

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.

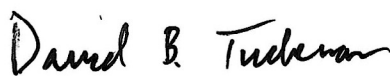
Patent No. 10,690,336 to Chen

IPR Case No.: IPR2024-01230

**Declaration of David B. Tuckerman, Ph.D. in Support of
Patent Owners' Preliminary Response**

Dated: November 22, 2024

Respectfully Submitted by:



David B. Tuckerman

I, DAVID B. TUCKERMAN, DECLARE AS FOLLOWS:

I. INTRODUCTION

1. I have been retained by the patent owner, Chen, Chien-Hao, and the exclusive licensee, Lian Li Industrial Co., Ltd. (collectively “Patentee”), as a technical expert to provide my opinions regarding U.S. Patent No. 10,690,336 (the “336 patent”) in this declaration in support of Patentee’s preliminary response (“Declaration”).

2. It is my opinion that none of the asserted prior art, alone or in combination, renders any of the challenged claims in this proceeding obvious under 35 U.S.C. § 103. My opinions and the bases and reasons for them are set forth in this Declaration.

3. I am being compensated at the rate of \$550.00 per hour for my work on this matter. My compensation in no way depends on the outcome of this proceeding, the content of my testimony, or any issues involved in or related to this proceeding.

4. I reserve the right to modify or supplement my opinions, as well as the bases for my opinions, including based on the nature and content of the documentation, data, proof, and other evidence or testimony that Thermaltake Technology Co., Ltd. and Thermaltake Inc. (collectively “Petitioner”), or their expert(s) may present, on any additional information provided to me or found by

me in this matter, or on further instructions or orders from the Patent Trial and Appeal Board (“PTAB”).

II. BACKGROUND AND QUALIFICATIONS

5. My qualifications and experiences are set forth in Exhibit A. Additionally, I provide the following overview of my background as it pertains to my qualifications for rendering expert opinions in this matter.

6. I have two B.S. degrees, one in Electrical Engineering and another in Physics, and an M.S. in Electrical Engineering and Computer Science, all from Massachusetts Institute of Technology, Cambridge, Massachusetts. I also have a Ph.D. in Electrical Engineering and an M.B.A. from Stanford University, Stanford, California. My Ph.D. thesis, titled “Heat-Transfer Microstructures for Integrated Circuits”, focused on developing new, high-performance liquid-cooled heat sinks for thermal management of high-speed integrated circuits, and received the Fannie and John Hertz Foundation Hertz Thesis Prize.¹ The key results in my Ph.D. thesis were published in the peer-reviewed journal IEEE Electron Device Letters with the title “High-Performance Heat Sinking for VLSI” in 1981, and this publication has so far received over 6,600 citations in the professional literature, as reported by Google Scholar.² This paper was selected by the IEEE Electron Devices Society to

¹ <https://www.hertzfoundation.org/hertz-fellows/awards/hertz-doctoral-thesis-prize/>

² https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=High-Performance+Heat+Sinking+for+VLSI&btnG=

receive the first “Paul Rappaport Award”, although this new award series was not officially approved by IEEE until 1983.³

7. I am an experienced innovator and inventor with approximately 180 issued U.S. patents, additional foreign patents, and numerous pending applications, spanning the fields of thermal management systems, heat transfer, electronic packaging and interconnect technologies, and superconducting devices and circuits, etc. More than 20 of my patents specifically describe novel electronic interconnection technologies.

8. Upon completing my Ph.D. in Electrical Engineering at Stanford University, I joined Lawrence Livermore National Laboratory (LLNL) as a physicist and later a project leader, supervising and managing advanced R&D programs in various fields including electronic packaging and interconnect. At LLNL, I developed and published novel methods for electrically connecting silicon chips to multichip module substrates.

9. I founded nCHIP, Inc. in 1989, focusing on advanced multi-chip module technologies enabling ultracompact high-performance digital systems. After I served for 6 years as its Chief Technical Officer, nCHIP was acquired by Flextronics International Ltd. in 1995. nCHIP’s technology employed novel methods for providing electrical connections between semiconductor chips using

³ <https://eds.ieee.org/awards/paul-rappaport-award>

new interconnection methods and substrates, which I published and patented during my tenure.

10. I am an experienced entrepreneur, venture capitalist, and executive leader with over 30 years of experience in founding, growing, and/or advising technology companies. While working as senior VP and CTO of Tessera Inc., I helped Tessera grow via various acquisitions, one of which led to the development of a new technology for silent air cooling of laptop computers as a replacement for fans. I also supervised the development of novel chip packaging and interconnection methods, and was an inventor on numerous patents related to electrical interconnections.

11. In 2001 I was elected by the Institute of Electrical and Electronic Engineers (IEEE) to the grade of Fellow, which is the highest membership grade, and for which selection is limited to less than 0.1% of the IEEE membership each year. I was specifically cited by the IEEE Components, Packaging and Manufacturing Technology (CPMT) Society (renamed in 2017 as the IEEE Electronics Packaging Society) “for contributions to high-performance electronic packaging and interconnection technologies, including the development of the microchannel heat sink”. In 2023 I became a “Life Fellow” of the IEEE owing to my many years of active membership.

12. I am a licensed Professional Electrical Engineer in good standing in the State of California.

13. I am currently an independent consultant through my own company Tuckerman and Associates, Inc., working on various technical and intellectual property matters in the high-tech industries. Some of my major clients have included CMEA Capital, Tessera, Intellectual Ventures, and Microsoft. I consulted for Microsoft's Quantum Computing and "Cold Logic" programs for 9 years (2011-2020), including management of a 6-year research contract with Auburn University to develop high-density flexible thin-film cryogenic interconnect having optimal heat-transfer properties (*i.e.*, minimal heat leakage between temperature stages) while maintaining excellent electrical performance. A major portion of this research involved developing novel methods for making electrical connections in quantum computers and superconducting logic. I was also a consultant for the first phase of Microsoft's "Project Natick" (which implemented a demonstrative underwater datacenter off the southern California coast in 2015), including the design of the heat exchanger structures and the subsequent analysis of its actual undersea performance. I have published papers in professional journals and conference proceedings as recently as 2022 specifically relating to novel electrical connectors and interconnection schemes, for use with superconducting devices and flexible superconducting cables.

14. I have attached an Appendix A listing my qualification and experience to this Declaration.

III. LEGAL PRINCIPLES

15. I understand that claim construction is an issue of law for the PTAB. I also understand that before an infringement or validity determination can be made, the claims must be construed by the PTAB.

16. I am informed that the words or phrases of a claim are generally given their plain and ordinary meanings that they would have had to a Person of Ordinary Skill in the Art (“POSITA”) at the time of the invention. To determine the meaning of a claim term, I am informed that the PTAB will look first to the claims and specification, then to the file history, and only if necessary, to extrinsic evidence such as dictionaries and treatises. I also understand that limitations generally may not be imported from the specification or any embodiment(s) into the claims.

17. It is my further understanding that the same words and phrases within a claim or claims are presumed to have the same meaning. It is also my understanding that different words and phrases within a claim or claims are presumed to have different meanings. Similarly, all words in a claim have meaning, and a word or phrase in a claim should not be interpreted so as to render other words or phrases in the claim superfluous.

18. It is also my understanding that the POSITA is deemed to have read a disputed claim term or phrase being construed not only in the context of the particular claim in which the disputed term or phrase appears, but in the context of the entire patent, including the other claims, the specification, and the prosecution history.

IV. LEVEL OF ORDINARY SKILL IN THE ART

19. I understand that, to determine the appropriate level of skill of a POSITA, the following four factors may be considered: (a) the types of problems encountered by those working in the field and prior art solutions thereto; (b) the sophistication of the technology in question, and the speed with which innovations occur in the field; (c) the educational level of active workers in the field; and (d) the educational level of the inventor. I have been instructed that the level of ordinary skill in the art should be determined at the time of the invention. I have been asked to presume that the relevant date for my evaluation is December 26, 2018, based on Taiwan Application No. 107217659.

20. The field of the '336 patent relates to computer or electronic hardware components and, specifically, a computer illumination fan connectable with at least one other illumination fan. Based on my review and analysis of the '336 patent and applying the considerations identified above as best they are known to me today, a POSITA in the field of the '336 patent as of December 26, 2018 would have (i)

earned a bachelor's degree in electrical engineering, mechanical engineering, or computer science, or a similar engineering or science degree, and (ii) attained two or more years of experience in designing and/or implementing hardware components for computers, servers, and/or other electronic devices. Alternatively, a person with a more advanced degree in the above fields might have had less practical experience and still be deemed a POSITA. Conversely, a person with a general college background not necessarily in the above fields might also have become a POSITA by acquiring more real-world experience in designing and/or implementing hardware components for computers, servers, and/or other electronic devices.

21. Under any of the definitions, I believe that I have the relevant experience and understanding of a POSITA qualified to opine on interpretation of the '336 patent.

V. MATERIALS CONSIDERED

22. In rendering my opinions in this Declaration, I have considered the following materials:

Material	Description
Paper 1	Petition for Inter Partes Review of U.S. Patent No. 10,690,336 ("Petition" or "IPR")
Exhibit 1001	U.S. Patent No. 10,690,336 B1 to Chen
Exhibit 1004	Declaration of Dr. Andrew Wolfe ("Wolfe Decl.")
Exhibit 1006	Japanese Publication No. 2018041147A to Tsuji et al. ("Tsuji") published March 15, 2018
Exhibit 1007	Certified Translation of Tsuji

Material	Description
Exhibit 1008	U.S. Patent No. 10,082,286 B1 to Huang issued September 15, 2018 (“Huang”)
Exhibit 1012	U.S. Publication No. 2017/0314777A1 to Lai (“Lai”)
Exhibit 1003	Japanese Publication No. 2005051085A to Hasegawa (“Hasegawa”)

VI. OVERVIEW OF THE ’336 PATENT

23. The ’336 patent relates to an illumination fan connectable with at least one other illumination fan for a computer. Computer fans are generally used for heat dissipation inside the housings of computers. To effectively dispel heat accumulated inside a computer housing, multiple cooling fans are often needed. Traditionally, each computer fan had to be connected to a power supply through an independent power cable, which creates a lot of wiring inside the housing and makes cable routing and managing cumbersome. Additionally, because of the need to connect to power supply with independent power cables, the number of cooling fans that can be assembled is limited by the finite number of connections available on the power supply.

24. In addition, computers are increasingly used for entertainment and related purposes, and hence more attention has been focused on the aesthetics of computer housing in addition to heat dissipation, especially for gaming enthusiasts. This includes integrating light sources with cooling fans such that the illuminated fans are visible from outside the housing (*e.g.*, through transparent panels).

25. To serve the increasing demand for aesthetically pleasing computer housings and improve the efficiency of heat dissipation for the computer at the same time, the invention contemplated by the '336 patent provides an illumination fan connectable with at least one other illumination fan for a computer.

26. Figure 1 of the '336 patent (reproduced and annotated below) shows an embodiment (*i.e.*, an example) of such an illumination fan, which “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**”. '336 pat. at 2:61-3:3, Fig. 1 (annotated). “As such, once the power socket **4** at a side of the body is supplied with power, the fan **2** of the body **1** can be driven into rotation and the illumination area **3** can be illuminated”. '336 pat. at 3:4-6.

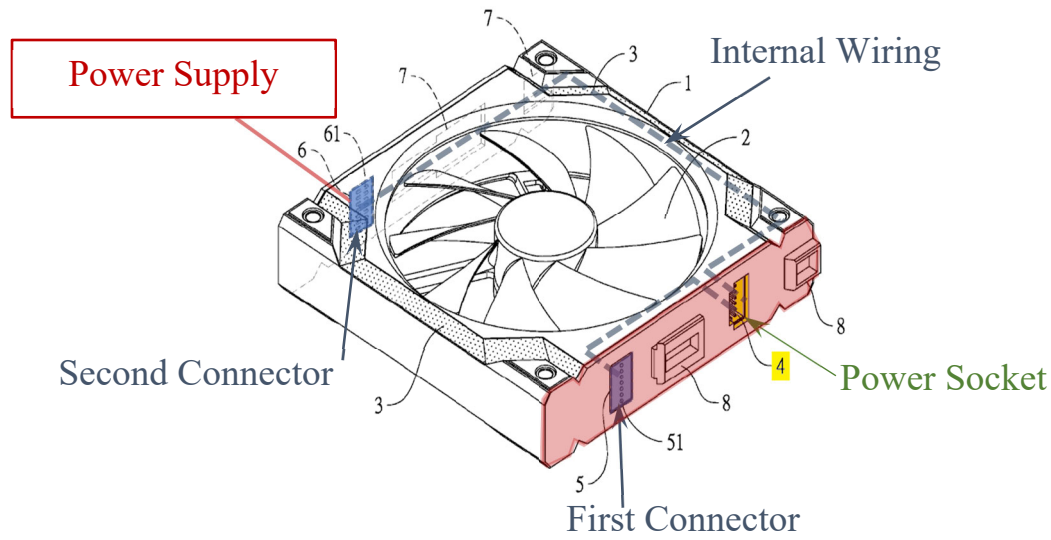
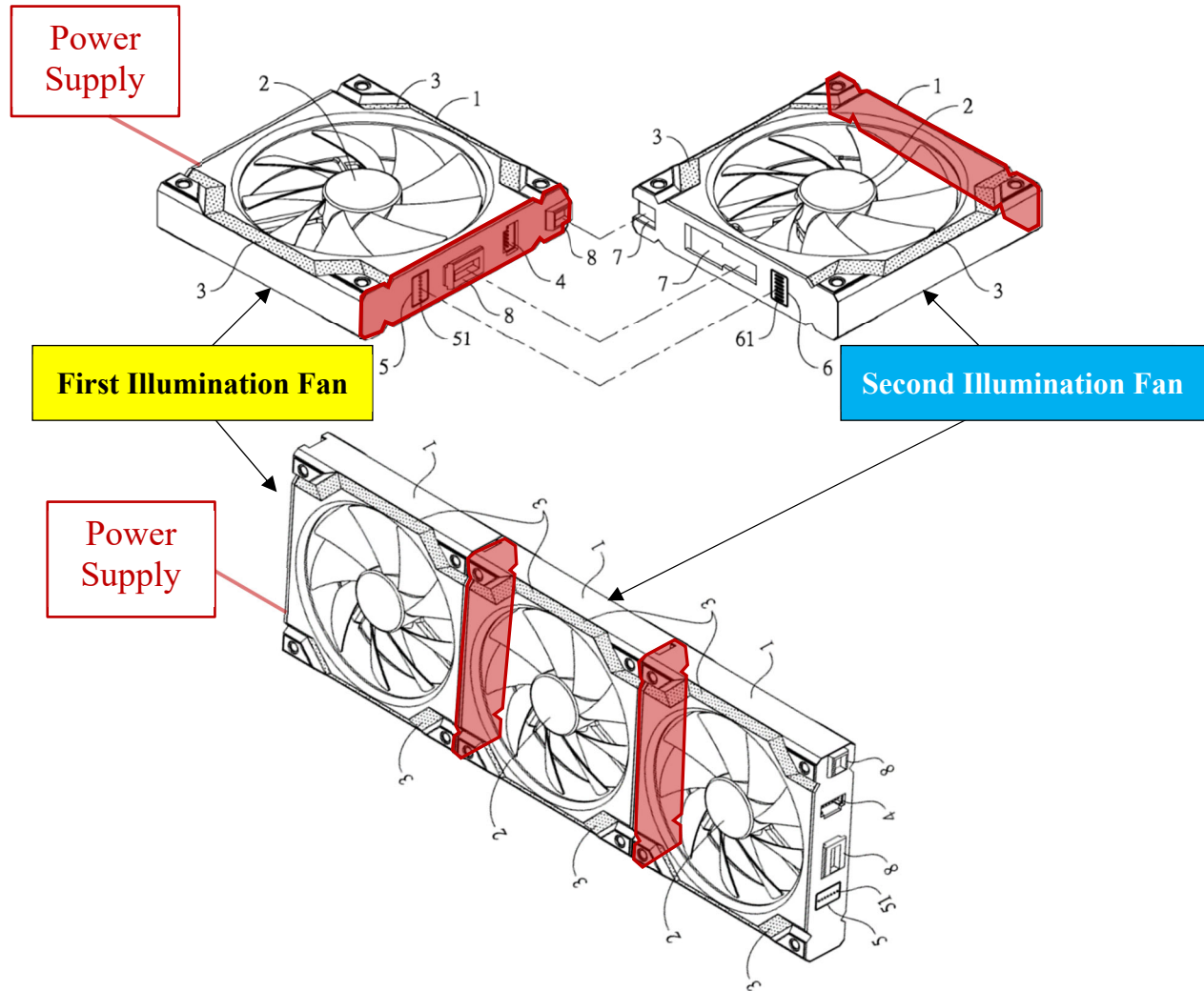


Fig. 1

'336 pat., Fig. 1 (exemplary annotations and highlighting added).

27. The power socket **4** of the embodiment shown in Figure 1 above can be supplied with power in various ways. For example, as shown above, the second connector **[6]** may receive power from a power supply, and the exemplary power socket **4** highlighted in yellow in the reproduced Figure 1 above can be supplied with power from behind by the second connector **[6]** that is electrically connected to the power socket through internal wiring of the illumination fan. The power socket **4** electrically connected with the first connector **5** can in turn supply power to the first connector **5** “so that when the first connector **5** of [an illumination fan’s] body **1** is connected to the second connector **6** of another [illumination fan’s] body **1**, the fan **2** of the another [illumination fan’s] body **1** can be driven into rotation and the illumination area **3** [of the another illumination fan’s body **1**] can be illuminated”.

'336 pat. at 3:7-16. This non-limiting exemplary configuration of connecting at least two illumination fans can be illustrated by Figures 2 and 3 of the '336 patent, reproduced and annotated below:



'336 pat., Fig. 2 (annotated) and Fig. 3 (rotated and annotated); *see also id.* at 3:7-16.

28. As shown above, a first illumination fan on the left (labeled in yellow) is connectable to a second illumination fan on the right (labeled in blue) through an

engaging block [8] and a groove [7]. When the first illumination fan is supplied with power, its fan [2] is driven into rotation and the illumination area [3] is illuminated; and when the second illumination fan is connected to the first illumination fan through joining the first connector [5] of the first illumination fan and the second connector [6] of the second illumination fan, the fan and illumination area of the second illumination fan are also driven into rotation and illumination, respectively.

29. Claim 1 of the '336 patent is reproduced below:

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

a body, provided with a fan in center of the body,

an illumination area on at least two sides of the fan at 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,

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.

VII. PRIORITY DATE OF THE '336 PATENT

30. I apply a priority date of December 26, 2018 for the '336 patent in rendering my opinions in this Declaration.

VIII. THE CHALLENGED CLAIMS OF THE '336 PATENT ARE VALID AND NOT OBVIOUS

31. Petitioner argues on various grounds (Grounds 1-7) that Claims 1-5 in the '336 patent are all obvious and hence unpatentable. However, only Ground 1 (Tsuji in view of Huang) and Ground 4 (Lai in view of Hasegawa) address the patentability of Claim 1. Claims 2-5 are all dependent on Claim 1, so it is only necessary to demonstrate that Petitioner's arguments against Claim 1 are manifestly faulty; then Petitioner's arguments against the remaining dependent claims will be similarly faulty. For that reason, I will limit my rebuttal of Petitioner's arguments to just their discussions of Claim 1, which are covered only in Grounds 1 and 4. I respectfully suggest that the PTAB will find my arguments wholly sufficient without the need to spend further time on reviewing any of the dependent claims. All '336 patent claim terms herein will be construed under their plain (i.e., ordinary and customary) meanings to a POSITA at the time of that patent's filing, a position which Petitioner's filing also takes. Petitioner's definition of a POSITA is substantially the same as my definition, and I qualify as a POSITA under either definition.

a. PETITIONER'S GROUND 1

32. Petitioner asserts that Claims 1-3 would have been obvious over Tsuji in view of Huang under Ground 1. I disagree. As discussed above, I am only going to discuss the arguments about Claim 1 in this declaration.

i. OVERVIEW OF PRIOR ART

33. Before getting into the detailed arguments, I will first provide a summary of the Tsuji patent application publication, based on its certified translation from Japanese (Ex. 1007 in Petitioner’s IPR petition, hereafter referred to as “Tsuji”). The stated problem that Tsuji is addressing is: “To provide an electronic device capable of assigning an address associated with a position of each fan unit to each fan unit even when the fan unit is swapped”. [Tsuji, p.2]

34. More specifically, Tsuji explains that: “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”. [Tsuji, ¶ 0002 ; bold-facing added]

35. Tsuji summarizes his solution as: “An electronic device includes an electronic apparatus, and a plurality of serially-connected fan units that cools the electronic apparatus. Each fan unit includes a controlling unit that assigns to its own fan unit an address that identifies its own fan unit among the plurality of fan units by associating the same with a connection position of its own fan unit among the plurality of fan units”. [Tsuji, p.2]

36. A POSITA would have therefore understood the Tsuji patent to address a specific market need, i.e., the ability to “hot-swap” a defective fan in a “large-scale backbone server”, such as would exist as part of a server farm in a large data center. This is an ultrahigh reliability environment where downtime is viewed as intolerable. A large-scale server will be designed with multiple fans to provide cooling redundancy, and it is desirable to be able to swap out a defective fan without shutting down the server nor any of its operating fans. Tsuji offers just such a method in his patent application.

37. A POSITA would have further understood that the essence of the Tsuji publication is about how to incorporate a controller in each fan to essentially make it a “smart fan”, so that when multiple fans are serially connected together in a row, with power connections between each fan and its neighbor, and also a serial bus connection such as I2C, it is possible for each fan to determine its location in the row and self-report its condition by signaling techniques. In Tsuji’s preferred embodiments, each fan also has a pair of redundant connectors CNA and CNB that can be connected to a pair of power supply cables (only the right-most fan is intended to be connected to these cables in normal operation). This feature permits a hot-swapping procedure whereby a new fan can be attached at the end of the row, powered up, slid into the server, and a fan at the opposite (left) end of the row can then be removed. The power cables A and B are transferred one at a time from the

original right-most fan to the newly attached right-most fan, so that all the fans are continuously supplied with power. This procedure can be repeated until the defective fan has been removed from the row.

38. A POSITA would most definitely **not** view the Tsuji reference as having any bearing on the subject of “illumination fans”, such as are a subject of the ’336 patent. A POSITA would have understood that the purpose of an illumination fan is to provide widely viewable lighting (usually with full-color RGB capability that can be dynamically varied) having some cosmetic or entertainment value to the user or his guests. Illumination fans are typically marketed to users of desktop personal computers or gamers, where the casing has been specifically designed to make the fans visible. They would not be designed into backbone servers (Tsuji’s target market), which are generally installed in rack-mounted cabinets in highly secure restricted-access facilities that are normally only viewed by maintenance engineers or technicians. To add illumination would increase fan cost, add to the power consumption and hence electricity cost, increase the heat load on the server which would reduce reliability (or require additional cooling fan capability to dispose of the heat), and increase the air conditioning load on the data center which further adds to electricity cost. All of these effects are detrimental to the goals of a data center operator, so the use of illumination fans would not be considered in that market. Tsuji [¶ 0005] specifically states “lower power consumption is desirable in

the servers in recent years”. The addition of illumination to Tsuji’s fan units would be contrary to this desire to minimize power, would provide no benefit, and would in fact cause significant detrimental effects to the heat dissipation and the economic operation of a data center.

39. A POSITA would therefore consider that cooling fans for high-reliability high-end servers are in a different “field of endeavor” from illumination fans for personal computers, which is the subject of the ’336 patent. Moreover, the inventive essence of the Tsuji publication is to enable the ability to “hot swap” fans in a high-reliability environment. Hot-swapping is not something that would be of interest to a designer of illumination fans. Personal computer manufacturers routinely caution against opening the computer case when it is powered up, primarily because it is unsafe for users (for example, fingers might get cut by spinning fan blades, might contact the high-voltage power connection, or might get burned on a hot semiconductor chip), but also because it could damage the electronics (e.g., by inadvertently short-circuiting components with a metal tool, by damaging semiconductor components with a static electricity discharge, or by adversely affecting the flow of cooling air so that components overheat). No typical illumination fan designer would want to encourage hot-swapping of fans, as it risks putting the user’s fingers in contact with sharp fan blades rotating at high speeds. Accordingly, it is my view that the Tsuji publication, being aimed at solving the

problem of hot swapping of fans, is not “reasonably pertinent” to a designer of illumination fans, and so Tsuji would not “logically commend itself” to an inventor’s attention who is focused on improving illumination fans. A POSITA would look at the Tsuji publication and consider that its purpose is to allow hot-swapping of a defective fan in an array of fans, and would not even consider that it is pertinent to illumination fans in a PC. For the reasons above, I contend that Tsuji does not represent “analogous art” to the Huang patent (which deals with various methods to create illumination effects in a single fan).

40. Petitioner attempts to categorize Tsuji as depicting an illumination fan merely because, in the preferred embodiments shown, the fan unit has a small “insertable / removable indicator lamp” on its right side to indicate the power status of the fan. Petitioner’s position is simply incorrect. Many electrical devices have indicator lamps to show the operational status of the device, for example battery chargers, hard disk drives, and washing machines, to name a few. We do not call them “illumination battery chargers”, “illumination disk drives”, or “illumination washing machines”, merely because they have one or more status lights on them. It would be clear to a POSITA that the sole function of the indicator lamp in Tsuji is to assist in performing a hot-swapping procedure, by confirming the power status of a fan (i.e., whether one or two power cables are plugged in, in which case the lamp respectively indicates yellow or green). The indicator lamp does not fulfill any

aesthetic function as an illumination fan would be expected to do, and indeed is not even visible except on the rightmost fan, since all the other fans in the serial connection would have the lamp covered up by their neighbors on the right. In fact, the indicator lamp is not even an essential component for practicing the Tsuji invention. Tsuji Figures 8-11 depict various steps in the hot-swapping procedure, none of which even show the indicator lamp. The flowchart in Tsuji Figure 20 makes it clear that the indicator lamp is not an essential part of the hot-swapping process; it merely provides additional assurance that power cables A/B have been correctly installed. The hot swap procedure could be successfully performed without referring at all to the indicator lamp. Tsuji apparently felt that the role of the indicator lamp is sufficiently non-essential to the invention that none of Tsuji's 9 claims mention it. Nor is the indicator lamp mentioned in any of Tsuji's 20 "Supplementary Notes", which are written in a form that suggests they were intended as additional potential claims.

41. The use of the phrase "insertable / removable" modifying every use of the phrase "indicator lamp" provides still further evidence that the lamp is not viewed as an essential component of the Tsuji invention. Tsuji does not explain the reasons why the indicator lamp should be insertable / removable, but given the excellent reliability of LED lamps at the time, it would be highly unusual for a fan designer to add cost and complexity by making the lamp replaceable merely because

of a concern that the lamp might burn out; in such an unlikely event, the relatively inexpensive fan unit could simply be tossed. My opinion is that Tsuji specified “insertable / removable” because the lamp is in fact intended to be inserted and removed by maintenance personnel during the hot-swapping operation. It does not need to be present on any fan during normal operation, even on the right-most fan. When installed, the lamp probably protrudes from the right side, since a flush-mounted or recessed lamp would be very difficult to be “removable”; thus, it would preferably not be installed in any of the interior fans, unless sufficient clearance was designed between adjacent fans so that the protruding lamp does not smash against its right-hand neighboring fan unit (which doesn’t appear to be the case in Tsuji’s Figure 6, as it depicts the neighboring fans as flush against each other). The lamp may or may not remain installed on the rightmost fan during normal operation (if not, the maintenance technician would bring a lamp with him when performing a hot swap). In my opinion, the insertable / removable feature further teaches away from the idea that the Tsuji fan unit is in any sense an “illumination fan”; the indicator lamp is clearly intended to be viewed only on the right-most fan during a hot-swap operation, and it does not need to be installed at all at any other times.

42. In the event that Tsuji and Huang are deemed to be “analogous art” (which I dispute, as discussed previously), there are still multiple defects in Petitioner’s arguments in Ground 1 as they pertain to independent Claim 1 of the

'336 patent, which I will now analyze in detail using the same notation and organization as in Petitioner's IPR petition (hereafter "IPR") beginning with Petition, p. 24.

ii. LIMITATIONS THAT ARE NOT MET

43. In my opinion, the preamble of claim 1, "[a]n illumination fan connectable with at least one illumination fan for a computer", to the extent it is limiting is not met by either Tsuji nor the combination of Tsuji and Huang. As discussed at length in the preceding paragraphs, Tsuji is not an illumination fan by any reasonable POSITA's interpretation. Additionally, a POSITA would not view Tsuji and Huang as analogous art, as further discussed in the preceding paragraphs. So Petitioner's analysis therefore fails immediately due to these factors. Even if one (incorrectly) accepts Petitioner's positions that Tsuji and Huang are analogous art and that Tsuji discloses an illumination fan, I disagree with Petitioner's assertion [IPR, p.29] that "a PHOSITA would have a good reason (e.g., larger, more uniform illumination)" to pursue this combination. As explained previously, the sole purpose of the indicator lamp on the right side of a fan unit is to assist in the hot-swapping of a failed fan unit by verifying the powered-up status of a new fan that is being inserted. There is no advantage to the maintenance technician in making this lamp larger or with more uniform illumination than a standard LED indicator lamp normally provides. To do so would require adding extra circuitry and/or light

diffusers, which increases fan unit cost, power consumption, and heat dissipation, all undesirable properties in a large-scale backbone server. Petitioner's arguments should fail just at this step without need for further discussion.

44. In my opinion, the limitation 1[b], “an illumination area on at least two sides of the fan at top of the body”, is not met by either Tsuji nor the combination of Tsuji and Huang. In all of Tsuji's preferred embodiments, the only illumination comes from a single “insertable / removable indicator lamp” on the “right side surface when viewed from the front surface” of each fan unit body [Tsuji 0040]. To a POSITA reading the '336 patent, “top of the body” clearly means that frontal portion of the body when viewing along the fan's axis of rotation. The '336 illumination areas are clearly shown and labeled as “3” in all the preferred embodiments ('336 patent Figures 1-5), and they are located on two different sides of the fan, both at “top of the body”. In stark contrast, Tsuji teaches that the single indicator lamp is located on the “*right* side surface when viewed from the front surface”. This location is clearly not at “top of the body”; rather, using the claim language of the '336 patent, such an indicator lamp would be described as being on the right “side of the body”, which is where Tsuji requires the lamp to be located. The only figure in Tsuji depicting the indicator lamp is Fig. 7(A), and the lamp's position is depicted as low on the right side of the fan unit between the front and rear faces, hence nowhere near the “top of the body” (i.e., nowhere near the front face),

and certainly not providing illumination for the front of the body. Thus, Petitioner's assertion that "Tsuji teaches an indicator lamp 12 on the side surface of the fan at the top of the body" is false and misleading. [IPR p. 31]

45. In Tsuji's words: "[b]ecause 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". [Tsuji ¶ 0040]. Thus Tsuji locates the indicator lamp on the "right side surface" of the fan unit, because the rest of the fan body is expected to be mostly if not entirely concealed by the server's case, as a POSITA would have understood.

46. Therefore, Tsuji teaches away from placing any type of illumination at the "top of the body" (as this term would be construed by a POSITA in the '336 patent), and instead teaches that the sole illumination (an indicator lamp) shall be placed on a "side of the body" (as this term is understood in the '336 patent). This is also further evidence that Tsuji's fan units were never contemplated nor intended to act as illumination fans, which are generally designed to provide significant frontal illumination, so there would be no motivation to combine with Huang.

47. Petitioner claims that it would have been obvious to place an additional lamp on a second side [IPR pp. 31-32] to be located on "two sides of the fan". But there would be no motivation for a POSITA to do this because it would increase cost

and generate more heat for no benefit. That is, Tsuji teaches away from this modification proposed by Petitioner, which also would not cure the fundamental defect that the proposed lamps would still be placed on the sides of the body, as taught by Tsuji to facilitate maintenance from the side(s). Hence, neither lamp would be located at “top of the body”, as required in the ’336 claim language, and there would be no motivation to add illumination at top of the body.

48. Petitioner incorrectly states that “Tsuji already teaches that it may be beneficial to have the indicator lamp visible from an additional location as the fans are connected during hot-swaps”, citing Tsuji [¶ 0135-0136] and Figures 8-12 (illustrating an embodiment using an external panel display) [IPR p. 32]. In reality, [¶0135-0136] in Tsuji are silent as to making the indicator lamp visible at additional locations. As for Figures 8-12, the only additional illumination depicted is a “8: Fan Fault External Display Panel” which is intended to be located at the front of the server rack, *not* on the fan body at all, so that the current position of a faulty fan can be immediately identified (a useful feature, as it allows the maintenance technician to follow the location of the faulty fan as it is pushed step by step from right to left in a series of hot swaps, until it is ejected). The intended function of the “Fan Fault External Display Panel” is also different from the indicator lamp on individual fan units, as can be understood from reading the Tsuji patent and reviewing the system diagram in Figure 12. The function of a fan unit indicator lamp is to indicate whether

one or two power cables A/B are connected during a hot swap (displaying yellow or green, respectively). In contrast, the function of the Fan Fault External Display Panel is to display whether a particular fan has failed. So, the Fan Fault External Display Panel is not providing an additional location for viewing the fan indicator lamp(s); it is instead acting as an entirely different display giving entirely different information. Petitioner appears to have misunderstood this fundamental distinction.

49. For all the above reasons, Petitioner’s arguments have failed to justify why a POSITA would consider or be motivated to modify Tsuji to create an illumination area “on at least two sides at top of the body”, something that would add cost, complexity, power consumption, and heat, for no apparent benefit. Petitioner’s arguments should fail at this step (if not earlier) without need for further discussion. Nevertheless, I continue:

50. In my opinion, the limitation 1[c], “a power socket and a first connector on one side of the body, and a second connector on another side of the body”, is not taught by Tsuji nor the combination of Tsuji and Huang. Petitioner identifies connectors CNA and CNB in each fan unit of Tsuji as being “power sockets” [IPR p.35]. However, neither CNA nor CNB is on a “side of the body”, as a POSITA would have interpreted the ’336 patent. An explanation follows immediately below.

51. In the ’336 patent, it is clear from the specification and associated figures that each fan body has an approximately square profile when viewed from

the front (i.e., viewing along the axis of fan rotation, so that the viewer is facing the illumination areas), and so has 4 sides, as well as a “top of the body” (containing the illumination area) and an opposite face which we might call the rear or “bottom” of the body (the ’336 patent does not name this bottom face, but its existence is apparent). In one or more of the ’336 patent’s embodiments, the power socket and first connector are located on one side of the body, and a second connector is located on another side of the body.

52. In contrast, applying the same interpretation of “side of the body” and “top of the body” to the Tsuji publication, it is apparent that connector CNA is located on the *top* (i.e., the front) of the fan body, not on a *side* of the fan body as required by claim 1 of the ’336 patent. This is evident from Figs. 7A and 7B in Tsuji, and is also evident from a close reading of paragraph [0039] in Tsuji, which states that “The connector CNA on one side is arranged on a lower part of the front surface of each fan”, and furthermore that “The connector CNB on the other side is arranged on an upper part of the rear surface of each fan unit...”. Note that Tsuji is using the phrases “one side” and “other side” to refer to the front and rear surfaces of the fan unit. This is different from the ’336 patent’s use of the word “side” in each embodiment’s “side of the body”, wherein the “side of the body” in the embodiments means one of the major faces or surfaces (there are four such faces in the preferred embodiments shown) bounding the fan body that are perpendicular to

the front and rear faces of the fan body. Tsuji’s “front surface” is equivalent to “top of the body” in the claim language of the ‘336 patent. Yet Petitioner makes the misleading claim that “Tsuji teaches a power socket and a first connector on one side of the body” (IPR, p.32, last line, or Petitioner’s Ex. 1004, i.e., the Wolfe declaration, ¶ 73). This appears to be an attempt to confuse the reader by taking advantage of the fact that the translation of Tsuji used the word “side” in describing the location of connectors CNA and CNB, but without including Tsuji’s additional explanatory language which makes it clear that the “front side” or “front surface” in this context is referring to the front or rear surfaces, not one of the “sides of the body” in the ’336 patent context, which are in fact perpendicular to the front and rear surfaces in the embodiments.

53. As discussed, a foundational purpose of Tsuji’s invention is to “enable hot swapping of one fan unit”, a goal Tsuji reiterates numerous times. *See id.* At Cl. 3 (“[T]he plurality of fan units is configured so as to enable hot swapping of one fan unit among the plurality of fan units ...”); [0002] (“[A]n ability to perform hot maintenance and swapping while maintaining a system operational state (energized state) is desirable”); [0008]-[0009] (“[Summary of the Invention] ... An object of the present invention is to provide an electronic device capable of assigning to each fan unit an address associated with a position of each fan unit even when the fan unit is swapped”); [0041] (“Therefore, fan unit 10 can be hot-swapped without having

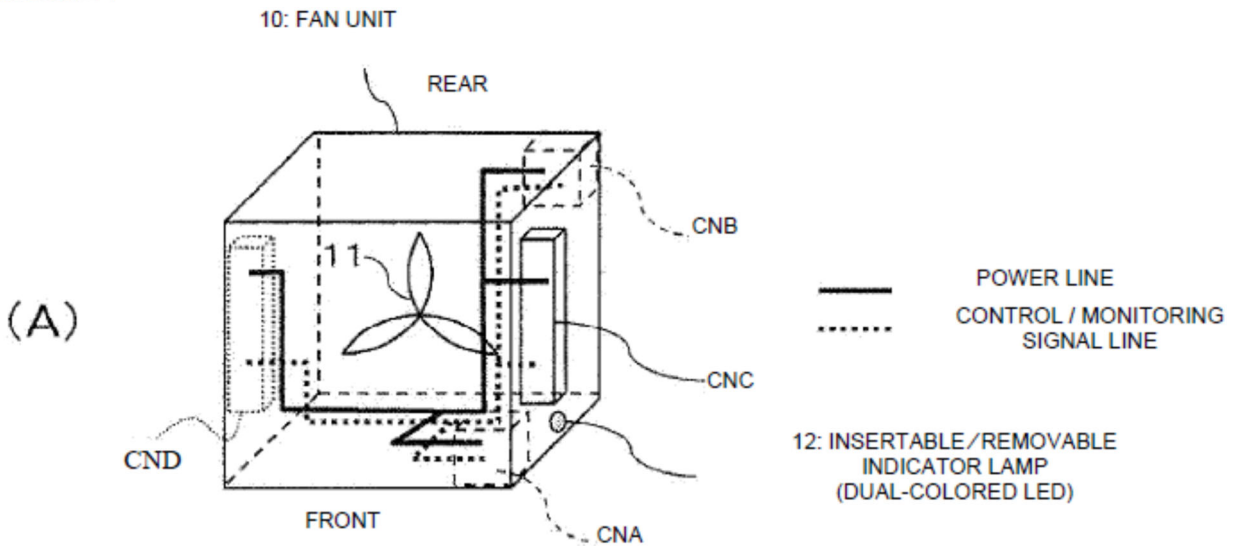
to stop the system ...”). Indeed, Tsuji’s emphasis on “hot swap”—mentioned no fewer than 55 times throughout the patent—underscores its central importance to the invention.

54. As also discussed above, for Tsuji’s hot-swapping to work, each fan unit must maintain at least two power sockets to ensure continuous power during a swap. This dual-socket configuration is crucial: when one power cable is disconnected from one power socket during maintenance, the second power cable connected to the second power socket maintains uninterrupted power. Tsuji’s procedural description further illustrates this necessity:

[0040] Furthermore, as shown in FIG. 7A [reproduced below], 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).

FIGURE 7

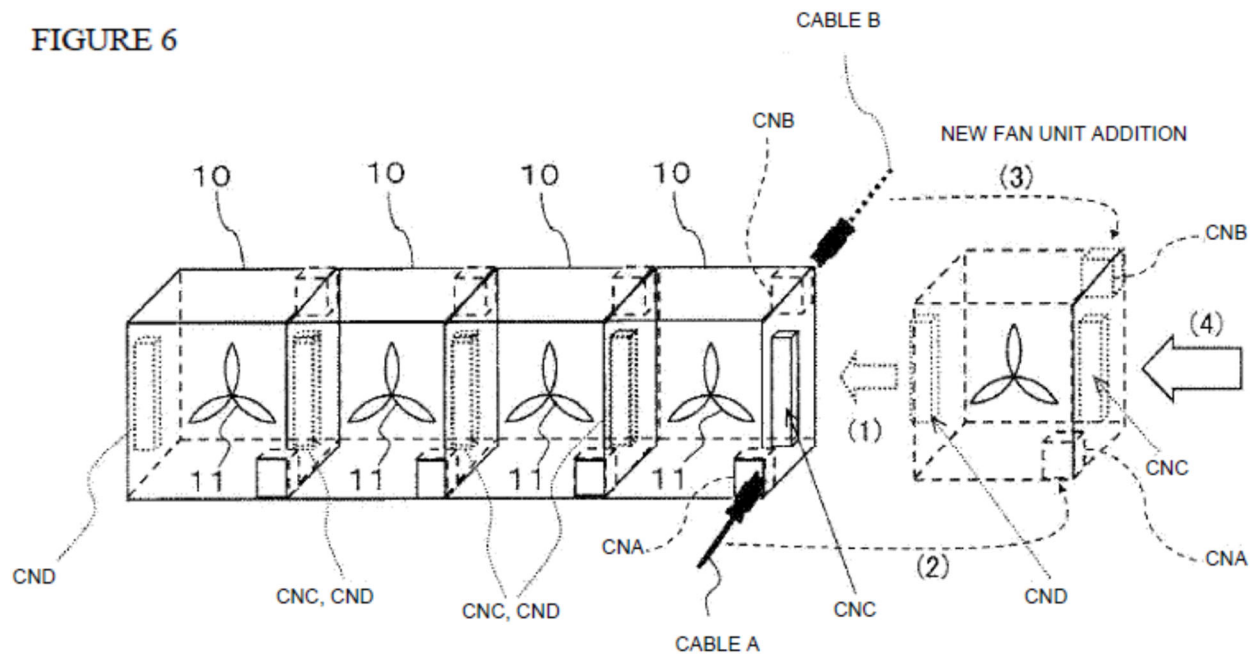


[0041] The power is supplied to the serially-connected plurality of fan units 10 from the power supplying unit 2 via the cables A and B and the connectors CNA, CNB, CNC, and CND explained above in a sequence. Moreover, the management unit 7 (I2C master; refer to FIGS. 8 to 13) and the fan controllers 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).

[0042] Next, *the hot-swapping procedure of fan unit 10 according to the present embodiment will be explained while referring to FIG. 6 [reproduced below]*. Here, an operation performed by the maintenance person when adding a new fan unit 10 on one side (right side) and sliding the already installed fan unit 10 in server 1 to push out fan unit 10 on the other end (left side) is explained. 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.

FIGURE 6

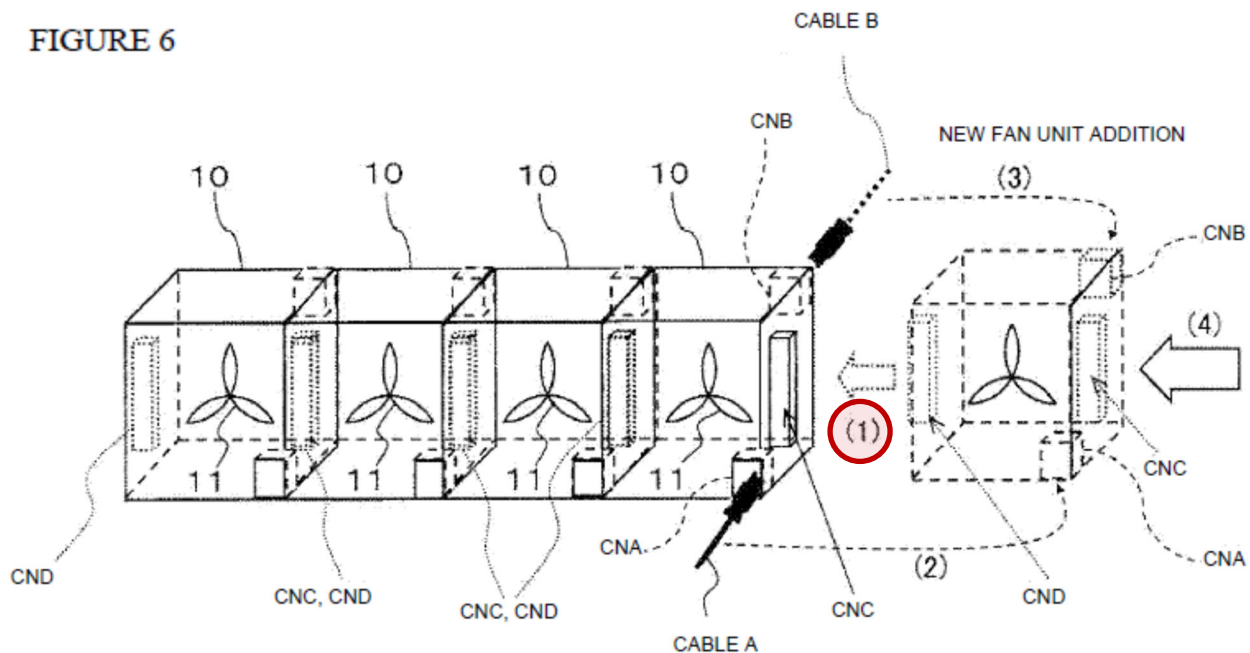


[0043] At this time, the maintenance person confirms that the insertable / removable indicator lamp 12 provided on the right side of fan unit 10 arranged on the right-most side among the already installed fan units 10 inside server 1 is in the green color state. In other words, the

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.

[0044] 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.*

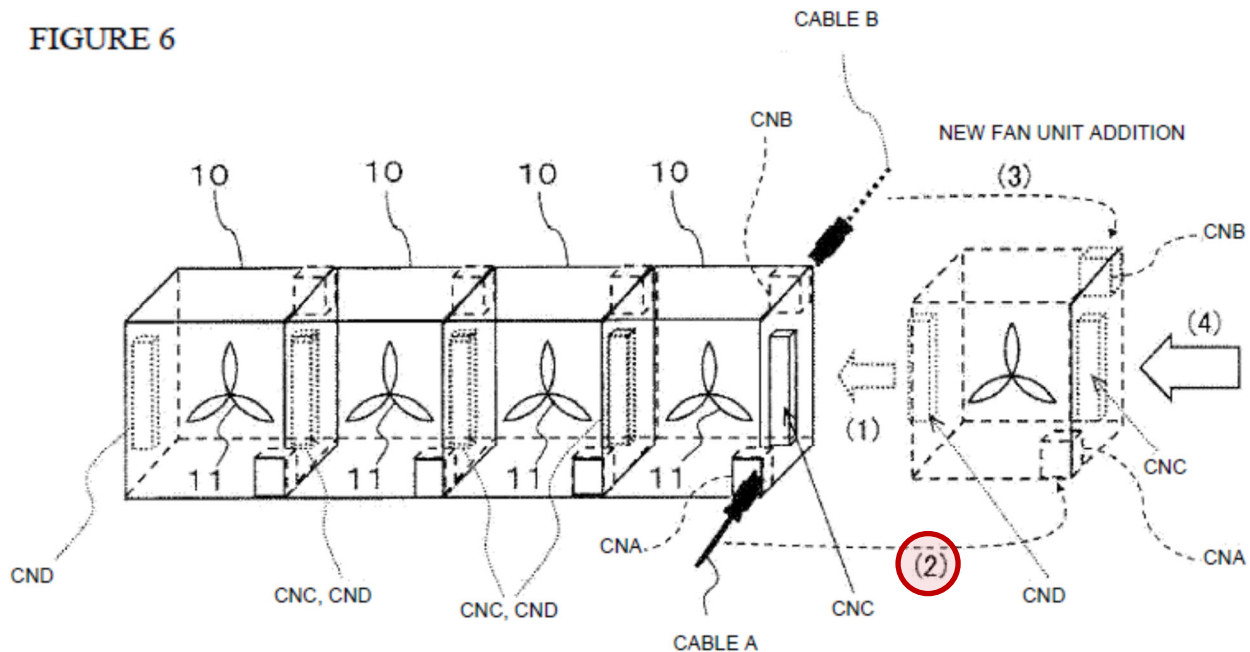
FIGURE 6



[0045] *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*

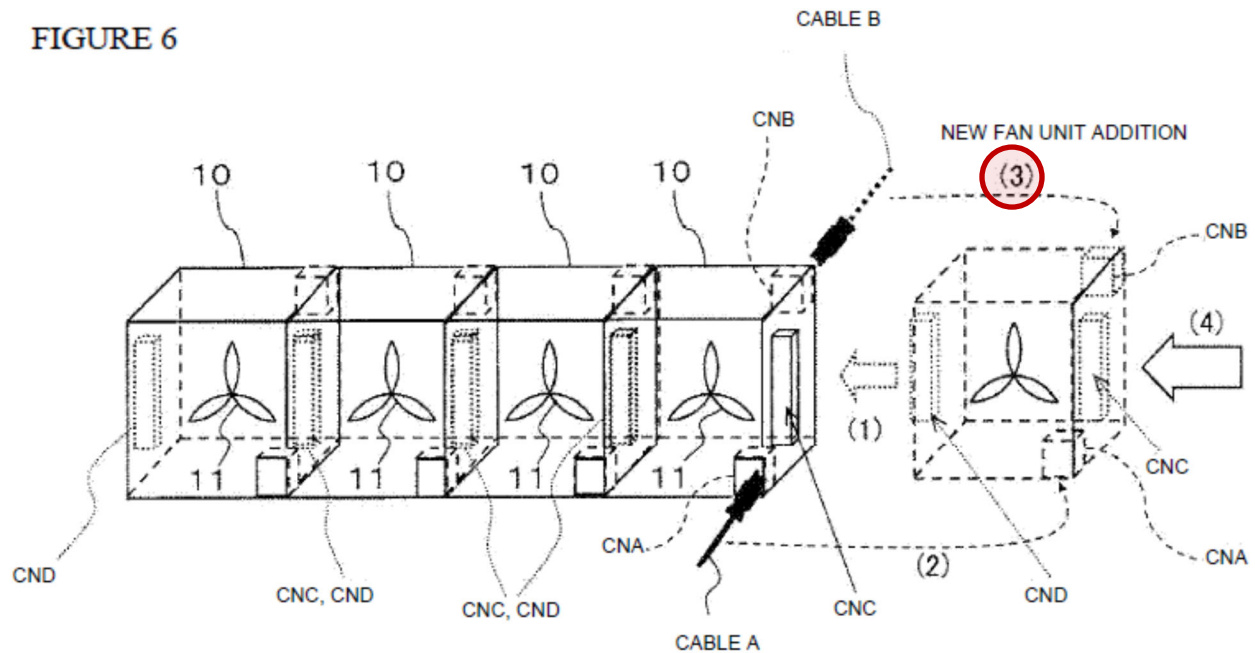
from the green color state to the yellow color state when the cable A is removed, and switches back to the green color when the cable A is connected to the connector CNA of the new fan unit 10.

FIGURE 6



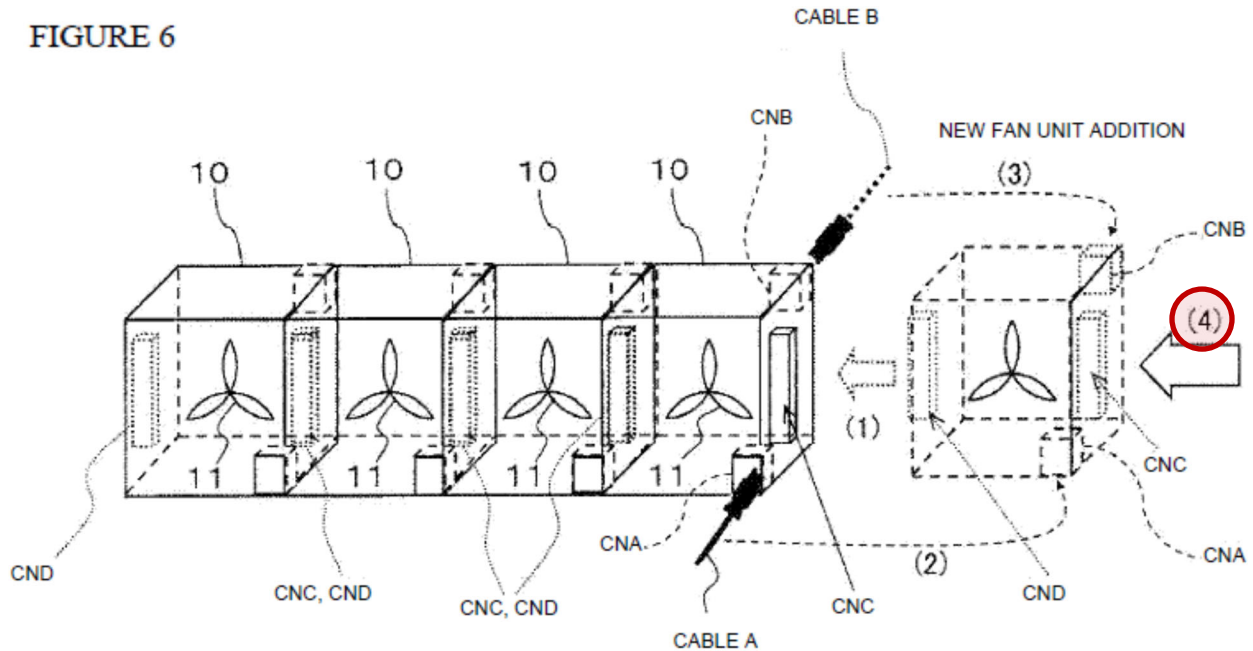
[0046] *Furthermore, the maintenance person removes the cable B that is connected to the connector CNB of fan unit 10 on the right-most side, and connects the same to the connector CNB of the additionally- linked new fan unit 10, as shown by Arrow (3) of FIG. 6. Even at this step, the insertable / removable indicator lamp 12 switches from the green color state to the yellow color state when the cable B is removed, and switches back to the green color when the cable B is connected to the connector CNB of the new fan unit 10.*

FIGURE 6



[0047] Subsequently, the maintenance person performs the sliding operation to move all five fan units 10 in which the new fan unit 10 is added on the right-most side in a direction of the Arrow (4) (left side) shown in FIG. 6. Accordingly, the new fan unit 10 is pushed inside server 1, and a fifth fan unit 10 from the right (left-most side) is pushed outside from server 1.

FIGURE 6



[0048] At this time, when the pushed-out fan unit 10 is a faulty fan unit to be swapped (target fan unit), the pushed out fan unit 10 is removed, and the swapping operation is completed. When the pushed-out fan unit 10 is not the target fan unit, the maintenance person adds and connects that pushed-out fan unit 10 on the right-most side and pushes thereof inside server 1 as the new fan unit 10 as explained above. The maintenance person repeats such an operation till the target fan unit is pushed out.

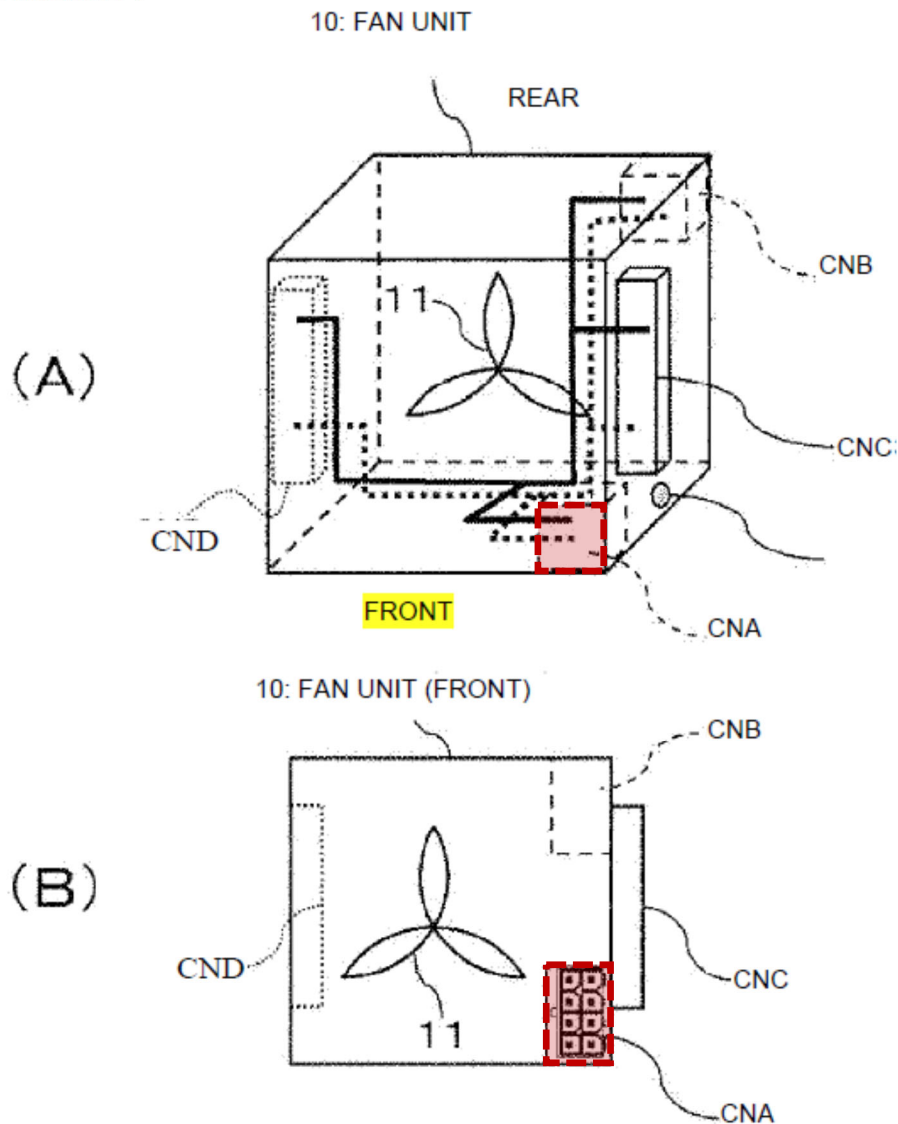
[0049] In such a way, a specific fan unit among the serially-connected four fan units 10 (faulty fan unit) can be swapped with a new fan unit 10 without stopping the power supply to fan unit 10. Accordingly, swapping of fan unit 10 in a state in which rotation of the cooling fan 11 provided in each fan unit 10 is maintained as is, that is, swapping of fan unit 10 in the hot state can be performed.

55. In my opinion, Tsuji alone or in view of Huang does not render any claims Obvious. Petitioner maps a connector CNC in the Tsuji patent as the “first connector” in the ’336 claim language. Tsuji explains that “connector CNC (male) ... is provided by protruding on the right side surface when viewed from a front surface of each fan unit 10”. [Tsuji ¶ 0038] In the language of the ’336 patent, connector CNC would indeed be considered as being “on one side of the body”. However, by glossing over the fact that Tsuji and the ’336 patent used the word “side” in two entirely different meanings (as recently explained above), Petitioner is attempting to promulgate the fiction that Tsuji embodies the claim limitation “a power socket and a first connector on one side of the body”. But for this to be true, the power socket and first connector would both need to be on the same side of the body. They are obviously not on the same sides, despite Petitioner’s attempt to label them as such in colored annotations of Tsuji’s Figures 6 and 7.

CABLE B



FIGURE 7



56. Petitioner identifies connector CNC as being the “first connector”, and connectors CNA and CNB are each labeled as a “power socket”. But it is unequivocal from the figures 6 and 7 (reproduced and annotated above) that connector CNA is mounted on a surface facing the reader (Tsuji’s “front surface”, which is equivalent to the ’336 patent’s “top of the body”), connector CNC is mounted on a surface facing to the right (Tsuji’s “right side surface” or “end side”,

and the '336 patent's "side of the body"), and connector CNB is mounted on a surface facing away from the reader (Tsuji's "rear surface" and what would be considered the "bottom of the body" in the '336 patent, though that term is never used). So, in both figures and text, Tsuji actually teaches away from having a power socket(s) and another connector being on the same side of the fan unit.

57. Claim 1 of the '336 patent requires, *inter alia*, "a power socket and a first connector on one side of the body." Petitioner appears to have misunderstood this limitation to mean that **only** the "first connector" need be on the "one side of the body" but not the "power socket." But claim 1 also recites that "the power socket [is] on **the** one side of the body," making clear that the "power socket" and the "first connector" must be located on the **same** "one side of the body" of the claimed illumination fan. ***This misunderstanding by Petitioner is a fatal flaw throughout the entire Petition,*** based on which alone the Board should decline institution, as explained in more detail below. Specifically, as shown in Fig. 1 of the '336 patent, the power socket **4** and the first connector **5** are located on the **same** side of the body of the illumination fan.

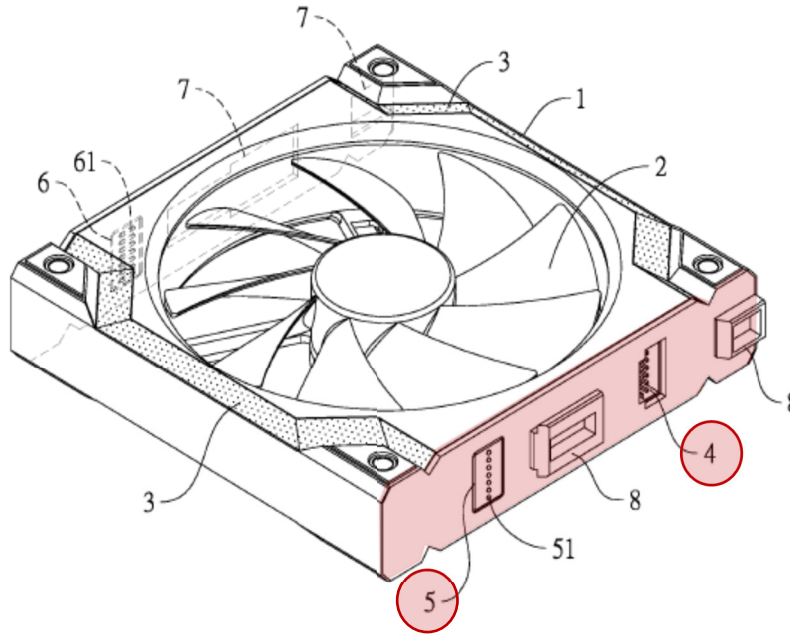


Fig. 1

(Ex-1001 at Fig. 1).

58. This feature is expressly required by claim 1, which recites “**a power socket and a first connector on one side of the body,**” *i.e.*, with both being on the same side of the body. This requirement is consistent with Petitioner’s own claim construction position taken in the district court litigation, in which Petitioner proposed that this claim limitation be construed to require the “power socket” and the “first connector” to be “both directly accessible and *placed on the same side* of the fan housing.” Ex-2003 at 4. Further, in contrast to the illumination area **3** located at the top of the body, the power socket **4** and the first connector **5** are *not* located at the top of the body because they are located on the side of the body.

59. Petitioner has mapped Tsuji's power connector CNA or CNB as the alleged "power socket." However, as acknowledged by Petitioner, Figure 6 of Tsuji illustrates the alleged power socket (CNA or CNB) on the "front" (equivalent to the "top" of the illumination fan body in '336 patent's Fig. 1 embodiment) or the "rear" (equivalent to the bottom of the illumination fan body in '336 patent's Fig. 1 embodiment), while the alleged first connector (CNC) is positioned on a separate "side." This arrangement in Tsuji does not read on the structure required by claim 1. Petitioner's own figures and analysis demonstrate that the CNA or CNB connector (the alleged "**power socket**") is, respectively, located on the "front" or the "rear" of the fan unit, while CNC connector (the alleged "first connector") is positioned on a separate side of the fan unit:

FIGURE 6

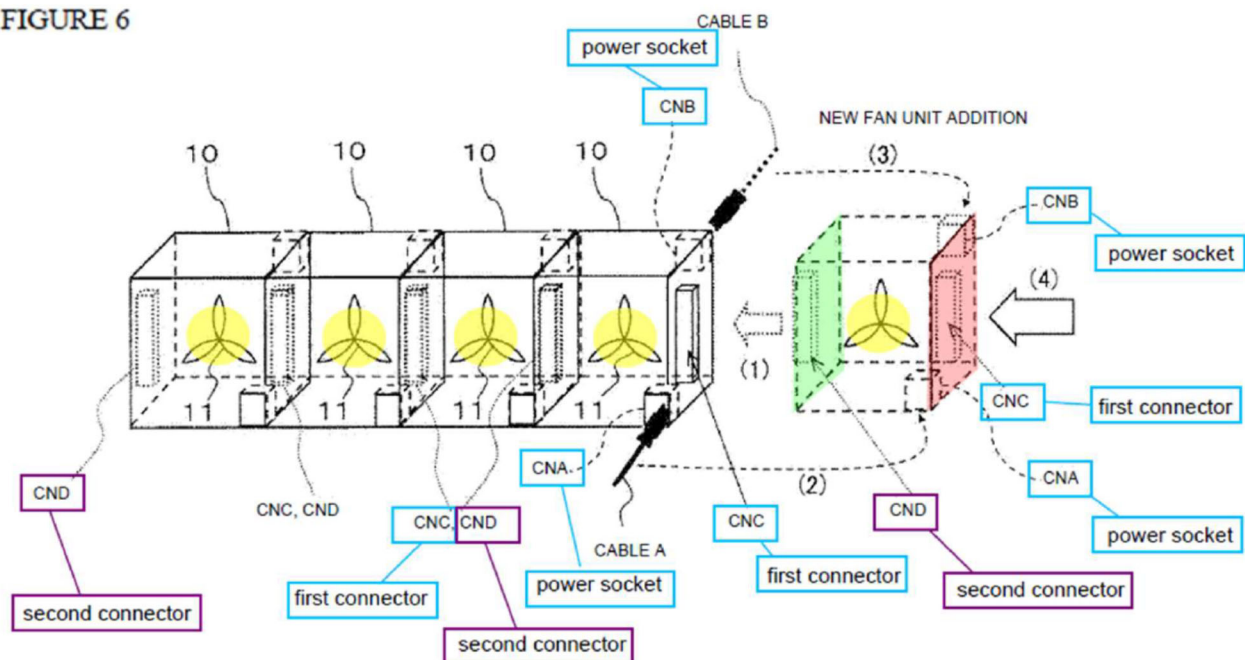
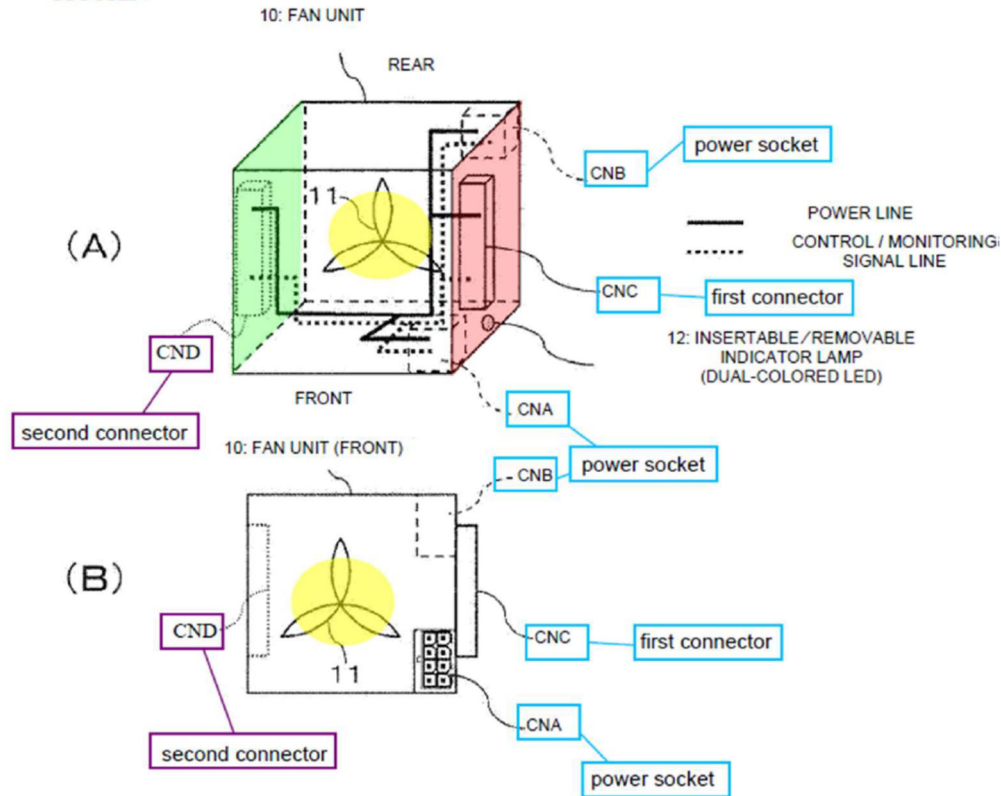


FIGURE 7

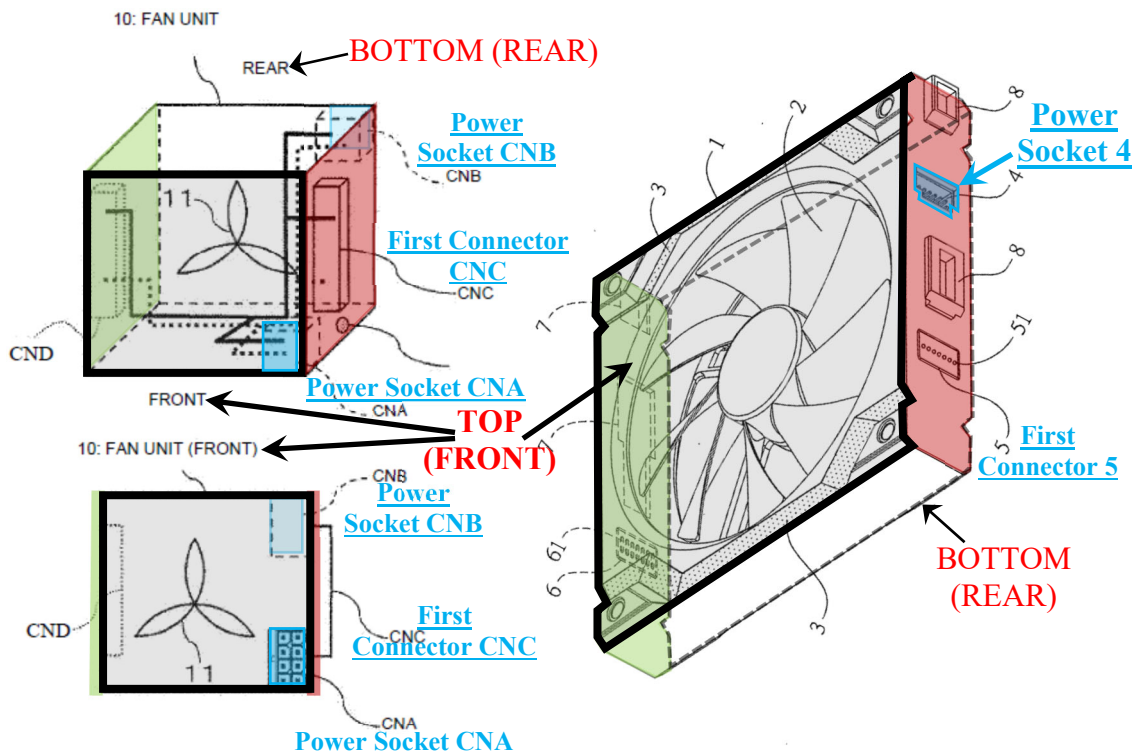


Petition at 34 (annotating Figs. 6-7 of Tsuji). In fact, Petitioner does not even allege – let alone attempt to demonstrate – that the CNA or CNB power connector (the alleged “**power socket**”) is on the same side of the body as that the CNC connector (the alleged “**first connector**”). Petition, at 35. Petitioner’s analysis of the “**on one side of the body**” limitation, in fact, only mentions the CNC connector and does not say anything about CNA/CNB.

60. In fact, Petitioner does not even allege – let alone attempt to demonstrate – that the CNA or CNB power connector (the alleged “**power socket**”) is on the same side of the body as that the CNC connector (the alleged “**first connector**”). Petition, at 35. Petitioner’s analysis of the “**on one side of the body**”

limitation, in fact, only mentions the CNC connector and does not say anything about CNA/CNB. *Id.*

61. To further clarify, the arrangement of connectors in Tsuji shown below directly contradicts the structure required by the '336 patent:



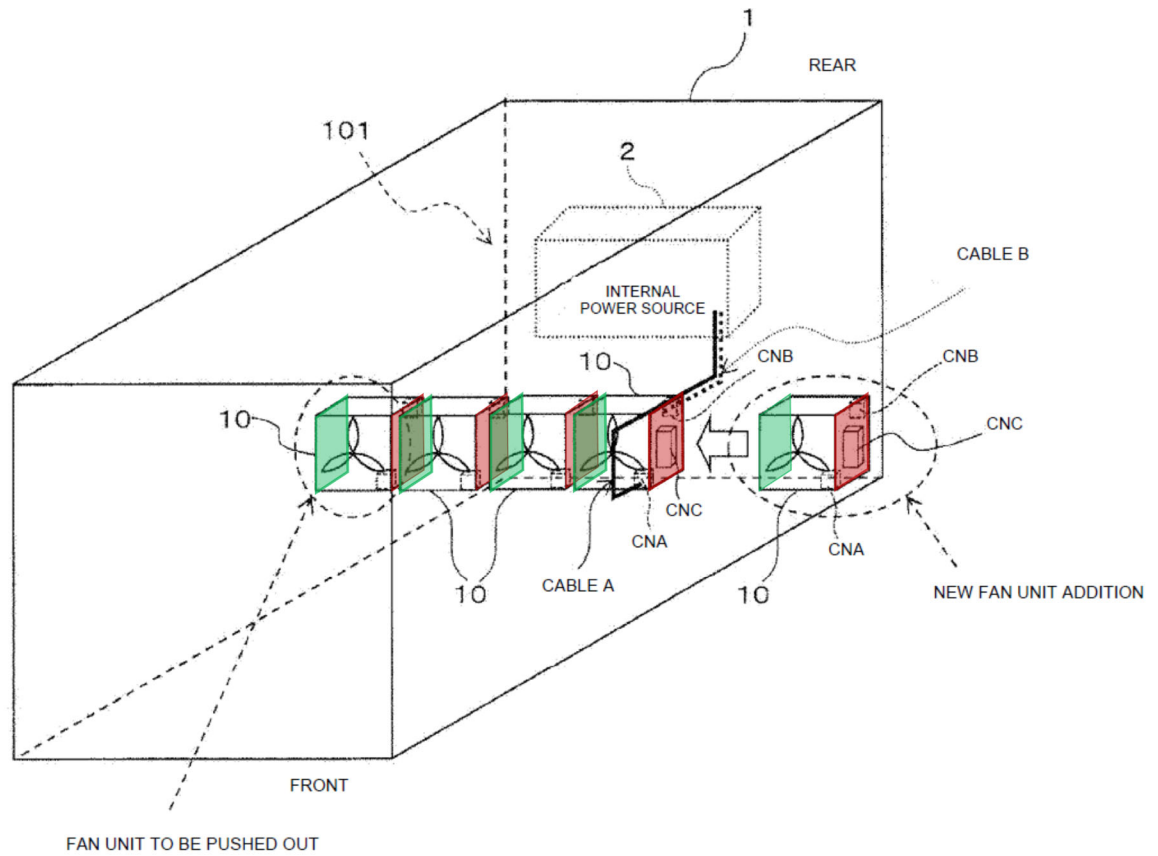
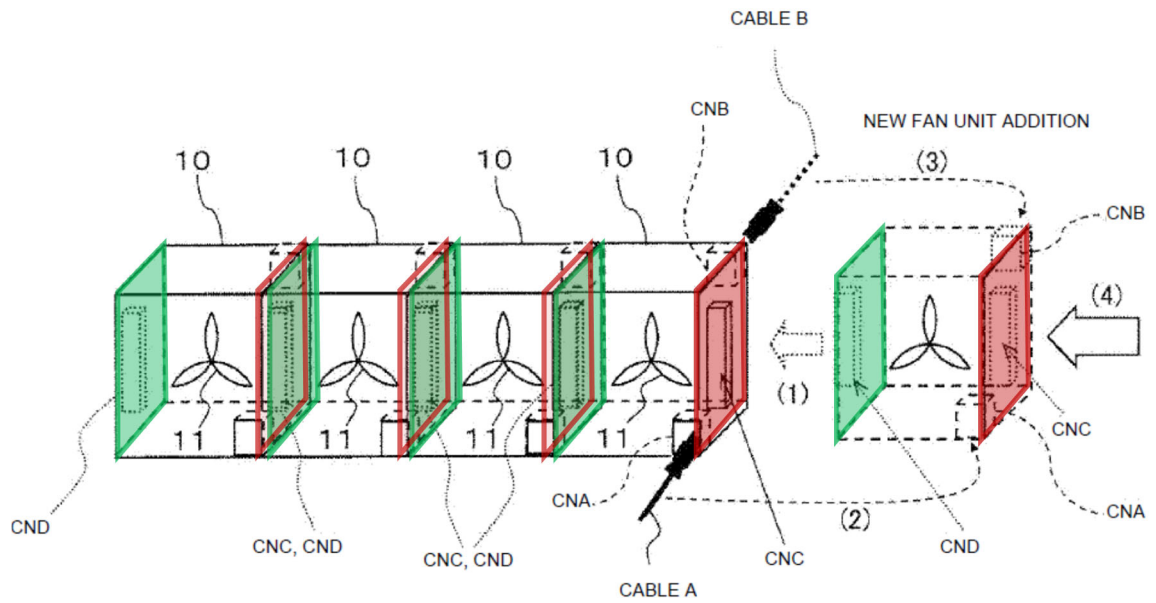
Compare Ex-1007 (FIGURE 7 of Tsuji, alleged “Power Socket”) with '336 pat. (FIG. 1 (rotated), “Power Socket 4”) (annotated).

62. The diagram above depicts a comparison between (1) on the left, a portion of Figure 7 from Tsuji showing the location of the connectors that Petitioner maps to the claimed the “**power socket**” (*i.e.* CNA/CNB) and (2) on the right, Figure 1 of the '336 patent depicting the location of the claimed power socket on the same

side of the body as that the first connector is on. As can be seen further above in Figures 6 and 7 of Tsuji as annotated by Petitioner, the connectors that Petitioner has mapped to the claimed “**power socket**” (CNA/CNB) are not located on the same side of the body as the connector that Petitioner mapped to the claimed “**first connector**” (CNC). Instead, as shown, the CNA structure is located on the equivalent “top” (front) whereas the CNB structure is located on the equivalent bottom (rear) of the fan unit. Because neither CNA nor CNB is located on the same side of the fan unit as where CNC is, Tsuji fails to disclose “a power socket *and* a first connector *on one side of the body*”, as recited in claim 1.

63. An astute reader might now say, “well, OK, Petitioner did use misleading language, and it’s now evident that the power socket and first connector are not on the same side of the body. But surely it would be obvious to a POSITA that one could move them onto the same side as a matter of design choice, right?” *Actually, no – because this proposed arrangement would be impossible.* The way the hot-swap process works, one must first connect a new fan unit to the right of the rightmost existing fan unit (mating connector CND of the new fan unit to connector CNC of the existing fan unit). This connection is done while “connectors CNA and CNB of the fan unit on the right-most side are connected to the cables A and B, respectively” [Tsuji ¶ 0042]. In other words, the power cables A and B initially remain plugged into the pre-existing right-most fan while the new fan is attached; if

both cables were removed, then all the fans would shut down, which could overheat the server. Leaving the cables attached would not be possible if either CNA or CNB was on the same side as connector CNC; the cable would be squashed when the two fans are plugged together, as is evident from inspection of Tsuji's Figures 5 and 6 below.



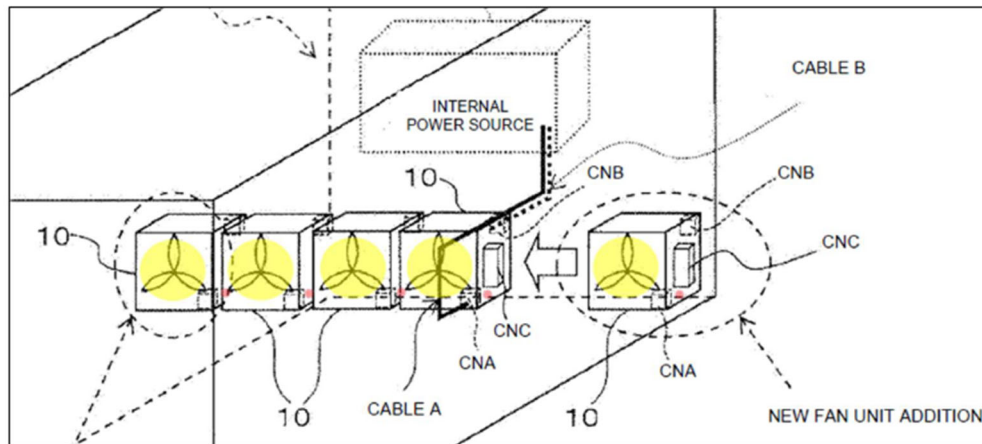
64. Indeed, the hot-swap procedure requires that one remove the two cables, one at a time, on the fan that is now in second position after a new fan has been attached on **the** right, so that they can be re-connected one at a time to the new right-most fan. And if the CNA and CNB are located on the same “side” as that CNC is located on, cables A and B will be jammed between the fans, making the serial removal of them, and hence the required “hot-swapping”, rendered impossible.

65. Tsuji’s entire hot-swapping concept relies on the physical necessity that connectors CNA and CNB (which Petitioner maps as power sockets) not be located on the same side as connector CNC (aka the “first connector” in Petitioner’s argument). *Tsuji therefore teaches away from the power socket and first connector being on the same side of the body*, as his concept cannot be implemented in such a configuration. Tsuji cannot be modified to comport with the above claim limitation. And, Huang cannot cure Tsuji’s deficiency because Petitioner uses Huang for the illumination area related limitations.

66. In sum, it is a physical impossibility in Tsuji’s hot-swapping scheme to have the power socket located on the same “side of the body” as that the first connector is located on as required by claim 1 of the ’336 patent.

67. Claim 1 requires an “illumination area on at least two sides of the fan **at top of the body**”. (Emphasis added.) Petitioner contends that “Tsuji teaches an

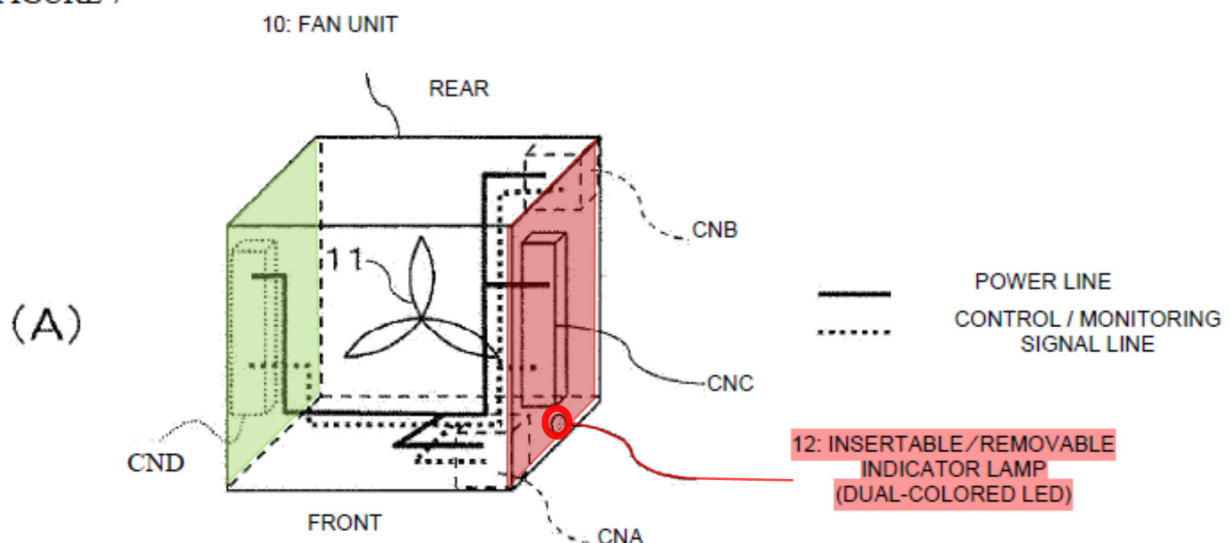
indicator lamp 12 on the side surface of the fan at the top of the body”, as purportedly illustrated below:



Petition, 31.

68. But as can be seen above and more clearly in Figure 7(A) (reproduced and annotated below), the indicator lamp 12 is not located at the “front”, or at the equivalent “top” in the ’336 patent, of the fan body:

FIGURE 7



69. Thus, Tsuji only discloses a *single* indicator lamp located on one side of the fan body, not on “at least two sides of the fan at top” of the body as required by claim 1 of the ’336 patent.

70. As can also be seen, the lamp 12 is only at one side of the fan 11, contrary to what claim 1 requires. Petitioner appears to acknowledge this deficiency by arguing that “it would have been obvious to a PHOSITA to include additional indicator lights on different sides (‘at least two sides’) of the fan body so that they can be viewed from multiple perspectives”. Petition, 32. Petitioner’s obviousness overlooks the many reasons a POSITA would have been discouraged to modify the Tsuji fan unit in the manner suggested, as the inclusion of more lamps would have conveyed no benefit and would only have added costs and energy consumption generation that a POSITA would have strived to avoid.

71. Thus, Tsuji fails to disclose “illumination area on at least two sides of the fan at top of the body” in claim 1 of the ’336 patent, and Tsuji does not render Claim 1 or any dependent claims of the ’336 patent obvious.

72. Petitioner incorrectly argues that a POSITA would be motivated to combine Tsuji’s server fan with the light-emitting assembly disclosed in Huang to create the illumination fan of the ’336 patent. However, no reasonable motivation exists from either an economic or technical perspective.

73. Tsuji’s purpose is explicitly directed to cooling fans designed for use in server rooms or casings. *See, e.g.*, Tsuji, [0002] (“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.”) Notably, the word “server” is referenced about 95 times throughout Tsuji, underscoring the highly specific enclosed server room application for this design. A POSITA would understand that server rooms and server casings are non-transparent, making internal illumination irrelevant in such settings. Indeed, Tsuji acknowledges as much, noting that only the outermost side of the fan unit may be visible to maintenance personnel when it is positioned at the edge of the server casing. *See, e.g., id.* at [0004] (“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.”)

74. From an economic perspective, incorporating illumination within a server fan would add unnecessary cost without delivering any benefit, as the light would be obscured or not visible from outside the server casing. A POSITA would understand that installing a lighting assembly solely for an enclosed environment where illumination would go unseen provides no value.

75. Adding lighting to a server room fan would also generate unnecessary heat, which is counterproductive to Tsuji's primary goal of cooling. Any additional heat from an illumination assembly would compromise the fan's cooling efficacy, directly contradicting Tsuji's core goal.

76. Accordingly, a POSITA would not have been motivated to combine Tsuji's server fan with Huang's illumination features, as doing so would impose unnecessary cost and run counter to Tsuji's technical objectives.

b. GROUND 4

77. Petitioner contends that Lai, alone or in view of Hasegawa, teaches or suggests each and every limitation of Claims 1-2 in the '336 patent, and therefore renders those claims obvious. I disagree. As discussed previously, I will only consider independent Claim 1 in my rebuttal.

i. OVERVIEW OF PRIOR ART

78. Before examining Petitioner's arguments in detail, I will first make some general comments on the Lai disclosure that the reader should be made aware of. Lai is a brief patent application that describes a method for connecting and controlling multiple LED fans simultaneously from a single controller, by using a serial (daisy-chained) configuration and a *one-wire* control bus. Lai's disclosure suffers from several defects. First, it appears that Figures 4 and 5 are incorrectly labeled, i.e., the references in the specification text to Figure 4 actually describe the

figure labeled as “FIG. 5” (depicting “addressable” RGB LEDs, labeled as 16; these contain built-in driver ICs), and the references to Figure 5 actually describe the figure labeled as “FIG. 4” (depicting RGB LEDs labeled as 11 connected to separate driver ICs labeled as 14). Second, the circuit schematic in Figure 2, which is identified as an LED fan that incorporates the addressable LEDs labeled as 16 (i.e., having built-in drivers) shows an “input” 111 and “output” 112, each having 6 input and output points, respectively, but none of these points are labeled, and none of the three system schematics (Figs. 4-6) comport with those counts of input and output points. Specifically, the figure labeled as FIG. 5 (but which appears to be described in the specification text as FIG. 4) is the only one containing addressable LEDs 16, and it shows 7 inputs and 6 outputs from each fan (not 6 inputs). Nor do any of the other figures show a configuration of 6 inputs and outputs as depicted in FIG. 2. An additional defect in Figs. 4-6 is that they do not explicitly show the motor power supply (voltage and ground) lines as connecting through from the input to the output, in contrast to the LED power supply lines which are drawn as connecting through. One has to infer that the motor supply lines do in fact connect, otherwise only the first fan in the daisy chain would rotate.

79. My point regarding the preceding critique is that one could argue that, with all its multiple defects, the Lai publication can be reasonably to disclose or teach anything that Petitioner attempts to argue. A POSITA might well disregard

Lai's disclosure as too illegible, error-riddled, confusing, and with items insufficiently labeled, to take advantage of its teachings. It strikes me as an unreasonable expectation that a POSITA would have been able to resolve these issues when Lai has himself not taken the trouble to describe his ideas accurately, legibly, and with a sufficiency of annotations on the schematics that a POSITA would expect and deserve when reading it.

80. In any event, I have numerous other reasons why a careful scrutiny of Lai's disclosure, with or without Hasegawa's disclosure, does not render Claim 1 of the '336 patent as obvious, and so will proceed now with that analysis. I use the same organization as the Petitioner's to discuss each claim element in turn.

ii. LIMITATIONS THAT ARE NOT MET

81. In my opinion, Lai does not disclose or teach limitation, "an illumination area on at least two sides of the fan at top of the body", nor does the combination of Lai and Hasegawa. Here Petitioner's argument has a major problem: even if we stipulate that the four discrete LEDs depicted in Lai's Figures 2 and 3 by themselves constitute an "illumination area", there is no evidence that Lai disclosed or intended that these LEDs should be located "at top of the body", and in fact Lai teaches away from locating them at the top, as will be discussed below.

82. Lai discloses the use of multiple RGB LEDs installed in each fan. The only information about how these LEDs might be positioned is provided in Figure 3,

and possibly Figure 2. However, Figure 2 is described as a “schematic view” [Lai 0006] which I understand means a circuit diagram, not a physical depiction. Four addressable RGB LEDs (labeled ‘16’) are electrically connected in a clockwise serial arrangement, with the electrical wiring starting at the input points (labeled as “111”) and progressing to the output points (labeled as “112”). The figure suggests that the preferred embodiment would place the four LEDs in roughly four equally spaced locations near the corners of the fan, but otherwise provides no information about whether the LEDs are at the top, middle, or bottom of the fan, nor their exact locations. This is to be expected, as the figure is a circuit diagram (albeit with its wiring inadequately annotated) rather than a physical model.

83. Figure 3 is described by Lai as a “planar view of an LED fan” [Lai 0007]. This is yet another example of the sloppiness of Lai’s disclosure, as it in fact depicts multiple fans and also a controller, not a single fan. Moreover, a POSITA would deem this figure as a non-planar view, not a planar view, as the terms are generally understood. (A planar view would be, for example, a top view). But it is fortunate that the view is non-planar, because it makes it clear that the LEDs (labeled “11”) are indeed attached near the corners of the fan body (as Fig. 2 also implied), and they are fixed to the inner surface of the large circular opening within which the fan blades rotate, about mid-height (or mid-depth, if one prefers the term). In other words, the LEDs are not at the “top of the body” (as this term would be

interpreted in the '336 patent, i.e., the front face of the fan body). They are not at the bottom of the body either; they are midway between. So, Lai's Figure 3 actually teaches away from the LEDs being "at top of the body", and there is nothing else in Lai's disclosure to contradict this impression.

84. While Lai is silent as to his reasoning for placing the LEDs at mid-depth in the body, I believe this was done because he intended the LEDs to shine their light onto the surfaces of the fan blades, illuminating them as they rotate by, as the primary illumination effect, as opposed to direct viewing of the LEDs. Placing the LEDs at the top of the body would not have been nearly as effective in accomplishing this visual effect, so a POSITA would not have been motivated to do so, contrary to Petitioner's argument. So again, Lai's design clearly teaches away from having an illumination area "at top of the body".

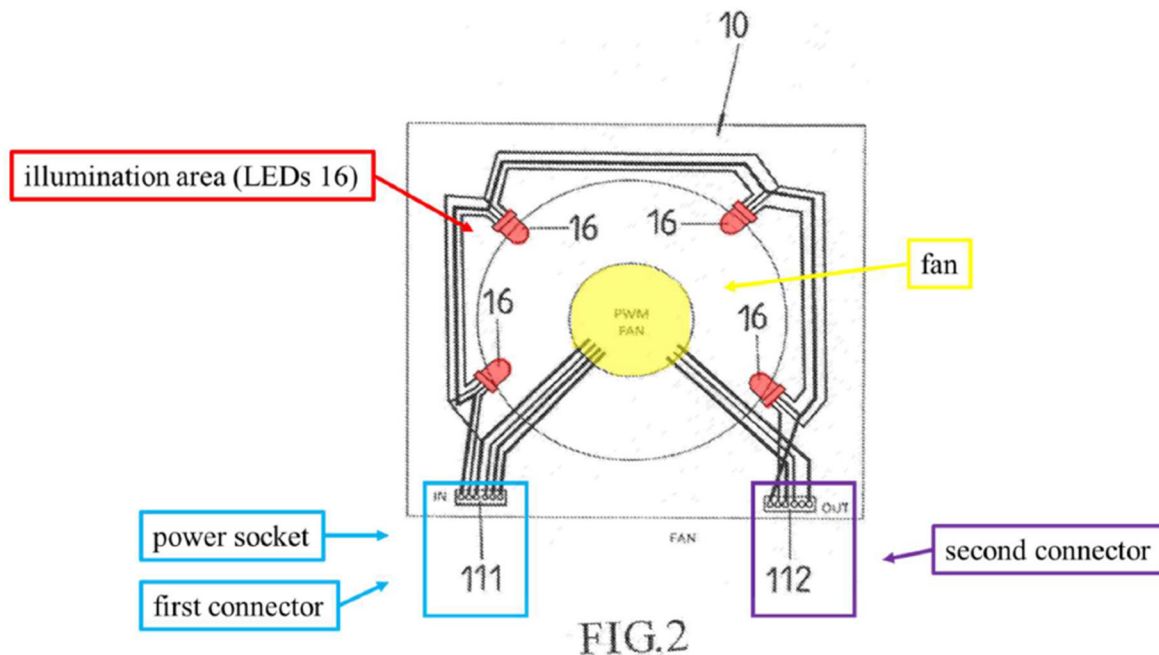
85. The LEDs depicted in Lai's Figure 3 may not even be usefully visible from a top view; it would only be the fan blades that would reflect and/or diffuse the LED light and create frontal visibility of the illumination. Even so, the illuminated fan blades are not themselves at "top of the body". In the terminology of the '336 patent, the fan is not even part of the body; it is a separate component "disposed in the center of the body" ['336 patent, line 63]). Note that an illuminated area being visible in a top view is not the same as an illumination area being physically located at the top of the body, as is required in the '336 patent. Yet petitioner seems to

conflate the idea of illumination being visible from the top of the fan, with the illumination area actually being physically located at the top of the fan. But if we accept that view, then virtually any illuminated fan would qualify as having its illumination area deemed “at top of the body”, and this limitation in the ’336 patent would have no meaning. The fact that the limitation “at top of the body” is called out in Claim 1 is a clear indication that the inventor did mean something specific by including this limitation, and there is clear support in the ’336 patent figures for an illumination area being physically located at the top of the body.

86. Further, in my opinion, the limitation, “a power socket and a first connector on one side of the body, and a second connector on another side of the body”, is not disclosed or taught by Lai, nor the combination of Lai and Hasegawa.

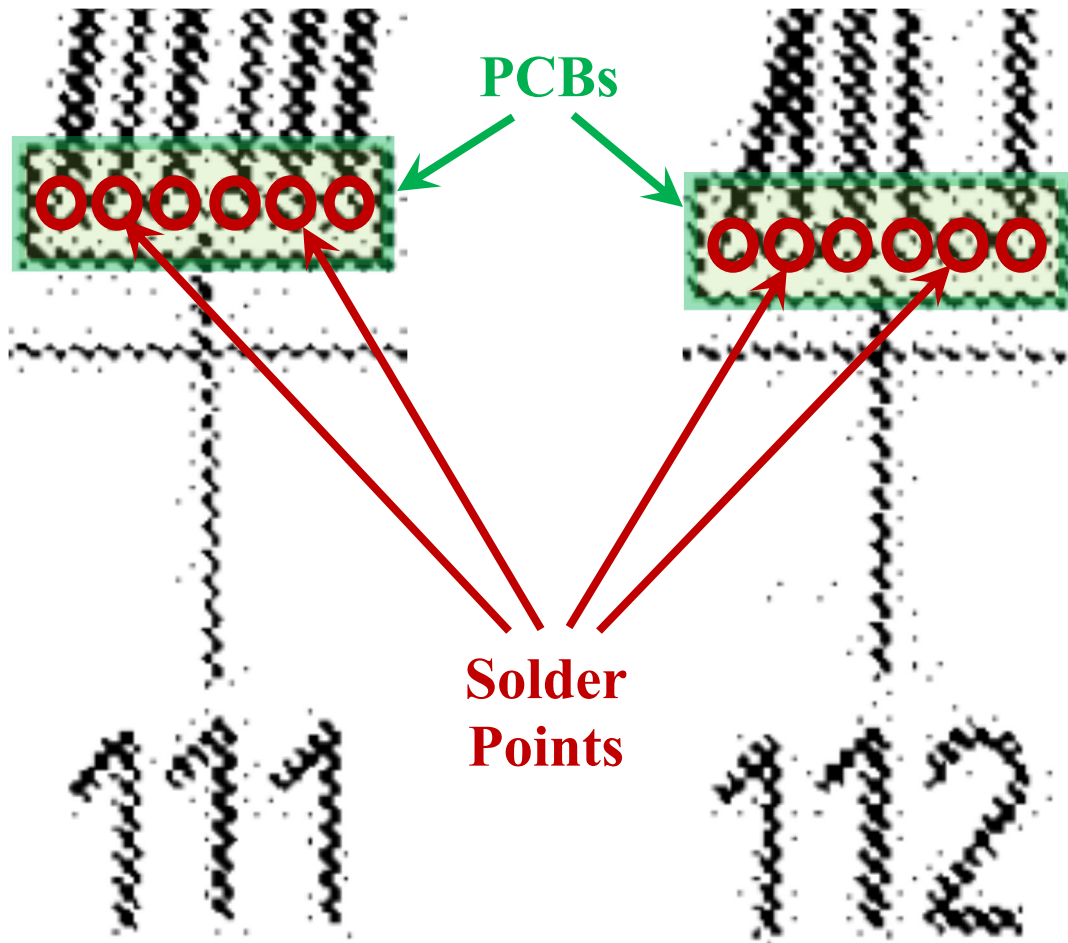
87. Lai fails to disclose or otherwise teach any “power socket” or “first connector” as required by claim 1. Critically, *neither “socket” nor “connector” of any kind is mentioned or even suggested at all throughout the entirety of Lai.*

88. As explained below, Petitioner’s tortured reading of Lai is based on impermissible hindsight and thus must be rejected. Petitioner attempts to characterize Lai’s single input 111 as both the “first connector” and “power socket”, and single output 112 as the “second connector”, as shown below in Figure 2:



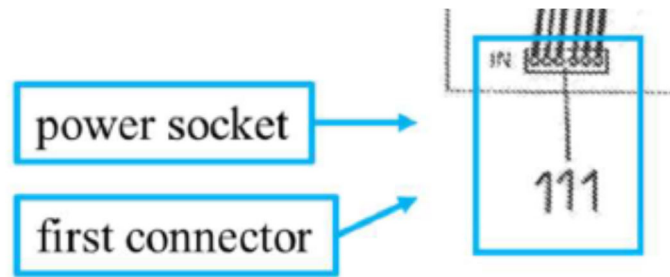
Petition, 68 (annotating Fig. 2 of Lai).

89. But contrary to Petitioner’s incorrect assertion, Lai does not characterize element 111 as, nor suggest it to be, any “socket” nor “connector” at all. *See generally* Ex-1012. Instead, Lai simply refers to it as a “**single** input 111”. *Id.* at 7 (emphasis added). Similarly, Lai does not characterize 112 as any “connector” but a “**single** output 112”. *Id.* Indeed, a POSITA would not have recognized Lai’s “single input 111” or “single output 112” as having any “socket” nor “connector” structures, as Petitioner misleadingly argues. Instead, based on Lai’s disclosure, the POSITA would have understood the single input 111 and single output 112 as having nothing more than fixed solder points on the printed circuit boards (or PCBs), as shown below:



90. In sum, Lai’s solder points of input 111 and output 112 do not disclose or otherwise teach the claimed “socket” nor “connector” structures.

91. Petitioner’s mapping of the single input 111 of Tsuji to *both* the “power socket” and “first connector” limitations simultaneously is also legally impermissible. According to Petitioner, the alleged “power socket” and “first connector” are coextensive and completely overlap with each other:



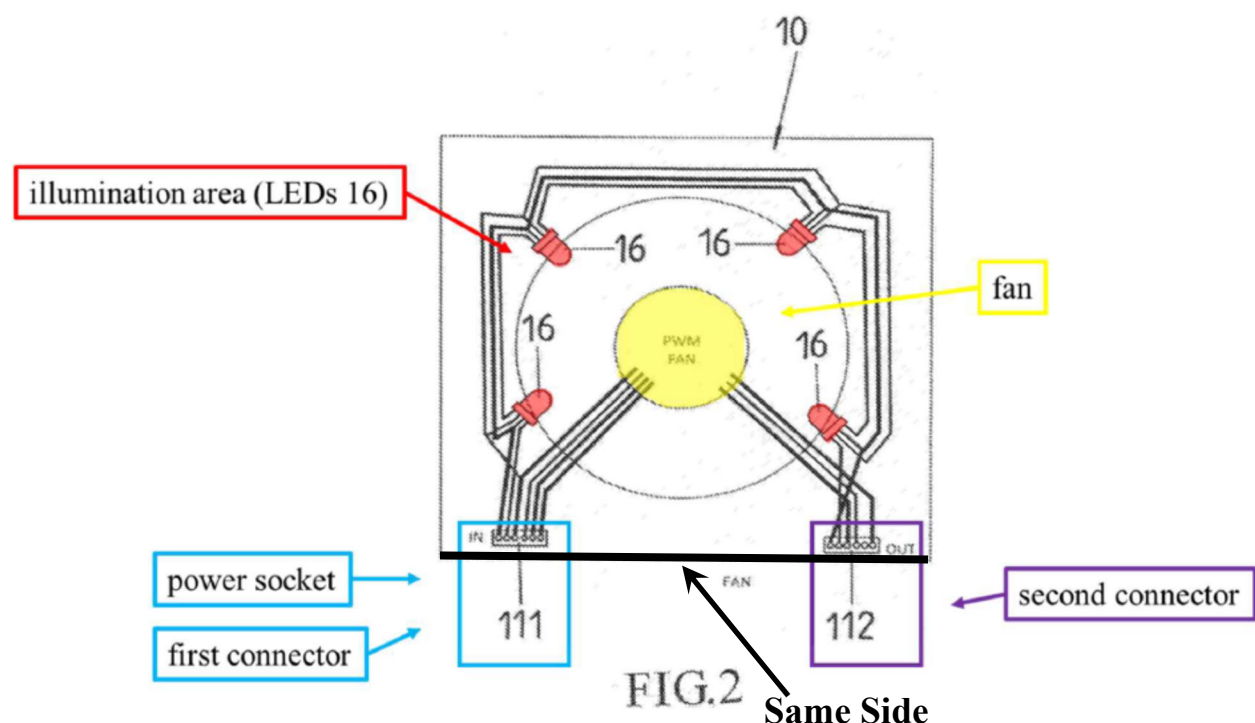
Petition at 68 (Lai’s “single input 111 comprising a power socket and a first connector on one side of the fan body”).

92. This mapping is improper because I understand that different claim elements should have different structures. Apparent acknowledging this deficiency, Petitioner argues that “[t]o the extent it is argued or found that the ‘power socket’ and ‘first connector’ require separate structures, it would be obvious to a PHOSITA to separate a set of VCC and ground terminals of Lai into a separate housing for the same reasons stated above”. Petition at 62. But Petitioner is wrong because Lai expressly requires that 111 be a “single input” connecting to a “single transmission line 12”. That is, a POSITA would not have considered splitting the *single* input 111 connecting to the *single* transmission line 12 in Lai into two separate structures, which would require two transmission lines, obviously.

93. As noted, claim 1 of the ’336 patent recites “a power socket and a first connector on one side of the body, and a second connector on another side of the body”. ’336 pat., Cl. 1. Claim 1 further recites “the power socket on *the* one side of the body”. *Id.* (emphasis added). That is, claim 1 requires that the “power socket”

be located on the *same* “one side” as that the “first connector” is located on, and that the “second connector” be located on “another side” of the same illumination fan that is *different* from the “one side”. As explained below, Petitioner fails to show that Lai, alone or in combination with Hasegawa, teaches these limitations.

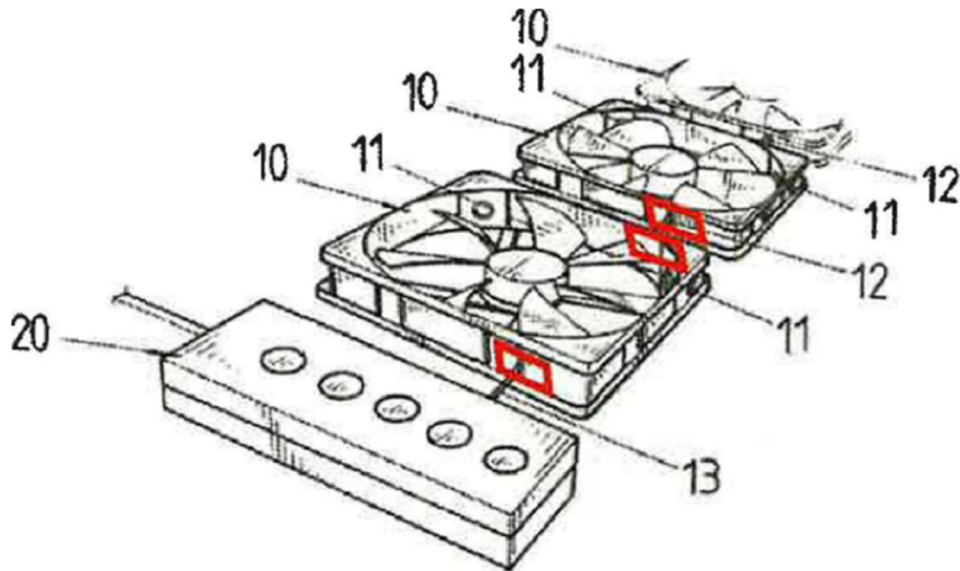
94. As discussed previously, claim 1 of the '336 patent requires, *inter alia*, “a power socket and a first connector on *one side* of the body, and a second connector on *another side* of the body”. '336 pat., Cl. 1 (emphasis added). Petitioner fails to show that Lai teaches this limitation at least because the alleged “second connector” 112 is not located on “another side”, and is instead on the *same* “one side” as that the alleged “power socket” and “first connector” 111 are located on, as explained below:



Petition, 68 (black “Same Side” labeling added, other annotations original).

95. As can be seen above, Petitioner maps Lai’s 111 as the “power socket” and “first connector”, and Lai’s 112 as the “second connector”. But 111 and 112 are on the same side of the fan body, so Petitioner fails to show that Lai teaches “a power socket and a first connector on *one side* of the body, and a second connector on *another side* of the body” as required by claim 1 of the ’336 patent.

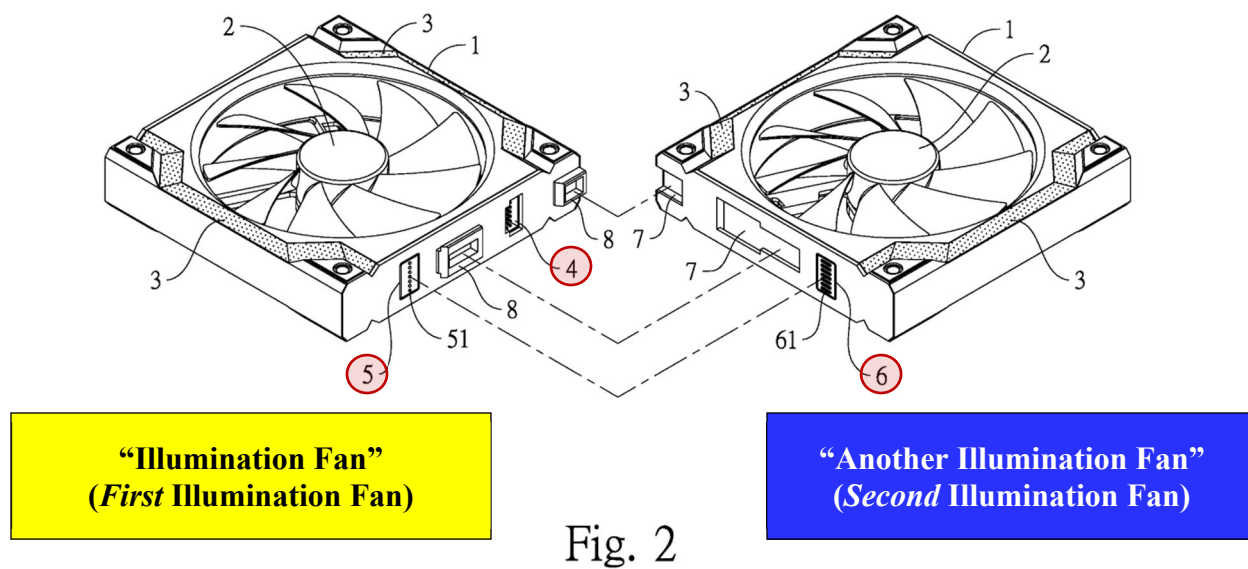
96. Acknowledging as much, Petitioner argues that “[t]o the extent it is argued or found that Lai does not to [*sic*] disclose connectors on *two* sides of the fan body, it would have been obvious to a PHOSITA that the connectors can be moved to opposite edges of the fan body without any substantial impact to the structure or operation of the fan of Lai”. Petition at 63 (emphasis added). Attempting to support its position, Petitioner argues that “[i]t would have been obvious to a PHOSITA to combine Lai and Hasegawa”. *Id.* at 66. Petitioner asserts that the purported combination of Lai and Hasegawa would have appeared similar to FIG. 3 of Lai, but with visible connectors on the fan body sides” in “*red boxes*”, as shown below:



Petition at 66-67.

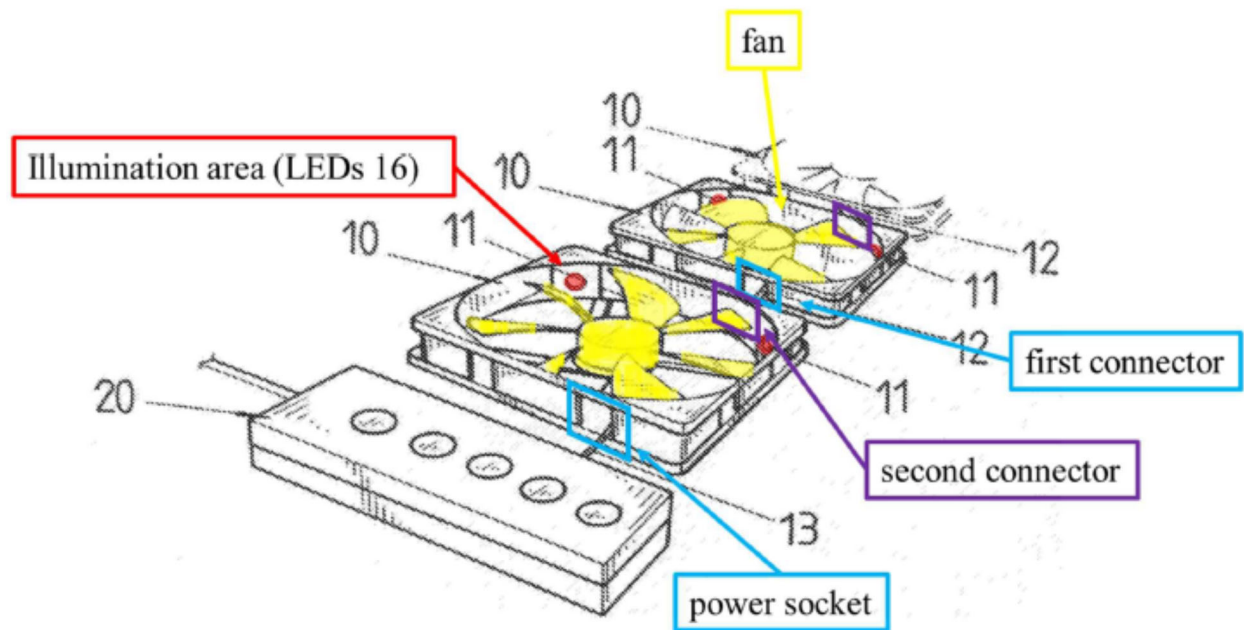
97. But as further discussed below, Petitioner fails to show that Hasegawa cures Lai's deficiency in this regard.

98. Claim 1 recites "[a]n illumination fan" as a **first illumination fan** and "another illumination fan" as a **second illumination fan**. This claimed arrangement is exemplarily illustrated in the annotated Fig. 2 embodiment of the '336 patent below:



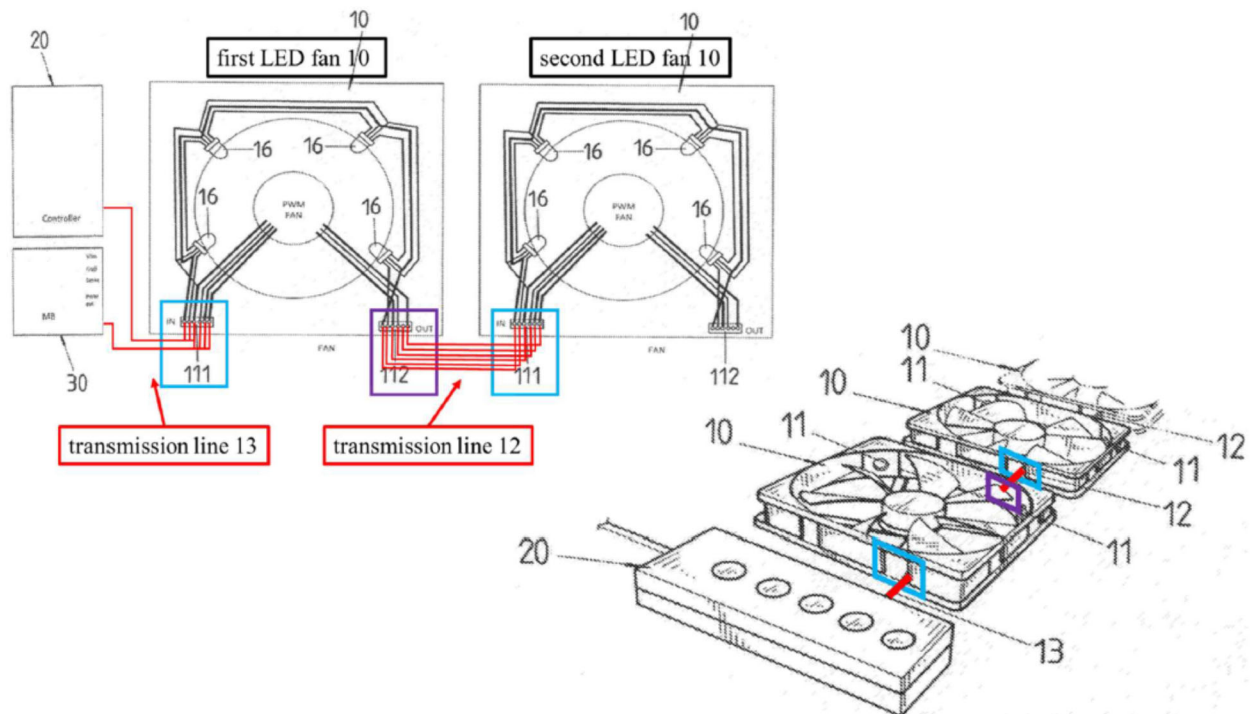
'336 pat., Fig. 2 (annotated).

99. As exemplified in the annotated Fig. 2 embodiment above, claim 1 further requires that, “when the power socket [4] on the one side of the body [of the illumination fan, *i.e.*, the **first illumination fan** on the left] 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 [5] of the body [of the illumination fan, *i.e.*, the **first illumination fan** on the left] is connected with a second connector [6] of the body of another illumination fan [*i.e.*, the **second illumination fan** on the right], a fan and an illumination area of the body of another illumination fan are respectively driven into rotation and illumination”. '336 pat., Cl. 1. Petitioner, however, fails to show that Lai in view of Hasegawa meets these requirements of claim 1. As can be seen below, Petitioner labels a multi-fan arrangement in Lai's Fig. 3 as purportedly modified in view of Hasegawa as follows:

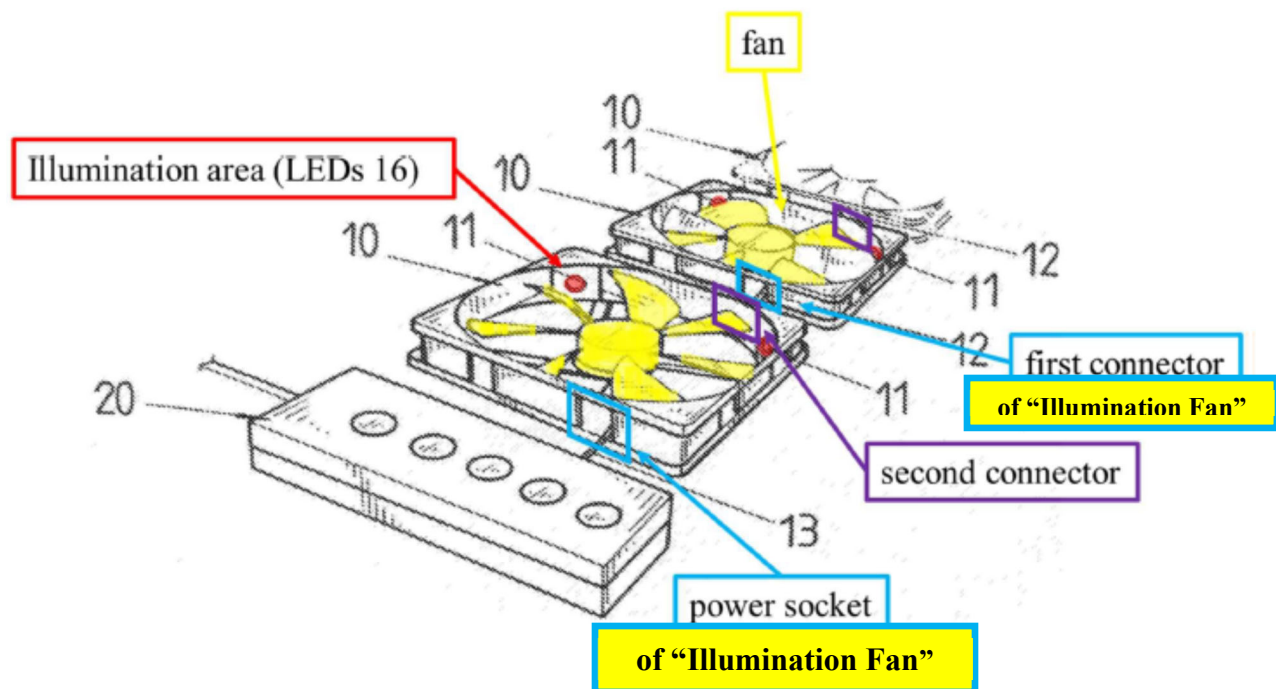


Petition at 69.

100. Based on the above labeling, Petitioner further asserts that “Lai discloses an LED fan controller device that links in serial at least two LED fans 10, wherein when the power socket of single output [*sic*] 111 of the first LED fan 10 is connected (via single transmission line 13), the fan (control motor 15) receives power and control from motherboard 30, and the illumination area (LEDs 16 or LEDs 11) from controller 20” as shown below:



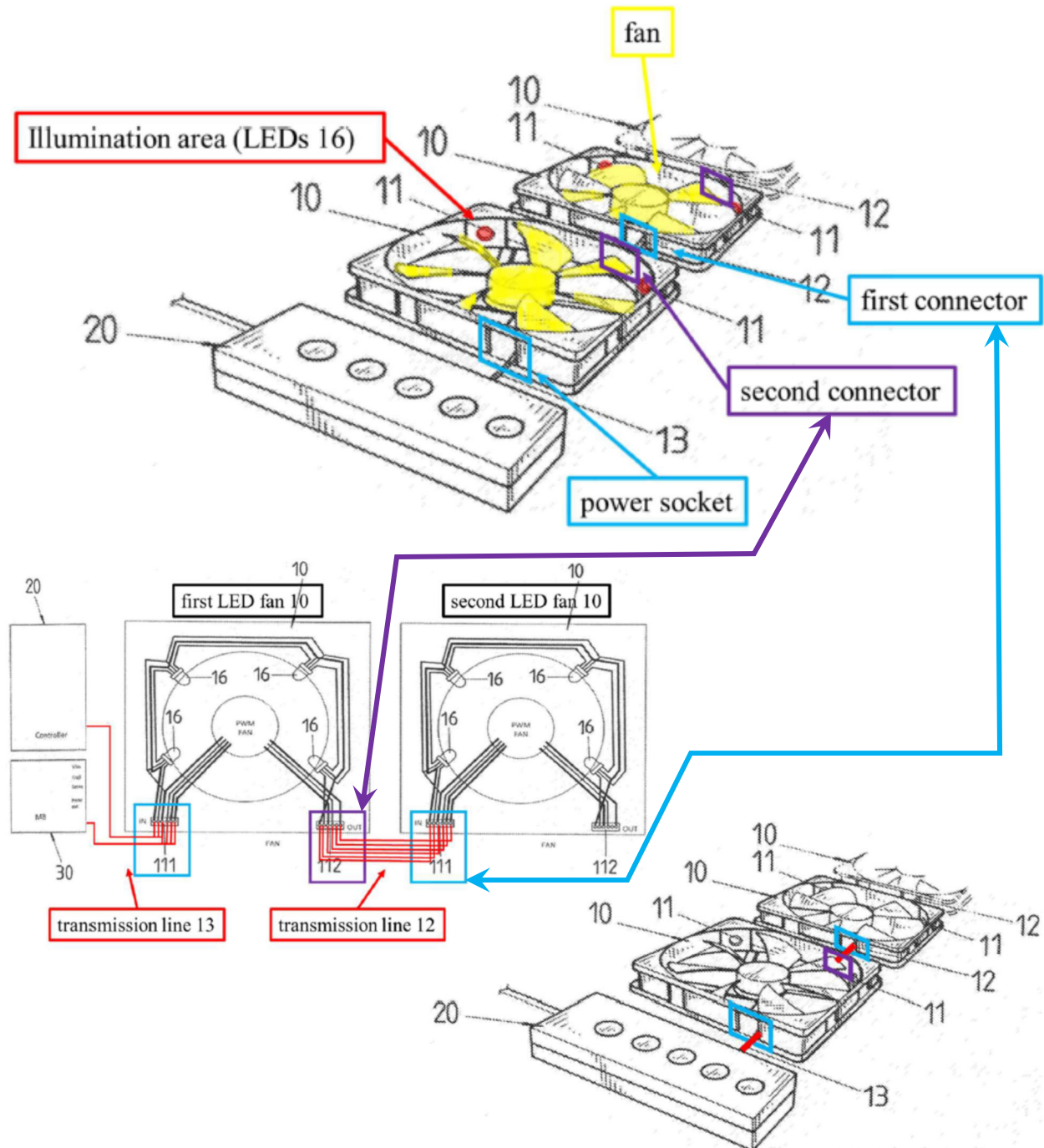
Petition at 70-71. That is, Petitioner maps the alleged “power socket” and “first connector” of the “illumination fan” in claim 1 of the ’336 patent as follows:



Petition at 68-69 (yellow “of ‘Illumination Fan” boxed in cyan labeling added, other annotations original). But as shown above, what Petitioner has mapped to as the “power socket” and “first connector” are not just on two different “sides,” they are actually on two different illumination fans, which simply cannot be correct.

101. In other words, Petitioner’s mappings for the alleged “power socket” and the alleged “first connector” show that the two structures are **not** on the same “side” as required by claim 1. That is, according to Petitioner, the alleged “power socket” is not “on the [same] one side of the body” that the alleged “first connector” is located on, contrary to the requirement of claim 1.

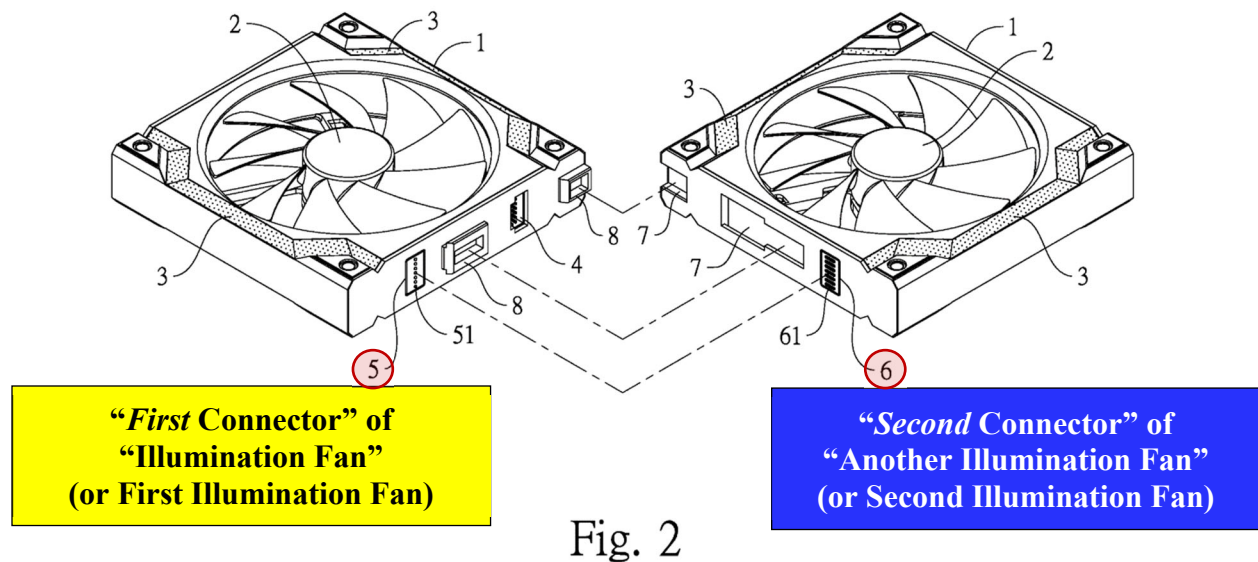
102. Petitioner fails to show that Lai alone or in combination with Hasegawa teaches “the **first** connector of the body [of the illumination fan] is connected with a **second** connector of a body of another illumination fan” as required by claim 1 of the ’336 patent. As can be seen below, Petitioner instead attempts to show the **opposite**, that the **second** connector 112 (in the purple box) of the “first LED fan 10” (purportedly the “illumination fan”) is connected with the **first** connector 111 of the “**second** LED fan 10” (purportedly the “**another** illumination fan”) via the “transmission line 12” (in red):



Petition at 69, 71 (purple and cyan double arrows added, other annotation original).

103. But as exemplified by the annotated Fig. 2 of the '336 patent below, claim 1 of the '336 patent instead recites the *opposite* to what Petitioner appears to

demonstrate above. That is, claim 1 in contrast recites “the *first* connector [5] of the body [of the illumination fan, *i.e.*, the **first illumination fan** on the left] is connected with a *second* connector [6] of a body of another illumination fan [*i.e.*, the **second illumination fan** on the right]” as exemplified below:



’336 pat., Cl. 1, Fig. 2 (annotated).

104. Thus, Petitioner fails to show that Lai alone or in view of Hasegawa teaches “the first connector of the body is connected with a second connector of a body of another illumination fan” as required by claim 1.

IX. CONCLUSION

105. At least for the reasons stated above, Petitioner's Grounds 1 and 4 fail.

X. RIGHT TO SUPPLEMENT

106. I reserve the right to amend, supplement, or otherwise modify my opinions, whether in a further written declaration or otherwise. I also reserve the right to reply to positions taken by the petitioner's experts.

107. I hereby declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001.

APPENDIX A: QUALIFICATIONS AND EXPERIENCE

David B. Tuckerman, Ph.D, P.E., FIEEE

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EXPERIENCE:

Tuckerman and Associates, Inc., 2009-present: Independent consultant on a variety of technical and IP matters in high-tech industries. Major clients have included CMEA Capital, Tessera, Intellectual Ventures, and Microsoft. Consultant to Microsoft from 2011 through 2020 in the fields of quantum computing and superconducting devices, including management of a 6-year research contract with Auburn University to develop high-density flexible thin-film superconducting interconnection technologies for quantum computing applications.

Tessera Inc., 2003-2009: Senior Vice President and Chief Technical Officer. Member of the executive team that executed a successful IPO in November 2003, with a market capitalization that later exceeded \$1 billion. Responsible for managing R&D activities and generating intellectual property in electronic packaging and related technologies, and for formulating a strategy for growth by acquisition. Identified numerous targets that were successfully acquired (North, Shellcase, Digital Optics, Eyesquad, Viewmagic, DBlur, Kronos); these acquisitions established Tessera in two new lines of business: “Imaging and Optics” (ultraminiature camera modules incorporating extended-depth-of-field wafer-scale optics; this ‘OptiML WLC’ technology was winner of an R&D 100 Award) and “Silent Air Cooling” (fanless, electrostatically driven air cooling, enabling quiet ultra-thin laptop computers).

CMEA Capital, 1997 – 2013: Venture Partner at a venture capital firm that has over \$1 billion under management. Responsible for sourcing and screening deals, performing due diligence, facilitating syndication, and making ongoing strategic and operational contributions to portfolio companies (including participating in Board meetings), for all deals having to do with physical technologies (electronics, optics, materials, energy, etc.). Primarily investing in technologies related to energy and advanced materials since 2008. Currently on Board of Directors of Reel Solar (electroplated CdTe photovoltaic technology).

nCHIP, Inc., 1989-1997: Founder, Sr. VP, and Chief Technical Officer. Developed advanced multi-chip module technologies enabling ultracompact high-performance digital systems. Responsible for all technical development activities prior to transfer to manufacturing. nCHIP was financed by venture capital from three top-tier venture funds: Kleiner Perkins, Mohr Davidow, and Mayfield. nCHIP grew to approximately \$12 million in annualized revenues, and was sold to **Flextronics International Ltd.** in 1995 for \$38 million. Venture investors who held their Flextronics stock received up to 40x their initial investment.

Lawrence Livermore National Laboratory, 1983-1989: Project Leader, Physics Department. Managed advanced R&D programs in laser processing, electronic packaging and interconnect, X-ray optics, and other national-defense related programs.

IBM T. J. Watson Research Center, 1977-1980 (MIT Co-op program): Member of the Josephson junction computer project (superconducting logic circuit design, simulation, and testing). Designed and demonstrated ultrahigh-performance sampling circuitry for on-chip diagnostics of superconducting logic.

EDUCATION:

M.I.T, B.S. Electrical Engineering, 1980.

M.I.T., B.S. Physics, 1980.

M.I.T., M.S. Electrical Engineering & Computer Science, 1980.

Stanford, Ph.D. Electrical Engineering, 1984.

Stanford, MBA, 1998.

PUBLICATIONS:

See attached list. 10,000+ citations in the professional literature (per Google Scholar)

PATENTS:

181 issued U.S. patents, plus various foreign patents and numerous pending applications. See attached list.

MAJOR HONORS:

Life Fellow of the IEEE

Licensed Professional Engineer (Electrical), California

IEEE Paul Rappaport Award

Fannie and John Hertz Foundation Outstanding Ph.D. Thesis

Consulting Associate Professor of E.E., Stanford University (late 1980's/early 1990's)
(co-supervised two PhD theses on 'laser planarization')

Best Paper Award, VLSI Multilevel Interconnection Conference, 1989

Technical Program Chair, IEEE Multichip Module Conference, 1995

General Chair, IEEE Multichip Module Conference, 1996

Plenary speaker, ASME 9th International Conference on Nanochannels, Microchannels, and Minichannels, 2011.

PRIOR EXPERT WITNESS EXPERIENCE:

Asetek Danmark A/S v. Coolit Systems Inc. (Northern District of California, 3:19-cv-00410-EMC)

Expert for Plaintiff Asetek Danmark A/S, engaged by Finnegan Henderson Farabow Garrett & Dunner, LLP

***Asetek Danmark A/S v. Corsair Gaming, Inc. et al* (Northern District of California,
3:20-cv-06541-EMC)**

Expert for Plaintiff Asetek Danmark A/S, engaged by Finnegan Henderson Farabow
Garrett & Dunner, LLP

Selected Publications

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David B. Tuckerman, Ph.D. - List of granted patents

1	US-4450472-A	Method and means for improved heat removal in compact semiconductor integrated circuits and similar devices utilizing coolant chambers and microscopic channels
2	US-4567505-A	Heat sink and method of attaching heat sink to a semiconductor integrated circuit and the like
3	US-4573067-A	Method and means for improved heat removal in compact semiconductor integrated circuits
4	US-4674176-A	Planarization of metal films for multilevel interconnects by pulsed laser heating
5	US-4681795-A	Planarization of metal films for multilevel interconnects
6	US-4814578-A	Planarization of metal films for multilevel interconnects
7	US-4992847-A	Thin-film chip-to-substrate interconnect and methods for making same
8	US-5017509-A	Stand-off transmission lines and method for making same
9	US-5046656-A	Vacuum die attach for integrated circuits
10	US-5134539-A	Multichip module having integral decoupling capacitor
11	US-5214844-A	Method of assembling integrated circuits to a silicon board
12	US-5274270-A	Multichip module having SiO ₂ insulating layer
13	US-5397997-A	Burn-in technologies for unpackaged integrated circuits
14	US-5541524-A	Burn-in technologies for unpackaged integrated circuits
15	US-5804004-A	Stacked devices for multichip modules
16	US-7224056-B2	Back-face and edge interconnects for lidded package
17	US-7262368-B2	Connection structures for microelectronic devices and methods for forming such structures
18	US-7298030-B2	Structure and method of making sealed capped chips
19	US-7351641-B2	Structure and method of forming capped chips
20	US-7449779-B2	Wire bonded wafer level cavity package
21	US-7462936-B2	Formation of circuitry with modification of feature height
22	US-7485956-B2	Microelectronic package optionally having differing cover and device thermal expansivities
23	US-7566853-B2	Image sensor employing a plurality of photodetector arrays and/or rear-illuminated architecture
24	US-7593636-B2	Pin referenced image sensor to reduce tilt in a camera module
25	US-7632708-B2	Microelectronic component with photo-imageable substrate
26	US-7709968-B2	Micro pin grid array with pin motion isolation
27	US-7793414-B2	Methods for forming connection structures for microelectronic devices
28	US-7816251-B2	Formation of circuitry with modification of feature height
29	US-7858445-B2	Wire bonded wafer level cavity package
30	US-8035258-B2	Systems and methods for assessing standoff capabilities of in-service power line insulators
31	US-8174270-B2	Systems and methods for assessing standoff capabilities of in-service power line insulators
32	US-8248080-B2	Systems and methods for assessing standoff capabilities of in-service power line insulators
33	US-8253525-B2	Smart link coupled to power line
34	US-8310036-B2	Chips having rear contacts connected by through vias to front contacts
35	US-8391934-B1	Customized hardware selection for a mobile phone
36	US-8405196-B2	Chips having rear contacts connected by through vias to front contacts
37	US-8425965-B2	Method for heating or sterilizing a liquid stream
38	US-8426736-B2	Maintaining insulators in power transmission systems
39	US-8427800-B2	Smart link coupled to power line
40	US-8460814-B2	Fluid-surfaced electrode
41	US-8531039-B2	Micro pin grid array with pin motion isolation
42	US-8563867-B2	Smart link coupled to power line
43	US-8595037-B1	Systems and methods for insurance based on monitored characteristics of an autonomous drive mode selection system
44	US-8673219-B2	Nasal passage insertion device for treatment of ruminant exhalations
45	US-8692226-B2	Materials and configurations of a field emission device

46	US-8735205-B2	Chips having rear contacts connected by through vias to front contacts
47	US-8776145-B2	In-transit electronic media with location-based content
48	US-8810131-B2	Field emission device with AC output
49	US-8810161-B2	Addressable array of field emission devices
50	US-8865361-B2	Instrumented fluid-surfaced electrode
51	US-8872022-B2	Phase-change cooling of subterranean power lines
52	US-8884813-B2	Surveillance of stress conditions of persons using micro-impulse radar
53	US-8889312-B2	Instrumented fluid-surfaced electrode
54	US-8897116-B1	Systems and methods for atomic film data storage
55	US-8907529-B2	Smart link coupled to power line
56	US-8909307-B2	Customized hardware selection for a mobile phone
57	US-8928228-B2	Embodiments of a field emission device
58	US-8946992-B2	Anode with suppressor grid
59	US-8958786-B2	Mobile device that activates upon removal from storage
60	US-8965288-B2	Cost-effective mobile connectivity protocols
61	US-8968903-B2	Fluid-surfaced electrode
62	US-8969848-B2	Materials and configurations of a field emission device
63	US-8970113-B2	Time-varying field emission device
64	US-8971043-B2	Management of exterior temperatures encountered by user of a portable electronic device in response to an inferred user contact with the portable electronic device
65	US-8971868-B2	Mobile device that activates upon removal from storage
66	US-8971869-B2	Mobile device that activates upon removal from storage
67	US-8971969-B2	Customized hardware selection for a mobile phone
68	US-8974939-B2	Fluid-surfaced electrode
69	US-9013564-B2	Controllable lenticular lenslets
70	US-9019149-B2	Method and apparatus for measuring the motion of a person
71	US-9024814-B2	Tracking identities of persons using micro-impulse radar
72	US-9055166-B2	Customized hardware selection for a mobile phone
73	US-9056556-B1	System and method for configuration and management of an energy storage system for a vehicle
74	US-9069067-B2	Control of an electronic apparatus using micro-impulse radar
75	US-9077815-B1	Customized hardware selection for a mobile phone
76	US-9079505-B1	System and method for management of a fleet of vehicles having an energy storage system
77	US-9083819-B2	Customized hardware selection for a mobile phone
78	US-9106764-B2	Customized hardware selection for a mobile phone
79	US-9140499-B2	Phase-change cooling of subterranean power lines
80	US-9143605-B2	Customized hardware selection for a mobile phone
81	US-9149010-B2	Harvesting and grafting of trees
82	US-9158908-B2	Power source for in-transit electronic media
83	US-9171690-B2	Variable field emission device
84	US-9177592-B2	Systems and methods for atomic film data storage
85	US-9177600-B2	Systems and methods for atomic film data storage
86	US-9191489-B2	Customized hardware selection for a mobile phone
87	US-9193068-B2	Structural assessment, maintenance, and repair apparatuses and methods
88	US-9193402-B2	Structural assessment, maintenance, and repair apparatuses and methods
89	US-9199193-B2	Treatment of ruminant exhalations
90	US-9207270-B2	Method and apparatus for measuring negawatt usage of an appliance
91	US-9216133-B2	Using a 3D display to train a weak eye
92	US-9230442-B2	Systems and methods for adaptive vehicle sensing systems
93	US-9269268-B2	Systems and methods for adaptive vehicle sensing systems
94	US-9270808-B2	Customized hardware selection for a mobile phone

95	US-9291297-B2	Multi-layer phononic crystal thermal insulators
96	US-9291399-B2	Management of exterior temperatures encountered by user of a portable electronic device
97	US-9291400-B2	Management of exterior temperatures encountered by user of a portable electronic device using multiple heat-rejection elements
98	US-9305737-B2	Liquid filament for incandescent lights
99	US-9320174-B2	Management of exterior temperatures encountered by user of a portable electronic device in response to an inferred user contact with the portable electronic device
100	US-9321357-B2	Method and apparatus for supplying auxiliary electrical power to an electric or hybrid vehicle
101	US-9341065-B2	Dual element turbine blade
102	US-9349562-B2	Field emission device with AC output
103	US-9373870-B2	Battery damage indicator
104	US-9396810-B2	Systems and methods for acoustic wave enabled data storage
105	US-9396814-B2	Systems and methods for acoustic wave enabled data storage
106	US-9424893-B2	Systems and methods for acoustic wave enabled data storage
107	US-9435320-B2	Mitigating wind turbine blade noise generation in view of a minimum power generation requirement
108	US-9437849-B2	Battery damage indicator
109	US-9451394-B2	Cost-effective mobile connectivity protocols
110	US-9452281-B2	Tattooing systems and methods
111	US-9456648-B2	Systems and methods for helmet liner evaluation
112	US-9457666-B2	Method and apparatus for supplying auxiliary electrical power to an electric or hybrid vehicle
113	US-9486386-B2	Using a 3D display to train a weak eye
114	US-9488670-B2	Systems and methods for detecting overhead line motion
115	US-9490097-B2	Liquid filament for incandescent lights
116	US-9511634-B2	Systems and methods for anticipatory tire pressure control
117	US-9512580-B2	Systems and methods for deicing
118	US-9514653-B2	Systems, methods, and devices for providing assistance to an unmanned aerial vehicle
119	US-9531864-B2	Customized hardware selection for a mobile phone
120	US-9548507-B2	Systems and methods for hydrogen fuel storage and hydrogen powered vehicles
121	US-9549406-B1	Automatically adjustable radiofrequency link
122	US-9553959-B2	Customized hardware selection for a mobile phone
123	US-9562704-B2	Phase-change cooling of subterranean power lines
124	US-9599407-B2	System and structure for heating or sterilizing a liquid stream
125	US-9602650-B2	Customized hardware selection for a mobile phone
126	US-9602673-B2	Systems and methods for monitoring sound during an in-building emergency
127	US-9648309-B2	Controllable lenticular lenslets
128	US-9653128-B2	Systems and methods for acoustic wave enabled data storage
129	US-9681557-B2	Metastable gas heating
130	US-9688402-B2	Systems, methods, and devices for unmanned aerial vehicle dispatch and recovery
131	US-9691500-B2	Casimir effect memory cell
132	US-9696119-B2	Camouflage for transmission towers and lines
133	US-9714494-B2	Systems and methods for deicing
134	US-9719902-B2	Systems and methods for helmet liner evaluation
135	US-9723702-B2	Liquid filament for incandescent lights
136	US-9751207-B2	Structural assessment, maintenance, and repair apparatuses and methods
137	US-9751812-B2	Taggant for cement authentication
138	US-9759196-B2	Mitigating wind turbine blade noise generation in response to an atmospheric variation
139	US-9772062-B2	Multi-layer phononic crystal thermal insulators
140	US-9776632-B2	Systems and methods for adaptive vehicle sensing systems
141	US-9781664-B2	Cost-effective mobile connectivity protocols

142	US-9788195-B2	Mobile device that activates upon removal from storage
143	US-9800738-B2	Systems and methods for monitoring sound during an in-building emergency
144	US-9801313-B2	Underwater container cooling via integrated heat exchanger
145	US-9805763-B2	Systems and methods for atomic film data storage
146	US-9810819-B2	Camouflage for transmission towers and lines
147	US-9819184-B2	Balancing power grid parameters using distributed energy control
148	US-9824845-B2	Variable field emission device
149	US-9826534-B2	Automatically adjustable radiofrequency link
150	US-9832628-B2	Cost-effective mobile connectivity protocols
151	US-9844167-B2	Underwater container cooling via external heat exchanger
152	US-9844983-B2	Systems and methods for anticipatory tire pressure control
153	US-9876762-B2	Cost-effective mobile connectivity protocols
154	US-9878631-B2	System and method for predictive control of an energy storage system for a vehicle
155	US-9878786-B2	System and method for operation and management of reconfigurable unmanned aircraft
156	US-9878787-B2	System and method for operating unmanned aircraft
157	US-9902491-B2	Reconfigurable unmanned aircraft system
158	US-9919797-B2	System and method for operation and management of reconfigurable unmanned aircraft
159	US-9924642-B2	Harvesting and grafting of trees
160	US-9930898-B2	Pasteurization system and method
161	US-9989077-B2	Systems and methods for selective control of fuel tanks
162	US-10015931-B2	Production of electricity from plants
163	US-10015971-B2	Articles and methods for administering CO2 into plants
164	US-10017392-B2	Articles and methods for administering CO2 into plants
165	US-10052469-B2	Tattooing systems and methods
166	US-10072503-B2	Dual element turbine blade
167	US-10074879-B2	Instrumented fluid-surfaced electrode
168	US-10119592-B2	Vehicle drivetrain with active magnetic bearings
169	US-10135302-B2	Mobile phone having a wireless power module
170	US-10136437-B2	Automatically adjustable radiofrequency link
171	US-10141493-B2	Thermal management for superconducting interconnects
172	US-10146222-B2	Driver training in an autonomous vehicle
173	US-10171677-B2	Systems and methods for monitoring sound during an in-building emergency
174	US-10184867-B2	Systems and methods for helmet liner evaluation
175	US-10348884-B2	Customized hardware selection for a mobile phone
176	US-10453592-B1	Reducing losses in superconducting cables
177	US-10651362-B2	Method of forming superconducting apparatus including superconducting layers and traces
178	US-10763013-B2	Reducing losses in superconducting cables
179	US-11114602-B2	Method of forming superconducting layers and traces
180	US-11211722-B2	Superconductor interconnect system
181	US-12027361-B2	High temperature superconductor-based interconnect systems with a lowered thermal load for interconnecting cryogenic electronics with non-cryogenic electronics
182	AU-2011326765-B2	Treatment of ruminant exhalations
183	AU-2018341994-B2	Fabrication of apparatus including superconducting wiring layers and interconnects
184	AU-2019265449-B2	Reducing losses in superconducting cables
185	CA-2057744-C	Multichip module
186	EP-2638389-B1	Treatment of ruminant exhalations
187	EP-2801102-B1	Anode with suppressor grid
188	EP-2920548-B1	Systems and methods for detecting overhead line motion
189	EP-3210279-B1	Wireless power receiver in a mobile device
190	EP-3610519-B1	Thermal management for superconducting interconnects

191	EP-3688796-B1	Fabrication of apparatus including superconducting wiring layers and interconnects
192	EP-3745481-B1	Thermal management for superconducting interconnects
193	EP-3791432-B1	Reducing losses in superconducting cables
194	TW-I317555-B	Image sensor employing a plurality of photodetector arrays and/or rear-illuminated architecture
195	TW-I333247-B	Method of forming a microelectronic connection component