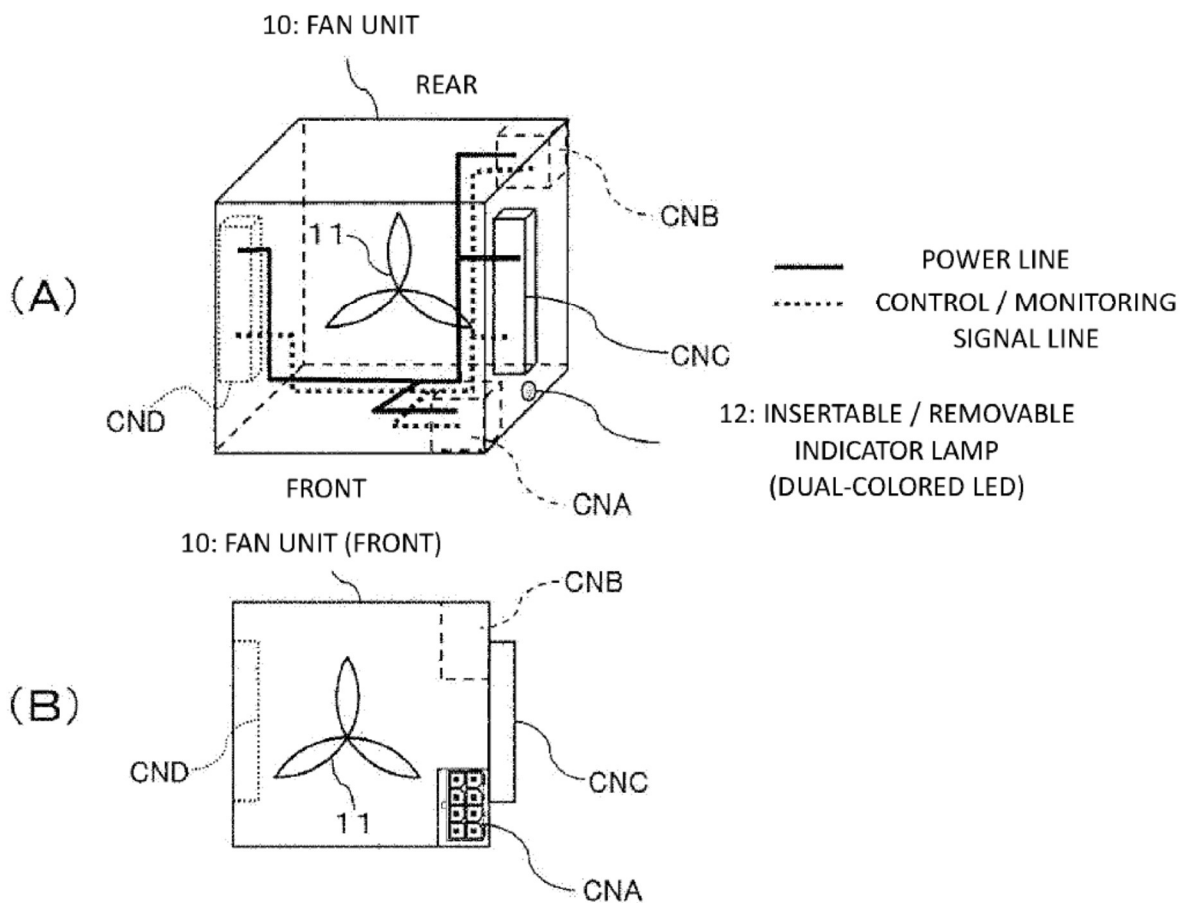


Fig. 1

Ex[1008] at Figure 1

6.2. 1a - a body, provided with a fan in center of the body,

66. Tsuji discloses a body (e.g. Fan Unit 10) which includes a fan (e.g. Fan 11) that is substantially in the center of the body. *See, e.g.,* Ex[1007] at Figures 1-8.



Ex[1007] at Figure 7

67. Huang also discloses a body (e.g. Frame Body 10) which includes a fan (e.g. Fan Assembly 30) that is substantially in the center of the body. “FIG. 2 is stereoscopic exploded schematic drawing of the first embodiment of the present invention.” Ex[1008] at 3:35-36. *See also e.g.*, Ex[1008] at Figures 1, 2, and 7.

6.3. 1b - an illumination area on at least two sides of the fan at top of the body,

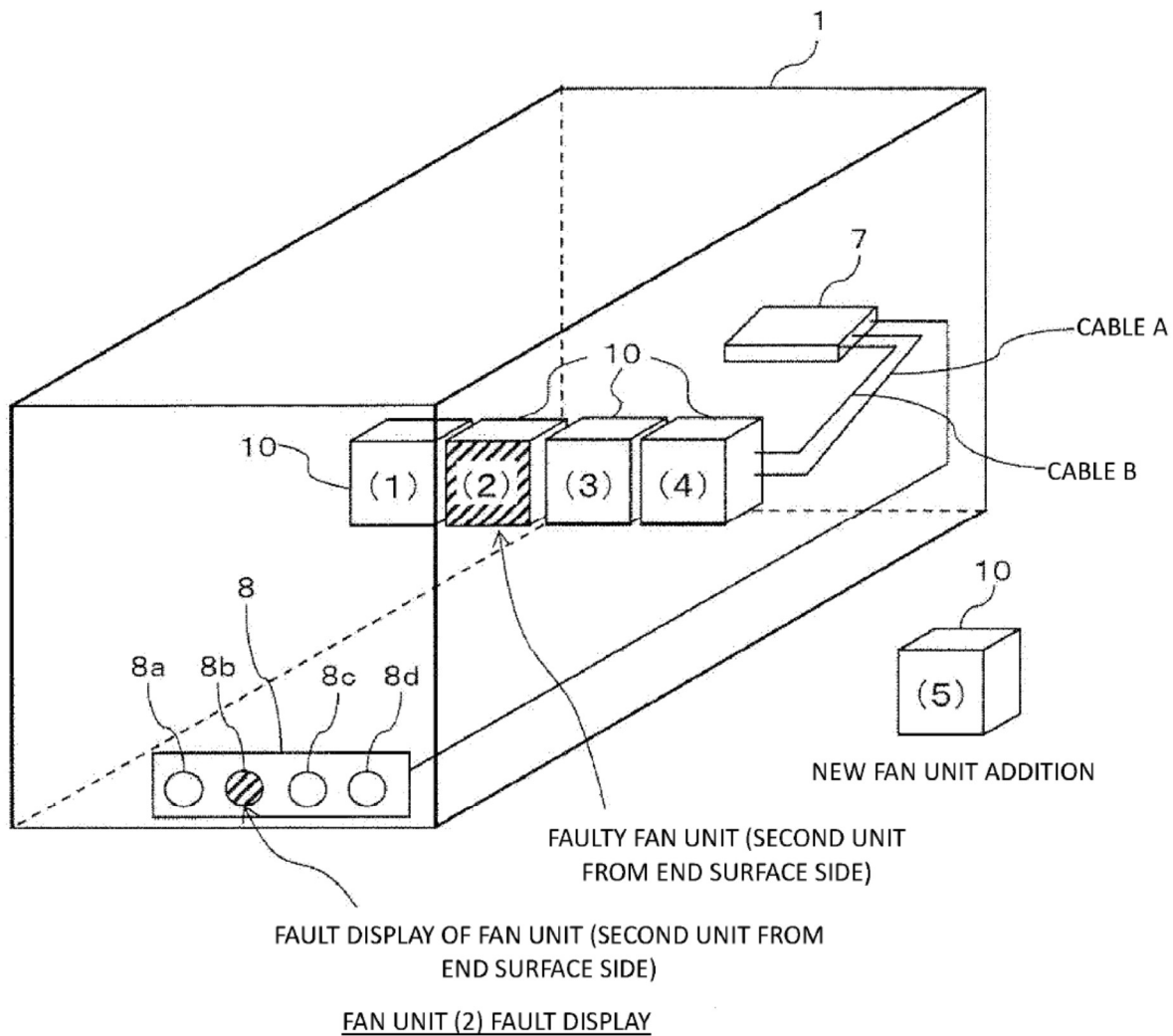
68. Tsuji discloses an indicator lamp 12 on the side surface of the fan at the top of the body. Ex[1007] at [0135]-[0136]. *See also e.g.* Ex[1007] at Figure 7. To the extent that Tsuji does not disclose that the illumination area is on at least two sides of the fan, it would be obvious to a POSITA to place an additional indicator lamp on a second side. Tsuji already teaches that it may be beneficial to have the indicator lamp visible from an additional location. Ex[1007] at [0135]-[0136]. *See also e.g.* Ex[1007] at Figures 8-12.

“Accordingly, a link between the installation position of each fan unit 10 inside the casing of server 1 and the I2C slave address thereof can be established without performing any special operation, and the management unit 7 can correctly recognize each fan unit 10 and appropriately perform the rotation speed control or abnormality condition monitoring of each fan unit 10. For example, correspondence between the faulty fan unit 10 and fault LEDs 8a to 8d that should be lit on a fan fault external display panel 8 can be correctly established, as explained later by referring to FIGS. 8 to 11. In such a manner, according to server 1 of the present embodiment, problems and issues of the related technology explained above by referring to FIGS. 1 to 4 can be resolved.” Ex[1007] at [0033]

“Furthermore, as shown in FIG. 7A, an insertable / removable indicator lamp 12 is provided on the right side surface when viewed from the front surface of each fan unit 10. Because the right side surface is exposed to the outside when fan unit 10 is arranged on the right-most side of the plurality of fan units 10 (when fan unit 10 is added), the maintenance person can check a lighting state of the insertable / removable indicator lamp 12.” Ex[1007] at [0040]

“As shown in FIGS. 8 to 11, a fan fault external display panel 8 is provided on a lower part of the front surface of server 1 according to the present embodiment. The fan fault external display panel 8 includes four LEDs (dual-colored LEDs) 8a, 8b, 8c, and 8d. The management unit 7 controls the lighting color of the LEDs 8a to 8d in accordance with the state of the four fan units 10 mounted inside server 1.” Ex[1007] at [0055]; *see also* Ex[1007] at [0056]-[0060], [0064]-[0066].

“As explained above while referring to FIGS. 8 to 11, the fan fault external display panel 8 is arranged on a lower part of the front surface of server 1, and includes the LEDs 8a to 8d that correspond to the four fan units 10. The LEDs 8a to 8d are controlled by the monitoring unit 7 so as to light in a color based on the state of the four fan units 10 installed inside server 1.” Ex[1007] at [0079].



Ex[1007] at Figure 9

69. In light of this teaching, a POSITA would find it obvious to include additional indicator lights on at least two sides of the fan assembly so that they can be visible from multiple perspectives as taught. It would be within the ordinary skill of a POSITA to modify the circuit in Figure 15 to drive two or more bicolor LEDs without any experimentation. Alternatively, it would be within the ordinary skill of a POSITA to replicate the circuit in Figure 15 to drive two or more bicolor

LEDs without any experimentation. As the fan modules can be observed from the top, it would also be obvious to place these indicator LEDs on the top of each of the two sides for improved visibility. There would be no technical adaptation required.

70. Additionally, a POSITA would have found it obvious to modify Tsuji to incorporate the teachings regarding light emitting and diffusing elements from Huang. Moreover, a POSITA could make this modification using the teachings in the references with no additional experimentation and with an extremely high and predictable expectation of success. In the first place, a POSITA would have been motivated to make this combination. Both patents are directed towards the structure and operation of computer cooling fans that include a mounting frame, rotating fan blades, and lights intended to be visible to a user. Thus, these two patents are in the same field of art. *See, e.g.*, Ex[1007] at [Abstract] [Problem] [Solution] and Ex[1008] at 1:6-9. Additionally, design incentive and market forces would encourage a POSITA to incorporate the teachings regarding light emitting and diffusing elements from Huang into Tsuji. Huang provides a larger illumination area that is more uniform. Ex[1008] at 1:57-2:7, Figure 2. This provides more visibility and can be seen from further away than the simpler LEDs in the Tsuji embodiments. Similarly, the light element that improved the fan in Huang would be obvious to use in the very similar fan in Tsuji in the same way.

The illumination element from Huang to be combined with the Tsuji fan design is completely analogous to the modular sensor in the KSR precedent. “It is common sense that familiar items may have obvious uses beyond their primary purposes, and a person of ordinary skill often will be able to fit the teachings of multiple patents together like pieces of a puzzle.” A top-viewable, diffused light as taught in Huang is a familiar item to a POSITA and can be incorporated into the Tsuji fan in the same manner as it is incorporated into the Huang fan. A POSITA would have a good reason (larger, more uniform illumination) to pursue this known option and it would almost certainly lead to anticipated success. Additionally, the positioning of the light on the top of the fan, visible from two sides, is one of a finite number of identified, predictable solutions to placing the light.

71. Huang teaches that the light element forms an illumination area at the top of the fan on at least two sides. In fact, the entire upper cover 11 is illuminated in some embodiments and the entire base 12 is illuminated in some embodiments.

“The cooling fan comprises a frame body, a light-emitting assembly and a fan blade assembly. The frame body includes a base and an upper cover which is made from a light-permeable material and forms an installation space together with the base. The light-emitting assembly is mounted on the base and includes a circuit board, a plurality of light-emitting elements which are electrically connected with the circuit board and emit a light respectively, and a light guide plate. The light guide plate includes a plurality of light guide strips which correspond to each of the plurality of light-emitting elements respectively to form a guide path that guides the light, and a light

diffusion portion which is connected with the plurality of light guide strips. The light diffusion portion includes a first diffusion portion in a position corresponding to each of the plurality of light guide strips, such that the light passes through the guide path to form a diffused light via the first diffusion portion, and the upper cover is in a uniform light-emitting state. The fan blade assembly is arranged in the installation space, and includes a driving unit which is electrically connected with the circuit board and a fan blade which is driven by the driving unit to rotate in the installation space.

In an embodiment, the light diffusion portion includes a first diffusion portion in a position corresponding to each of the plurality of light guide strips, such that the light passes through the guide path and then forms a diffused light using the first diffusion portions, and therefore the upper cover is in a uniform light-emitting state.” Ex[1008] at 1:52-2:14.

“In an embodiment, the plurality of light guide strips further include a plurality of first light guide strips and a plurality of second light guide strips, wherein each of the plurality of first light guide strips extends to the light diffusion portion from each of the plurality of light-emitting elements; each of the plurality of second light guide strips further comprises a first section which extends from the plurality of light-emitting elements and two second sections which extend to the light diffusion portion from the first section respectively.

In an embodiment, the diffused light further comprises a first diffused light and a second diffused light, wherein the first diffused light is formed by passing through the plurality of first light guide strips and then through the first diffusion portions; the second diffused light is formed by passing through the first sections of the plurality of second light guide strips to form two branched lights and then enabling the two branched lights to pass through the second sections and then through the first diffusion portion.” Ex[1008] at 2:29-47.

“In an embodiment, the base is further made from a light-permeable material, such that the entire frame body is in a uniform light-emitting state using the diffused light.

In an embodiment, the base further comprises a bottom plate in which the first connection portion is arranged, and a plurality of outer side plates which are annularly arranged on the bottom plate.” Ex[1008] at 2:52-58.

“In an embodiment, the diffused light further includes a first diffused light, a second diffused light and a third diffused light, wherein the first diffused light is formed by passing through the first light guide strips and then through the first diffusion portion; the second diffused light is formed by passing through the first sections of the second light guide strips to form two branched lights and then enabling the two branched lights to pass through the second sections and then through the first diffusion portion; the third diffused light is formed by enabling the first diffused light and the second diffused light to pass through the second diffusion portion.” Ex[1008] at 3:1-12.

“According to the present invention, the light emitted from the plurality of light-emitting elements is uniformly diffused through the convex lens portion on the light diffusion portion and the semi-concave lens surface of the gap portion, such that the entire upper cover or the entire frame body can present a uniform light-emitting state to increase the visibility when the cooling fan is used.” Ex[1008] at 3:23-29.

“In the present embodiment, the upper cover 11 and the base 12 may further be made from a light-permeable material, such that the entire frame body 10 is in a light-permeable state, or the upper cover 11 may be made from a light-permeable material while the base 12 is made from a light-tight material, such that the upper cover 11 is in a light-permeable state. When the base 12 is made from the light-tight material, a reflection layer is respectively formed on one side of the bottom plate 121 and the plurality of outer side plates 122 of the base 12 inside the accommodating space 14, so as to increase the reflectivity of the bottom plate 121 and the plurality of outer side plates 122. The reflection layers can be formed by embossing, coating or deposition.” Ex[1008] at 4:14-28.

“Therefore, when the light 27 respectively passes through the first light guide strips 221 and the second sections 224 to form the two branched lights 272, the two branched lights 272 will then enter into

the light diffusion portion 23 and then pass through the first diffusion portions 281 to form the first diffused light 271 and the second diffused light 273 respectively, and further the entire light diffusion plate 24 forms a uniform light-emitting effect. Furthermore, since the partition wall 111 is connected to one end surface of the light diffusion portion 23, a part of the first diffused light 271 and the second diffused light 273 will be guided into the upper cover 11 via the light diffusion portion 23, such that the upper cover 11 produces a uniform light-emitting effect.” Ex[1008] at 7:9-22.

“Accordingly, in the present embodiment, when the light 277 passes through the first light guide strips 221 and the second sections 224 respectively to form the two branched lights 272, and the two branched lights 272 will then enter into the light diffusion portion 23 and next passes through the first diffusion portions 281 to form the first diffused light 271 and the second diffused light 273 respectively, the first diffused light 271 and the second diffused light 273 will pass through the gap portion 29 and form a third diffused light 274 via the second diffusion portion 282, such that the third diffused light 274 is uniformly distributed in the light diffusion plate 24, and further the entire light diffusion plate 24 forms a uniform light-emitting effect.

Therefore, when the base 12 is made from a light-permeable material, the bottom plate 121 and the plurality of outer side plates 122 of the base 12 present a uniform light-emitting effect through the first diffused light 271, the second diffused light 273 and the third diffused light 274 which are formed by the light diffusion portion 23, the first diffusion portion 281 and the second diffusion portion 282, and further any face of the entire frame body 10 presents a uniform reflective effect.” Ex[1008] at 7:35-56.

See also Ex[1008] at Figures, 1, 2, and 3.

72. When Tsuji is modified to include the teachings related to the lighting element of Huang (e.g. the lights, light guides, diffusors, reflectors, and/or light-permeable materials combined as disclosed in Huang) it will also comprise a fully-illuminated upper cover and a fully-illuminated base.

6.4. 1c - a power socket and a first connector on one side of the body, and a second connector on another side of the body,

73. Tsuji discloses a power socket and a first connector on one side of the body, and a second connector on another side of the body. For example, Tsuji discloses “two adjacent fan units among the plurality of the fan units transmit the pulse signal from one side to the other side, and are connected via an inter-fan unit connector that supplies power from one end to the other end.” Ex[1007] at claim 5.

74. Tsuji also discloses the power connector in claim 6. “The electronic device as claimed in Claim 5, wherein each fan unit among the plurality of the fan units includes a power connector to which two or more power cables that can supply power to its own fan unit are connected when its own fan unit is arranged on one end side of the plurality of the fan units.” Ex[1007] at claim 6.

75. The power sockets are shown as connectors CAN and CNB in Figures 5-7 and Figure 14. Each includes power (VCCA or VCCB) and ground (GND). A POSITA would understand these to be power sockets since they receive a male end part plug from cables A and B. Ex[1007] at [0039] Additionally, a first connector CNC is provided on one side of the body and a second connector CND is provided on another side of the body. These can be seen in Figures 5-7 and Figure 14 as well.

“Moreover, each fan unit 10 includes power connectors CNA and CNB to which two or more power cables capable of supplying power to its own fan unit are connected when its own fan unit is arranged on one end side of the plurality of fan units 10 (refer to FIGS. 5 to 7).” Ex[1007] at [0031].

“Each of fan unit 10 that form such a connection structure includes connectors CNA, CNB, CNC, CND for supplying power and transmitting a control signal / monitoring signal to the adjacent fan unit 10, as shown in FIGS. 5, 6, 7A, and 7B. Furthermore, in the following explanation, the control signal / monitoring signal may be referred to as a control / monitoring signal.” Ex[1007] at [0037].

“Moreover, two connectors CNA and CNB (both female) that enable power supply and live connection of the control signal / monitoring signal are provided on one end of each fan unit 10 (right side when viewed from the front surface). The connector CNA on one side is arranged on a lower part of the front surface of each fan unit 10 such that an end part plug (male) of a cable A is inserted from the front surface side so as to be live-connected. The connector CNB on the other side is arranged on an upper part of the rear surface of each fan unit 10 such that an end part plug (male) of a cable B is inserted from the rear surface side so as to be live-connected. The two cables A and B are connected to the connectors CNA and CNB, respectively, when fan unit 10 is arranged on a right-most side (one side) of the plurality of fan units 10 (when adding fan unit 10). The cables A and B each supply power from a power supplying unit (internal power source) 2 of server 1 and transmits the control signal / monitoring signal and the like received from the management unit 7 (refer to FIGS. 8 to 13).” Ex[1007] at [0039].

“The power is supplied to the serially-connected plurality of fan units 10 from the power supplying unit 2 via the cables A and B and the connectors CNA, CNB, CNC, and CND explained above in a sequence. Moreover, the management unit 7 (I2C master; refer to FIGS. 8 to 13) and the fan controllers 13 of the plurality of fan units 10 (I2C slaves; refer to FIGS. 12 and 13) are connected in a daisy chain form by a serial interface such as I2C. Accordingly, the control signal (pulse signal) from the management unit 7 or the adjacent fan unit 10 is transmitted to the serially-connected plurality of fan units 10

via the cables A and B and the connectors CNA, CNB, CNC, and CND explained above. Therefore, fan unit 10 can be hot-swapped without having to stop the system (server 1).” Ex[1007] at [0041].

“At the start of the operation, four serially-connected fan units 10 are installed in server 1 and the connectors CNA and CNB of the fan unit on the right-most side are connected to the cables A and B, respectively.” Ex[1007] at [0042].

“In other words, the maintenance person confirms that the connectors CNA and CNB of fan unit 10 arranged on the right-most side is connected to the cables A and B, and is in a state in which the cable can be inserted / removed.” Ex[1007] at [0043].

“Upon visually confirming the insertable / removable indicator lamp 12 and confirming that it is the state in which the cable can be inserted / removed, the maintenance person engages the connector CNC (male) of fan unit 10 on the right-most side with the connector CND of the new fan unit 10 (refer to Arrow (1) shown in FIG. 6). Accordingly, the new unit 10 is connected to fan unit 10 on the right-most side as a fifth fan unit 10.” Ex[1007] at [0044].

“The power source unit 2 is an internal power source mounted inside server 1, and as explained above, supplies power to the plurality of fan units 10 via the cable A, the cable B, and the connectors CNA to CND. Moreover, in addition to supplying power to electronic apparatus such as the CPU 3, the MEM 4, and the HDD 5, the power source unit 2 supplies power to other various not-shown electronic apparatus and the like via the electric voltage regulator 6.” Ex[1007] at [0069].

“In the present embodiment, the power line and the control / monitoring signal line of the four fan units 10 inside server 1 are joined in a daisy chain form via the cables A and B, and the connectors CNA, CNB, CNC, and CND. Particularly, as shown in FIG. 13, monitoring unit 7, which is the I2C master, and the fan controller 13, which is the I2C slave in each fan unit 10, are connected by the control / monitoring signal lines SCL and SDL that form the I2C serial interface. SCL is an abbreviation of Serial Clock Line, and

SDL is an abbreviation of Serial Date [*sic*, Data] Line.” Ex[1007] at [0076].

“As shown in FIG. 14, each fan unit 10 includes the connectors (power source connectors) CNA and CNB for the cables A and B, and the inter-fan connectors CNC and CND explained above.” Ex[1007] at [0084].

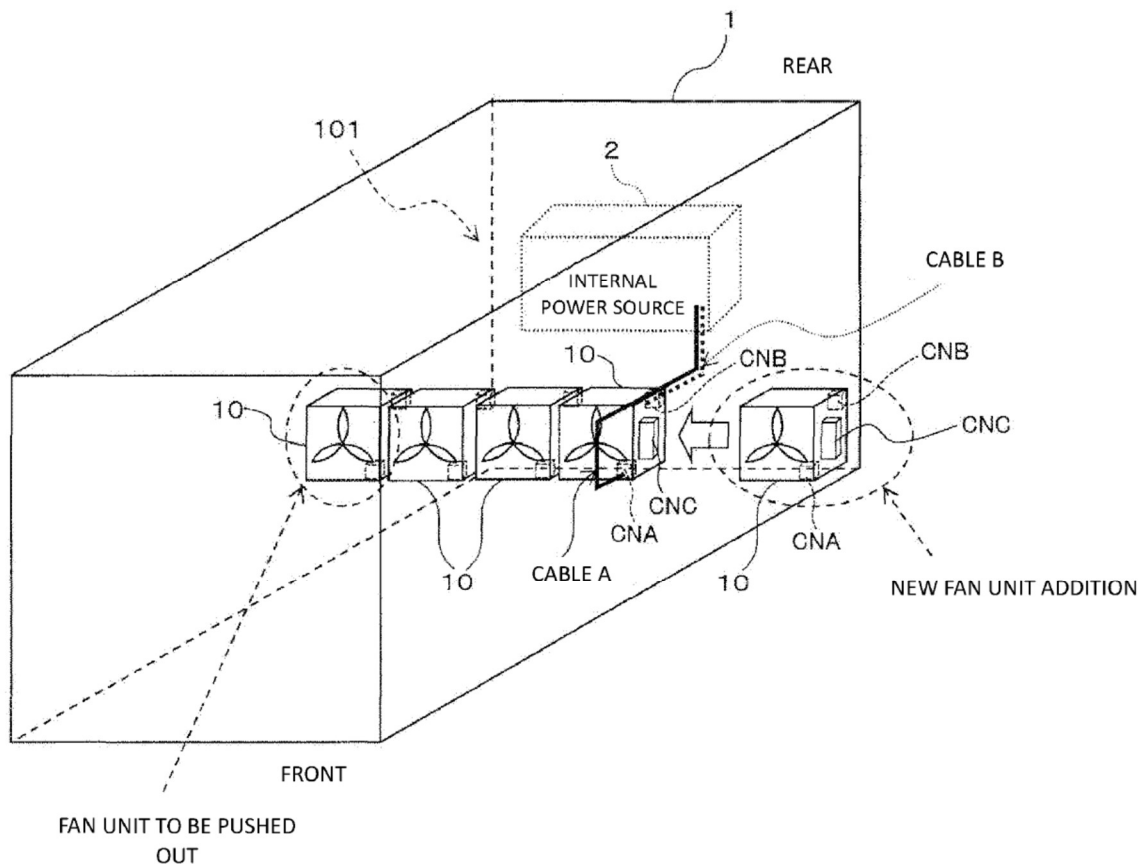
“In FIG. 14, the connectors CNA and CNB are connected to the cables A and B that are connected to a main body unit of server 1, respectively, as explained above. However, the cables A and B can only be connected to the connectors CNA and CNB of the first fan unit 10. The connectors CNC and CND connect the adjacent fan units 10 as explained above.

The connector CNA of the first fan unit 10 is connected to the main body unit of server 1 via the cable A, and is connected to a power source and a signal (a power supply VCCA, an I2C control / monitoring signal line (SCL, SDL) I2CA, an alarm signal Alma, a ground GND) of a first system A. Similarly, the connector CNB of the first fan unit 10 is connected to the main body unit of server 1 via the cable B, and is connected to a power source and a signal (a power supply VCCB, an I2C control / monitoring signal line I2CB, an alarm signal AlmB, the ground GND) of a second system B.

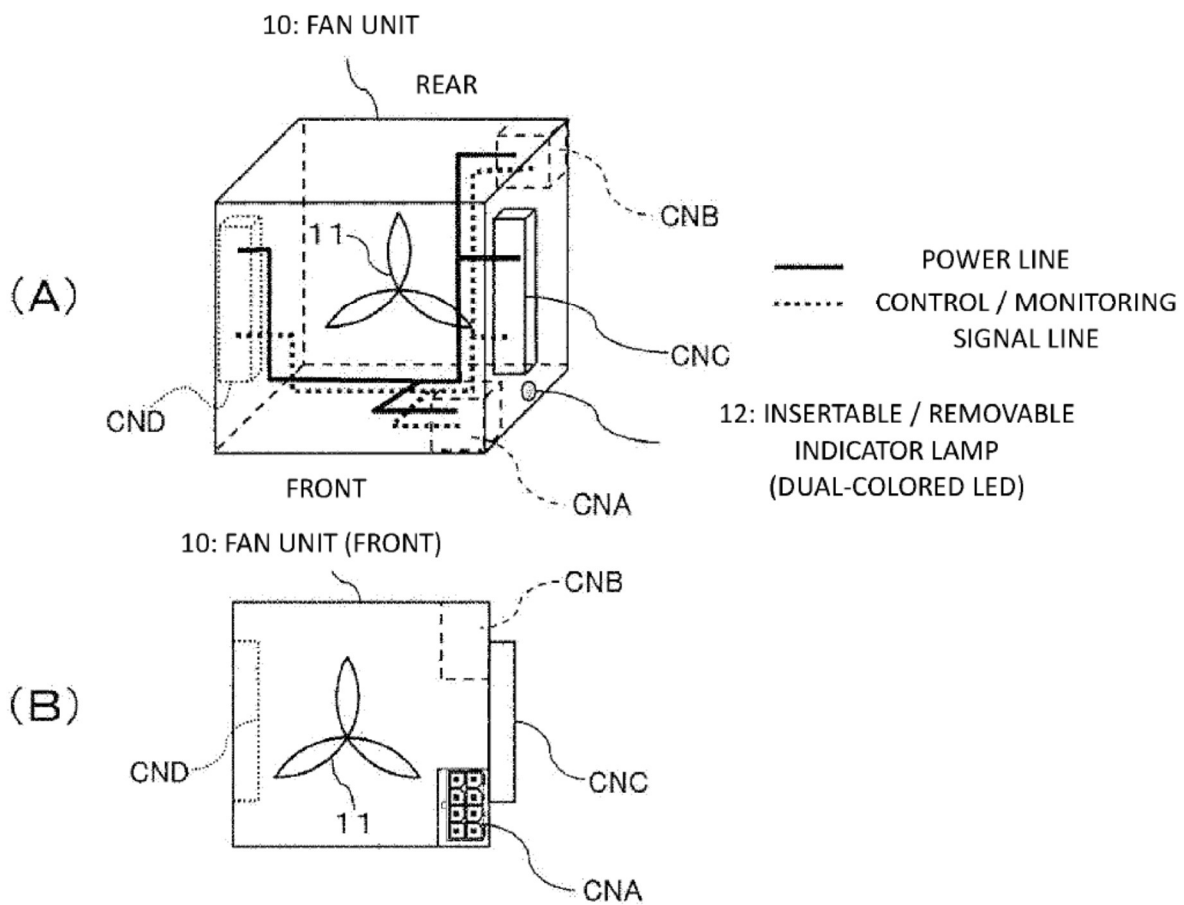
Moreover, in FIG. 14, VCC indicates the power source, and GND indicates ground. Moreover, a character "o" assigned to signals *ALo, I2Co, S0o, S1o, S2o indicates this signal is output from the respective fan unit 10. Similarly, a character "i" assigned to signals *ALi, I2Ci, S0i, S1i, S2i indicates this signal is input to the respective fan unit 10.” Ex[1007] at [0091]-[0093].

“Particularly, in the edge generating circuit 40 shown in FIG. 17, a pulse signal with a delay time (time width, pulse width) DL1 is generated on the internal signal S0x in accordance with the edge notified from the first fan unit 10 (refer to t3 in FIG. 19). Accordingly, the I2C address counter 60 and the D-FF 52 of the pulse generating circuit 50 are reset. The S0i terminal of the connector CNC and the S0o terminal of the connector CND are electrically serially-connected,

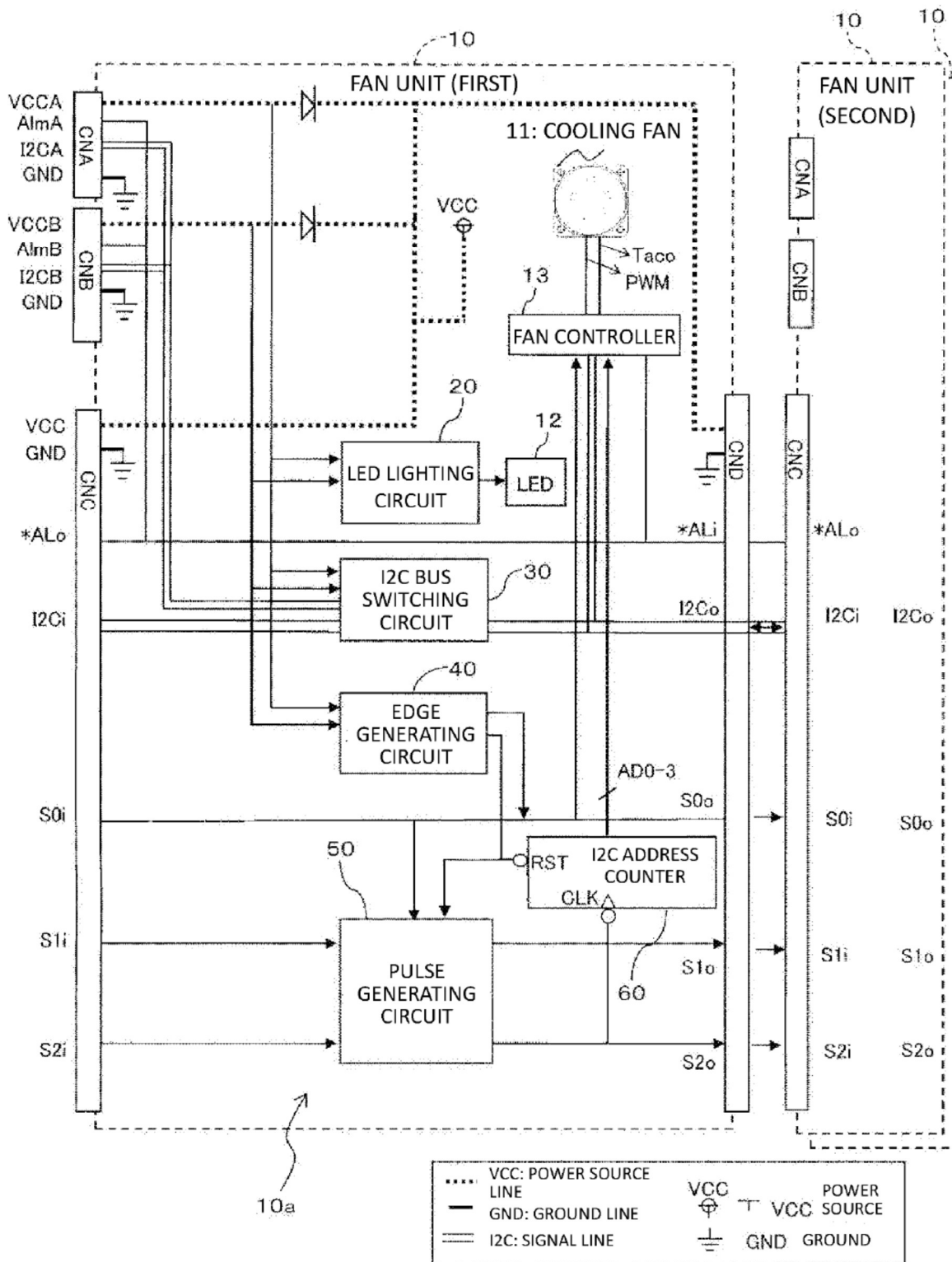
and the D-FF 52 and the I2C address counter 60 inside all fan units 10 are reset.” Ex[1007] at [0115].



Ex[1007] at Figure 5



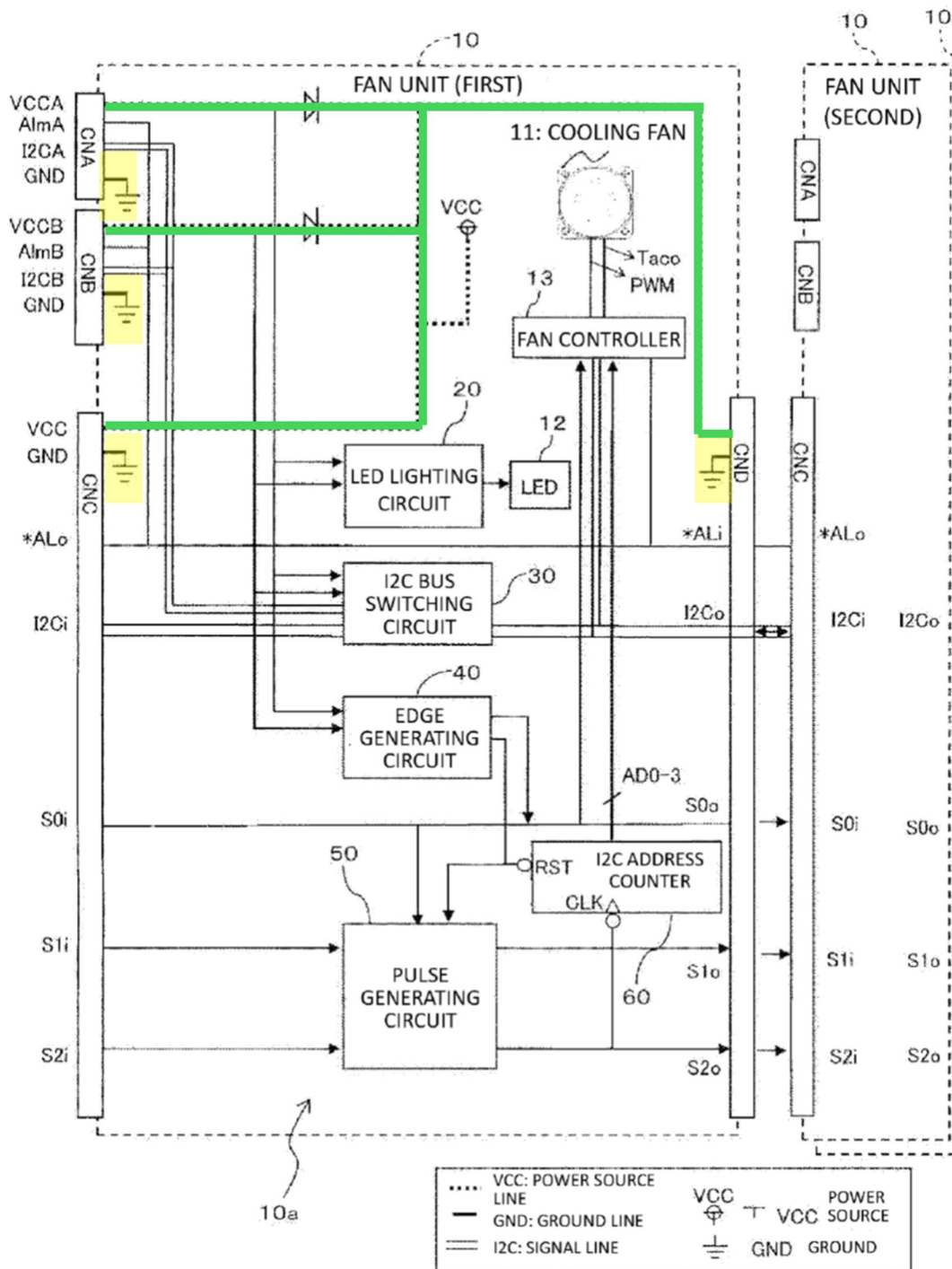
Ex[1007] at Figure 7



Ex[1007] at Figure 14

6.5. 1d - wherein the power socket is electrically connected with the first connector, the second connector, the fan and the illumination area, such that when the power socket on the one side of the body is supplied with power, the fan and the illumination area of the body are respectively driven into rotation and illumination, and when the first connector of the body is connected with a second connector of a body of another illumination fan, a fan and an illumination area of the body of another illumination fan are respectively driven into rotation and illumination.

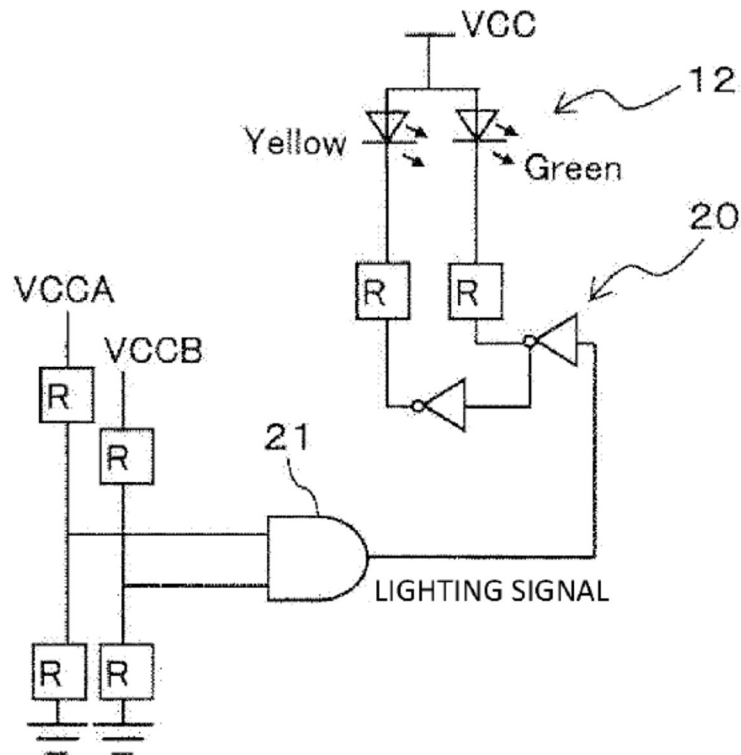
76. Tsuji teaches that the power socket is electrically connected with the first connector, the second connector, the fan and the illumination area. One place to see this teaching is in Tsuji Figure 14. An annotated version of Figure 14 appears below. The yellow highlighted portions of the drawing indicate that the ground signal from power sockets CNA and CNB is electrically connected with first connector CNC and second connector CND. The green highlighted portions of the drawing indicate that the VCC signal from power sockets CNA and CNB is electrically connected with first connector CNC and second connector CND.



Ex [1007] Figure 14 (annotated)

77. These power and ground signals are also connected to the illumination area through LED lighting circuit 20 and LED 12. This is illustrated both in Figure

14 and Figure 15. VCC connects directly to the LEDs and Ground connects through LED lighting circuit 20.



Ex[1007] at Figure 15

78. The power sockets supply power to the fan units. Power is supplied through the fan controller 13 to the cooling fan 11. The controller responds to speed control commands from the I2C signals that are also connected from the power controller to the fan controller. This can be seen in Figure 14. This functionality is also described in Figure 20. Fan 11 is directly connected to a PWM signal. A POSITA would understand that at least one of the PWM signals

would directly correspond to VCC or ground in the normal implementation and it would at least be obvious to implement it in this manner.

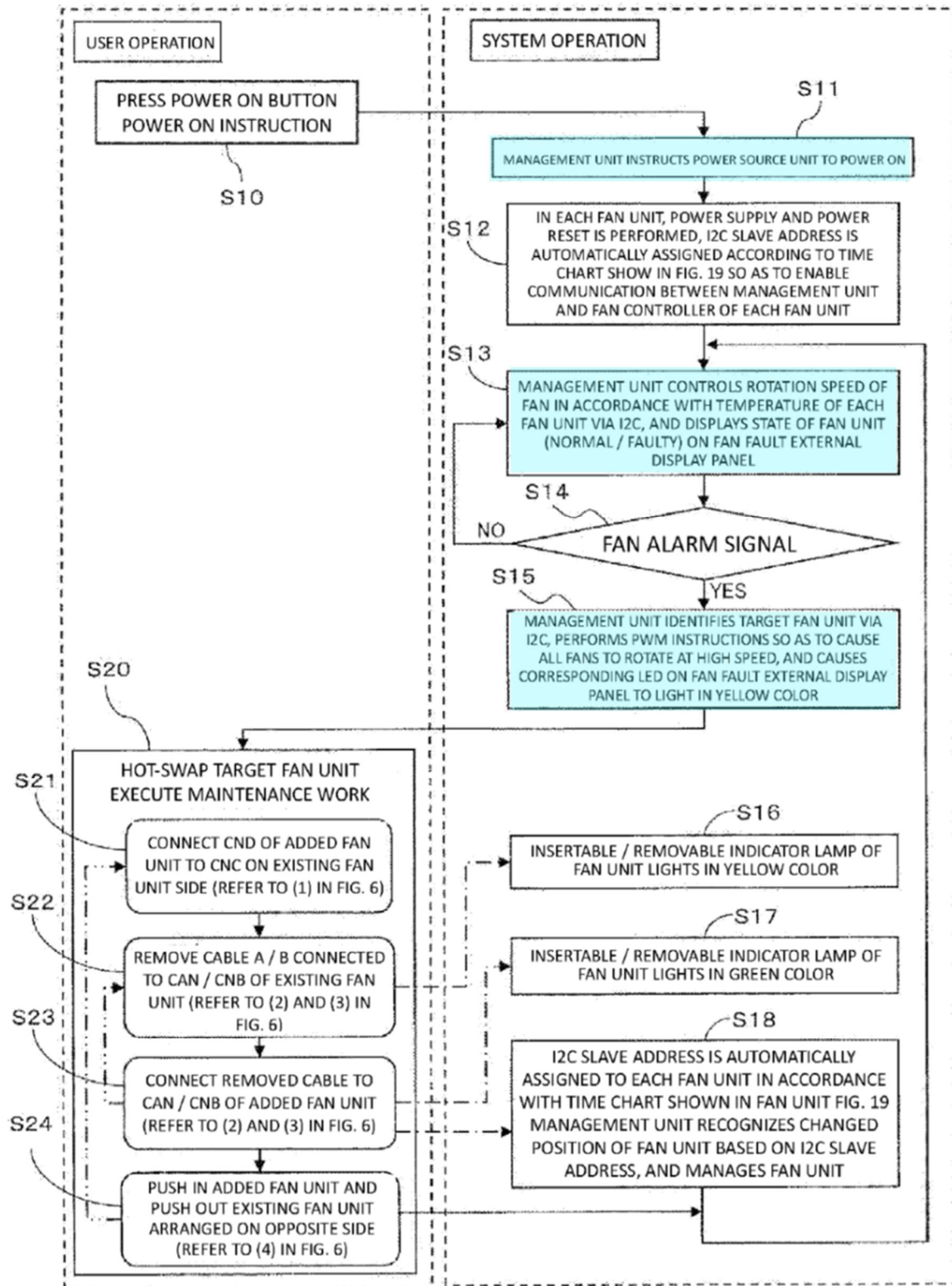
“Each fan unit 10 includes a cooling fan 11 that is driven rotationally by a motor (not-shown), and a controlling unit (not-shown). The controlling unit controls each fan unit 10, and includes a fan controller 13, circuits 20, 30, 40, and 50, and a counter 60 (refer to FIG. 14) explained later. The fan controller 13 monitors and controls the operation of the cooling fan 11. Particularly, the controlling unit performs a function of assigning to its own fan unit (fan controller 13) an address that identifies its own fan unit among the plurality of fan units 10 (for example, I2C slave address) by corresponding thereof with the connection position of its own fan unit among the plurality of fan units 10.” Ex[1007] at [0027].

“Moreover, each fan unit 10 includes power connectors CNA and CNB to which two or more power cables capable of supplying power to its own fan unit are connected when its own fan unit is arranged on one end side of the plurality of fan units 10 (refer to FIGS. 5 to 7).” Ex[1007] at [0031].

“On the other hand, when the alarm signal is detected (YES route at Step SI4), the management unit 7 identifies the target fan unit (faulty fan unit) 10 and reads the temperature of the target fan unit 10 via the I2C interface. Moreover, the management unit 7 controls the PWM signal transmitted from each fan controller 13 to the cooling fan 11 so as to forcefully cause the cooling fans 11 of all fan units 10 to rotate at 100% high speed. Furthermore, the management unit 7 causes the LED among the LEDs 8a to 8d corresponding to the target fan unit 10 on the fan fault external display panel 8 to be lit in the yellow color (Step SI5).

Furthermore, in the present embodiment, each fan controller 13 is configured to switch the rotation state of the cooling fan 11 between a 100% high speed rotation and a normal rotation. When a fault in the cooling fan 11 is detected, or when a cable is connected to connector CNA or the connector CNB, that is, when it is recognized that it is time for hot-swapping of fan unit 10, the management unit 7 can

forcefully switch the rotation state of the cooling fan 11 to the high speed rotation.” Ex[1007] at [0131]-[0132].



Ex[1007] at Figure 20 (annotated)

79. These signals are passed from one fan unit to the next fan unit when the first connector of the body is connected with a second connector of a body of another illumination fan.

“Each of fan unit 10 that form such a connection structure includes connectors CNA, CNB, CNC, CND for supplying power and transmitting a control signal / monitoring signal to the adjacent fan unit 10, as shown in FIGS. 5, 6, 7A, and 7B. Furthermore, in the following explanation, the control signal / monitoring signal may be referred to as a control / monitoring signal.” Ex[1007] at [0037].

“The power is supplied to the serially-connected plurality of fan units 10 from the power supplying unit 2 via the cables A and B and the connectors CNA, CNB, CNC, and CND explained above in a sequence. Moreover, the management unit 7 (I2C master; refer to FIGS. 8 to 13) and the fan controllers 13 of the plurality of fan units 10 (I2C slaves; refer to FIGS. 12 and 13) are connected in a daisy chain form by a serial interface such as I2C. Accordingly, the control signal (pulse signal) from the management unit 7 or the adjacent fan unit 10 is transmitted to the serially-connected plurality of fan units 10 via the cables A and B and the connectors CNA, CNB, CNC, and CND explained above. Therefore, fan unit 10 can be hot-swapped without having to stop the system (server 1).” Ex[1007] at [0041].

“In the present embodiment, the power line and the control / monitoring signal line of the four fan units 10 inside server 1 are joined in a daisy chain form via the cables A and B, and the connectors CNA, CNB, CNC, and CND. Particularly, as shown in FIG. 13, monitoring unit 7, which is the I2C master, and the fan controller 13, which is the I2C slave in each fan unit 10, are connected by the control / monitoring signal lines SCL and SDL that form the I2C serial interface. SCL is an abbreviation of Serial Clock Line, and SDL is an abbreviation of Serial Date [*sic*, Data] Line.” Ex[1007] at [0076].

“The four fan units 10 are serially connected, and cool down the electronic apparatus including the CPU 3, the MEM 4, and the HDD

5. Each fan unit 10 includes a cooling fan 11 that is driven rotationally by a not-shown motor. Moreover, the four fan units 10 are configured so as to be hot-swappable by performing the sliding operation of a part of fan units 10 as explained above while referring to FIGS. 5 to 11.” Ex[1007] at [0080].

“As shown in FIG. 14, each fan unit 10 includes the connectors (power source connectors) CNA and CNB for the cables A and B, and the inter-fan connectors CNC and CND explained above.” Ex[1007] at [0084].

“In FIG. 14, the connectors CNA and CNB are connected to the cables A and B that are connected to a main body unit of server 1, respectively, as explained above. However, the cables A and B can only be connected to the connectors CNA and CNB of the first fan unit 10. The connectors CNC and CND connect the adjacent fan units 10 as explained above.

The connector CNA of the first fan unit 10 is connected to the main body unit of server 1 via the cable A, and is connected to a power source and a signal (a power supply VCCA, an I2C control / monitoring signal line (SCL, SDL) I2CA, an alarm signal Alma, a ground GND) of a first system A. Similarly, the connector CNB of the first fan unit 10 is connected to the main body unit of server 1 via the cable B, and is connected to a power source and a signal (a power supply VCCB, an I2C control / monitoring signal line I2CB, an alarm signal AlmB, the ground GND) of a second system B.

Moreover, in FIG. 14, VCC indicates the power source, and GND indicates ground. Moreover, a character "o" assigned to signals *ALo, I2Co, S0o, S1o, S2o indicates this signal is output from the respective fan unit 10. Similarly, a character "i" assigned to signals *ALi, I2Ci, S0i, S1i, S2i indicates this signal is input to the respective fan unit 10.” Ex[1007] at [0091]-[0093].

“Each fan controller 13 according to the present embodiment is monitored by the monitoring unit 7 via the I2C interface, and can control the rotation speed of the cooling fan 11 (driving motor) by a pulse width modulation (PWM) signal.” Ex[1007] at [0124].

“In FIG. 4, an example of a method in which hot swapping the fan unit 110 is performed without using the power rails shown in FIG. 3. Furthermore, FIG. 4 is a diagram showing a fourth example of the related technology. In FIG. 4, three serially-connected fan units 110 are moveably provided so as to slide in the horizontal direction. At the time of a normal operation, power is supplied from the internal power source 120 of server 100 to the three fan units 110 via a power cable 141. Power is supplied from the internal power source 130 to the three fan units 110, which are the units to be swapped, via a power cable 142. The adjacent fan units 110 are connected via a connector, and power is supplied between the fan units via the connector. In a configuration shown in FIG. 4, by pushing in the three fan units 110 to be swapped from the right side, the three fan units 110 arranged inside server 100 are pushed out from the left side. Subsequently, the power cable 141 is connected to the three fan units 110 that are pushed out so as to supply power from the internal power source 120. Accordingly, the three fan units 110 are hot-swapped. In the example shown in FIG. 4, hot swapping of the fan unit 110 can be performed without using the power rails as shown in FIG. 3. However, because the plurality of the fan units 110 are hot-swapped in a batch, only a part of the fan units 110 among the plurality of the fan units 110 cannot be hot-swapped. In other words, only the fan unit 110 that needs to be swapped cannot be swapped.” Ex[1007] at [0018].

80. When the power is supplied to the power socket, one of the LED's will light up. A POSITA would understand from the Figure 15 circuit that if both VCCA and VCCB are powered, the green LED will illuminate. If only one of VCCA or VCCB is powered, the yellow LED will illuminate. This is corroborated by the specification text.

“As shown in FIG. 15, the LED lighting circuit 20 is configured so as to control the lighting color (luminescent color) of the insertable / removable indicator lamp 12 when hot-swapping fan unit 10, as explained above while referring to FIG. 7A. LED lighting circuit 20 includes an AND gate 21. In FIG. 15, VCC A indicates a power

source of the first system A supplied from the connector CNA, and VCCB indicates a power source of the second system B supplied from the connector CNB.” Ex[1007] at [0096].

“Accordingly, when the cables A and B are respectively connected to the connectors CNA and CNB, that is, the cables A and B is in the insertable / removable state (the state in which the power supply is not interrupted even when one of the cables is removed), the insertable / removable indicator lamp 12 is controlled to be in the green color state. On the other hand, when only one of the cables A and B is connected to the connector CNA and CNB (hereinafter, a state in which the power supply is interrupted when the cable is removed), the insertable / removable indicator lamp 12 is controlled to be in the yellow color state.” Ex[1007] at [0098].

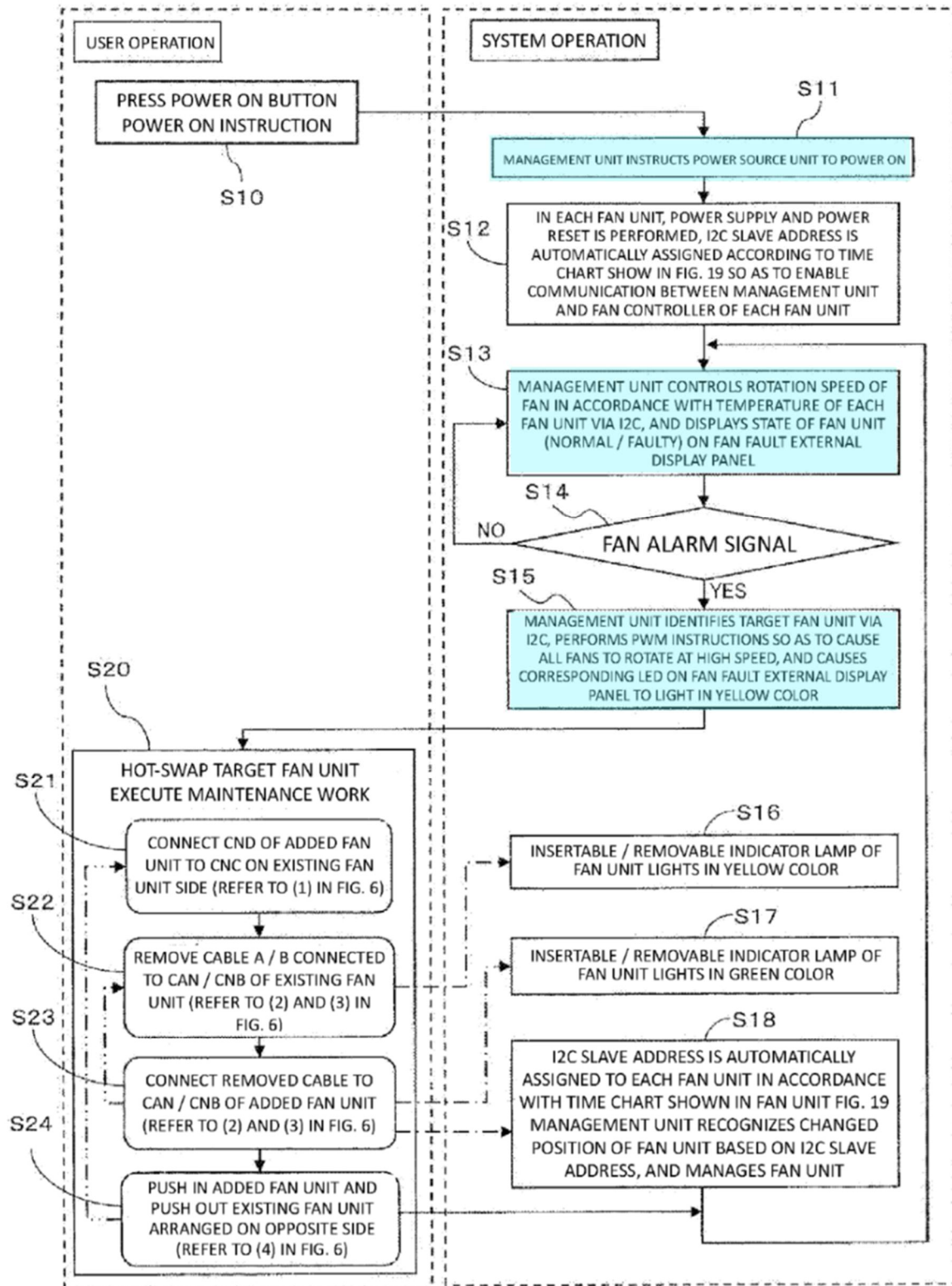
“Furthermore, as shown in FIG. 7A, an insertable / removable indicator lamp 12 is provided on the right side surface when viewed from the front surface of each fan unit 10. Because the right side surface is exposed to the outside when fan unit 10 is arranged on the right-most side of the plurality of fan units 10 (when fan unit 10 is added), the maintenance person can check a lighting state of the insertable / removable indicator lamp 12. The insertable / removable indicator lamp 12 is, for example, a dual-colored LED. The lighting color (luminescent color) of the insertable / removable indicator lamp 12 is controlled by a later-explained LED lighting circuit 20 (refer to FIGS. 14 and 15). For example, when the cables A and B are respectively connected to the connectors CNA and CNB, that is, the cables A and B are in a insertable / removable state (a state in which the power supply is not interrupted even when one of the cables is removed), the insertable / removable indicator lamp 12 is controlled to be in a green color state (to lit up in green color). On the other hand, when only one of the cables A and B is connected to the connector CNA and CNB (hereinafter, a state in which the power supply is interrupted when a cable is removed), the insertable / removable indicator lamp 12 is controlled to be in a yellow color state (to lit up in yellow color).” Ex[1007] at [0040].

“At this time, the maintenance person confirms that the insertable / removable indicator lamp 12 provided on the right side of fan unit 10 arranged on the right-most side among the already installed fan units

10 inside server 1 is in the green color state. In other words, the maintenance person confirms that the connectors CNA and CNB of fan unit 10 arranged on the right-most side is connected to the cables A and B, and is in a state in which the cable can be inserted / removed.” Ex[1007] at [0043].

“Subsequently, the maintenance person removes the cable A that is connected to the connector CNA of fan unit 10 on the right-most side, and connects the same to the connector CNA of the additionally-linked new fan unit 10, as shown by Arrow (2) of FIG. 6. At this step, the insertable / removable indicator lamp 12 switches from the green color state to the yellow color state when the cable A is removed, and switches back to the green color when the cable A is connected to the connector CNA of the new fan unit 10.” Ex[1007] at [0045].

81. When the power is supplied to the power socket, the fan will rotate with a speed corresponding to the temperature. The steps illustrated in Figure 20 show this. This is corroborated by the specification text. Additionally, it would be obvious to a POSITA to simply substitute a basic fan circuit that rotates at a fixed speed whenever power is present.



Ex[1007] at Figure 20 (annotated)

“The present embodiment discloses a technology that resolves various problems and issues of the related technology explained above while referring to FIGS. 1 to 4. Particularly, in the present embodiment, a technology that enables automatic assignment to each fan unit of the position and the associated address (ID) of each fan unit even after hot-swapping the fan unit in the electronic devices such as server is disclosed.” Ex[1007] at [0024].

“Each fan unit 10 includes a cooling fan 11 that is driven rotationally by a motor (not-shown), and a controlling unit (not-shown). The controlling unit controls each fan unit 10, and includes a fan controller 13, circuits 20, 30, 40, and 50, and a counter 60 (refer to FIG. 14) explained later. The fan controller 13 monitors and controls the operation of the cooling fan 11. Particularly, the controlling unit performs a function of assigning to its own fan unit (fan controller 13) an address that identifies its own fan unit among the plurality of fan units 10 (for example, I2C slave address) by corresponding thereof with the connection position of its own fan unit among the plurality of fan units 10.” Ex[1007] at [0027].

“The four fan units 10 are serially connected, and cool down the electronic apparatus including the CPU 3, the MEM 4, and the HDD 5. Each fan unit 10 includes a cooling fan 11 that is driven rotationally by a not-shown motor. Moreover, the four fan units 10 are configured so as to be hot-swappable by performing the sliding operation of a part of fan units 10 as explained above while referring to FIGS. 5 to 11.” Ex[1007] at [0080].

Furthermore, in the present embodiment, each fan controller 13 is configured to switch the rotation state of the cooling fan 11 between a 100% high speed rotation and a normal rotation. When a fault in the cooling fan 11 is detected, or when a cable is connected to connector CNA or the connector CNB, that is, when it is recognized that it is time for hot-swapping of fan unit 10, the management unit 7 can forcefully switch the rotation state of the cooling fan 11 to the high speed rotation.” Ex[1007] at [0132].

82. Tsuji also teaches that when the first connector of the body is connected with a second connector of a body of another illumination fan, a fan and an illumination area of the body of another illumination fan are respectively driven into rotation and illumination. A POSITA would understand this from Figures 14 and 19, but it is also corroborated by the specification text.

“To resolve such a problem, in a structure in which the fan units are hot-swappable by sliding operation as explained above, it is possible to adopt a serial interface capable of monitoring and controlling the fan units by using fewer signal lines. For example, the plurality of the fan units is connected in a daisy chain form by using a serial interface such as Inter-Integrated Circuit (I2C). In such a case, the management and monitoring unit monitors and controls each fan unit while identifying each fan unit by a unique address (ID; identification information) assigned to each fan unit beforehand.” Ex[1007] at [0006].

“To resolve such a problem, in a structure in which the fan units 110 are hot-swappable by sliding operation, it is possible to use a serial interface capable of monitoring and controlling the fan units 110 by using fewer signal lines. For example, the plurality of the fan units 110 is connected in a daisy chain form by using a serial interface such as I2C. In such a case, the management and monitoring unit monitors and controls each fan unit 110 while identifying each fan unit 110 by using a unique address (ID; identification information) assigned to each fan unit 110 beforehand.” Ex[1007] at [0020].

“The power is supplied to the serially-connected plurality of fan units 10 from the power supplying unit 2 via the cables A and B and the connectors CNA, CNB, CNC, and CND explained above in a sequence. Moreover, the management unit 7 (I2C master; refer to FIGS. 8 to 13) and the fan controllers 13 of the plurality of fan units 10 (I2C slaves; refer to FIGS. 12 and 13) are connected in a daisy chain form by a serial interface such as I2C. Accordingly, the control signal (pulse signal) from the management unit 7 or the adjacent fan

unit 10 is transmitted to the serially-connected plurality of fan units 10 via the cables A and B and the connectors CNA, CNB, CNC, and CND explained above. Therefore, fan unit 10 can be hot-swapped without having to stop the system (server 1).” Ex[1007] at [0041].

“In the present embodiment, the power line and the control / monitoring signal line of the four fan units 10 inside server 1 are joined in a daisy chain form via the cables A and B, and the connectors CNA, CNB, CNC, and CND. Particularly, as shown in FIG. 13, monitoring unit 7, which is the I2C master, and the fan controller 13, which is the I2C slave in each fan unit 10, are connected by the control / monitoring signal lines SCL and SDL that form the I2C serial interface. SCL is an abbreviation of Serial Clock Line, and SDL is an abbreviation of Serial Data [*sic*, Data] Line.” Ex[1007] at [0076].

“FIG. 19 is a time chart explaining an operation that is performed when the four fan units shown in FIG. 14.” Ex[1007] at [0012].

“Next, the operation of fan unit 10 according to the present embodiment will be explained while referring to FIG. 19. Here, operation performed when four fan units 10 shown in FIGS. 14 to 18 are serially connected (function of each fan module 10 as the controlling unit explained above) is explained in accordance with the time chart shown in FIG. 19. Particularly, an operation in which the I2C slave address is automatically generated, assigned, and set to the fan controller 13 of each fan unit 10 is explained. Furthermore, in FIG. 19, t1 to t11 indicate timing of a fixed time interval (for example, the time width DL1 in the present embodiment). For example, t1 indicates connection timing of cable A, and t3 indicates connection timing of the cable B.” Ex[1007] at [0111].

“In FIG. 4, an example of a method in which hot swapping the fan unit 110 is performed without using the power rails shown in FIG. 3. Furthermore, FIG. 4 is a diagram showing a fourth example of the related technology. In FIG. 4, three serially-connected fan units 110 are moveably provided so as to slide in the horizontal direction. At the time of a normal operation, power is supplied from the internal power source 120 of server 100 to the three fan units 110 via a power cable 141. Power is supplied from the internal power source 130 to the three

fan units 110, which are the units to be swapped, via a power cable 142. The adjacent fan units 110 are connected via a connector, and power is supplied between the fan units via the connector. In a configuration shown in FIG. 4, by pushing in the three fan units 110 to be swapped from the right side, the three fan units 110 arranged inside server 100 are pushed out from the left side. Subsequently, the power cable 141 is connected to the three fan units 110 that are pushed out so as to supply power from the internal power source 120. Accordingly, the three fan units 110 are hot-swapped. In the example shown in FIG. 4, hot swapping of the fan unit 110 can be performed without using the power rails as shown in FIG. 3. However, because the plurality of the fan units 110 are hot-swapped in a batch, only a part of the fan units 110 among the plurality of the fan units 110 cannot be hot-swapped. In other words, only the fan unit 110 that needs to be swapped cannot be swapped.” Ex[1007] at [0018].

83. To the extent that the fans do not begin to rotate until the appropriate signals are received to start rotation, Figures 18 and 19 indicate that the normal, expected operation taught by Tsuji includes generating signals to start the rotation of each fan shortly after power is supplied. Figure 20 corroborates that this is the case. Additionally, it would be obvious to a POSITA to simply substitute a basic fan circuit that rotates at a fixed speed whenever power is present.

84. Tsuji, in light of Huang, thus teaches each and every limitation of claim 1 rendering claim 1 obvious.

6.6. 2pre - The illumination fan connectable with at least one illumination fan for a computer of claim 1,

85. Tsuji, in light of Huang, teaches each and every limitation of claim 1 rendering claim 1 obvious as explained above.

6.7. 2a- wherein an electrically conductive terminal is provided in the first connector, and an electrically conductive contact surface is provided in the second connector for being electrically connected with the electrically conductive terminal,

86. A POSITA would understand that Tsuji teaches that first connector CNC includes at least 7 electrically conductive terminals corresponding to the signals indicated in Figure 14 and described in the specification. CNC is a male multi-conductor connector. See Figures 5-7 to see how it couples to connector CND. The specification refers to individual terminals on connector CNC. *See, e.g., Ex[1007] at [0094], [0115].*

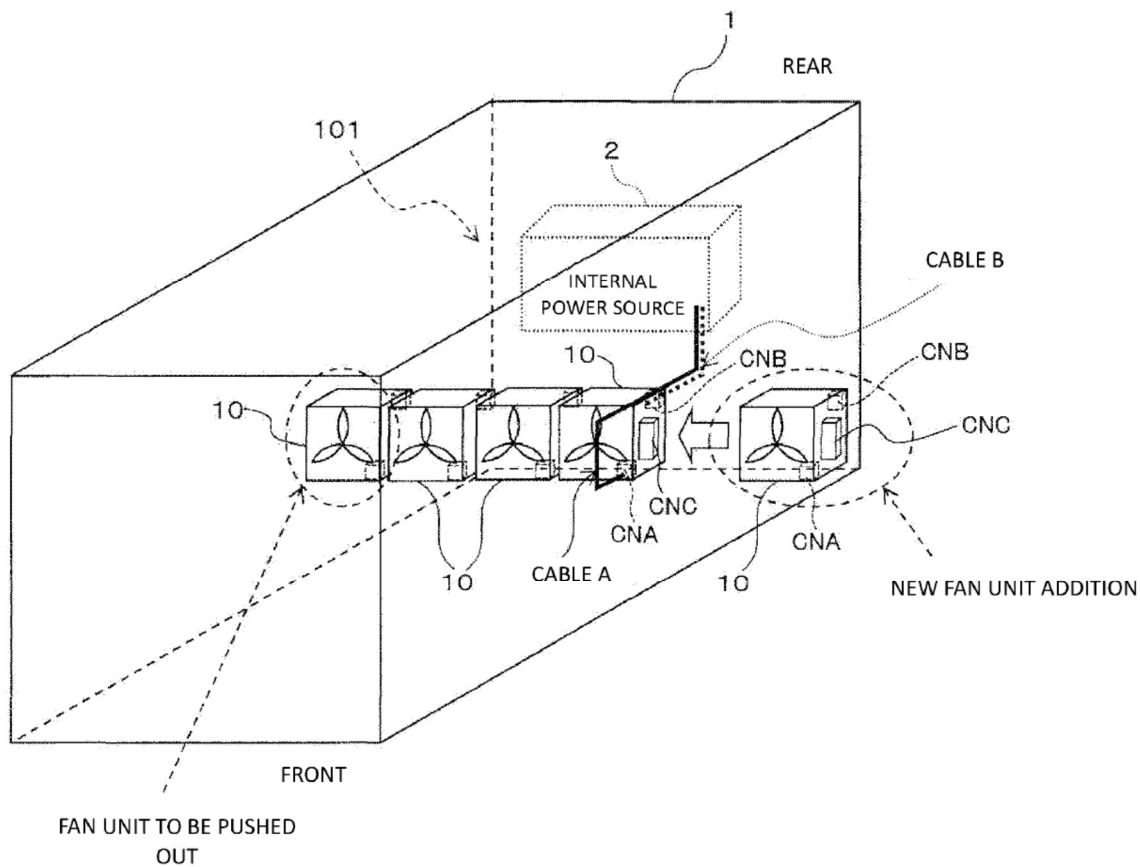
87. A POSITA would also understand that Tsuji teaches that second connector CND includes at least 7 electrically conductive contact surfaces corresponding to the signals indicated in Figure 14 and described in the specification for being connected to the conductive terminals on connector CNC. The specification refers to individual terminals on connector CND which a POSITA would understand to include electrically conductive contact surfaces. *See, e.g., Ex[1007] at [0094], [0103], [0107], [0115], [0116].*

“Each of fan unit 10 that form such a connection structure includes connectors CNA, CNB, CNC, CND for supplying power and transmitting a control signal / monitoring signal to the adjacent fan unit 10, as shown in FIGS. 5, 6, 7A, and 7B. Furthermore, in the following explanation, the control signal / monitoring signal may be referred to as a control / monitoring signal.

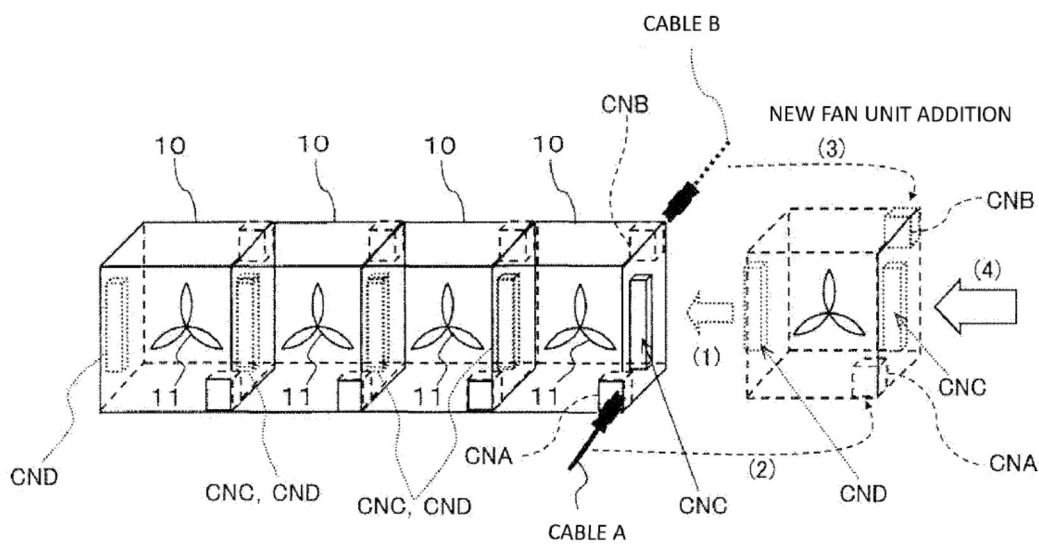
In other words, a connector CNC (male) that enables power supply and live connection of the control signal / monitoring signal is provided by protruding on the right side surface when viewed from a front surface of each fan unit 10. A connector CND (female) that enables power supply and live connection of the control signal / monitoring signal is provided by recessing on the left side surface when viewed from the front surface of each fan unit 10. The two adjacent fan units 10 are connected so as to enable power supply and transmission of the control signal / monitoring signal by engaging the connector CNC of fan unit 10 on one side and the connector CND of fan unit 10 on the other end.” Ex[1007] at [0037]-[0038].



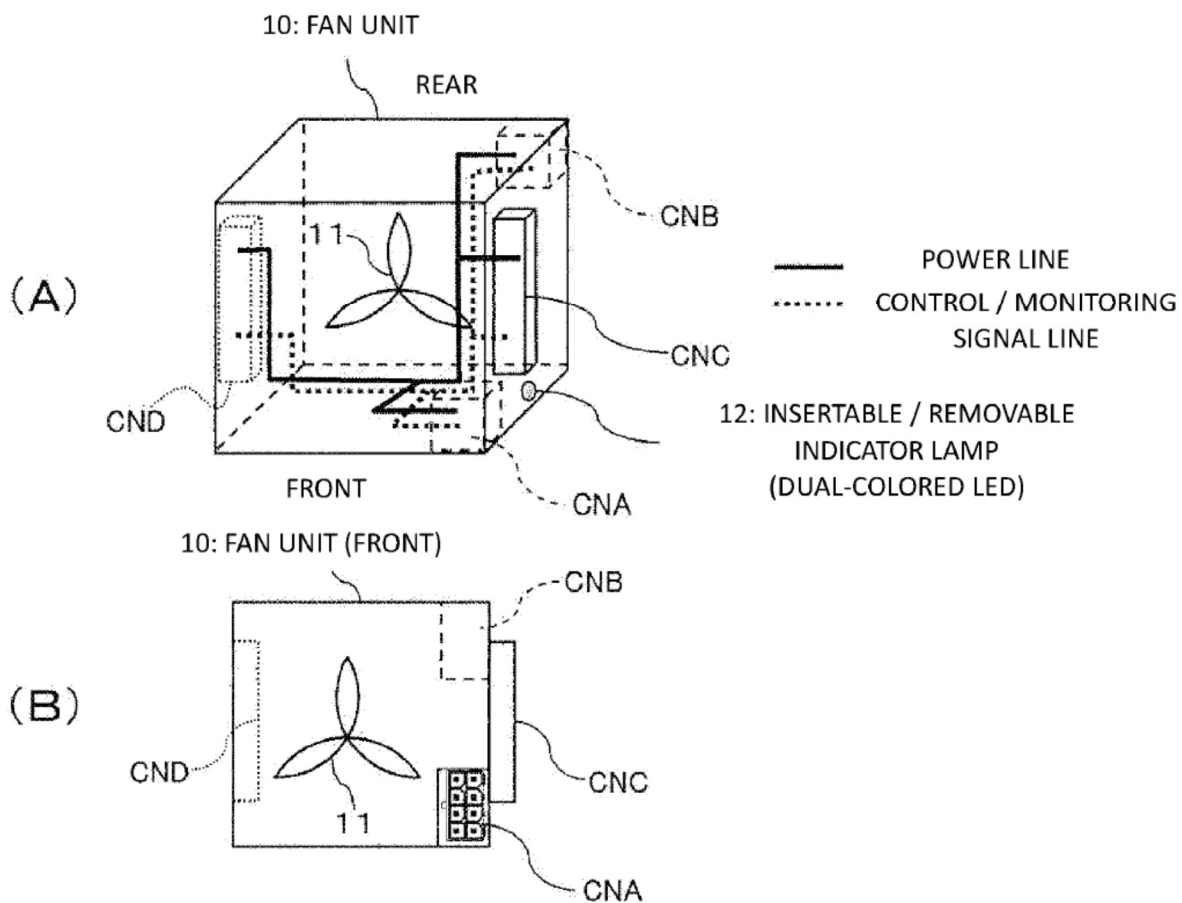
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Ex[1007] at Figure 5



Ex[1007] at Figure 6



Ex[1007] at Figure 7

6.8. 2b-such that when the first connector of the body of the illumination fan is connected with the second connector of the body of another illumination fan, the fan and the illumination area of the body of another illumination fan are respectively driven into rotation and illumination.

88. A POSITA would understand from the circuits shown in Figure 14 and the operational signals illustrated in Figure 19, that when first connector of the body of the illumination fan is connected with the second connector of the body of another illumination fan, the fan and the illumination area of the body of another

illumination fan are respectively driven into rotation and illumination. Power and control signals are supplied from connector CND to connector CNC to enable illumination and cooling under normal operation.

89. To the extent that one would contend that illumination only occurs when at least one of CNA and/or CNB is connected, this is not the case. Figure 15 indicates that the yellow LED is illuminated when VCC is present even if neither CNA nor CNB is connected or powered.

90. Huang also provides illumination when the fan module is connected to a power source. Ex[1008] at 5:64-6:47.

91. To the extent that the fans do not begin to rotate until the appropriate signals are received to start rotation, Figures 18 and 19 indicate that the normal, expected operation taught by Tsuji includes generating signals to start the rotation of each fan shortly after power is supplied. Figure 20 corroborates that this is the case. Additionally, it would be obvious to a POSITA to simply substitute a basic fan circuit that rotates at a fixed speed whenever power is present.

92. Tsuji, in light of Huang, thus teaches each and every limitation of claim 2 rendering claim 2 obvious.

6.9. 3pre –The illumination fan connectable with at least one illumination fan for a computer of claim 1,

93. Tsuji, in light of Huang, teaches each and every limitation of claim 1 rendering claim 1 obvious as explained above.

6.10. 3a- wherein when the body of the illumination fan is connected with the body of another illumination fan, the illumination areas of the two bodies form a continuous illumination area.

94. A POSITA would understand from the teachings of Tsuji, modified as explained above based on the teachings of Huang to include a full-surface lighting element, that when the body of the illumination fan is connected with the body of another illumination fan, the illumination areas of the two bodies form a continuous illumination area.

95. Huang teaches that the light element forms an illumination area at the top of the fan on at least two sides. In fact, the entire upper cover 11 is illuminated in some embodiments and the entire base 12 is illuminated in some embodiments. When the body of one illumination fan is connected with the body of another illumination fan as taught in Tsuji, e.g. as in Tsuji figures 3-7, the body of the first illumination fan would be adjacent to and touching the body of the second illumination fan. Portions of connector CND from the first fan would be inside of portions of connector CNC from the second fan. The front-facing surfaces would form a continuous frame for the air openings.

96. When modified to include a full-surface lighting element, these fans would form a continuous illumination area. Upper cover 11 reaches from edge to edge and base 12 also reaches from edge to edge.

“The cooling fan comprises a frame body, a light-emitting assembly and a fan blade assembly. The frame body includes a base and an upper cover which is made from a light-permeable material and forms an installation space together with the base. The light-emitting assembly is mounted on the base and includes a circuit board, a plurality of light-emitting elements which are electrically connected with the circuit board and emit a light respectively, and a light guide plate. The light guide plate includes a plurality of light guide strips which correspond to each of the plurality of light-emitting elements respectively to form a guide path that guides the light, and a light diffusion portion which is connected with the plurality of light guide strips. The light diffusion portion includes a first diffusion portion in a position corresponding to each of the plurality of light guide strips, such that the light passes through the guide path to form a diffused light via the first diffusion portion, and the upper cover is in a uniform light-emitting state. The fan blade assembly is arranged in the installation space, and includes a driving unit which is electrically connected with the circuit board and a fan blade which is driven by the driving unit to rotate in the installation space.

In an embodiment, the light diffusion portion includes a first diffusion portion in a position corresponding to each of the plurality of light guide strips, such that the light passes through the guide path and then forms a diffused light using the first diffusion portions, and therefore the upper cover is in a uniform light-emitting state.” Ex[1008] at 1:52-2:14.

“In an embodiment, the base is further made from a light-permeable material, such that the entire frame body is in a uniform light-emitting state using the diffused light.

In an embodiment, the base further comprises a bottom plate in which the first connection portion is arranged, and a plurality of outer side

plates which are annularly arranged on the bottom plate.” Ex[1008] at 2:52-58.

“In the present embodiment, the upper cover 11 and the base 12 may further be made from a light-permeable material, such that the entire frame body 10 is in a light-permeable state, or the upper cover 11 may be made from a light-permeable material while the base 12 is made from a light-tight material, such that the upper cover 11 is in a light-permeable state. When the base 12 is made from the light-tight material, a reflection layer is respectively formed on one side of the bottom plate 121 and the plurality of outer side plates 122 of the base 12 inside the accommodating space 14, so as to increase the reflectivity of the bottom plate 121 and the plurality of outer side plates 122. The reflection layers can be formed by embossing, coating or deposition.” Ex[1008] at 4:14-28.

Therefore, when the base 12 is made from a light-permeable material, the bottom plate 121 and the plurality of outer side plates 122 of the base 12 present a uniform light-emitting effect through the first diffused light 271, the second diffused light 273 and the third diffused light 274 which are formed by the light diffusion portion 23, the first diffusion portion 281 and the second diffusion portion 282, and further any face of the entire frame body 10 presents a uniform reflective effect.” Ex[1008] at 7:35-56.

See also Ex[1008] at Figures, 1, 2, and 3.

97. To the extent that a POSITA would understand there to be some small gap between fan units that is not illuminated, it would be obvious to extend the illumination area to close such a gap or even to extend to an overlapping portion of the upper covers to be completely continuous.

98. Tsuji, in light of Huang, thus teaches each and every limitation of claim 3 rendering claim 3 obvious.

7. Ground 2 - JP2018041147A (“Tsuji”) in view of US10,082,286 (“Huang”) and US Patent Application 2008/0124234 (“Echazarreta”) renders claim 4 obvious.

7.1. 4pre-The illumination fan connectable with at least one illumination fan for a computer of claim 1,

99. Tsuji, in light of Huang, teaches each and every limitation of claim 1 rendering claim 1 obvious as explained above.

7.2. 4a-wherein a groove is provided on one side of the body of the illumination fan, while an engaging block is provided on another side thereof to be engaged into the groove, such that when the groove of the body of the illumination fan is engaged with the engaging block of the body of another illumination fan, the body of the illumination fan is connected with the body of another illumination fan.

100. A POSITA would have found it obvious to incorporate the groove and engaging block from Echazarreta (Ex[1009]) into the fan module described above with respect to claim 1. Tsuji, as modified by Huang, is a fan module with a substantially round fan structure within a substantially square mounting frame. Echazarreta is also a fan module with a substantially round fan structure within a substantially square mounting frame. Moreover, Tsuji already includes a male connector that is inserted into a female connector within the side of the frame in order to connect two fan bodies together. It would be well within the capabilities of a POSITA to add Echazarreta’s groove and engaging block to the fan frame of Tsuji, as modified by Huang without substantial experimentation and with a highly predictable expectation of success. Tsuji, as modified by Huang suggests

connecting fan blocks. Echazarreta provides an express motivation to do so using his technique. “Casting these pieces together reduces the complexity and cost of manufacturing the fan trays.” Ex[1009] at Abstract. Moreover, A POSITA would understand that this is a simple and quick mechanism for connecting fan blocks as suggested by Tsuji.

101. Echazarreta discloses a groove is provided on one side of the body of the illumination fan, e.g. opening 1202 and or opening 1204. Echazarreta also discloses an engaging block provided on another side thereof to be engaged into the groove, e.g. side rail 454 and the unnumbered similar side rail shown in Figure 12. Echazarreta explains that “on the other side, the fan tray 1200 defines a complementary-shaped opening (also referred to as a side rail receiver or a mounting bracket receiver) 1202, into which the side rail 454 of another fan tray (not shown) can be slid, thus forming a multi-fan tray. Preferably, the side rail 454 and the opening 1202 interlock when the side rail 454 is slid into the opening 1202.” This satisfies the remainder of this limitation.

“Thus far, a fan tray 400 or 700 that includes a single fan has been described. However, in other embodiments of the present invention, a fan tray can include more than one fan. For example, as shown in FIG. 11, a fan tray 1100 includes two fans 1102 and 1104. Other embodiments can include other numbers of fans, and the fans can be arranged in any pattern. Most other aspects of the multi-fan fan tray 1100 are similar to the fan trays 400 and 700 described above.

Modular fan tray units can also be constructed, according to another embodiment of the present invention. For example, as shown in FIG. 12, a fan tray 1200 includes a side rail 454 on one side, as described above. However, on the other side, the fan tray 1200 defines a complementary-shaped opening (also referred to as a side rail receiver or a mounting bracket receiver) 1202, into which the side rail 454 of another fan tray (not shown) can be slid, thus forming a multi-fan tray. Preferably, the side rail 454 and the opening 1202 interlock when the side rail 454 is slid into the opening 1202; however, interlocking rails and openings are not necessary.

Optionally, the rear wall of the fan tray 1200 also includes a similar opening (also referred to as a front rail receiver or a mounting bracket receiver) 1204. In this case, another fan tray (not shown) that includes a front rail (instead of a handle) can be joined to the rear of the fan tray 1200. By this mechanism, a fan tray consisting of any number of desired fans, arranged in any desired pattern, can be easily assembled by an end user or system administrator.

Although the side rail 454, the side rail receiver 1202 and the front rail receiver 1204 are shown as being horizontally oriented, i.e., parallel to the plane of the fan tray 1200, the side rail 454 and the rail receivers 1202-1204 can be oriented along other lines.” Ex[1009] at [0069] – [0072].

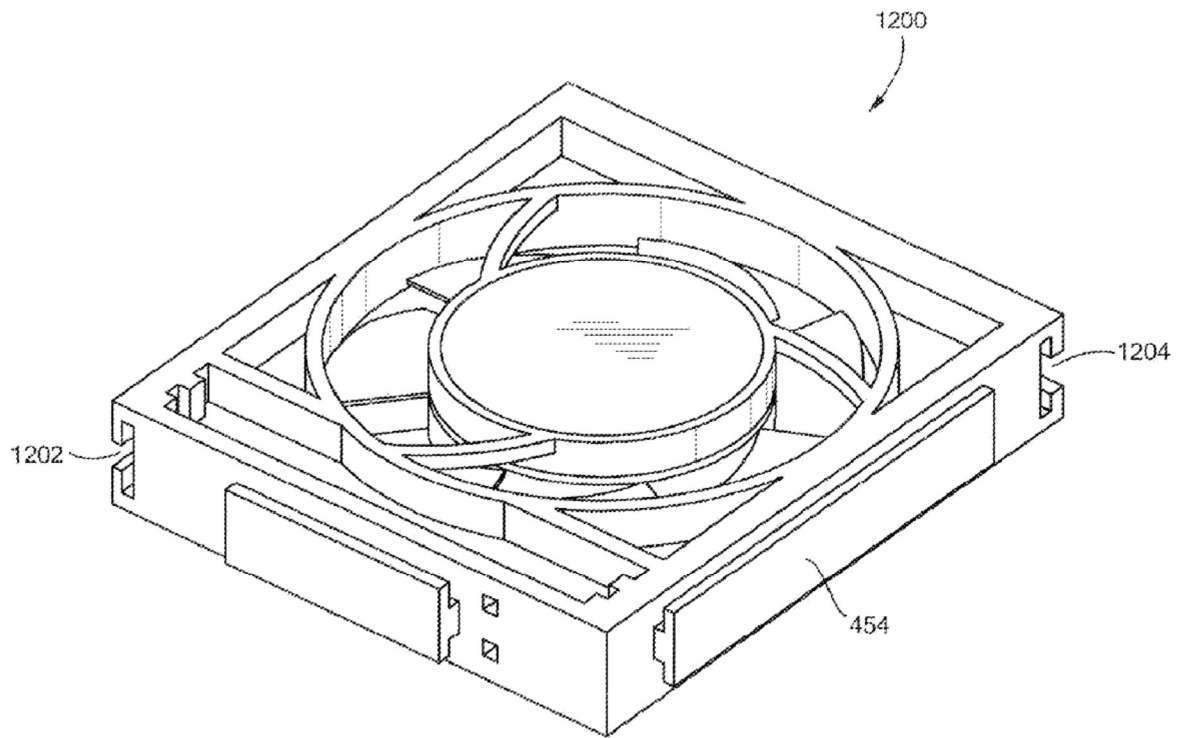


FIG. 12

Ex[1009] at FIG. 12

102. Tsuji, in light of Huang and US Patent Application 2008/0124234 (“Echazarreta”), thus teaches each and every limitation of claim 4 rendering claim 4 obvious.

8. Ground 3 - JP2018041147A (“Tsuji”) in view of US10,082,286 (“Huang”) and US Patent Application 2008/0279694 (“Chou”) or US Patent Application 2015/0233391 (“Liu”) renders claim 5 obvious.

8.1. 5pre-The illumination fan connectable with at least one illumination fan for a computer of claim 1,

103. Tsuji, in light of Huang, teaches each and every limitation of claim 1 rendering claim 1 obvious as explained above.

8.2. 5a-wherein a groove is provided on two sides of the body of the illumination fan, and the body of the illumination fan is connected with the body of another illumination fan by respectively engaging an engaging block with one of the grooves on the sides of the body of the illumination fan and one of the grooves on the sides of the body of another illumination fan

104. A POSITA would have found it obvious to incorporate the grooves from Chou (Ex[1010]) into the fan module described above with respect to claim 1 and to use the engaging block disclosed in Chou to connect two fans. Tsuji, as modified by Huang, is a fan module with a substantially round fan structure within a substantially square mounting frame. Chou is also a fan module with a substantially round fan structure within a substantially square mounting frame. Moreover, Tsuji already includes a male connector that is inserted into a female connector within the side of the frame in order to connect two fan bodies together. It would be well within the capabilities of a POSITA to add Chou’s grooves on two sides of the body and respectfully engage an engaging block to the fan frame of each of two fans from Tsuji, as modified by Huang without substantial

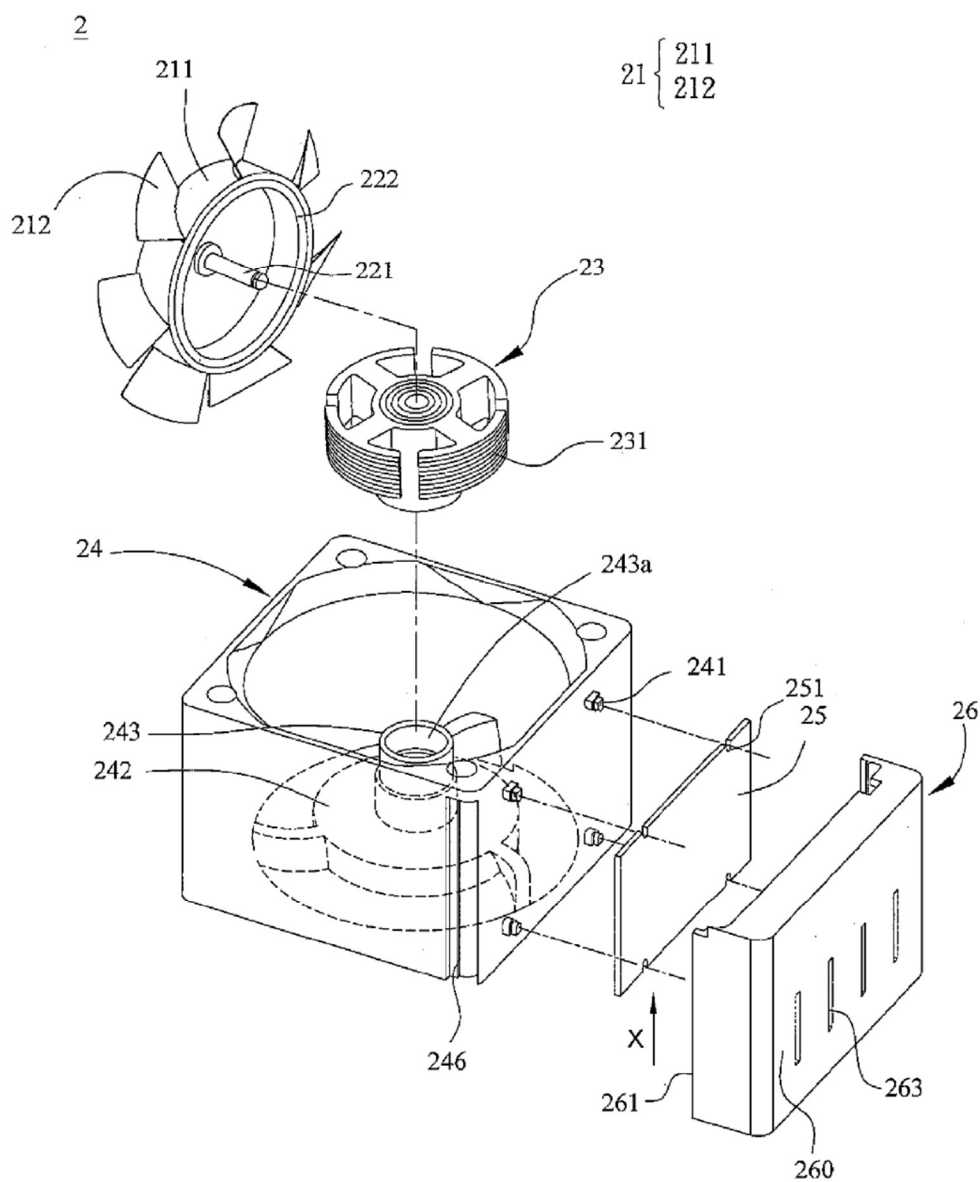
experimentation and with a highly predictable expectation of success. Tsuji, as modified by Huang suggests connecting fan blocks. Chou provides an express motivation to do so using his technique. It provides an opportunity to share a printed circuit board between fans. Ex[1010] at [0025]. Tsuji also suggests that fans should be connected. Moreover, A POSITA would understand that this is a simple and quick mechanism for connecting fan blocks as suggested by Tsuji.

105. Chou teaches that each fan module can have grooves on two sides. *See, e.g.,* sliding rails 246. Since something can slide into sliding rails 246, a POSITA would understand it to be, or at least include, a groove.

“In addition, the fan 2 of the present invention further includes a connecting member 26, which is disposed at one side of the fan frame 24 and covers the circuit board 25. In this embodiment, the connecting member 26 is a cover having a rectangular shape or other shapes. The connecting member 26 has a bottom 260 and two sidewalls 261 connected to the bottom. The connecting member 26 is connected to the fan frame 24 by way of sliding, engaging or hooking. In other words, the connecting member 26 is detachably disposed on the fan frame 24. In addition, the fan frame has at least two sliding rails 246 disposed at a peripheral corner of the fan frame 24. The sidewall 261 of the connecting member is correspondingly disposed on the sliding rail 246. When the connecting member 26 of this embodiment slides into the sliding rail 246 along a predetermined direction X, the connecting member 26 is connected to and combined with the fan frame 24. When one of the electronic components on the circuit board 25 needs to be repaired or the circuit board 25 has to be replaced, reworking is needed to be performed. As the time, it is only necessary to slide the connecting member 26 along a direction, which is reverse to the predetermined direction X, and the connecting member 26 is

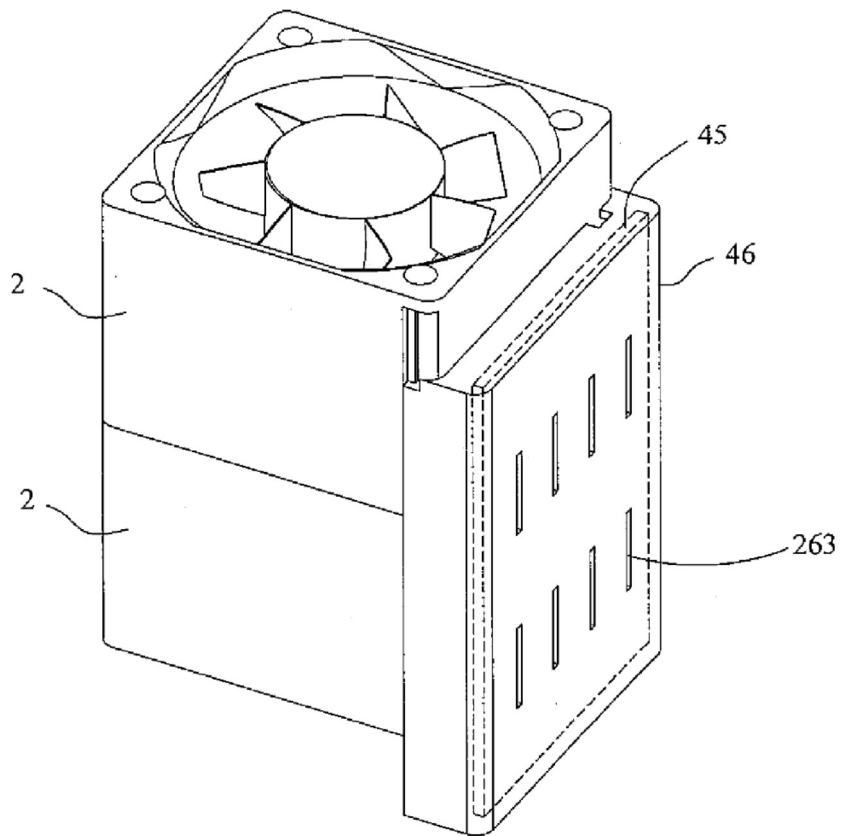
easily disconnected and separated from the fan frame 24 so that the circuit board 25 can be easily took out.” Ex[1010] at [0022].

106. Chou also teaches that a connecting member, 26, can be used to connect with one of the grooves on the sides of the body of one fan and one of the grooves on the sides of the body of another fan. *See* Ex[1010] at [0022] and Figures 2 and 4. A POSITA would understand that connecting member, 26 is an engaging block.



Ex [1010] at Figure 2

4



Ex [1010] at Figure 4

107. Alternatively, a POSITA would have found it obvious to incorporate the grooves from Liu (Ex[1011]) into the fan module described above with respect to claim 1 and to use the engaging block disclosed in Liu to connect two fans.

Tsuji, as modified by Huang, is a fan module with a substantially round fan structure within a substantially square mounting frame. Liu is also a fan module with a substantially round fan structure within a substantially square mounting frame. Moreover, Tsuji already includes a male connector that is inserted into a female connector within the side of the frame in order to connect two fan bodies

together. It would be well within the capabilities of a POSITA to add Liu's grooves on two sides of the body and respectfully engage an engaging block to the fan frame of each of two fans from Tsuji, as modified by Huang without substantial experimentation and with a highly predictable expectation of success. Tsuji, as modified by Huang suggests connecting fan blocks. Liu provides an express motivation to do so using his technique. "According to the above structural design, the co-vibration of the series fan is offset or restrained to greatly reduce the vibration of the fan and lower the noise." Ex[1011] at [Abstract]. Tsuji also suggests that fans should be connected. Moreover, A POSITA would understand that this is a simple and quick mechanism for connecting fan blocks as suggested by Tsuji.

108. Liu teaches that each fan module can have grooves on two sides. *See, e.g.,* connection sections 214. The connection sections 214 can be holes, sockets, mortises or posts. Ex[1011] at [0033] and Figure 4A, 4B. A POSITA would understand that at least a mortise is a type of groove:

mortise 1 of 2 noun

mor·tise 'môr-təs 

variants or less commonly **mortice**

: a hole, groove, or slot into or through which some other part of an arrangement of parts fits or passes

especially : a cavity cut into a piece of material (such as timber) to receive a tenon

<https://www.merriam-webster.com/dictionary/mortise>

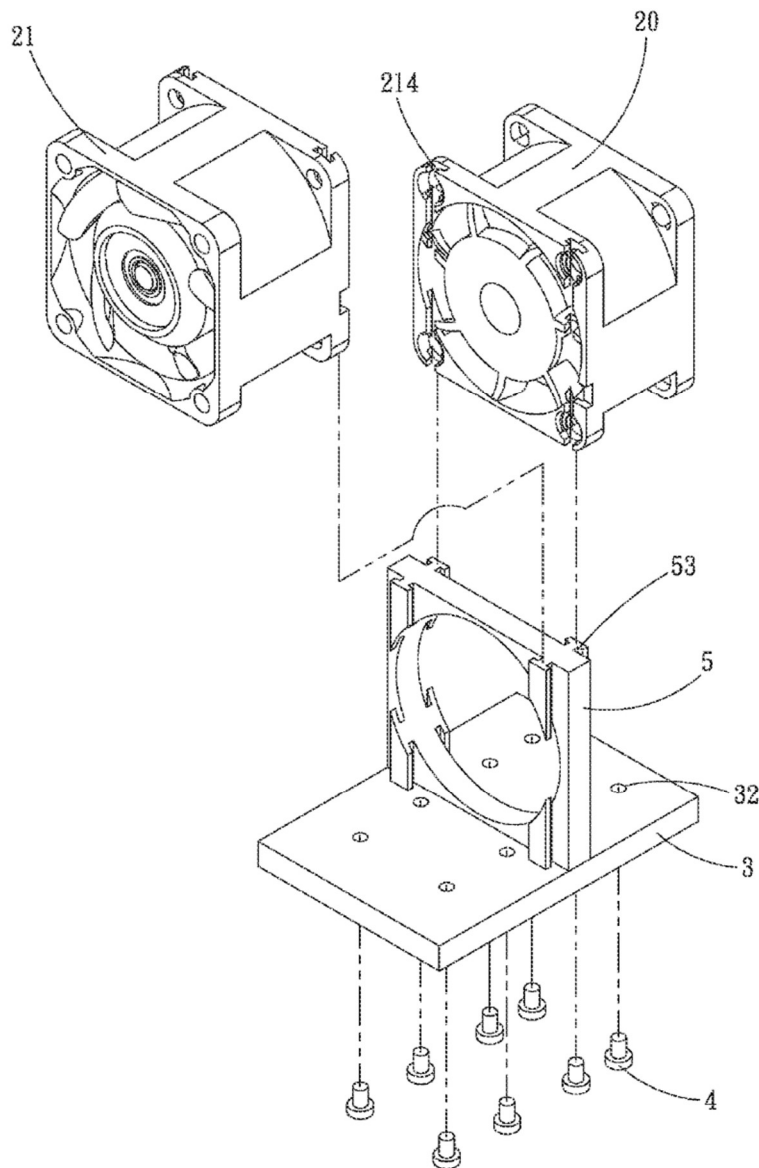
109. Liu also teaches that assembling member, 5, can be used to connect with one of the grooves on the sides of the body of one fan and one of the grooves on the sides of the body of another fan. *See* Ex[1011] at [0035] and Figure 4A, 4B. It can connect by means of a slide rail. A POSITA would understand that assembling member, 5 is an engaging block.

“The assembling member 5 is formed with multiple assembling sections 53. The series fan assembly 2 is formed with multiple connection sections 214 correspondingly assembled with the assembling sections 53. The assembling sections 53 can be holes, sockets, mortises or posts. The connection sections 214 can be holes, sockets, mortises or posts.

The first fan 20 further has a first opening 2021 and a second opening 2022 opposite to the first opening 2021. The first flow passage 202 is defined between the first and second openings 2021, 2022. The second fan 21 further has a third opening 2121 and a fourth opening 2122 opposite to the third opening 2121. The second flow passage 212 is defined between the third and fourth openings 2121, 2122. The fourth opening 2122 correspondingly communicates with the second opening 2022.

In this embodiment, the assembling member 5 is disposed between the second and fourth openings 2022, 2122. The first end face 50 is assembled with the second opening 2022, while the second end face

51 is assembled with the fourth opening 2122. The passageway 52 correspondingly communicates with the first and second flow passages 202, 212. In this embodiment, the series fan assembly 2 is assembled with the assembling member 5 by means of engagement. In practice, the first and second fans 20, 21 can be assembled with the first and second end faces 50, 51 by any other means that can securely connect the first and second fans 20, 21 with the first and second end faces 50, 51, for example, by means of slide rail (as shown in FIGS. 4A and 4B, a third embodiment of the present invention), locking, insertion, adhesion or latching. This is not limited.” Ex[1011] at [0033]-[0035]



Ex [1011] Figure 4A

110. Tsuji, in light of Huang and US Patent Application 2008/0279694 (“Chou”) or US Patent Application 2015/0233391 (“Liu”), thus teaches each and every limitation of claim 5 rendering claim 5 obvious.

9. Ground 4 - 2017/0314777 (“Lai”) in view of 2005051085 (“Hasegawa”) renders claims 1-2 obvious.

9.1. 1pre - An illumination fan connectable with at least one illumination fan for a computer, comprising:

111. To the extent that the preamble is limiting, Lai (Ex[1012]) discloses at least one illumination fan for a computer. Figure 2 illustrates a speed-adjustable fan with 4 LED lights. Figure 1 illustrates “several conventional LED fans” as known in the prior art. Ex [1012] at [0002]. Figure 3 illustrates that it is connectable with another illumination fan.

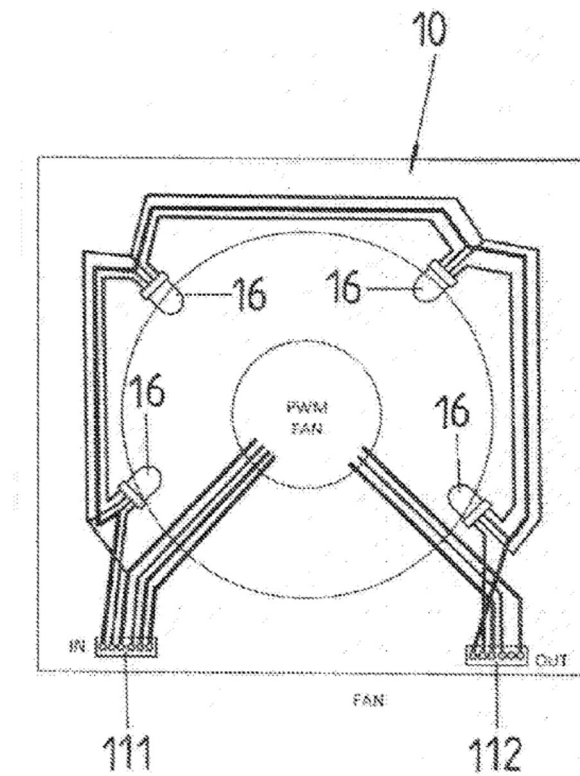


FIG.2

Ex [1012] at Figure 2

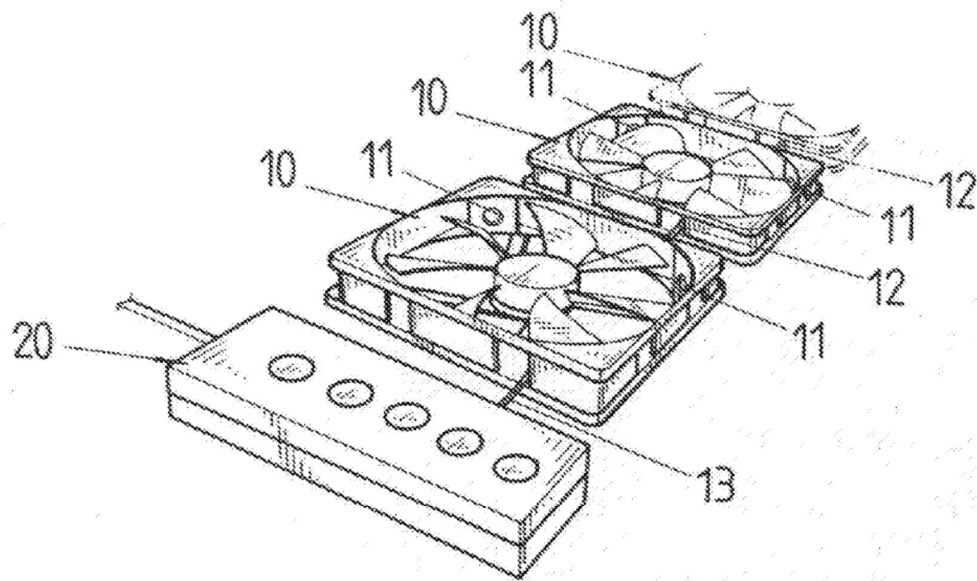


FIG.3

Ex [1012] at Figure 3

“FIG. 1 shows a schematic view of a conventional LED fan controller device, which connects several LED fans.

FIG. 2 shows a schematic view of an LED fan controller device, which links several LED fans, according to the present invention.” Ex [1012] at [0005]-[0006].

“The primary objective of the present invention is to provide an LED fan controller device that connects multiple fans, and synchs each individual LED light to the user's preference, while maintaining the speed of each fan.” Ex [1012] at [0003].

“Referring to FIG. 3, which shows a planar view of an LED fan, according to the present invention, wherein LED fans 10 are linked together using a single transmission line 12, and LED fans 10 are linked together with controller 20 by another transmission line 13” Ex [1012] at [0012].

9.1. 1a - a body, provided with a fan in center of the body,

112. Lai discloses a body (e.g. LED Fan 10) which includes a fan motor and blades that are substantially in the center of the body. *See, e.g.*, Ex [1012] at Figures 1-3.

“Each LED fan 10 is provided respectively with a control motor 15 and each control motor 15 linked together with a mother board (MB) 30.” Ex [1012] at [0013].

“Each LED fan 10 is provided with a control motor 15, and at the end of each control motor 15 is linked with the microcontroller 17; whereas, the control motor 15 is linked with the controller 20.” Ex [1012] at [0015].

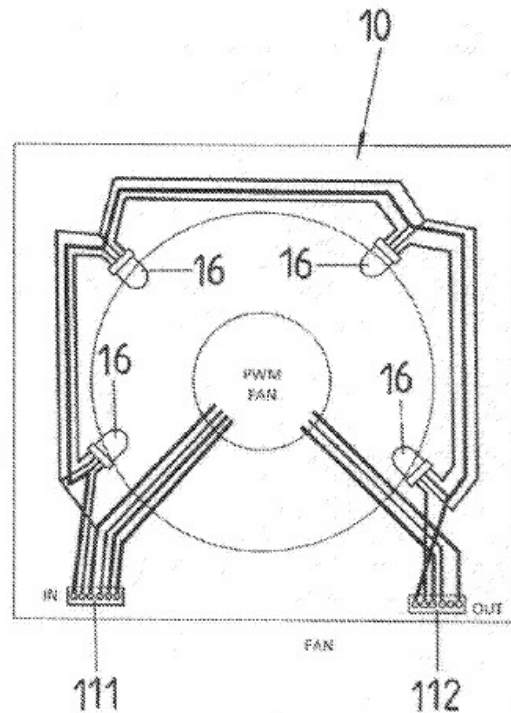
9.2. 1b - an illumination area on at least two sides of the fan at top of the body,

113. Lai discloses a plurality of RGB LEDs in each fan.

“[E]ach LED fan 10 on the LED fan controller device of the present invention is provided with various addressable RGB (Red-Green-Blue) LEDs 16. Each addressable RGB LED 16 is built in with an IC (Integrated Circuit) control chip which is equipped with a one-wire bus control function and can be connected in a series freely.” Ex [1012] at [0011].

114. In the embodiment illustrated in Figures 2 and 3, these LEDs are on the left and right sides of the fan and are visible from the top of the body. The ordinary RGB LEDs illustrated would be known by a POSITA to have a wide viewing area. Moreover, Lai explains that the purpose of these LEDs is to provide

decorative lighting which would be understood to be visible from outside the housing when the fans are normally mounted. Ex [1012] at [0011], claim 1.



Ex [1012] Figure 2

115. To the extent that one was to interpret the claim to require the lights to face a specific direction other than what is illustrated in figure 2 (which I do not) it would be obvious to mount them on a different surface of the fan housing or pointing in a different direction. Lai already indicates that lights should be visible from outside, including from the top, of the fan body. There are no physical limitations that prevent or discourage moving them to the top surface. Wire lengths would not need to substantially change and there are no obstacles to avoid.

Electronics modules are commonly available in a choice of light configurations, e.g. top or corner or side lights, to facilitate wiring.

9.3. 1c - a power socket and a first connector on one side of the body, and a second connector on another side of the body,

116. Lai discloses a power socket and a first connector on one side of the body and a second connector on another side of the body. On the left side of the body as illustrated in figure 2, the power socket and first connector comprise input 111. Input 111 is illustrated in figure 2 as including 6 connectors, which corresponds to the embodiments illustrated in figures 4 and 5. (Note that Figure 2 shows a single ground connection on input 111 connected to both the fan and the lights.) The power socket is comprised of the ground connector and the two VCC connectors. The first connector is comprised of the LED data signal, the PWM signal, and the sense signal. Alternatively, it would be obvious to include separate power and ground signals as suggested by Figure 6 on the first connector. Figures 4, 5, and 6 all suggest that there are two places where power and ground are required in the fan system and illustrate two sets of connections on one side. It would have been obvious therefore to have two connectors on one side that each have power and ground and each have control signals. Either one could be the power socket and the other would be the first connector. It would additionally be obvious to a POSITA to separate a first connector and the power socket into two

housings for the same reasons stated above. A plurality of signals can be combined onto a single connector housing or split between two as a matter of simple design choice in this application. To the extent that the power and ground terminals are not a “socket” it would be obvious to a POSITA to use a socket-style power connector. These were common in the art and often used for fans. *See, e.g.,* Tsuji above. They would be a trivial substitute for a connector that was not considered a “socket”. Both male and female connectors are commonly available and for low-voltage applications can be interchangeable as to which is on the cable, and which is on the device.

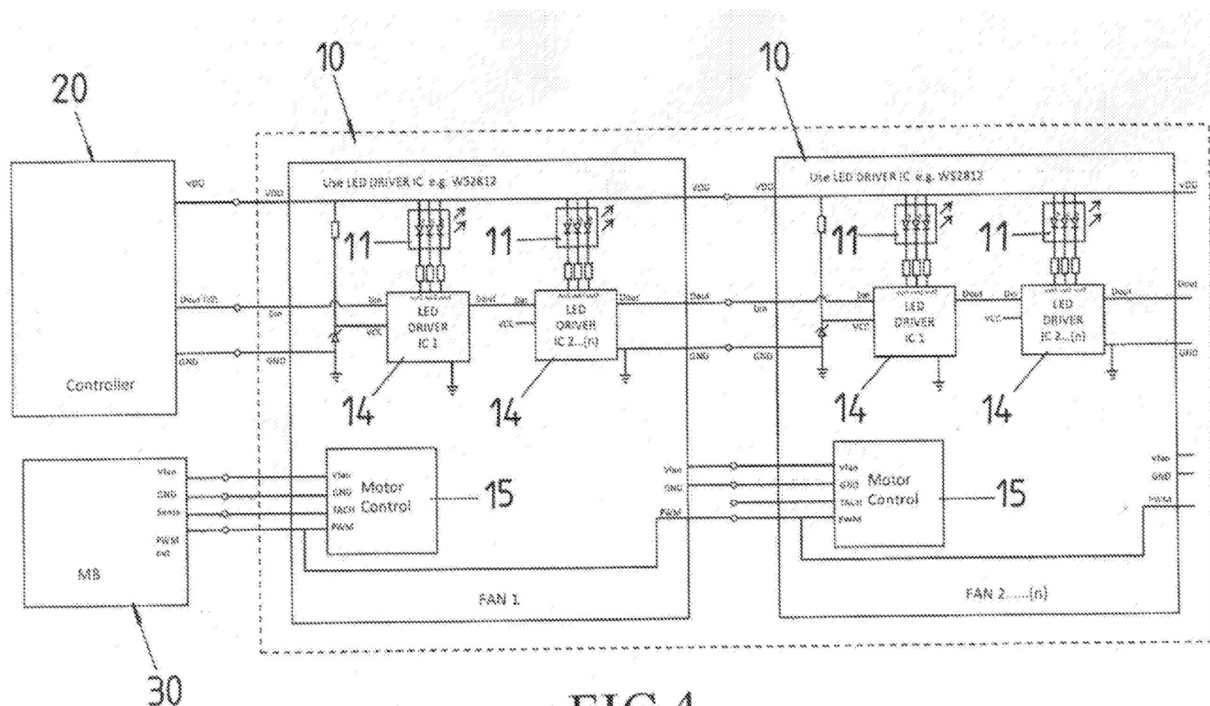


FIG.4

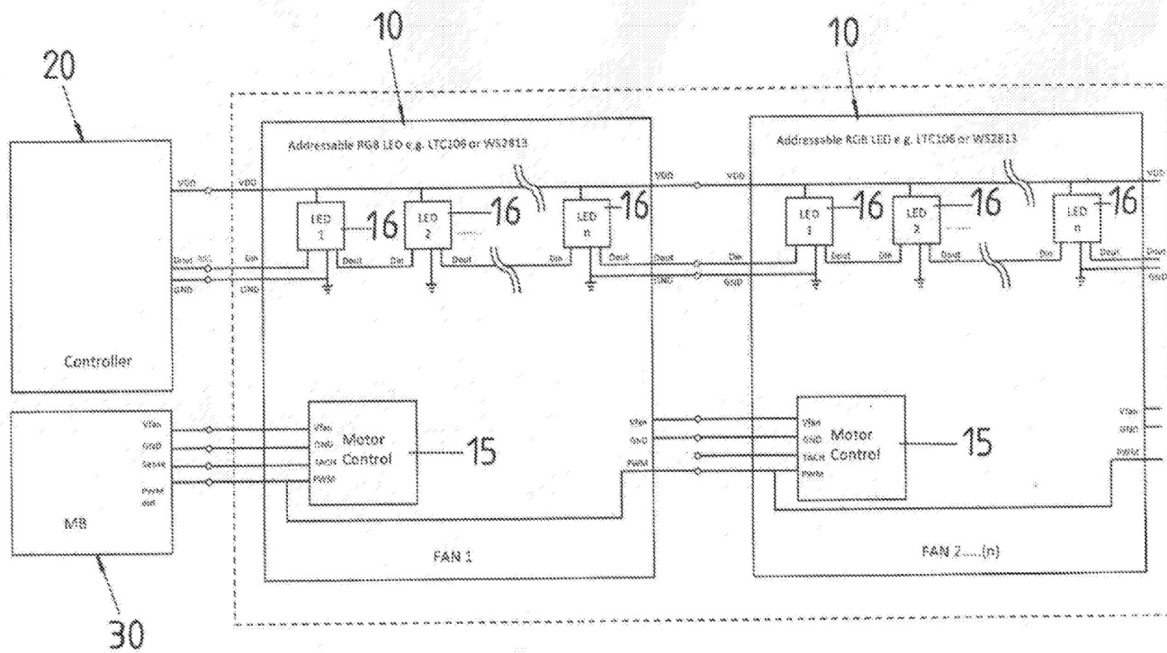


FIG. 5

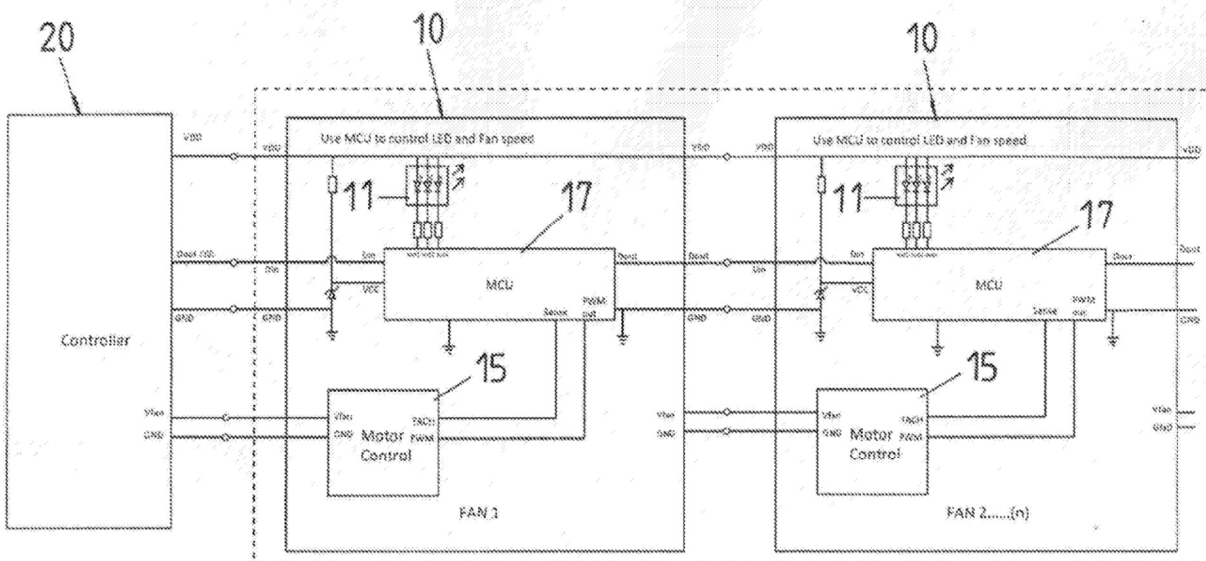


FIG. 6

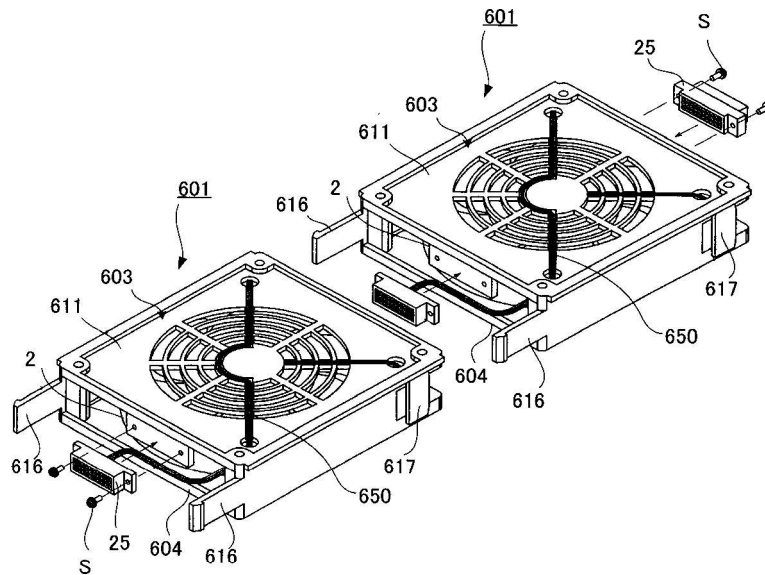
117. Lai further discloses a second connector 112 on the right side of the fan body. The second connector is comprised of the ground connector and the two

VCC connectors, LED data signal, and the PWM signal. *See* Ex [1012] at Figures 3-6.

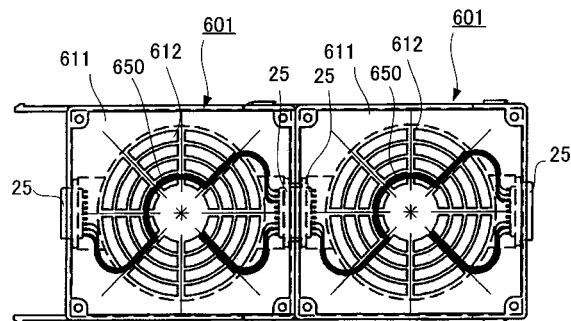
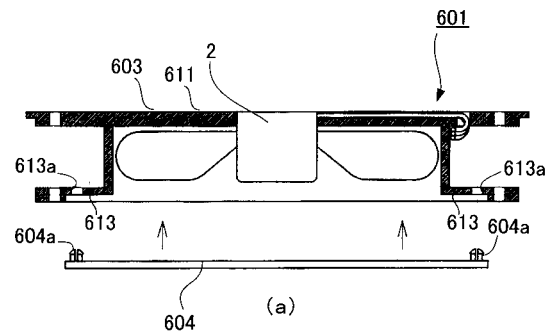
118. To the extent that one was to understand Lai not to disclose connectors on two sides of the fan body, it would be obvious to a POSITA that these connectors can be moved to the left and right edges of the fan body without any substantial impact to the structure or operation of Lai's embodiments. Lai already indicates that one connector should be near the left corner, and one should be near the right corner. There are no physical limitations that prevent or discourage moving them around the corner to the sides. Wire lengths would not need to substantially change and there are no obstacles to avoid. Electronics modules are commonly available in a choice of connector configurations, e.g. top or bottom or side connectors, to facilitate wiring. Side-mounted connectors would reduce or eliminate the cabling required to connect adjacent fans as suggested in Lai figure 3.

119. Furthermore, a POSITA would be motivated to look to Hasegawa (Ex[1014]) to see an alternative positioning of the connectors for serial connection of fans and modify Lai to place connectors on opposing sides. The connectors on two sides are illustrated in figures 29 and 31. A POSITA would understand that Lai and Hasegawa are analogous art, both describing fans in generally

rectangular/square housings with input and output connectors for daisy-chain connection of the fan modules.



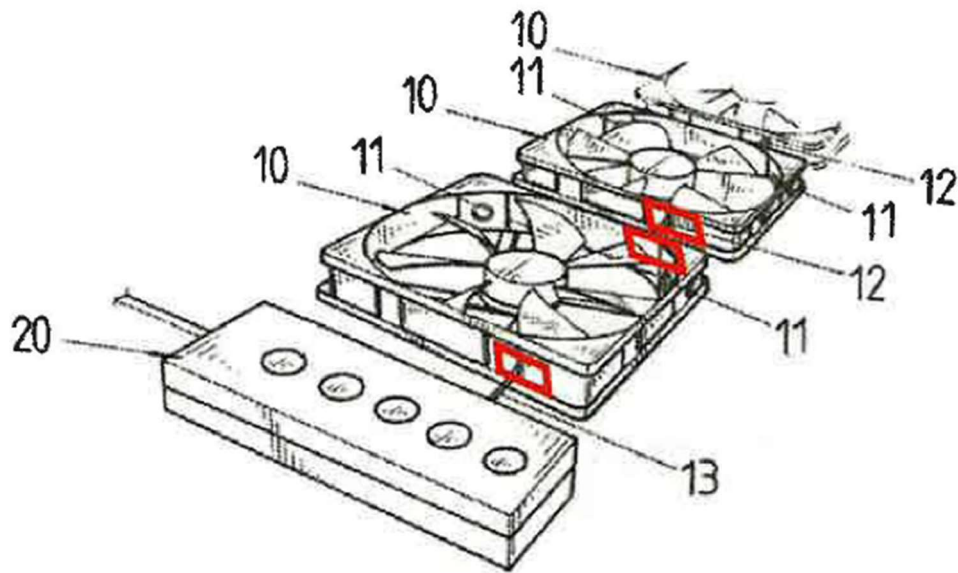
Ex [1014] at Figure 29



(b)

Ex [1014] at Figure 31

120. The combination of Lai and Hasegawa would have involved applying Hasegawa's known technique of placing cooling fan connectors on the fan body sides to the known LED fans of Lai to yield predictable results of connecting the fans in series. The combination would have appeared similar to Figure 3 of Lai, but with visible connectors on the fan body sides as shown below in red boxes and not just visible transmission lines:



Ex[1012] at Figure 3 (modified)

9.4. 1d - wherein the power socket is electrically connected with the first connector, the second connector, the fan and the illumination area, such that when the power socket on the one side of the body is supplied with power, the fan and the illumination area of the body are respectively driven into rotation and illumination, and when the first connector of the body is connected with a second connector of a body of another illumination fan, a fan and an illumination area of the body of another illumination fan are respectively driven into rotation and illumination.

121. Lai teaches that the power socket is electrically connected to the first connector, the second connector, the fan, and the illumination area. In particular, the ground line illustrated in Figure 3, Figure 4, Figure 5, and Figure 6 is connected to the power socket, the first connector, the second connector, the fan, and the illumination area. Additionally, the VCC signal is connected to the power socket, the first connector, the second connector, the fan, and the illumination area.

122. Lai explains that conventional fans can be connected in a series. “A conventional fan controller device allow user to control fan(s) by altering their rotational speeds and control the LEDs as a series, but only as a series and not individually.” Ex [1012] at [0002].

123. Additionally, Lai clearly intends to serially connect his fans in a manner that when they are connected together, the fans all spin when powered and so instructed with the PWM signal and the lights all illuminate when programmed with a color via the serial connection. *See also* Ex [1012] at Figs 3-6.

“Each addressable RGB LED is built in with an IC (Integrated Circuit) control chip, which is equipped with a one-wire bus control function and can be connected in a series freely.” Ex [1012] at abstract.

“A multiLED fan controller apparatus, wherein a device can control each LED light on multiple fans and also the rotation speed of each LED fans by being linked together on the single device.” Ex [1012] at Claim 1.

“The neighboring LED fans are linked with one another, and the LED driver IC is linked with the controller; Furthermore, each LED fan is provided with a control motor, and each control motor is linked with a mother board (MB).” Ex [1012] at Claim 3.

“The present invention relates to an LED (Light Emitting Diode) fan control device, which connects multiple fans by wiring each one to a single controller device. By doing this, each individual LED light and the fan's rotational speed can be adjusted.” Ex [1012] at [0001].

“Referring to FIG. 3, which shows a planar view of an LED fan, according to the present invention, wherein LED fans 10 are linked together using a single transmission line 12, and LED fans 10 are linked together with controller 20 by another transmission line 13” Ex [1012] at [0012].

124. A POSITA would understand from these disclosures that when the power socket on the one side of the body is supplied with power, the fan and the illumination area of the body are respectively driven into rotation and illumination, and when the first connector of the body is connected with a second connector of a body of another illumination fan, a fan and an illumination area of the body of another illumination fan are respectively driven into rotation and illumination. The mere act of connecting the fans in this manner and applying power provides power

to the fans and illumination area. The text, including the citations above, clearly indicates that the disclosed operations is that the fans would rotate, and the lights would illuminate, at this time. A POSITA would understand that the required control signals are provided. In an ordinary implementation that would be continuously provided.

125. To the extent that the Lai design requires an RGB control signal and a PWM signal to illuminate and rotate, respectively, it would be obvious to have a default illumination value and rotation speed whenever power is applied. A POSITA would understand that complex lighting effects and primarily decorative and that simply lighting to a default illumination (such as the light turns on when power is applied) would generally suffice for any functional requirements. Moreover, this simple alternative (turning on a light when power is applied) was well known and easy and cheap to implement. Similarly, a POSITA would understand that reduced fan speeds (less than 100%) are primarily used to reduce noise and that the system can function, at least initially, at 100% fan speed. Furthermore, a slower default fan speed such as 35% may be sufficient at power on since little heat is present at that time. The simple alternative of turning on the fan when power is applied) was well known and easy and cheap to implement. Also, a typical computer fan defaults to full speed when power is applied and no PWM signal is provided, since in the case of a failure or loose connection it is preferable

to have maximum cooling than to have none. Additionally, it would be obvious to substitute a fixed-speed fan and/or a fixed-illumination LED into this design as both were well known at the time and had identical form factors to what is illustrated in Lai's embodiment.

126. Lai, in light of Hasegawa, thus teaches each and every limitation of claim 1 rendering claim 1 obvious.

9.5. 2pre - The illumination fan connectable with at least one illumination fan for a computer of claim 1,

127. Lai, in light of Hasegawa, teaches each and every limitation of claim 1 rendering claim 1 obvious as explained above.

9.6. 2a- wherein an electrically conductive terminal is provided in the first connector, and an electrically conductive contact surface is provided in the second connector for being electrically connected with the electrically conductive terminal,

128. A POSITA would understand that Lai discloses that first connector 111 includes multiple electrically conductive terminals and second connector 112 includes an electrically conductive contact surface and that when configured as in Lai Figures 3-6, the second connector is electrically connected with the electrically conductive terminal in the first connector.

9.7. 2b-such that when the first connector of the body of the illumination fan is connected with the second connector of the body of another illumination fan, the fan and the illumination area of the body of another illumination fan are respectively driven into rotation and illumination.

129. When the first connector of the body of the illumination fan is connected with the second connector of the body of another illumination fan, the fan and the illumination area of the body of another illumination fan are respectively driven into rotation and illumination. See Section 9.4 (claim 1d).

130. Lai, in light of Hasegawa, teaches each and every limitation of claim 2 rendering claim 2 obvious as explained above.

10.Ground 5 - 2017/0314777 (“Lai”) in view of 2005051085 (“Hasegawa”) and US10082286 (“Huang”) renders claim 3 obvious.

10.1. 3pre –The illumination fan connectable with at least one illumination fan for a computer of claim 1,

131. Lai, in light of Hasegawa, teaches each and every limitation of claim 1 rendering claim 1 obvious as explained above.

10.2. 3a – wherein when the body of the illumination fan is connected with the body of another illumination fan, the illumination areas of the two bodies form a continuous illumination area.

132. Huang discloses a similar illumination fan in a computer.

“A cooling fan having a light-emitting effect comprises a frame body, a light-emitting assembly and a fan blade assembly, wherein the frame body has a base and an upper cover” Ex[1008] at Abstract.

“FIG. 1 is a stereoscopic schematic drawing of a first embodiment of the present invention.” Ex[1008] at 3:33-34.

“A fan used in a computer is mainly used to discharge the thermal energy released by the operation of a host computer to the outside. The conventional host computer is often placed in a corner because of its monotony. In order to increase the visibility of the host computer, there are many transparent or light-emitting cases available in the market that can render the host computer different light changes, a variety of cooling fans, heat-conducting water drains and the like which can emit different light changes are provided in the host computer so as to enhance the visibility of the host computer through different light changes.” Ex[1008] at 1:12-22.

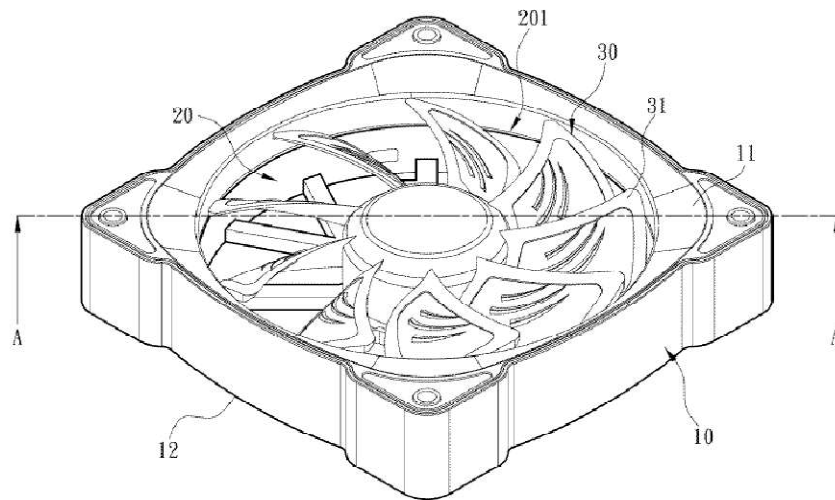
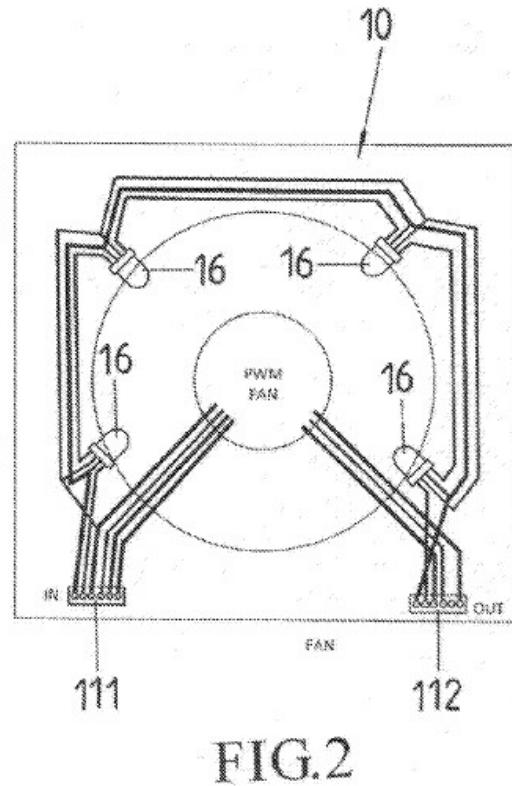


Fig. 1

Ex[1008] at Figure 1

133. Lai discloses a body (e.g. Fan Unit 10) which includes a fan (e.g. Fan 11) that is substantially in the center of the body. *See, e.g.*, Ex [1012] at Figures 2-3.



Ex [1012] at Figure 2

134. Huang also discloses a body (e.g. Frame Body 10) which includes a fan (e.g. Fan Assembly 30) that is substantially in the center of the body. “FIG. 2 is stereoscopic exploded schematic drawing of the first embodiment of the present invention.” Ex[1008] at 3:35-36. *See also e.g.* Ex[1008] at Figures 1, 2, and 7.

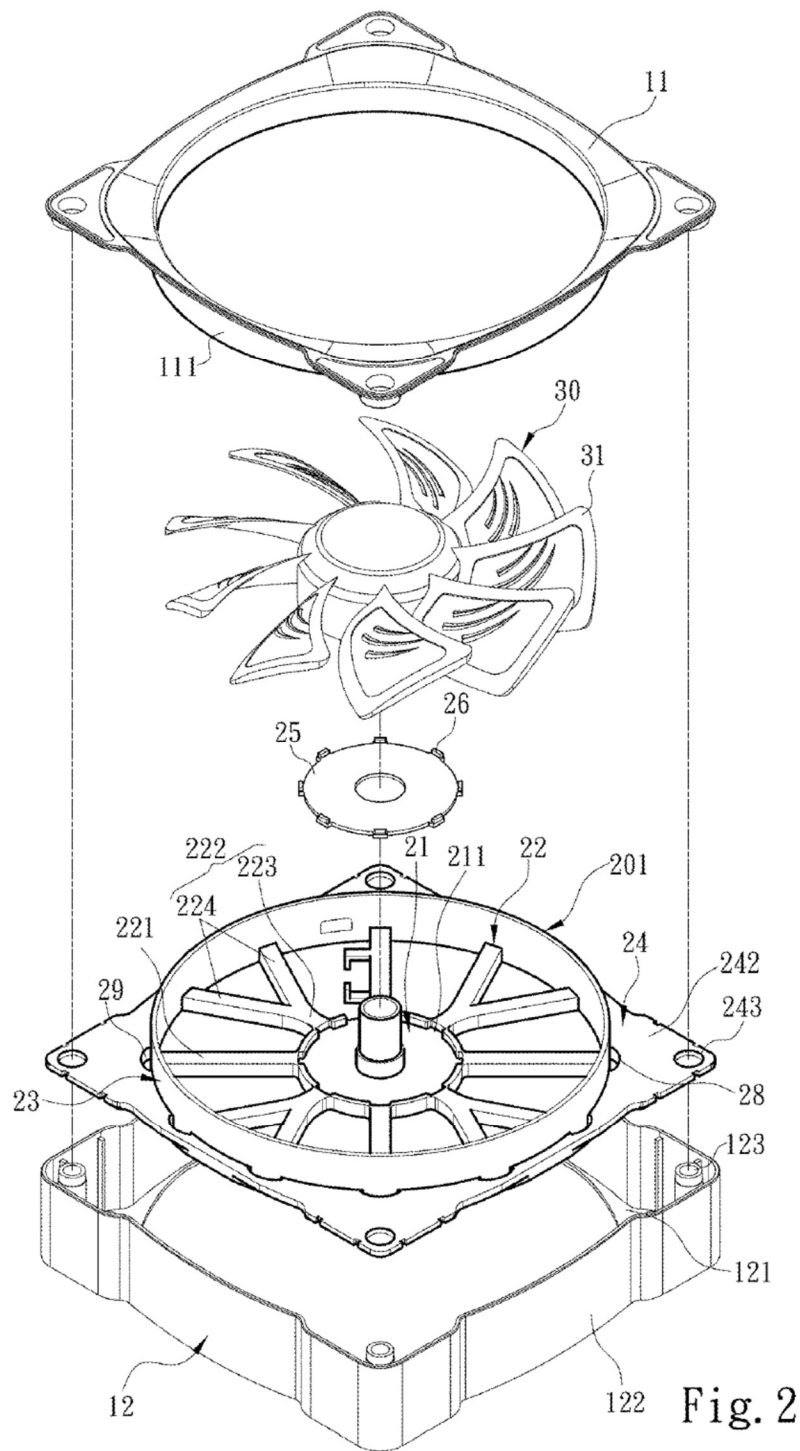


Fig. 2

Ex[1008] at Figure 2

135. Lai discloses a plurality of RGB LEDs in each fan.

“[E]ach LED fan 10 on the LED fan controller device of the present invention is provided with various addressable RGB (Red-Green-Blue) LEDs 16. Each addressable RGB LED 16 is built in with an IC (Integrated Circuit) control chip which is equipped with a one-wire bus control function and can be connected in a series freely.”
Ex[1012] at [0011].

136. In the embodiment illustrated in Figures 2 and 3, these LEDs are on the left and right sides of the fan and are visible from the top of the body. The ordinary RGB LEDs illustrated would be known by a POSITA to have a wide viewing area. Moreover, Lai explains that the purpose of these LEDs is to provide decorative lighting which would be understood to be visible from outside the housing when the fans are normally mounted. Ex[1012] at [0011], claim 1.

137. In light of this teaching, a POSITA would have found it obvious to modify Lai to incorporate the teachings regarding light emitting and diffusing elements from Huang. Moreover, a POSITA could make this modification using the teachings in the references with no additional experimentation and with an extremely high and predictable expectation of success. In the first place, a POSITA would have been motivated to make this combination. Both patents are directed towards the structure and operation of computer cooling fans that include a mounting frame, rotating fan blades, and lights intended to be visible to a user. Thus, these two patents are in the same field of art. Additionally, design incentive and market forces would encourage a POSITA to incorporate the teachings

regarding light emitting and diffusing elements from Huang into Lai. Huang provides a larger illumination area that is more uniform. Ex[1008] at 1:57-2:7, Figure 2. This provides more visibility and can be seen from further away than the simpler LEDs in the Lai embodiments. Similarly, the light element that improved the fan in Huang would be obvious to use in the very similar fan in Lai in the same way. The illumination element from Huang to be combined with the Lai fan design is completely analogous to the modular sensor in the KSR precedent. “It is common sense that familiar items may have obvious uses beyond their primary purposes, and a person of ordinary skill often will be able to fit the teachings of multiple patents together like pieces of a puzzle.” A top-viewable, diffused light as taught in Huang is a familiar item to a POSITA and can be incorporated into the Lai fan in the same manner as it is incorporated into the Huang fan. A POSITA would have a good reason (larger, more uniform illumination) to pursue this known option and it would almost certainly lead to anticipated success. Additionally, the positioning of the light on the top of the fan, visible from two sides, is one of a finite number of identified, predictable solutions to placing the light.

138. Huang teaches that the light element forms an illumination area at the top of the fan on at least two sides. In fact, the entire upper cover 11 is illuminated in some embodiments and the entire base 12 is illuminated in some embodiments.

“The cooling fan comprises a frame body, a light-emitting assembly and a fan blade assembly. The frame body includes a base and an upper cover which is made from a light-permeable material and forms an installation space together with the base. The light-emitting assembly is mounted on the base and includes a circuit board, a plurality of light-emitting elements which are electrically connected with the circuit board and emit a light respectively, and a light guide plate. The light guide plate includes a plurality of light guide strips which correspond to each of the plurality of light-emitting elements respectively to form a guide path that guides the light, and a light diffusion portion which is connected with the plurality of light guide strips. The light diffusion portion includes a first diffusion portion in a position corresponding to each of the plurality of light guide strips, such that the light passes through the guide path to form a diffused light via the first diffusion portion, and the upper cover is in a uniform light-emitting state. The fan blade assembly is arranged in the installation space, and includes a driving unit which is electrically connected with the circuit board and a fan blade which is driven by the driving unit to rotate in the installation space.

In an embodiment, the light diffusion portion includes a first diffusion portion in a position corresponding to each of the plurality of light guide strips, such that the light passes through the guide path and then forms a diffused light using the first diffusion portions, and therefore the upper cover is in a uniform light-emitting state.” Ex[1008] at 1:52-2:14.

“In an embodiment, the plurality of light guide strips further include a plurality of first light guide strips and a plurality of second light guide strips, wherein each of the plurality of first light guide strips extends to the light diffusion portion from each of the plurality of light-emitting elements; each of the plurality of second light guide strips further comprises a first section which extends from the plurality of light-emitting elements and two second sections which extend to the light diffusion portion from the first section respectively.

In an embodiment, the diffused light further comprises a first diffused light and a second diffused light, wherein the first diffused light is formed by passing through the plurality of first light guide strips and then through the first diffusion portions; the second diffused light is

formed by passing through the first sections of the plurality of second light guide strips to form two branched lights and then enabling the two branched lights to pass through the second sections and then through the first diffusion portion.” Ex[1008] at 2:29-47.

“In an embodiment, the base is further made from a light-permeable material, such that the entire frame body is in a uniform light-emitting state using the diffused light.

In an embodiment, the base further comprises a bottom plate in which the first connection portion is arranged, and a plurality of outer side plates which are annularly arranged on the bottom plate.” Ex[1008] at 2:52-58.

“In an embodiment, the diffused light further includes a first diffused light, a second diffused light and a third diffused light, wherein the first diffused light is formed by passing through the first light guide strips and then through the first diffusion portion; the second diffused light is formed by passing through the first sections of the second light guide strips to form two branched lights and then enabling the two branched lights to pass through the second sections and then through the first diffusion portion; the third diffused light is formed by enabling the first diffused light and the second diffused light to pass through the second diffusion portion.” Ex[1008] at 3:1-12.

“According to the present invention, the light emitted from the plurality of light-emitting elements is uniformly diffused through the convex lens portion on the light diffusion portion and the semi-concave lens surface of the gap portion, such that the entire upper cover or the entire frame body can present a uniform light-emitting state to increase the visibility when the cooling fan is used.” Ex[1008] at 3:23-29.

“In the present embodiment, the upper cover 11 and the base 12 may further be made from a light-permeable material, such that the entire frame body 10 is in a light-permeable state, or the upper cover 11 may be made from a light-permeable material while the base 12 is made from a light-tight material, such that the upper cover 11 is in a light-permeable state. When the base 12 is made from the light-tight material, a reflection layer is respectively formed on one side of the

bottom plate 121 and the plurality of outer side plates 122 of the base 12 inside the accommodating space 14, so as to increase the reflectivity of the bottom plate 121 and the plurality of outer side plates 122. The reflection layers can be formed by embossing, coating or deposition.” Ex[1008] at 4:14-28.

“Therefore, when the light 27 respectively passes through the first light guide strips 221 and the second sections 224 to form the two branched lights 272, the two branched lights 272 will then enter into the light diffusion portion 23 and then pass through the first diffusion portions 281 to form the first diffused light 271 and the second diffused light 273 respectively, and further the entire light diffusion plate 24 forms a uniform light-emitting effect. Furthermore, since the partition wall 111 is connected to one end surface of the light diffusion portion 23, a part of the first diffused light 271 and the second diffused light 273 will be guided into the upper cover 11 via the light diffusion portion 23, such that the upper cover 11 produces a uniform light-emitting effect.” Ex[1008] at 7:9-22.

“Accordingly, in the present embodiment, when the light 277 passes through the first light guide strips 221 and the second sections 224 respectively to form the two branched lights 272, and the two branched lights 272 will then enter into the light diffusion portion 23 and next passes through the first diffusion portions 281 to form the first diffused light 271 and the second diffused light 273 respectively, the first diffused light 271 and the second diffused light 273 will pass through the gap portion 29 and form a third diffused light 274 via the second diffusion portion 282, such that the third diffused light 274 is uniformly distributed in the light diffusion plate 24, and further the entire light diffusion plate 24 forms a uniform light-emitting effect.

Therefore, when the base 12 is made from a light-permeable material, the bottom plate 121 and the plurality of outer side plates 122 of the base 12 present a uniform light-emitting effect through the first diffused light 271, the second diffused light 273 and the third diffused light 274 which are formed by the light diffusion portion 23, the first diffusion portion 281 and the second diffusion portion 282, and further any face of the entire frame body 10 presents a uniform reflective effect.” Ex[1008] at 7:35-56.

See also Ex[1008] at Figures, 1, 2, and 3.

139. When Lai is modified to include the teachings related to the lighting element of Huang (e.g. the lights, light guides, diffusors, reflectors, and/or light-permeable materials combined as disclosed in Huang) it will also comprise a fully-illuminated upper cover and a fully-illuminated base.

140. To the extent that a POSITA would understand there to be some small gap between fan units that is not illuminated, it would be obvious to extend the illumination area to close such a gap or even to extend to an overlapping portion of the upper covers to be completely continuous.

141. Lai, in light of Hasegawa and Huang, thus teaches each and every limitation of claim 3 rendering claim 3 obvious.

11. Ground 6 - 2017/0314777 (“Lai”) in view of 2005051085 (“Hasegawa”) and US Patent Application 2008/0124234 (“Echazarreta”) renders claim 4 obvious.

11.1. 4pre-The illumination fan connectable with at least one illumination fan for a computer of claim 1,

142. Lai, in light of Hasegawa, teaches each and every limitation of claim 1 rendering claim 1 obvious as explained above.

11.2. 4a-wherein a groove is provided on one side of the body of the illumination fan, while an engaging block is provided on another side thereof to be engaged into the groove, such that when the groove of the body of the illumination fan is engaged with the engaging block of the body of another illumination fan, the body of the illumination fan is connected with the body of another illumination fan.

143. A POSITA would have found it obvious to incorporate the groove and engaging block from Echazarreta into the fan module described above with respect to claim 1. Lai, as modified in light of Hasegawa, is a fan module with a substantially round fan structure within a substantially square mounting frame. Echazarreta is also a fan module with a substantially round fan structure within a substantially square mounting frame. It would be well within the capabilities of a POSITA to add Echazarreta's groove and engaging block to the fan frame of Lai, as modified in light of Hasegawa without substantial experimentation and with a highly predictable expectation of success. Lai, as modified in light of Hasegawa suggests connecting fan blocks. Echazarreta provides an express motivation to do so using his technique. "Casting these pieces together reduces the complexity and cost of manufacturing the fan trays." Ex[1009] at Abstract. Moreover, A POSITA would understand that this is a simple and quick mechanism for connecting fan blocks as suggested by Lai, as modified in light of Hasegawa.

144. Echazarreta discloses a groove is provided on one side of the body of the illumination fan, e.g. opening 1202 and or opening 1204. Echazarreta also

discloses an engaging block provided on another side thereof to be engaged into the groove, e.g. side rail 454 and the unnumbered similar side rail shown in Figure 12. Echazarreta explains that “on the other side, the fan tray 1200 defines a complementary-shaped opening (also referred to as a side rail receiver or a mounting bracket receiver) 1202, into which the side rail 454 of another fan tray (not shown) can be slid, thus forming a multi-fan tray. Preferably, the side rail 454 and the opening 1202 interlock when the side rail 454 is slid into the opening 1202.” This satisfies the remainder of this limitation.

“Thus far, a fan tray 400 or 700 that includes a single fan has been described. However, in other embodiments of the present invention, a fan tray can include more than one fan. For example, as shown in FIG. 11, a fan tray 1100 includes two fans 1102 and 1104. Other embodiments can include other numbers of fans, and the fans can be arranged in any pattern. Most other aspects of the multi-fan fan tray 1100 are similar to the fan trays 400 and 700 described above.

Modular fan tray units can also be constructed, according to another embodiment of the present invention. For example, as shown in FIG. 12, a fan tray 1200 includes a side rail 454 on one side, as described above. However, on the other side, the fan tray 1200 defines a complementary-shaped opening (also referred to as a side rail receiver or a mounting bracket receiver) 1202, into which the side rail 454 of another fan tray (not shown) can be slid, thus forming a multi-fan tray. Preferably, the side rail 454 and the opening 1202 interlock when the side rail 454 is slid into the opening 1202; however, interlocking rails and openings are not necessary.

Optionally, the rear wall of the fan tray 1200 also includes a similar opening (also referred to as a front rail receiver or a mounting bracket receiver) 1204. In this case, another fan tray (not shown) that includes a front rail (instead of a handle) can be joined to the rear of the fan

tray 1200. By this mechanism, a fan tray consisting of any number of desired fans, arranged in any desired pattern, can be easily assembled by an end user or system administrator.

Although the side rail 454, the side rail receiver 1202 and the front rail receiver 1204 are shown as being horizontally oriented, i.e., parallel to the plane of the fan tray 1200, the side rail 454 and the rail receivers 1202-1204 can be oriented along other lines.” Ex[1009] at [0069]-[0072].

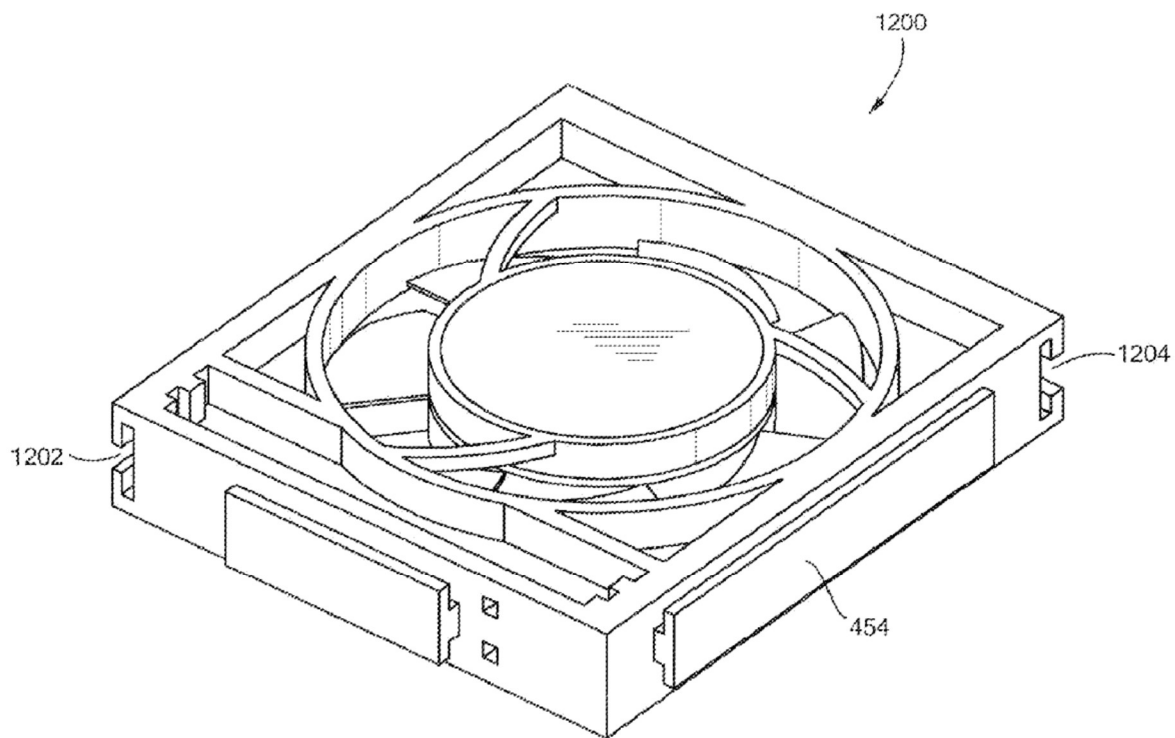


FIG. 12

Ex [1009] at Figure 12

145. Lai, as modified in light of Hasegawa and US Patent Application 2008/0124234 (“Echazarreta”), thus teaches each and every limitation of claim 4 rendering claim 4 obvious.

12. Ground 7 - Lai, in view of Hasegawa and US Patent Application 2008/0279694 (“Chou”) or US Patent Application 2015/0233391 (“Liu”) renders claim 5 obvious.

12.1. 5pre-The illumination fan connectable with at least one illumination fan for a computer of claim 1,

146. Lai, in view of Hasegawa, teaches each and every limitation of claim 1 rendering claim 1 obvious as explained above.

12.2. 5a-wherein a groove is provided on two sides of the body of the illumination fan, and the body of the illumination fan is connected with the body of another illumination fan by respectively engaging an engaging block with one of the grooves on the sides of the body of the illumination fan and one of the grooves on the sides of the body of another illumination fan

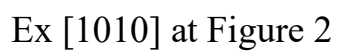
147. A POSITA would have found it obvious to incorporate the grooves from Chou into the fan module described above with respect to claim 1 and to use the engaging block disclosed in Chou to connect two fans. Lai, as modified in light of Hasegawa, is a fan module with a substantially round fan structure within a substantially square mounting frame. Chou is also a fan module with a substantially round fan structure within a substantially square mounting frame. It would be well within the capabilities of a POSITA to add Chou’s grooves on two sides of the body and respectfully engage an engaging block to the fan frame of each of two fans from Lai, as modified in light of Hasegawa without substantial experimentation and with a highly predictable expectation of success. Lai, as modified in light of Hasegawa suggests connecting fan blocks. Chou provides an

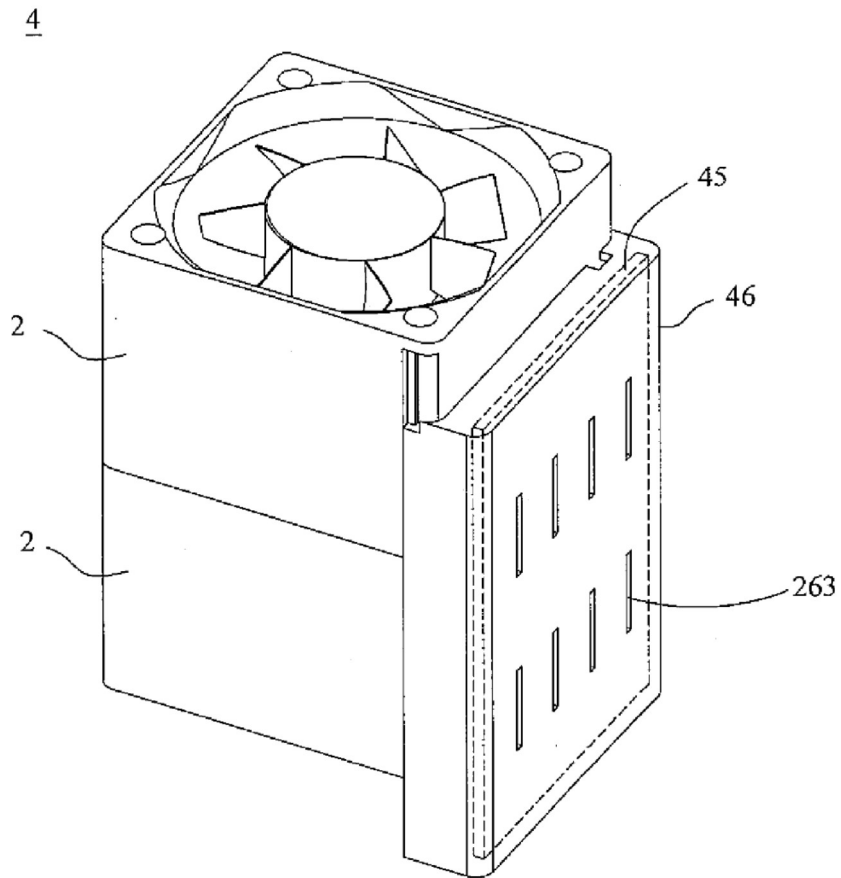
express motivation to do so using his technique. It provides an opportunity to share a printed circuit board between fans. Ex[1010] at [0025]. Lai, as modified in light of Hasegawa also suggests that fans should be connected. Moreover, A POSITA would understand that this is a simple and quick mechanism for connecting fan blocks as suggested by Lai, as modified in light of Hasegawa.

148. Chou teaches that each fan module can have grooves on two sides. *See, e.g.*, sliding rails 246. Since something can slide into sliding rails 246, a POSITA would understand it to be, or at least include, a groove.

“In addition, the fan 2 of the present invention further includes a connecting member 26, which is disposed at one side of the fan frame 24 and covers the circuit board 25. In this embodiment, the connecting member 26 is a cover having a rectangular shape or other shapes. The connecting member 26 has a bottom 260 and two sidewalls 261 connected to the bottom. The connecting member 26 is connected to the fan frame 24 by way of sliding, engaging or hooking. In other words, the connecting member 26 is detachably disposed on the fan frame 24. In addition, the fan frame has at least two sliding rails 246 disposed at a peripheral corner of the fan frame 24. The sidewall 261 of the connecting member is correspondingly disposed on the sliding rail 246. When the connecting member 26 of this embodiment slides into the sliding rail 246 along a predetermined direction X, the connecting member 26 is connected to and combined with the fan frame 24. When one of the electronic components on the circuit board 25 needs to be repaired or the circuit board 25 has to be replaced, reworking is needed to be performed. As the time, it is only necessary to slide the connecting member 26 along a direction, which is reverse to the predetermined direction X, and the connecting member 26 is easily disconnected and separated from the fan frame 24 so that the circuit board 25 can be easily took out.” Ex[1010] at [0022]

149. Chou also teaches that a connecting member, 26, can be used to connect with one of the grooves on the sides of the body of one fan and one of the grooves on the sides of the body of another fan. *See* Ex[1010] at [0022] and Figures 2 and 4. A POSITA would understand that connecting member, 26 is an engaging block.





Ex [1010] at Figure 4

150. Alternatively, a POSITA would have found it obvious to incorporate the grooves from Liu into the fan module described above with respect to claim 1 and to use the engaging block disclosed in Liu to connect two fans. Lai, as modified in light of Hasegawa, is a fan module with a substantially round fan structure within a substantially square mounting frame. Liu is also a fan module with a substantially round fan structure within a substantially square mounting frame. It would be well within the capabilities of a POSITA to add Liu's grooves on two sides of the body and respectfully engage an engaging block to the fan

frame of each of two fans from Lai, as modified by Huang without substantial experimentation and with a highly predictable expectation of success. Lai, as modified in light of Hasegawa suggests connecting fan blocks. Liu provides an express motivation to do so using his technique. “According to the above structural design, the co-vibration of the series fan is offset or restrained to greatly reduce the vibration of the fan and lower the noise.” Ex[1011] at [Abstract]. Lai also suggests that fans should be connected. Moreover, A POSITA would understand that this is a simple and quick mechanism for connecting fan blocks as suggested by Lai, as modified in light of Hasegawa.

151. Liu teaches that each fan module can have grooves on two sides. *See, e.g.,* connection sections 214. The connection sections 214 can be holes, sockets, mortises or posts. Ex[1011] at [0033] and Figure 4A, 4B. A POSITA would understand that at least a mortise is a type of groove.:

mortise 1 of 2 noun

mor·tise 'môr-tēs 

variants or less commonly **mortice**

: a hole, groove, or slot into or through which some other part of an arrangement of parts fits or passes

especially : a cavity cut into a piece of material (such as timber) to receive a tenon

<https://www.merriam-webster.com/dictionary/mortise>

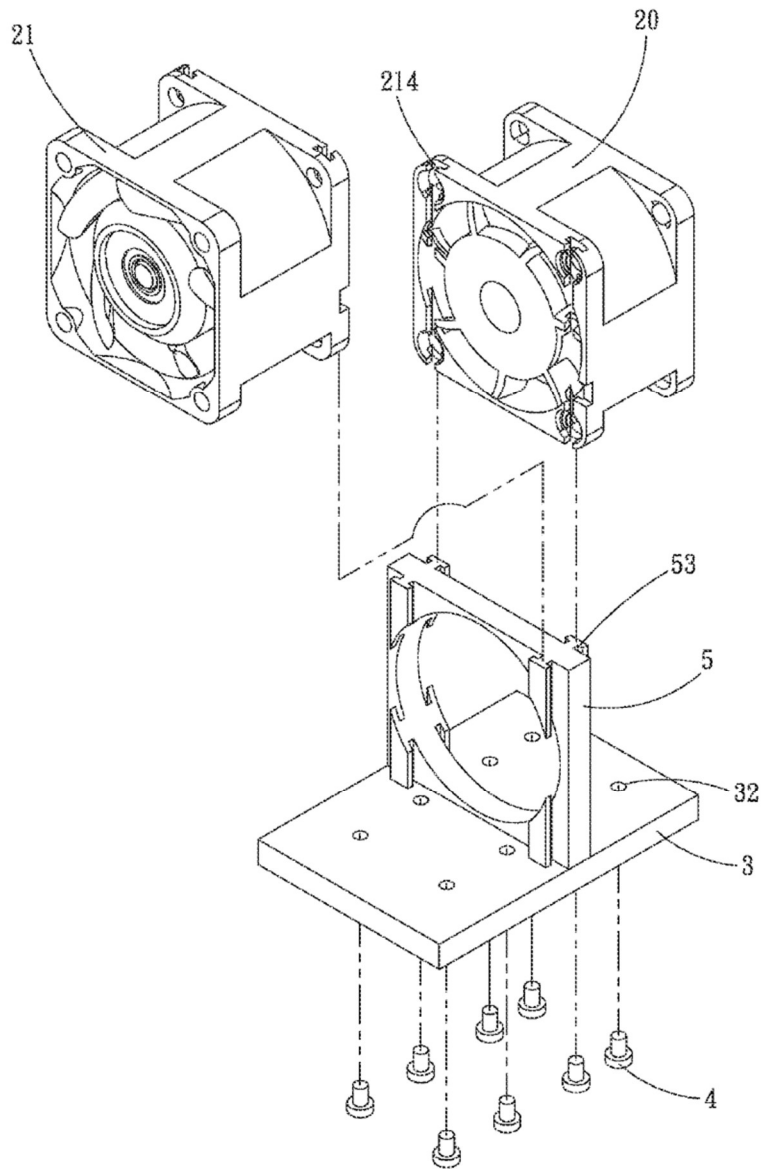
152. Liu also teaches that assembling member, 5, can be used to connect with one of the grooves on the sides of the body of one fan and one of the grooves on the sides of the body of another fan. *See* Ex[1011] at [0035] and Figure 4A, 4B. It can connect by means of a slide rail. A POSITA would understand that assembling member, 5 is an engaging block.

“The assembling member 5 is formed with multiple assembling sections 53. The series fan assembly 2 is formed with multiple connection sections 214 correspondingly assembled with the assembling sections 53. The assembling sections 53 can be holes, sockets, mortises or posts. The connection sections 214 can be holes, sockets, mortises or posts.

The first fan 20 further has a first opening 2021 and a second opening 2022 opposite to the first opening 2021. The first flow passage 202 is defined between the first and second openings 2021, 2022. The second fan 21 further has a third opening 2121 and a fourth opening 2122 opposite to the third opening 2121. The second flow passage 212 is defined between the third and fourth openings 2121, 2122. The fourth opening 2122 correspondingly communicates with the second opening 2022.

In this embodiment, the assembling member 5 is disposed between the second and fourth openings 2022, 2122. The first end face 50 is assembled with the second opening 2022, while the second end face 51 is assembled with the fourth opening 2122. The passageway 52 correspondingly communicates with the first and second flow passages 202, 212. In this embodiment, the series fan assembly 2 is assembled with the assembling member 5 by means of engagement. In practice, the first and second fans 20, 21 can be assembled with the first and second end faces 50, 51 by any other means that can securely connect the first and second fans 20, 21 with the first and second end faces 50, 51, for example, by means of slide rail (as shown in FIGS. 4A and 4B, a third embodiment of the present invention), locking,

insertion, adhesion or latching. This is not limited.” Ex[1011] at [0033]-[0035]



Ex [1011] at Figure 4A

153. Lai, as modified in light of Hasegawa and US Patent Application 2008/0279694 (“Chou”) or US Patent Application 2015/0233391 (“Liu”), thus teaches each and every limitation of claim 5 rendering claim 5 obvious.

13. Summary of Conclusions

154. Based on the foregoing analysis, the following chart summarizes my opinions regarding the invalidity of the '336 patent:

Ground	Opinion
1	Claims 1-3 would have been obvious over Tsuji in view of Huang
2	Claim 4 would have been obvious over Tsuji in view of Huang and further in view of Echazarreta
3	Claim 5 would have been obvious over Tsuji in view of Huang and further in view of Chou or Liu
4	Claims 1-2 would have been obvious over Lai in view of Hasegawa
5	Claim 3 would have been obvious over Lai in view of Hasegawa and further in view of Huang
6	Claim 4 would have been obvious over Lai in view of Hasegawa further in view of Echazarreta
7	Claim 5 would have been obvious over Lai in view of Hasegawa in view of Chou or Liu

14. Secondary Considerations

155. As discussed above, I have been informed that secondary considerations are a factor in the determination of obviousness. I have considered the current information related to secondary considerations of obviousness and determined that it has no impact on my conclusions. To the extent patent owner comes forward with any additional information, I will consider it.

15. Right to Supplement

156. This declaration represents the opinions on the '366 patent that I have formed to date. I reserve the right to revise, supplement, and/or amend my opinions stated herein based on new information that becomes available to me and on my continuing analysis of the materials already provided. In connection with any arguments raised by patent owner, opinions by patent owner's expert(s), additional evidence and testimony, and/or judicial determinations, whether in this or a related proceeding, I reserve the right to supplement my opinions in the future to respond thereto.

I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct, that all statements made of my own knowledge are true, and that all statements made on information and belief are believed to be true. I understand that willful false statements are punishable by fine or imprisonment or both pursuant to 18 U.S.C. § 1004.

Date: 7/26/2024



Andrew Wolfe, Ph.D.