

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BOE Technology Group Co., Ltd.
Petitioner

v.

Optronic Sciences LLC
Patent Owner

Inter Partes Review No.: IPR2024-01130

**PETITIONER'S REPLY TO PATENT OWNER'S RESPONSE TO
PETITION FOR INTER PARTES REVIEW OF U.S. PATENT 7,168,842**

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Exhibit No.	Description
1001	U.S. Pat. No. 7,168,842 (“ the 842 Patent ”)
1002	Declaration of Dr. R. Jacob Baker
1003	File History of 7,168,842 (11/00,372)
1004	JP 2004-279262 (“ Kurokawa ”)
1005	U.S. 7,218,041 (“ Isoda ”)
1006	U.S. 2002/0047978 (“ Fukuta ”)
1007	U.S. 2002/0140880 (“ Weindorf ”)
1008	U.S. Pat. No. 6,927,424 (“ Uekusa ”)
1009	U.S. 2002/0030445 (“ Fukasawa ”)
1010	JP 2002-164583 (Machine Translated via Google Translate and Espacenet)
1011	U.S. 2004/0061440 (“ Imai ”)
1012	U.S. 2004/0130884 (“ Yoo ”)
1013	JP 2004-193002 (“ Sakai ”) (Machine Translated via Google Translate)
1014	U.S. 2004/0262053 (“ Ludewig ”)
1015	U.S. 2004/0169451 (“ Oishi ”)
1016	KR 2004/0057269 (Machine Translated via Google Translate)
1017	EP 1467414 (“ Ge ”)
1018	U.S. 2001/0024250 (“ Fujishiro ”)
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1020	U.S. 2001/0030866 (“ Hochstein ”)
1021	Curriculum Vitae of Dr. R. Jacob Baker
1022	Docket Navigator Report (highlighted)
1023	'842 Statutory Disclaimer
1024	July 17, 2025, Deposition Transcript of Dr. Eric Bretschneider, IPR2024-01130
1025	Dr. R. Jacob Baker Matter List
1026	July 23, 2025, Markman Hearing Transcript, <i>Optronic Sciences LLC v. BOE Technology Group Co., Ltd.</i> , 2:23-cv-00549
1027	July 23, 2025, Preliminary Claim Construction, <i>Optronic Sciences LLC v. BOE Technology Group Co., Ltd.</i> , 2:23-cv-00549
1028	April 22, 2025, Exhibit A, Joint Claim Construction and Prehearing Statement

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1029	June 3, 2025, Optronicon Science's Opening Claim Construction Brief
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1031	Reply Declaration of Dr. R. Jacob Baker

I. INTRODUCTION

PO primarily relies on a narrow construction of “fastener” in its POR in a futile attempt to distinguish the prior art. However, after it filed its POR, PO agreed to a broader construction of “fastener” in the underlying litigation that completely undermines its arguments.

The rest of PO's arguments should be rejected because they are based on an erroneous interpretation of the technology at issue and level of skill in the art. The '842 patent relates to simple electronic system design: the design of a light emitting device backlight package which incorporates a light emitting diode (LED) package. The patent provides an adjustment to the form factor of a backlight which decreases the space required in the longitudinal direction of the light guiding plate and increases the space required in the orthogonal direction.

PO & Dr. Bretschneider mischaracterize the patent and technology at issue. The patent is not about designing the LED, the LED module, the circuit board, or a heat sink. It is about designing the final assembly of a backlight package using those well-known components and an L-shaped fastener. The patent relates to using and placing an LED module in the assembly, not determining the chemical composition of the LED to, e.g., emit a particular amount of light. Similarly, it relates to using and placing heat dissipating means in the assembly, not

determining the material composition of its metal to, e.g., dissipate a particular amount of heat.

PO's mischaracterization of the technology at issue results in PO advancing a level of skill that is too narrow and erroneously focused on heat transfer. The '842 patent requires the same understanding of heat transfer present in any general electronic system design. All electronic systems generate some heat, and a POSITA designing an electronic systems would have known how to use additional heat dissipating means to remove that heat if necessary. Dr. Baker is a POSITA under the proper definition and has been qualified as an expert in a plethora of litigations and post-grant proceedings related to similar technology.

Finally, no improper hindsight is used. By definition, one must first ascertain any differences between the claims and the prior art before determining whether any such difference would have been obvious. While none of the grounds in the Petition are based on hindsight, PO confusingly focuses its meritless allegations of hindsight on whether Kurokawa includes the claimed fastener and anticipates the claims. POR, 2.

II. LEVEL OF ORDINARY SKILL IN THE ART

PO's definition of a POSITA is far too narrow. The backlight package described by the '842 patent is much broader than LED package design and thermal management systems. EX1031 ¶¶ 9-40.

It is undisputed that Dr. Baker is a POSITA under the appropriate definition.¹ A POSITA would have had a Bachelors' degree in electrical engineering or a comparable field of study, plus approximately one or more years of professional experience with electronic and optoelectronic system design. Additional graduate education could substitute for professional experience, and significant experience in the field could substitute for formal education. EX1031 ¶ 9.

The patent defines LED, not in its conventional use as a “light emitting *diode*,” but rather as a “light emitting *device* (LED).” EX1001, 3:07. The only place “diode” is used in the '842 patent is in the title of the patent. There are no teachings in the '842 patent about packaging light emitting diodes (LEDs) or the corresponding thermal management of LED packages. EX2020 ¶¶ 30-50, 75-87. Rather, the '842 patent is concerned with the dimensions of the backlight package and heat removal from the already packaged LEDs (“light-emitting chip”). The '842 patent is concerned with a light emitting device for use as a backlight in a display using packaged light-emitting chips, the thermal concerns related to

¹ Notably, PO did not challenge Dr. Baker's qualifications to testify in the claim construction proceedings for the '842 patent in the district court litigation—waiving any assertion that he is not qualified to testify as an expert. EX1029, 8-9.

mounting packaged light-emitting chips on a circuit board, and the orientation of the light-emitting chips in the light emitting display. EX1031 ¶¶ 12-14. Thermal concerns related to components of circuit designs, such as LED chips or power transistors, implemented on a printed circuit board used in light emitting devices are routine concerns that would fall within the scope of a POSITA under either definition of POSITA. EX1031 ¶ 15.

A. Types of Problems in the Art

The '842 patent *specifically* discloses that the *use* of LED packages is a sub-part of the electronic backlight system that is being designed. EX1001 at 1:7-27. Specific design considerations for a backlight package would vary substantially depending on the end application, and therefore broader experience in electronic and optoelectronic design would be advantageous to a POSITA practicing the invention to ensure a small form factor backlight that produces maximal luminosity. EX1031 ¶¶ 16-17.

Additionally, the requirement of “experience in design of thermal management systems for LEDs” is also far too narrow for the disclosures in the '842 patent. The extent of the disclosures in the '842 patent of *any* discussion regarding heat dissipation are general (at best) and are limited to unspecified “heat dissipating means” or heat dissipating plates to “conduct, or dissipate, heat produced by electronic components disposed on PCB 45.” EX1001, claims 1, 6, 9,

1:63-2:11, 2:36-40, 3:29-31, 3:51-57. In the only disclosed embodiment, the “LED module 40” is not one of the electronic components “disposed on PCB 45.” Not one of the components the patent teaches has heat dissipated by the heat dissipating means. PO and Dr. Bretschneider’s hyper-focus on heat dissipation for the LED and LED module/package portion of the overall claimed backlight package is clearly misplaced. While thermal management may be a relevant consideration for the design of a LED package itself that may be utilized in a backlight LED package, the knowledge of the specific design of the packaging of a LED is not required by the claims of the ’842 patent. EX1031 ¶ 18.

Dr. Bretschneider admitted that the ’842 patent is not directed towards maximizing heat transfer and that “if you say maximize heat dissipation, you will probably end up with a different configuration and one that would not minimize space... the ’842 patent is trying to create a compact package, they’re trying to minimize the space required, which normally goes contrary to maximizing heat dissipation.” EX1024 113:08-114:13. Broader electronic and optoelectronic system design would be necessary in order to minimize the backlight package size for a variety of end uses for the backlight package. EX1031 ¶ 19.

Dr. Bretschneider admitted that any LED package that included or needed a “heat sink” would be “at best, a highly specialized package.” EX1024, 25:5-11, 45:09-13, 46:04-10. Further, many structures can be used for heat management

including heat sink fin structures, heat pipes, active cooling, and other passive ways to conduct thermal management. EX1024, 59:14-60:03. Other than arguably heat fins, none of these are disclosed, claimed, or relevant to '842 Patent. At best, to practice claim 5 for example, a basic understanding of selecting an already created LED package, circuit board, and light guide plate are all that is required to create a backlight package. EX1031 ¶ 20.

B. Prior Art Solutions

Prior art solutions to the problems the '842 patent describes of minimizing space while maximizing luminosity encompasses a variety of different types of LED packages and backlight package systems which would all depend on the system that the package is being used in. EX1031 ¶ 21.

C. Invention Rapidity

Backlight technology was slow changing, but that the specific characteristics of the package design, i.e. type of LED package, LED chip, circuit board, and any additional heat dissipation means, would be highly application specific and beyond the scope of the '842 patent. EX1031 ¶ 22.

D. Technology Sophistication

Each component of the claimed backlight package is its own field of art with substantial amounts of patented technology that is not relevant to the applicable field and purported invention in the '842 patent. For example, there is a deep field of art related to LEDs that relate to their chemical composition and design to

achieve the desired color, luminosity, and efficiency. Similarly, there is a deep field of art for powerful heat sinks (e.g., for high powered CPUs) that related to their shape, metallurgical composition, and even thermal adhesives to maximize heat dissipation. But none of that is relevant here. Rather, a broad understanding of electronic and optoelectronic system design is all that is required, given the variety of end use applications for the backlight packages. Because the '842 patent just uses generic components in creating the backlight package, the relevant level of skill and sophistication is not particularly high. EX1031 ¶¶ 23-24.

E. Education Level

For electronic and optoelectronic system design, even in relation to LED backlight package design, a POSITA would have had a Bachelors' degree in electrical engineering or a comparable field of study. PO's definition of a bachelor's degree in (unspecified) engineering incorrectly encompasses engineering fields clearly having nothing to do with light emitting displays. Examples of these engineering fields include: biomedical, environmental and chemical engineering. For example and knowing about the chemical properties used in the materials used to fabricate the LEDs, printed circuit boards, fasteners, etc. would not be particularly relevant to understanding the electrical, mechanical, and thermal considerations associated with designing and implementing a light emitting display. An engineer educated in electrical engineering, would know how

to mount electrical components on a PCB and, if necessary, remove the heat from the component. EX1031 ¶ 25.

Dr. Baker has been qualified, opined, and been deposed in many legal proceedings regarding the use of packaged LEDs, systems designed using packaged LEDs, and thermal management systems for LEDs/electrical systems (including in proceedings related to LED packages for the attorney's representing PO). EX1031 ¶¶ 26-35. PO's criticisms of Dr. Baker fall flat. Dr. Baker's experience at Cirque is directly relevant because he worked on fitting components into a backlight display package that included LED packages and involved display design constraints using LED packages. Dr. Baker is a highly qualified POSITA who has relevant experience with heat transfer, industry, and designing electronic and optoelectronic systems. EX1031 ¶¶ 36-38.

F. Dr. Baker Does Not Use Hindsight

PO faults Dr. Baker for reviewing the '842 patent, before looking at the prior art to form an opinion about what was obvious, alleging that infects him with hindsight. POR, 10. PO's argument defies logic, as this Board would be unqualified to decide obviousness if it dared to look at the '842 patent before the prior art, as would patent examiners because they looked at the claims first to know what prior art to search for.

The same illogic is argued with respect to Dr. Baker's deposition, where he was asked what modifications were necessary and obvious (to meet the claim language), and then faulted Dr. Baker for looking at the claims. POR, 10-11. The answers reflect the order of counsel's questioning, not the thought process by which Dr. Baker reached his original conclusions (for which he was never asked). Counsel failed to ask a single question about the paragraphs containing Dr. Baker's opinions explaining how obvious combinations would be implemented for Grounds 2 and 6.

Finally, the POR is riddled with arguments that hindsight was used to formulate obviousness combinations. This handwaving can be ignored, because these arguments fail to address the actual identified motivations to combine the references. PO's argument about Kurokawa is particularly misplaced. POR, 11-12. PO does not even address Dr. Baker's primary theory, which does not have any of the alleged shortcomings. § VIII. Hindsight cannot change whether metal plate 71 is, or is not, the claimed fastener for purposes of anticipation. EX1031 ¶¶ 79-82. Dr. Baker explains, for the obvious combinations, why a POSITA would have been motivated to add a heat sink to Kurokawa's design, and why they would not cover the ventilation holes.

III. CLAIM CONSTRUCTION

A. “fastener” (all claims)

PO agreed to a construction for “fastener” of “[a] feature that attaches or holds something in place” in the District Court. EX1026, 42:12-43:02; EX1027. The same construction of fastener should be applied here to maintain consistency between district court and IPR proceedings. CFR 42.100(b). EX1031 ¶ 42.

PO and its expert's opinions in the POR are premised on a narrower construction of fastener as “one feature whose primary purpose is to attach something.” EX2020 ¶ 117. PO modified its proposed construction of “fastener” in the associated District Court litigation from “an article whose primary purpose is to attach or fasten one object to another” in its joint claim construction statement, to “[a] feature that attaches something” in its opening claim construction brief, and ultimately agreed to the District Court's preliminary construction of “[a] feature that attaches or holds something in place.” EX1028, 4, EX1029, 12. The agreed construction is both consistent with the Institution Decision and the plain and ordinary meaning of “fastener.” EX1031 ¶¶ 43-44.

Any narrowing of the construction to require that the “fastener” component has a “primary purpose,” “fasten one object to another,” or *require* that the fastener “attaches something” in addition to holding something in place is contrary to the parties' agreed construction and should be rejected. EX1031 ¶ 45.

B. “heat dissipating means...for conducting a heat generated thereon” (claims 6 and 9)

PO argues that the heat dissipating means “would involve dissipating the heat generated by the LED, usually into the surrounding air.” EX2020 ¶ 118. This construction is incorrect to the extent that the “heat dissipating means” requires dissipating heat directly from a heat dissipating means to an area outside of a device. A POSITA would understand that, in consumer electronic devices (which the '842 patent discloses includes televisions, computers, and cell phones) very few heat sinks (almost none) are external and almost all are internal to the device. The '842 specification does not say where the heat dissipating means are located in relation to a device, but a POSITA with basic experience with consumer electronic devices would understand the heat dissipating means is within the device. Indeed, the specification supports this, as the backlight package described in the '842 patent does not claim a bezel, and a POSITA would understand the heat dissipating means to be located in a device, covered by any such bezel. Therefore, although the heat dissipating means may in the first instance dissipate heat in the interior of the device (i.e. inside of the bezel), the heat from inside of the device will transfer to the exterior of the device. EX1001, Figs. 1-5, 1:5-29. EX1031 ¶ 46.

The specification is clear that the heat dissipating means is not necessarily required to dissipate heat from the LED, but rather dissipates heat any number of components disposed on the circuit board, as the specification notes that the “heat

dissipating plates 46 conduct, or dissipate, heat produced by electronic components disposed on the PCB 45.” EX1001, 3:27-31. Additionally, claims 6 and 9 specifically claim a heat dissipating means “attached onto the surface of a circuit board for conducting heat generated thereon.” A POSITA would understand that those components could include resistors, transistors, and diodes. Indeed, in his deposition Dr. Bretschneider agreed that circuits that provide power to other components (i.e. driving circuits) are known to generate a substantial amount of heat that may need to be dissipated. POR at 7; EX1024, 62:15-63:13. EX1031 ¶ 47.

Petitioner does not argue that anything “conducting a heat” qualifies as a heat dissipating means. POR at 16. Rather, as properly construed, single metal structures (or portions thereof) can satisfy both the fastener and heat dissipating mean limitations in claims 6 and 9. EX1002 ¶¶ 107-109, 185-191. Nothing in the plain language of claims (or their preceding independent claims) precludes the structures from being the same, and metal structures (as disclosed by the metal plates in the specification) can dissipate heat. EX1002 ¶¶ 107-109, 185-191. This is consistent with the teachings in the art. EX1004, [0020]-[0021], [0037]-[0039], [0047]-[0048]. Neither PO nor Dr. Bretschneider contest that a metal structure can satisfy both the fastener and heat dissipating means limitations. Indeed, a POSITA would have understood that a fastener structure could act as both a heat dissipating

means and a fastener depending on the material that is used. Dr. Bretschneider agreed that metal fastener structures can dissipate heat. EX1024, 25:05-21.

EX1031 ¶¶ 48-49.

C. “the circuit board connecting the second portion” (claims 5 and 7)

PO agreed to a construction for “the circuit board connecting the second portion” of “circuit board connecting to the second portion” in the District Court. EX1030, 2. However, PO argues “‘connecting’ requires something more than just touching, such as attaching or completing an electrical connection.” EX2020 ¶ 119. EX1031 ¶¶ 50-51.

That construction of “connecting” impermissibly narrows the plain and ordinary meaning to require the connection “requires something more than just touching, such as attachment.” POR at 17; EX2020 ¶ 119. To the extent PO suggests “connecting” requires solder or some other medium, that should be rejected as not required by the claims or the specification. EX1031 ¶52.

However, “something more than touching” is not required under plain and ordinary meaning of the term. The claims use specific language to describe the type of connection including noting that the light emitting device is “disposed on” the fastener (claim 3 & 7) and noting that the claimed conducting wire is “electrically coupling” the light emitting device to the circuit board (claim 5 & 7). EX1031 ¶53.

To the extent some sort of attachment is required between the PCB and fastener, that would include holding components in place (as PO agreed to for purposes of the fastener limitation). The specification does not go into detail how components including the frame and PCB must be connected, with the term “disposed on” being used in the specification to describe the fastener and PCBs relationship. EX1001, Abstract (“a circuit board disposed on one face of the horizontal member”), 3:19-21. Therefore, to the extent that the circuit board is required to be connected to the second portion, this would include the fastener holding or being held in place. EX1031 ¶ 54.

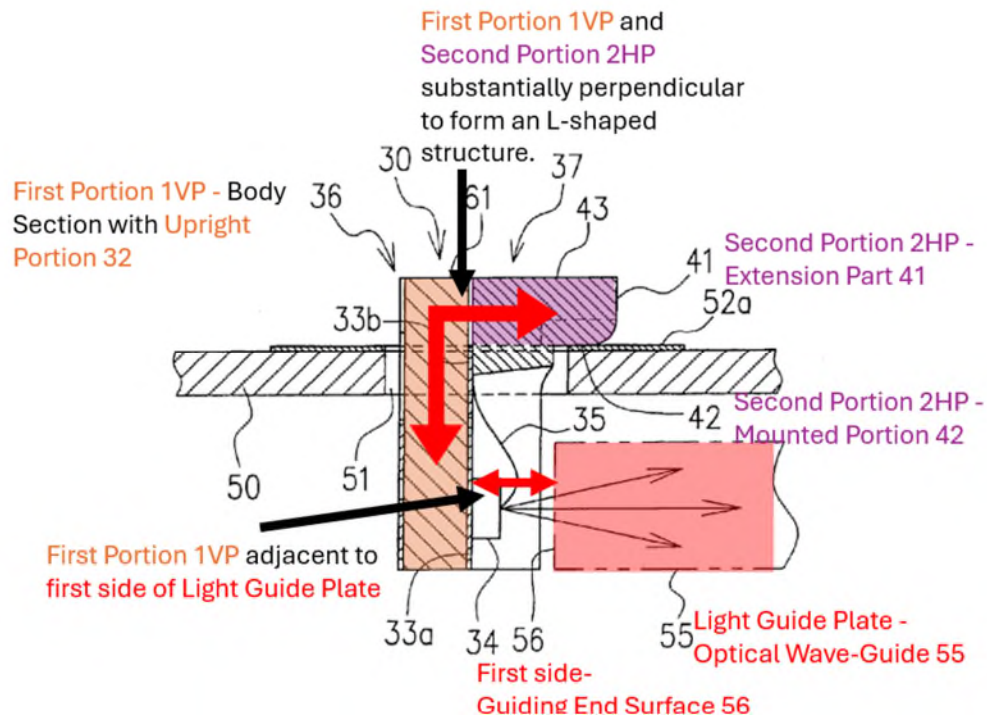
IV. GROUND 1: Claims 5 to 9 are Anticipated By UEKUSA

Patent owner only disputes that (1) Uekusa does not disclose an L-shaped fastener, (2) Uekusa’s “fastener” does not do anything more than touch the circuit board, and (3) that Uekusa lacks a heat dissipating means. Patent owner provides no arguments of validity under Ground 1 for claims [3pre], 3[a], 3[c], 4, 7, and 8. POR at 17-39.

A. [3b] Uekusa Discloses an L-Shaped Fastener

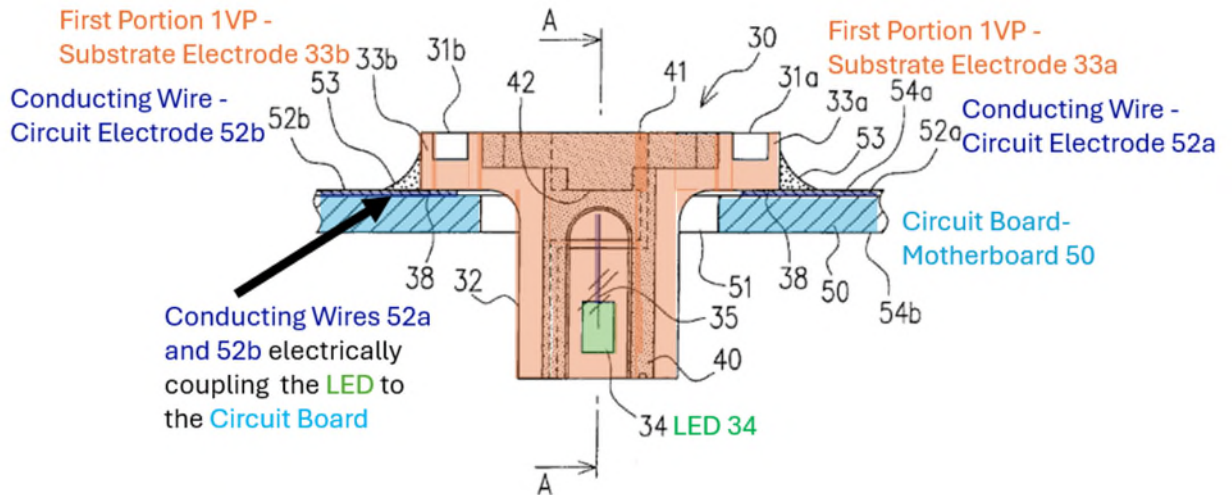
Patent Owner did not apply the agreed construction of “[a] feature that attaches or holds something in place.” Under the agreed construction, Uekusa discloses a fastener.

A POSITA would recognize that two portions in Uekusa as the fastener. The first portion is an upright portion 32 and the second portion is the combination of extension part 41 and mounted portion 42. EX1002 ¶¶ 85-86, 90-93, 99-103; EX1031 ¶ 57.



In the alternative, the first portion of the fastener is the combination of upright portion 32 and electrodes 33a and 33b and the second portion of the fastener is the combination of extension part 41 and mounted portion 42. EX1002 ¶¶ 88, 94, 104; EX1031 ¶ 58.

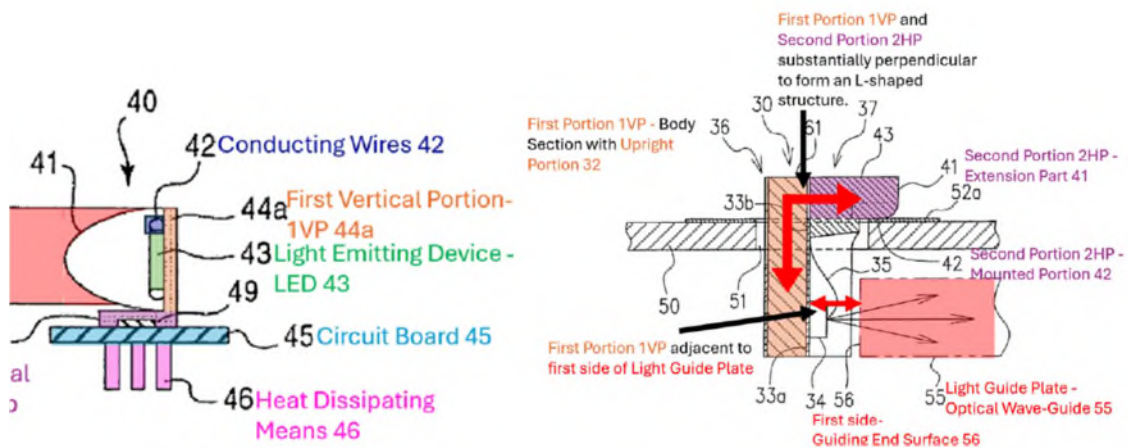
Fig. 2



Both alternatives hold LED 34 in place as well as provide support for the structure. EX1031 ¶ 59. Without the disclosed upright portion 32, electrodes 33a and 33b, and extension part 41 and mounted portion 42, the LED would not be held in place, or attached, to anything. PO also acknowledges that the resin fastener as “mounted portion mounted on a peripheral edge of the hole of a motherboard” and the LEDs as “mounted” on the substrate electrode 33a. EX1008 2:35-49, 4:11-18, 4:61-5:6; EX2020 ¶ 128. A POSITA would recognize that a component that is “mounted” is more than just touching. EX1031 ¶ 59. Under both PO’s construction and the appropriate construction of “fastener,” Uekusa “attaches” the LED and circuit board, and holds components in place.

The structures that comprise the fastener are “L-shaped” from the profile view of the images. EX1031 ¶ 60. Patent owner’s argument that the structure is “T-

shaped” rather than “L-Shaped” is partially based on incorrect perspective. For example, when viewed from the front of the structure disclosed in the '842 patent, the structure appears to be a square, despite being called “L-shaped” in the '842 patent. *Id.* From the front of Uekesa, the structure may look like a T-shape. But viewed from the side, a POSITA would recognize an L-shape “from even a cursory glance.” EX1031 ¶61.



B. [5] Uekusa's Circuit Board is “Connecting to the Second Portion”

Patent owner's construction of “connecting,” which requires “something more than touching,” is improper. A proper construction of “connecting” would include the fastener holding or being held in place. §III.C; EX1031 ¶ 63. Uekusa discloses that the second portion (extension part 41 and mounted portion 42) of the fastener as “mounted” on the circuit board. EX1008 at 2:35-49, 4:11-18, 4:61-5:6; EX1031 ¶ 63. At minimum, this shows that there is more than “touching” occurring, with mounted portion 42 attaching or holding the framed in place

relative to the circuit board. *Id.* Uekusa discloses a circuit board “connecting to the second portion.”

C. [6] & [9] Uekusa Includes a Heat Dissipating Means

The “heat dissipating means” should not be limited to heat dissipating plates like PO suggests. The ’842 patent does not provide any specific requirement with respect to heat dissipating performance; all it requires is that heat dissipation occurs. EX1031 ¶ 66. In Uekusa, the electrode 33a necessarily dissipates heat generated by the LED, as PO agrees.

V. GROUND 2: UEKUSA, ISODA

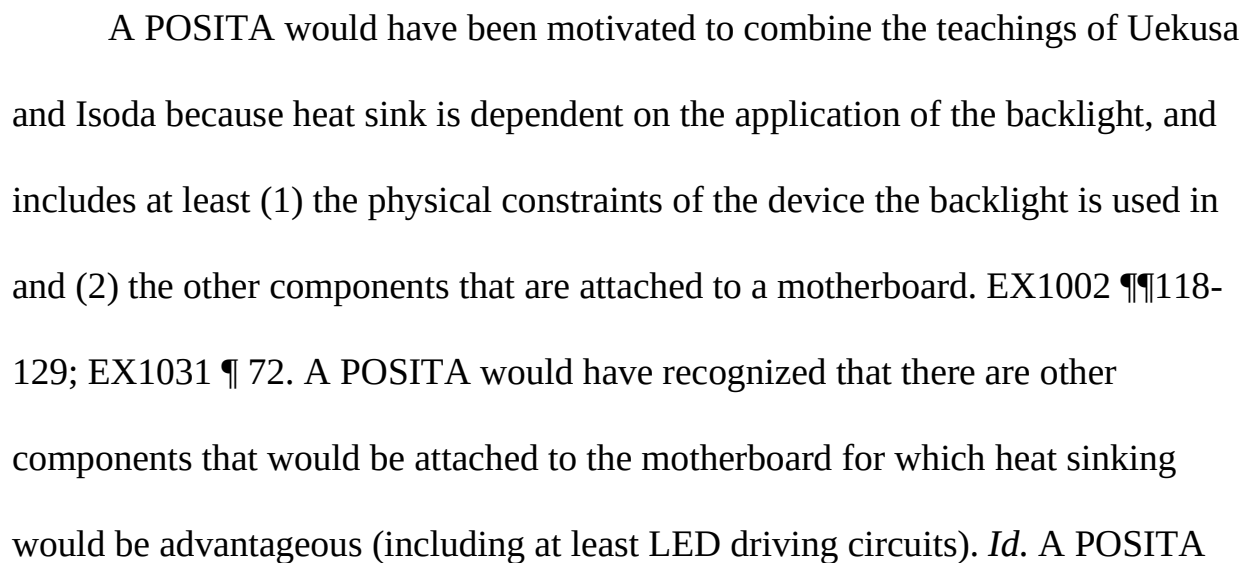
For the reasons described above in Ground 1 and the Petition, Uekusa renders claims 5-9 obvious. § IV, EX1002 ¶¶ 118-157.

A. A POSITA Would Have Been Motivated to Combine Uekusa and Isoda

The ’842 patent is not directed to optimal heat transfer and can include many different components disposed on a circuit board that generate heat. Its stated goal is requiring minimal space for a backlight package while maximizing luminosity. EX1001, 1:1-11; EX1031 ¶ 70.

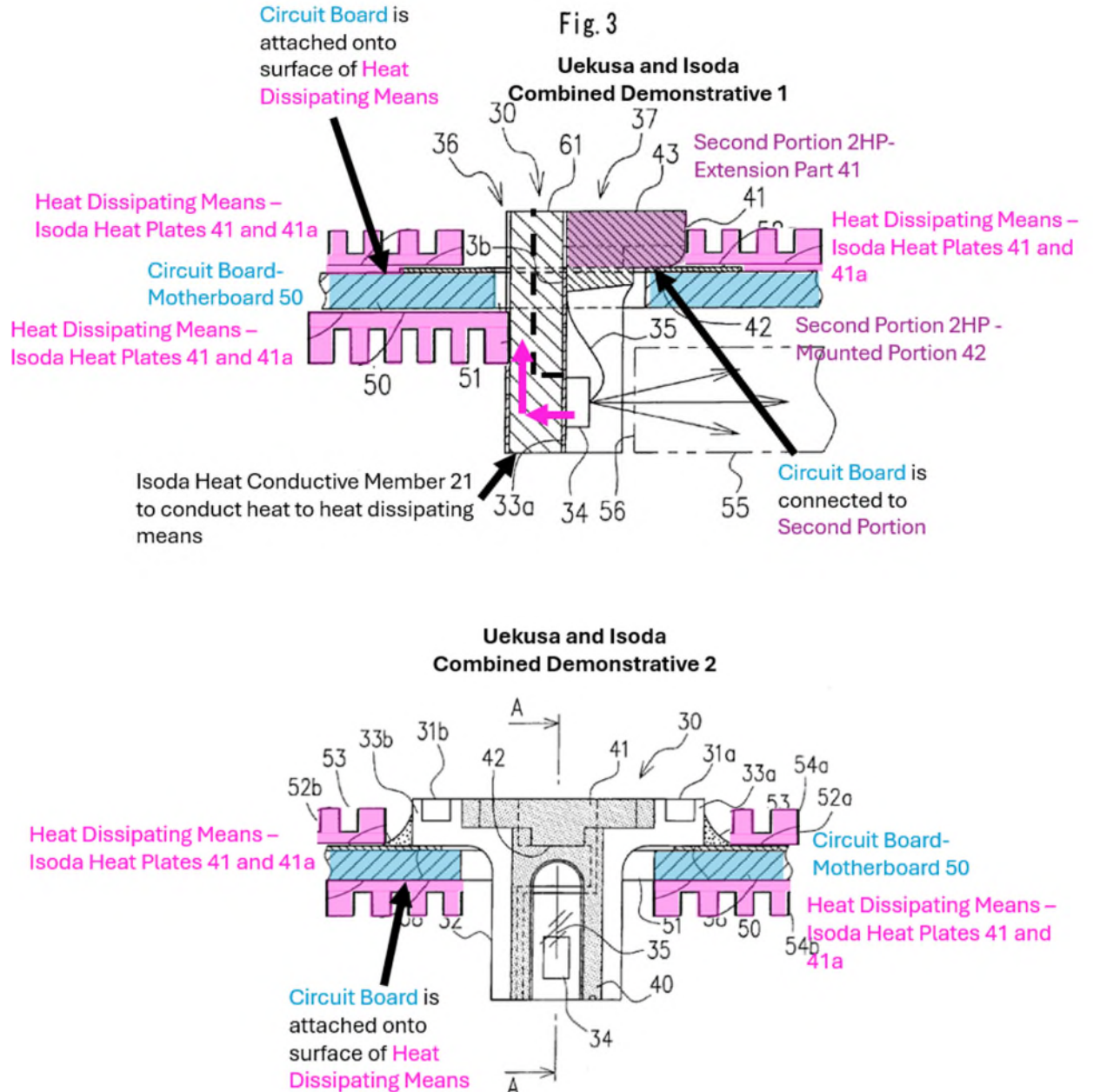
A POSITA would have understood that Isoda, like the 842 patent implicitly teaches and recognizes the importance of form factor of the backlight package. EX1031 ¶¶ 70, 71. Isoda includes a first embodiment, Fig. 4, that would have “optimal” heat transfer for heat generated by the light emitting, by attaching the

FIG. 8



would have been motivated by the application for the device to place any additional heatsink wherever room was available, including directly on the frame in Uekusa. POSITA may well have combined Uekusa and Isoda to locate the heat sink directly on the frame in Uekusa, but they would recognize that it would be dependent on the application of the device. *Id.* Uekusa's teaching that its backlight can be used in small form factor devices including portable phones and other small electronic devices, would motivate a POSITA to utilize the teachings in Isoda to locate heat sinks on a motherboard. EX1002 ¶¶118-129; EX1031 ¶ 72.

The demonstratives provided in the Petition, rendered below, show exemplary arrangements that would have been obvious to a POSITA, but the specific location for any particular heat sink would be dependent on application and the components included with the backlight package. EX1002 ¶ ¶ 142-143; EX1031 ¶ 73.



The placement of heatsinks around the device allow for a LED structure to be inserted through the hole of a PCB . EX1031 at ¶ 74. A POSITA would understand that the heat dissipating means could be placed after the LED device is inserted into the motherboard. Although the complexity of manufacture might be slightly increased by modifying the resin frame structure, improving the longevity

and operation of the LED and corresponding device using the backlight package would be worth the tradeoff. *Id.*

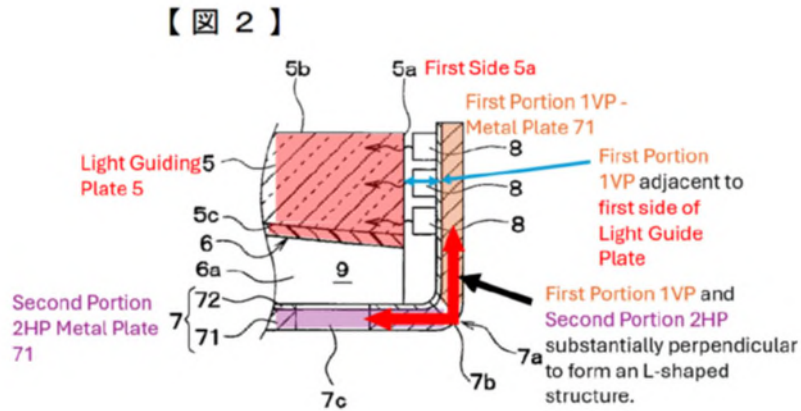
Claims 6 and 9 include a heat dissipating means “attached onto the surface of a circuit board for conducting heat generated thereon.” Dr. Bretschneider and PO do not contest that the heat fins would be used to dissipate heat from components that are disposed on circuit board 50, so for at least that independent reason as POSITA would have been motivated to use the heat sinks disclosed in Uekusa to improve the device disclosed by Uekusa. EX1031 ¶ 75.

A POSITA would have been motivated to combine Uekusa and Isoda, and had a reasonable expectation of success when doing so, rendering claims 5-9 obvious.

VI. GROUND 4: KUROKAWA ANTICIPATION

A. [3b] Kurokawa Discloses a First Fastener (Metal Plate 71)

Dr. Baker disclosed three theories that show Kurokawa anticipates the “fastener” limitation. The primary one for claim three was that the claimed fastener is Metal Plate 71 (as shown below). EX1002, ¶¶ 166-167, 171-175; EX1031 ¶ 79.



Dr. Baker's other two theories are irrelevant to the current petition given that PO disclaimed claims 3 and 4. The primary theory, however, was not responded to by the PO. EX2020, ¶¶ 193-197; EX1031 ¶ 82.

Kurokawa's specification is clear that the printed wiring board 72 is a separate component from metal plate 71. EX1031 ¶ 83. It is appropriate for a POSITA to point to metal plate 71 as the claimed "fastener." *Id.* Kurokawa discloses that flexible printed wiring board 72 is *bonded* to a metal plate 71, indicating that 71 and 72 are separate components. EX1004 [0021], [0037]-[0040]; Petition, 50-51. Each metal plate 71 and printed wiring board 72 are comprised of different materials. EX1004 Fig. 2, [0037]-[0040]. A POSITA would understand that printed wiring board 72 is itself a PCB, because an insulator with a printed conductor pattern on it is a PCB. EX1031 ¶ 85. A POSITA would also understand that a metal plate 71 is not a PCB, because it is solid metal. *Id.*

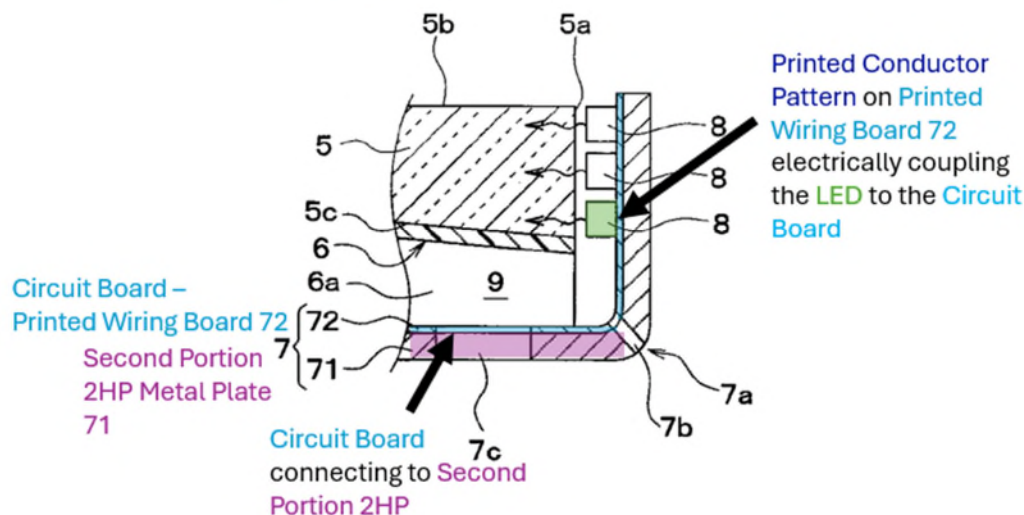
A POSITA would understand that Metal plate 71 qualifies as a fastener; in other words, that Metal plate 71 is a “feature that holds something in place” and also “[a] feature that attaches something.” EX1031 ¶ 86. Metal plate 71 ensures that flexible wiring board 72 and LED 8 are attached and held in place. EX1004 Fig. 2, [0023], [0027], [0037]-[0040]; EX1031 ¶ 86. In sum, Kurokawa disclosed an L-shaped fastener in Figure 2. *Id.*

Dr. Bretschneider criticizes that Kurokawa does not meet the “disposed on” limitation “because Kurokawa’s LED is disposed directly on the PCB,” but provides no analysis as to why disposed on requires a component to be “directly” disposed. EX2020 ¶¶ 187, 193, 197, 208, 211, 231. However, as set forth in the initial petition, the ordinary meaning of “disposed on” includes both indirectly and directly disposed on, particularly in the context of a “comprising” claim like claim 3. EX1031 ¶ 88-89. The ’842 patent has examples of using “disposed on” to broadly refer to components that are indirectly disposed on each other. *Id.* Additionally, PO does not dispute Dr. Baker’s broad construction of “disposed on” and that LED 8 is indirectly “disposed on” the claimed fastener (metal plate 71). POR, 50-56; Petition, 51-52.

B. [5] Kurokawa Discloses a Circuit Board and a Conducting Wire, the Circuit Board Connecting the Second Portion, and the Conducting Wire Electrically Coupling the Light Emitting Device to the Circuit Board

In Kurokawa Figure 2, flexible printed wiring board 72 is bonded to metal plate 71 and is comprised of “for example, an insulating film such as polyimide film or polyester film with a printed conductor pattern.” EX1004 Fig. 2, [0037]-[0040]. A POSITA would understand that printed wiring board 72 is itself a PCB, because an insulator with a printed conductor pattern on it is a PCB. A POSITA would have understood this to be a circuit board, as multiple components, including those which drive LED 8 are connected to the flexible printed wiring board. Petition at 58-60, EX1004, [0039], [0043]-[0044] (LED drive circuit), [0057] (resistor), [0059] (all other electronics), [0060]; EX1031 ¶ 90.

【 図 2 】



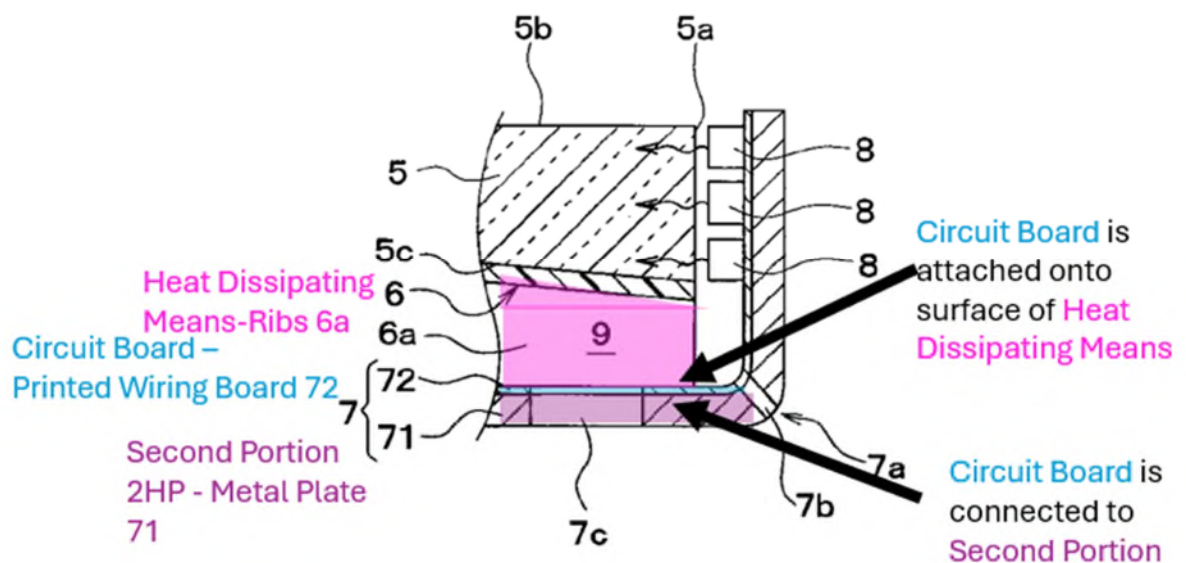
PO's sole argument is that it is improper to point to printed wiring board 72 and metal plate 71 as the circuit board and fastener respectively. POR at 54; EX2020 ¶ 198. As stated previously, it is appropriate to point to printed wiring board 72 as the claimed circuit board and the metal plate 71 as the claimed fastener. EX1031 ¶ 91.

C. [6] & [9] Kurokawa Includes a Heat Dissipating Means

There are two theories regarding what the claimed "heat dissipating means" are in Kurokawa. EX1031 ¶ 92. In the primary theory, the fastener acts as the heat dissipating means. EX1002 ¶¶ 184-191, EX1031 ¶ 92. This primary theory is not rebutted by PO.

The alternative alternative theory, the Kurokawa Ribs 6a are the "heat dissipating means." EX1002, ¶¶ 192-193; EX1031 ¶ 95.

【 図 2 】



PO argues that Kurokawa Ribs 6a are not a heat dissipating means. EX2020 ¶¶ 204-207. However, Kurokawa teaches, and a POSITA would have understood, that air would flow from heat dissipation space through ventilation holes 7b to the ambient environment, thereby dissipating heat. EX1004 [0017], [0019], [0040]-[0041], [0044], [0052]; EX1031 ¶ 96. Therefore, a POSITA would understand that the heat would be transferred out of the device into the periphery and flow from the electronic components on flexible printed wiring board 72, to heat dissipation space 9 (warmer area), out through the ventilation holes 7c to the ambient air (cooler area). EX1031 ¶ 96.

Under both theories, Kurokawa anticipates claims 6 and 9 of the '842 patent. PO does not dispute that Kurokawa anticipates every limitation except [3b], [5], [6], and [9]. Therefore, Kurokawa renders claims 3-9 anticipated.

VII. GROUND 5: KUROKAWA OBVIOUSNESS

PO and Dr. Bretschneider only incorporate by reference their analysis under Ground 4 and do not make any unique arguments to Ground 5. Kurokawa renders claims 4 and 7-9 obvious. § VI; EX1002 ¶¶ 202-212; EX1031 ¶ 99.

VIII. GROUND 6: KUROKAWA, ISODA

PO and Dr. Bretschneider incorporate by reference their analysis under Grounds 4 and 5. Kurokawa claims 5-9, for the reasons described above and in the opening petition, are obvious. § VI, VII; EX1002 ¶¶ 213-249; EX1031 ¶ 100.

A. A POSITA Would Have Been Motivated to Combine Kurokawa and Isoda and a Reasonable Expectation of Success

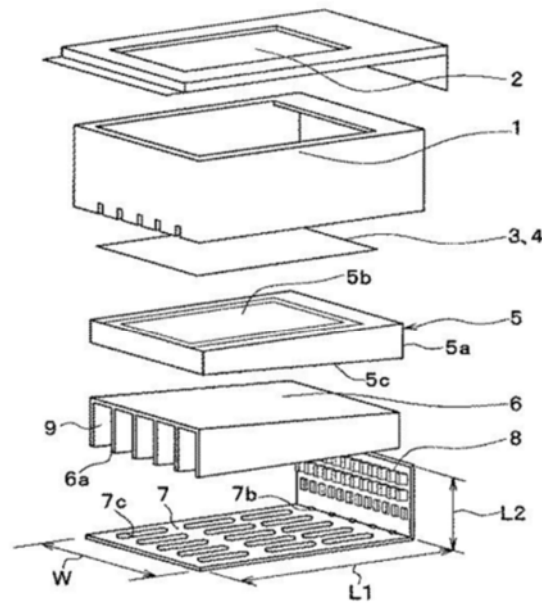
PO argues that POSITA would have not been motivated to combine Kurokawa with Isoda because Isoda states “if a print substrate is made with a metal having a high heat conductivity, the heat radiation problem is solved,” and that “Kurokawa’s PCB is made of metal.” EX2020 ¶ 202 (citing EX1005, 2:1-3). This analysis ignores that, first, it is not clear that the print substrate “made with metal having high heat conductivity” is the structure pointed to in Kurokawa. Second, Isoda makes it clear that the type of substrate used depends heavily on the application of the end device and notes that “the print substrate is not provided for mounting only the light emitting device . . . for [] other parts, the print substrate having high heat conductivity is not necessary.” EX1005 2:3-10; EX1031 ¶ 102.

Kurokawa and Isoda are also within related fields of art. Isoda is directed to “a light emitting device using a light emitting diode (LED)” and Kurokawa teaches an entire backlight package and display unit. EX1004, Abstract, Fig. 1, [0030]; EX1005 1:9-10. A POSITA would have been motivated to utilize the teachings from Isoda, with respect to print substrate used in LED system designs, to improve the backlight package disclosed in Kurokawa. EX1031 ¶¶ 103, 104.

Similarly, a POSITA would also have a reasonable expectation of success combining the heat fins in Isoda in the Kurokawa device. EX1031 ¶ 105. Dr. Bretschneider’s argument that it would cover the ventilation holes 7c is

unwarranted. Figure 1 below shows that the ventilation holes 7c have ample space between them, which would allow for heat sinks or fins to be placed without covering the ventilation holes. *Id.* ¶ 106.

[Fig. 1]



5: Light guide plate
 5a: Side edge
 7: Printed wiring board
 8: Light emitting diode
 71: Metal plate

Regarding Dr. Bretschneider's comment that the fin structure would conduct heat towards the interior of the device, Kurokawa's active cooling fans and ventilation holes would allow for air flow out of the device. In addition, the '842 patent's backlight package would likely be implemented in a structure that includes bezel, and would be dissipated from the interior of the bezel to the exterior of the device. Therefore, a POSITA would be motivated to combine Isoda

and Kurokawa, and had a reasonable expectation of success. The combination of Isoda and Kurokawa renders claims 5-9 obvious. EX1031 ¶¶ 107, 108.

Date: August 1, 2025

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), Petitioner certifies that this Petitioner's Reply to Patent Owner's Response includes 5600 words, as measured by Microsoft Word, exclusive of the table of contents, mandatory notices under § 42.8, certificates of service, word count, claim listing, and exhibits.

Date: August 1, 2025

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CERTIFICATE OF SERVICE

The undersigned certifies pursuant to 37 C.F.R. §§ 42.6(e) and 42.105 that on August 1, 2025, a true and correct copy of the Petitioner's Reply to Patent Owner's Response to Petition for Inter Partes Review of U.S. Patent No. 7,168,842 was served by emailing a copy of same (by agreement) to the following attorneys for the Patent Owner:

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