

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Nichia Corp.,
Petitioner

v.

BX LED LLC,
Patent Owner

Case No. IPR2024-00544
Patent No. 7,973,465

Petition for *Inter Partes* Review

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LIST OF EXHIBITS

Exhibit No.	Description
1001	U.S. Patent No. 7,973,465
1002	File History of U.S. Patent No. 7,973,465
1003	Declaration of Dr. Nan Jokerst
1004	<i>Curriculum Vitae</i> of Dr. Nan Jokerst
1005	Japanese Patent App. Pub. No. 2005-57089A with <i>certified translation</i> (“Shoji”)
1006	U.S. Patent App. Pub. No. 2011/0006668 (“Hussell”)
1007	U.S. Patent App. Pub. No. 2008/0179611 (“Chitnis”)
1008	U.S. Patent App. Pub. No. 2006/0022211 (“Yatsuda”)
1009	U.S. Patent App. Pub. No. 2007/0287208 (“Thompson”)
1010	U.S. Patent App. Pub. No. 2005/0224830 (“Blonder”)
1011	U.S. Patent No. 8,004,172 (“Hussell172”)
1012	U.S. Patent No. 6,949,772 (“Shimizu772”)
1013	U.S. Patent App. Pub. No. 2008/0055901 (“Sanpei”)
1014	Schubert, F., <u>Light Emitting Diodes</u> , Cambridge Univ. Press (2006) (<i>excerpted</i>)
1015	Tummala, Rao R., <u>Microelectronics Packaging Handbook</u> , Van Nostrand Reinhold (1989) (<i>excerpted</i>)
1016	U.S. Patent App. Pub. No. 2005/0174753 (“Cao”)
1017	Patent Owner’s Responsive Claim Construction Brief, Dkt. 28, dated Feb. 17, 2023, in <i>BX LED LLC v. Walmart Inc.</i> , No. 6:22-cv-00445 (W.D. Tex.) (<i>excerpted</i>)

Exhibit No.	Description
1018	Patent Owner’s Sur-Reply Claim Construction Brief, Dkt. 32, dated Mar. 24, 2023, in <i>BX LED LLC v. Walmart Inc.</i> , No. 6:22-cv-00445 (W.D. Tex.) (<i>excerpted</i>)
1019	Notice of Resolution of Claim Construction Dispute, Dkt. 39, dated Apr. 28, 2023, in <i>BX LED LLC v. Walmart Inc.</i> , No. 6:22-cv-00445 (W.D. Tex.)
1020	Declaration of John K. Roberts in Support of Patent Owner’s Responsive Claim Construction Brief, Dkt. 28-1, dated Feb. 17, 2023, in <i>BX LED LLC v. Walmart Inc.</i> , No. 6:22-cv-00445 (W.D. Tex.) (<i>excerpted</i>)
1021	Amended Claim Construction Order, Dkt. 43, dated May 3, 2023, in <i>BX LED LLC v. Walmart Inc.</i> , No. 6:22-cv-00445 (W.D. Tex.)
1022	Sergent, Jeremy, <u>Thermal Management Handbook for Electronic Assemblies</u> , McGraw-Hill (1998) (<i>excerpted</i>)
1023	Suryanarayana, C., <u>X-Ray Diffraction, A Practical Approach</u> , Plenum Press (1998) (<i>excerpted</i>)
1024	<u>McGraw-Hill Dictionary of Scientific and Technical Terms</u> , 6th Ed., McGraw-Hill (2003) (<i>excerpted</i>)
1025	U.S. Patent App. Pub. No. 2005/0212008 (“Miyoshi”)
1026	U.S. Patent App. Pub. No. 2008/0037252 (“Nii”)
1027	Chung, Yip-Wah, <u>Introduction to Materials Science and Engineering</u> , CRC Press (2007) (<i>excerpted</i>)
1028	U.S. Patent App. Pub. No. 2004/0104391 (“Maeda”)
1029	U.S. Patent App. Pub. No. 2006/0105485 (“Basin”)
1030	U.S. Patent App. Pub. No. 2007/0075325 (“Baek”)

Exhibit No.	Description
1031	U.S. Patent No. 5,998,925 (“Shimizu925”)

LISTING OF CLAIMS

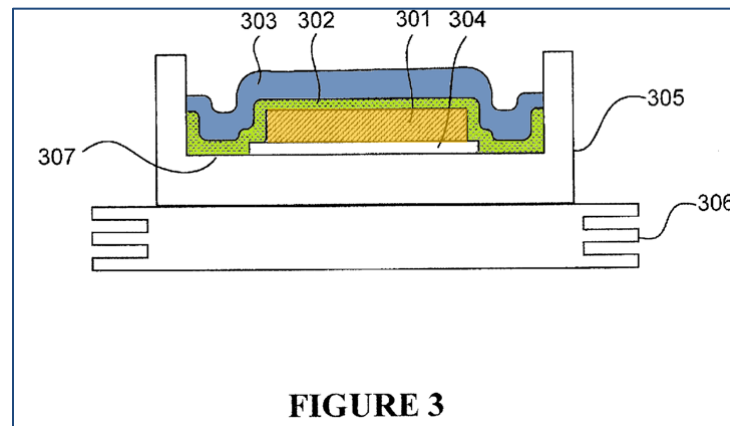
Element	Claim Language
Claim 1	
1[pre]	An apparatus comprising:
1[a]	a light emitting device;
1[b]	a phosphor bearing film arranged with the light emitting device, the phosphor bearing film comprising phosphor and a silicone carrier; and
1[c]	a cured silicone film on the phosphor bearing film, the cured silicone film being substantially free of phosphor.
Claim 2	
2	The apparatus of claim 1, wherein the phosphor bearing film is 60%-80% phosphor.
Claim 3	
3	The apparatus of claim 1, wherein the phosphor bearing film is at least partially on the light emitting device.
Claim 4	
4	The apparatus of claim 3, further comprising a metallic package, wherein the light emitting device is in the metallic package.
Claim 5	
5	The apparatus of claim 4, wherein the phosphor bearing film is at least partially on a surface of the metallic package.
Claim 6	
6	The apparatus of claim 5, further comprising a heat sink, wherein the package is on the heat sink.
Claim 7	
7[pre]	An apparatus comprising:
7[a]	a light emitting device;
7[b]	a phosphor bearing film arranged with the light emitting device, the film comprising phosphor and a carrier,
7[c]	wherein the phosphor bearing film is 60%-80% phosphor; and
7[d]	a rigid film on the phosphor bearing film.
Claim 8	
8	The apparatus of claim 7 wherein the carrier comprises silicone.
Claim 9	
9	The apparatus of claim 7 wherein the rigid film comprises a transparent cured silicone film.

Element	Claim Language
Claim 10	
10	The apparatus of claim 7, further comprising a metallic package, wherein the light emitting device is in the metallic package.
Claim 11	
11	The apparatus of claim 10, wherein the phosphor bearing film is at least partially on a surface of the package.
Claim 12	
12	The apparatus of claim 10, further comprising a heat sink, wherein the package is on the heat sink.

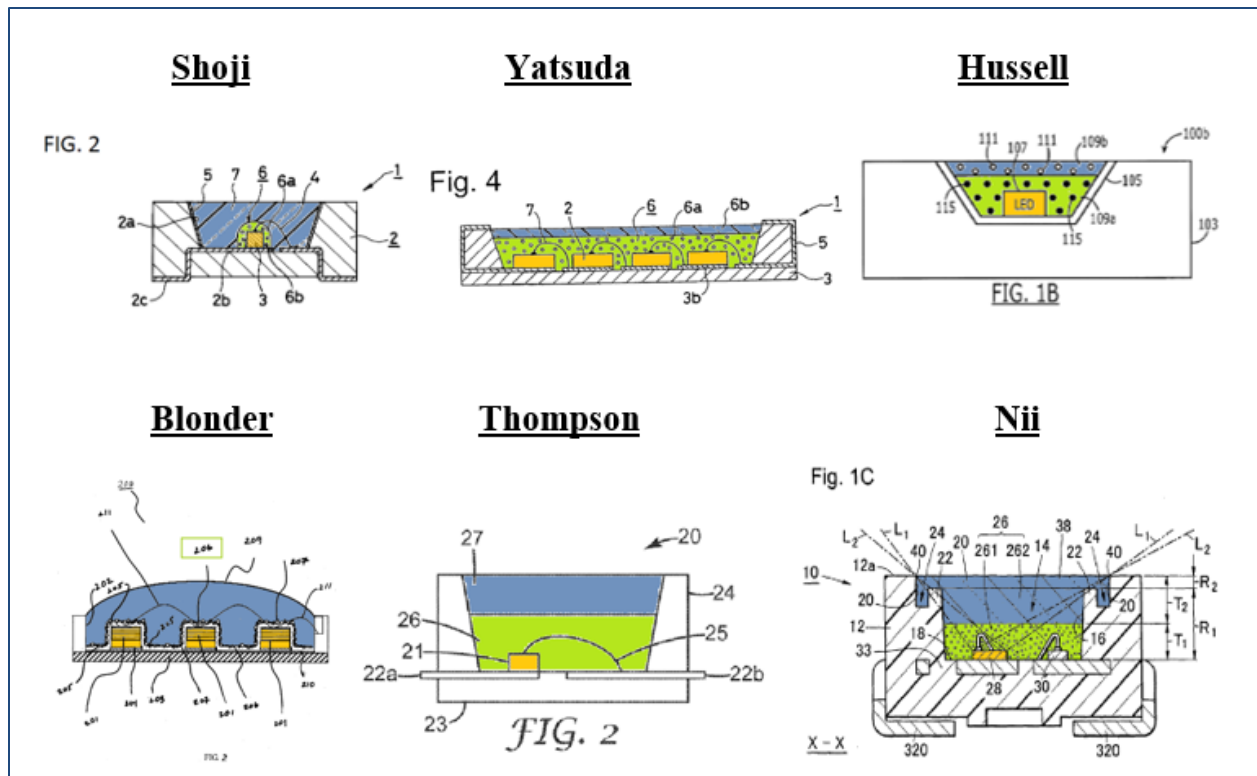
Nichia Corporation (“Petitioner”) requests *inter partes* review of claims 1-12 of U.S. Patent No. 7,973,465 (EX1001, the “’465 patent”), assigned to BX LED LLC (“Patent Owner”). There is a reasonable likelihood Petitioner will prevail on at least one challenged claim.

I. Introduction

The ’465 patent discloses and claims simple concepts that were well-known in the LED packaging field by the time of the patent’s November 2009 priority date. The claims are directed to an “LED apparatus” with two “films,” where **one film** comprises phosphor in a silicone carrier over an **LED chip**, and the **other film** is cured silicone (or rigid) that, in certain claims, is also substantially phosphor-free.



But such an LED apparatus construction pre-dated the ’465 patent. The prior art in this Petition—including each of *Shoji*, *Yatsuda*, *Hussell*, *Blonder*, *Thompson*, and *Nii*—discloses the same two-film LED apparatus structure, made of the same materials, arranged in the same way as the claims.



As explained below and in the declaration of Dr. Jokerst, there is nothing inventive about the challenged claims. The Board should institute this petition and cancel the claims.

II. Mandatory Notices (37 C.F.R. §42.8)

A. Real Parties in Interest (37 C.F.R. §42.8(b)(1))

Nichia Corporation is the sole real party in interest.

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

The '465 patent is currently being asserted by Patent Owner in *BX LED LLC v. Current Lighting Solutions, LLC*, No. 6:24-cv-00095 (W.D. Tex., filed Feb. 19, 2024) and *BX LED LLC v. Keystone Technologies, LLC*, No. 3:23-cv-02862 (N.D. Tex., filed Dec. 27, 2023).

The '465 patent was also asserted by Patent Owner in *BX LED LLC v. Lowe's Companies, Inc.*, No. 6:23-cv-00451 (W.D. Tex., filed June 13, 2023). While the case remains pending, (i) on February 15, 2024, the parties jointly moved to stay the case because they had “reached an agreement in principle that would resolve all claims and defenses,” which stay was granted by the Court pending finalizing settlement; and (ii) on March 20, 2024, the parties informed the Court that “[t]he agreement has been finalized, but additional time is necessary for the agreement to be executed by all Parties and for the dismissal to be filed.”

The '465 patent was also previously asserted by Patent Owner in cases that have been voluntarily dismissed: (i) *BX LED LLC v. Wayfair LLC*, No. 6:22-cv-00446 (W.D. Tex., filed May 2, 2022; dismissed Feb. 27, 2023); (ii) *BX LED LLC v. Walmart Inc.*, No. 6:22-cv-00445 (W.D. Tex., filed May 2, 2022; dismissed Aug. 31, 2023); (iii) *BX LED LLC v. Home Depot USA, Inc.*, No. 6:22-cv-00444 (W.D. Tex., filed May 2, 2022; dismissed Dec. 22, 2022); and (iv) *BX LED LLC v. RAB Lighting, Inc.*, No. 3:23-cv-01323 (N.D. Tex., filed Jun. 13, 2023; dismissed Sept. 1, 2023).

C. Counsel and Service Information (37 C.F.R. §§42.8(b)(3)-(4))

Petitioner designates the following lead and back-up counsel:

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III. Requirements for *Inter Partes* Review (37 C.F.R. §42.104)

A. Grounds for Standing (37 C.F.R. §42.104(a))

Petitioner certifies the '465 patent is available for IPR, and Petitioner is not barred or estopped from requesting IPR challenging the claims on the identified grounds.

B. Identification of Challenge (37 C.F.R. §42.104(b)(1)-(2)) and Relief Requested (37 C.F.R. §42.22(a)(1))

Petitioner requests the Board institute IPR because the challenged claims are anticipated and/or obvious under pre-AIA 35 U.S.C. §§102 and 103 based on the following grounds:

Ground	Prior Art	Basis	Claims
1	Japanese Patent App. Pub. No. 2005-57089A (“Shoji”)	§102	1-5, 7-11
2	Shoji alone or in view of U.S. Patent App. Pub. No. 2006/0022211 (“Yatsuda”)	§103	2, 4-12
3	Yatsuda	§103	1, 3-6
4	U.S. Patent App. Pub. No. 2011/0006668 (“Hussell”)	§102	1, 3-5
5	Hussell	§103	2, 6-12
6	U.S. Patent App. Pub. No. 2005/0224830 (“Blonder”)	§103	1-5, 7-11
7	Blonder alone or in view of Yatsuda	§103	6, 12
8	U.S. Patent App. Pub. No. 2007/0287208 (“Thompson”)	§102	1-3, 7-9

Ground	Prior Art	Basis	Claims
9	Thompson alone or in view of Yatsuda and/or U.S. Patent App. Pub. No. 2008/0037252 ("Nii")	§103	1-12

IV. Relevant Information Concerning the Contested Patent

A. '465 Patent Overview

The '465 patent "relates to light emitting diodes with a thin phosphor layer." EX1001, 1:16-17. It is a divisional of an application filed November 3, 2009. *Id.*, Cover Page.

Per the patent, prior art white LEDs were formed by "introducing a suspension of phosphor particles into a carrier (e.g., silicone), encapsulating the LEDs in the carrier, and curing the carrier to provide a solid layer of material in which the phosphor particles will remain suspended." *Id.*, 1:37-41. However, the patent asserts that because "phosphors generate heat" and "silicone is a poor thermal conductor," "when a phosphor-coated LED with a cured silicone carrier is used in a high-power application, the cured silicone may crack and/or have a reduced lifetime." *Id.*, 1:41-45.

The patent purports to solve this problem through "a method of manufacturing" (or an article prepared by a method) that "includes dispensing a mixture including phosphor and an uncurable fluid onto a surface, and at least partially drying the mixture," whereupon "[a] curable fluid is dispensed onto the at

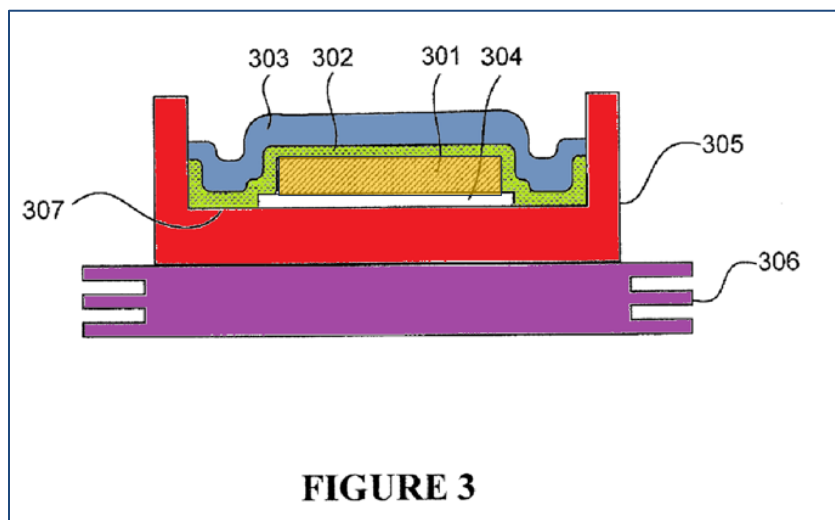
least partially dried mixture, and the curable fluid is cured.” *Id.*, 1:55-65. The patent also discloses “an apparatus includ[ing] a phosphor bearing film including phosphor and a carrier, and a rigid film on the phosphor bearing film.” *Id.*, 1:66-2:2.

The patent contrasts prior art packages where the “phosphor dispersed in th[e] silicone [was] generally limited to 33-35%,” with its “high concentration” phosphor that “may be from 60% to 80% phosphor.” *Id.*, 4:4-45, 6:17-20. The patent does not ascribe any significance to this range and only certain claims require a range (*i.e.*, claims 2 and 7-12).

Figure 3 depicts “an exemplary apparatus,” showing “**light emitting diode 301**,” “**phosphor bearing layer 302**,” and “**rigid layer 303**,” along with **package 305** on **heat sink 306**.¹ *Id.*, 6:12-41. **Phosphor bearing layer 302** “may include a high concentration of phosphor (e.g., from 60% to 80% phosphor), and may include treated silica and... uncurable silicone.” *Id.*, 6:17-20. **Rigid layer 303** “may be a silicone material that has been subjected to a curing process such that it provides a mechanical protective layer over the phosphor bearing layer 302,” and “[i]n some embodiments,” may be “substantially free of phosphor, by virtue of it having been

¹ Unless otherwise noted, all emphasis and coloring has been added and case citations have been cleaned up.

deposited after at least partially drying the phosphor bearing layer 302.” *Id.*, 6:24-30.



B. Person of Ordinary Skill in the Art

Several factors may be considered in determining the qualifications of a person of ordinary skill in the art (“POSA”). M.P.E.P. §2141.03. Here, the level of skill is apparent from the cited art. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995).

Petitioner submits that a POSA would have had at least a bachelor’s degree in electrical engineering, materials science, or a related field, and three years’ experience in the field of LED package design. EX1003 ¶¶24-27. This description is approximate—a higher education or skill level might make up for less experience,

and vice-versa. EX1003 ¶26. Petitioner's expert, Dr. Jokerst, was at least a POSA as of the '465 patent's priority date, November 3, 2009. EX1003 ¶¶5-12, 27; EX1004.²

C. Claim Construction (37 C.F.R. §42.104(b)(3))

This Petition construes terms consistent with the understanding a POSA would have had at the time of the invention, in view of the evidence of record (including the intrinsic record and any extrinsic evidence). *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1313-14 (Fed. Cir. 2005). Only terms subject to a legitimate dispute relevant to the invalidity issues in this IPR need to be construed here. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017); *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

As shown herein, the prior art anticipates and renders obvious the challenged claims under any reasonable construction. Any implicit constructions derived from Petitioner's analysis are for purposes of this IPR only and may be based in-part on positions Patent Owner took during district court litigation.

² Dr. Jokerst is an expert in optoelectronics, including LEDs and LED packaging. EX1003 ¶¶5-12; EX1004 (CV).

Petitioner notes one previous claim-construction briefing, where Patent Owner asserted:

No.	Term	Patent Owner's Proposed Construction
#1	“a phosphor bearing film arranged with the light emitting device” (independent claims 1, 7; claims 2-6, 8-12 by dependency)	Plain and ordinary meaning
#2	“the phosphor bearing film is 60%-80% phosphor” (dependent claim 2; independent claim 7; claims 8-12 by dependency)	Plain and ordinary meaning Alternatively, “the phosphor bearing film is 60%-80% phosphor <i>by weight</i> ” (emphasis in original)

EX1017, 9-15; EX1018, 6-9; EX1020 ¶¶48-57.

The magistrate judge found *Term #1* to have its “Plain and Ordinary Meaning.” EX1021, 3-4.

After briefing, the parties reached agreement on *Term #2*. EX1019, 1. The magistrate judge then found it to have its “Plain and Ordinary Meaning (as agreed to by the parties, see ECF No. 39 [EX1019]).” EX1021, 4.

For purposes of this IPR, Petitioner relies—in certain instances—on alternative claim constructions and demonstrates how the prior art anticipates and/or renders obvious the challenged claims, regardless of the particular construction.

For example, Petitioner explains below how the prior art anticipates and/or renders obvious relevant claims (*i.e.*, claims 2 and 7-12) should the term “the phosphor bearing film is 60%-80% phosphor”—which does not have a unit measurement in the claims—be interpreted as percent by (i) weight or (ii) volume.

Petitioner notes that, per Patent Owner, the by-weight interpretation is appropriate in view of the '465 patent, but that the claim term could theoretically encompass “both ‘embodiments’ [*i.e.*, “by either weight or volume”] with definite boundaries.” EX1018, 8-9. Patent Owner’s argument is based primarily on “the '465 Patent provid[ing] a ‘detailed example’ of combining the film’s components referencing the weight of each component” (*i.e.*, grams). EX1017, 14 (citing EX1001, 5:50-68 [sic: 67]); EX1018, 9.³

Although Petitioner explains below how the prior art renders the relevant claims invalid under both interpretations, given the above, Petitioner respectfully submits—for purposes of this IPR—***the Board only need to evaluate the by-weight***

³ Petitioner notes that (i) there are no other examples in the patent, and (ii) the percentage is described throughout the patent without qualifying the units or how it is determined. EX1001, 2:1-2, 4:42-45, 6:17-20; *see also generally id.*

*interpretation to find the relevant claims unpatentable.*⁴ See *Oatey Co. v. IPS Corp.*, 514 F.3d 1271, 1276 (Fed. Cir. 2008); *CUPP Computing AS v. Trend Micro Inc.*, 53 F.4th 1376, 1381 (Fed. Cir. 2022).

V. The Specific Grounds of Unpatentability

As evidenced by the prior art and Dr. Jokerst’s declaration, there was nothing new or novel about the ’465 patent’s claims.

A. Exemplary Prior Art and State of the Art

The below provides an overview of certain exemplary prior art; additional art is discussed in Sections V.B-J.

No prior art in the Grounds was previously before the Patent Office.

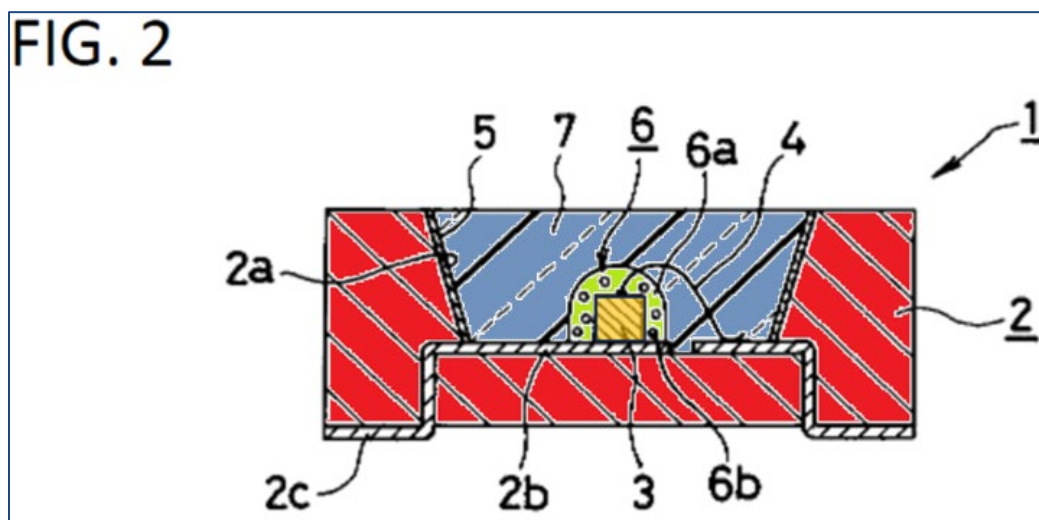
1. Shoji

Shoji was filed August 5, 2003 and published March 3, 2005. EX1005, Cover Page. It is prior art under pre-AIA §102(b).

Shoji discloses, in Figure 2, a multi-layer LED package with “**inner molding layer 6** [] formed by covering **LED chip 3** with a member in which a phosphor 6b is dispersed in a transparent silicone resin 6a.” *Id.*, [0008]-[0010], [0020]. After **molding layer 6** is formed “it is heated to about 80°C... to be temporarily cured....”

⁴ That is, the Board only needs to evaluate “by volume” should it determine that “by weight” is not covered.

Id., [0011]. “[T]ransparent silicone resin into which no phosphor 6b is added is then injected into the remaining portion of the chip housing recess 2a to form an **outer molding layer 7**.” *Id.*, [0012]. Both molding layers are then cured at $\geq 80^{\circ}\text{C}$. *Id.*, [0012]. Shoji discloses “**package 2**” that may be ceramic and includes “reflector 5... formed on the side surface of chip housing recess 2a by a reflective treatment such as silver plating....” *Id.*, [0008]-[0009].



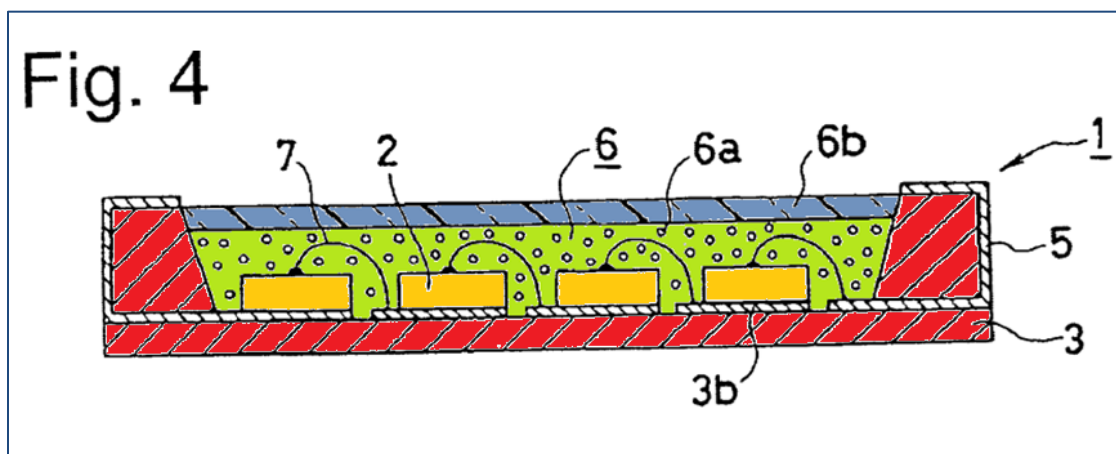
Shoji describes the amount of phosphor for molding layer 6, stating that “luminance improves as the percentage added increases,” reaching its maximum value at approximately 60% phosphor by weight. *Id.*, [0020].

In cases where “a quantity of light is required and drive power is increased,” Shoji recognizes that “cooling of the LED chip 3 is more necessary than before, and the part where... LED chip 3 is die-mounted may be formed... as a metal block with excellent heat conduction.” *Id.*, [0034].

2. Yatsuda

Yatsuda was filed July 25, 2005 and published February 2, 2006. EX1008, Cover Page. It is prior art under pre-AIA §102(b).

Yatsuda discloses, in Figure 4, “LED lamp 1” with **LED chips 2** mounted in a cavity of **base 3**, and “**transparent silicone resin 6**, into which a phosphor 6a is mixed to obtain white light,” which is covered by “**a film of a hard silicone resin 6b**.” *Id.*, [0033]-[0034], [0041]. Yatsuda discloses that its base “should be made of a material being superior in heat conductivity,” and specifies various metallic materials, including metal (*e.g.*, copper) and ceramic (*e.g.*, aluminum nitride). *Id.*, [0033]-[0034].

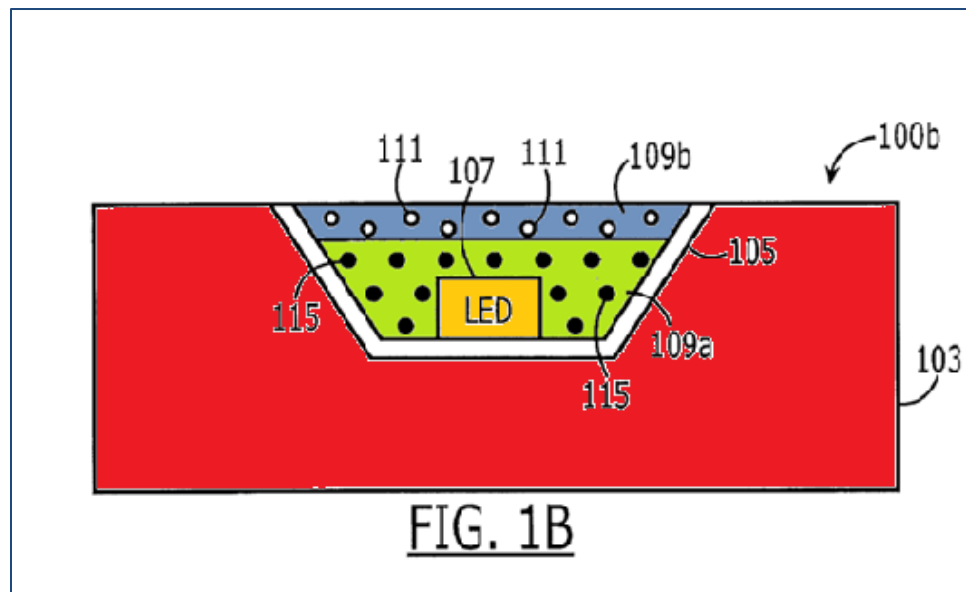


3. Hussell

Hussell was filed July 10, 2009 and published January 13, 2011. EX1006, Cover Page. It is prior art under pre-AIA §102(e).

Hussell discloses, in Figure 1B, **LED 107** under **encapsulating layer 109a** that includes phosphor particles 115, which layer 109a is under **encapsulating layer**

109b that is “substantially free of phosphor particles 115.” *Id.*, [0033]-[0034]. To create this structure, “liquid encapsulating material with phosphor particles 115 mixed therein may be dispensed on LED 107 and then at least partially cured/hardened to provide [layer] 109a.” *Id.*, [0034]. Liquid encapsulating material may subsequently be dispensed on layer 109a “and then cured/hardened to provide [layer] 109b.” *Id.*, [0034]. Encapsulating material 109 may be silicone. *Id.*, [0039]. **LED 107** is mounted in the cavity of **substrate 103**. *Id.*, [0031]-[0033].



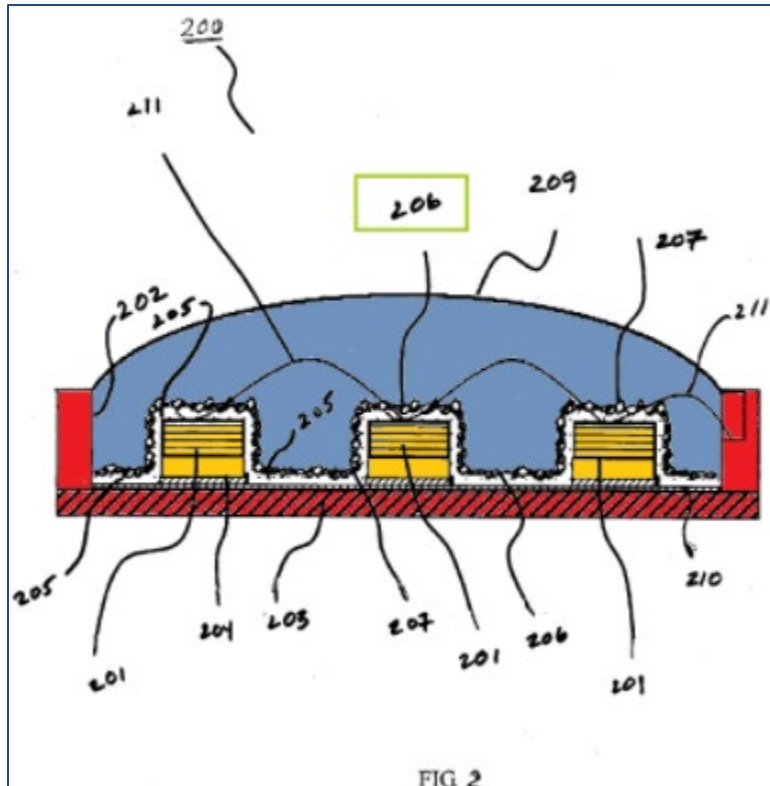
4. **Blonder**

Blonder was filed April 9, 2004 and published October 13, 2005. EX1010, Cover Page. It is prior art under pre-AIA §102(b).

Blonder discloses, in Figure 2, **LEDs 201** mounted in a **cavity of a highly thermally conductive substrate 203** made of metal (*e.g.*, copper) or ceramic (*e.g.*, aluminum nitride). *Id.*, [0018]-[0019]. Blonder discloses “transparent adhesive

monolayer 205... placed on top of the multiple LED bodies 201 and a layer 206 of phosphor particles 207... adhered overlying and over the sides of the bodies 201,” which monolayer 205 may be silicone. *Id.*, [0018], [0023]-[0024]. “The particles 207 of the phosphor layer coating can attach to the tacky layer 205 creating a **closed [sic: close] packed dense film layer 206.**” *Id.*, [0018].

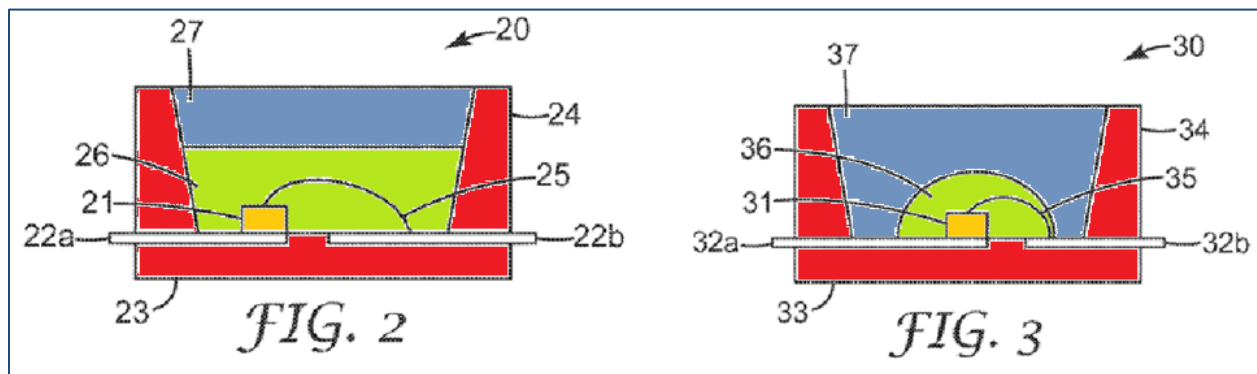
Blonder discloses to seal assembly 200 including layer 206 “with a **second transparent material 209,**” which may be silicone. *Id.*, [0018], [0026].



5. Thompson

Thompson was filed April 30, 2007 and published December 13, 2007. EX1009, Cover Page. It is prior art under pre-AIA §102(b).

In Figures 2 and 3, Thompson discloses **LED dies (21, 31)** “encapsulated with a multilayer encapsulant” and “disposed on **substrate [22, 33] in reflecting cup [24, 34].**” *Id.*, [0015], [0058]. The multilayer encapsulant comprises **first encapsulant layer (26, 36)** and **second encapsulant layer (27, 37)**. *Id.*, [0015], [0058]. The first encapsulant may comprise silicone. *Id.*, [0017], [0019]. The second encapsulant may be cured silicone resin. *Id.*, [0022]-[0025]. The first and/or second encapsulants can comprise phosphor such as doped garnets (*e.g.*, YAG:Ce). *Id.*, [0050], [0054]. “If used, the phosphor particles are preferably included in the encapsulating material in an amount of no greater than 85 wt-%, and in an amount of at least 1 wt-%, based on the total weight of the encapsulating material.” *Id.*, [0054].

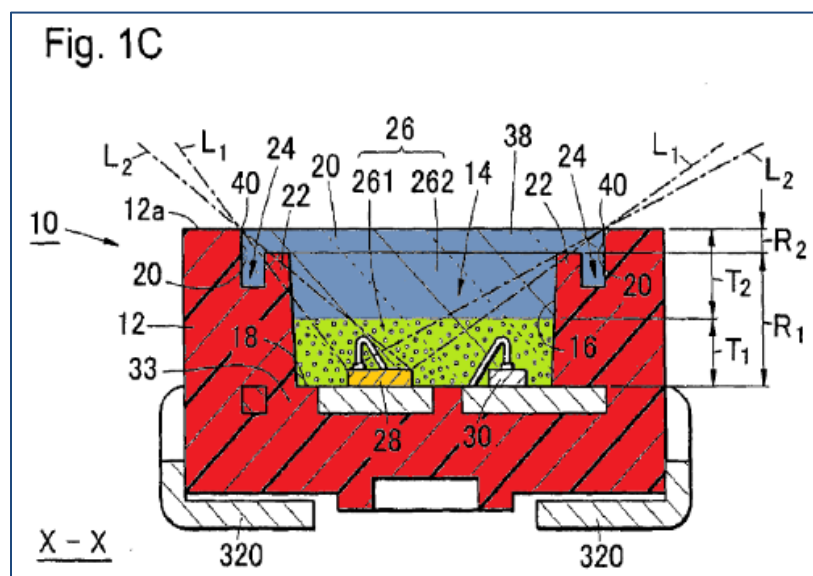


6. Nii

Nii was filed August 2, 2007 and published February 14, 2008. EX1026, Cover Page. It is prior art under pre-AIA §102(b).

Nii discloses, in Figure 1C, an LED package with a multi-layer encapsulant, where **first sealing layer 261** may be silicone and include fluorescent material such

as phosphor, and **second sealing layer 262** may be silicone and phosphor free, with **light emitting element 28** mounted in **housing 12**. *Id.*, [0076], [0090]-[0091], [0112]-[0113], [0123], [0130], [0164].



B. Shoji Anticipates Claims 1-5 and 7-11

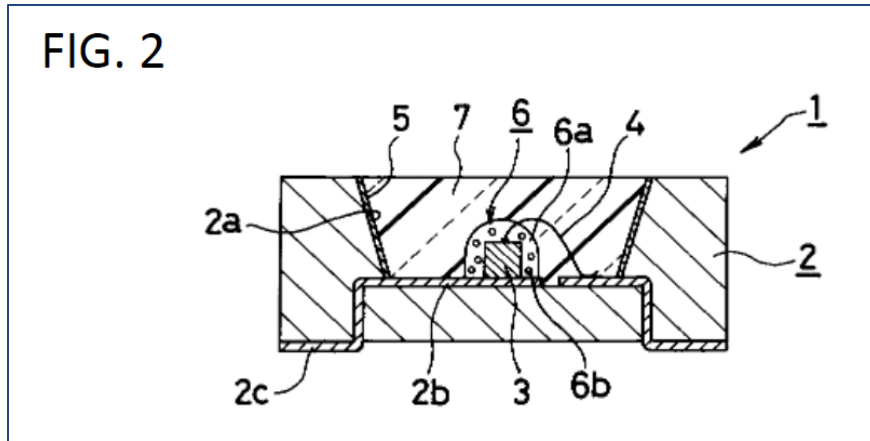
Shoji discloses claims 1-5 and 7-11, arranged as in the claims.

1. Claim 1

1[pre] “An apparatus comprising:”

Shoji discloses the preamble, regardless of whether it is limiting. EX1003 ¶85;
see limitations 1[a]-1[c].

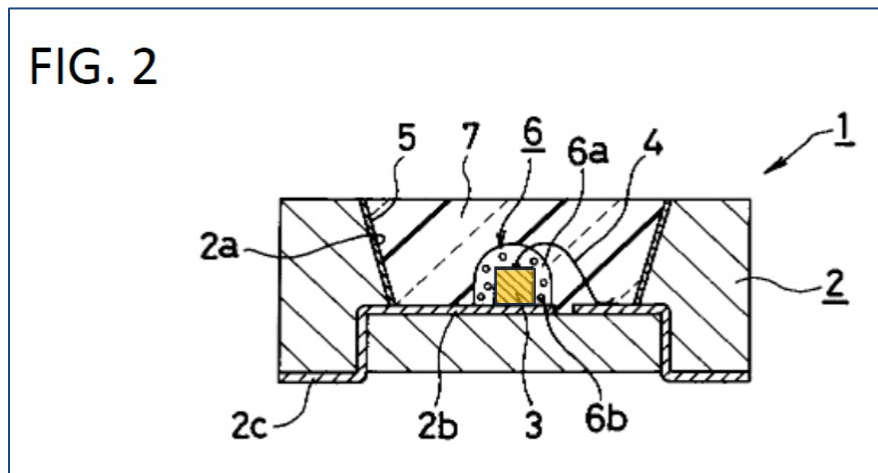
Shoji discloses an apparatus, such as “LED lamp 1” in Figure 2. EX1005, [0008]; EX1003 ¶85.



1[a] “a light emitting device;”

Shoji discloses limitation 1[a]. EX1003 ¶¶86-88.

Shoji discloses **LED chip 3** in Figure 2. EX1005, [0007] (“light emitted from the LED chip”), [0009] (“LED chip 3 can be illuminated”); EX1003 ¶87.



A POSA would have understood that the claimed “light emitting device” in the context of the ’465 patent corresponds to at least a light emitting diode. EX1003 ¶88; EX1001, 5:8-9 (“packaged and wire-bonded light emitting device”), 6:31-35 (“LED 301 may be attached to a package 305 [which] enclose[es] the light emitting device.”); *see also* 1:18-19, FIG. 3; EX1002, 39 (rejection for failure to include

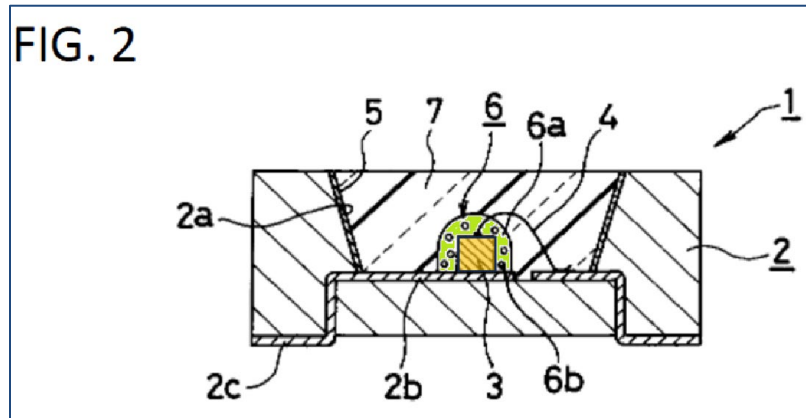
“light emitting diode”), 52 (applicant’s response using term “light emitting device”); EX1017, 12-13 (Patent Owner asserting “light emitting device” is “LED,” *e.g.*, “light emitting diode 301”); EX1020 ¶54.

1[b] “a phosphor bearing film arranged with the light emitting device, the phosphor bearing film comprising phosphor and a silicone carrier; and”

Shoji discloses limitation 1[b]. EX1003 ¶¶89-91.

Shoji discloses that “**inner molding layer 6** is formed by covering **LED chip 3** with a member in which a **phosphor 6b** is dispersed in a transparent **silicone resin 6a**,” which a POSA would have understood corresponds to the claimed “phosphor bearing film arranged with the light emitting device” and “comprising phosphor and a silicone carrier.” EX1005, [0010], [0020] (phosphor 6b is “mixed and dispersed into transparent silicone resin 6a in the inner molding layer 6”), [0023] (“inner molding layer 6 is formed wherein transparent silicone resin 6a and phosphor 6b are mixed in an appropriate ratio... thus enabling, firstly, the placement of an appropriate amount of phosphor 6b....”); EX1002, 53 (applicant asserting “‘carrier’ is a medium for ‘carrying,’ [] another substance, which in this case is, for example, phosphor....”); EX1001, 5:50-6:11 (“mixing” phosphor and silicone), 6:12-47 (“phosphor bearing *layer* 302” or “*film* 302” used interchangeably); EX1003 ¶¶90-91.

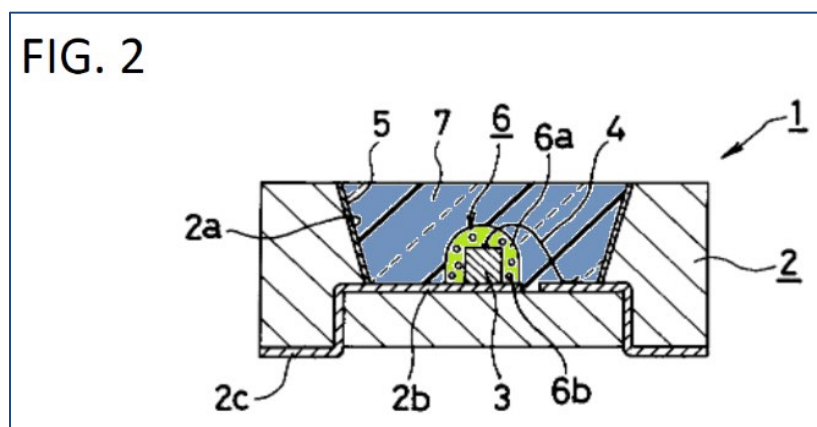
Figure 2 depicts **molding layer 6** arranged with **LED chip 3**. EX1005, [0010]; EX1003 ¶90. This is like the '465 patent. EX1001, FIG. 3; EX1003 ¶¶91, 37; §IV.A.



1[c] “a cured silicone film on the phosphor bearing film, the cured silicone film being substantially free of phosphor.”

Shoji discloses limitation 1[c]. EX1003 ¶¶92-95.

Shoji discloses “**outer molding layer 7**” formed from “transparent *silicone* resin into which *no* phosphor 6b is added.” EX1005, [0012]; EX1003 ¶93. **Outer molding layer 7** is cured. EX1005, [0012] (“heated at a temperature of $\geq 80^{\circ}\text{C}$ to implement the curing process”); EX1003 ¶93. In Figure 2, **molding layer 7** is on **molding layer 6**. EX1005, [0010]-[0012]; EX1003 ¶94; *see also* EX1001, 3:1-4.



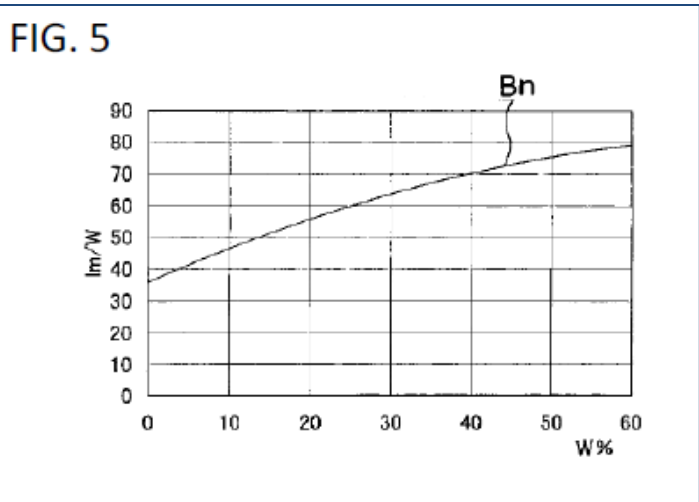
Accordingly, a POSA would have understood that outer molding layer 7 is: (i) a cured silicone film; (ii) on the phosphor bearing film (*i.e.*, inner molding layer 6); and (iii) substantially free of phosphor (and, per Shoji, has “no” phosphor at all). EX1003 ¶95.

2. Claim 2

“The apparatus of claim 1, wherein the phosphor bearing film is 60%-80% phosphor.”

Shoji discloses claim 1. §V.B.1. Shoji also discloses claim 2. EX1003 ¶¶96-105.

Shoji discloses that mold layer 6 (the claimed “phosphor bearing film”) may comprise 60% phosphor by weight. EX1005, [0020] (“[I]n the present invention (see Figure 5), the state in which the ratio of phosphor 6b, mixed and dispersed into transparent silicone resin 6a in the inner mold layer 6, is gradually increased by weight % [L]uminance improves as the percentage added increases, and at [] approximately **60% (wt.%)** [luminance] reaches [what] is considered to be the maximum value.”), FIG. 5; EX1003 ¶¶97-99.



That Shoji discloses both a particular point within the claimed range and an overlapping range leads to anticipation for two independent reasons.

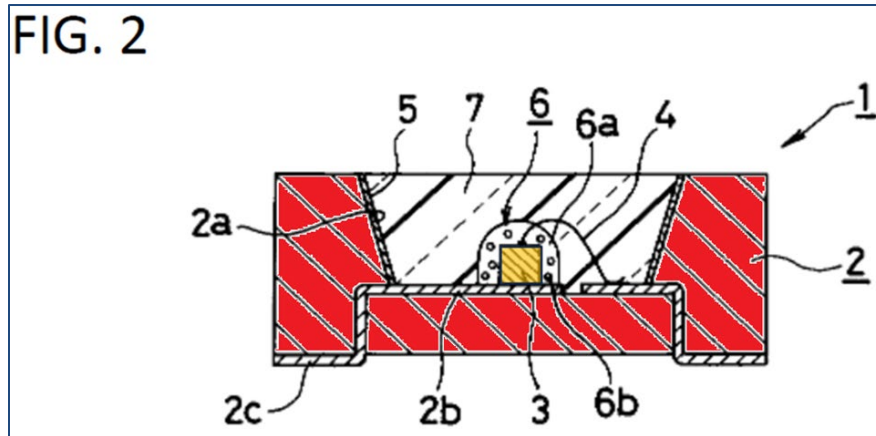
First, Shoji discloses a particular point—approximately 60% by weight—within the claimed range, EX1005, [0020]; EX1003 ¶97, which demonstrates that Shoji discloses this limitation. *See Ineos USA LLC v. Berry Plastic Corp.*, 783 F.3d 865, 869 (Fed. Cir. 2015) (“When a patent claims a range, as in this case, that range is anticipated by a prior art reference if the reference discloses a point within the range.”); *see also ModernaTX, Inc. v. Arbutus Biopharma Corp.*, 18 F.4th 1352, 1363-64 (Fed. Cir. 2021); *Titanium Metals Corp. of Am. v. Banner*, 778 F.2d 775, 781 (Fed. Cir. 1985).

Second, Shoji discloses an overlapping range with the claimed range, EX1005, [0020], FIG. 5; EX1003 ¶98, and thus Petitioner has additionally established—at a minimum—a prima face case of anticipation. *See Genentech, Inc. v. Hospira, Inc.*, 946 F.3d 1333, 1338 (Fed. Cir. 2020) (“Once the patent challenger

has established, through overlapping ranges, its prima facie case of anticipation, ... patentee [must] establish[] that the claimed range is critical to the operability of the claimed invention.”); *E.I. DuPont de Nemours & Co. v. Synvina C.V.*, 904 F.3d 996, 1008 (Fed. Cir. 2018); *Lazare Kaplan Int’l Inc. v. Photoscribe Techs., Inc.*, 628 F.3d 1359, 1380-81 (Fed. Cir. 2010).

Further confirming to a POSA that Shoji’s range discloses the claimed range and there is no criticality to the claimed range, the ’465 patent does not assert that there is any criticality to the particular claimed 60%-80% range, nor does it explain what would make that range critical. *See generally* EX1001; EX1003 ¶100. Rather, the ’465 patent simply asserts that the prior art discloses “thin phosphor layers” and low-viscosity silicone where “the percentage of phosphor dispersed in this [low-viscosity] silicone is generally limited to 33-35%,” and that such process does not “appear[] capable of producing a satisfactorily thin phosphor layer including a high concentration of phosphor.” EX1001, 3:61-4:45; EX1003 ¶102. The ’465 patent further states that a particular percentage is optional, *e.g.*, that “phosphor bearing layer 302 may include a high concentration of phosphor (*e.g.*, from 60% to 80% phosphor)....” EX1001, 6:17-20, 4:40-45; EX1003 ¶101. Nowhere does the ’465 patent explain why the 60%-80% range is critical; only that there was an alleged desire for a higher concentration than the patent (wrongly) asserts was known. *See generally* EX1001; EX1003 ¶¶102-103.

Figure 2 depicts **LED chip 3** housed in **package 2**, which may be ceramic and include a metal reflector (*e.g.*, plated silver). EX1005, [0008]-[0009]; EX1003 ¶¶110-111. Shoji discloses that “since a quantity of light is required and drive power is increased, cooling of the LED chip 3 is more necessary than before, and the part where... LED chip 3 is die-mounted may be formed... as a metal block with excellent heat conduction.” EX1005, [0034]; *see also* [0033], [0008]; EX1003 ¶¶111-113.



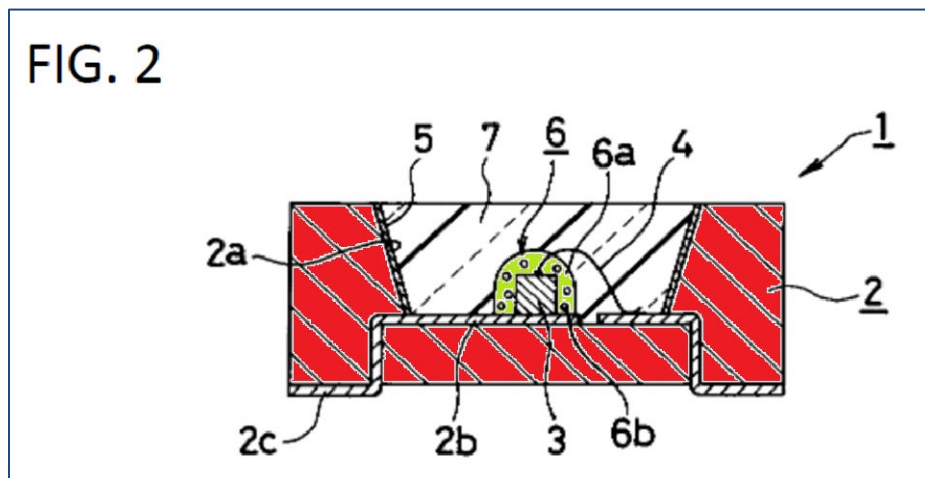
Accordingly, a POSA would have understood package 2—which can be or include a metal block—constitutes the claimed metallic package. EX1003 ¶114; EX1001, 3:61-64, 6:35-39.

5. Claim 5

“The apparatus of claim 4, wherein the phosphor bearing film is at least partially on a surface of the metallic package.”

Shoji discloses claims 1, 3, and 4. §§V.B.1, V.B.3-4. Shoji also discloses claim 5. EX1003 ¶¶115-116.

As shown in Figure 2, **molding layer 6** is at least partially on a surface of **package 2**. EX1005, [0008]-[0010]; EX1003 ¶116; EX1001, 3:1-4 (explaining element “on” another).



6. Claims 7-11

As shown in the following table, claims 7-11 are highly similar to claims 1-2 and 4-5 relative to the invalidity analysis herein. EX1003 ¶¶117-124.

Claims 1-2, 4-5	Claims 7-11
1[pre] An apparatus comprising:	7[pre] An apparatus comprising:
1[a] a light emitting device;	7[a] a light emitting device;
1[b] a phosphor bearing film arranged with the light emitting device, the phosphor bearing film comprising phosphor and a <u>silicone</u> carrier; and	7[b] a phosphor bearing film arranged with the light emitting device, the film comprising phosphor and a carrier, 8. The apparatus of claim 7 wherein the carrier comprises <u>silicone</u> .

Claims 1-2, 4-5	Claims 7-11
2. The apparatus of claim 1, wherein the phosphor bearing film is 60%-80% phosphor.	7[c] wherein the phosphor bearing film is 60%-80% phosphor.
1[c] a <u>cured silicone</u> film on the phosphor bearing film, <u>the cured silicone film being substantially free of phosphor</u> .	7[d] a <u>rigid</u> film on the phosphor bearing film. 9. The apparatus of claim 7 wherein the rigid film comprises a <u>transparent cured silicone</u> film.
4. The apparatus of claim 3, further comprising a metallic package, wherein the light emitting device is in the metallic package.	10. The apparatus of claim 7, further comprising a metallic package, wherein the light emitting device is in the metallic package.
5. The apparatus of claim 4, wherein the phosphor bearing film is at least partially on a surface of the metallic package.	11. The apparatus of claim 10, wherein the phosphor bearing film is at least partially on a surface of the package.

EX1001, 7:5-14, 7:17-21, 8:3-17.

As the table shows: (i) claims 7-9 are collectively of the same relevant (or broader) scope than claims 1-2; and (ii) claims 10-11 correspond to claims 4-5 (though are broader given their dependencies). *See also* EX1003 ¶118.

As to the differences between claims 7-9 and claims 1-2, as the table shows:

- independent claim 7 is broader than claim 1 in that (i) claim 7 does not specify the type of carrier (that is found in dependent claim 8), (ii) claim 7 requires only a “rigid film” rather than a “cured silicone film” as in claim 1 (dependent claim 9 introduces the “cured silicone film” and thus by claim differentiation, the “rigid film” in claim 7 encompasses “cured silicone film”), and (iii) claim 7 does not require that the “rigid film” is “substantially free of phosphor”;
- claim 9 is narrower in that it requires the “cured silicone film” to be “transparent,” which is not found in claims 1, 2, 4, or 5 (but is typical of such films) and broader in that it does not require the film to be “substantially free of phosphor”; and
- claim 7 is narrower than claim 1 as it requires that the phosphor bearing film is 60%-80% phosphor (such limitation is found in dependent claim 2).

See also EX1003 ¶¶119-123.

Accordingly, as further explained below, claims 7-11 are anticipated by Shoji for essentially the same reasons as claims 1-2 and 4-5. *See also* EX1003 ¶124. And, given that claims 7-11 are broader in certain respects as shown above, it further demonstrates that Shoji anticipates these claims.

7[pre] “An apparatus comprising:”

Shoji discloses the preamble of claim 7, regardless of whether it is limiting, for the same reasons it discloses claim 1’s preamble. EX1003 ¶125; §V.B.1 (1[pre]).

7[a] “a light emitting device;”

Shoji discloses limitation 7[a] for the same reasons it discloses limitation 1[a]. EX1003 ¶126; §V.B.1 (1[a]).

7[b] “a phosphor bearing film arranged with the light emitting device, the film comprising phosphor and a carrier,”

Shoji discloses limitation 7[b] for the same reasons it discloses limitation 1[b]. EX1003 ¶127; §V.B.1 (1[b]).

7[c] “wherein the phosphor bearing film is 60%-80% phosphor; and”

Shoji discloses limitation 7[c] for the same reasons it discloses claim 2. EX1003 ¶128; §V.B.2.

7[d] “a rigid film on the phosphor bearing film.”

Shoji discloses limitation 7[d] for the same reasons it discloses limitation 1[c]. EX1003 ¶¶129-132; §V.B.1 (1[c]). Petitioner notes that, unlike limitation 1[c], limitation 7[d] does not require that the rigid film be substantially phosphor free (even though it is in Shoji).

Moreover, a POSA would have understood that a cured silicone film is a rigid film, consistent with both: (i) the description of curing in the ’465 patent, EX1001, 5:32-34 (“curable silicone 901 may be any suitable fluid such as silicone, which

hardens or becomes more rigid when subjected to a curing process”), 6:24-27 (“rigid layer 303 may be a silicone material that has been subjected to a curing process”); EX1003 ¶131; and (ii) dependent claim 9 which states that the rigid film comprises a transparent cured silicone film (indicating to a POSA that a cured silicone film is one type of rigid film), EX1001, 8:12-13; EX1003 ¶¶132, 130.

“8. The apparatus of claim 7 wherein the carrier comprises silicone.”

Shoji discloses claim 7. §V.B.6 (cl. 7). Shoji discloses claim 8 for the same reasons it discloses limitation 1[b]. EX1003 ¶133; §V.B.1 (1[b]).

“9. The apparatus of claim 7 wherein the rigid film comprises a transparent cured silicone film.”

Shoji discloses claim 7. §V.B.6 (cl. 7). Shoji discloses claim 9 for the same reasons it discloses limitation 1[c]. EX1003 ¶¶134-135; §V.B.1 (1[c]); *see also* limitation 7[d].

Additionally, as discussed in limitation 1[c], Shoji discloses that the cured outer molding layer is made of “**transparent** silicone resin.” EX1005, [0012]; EX1003 ¶135; §V.B.1 (1[c]).

“10. The apparatus of claim 7, further comprising a metallic package, wherein the light emitting device is in the metallic package.”

Shoji discloses claim 7. §V.B.6 (cl. 7). Shoji discloses claim 10 for the same reasons it discloses claim 4. EX1003 ¶136; §V.B.4.

“11. The apparatus of claim 10, wherein the phosphor bearing film is at least partially on a surface of the package.”

Shoji discloses claims 7 and 10. §V.B.6 (cls. 7, 10). Shoji discloses claim 11 for the same reasons it discloses claim 5. EX1003 ¶137; §V.B.5.

C. Shoji Alone or in View of Yatsuda Renders Obvious Claims 2 and 4-12

Shoji alone or in view of Yatsuda renders obvious claims 2 and 4-12.

1. Motivation to Combine and Reasonable Expectation of Success

A POSA would have been motivated to apply, and had a reasonable expectation of success in applying, Yatsuda’s express metallic package and heat sink disclosure to Shoji’s Figure 2. EX1003 ¶¶139-147.

First, Shoji and Yatsuda are in the same field as each other and the ’465 patent (LED packaging for lighting devices). EX1003 ¶140; EX1005, Abstract, [0001]; EX1008, Abstract, [0003]-[0009]; EX1001, 1:15-51. A POSA would have known of, and naturally looked to, their complementary teachings when constructing an LED package. EX1003 ¶¶142-143, 54-65; §§V.A.1-2.

Second, Shoji and Yatsuda are directed to the same problem: improved LED packages for efficient light extraction for, *e.g.*, white LED packages including phosphor dispersed into silicone—like the ’465 patent. EX1003 ¶141; EX1005, Abstract, [0001]-[0005], [0008]-[0012]; EX1008, [0005]-[0015], [0033]-[0041]; EX1001, 1:18-51, 6:12-47; §§V.A.1-2.

Third, Shoji and Yatsuda share highly similar and complementary disclosures. *See* §§V.A.1-2; EX1003 ¶¶142-143, 54-65.

Fourth, a POSA would have been motivated to make Shoji's metal-plated ceramic package 2 of a high thermal conductivity material (metallic material) and mount that package to a heat sink, in order to further improve heat dissipation. EX1003 ¶¶144, 52; EX1008, [0033], FIGs. 2-4; EX1005, [0033]-[0034]; EX1016, [0017], [0019]-[0020], [0024], [0027]-[0028]; EX1030, [0083]-[0087]; EX1014, 192; EX1013, [0117], [0127]-[0128], [0137]-[0138]; §§V.C.2-3.

And, as evidenced by the state of the art, a POSA would have understood that it would have been a simple modification to select a particular material (such as a metal or a particular ceramic for Shoji's disclosed general ceramic) and to mount that package to a heat sink. EX1003 ¶¶145, 52; EX1008, [0033]-[0034], [0036], FIGs. 2-4; EX1016, [0017], [0019]-[0020], [0024], [0027]-[0028]; EX1015, 493-494; EX1022, 3.7-3.16; EX1010, [0019]; EX1030, [0083]-[0087]; §§V.C.2-3.

Indeed, the '465 patent provides no detail about how to construct its metallic package or heat sink, *see generally* EX1001, further confirming there would be no technical difficulties in doing so. EX1003 ¶146. *See Streck, Inc. v. Research & Diagnostics Sys.*, 665 F.3d 1269, 1288 (Fed. Cir. 2012); *Trustees of Columbia Univ. in the City of New York v. Illumina, Inc.*, 620 F. App'x 916, 933 (Fed. Cir. 2015).

The obviousness of combining Shoji and Yatsuda and of the claims is discussed further below.

2. Claims 2 and 7-12

To the extent that Shoji does not anticipate claims 2 or 7-11 because of the claimed 60%-80% phosphor range, Shoji alone renders these claims obvious. All other limitations of these claims are taught by Shoji. *See* §§V.B.1-2, V.B.6. The obviousness of the phosphor range would likewise apply to claim 12.⁵

As explained in Section V.B.2, Shoji discloses both a point within the range (60%) as well as an overlapping range. EX1005, [0020], FIG. 5; EX1003 ¶151.

Accordingly, Petitioner has established a prima facie obviousness case. *Pfizer Inc. v. Sanofi Pasteur Inc.*, --- F.4th ----, 2024 WL 925802, at *3 (Fed. Cir. Mar. 5, 2024); *In re Peterson*, 315 F.3d 1325, 1329 (Fed. Cir. 2003).

For essentially the same reasons discussed in Section V.B.2 regarding the lack of criticality of the claimed range, Patent Owner will be unable to overcome the

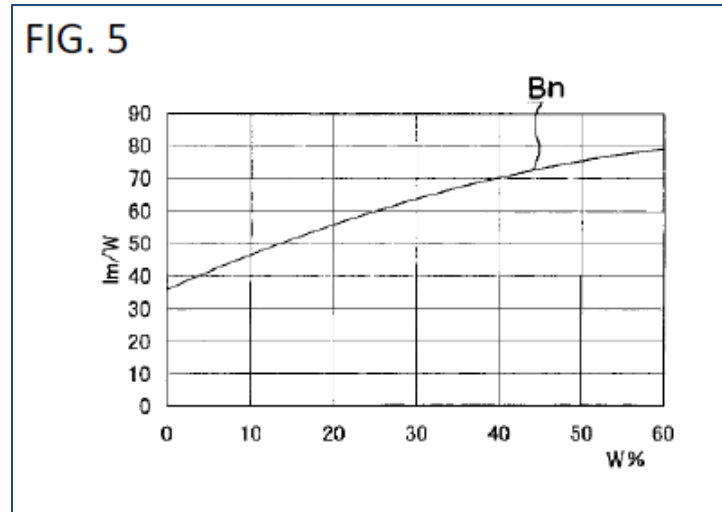
⁵ The phosphor-percentage limitation is found in claims 2 and 7-12. Petitioner notes that claims 7-12 are broader than claims 1, 2, and 4-6 in certain respects, *see* §V.B.6; EX1001, 7:5-8:20, which further demonstrates that Shoji alone or in view of Yatsuda renders obvious claims 7-12.

presumption. EX1003 ¶152; §V.B.2. *See Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1322 (Fed. Cir. 2004) (“Where the difference between the claimed invention and the prior art is some range or other variable within the claims, the patentee must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results.”); *Peterson*, 315 F.3d at 1329-31 (patentee failed to show claimed range is “critical” and “unexpected results [were] commensurate in scope with the claimed range” where patent specification failed to provide examples of unexpected results “for the entire claimed range”); *see also Pfizer*, 2024 WL 925802, at *3.

Further, in addition to the reasons stated in *Shoji*, a POSA would have understood to adjust the phosphor concentration, *e.g.*, based on film thickness, desired color temperature, and/or desired color of light to be emitted (*e.g.*, if a POSA desired for the package to emit a color other than white disclosed in *Shoji*)—which amounts to nothing more than routine optimization. EX1003 ¶¶153-154; EX1009, [0008], [0054], [0061]; EX1011, 7:47-8:3; EX1007, [0103], [0145]; EX1005, [0006]-[0007]; EX1031, 7:48-52, 10:36-44, 15:2-10, FIG. 17, Table 1. *See Gentiluomo v. Brunswick Bowling & Billiards Corp.*, 36 F. App’x 433, 439 (Fed. Cir. 2002) (“one of ordinary skill would have experimented with various thicknesses to obtain an optimum range”); *K-Swiss Inc. v. Glide’n Lock GmbH*, 567 F. App’x 906, 913 (Fed. Cir. 2014) (“where the general conditions of a claim are disclosed in

the prior art, ... it is not inventive to discover the optimum or workable ranges by routine experimentation”); *Gardner v. TEC Sys., Inc.*, 725 F.2d 1338, 1345-49 (Fed. Cir. 1984); *In re Aller*, 220 F.2d 454, 456 (C.C.P.A. 1955).

Further confirming that adjusting the phosphor concentration was routine optimization, although the x-axis of Shoji’s Figure 5 (weight %) ends at 60%, a POSA would have understood Shoji to encompass higher weight percentages, as the curve of Bn at 60% by weight in Figure 5 is sloped. EX1003 ¶154.



This would simply be the result of the application requirements for the LED package (depending on, *e.g.*, desired light output or intensity, color, color temperature, and film thickness). EX1003 ¶¶153-154; EX1009, [0008], [0054], [0061]; EX1011, 7:47-8:3; EX1007, [0103], [0145]; EX1005, [0006]-[0007]; EX1031, 7:48-52, 10:36-44, 15:2-10, FIG. 17, Table 1.

3. Claims 4-6 and 10-12

Petitioner explains in this section how Shoji alone or in view Yatsuda of renders obvious claims 4-6 and 10-12, in particular, regarding the “metallic package” and “heat sink” limitations.

“Metallic Package” (claims 4-6, 10-12): To the extent that Shoji is found not to disclose the claimed “metallic package,” claims 4-6 and 10-12 would be obvious over Shoji alone or in view of Yatsuda. EX1003 ¶¶155-161.

As explained in Section V.B.4, Shoji teaches, *e.g.*, a ceramic package that may be plated with silver and that the LED chip may be mounted on “a metal block with excellent heat conduction.” EX1003 ¶159; §V.B.4.

Shoji does not specify its particular ceramic, but consistent with the knowledge of a POSA—including the known need and desirability of efficiently dissipating heat generated by the LED out of the package—a POSA would have logically looked to various known ceramics used for LED packages and selected one with high heat conductivity to achieve this goal (*e.g.*, aluminum nitride or silicon carbide commonly known to be used in LED packages for this purpose). EX1003 ¶¶160, 144-145; EX1015, 493-494 (aluminum nitride has “[t]hermal conductivity approaching aluminum” and “high thermal conductivity”; silicon carbide has “[t]hermal conductivity better than Aluminum metal”); EX1022, 3.7-3.16; EX1008, [0033], [0036], FIG. 3; EX1012, 13:39-42, 14:54-61; §V.C.1. A POSA would have

had no technical difficulty in selecting a particular material because it applies a known technique (material selection) to a known device (the package) to yield a predictable improvement (better heat dissipation). EX1003 ¶¶161, 145; §V.C.1. If metal was used, a POSA would further have understood to add an insulating layer as needed to prevent a short circuit, as taught by Yatsuda. EX1008, [0034]; EX1003 ¶145.

For example, as further support for the obviousness of using a “metallic package” as package 2 in Shoji, Yatsuda discloses to use as its base package—on which an LED chip is mounted—“a material being superior in heat conductivity” such as a metal (*e.g.*, copper), “ceramic like (AlN) aluminum nitride” and “the like.” EX1008, [0033], [0036], FIGs. 2-3; EX1003 ¶¶160, 144; §V.A.2.

Both metal (*e.g.*, copper) and a highly thermally conductive ceramic would meet the “metallic package” requirement per the ’465 patent. EX1003 ¶¶161, 158; EX1001, 3:61-64, 6:35-39.

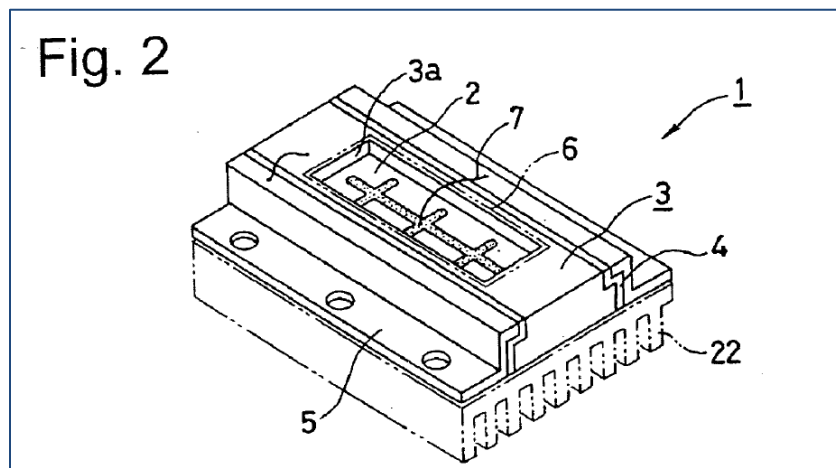
“Heat Sink” (claims 6, 12): Claims 6 and 12 require that the apparatus “further compris[es] a heat sink, wherein the package is on the heat sink.”

As discussed above in this section and in Section V.B.4, Shoji alone—or in view of Yatsuda—discloses the claimed package.

Shoji discloses that, where “drive power is increased, cooling of the LED chip 3 is more necessary than before, and the part where... LED chip 3 is die-mounted

may be formed... as a metal block....” EX1005, [0034]; EX1003 ¶164. However, Shoji does not explicitly disclose that the package is “on a heat sink.”

Similar to Shoji, Yatsuda teaches that, where the electric current applied to the LED chip is “as much as possible[] to obtain as much amount of light as possible,” the base package on which the LED chip is mounted “should be made of a material being superior in heat conductivity....” EX1008, [0033]; EX1003 ¶165. Yatsuda further teaches that, in such a case, “heat sink 22” can be connected to the base “in its rear surface,” such as in Yatsuda’s Figure 2 (*i.e.*, the package is on the heat sink). EX1008, [0033]; EX1003 ¶¶165-166.



A POSA would have advantageously thought to apply—and had no technical difficulty in applying—the heat sink of Yatsuda to the metallic package of Shoji because it applies a known technique (the heat sink) to a known device (the metallic package) to yield a predictable improvement (better heat dissipation). EX1003 ¶167; §V.C.1; EX1016, [0017], [0024], [0027]-[0028] (heat sinks improve thermal

dissipation and can be attached using various conventional means); EX1030, [0086]-[0087] (package mounted on heat sink improves heat dissipation); EX1013, [0117], [0127]-[0128], [0137]-[0138]; EX1014, 192.

D. Yatsuda Renders Obvious Claims 1 and 3-6

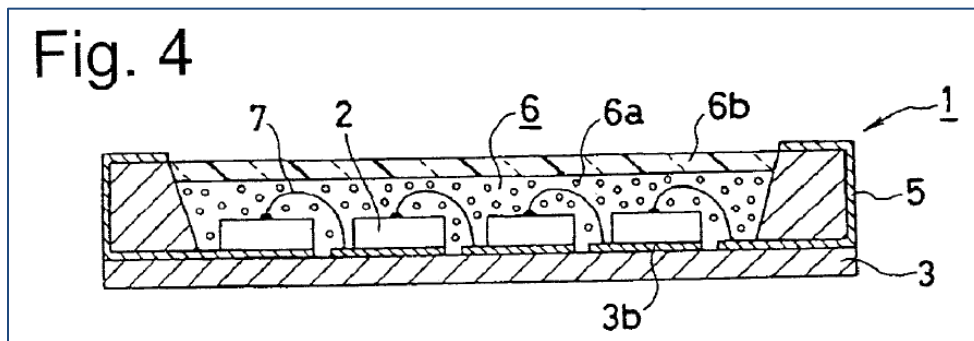
Yatsuda renders obvious claims 1 and 3-6.

1. Claim 1

1[pre] “An apparatus comprising:”

Yatsuda discloses the preamble, regardless of whether it is limiting. EX1003 ¶169; *see* limitations 1[a]-1[c].

Yatsuda discloses an apparatus, such as in Figure 4, described as “LED lamp 1.” EX1008, [0032]-[0041]; EX1003 ¶169.

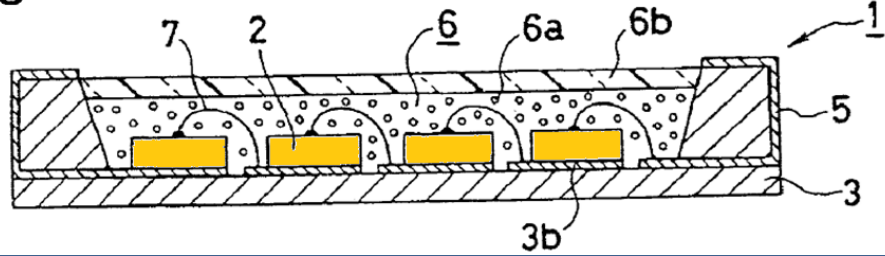


1[a] “a light emitting device;”

Yatsuda discloses limitation 1[a]. EX1003 ¶¶170-171.

Yatsuda discloses, in Figure 4, “**LED chips 2.**” EX1008, [0033]-[0041]; EX1003 ¶¶170-171; *see also* §V.B.1 (1[a]) (explaining “light emitting device” can be an LED chip).

Fig. 4



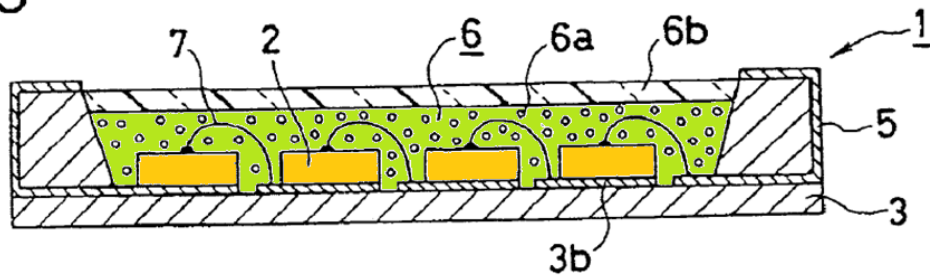
1[b] “a phosphor bearing film arranged with the light emitting device, the phosphor bearing film comprising phosphor and a silicone carrier; and”

Yatsuda discloses limitation 1[b]. EX1003 ¶¶172-176.

Yatsuda discloses “transparent silicone resin 6, into which a phosphor 6a is mixed to obtain white light,” which a POSA would have understood corresponds to the “phosphor bearing film... comprising phosphor and a silicone carrier.” EX1008, [0034], [0041]; EX1003 ¶¶173-176; *see also* §V.B.1 (1[b]) (explaining ’465 patent’s “film” and “carrier”).

Figure 4 depicts silicone resin 6 arranged with LED chips 2. EX1008, [0041]; EX1003 ¶175; *see also* §V.B.1 (1[b]).

Fig. 4



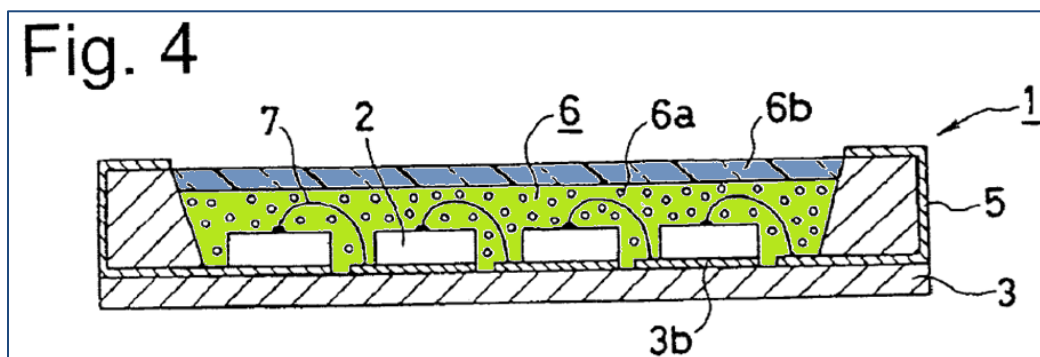
1[c] “a cured silicone film on the phosphor bearing film, the cured silicone film being substantially free of phosphor.”

Yatsuda discloses—or it would have been obvious to include as part of its Figure 4 embodiment—limitation 1[c]. EX1003 ¶¶177-182.

Yatsuda discloses, in Figure 4, “**a film of a hard silicone resin 6b**,” which is “provided over the **transparent silicone resin 6**.” EX1008, [0041]; EX1003 ¶178.

Yatsuda further discloses (and depicts in Figure 4) that silicone resin 6b may be free of phosphor (*i.e.*, it is an optional component in resin 6b that “may”—but need not be—included). EX1008, [0041] (“In this case, the phosphor 6a or other wavelength conversion material may be mixed into the hard silicone resin 6b.”); EX1003 ¶¶179-180.

Figure 4 shows **silicone resin 6** includes phosphor 6a, while **silicone resin 6b** does not. EX1003 ¶¶178-180.



Yatsuda does not expressly state that “hard silicone resin 6b” is “cured” or how it is hardened, but a POSA would have understood—or at least found it obvious—that hard silicone resin 6b would be a cured silicone resin including

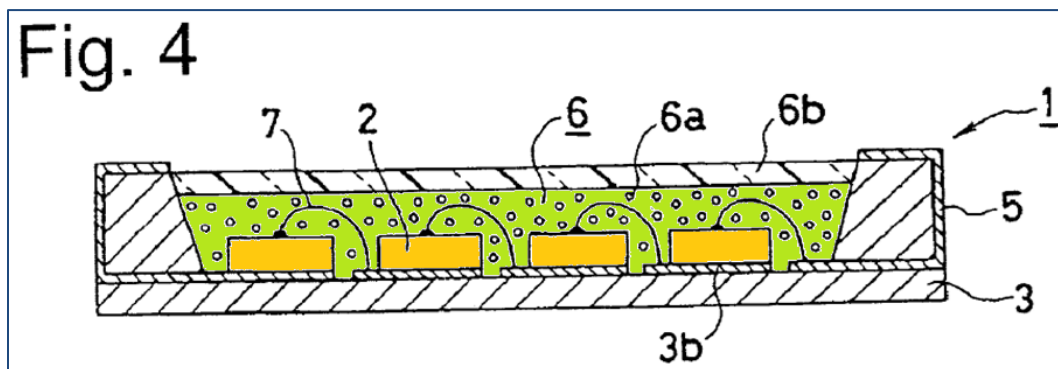
because curing was a well-known, common technique for hardening silicone resins within cavities of LED packages such that the hardened silicone resin provides protection for the LED chip and components (like in Yatsuda). EX1003 ¶¶181-182; EX1008, [0041], cl. 8; EX1006, [0029], [0034], [0043]-[0044], [0046] (using “cured” and “hardened” interchangeably for silicone encapsulant); EX1005, [0002] (“conventional method” includes curing resin to cover and protect LED chip), [0012] (curing silicone resin); EX1009, [0014]-[0016], [0022]; EX1025, [0045], [0050] (cured silicone resin serves to protect LED chip); EX1024, 526.

2. Claim 3

“...wherein the phosphor bearing film is at least partially on the light emitting device.”

Yatsuda renders obvious claim 1, see §V.D.1, and also claim 3. EX1003 ¶¶183-185.

Figure 4 shows that **silicone resin 6** is at least partially on **LED chips 2**. EX1008, [0041]; EX1003 ¶¶184-185; EX1001, 3:1-4; see also §V.D.1 (1[b]).



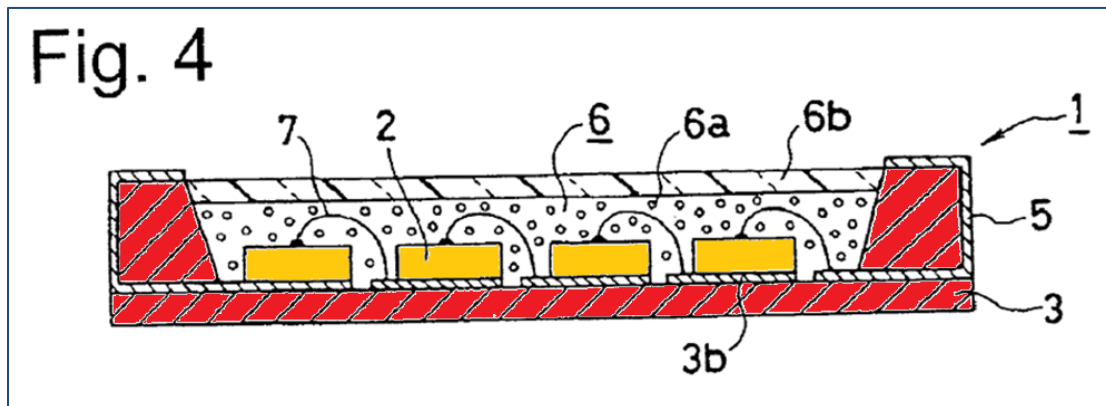
3. Claim 4

“...further comprising a metallic package, wherein the light emitting device is in the metallic package.”

Yatsuda renders obvious claims 1 and 3. §§V.D.1-2. Yatsuda also renders obvious claim 4 for three independent reasons. EX1003 ¶¶186-193.

First, Yatsuda discloses—or it would have been obvious to include as part of its Figure 4 embodiment—claim 4. EX1003 ¶¶187-192.

Figure 4 includes **base 3** with **LED chips 2** therein. EX1008, [0041]; EX1003 ¶187.

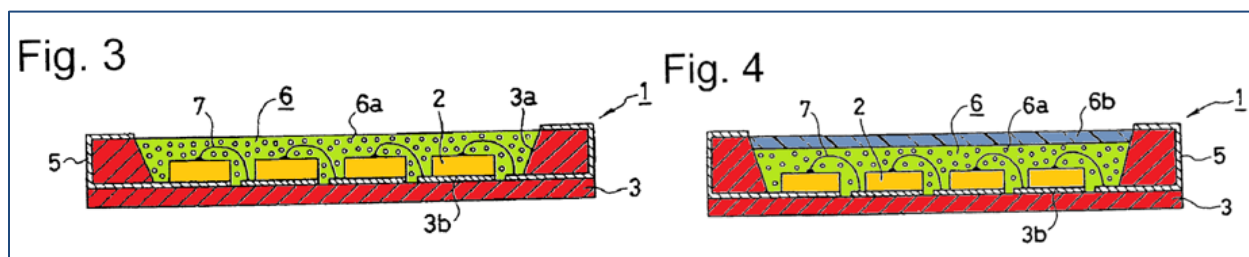


Yatsuda does not specify the particular base material for base 3 in Figure 4. However, Yatsuda discloses that base 3 “***should be*** made of a material being superior in heat conductivity,” and specifies, for example, metallic materials for its base 3 in Figure 2 (metal such as copper) and Figure 3 (ceramic such as aluminum nitride). EX1008, [0033]-[0034]; EX1003 ¶188; *see also* §V.C.3.

Yatsuda’s disclosure that its base 3 “***should be*** made of a material being ***superior in heat conductivity***” is consistent with the ’465 patent’s description of its

metallic package (*e.g.*, focusing on high thermal conductivity). EX1003 ¶¶188-189; EX1001, 3:61-64, 6:35-39; *see also* §V.C.3.

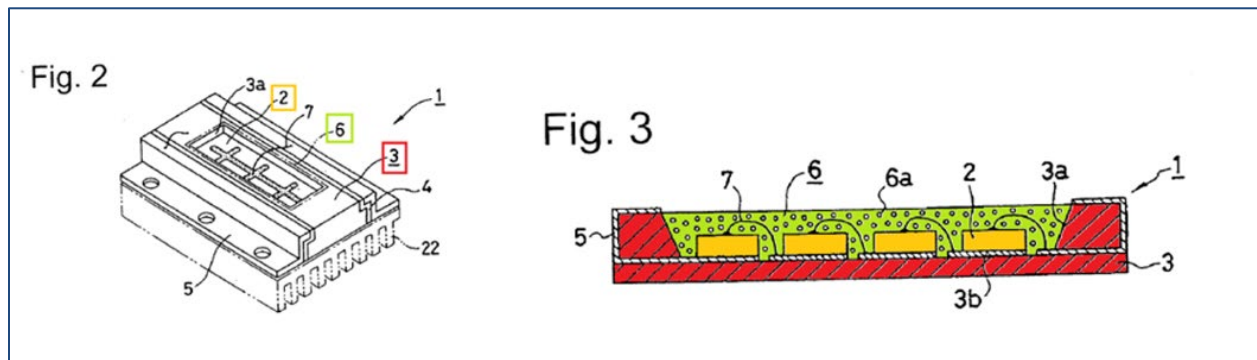
Further confirming a POSA's understanding that base 3 in Figure 4 would be metallic, Yatsuda discloses that the difference between its Figure 3 and 4 embodiments is the addition of **silicone resin 6b**, which a POSA would have understood to mean that otherwise the embodiments are the same. EX1008, [0041]; EX1003 ¶¶190-191. That would include the base 3 material—which in Figure 3 is a highly conductive ceramic such as aluminum nitride (*i.e.*, a metallic material). EX1008, [0033]; EX1003 ¶190; EX1015, 493-494; EX1012, 13:39-42, 14:54-61; EX1022, 3.7-3.16; *see also* §V.C.3.



Moreover, a POSA would logically have thought to use a metal (such as copper) as disclosed in highly similar Figure 2 as the base material in the Figure 4 embodiment, for essentially the same reasons. EX1008, [0033]-[0034], [0041]; EX1003 ¶192. This would only require simple routine adjustments—as explained in Yatsuda itself—and result in an even higher thermal conductivity package using copper, with insulating layers 4 provided in proper positions on both side faces of

base 3 as shown in Figure 2 (e.g., to prevent a short circuit). EX1008, [0034]; EX1022, 3.8-3.11; EX1003 ¶192.

Second and third, a POSA would have thought to add silicone layer 6b to either Figures 2 or 3, which would create the claimed structure with the existing bases in each figure. EX1008, [0033]-[0041], FIGs. 2-3; EX1003 ¶193.



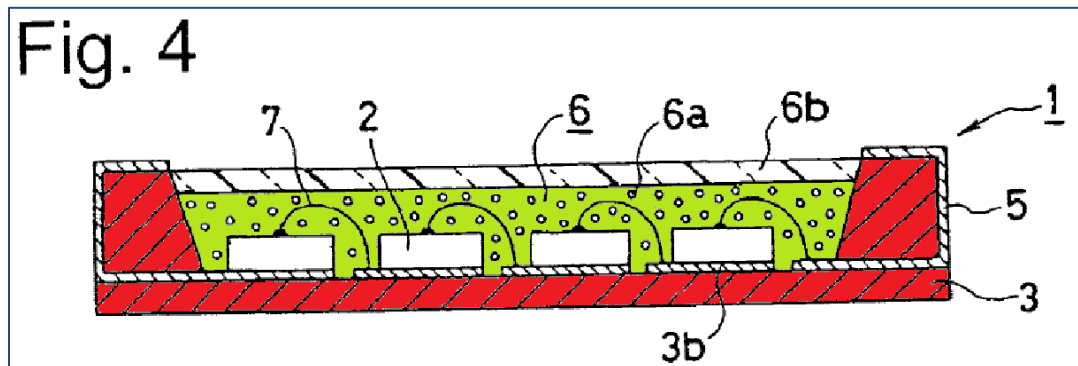
This would be a simple addition of silicone 6b over silicone resin 6 in Figures 2 and 3, using the techniques disclosed in Yatsuda, in otherwise identical embodiments (for Figure 3) and essentially identical embodiments (for Figure 2, except for the adjustments made to account for metal base 3). EX1008, [0033]-[0041], FIGs. 2-3; EX1003 ¶193. It would also improve the Figures 2 and 3 embodiments for the same reason as Yatsuda discloses regarding Figure 4 (e.g., protective function). EX1008, [0041]; EX1003 ¶193.

4. Claim 5

“...wherein the phosphor bearing film is at least partially on a surface of the metallic package.”

Yatsuda renders obvious claims 1, 3, and 4, *see* §§V.D.1-3, and also claim 5. EX1003 ¶¶194-196.

As shown in Figure 4, **silicone resin 6** is at least partially on a surface of **base 3** (which as explained in Section V.D.3 is or obviously would be metallic). EX1008, [0041]; EX1003 ¶195. The same is true for Figures 2 and 3, EX1008, [0033]-[0034], FIGs. 2-3; EX1003 ¶196, *i.e.*, where silicone layer 6*b* is added to those embodiments as discussed in Section V.D.3.



5. Claim 6

“...further comprising a heat sink, wherein the package is on the heat sink.”

Yatsuda renders obvious claims 1 and 3-5. §§V.D.1-4. Yatsuda also renders obvious claim 6 for three independent reasons. EX1003 ¶¶197-200.

First, Yatsuda discloses—or it would have been obvious to include as part of its Figure 4 embodiment—claim 6. EX1003 ¶199.

Yatsuda discloses that “the thickness of the base 3 should be sufficient, if desired, for thermal diffusion after connecting with a **heat sink 22** in its rear surface.” EX1008, [0033]; EX1003 ¶64.

Although heat sink 22 is depicted only in Figure 2, a POSA would have found that such heat sink would be included in Figure 4—or at least it would have been obvious to include it. EX1003 ¶199. Indeed, it was common and well-known to mount a package (here, base 3) to a heat sink to further improve heat dissipation using conventional techniques. EX1003 ¶¶199, 167. For example, a POSA would have advantageously thought to apply—and had no technical difficulty in applying—the heat sink of Yatsuda to the metallic package in Figure 4 because it applies a known technique (the heat sink) to a known device (the metallic package) to yield a predictable improvement (better heat dissipation). EX1003 ¶¶199, 167; EX1008, [0033]; EX1016, [0017], [0024], [0027]-[0028]; EX1030, [0065]-[0066], [0086]-[0087]; EX1014, 192; EX1013, [0117], [0127]-[0128], [0137]-[0138].

Second, a POSA would also have thought to add the heat sink to Figure 3 for the same reasons (where silicone layer 6b is added, *see* §§V.D.3-4, to otherwise meet the claims). EX1003 ¶200.

Third, when a POSA uses the Figure 2 embodiment, *see* §§V.D.3-4, the heat sink is already disclosed with metal base 3 thereon. EX1008, [0033], FIG. 2; EX1003 ¶198.

E. Hussell Anticipates Claims 1 and 3-5

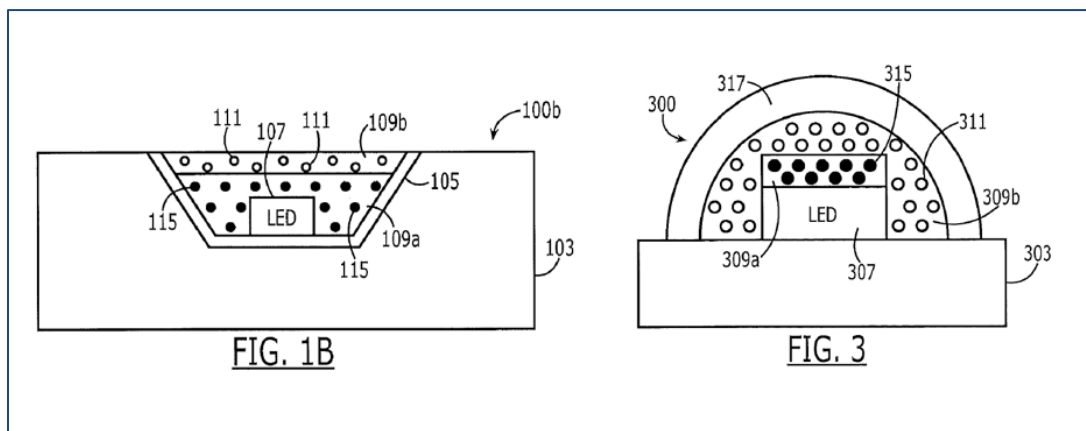
Hussell anticipates claims 1 and 3-5, arranged as in the claims.

1. Claim 1

1[pre] “An apparatus comprising:”

Hussell discloses the preamble, regardless of whether it is limiting. EX1003 ¶202; *see* limitations 1[a]-1[c].

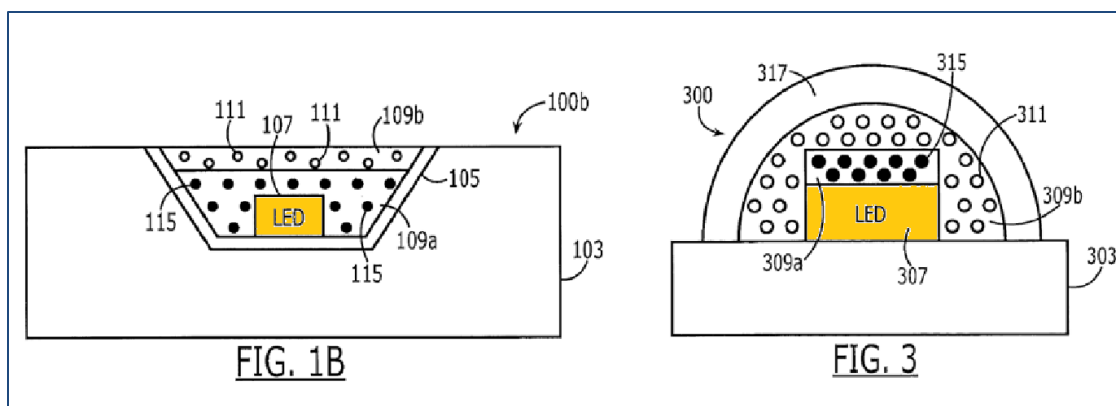
Hussell discloses an apparatus in Figures 1B and 3, “lighting structures” 100b and 300. EX1006, [0033]-[0034], [0044], [0049]; EX1003 ¶202.



1[a] “a light emitting device;”

Hussell discloses limitation 1[a]. EX1003 ¶¶203-205.

Hussell discloses “**semiconductor light emitting device[s] or LED[s]**” 107 and 307. EX1006, [0025], [0034]-[0035], [0044]-[0045]; EX1003 ¶¶203-204; *see also* §V.B.1 (1[a]).



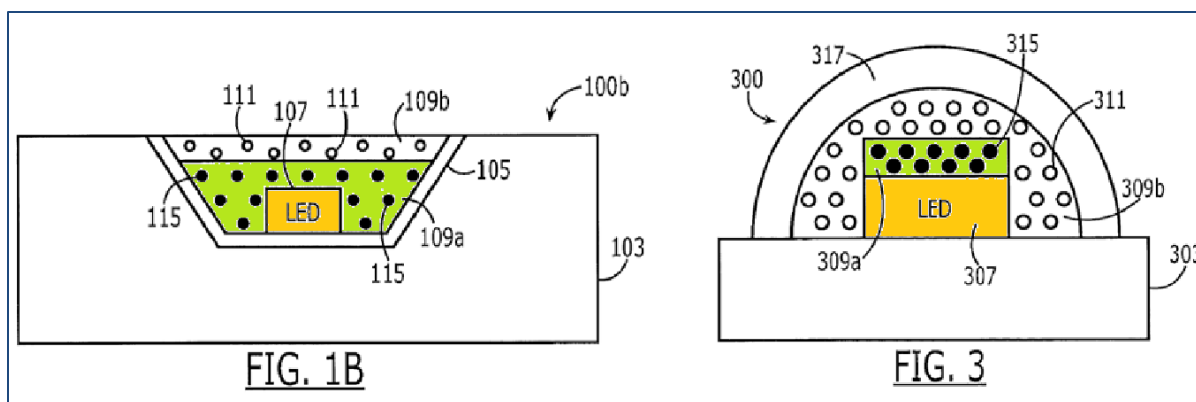
1[b] “a phosphor bearing film arranged with the light emitting device, the phosphor bearing film comprising phosphor and a silicone carrier; and”

Hussell discloses limitation 1[b]. EX1003 ¶¶206-211.

Hussell discloses, in Figure 1B, “**layer of encapsulating material 109a**” that includes “cerium doped **YAG phosphor** particles 115.” EX1006, [0032]-[0034]. [0008], [0026]; EX1003 ¶¶207-208. Hussell discloses, in Figure 3, “**layer of encapsulating material 309a**” that includes cerium doped **YAG phosphor** particles 315. EX1006, [0044]-[0045], [0008]; EX1003 ¶¶207-208. These encapsulants “may be... **silicone**.” EX1006, [0014], [0029], [0033], [0046]; EX1003 ¶209.

A POSA would have understood that each of layers 109a and 309a corresponds to the “phosphor bearing film... comprising phosphor and a silicone carrier.” EX1003 ¶¶210-211; *see also* §V.B.1 (1[b]).

Figures 1B and 3 show the **layers** arranged with **LEDs**. EX1003 ¶207; *see also* §V.B.1 (1[b]).

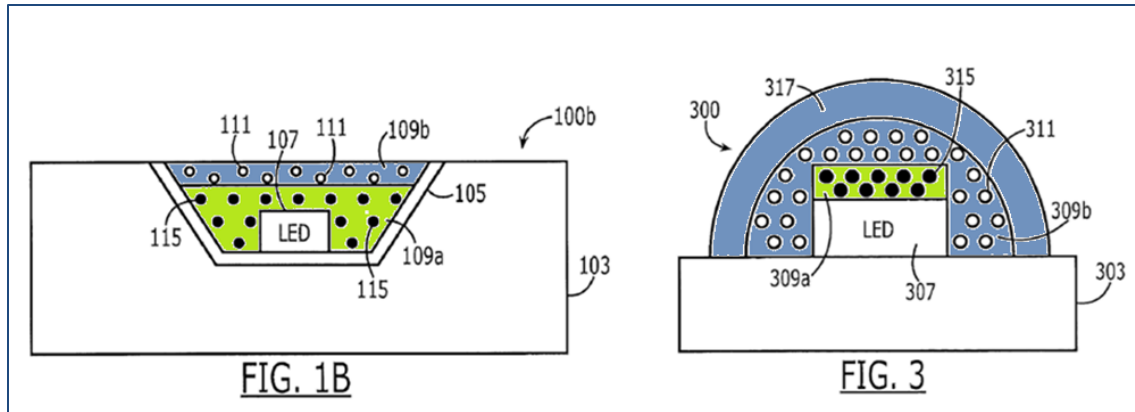


1[c] “a cured silicone film on the phosphor bearing film, the cured silicone film being substantially free of phosphor.”

Hussell discloses limitation 1[c]. EX1003 ¶¶212-218.

Hussell discloses, in Figure 1B, **encapsulating layer 109b** which “may be substantially free of phosphor particles 115.” EX1006, [0034]; EX1003 ¶213. Hussell discloses in, Figure 3, **encapsulating layer 309b**, which may be “substantially free of phosphor particles 315.” EX1006, [0044]; EX1003 ¶213. Hussell also discloses, in Figure 3, **encapsulating layer 317** which is likewise “substantially free” of phosphor particles. EX1006, [0044]; EX1003 ¶213. Hussell further discloses that these encapsulant layers are “cured/hardened,” EX1006, [0034], [0044]; EX1003 ¶¶214, 68, and made of silicone and transparent, EX1006, [0006], [0010], [0014], [0029], [0046], cl. 25; EX1003 ¶¶212, 214, 68. In Figure 3, a POSA would have understood that the claimed “cured silicone film” can be layer 309b, layer 317, or both. EX1003 ¶¶214-215.

Figures 1B and 3 depict Hussell’s **cured silicone films** on its **phosphor bearing films**. EX1003 ¶213.



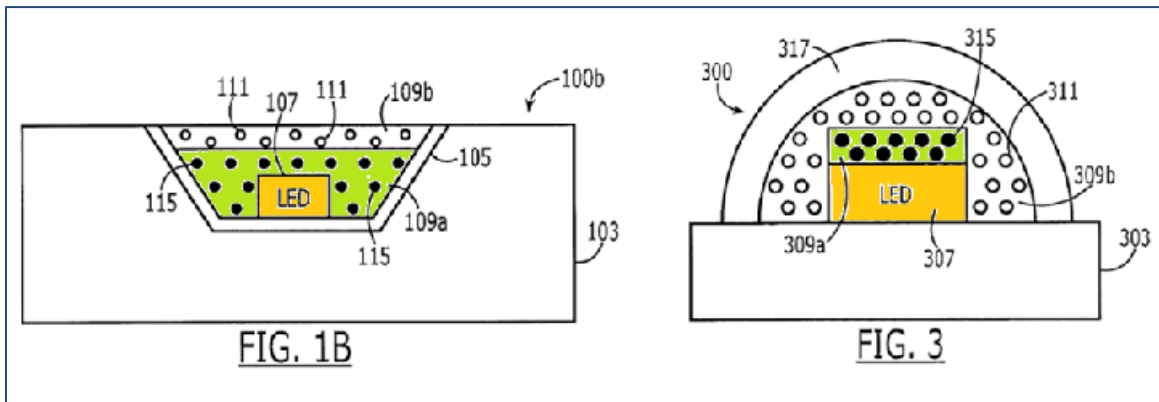
Hussell discloses that layers 109b and 309b may include “non-luminescent phosphor host diffuser particles,” which—although a slightly confusing naming convention—are (i) not luminescent and (ii) different than the luminescent phosphor particles in the phosphor bearing film. EX1003 ¶¶215-217; EX1006, [0026]-[0029], [0034], [0045]. A POSA would have understood these host particles are not the “phosphor” of the ’465 patent’s claims. EX1003 ¶217; EX1014, 349-351 (“The most common wavelength-converter materials are *phosphors*.... Phosphors consist of an inorganic host material doped with an optically active element.”) (emphasis in original). And, regardless, Hussell’s cured silicone layer 317 in Figure 3 would still meet this claim limitation, as it has no phosphor and is also on phosphor bearing film 309a. EX1003 ¶¶218, 213; EX1006, [0044]; EX1001, 3:1-4 (elements “on” another can have “intervening elements”).

2. Claim 3

“...wherein the phosphor bearing film is at least partially on the light emitting device.”

Hussell discloses claim 1. §V.E.1. Hussell also discloses claim 3. EX1003 ¶¶219-221.

As shown in Figures 1B and 3, **layers 109a and 309a**, which correspond to the claimed phosphor bearing film, are at least partially on the **LEDs**. EX1006, [0034], [0044]; EX1003 ¶¶220-221; EX1001, 3:1-4; §V.E.1 (1[b]).



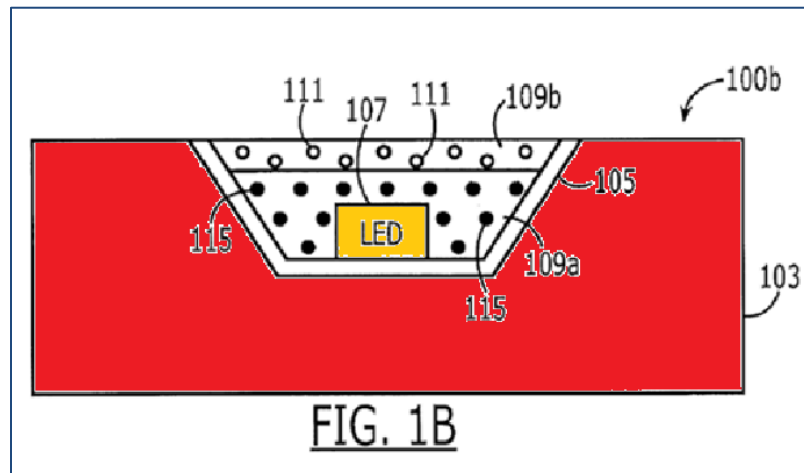
3. Claim 4

“...further comprising a metallic package, wherein the light emitting device is in the metallic package.”

Hussell discloses claims 1 and 3. §§V.E.1-2. Hussell also discloses claim 4. EX1003 ¶¶222-223.

Hussell discloses, in Figure 1B, that “**substrate 103**” includes a “metal base” with a cup thereon or a metal-plated ceramic and **LED 107** therein. EX1006, [0031],

[0033] (FIG. 1B “is the same as” FIG. 1A with exception of separate layers), [0025] (“substrate 103 defining a cup or depression”); EX1003 ¶223.

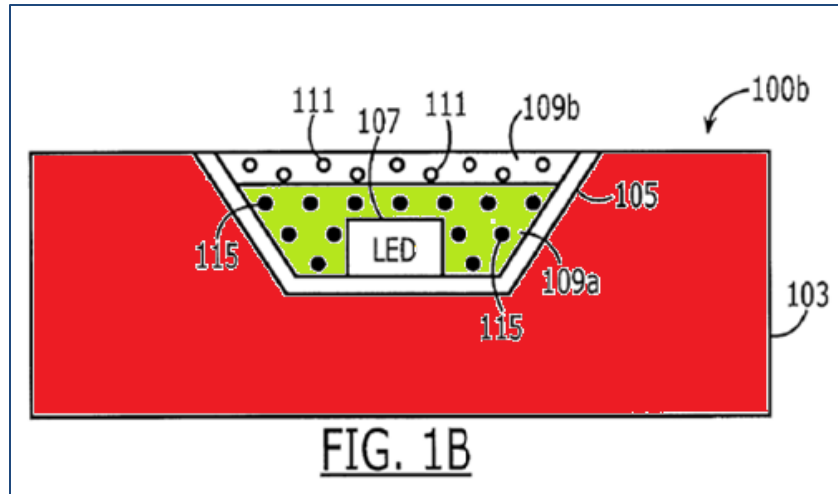


4. Claim 5

“...wherein the phosphor bearing film is at least partially on a surface of the metallic package.”

Hussell discloses claims 1, 3, and 4. §§V.E.1-3. Hussell also discloses claim 5. EX1003 ¶¶224-225.

Hussell discloses, in Figure 1B, that **layer 109a** is at least partially on the surface of **substrate 103**. EX1006, [0033]-[0034]; *see also* [0025], [0031]; EX1003 ¶225; EX1001, 3:1-4.



F. Hussell Renders Obvious Claims 2 and 6-12

Hussell renders obvious claims 2 and 6-12.

1. Claim 2

“...wherein the phosphor bearing film is 60%-80% phosphor.”

Hussell discloses claim 1. §V.E.1. Hussell also discloses claim 2 when incorporated references are considered. EX1003 ¶¶227-237.

Hussell does not expressly specify the phosphor percentages in its layers 109a and 309a in Figures 1B and 3. However, Hussell “incorporate[s]” in their entirety several references, including U.S. Patent App. Pub. No. 2008/0179611 (“Chitnis”; EX1007) also directed to LED and LED packages with phosphor in a silicone carrier. EX1006, [0051]-[0052]; EX1007, [0007], [0072]-[0076], [0103]-[0107], [0187]; EX1003 ¶¶228-229.

Chitnis discloses to apply a “coating” to the top surface of an LED consisting of phosphor that is bound in silicone, where the coating can have “different

concentrations or loading of phosphor materials in the binder, with a typical **concentration being in range of 30-70% by weight**,” and “[i]n one embodiment, the phosphor concentration is **approximately 65% by weight**, and is preferably uniformly dispersed throughout the binder.” EX1007, [0103]-[0106]; *see also* [0072]-[0076]; EX1003 ¶¶230-231. A POSA, looking to determine the concentration of the phosphor in Hussell, would have naturally looked to this teaching in the incorporated Chitnis reference, and thought to vary the phosphor concentration in Hussell in making such determination. EX1003 ¶¶230-234. Alternatively, a POSA would have thought to use the techniques in Chitnis for directly applying the phosphor-bound-in-silicone to the LED to create an LED chip and implement that chip as, *e.g.*, LED 107 or 307 in Hussell Figures 1B and 3. EX1006, [0052] (teaching to use LED chips from Chitnis and others as LEDs 107 and 307); EX1003 ¶¶235-237. In such a scenario, the claimed “phosphor bearing film” would correspond to the phosphor-bound-in-silicone as disclosed in Chitnis (which could be simply applied into Figures 1B or 3, or alternatively, would simplify those embodiments by removing the need to add separate layers 109a and 309a). EX1007, [0103]-[0110], [0054], [0061]; EX1003 ¶¶235-237.

A POSA would have further understood to adjust the phosphor concentration, for example, based on film thickness, desired color temperature, and/or desired color of light to be emitted (*e.g.*, if a POSA desired for the package to emit a color other

than white disclosed in Hussell)—which amounts to nothing more than routine optimization. EX1003 ¶233; EX1009, [0008], [0054], [0061]; EX1011, 7:47-8:3; EX1007, [0103], [0145]; EX1005, [0006]-[0007]; EX1031, 7:48-52, 10:36-44, 15:2-10, FIG. 17, Table 1. *See Gentiluomo*, 36 F. App’x at 439; *K-Swiss*, 567 F. App’x at 913; *Gardner*, 725 F.2d at 1345-49; *Aller*, 220 F.2d at 456.

Thus, because both an overlapping range and a particular point within the claimed range are disclosed, Petitioner has established a prima facie obviousness case. *Pfizer*, 2024 WL 925802, at *3; *Peterson*, 315 F.3d at 1329. And, for essentially the same reasons discussed above in Sections V.B.2 and V.C.2, Patent Owner will be unable to overcome the presumption. §§V.B.2, V.C.2. *See Iron Grip*, 392 F.3d at 1322; *Peterson*, 315 F.3d at 1329-30; *Pfizer*, 2024 WL 925802, at *3.

2. Claim 6

“... further comprising a heat sink, wherein the package is on the heat sink.”

Hussell discloses claims 1 and 3-5. §§V.E.1-4. Hussell also discloses claim 6 when incorporated references are considered. EX1003 ¶¶238-242.

Hussell incorporates “in [its] entirety by reference” U.S. Patent App. No. 12/273,216, EX1006, [0051], which application led to U.S. Patent No. 8,004,172 (“Hussell172”; EX1011); EX1003 ¶¶239-240. A POSA would naturally have looked to the incorporated references when evaluating Hussell’s teachings. EX1003 ¶¶239-241.

Hussell¹⁷² states that “any of the embodiments illustrated herein” may “include heat sinks,” EX1011, 12:9-19, and a POSA would be motivated to add, and had a reasonable expectation of success in adding, a heat sink to Hussell’s figures, for essentially the same reasons discussed in Section V.C.3. EX1003 ¶¶241-242; §V.C.3; EX1008, [0033]; EX1016, [0017], [0024], [0027]-[0028]; EX1030, [0086]-[0087]; EX1014, 192; EX1013, [0117], [0127]-[0128], [0137]-[0138].

3. Claims 7-12

Hussell renders obvious claims 7-12 for essentially the same reasons as claims 1-2 and 4-6 (including, as explained above in Section V.E.1 (limitation 1[c]) Hussell’s cured silicone film is transparent). EX1003 ¶¶243-245; §V.B.6 (explaining relationship among claims). Moreover, Hussell would still render obvious claims 7-12 without consideration of host diffuser particles 111 and 311 in cured silicone films 109*b* and 309*b*. EX1003 ¶246; §V.E.1 (1[c]). That is, Petitioner notes that claims 7-12 are broader than claims 1-2 and 4-6 in certain respects, *e.g.*, the rigid film does not need to be substantially phosphor free in claims 7-12, *see* §V.B.6; EX1001, 7:5-8:20, which further demonstrates that Hussell renders obvious these claims.

G. Blonder Renders Obvious Claims 1-5 and 7-11

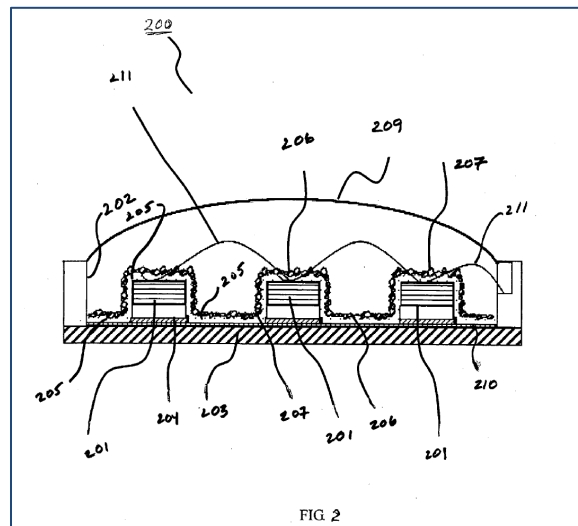
Blonder renders obvious claims 1-5 and 7-11. And as to claims 2 and 7-11, Blonder renders these claims obvious regardless of whether the claimed phosphor percentage is by weight or by volume.

1. Claim 1

1[pre] “An apparatus comprising:”

Blonder discloses the preamble, regardless of whether it is limiting. EX1003 ¶248; *see* limitations 1[a]-1[c].

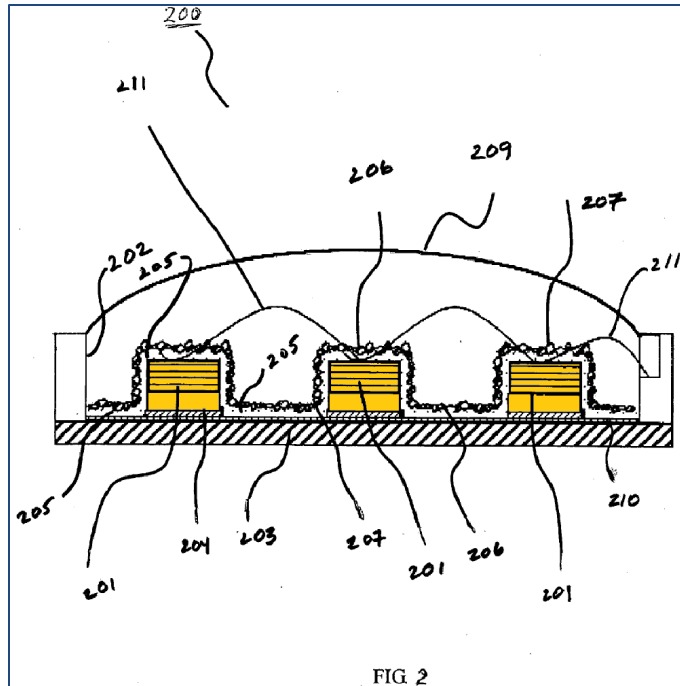
Blonder discloses an apparatus, such as LED package assembly 200 in Figure 2. EX1010, [0018]; EX1003 ¶248.



1[a] “a light emitting device;”

Blonder discloses limitation 1[a]. EX1003 ¶¶249-250.

Blonder discloses **LEDs 201** in Figure 2. EX1010, [0018], [0001], [0008]; EX1003 ¶249; *see also* §V.B.1 (1[a]).



1[b] “a phosphor bearing film arranged with the light emitting device, the phosphor bearing film comprising phosphor and a silicone carrier; and”

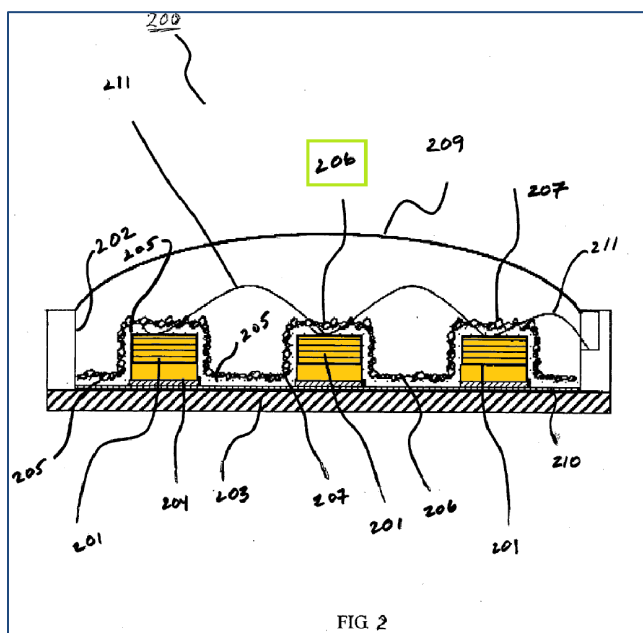
Blonder discloses limitation 1[b]. EX1003 ¶¶251-253.

Blonder discloses “[a] transparent adhesive monolayer 205 [that] is placed on top of the multiple **LED bodies 201** and a **layer 206** of phosphor particles 207 [that] is adhered overlying and over the sides of the bodies 201.” EX1010, [0018]; EX1003 ¶252. Blonder also refers to monolayer 205 as a “first tacky transparent material 205,” which is a resin preferably made of “silicone.” EX1010, [0018], [0023]-[0024]; EX1003 ¶252.

Blonder discloses that “the particles 207 of the phosphor layer coating can attach to the tacky layer 205 creating **a [close] packed dense film layer 206.**” EX1010, [0018]; EX1003 ¶¶252, 73.

A POSA would have understood that this close packed dense film layer 206—which consists of particles 207 and silicone resin in the space between the particles—corresponds to the claimed phosphor bearing film comprising phosphor and a silicone carrier. EX1003 ¶253; *see also* §V.B.1 (1[b]).

As shown in Figure 2, **film layer 206** is arranged with **LEDs 201**. EX1010, [0018]; EX1003 ¶252; *see also* §V.B.1 (1[b]).



1[c] “a cured silicone film on the phosphor bearing film, the cured silicone film being substantially free of phosphor.”

It would have been obvious to include, as part of Blonder’s Figure 2 embodiment, limitation 1[c]. EX1003 ¶¶254-258.

Blonder discloses to seal assembly 200 “with a **second transparent material 209** that can optionally create a dome or lens” which “minimizes TIR.” EX1010, [0018], [0017] (“TIR” is “total internal reflection”); EX1003 ¶255. Blonder further

discloses that silicone is a “[u]seful material[.]” for the “transparent encapsulant” of assembly 200. EX1010, [0026]; EX1003 ¶255. The transparent encapsulant “can serve two purposes”: (i) “seal or encapsulate the cavity containing the coated LEDs,” and (ii) “create a lens that minimizes TIR.” EX1010, [0026]; EX1003 ¶255.

Blonder does not specify that the second transparent material 209 would be *cured* silicone, but it would have nonetheless been obvious to a POSA to make material 209 of a cured silicone including because curing was a well-known, common technique for silicone encapsulants within cavities of LED packages such that the cured silicone effectively seals and protects the LED chips and package components (consistent with the goals in Blonder and as known in the art). EX1003 ¶¶255-257; EX1010, [0018], [0026]; EX1008, [0041], cl. 8; EX1006, [0029], [0043]-[0044], [0046]; EX1005, [0002], [0012]; EX1009, [0014]-[0016], [0022]; EX1025, [0038], [0045], [0050]; EX1024, 526.

As shown in Figure 2, **film layer 206** includes phosphor 207 while **second transparent material 209** (on film layer 206) does not. EX1003 ¶258.

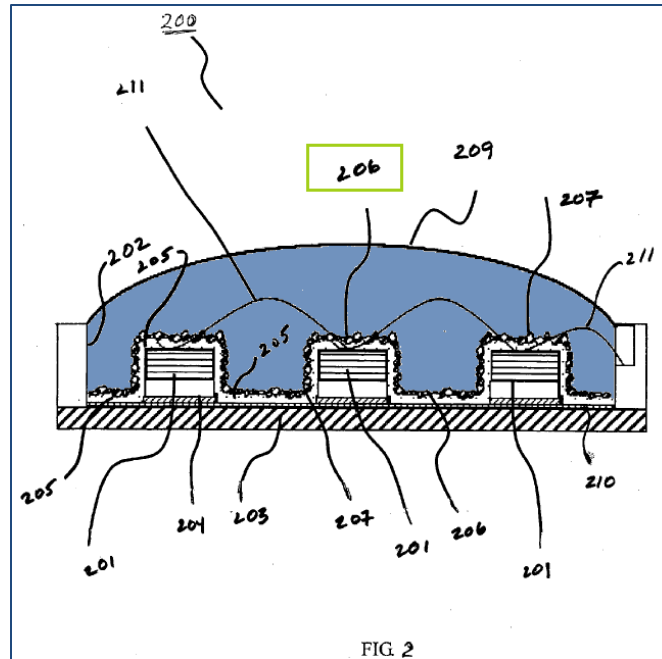


FIG. 2

2. Claim 2

“...wherein the phosphor bearing film is 60%-80% phosphor.”

Blonder renders obvious claim 1. §V.G.1. Blonder also discloses, or it would have been obvious to include as part of Blonder, claim 2, regardless of whether the concentration is weight or volume. EX1003 ¶¶259-263.

Blonder discloses that “the particles 207 of the phosphor layer coating can attach to the tacky layer 205 creating a **[close] packed dense** film layer 206,” EX1010, [0018]; EX1003 ¶260, where film layer 206 consists of silicone resin containing phosphor particles, EX1010, [0023], [0028]; EX1003 ¶261. Blonder further discloses that “[t]he adhesion mechanism that holds the particle layer can involve many mechanisms of particle-to-particle bonding,” such as “mechanical interlocking, molecular forces, Vanderwaals adhesion forces, capillary, electrostatic,

magnetic, and free chemical forces,” and how “to increase the packing density of [phosphor] particles....” EX1010, [0028]-[0029]; EX1003 ¶¶260-262.

A POSA would have understood that Blonder’s close packed dense film layer 206 would result in approximately 74% phosphor by volume (*i.e.*, within the claimed range when volume is used). EX1003 ¶262; EX1027, 16; EX1023, 31.

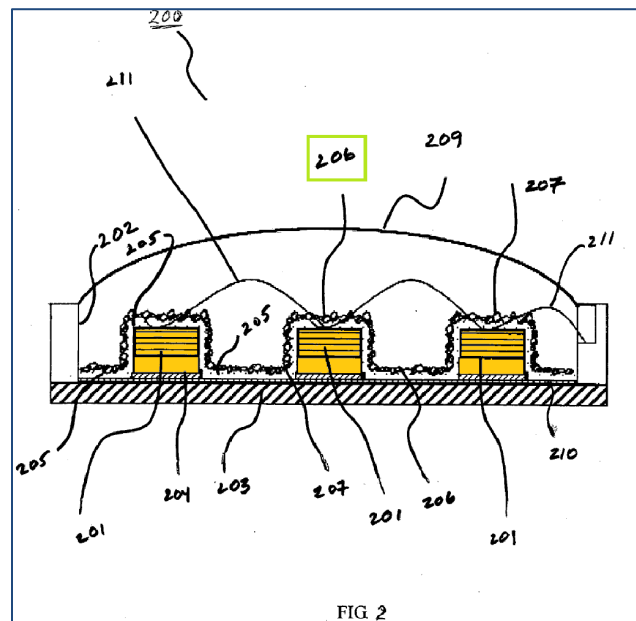
Moreover, a POSA would have found claim 2 obvious under either the weight or volume interpretation, as it would simply have been routine optimization to adjust the phosphor concentration in close packed dense film layer 206, consistent with teachings in Blonder to create a thin, close-packed dense film—especially given the lack of criticality of the claimed range. EX1003 ¶263; §§V.B.2, V.C.2. *See Gentiluomo*, 36 F. App’x at 439; *K-Swiss*, 567 F. App’x at 913; *Gardner*, 725 F.2d at 1345-49; *Aller*, 220 F.2d at 456. And, further confirming that it would be routine optimization, a POSA would have understood to adjust the phosphor concentration, for example, based on film layer thickness, desired color temperature, and/or desired color of light to be emitted. EX1003 ¶263; EX1009, [0008], [0054], [0061]; EX1011, 7:47-8:3; EX1007, [0103], [0145]; EX1005, [0006]-[0007]; EX1031, 7:48-52, 10:36-44, 15:2-10, FIG. 17, Table 1.

3. Claim 3

“...wherein the phosphor bearing film is at least partially on the light emitting device.”

Blonder renders obvious claim 1, see §V.G.1, and also claim 3. EX1003 ¶¶264-266.

As shown in Figure 2, **layer 206** is at least partially on **LEDs 201**. EX1010, [0018]; EX1003 ¶¶265-266; EX1001, 3:1-4; see also §V.G.1 (1[b]).



4. Claim 4

“... further comprising a metallic package, wherein the light emitting device is in the metallic package.”

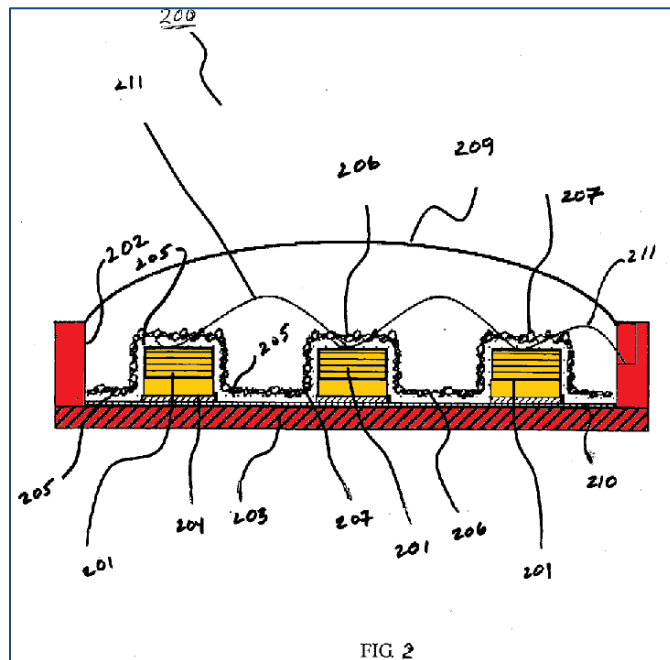
Blonder renders obvious claims 1 and 3, see §§V.G.1, V.G.3, and also claim 4. EX1003 ¶¶267-269.

Blonder discloses that “[s]ubstrate 203 advantageously comprises a highly thermally conductive metal such as copper, tungsten or molybdenum and/or a highly

thermally conductive ceramic,” such as aluminum nitride, silicon carbide, or aluminum oxide. EX1010, [0019]; EX1003 ¶268. Blonder further discloses “ceramic cavity 202,” EX1010, [0018], which a POSA would have understood to likewise be highly thermally conductive (or at least obviously so), for the reasons discussed in Section V.C.3 (including for heat-dissipation purposes). EX1003 ¶268; §V.C.3. Notably, Blonder treats the cavity as part of the substrate, disclosing that the “substrate [has] a surface and a cavity in the surface.” EX1010, [0008], Abstract, cl. 1; EX1003 ¶268.

Blonder's **metallic package** with **LEDs 201** therein is shown in Figure 2.

EX1003 ¶269.

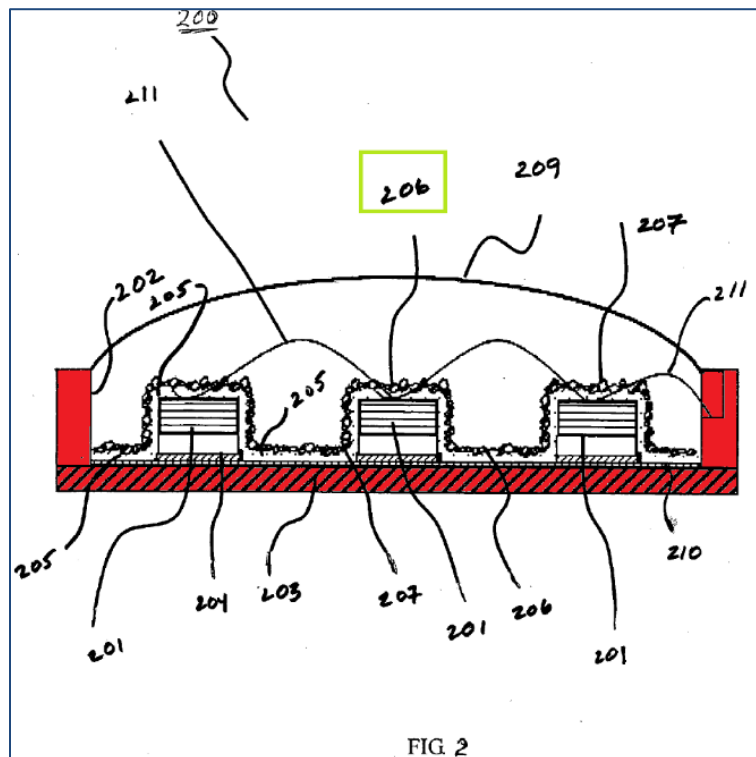


5. Claim 5

“...wherein the phosphor bearing film is at least partially on a surface of the metallic package.”

Blonder renders obvious claims 1, 3, and 4, *see* §§V.G.1, V.G.3-4, and also claim 5. EX1003 ¶¶270-271.

As shown in Figure 2, **film layer 206** is at least partially on a surface of the **metallic package**. EX1010, [0018]; EX1003 ¶271; EX1001, 3:1-4.



6. Claims 7-11

Blonder renders obvious claims 7-11 for essentially the same reasons as claims 1-2 and 4-5 (including, as explained above in Section V.G.1 (limitation 1[c]), that Blonder's cured silicone film is transparent). EX1003 ¶¶272-275; §V.B.6 (explaining relationship among claims).

Petitioner again notes that claims 7-11 are broader than claims 1-2 and 4-5 in certain respects, *e.g.*, the rigid film does not need to be substantially phosphor free in claims 7-11, *see* §V.B.6; EX1001, 7:5-8:18, which further demonstrates that Blonder renders obvious these claims.

H. Blonder Alone or in View of Yatsuda Renders Obvious Claims 6 and 12

Blonder alone or in view of Yatsuda renders obvious claims 6 and 12.

1. Motivation to Combine and Reasonable Expectation of Success

A POSA would have been motivated to apply, and had a reasonable expectation of success in applying, Yatsuda's express heat sink disclosure to Figure 2 of Blonder. EX1003 ¶¶277-285.

First, Blonder and Yatsuda are in the same field as each other and the '465 patent (LED packaging for lighting devices). EX1003 ¶278; EX1010, Abstract, [0001]; EX1008, Abstract, [0003]-[0009]; EX1001, 1:15-51. A POSA would have known of, and naturally looked to, their complementary teachings when constructing an LED package. EX1003 ¶¶280-281, 59-64, 71-74; §§V.A.2, V.A.4.

Second, Blonder and Yatsuda are directed to the same problem: improved LED packages for efficient light extraction for, *e.g.*, LED packages with phosphor dispersed into silicone—like the '465 patent. EX1003 ¶279; EX1010, [0002]-

[0009], [0018]-[0024]; EX1008, [0005]-[0015], [0033]-[0041]; EX1001, 1:18-51, 6:12-47; §§V.A.2, V.A.5.

Third, Blonder and Yatsuda share highly similar and complementary disclosures. *See* §§V.A.2, V.A.4; EX1003 ¶¶280-281, 59-64, 71-74.

Fourth, a POSA would have been motivated to mount Blonder's substrate package to a heat sink, in order to further improve heat dissipation; and, as evidenced by the state of the art and confirmed by the '465 patent (which includes no explanation for mounting the heat sink), a POSA would further have understood that it would have been a simple modification to mount that package to a heat sink. EX1003 ¶¶282-284, 52; EX1008, [0033], [0036], FIGs. 2-4; EX1016, [0017], [0019]-[0020], [0024], [0027]-[0028]; EX1030, [0086]-[0087]; EX1014, 192; EX1013, [0117], [0127]-[0128], [0137]-[0138]; §V.H.2. *See Streck*, 665 F.3d at 1288; *Trustees of Columbia Univ.*, 620 F. App'x at 933.

The obviousness of combining Blonder and Yatsuda and of the claims is discussed further below.

2. Claims 6 and 12

Dependent claims 6 and 12 require "a heat sink, wherein the package is on the heat sink." Blonder renders obvious claims 1 and 3-6, and claims 7 and 10 from which claims 6 and 12 depend, respectively. §§V.G.1, V.G.3-6. Blonder alone or in view of Yatsuda also renders obvious claim 6 and 12. EX1003 ¶¶286-290.

mounted to the LED package of Blonder). EX1003 ¶290; §§V.C.1, V.H.1; *see also* EX1016, [0017], [0024], [0027]-[0028]; EX1030, [0086]-[0087], [0065]-[0066]; EX1014, 192; EX1013, [0117], [0127]-[0128], [0137]-[0138].

I. Thompson Anticipates Claims 1-3 and 7-9

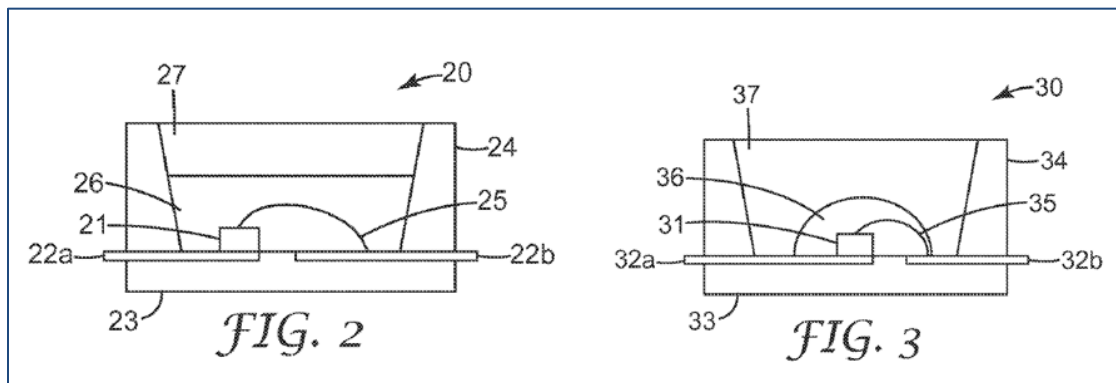
Thompson discloses claims 1-3 and 7-9, arranged as in the claims.

1. Claim 1

1[pre] “An apparatus comprising:”

Thompson discloses the preamble, regardless of whether it is limiting. EX1003 ¶292; *see* limitations 1[a]-1[c].

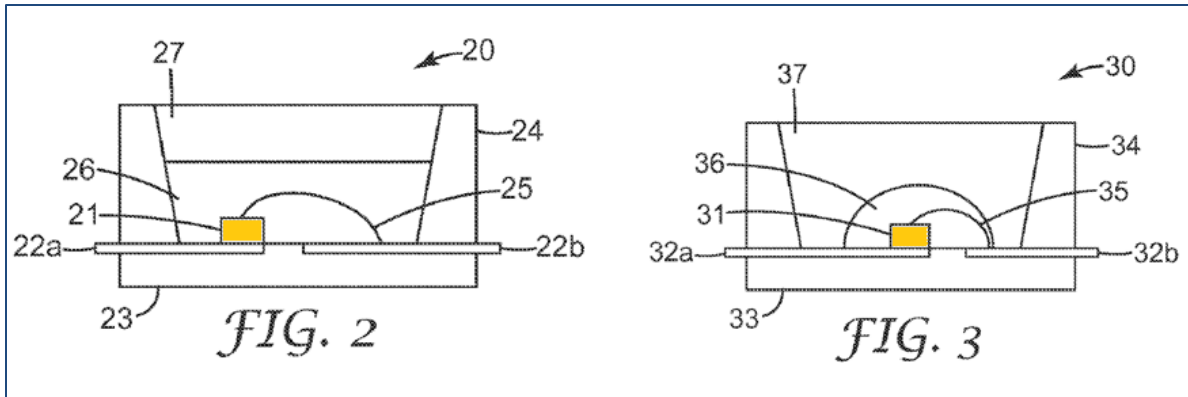
Thompson discloses an apparatus, such as “exemplary LED light emitting devices” 20 and 30 in Figures 2 and 3. EX1009, [0015], [0058]; EX1003 ¶292.



1[a] “a light emitting device;”

Thompson discloses limitation 1[a]. EX1003 ¶¶293-294.

Thompson discloses **LED dies 21 and 31** in Figures 2 and 3. EX1009, [0015], [0058]; EX1003 ¶293; *see also* §V.B.1 (1[a]).

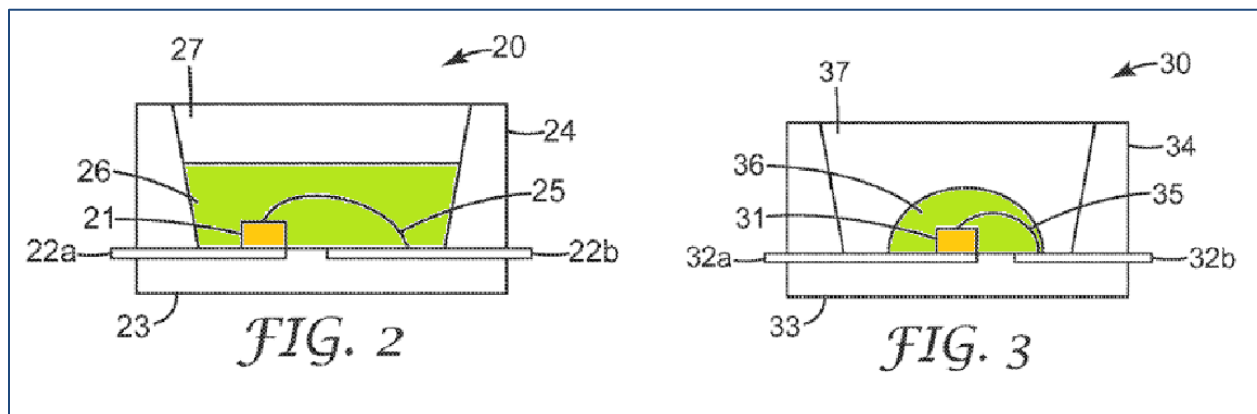


1[b] “a phosphor bearing film arranged with the light emitting device, the phosphor bearing film comprising phosphor and a silicone carrier; and”

Thompson discloses limitation 1[b]. EX1003 ¶¶295-297.

Thompson discloses **first encapsulant layers 26 and 36** in Figures 2 and 3. EX1009, [0015], [0058]; EX1003 ¶296. The first encapsulant may be a silicone encapsulant with phosphors carried therein that “adjust[s] the color emitted from the LED.” EX1009, [0017], [0019], [0024]-[0025], [0050], [0054]; EX1003 ¶296.

As shown in Figures 2 and 3, **first encapsulant layers 26 and 36** are arranged with **LED dies 21 and 31**. EX1003 ¶¶296-297; *see also* §V.B.1 (1[b]).



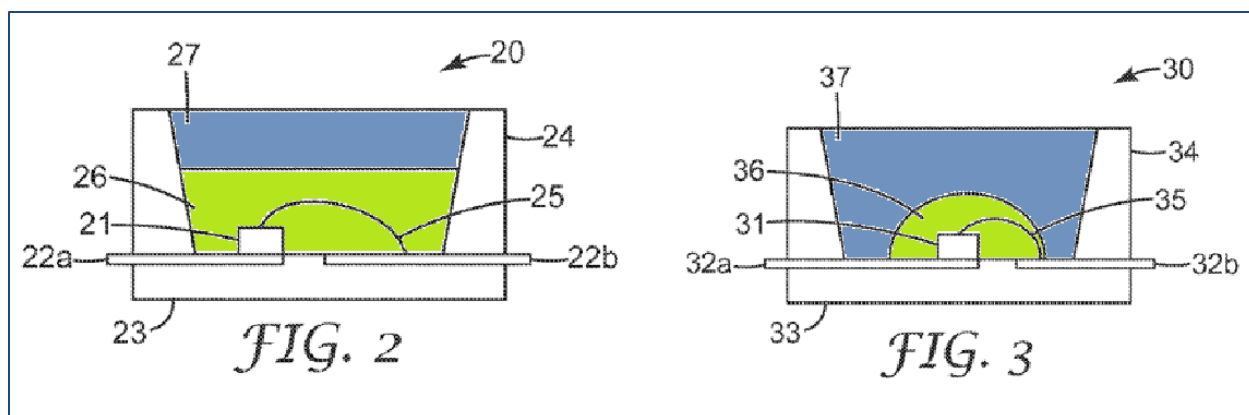
1[c] “a cured silicone film on the phosphor bearing film, the cured silicone film being substantially free of phosphor.”

Thompson discloses limitation 1[c]. EX1003 ¶¶298-302.

Thompson discloses that **second encapsulants 27 and 37** are layers made of silicone that has been cured. EX1009, [0014]-[0016], [0022], [0058], [0062]; EX1003 ¶299. Per Thompson, these encapsulants form a “hard outer surface” that, for example, “resists scratching and other types of physical defects that might otherwise affect the optical characteristics of light emitted by the device.” EX1009, [0014]-[0016]; EX1003 ¶300. A POSA would have understood that the encapsulants are transparent. EX1009, [0002]-[0004], [0052]; EX1003 ¶300.

Thompson further discloses that the phosphors are optional in each of the first and second encapsulants, and thus a POSA would have understood that when phosphors are not used in the second encapsulant it is “substantially free of phosphor” as required by the claim. EX1009, [0050] (“The first **and/or** second encapsulants **can** comprise ... phosphors....”), [0054] (“Phosphors can optionally be included....”); EX1003 ¶301.

As shown in Figures 2 and 3, the **second encapsulant layers** are *on* the **first encapsulant layers**. EX1009, [0014]-[0016], [0022], [0058], [0062]; EX1003 ¶¶299, 302.



Accordingly, a POSA would have understood that the second encapsulant layers are: (i) cured silicone film; (ii) on the phosphor bearing film (*i.e.*, first encapsulants); and (iii) substantially free of phosphor (and, in fact, have no phosphor at all). EX1003 ¶302.

2. Claim 2

“...wherein the phosphor bearing film is 60%-80% phosphor.”

Thompson discloses claim 1. §V.I.1. Thompson also discloses claim 2. EX1003 ¶¶303-304.

Thompson discloses that “[i]f used, the phosphor particles are preferably... in an amount of no greater than 85 wt-%, and in an amount of at least 1 wt-% based on the total weight of the encapsulating material.” EX1009, [0054]; EX1003 ¶304. Thompson further discloses that “[t]he amount of phosphor used will be adjusted according to the thickness of the siloxane layer containing the phosphor and the desired color of the emitted light.” EX1009, [0054]; EX1003 ¶304.

Accordingly, Petitioner has established a prima facie case of anticipation. *See Genentech*, 946 F.3d at 1338; *E.I. DuPont*, 904 F.3d at 100; *Lazare Kaplan*, 628 F.3d at 1380-81.

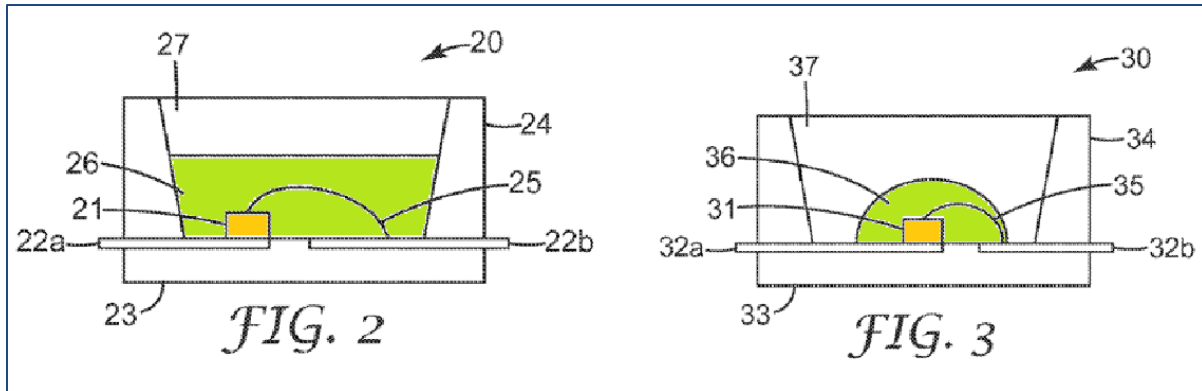
And for essentially the same reasons discussed above in Section V.B.2 regarding the lack of criticality of the claimed range, Patent Owner will be unable to overcome the presumption. EX1003 ¶304; §V.B.2; *see also ClearValue, Inc. v. Pearl Rivers Polymers, Inc.*, 668 F.3d 1340, 1344-45 (Fed. Cir. 2012) (reversing district court denial of judgment as a matter of law for anticipation and obviousness where prior art disclosed broader range that encompassed claimed range and patent owner failed to show range was critical).

3. Claim 3

“...wherein the phosphor bearing film is at least partially on the light emitting device.”

Thompson discloses claim 1. §V.I.1. Thompson also discloses claim 3. EX1003 ¶¶305-307.

As shown in Figures 2 and 3, the **first encapsulants** are at least partially on the **LED dies**. EX1009, [0015], [0058]; EX1003 ¶¶306-307; EX1001, 3:1-4; *see also* §V.I.1 (1[b]).



4. Claims 7-9

Thompson anticipates claims 7-9 for essentially the same reasons as claims 1 and 2 (including, as explained above in Section V.I.1 (1[c]), Thompson's cured silicone film is transparent). EX1003 ¶¶308-311; §V.B.6 (explaining relationship among claims).

Petitioner notes that claims 7-9 are broader than claims 1 and 2 in certain respects, *e.g.*, the rigid film does not need to be substantially phosphor free in claims 7-9, *see* §V.B.6; EX1001, 7:5-8:13, which further demonstrates that Thompson anticipates these claims.

J. Thompson Alone or in View of Yatsuda and/or Nii Renders Obvious Claims 1-12

Thompson alone or in view of Yatsuda and/or Nii renders obvious claims 1-12.

1. Motivation to Combine and Reasonable Expectation of Success

A POSA would have been motivated to apply, and had a reasonable expectation of success in applying, to Figures 2 and 3 of Thompson, (i) Yatsuda's express metallic package and heat sink disclosure and (ii) Nii's phosphor and silicone disclosure.⁶ EX1003 ¶¶313-329.

First, Thompson, Yatsuda, and Nii are in the same field as each other and the '465 patent (LED packaging for lighting devices). EX1003 ¶314; EX1009, [0002]-[0004]; EX1008, Abstract, [0003]-[0009]; EX1026, Abstract, [0002]; EX1001, 1:15-51. A POSA would have known of, and naturally looked to, their complementary teachings when constructing an LED package. EX1003 ¶¶315-319, 59-64, 75-83; §§V.A.2, V.A.5-6.

Second, Thompson, Yatsuda, and Nii are directed to the same problem: improved LED packages for efficient light extraction for, *e.g.*, LED packages with phosphor dispersed into silicone—like the '465 patent. EX1003 ¶315; EX1009, [0004]-[0009], [0015], [0058]; EX1008, [0005]-[0015], [0033]-[0041]; EX1026,

⁶ The addition of Nii applies under the “60%-80% phosphor” by-volume interpretation.

[0075]-[0082], [0090]-[0091], [0112]-[0113]; EX1001, 1:18-51, 6:12-47; §§V.A.2, V.A.5-6.

Third, Thompson, Yatsuda, and Nii share highly similar and complementary disclosures. *See* §§V.A.2, V.A.5-6; EX1003 ¶¶315-319, 59-64, 75-83.

Fourth, a POSA would have been motivated to make Thompson's substrate and reflecting cup of a high thermal conductivity material (metallic material) and mount that package to a heat sink, in order to further improve heat dissipation. EX1003 ¶¶320-321, 52; EX1008, [0033], FIGs. 2-4; EX1005, [0034]; EX1016, [0017], [0019]-[0020], [0024], [0027]-[0028]; EX1030, [0083]-[0087]; EX1014, 192; EX1013, [0117], [0127]-[0128], [0137]-[0138]; §§V.J.2-8. A POSA also would have been motivated to select a particular phosphor and silicone combination for Thompson's first layer to effectively emit the light and protect the LED and components—such as a combination known to have been successfully used in similar two-layer LED packages. EX1003 ¶¶323-328, 52; EX1006, [0054]; EX1026, [0076], [0090]-[0091], [0112]-[0113], [0123], [0130], [0164], FIGs. 1C, 2B; §V.J.3.

And, as evidenced by the state of the art, a POSA would further have understood that it would have been a simple modification to select a particular material (such as a particular ceramic or metal), to mount that package to a heat sink, and to select a particular phosphor and silicone. EX1003 ¶¶321-328, 52; §§V.J.2-8.

Again, the '465 patent provides no detail about how to construct its metallic package or heat sink, *see generally* EX1001, further confirming there would be no technical difficulties in doing so. EX1003 ¶322. *See Streck*, 665 F.3d at 1288; *Trustees of Columbia Univ.*, 620 F. App'x at 933.

The obviousness of combining Thompson, Yatsuda, and Nii, and of the claims is discussed further below.

2. Claims 1-6

To the extent that Thompson's second encapsulants 27 and 37 (*i.e.*, the claimed "cured silicone film") are not "substantially free of phosphor," Thompson alone or in view of Yatsuda renders obvious claims 1-6. All other limitations of these claims are taught by Thompson alone or in view of Yatsuda. *See* §§V.I.1-3, V.J.3-7.

Yatsuda, for example, discloses adding a second transparent silicone encapsulant layer that is free of phosphor over a first silicone encapsulant layer containing phosphor. EX1008, [0041]; EX1003 ¶332; §V.D.1 (1[b]). In fact, a substantially phosphor free second silicone layer was well-known. EX1003 ¶332; EX1005, [0012]; EX1006, [0005], [0032]-[0034], [0044]-[0046]; EX1026, [0090]-[0091], [0112]-[0113]; EX1028, [0026]-[0027], FIGs. 7, 10; EX1029, [0055], FIG. 10. The advantages of including such a second encapsulant layer were also well-known, as explained by Yatsuda and other state of the art in the LED packaging field, including: (i) LED and component protection and sealing; (ii) foreign-matter-

adhesion prevention; (iii) lens creation; (iv) scratch and damage resistance; (v) uniform light dispersion; and (vi) improved package and life performance. EX1008, [0041]; EX1005, [0001], [0003]-[0012]; EX1009, [0016]; EX1010, [0026], [0035]; EX1026, [0112]; EX1003 ¶333. A POSA would have readily known how to make the second layer substantially phosphor free using a two-layer application (*e.g.*, by not including phosphor when applying in second encapsulants 27 and 37 of Thompson). EX1009, [0015]-[0016], [0058]; EX1008, [0041]; EX1005, [0008]-[0012]; EX1026, [0090]-[0091], [0112]-[0113], FIGs. 1A-1C; EX1003 ¶334.

3. Claims 2 and 7-12

To the extent that Thompson does not anticipate claims 2 or 7-9 because of the claimed 60%-80% phosphor range, Thompson alone or with Nii renders these claims obvious. All other limitations of these claims are taught by Thompson, or obvious over Thompson alone or with Yatsuda. *See* §§V.I.1-2, V.I.4, V.J.2. The obviousness of the phosphor range would likewise apply to claims 10-12.⁷

⁷ The phosphor-percentage limitation is found in claims 2 and 7-12. Petitioner again notes that claims 7-12 are broader than claims 1-2 and 4-6 in certain respects, *e.g.*, the rigid film does not need to be substantially phosphor free in claims 7-12, *see*

As explained in Section V.I.2, Thompson discloses the claimed range by weight. EX1009, [0054]; EX1003 ¶¶336, 304.

To determine volume percentage, a POSA logically would have examined existing phosphors and silicones, such as those used in LED packages for the same or similar purposes as in Thompson (*e.g.*, phosphor for light conversion and silicone for protection), including particular examples of the general types Thompson suggests to use (*e.g.*, (Y,Gd)AG:Ce or YAG phosphor). EX1003 ¶¶323-324; EX1009, [0054]; §§V.J.1-2. A POSA would have selected an appropriate phosphor and silicone combination, *e.g.*, from similar LED packages with one or more silicone encapsulant layers. EX1003 ¶¶323-324; §§V.J.1-2. As one example combination, Nii discloses—in a similar multi-layer LED package—to use $(Y_{0.98}Gd_{0.02})_{2.85}Ce_{0.15}Al_5O_{12}$ phosphor carried in silicone resin to create a first layer, where the silicone resin is advantageously used because of its translucency and heat resistance. EX1003 ¶¶324-328, 339; EX1026, [0090]-[0091], [0112]-[0113], [0130], [0162]-[0164]; §V.J.1 (further explaining obviousness). When such

§V.B.6; EX1001, 7:5-8:20, which further demonstrates that Thompson alone or in view of Yatsuda and/or Nii renders obvious these claims.

phosphor and silicone are used, considering their specific gravities, 85% by weight corresponds to approximately 63% by volume. EX1003 ¶339; EX1026, [0164].

Accordingly, Petitioner has established a prima facie obviousness case. *Pfizer*, 2024 WL 925802, at *3; *Peterson*, 315 F.3d at 1329. And, for essentially the same reasons discussed above in Sections V.B.2, V.C.2, V.F.1, and V.G.2, Patent Owner will be unable to overcome the presumption. EX1003 ¶340; §§V.B.2, V.C.2, V.F.1, V.G.2. *See Iron Grip*, 392 F.3d at 1322; *Peterson*, 315 F.3d at 1329-30; *Pfizer*, 2024 WL 925802, at *3.

Using either weight or volume, the claims would have been obvious because (i) of the overlapping range, (ii) there is no meaningful difference in the operation of the prior art and claimed range (*e.g.*, both would effectively exhibit light at a particular desired color or color temperature), and (iii) the lack of criticality of the claimed range. EX1003 ¶340; §§V.B.2, V.C.2, V.F.1, V.G.2. *See Peterson*, 313 F.3d at 1329; *In re Brandt*, 886 F.3d 1171, 1176-77 (Fed. Cir. 2018); *Gentiluomo*, 36 F. App'x at 439; *K-Swiss*, 567 F. App'x at 913.

Moreover, a POSA would have found claims 2 and 7-12 obvious under either the weight or volume interpretation, as it would simply have been routine optimization to adjust the phosphor concentration, consistent with the knowledge of a POSA—especially given lack of criticality of the claimed range. EX1003 ¶340; §§V.B.2, V.C.2, V.F.1, V.G.2. *See Gentiluomo*, 36 F. App'x at 439; *K-Swiss*, 567 F.

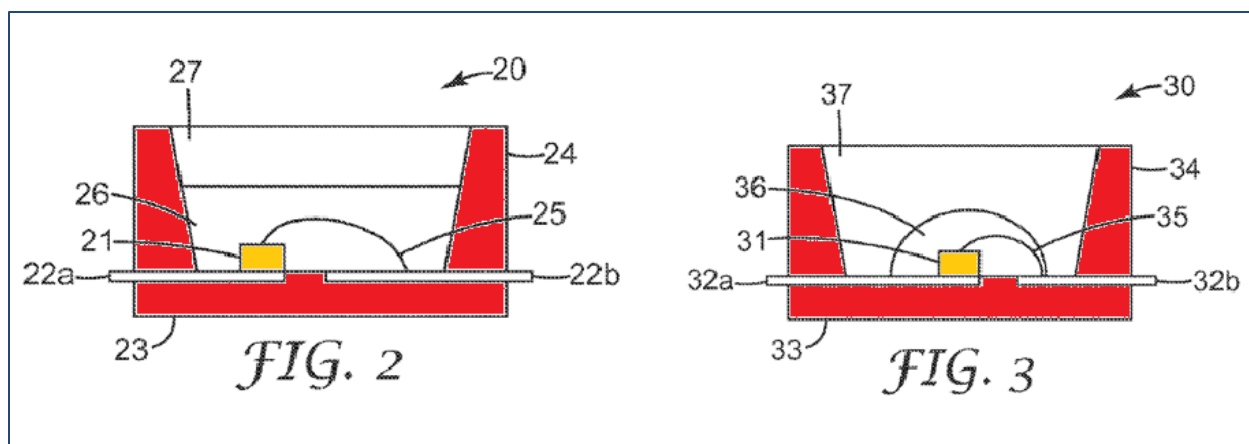
App’x at 913; *Gardner*, 725 F.2d at 1345-49; *Aller*, 220 F.2d at 456. And, a POSA would have further understood to adjust the phosphor concentration, for example, depending on, *e.g.*, desired light output or intensity, color, color temperature, and film thickness (as explained by Thompson and other references)—which amounts to nothing more than routine optimization. EX1003 ¶340; EX1007, [0103], [0145]; EX1009, [0008], [0054], [0061]; EX1005, [0006]-[0007]; EX1011, 7:47-8:3; EX1031, 7:48-52, 10:36-44, 15:2-10, FIG. 17, Table 1. *See Gentiluomo*, 36 F. App’x at 439; *K-Swiss*, 567 F. App’x at 913; *Gardner*, 725 F.2d at 1345-49; *Aller*, 220 F.2d at 456.

4. Claim 4

“...further comprising a metallic package, wherein the light emitting device is in the metallic package.”

Thompson discloses claims 1 and 3. §§V.I.1, V.I.3. Thompson alone or in view of Yatsuda also renders obvious claims 1 and 3, *see* §V.J.2, as well as claim 4. EX1003 ¶¶341-345.

Thompson discloses “**LED die 21**... mounted on metallized contact 22a disposed on **substrate 23 in reflecting cup 24**” in Figure 2, and “**LED die 31**... mounted on metallized contact 32a disposed on **substrate 33 in reflecting cup 34**” in Figure 3. EX1009, [0015], [0058]; EX1003 ¶342.



Thompson does not specify the material for the substrate and reflecting cup, but consistent with the knowledge of a POSA—including the known need and desirability of efficiently dissipating heat generated by the LED out of the package—a POSA would have logically looked to various known ceramics or metals and selected one with high heat conductivity to achieve this goal (such as copper, aluminum nitride or silicon carbide commonly known to be used in LED packages for this purpose). EX1003 ¶343; EX1015, 493-494; EX1022, 3.7-3.16; EX1008, [0033], [0036], FIG. 3; EX1012, 13:39-42, 14:54-61; EX1016, [0027]. A POSA would have had no technical difficulty in selecting a particular material because it applies a known technique (material selection) to a known device (the package) to yield a predictable improvement (better heat dissipation). EX1003 ¶¶343-344; §V.J.1. If metal was used, a POSA would further have understood to add an insulating layer as needed to prevent a short circuit, as taught by Yatsuda. EX1008, [0034]; EX1003 ¶321.

For example, as further support for the obviousness of using a “metallic package” in Thompson, Yatsuda discloses to use as its base package—on which an LED chip is mounted—“a material being superior in heat conductivity, such as a metal like copper,” “ceramic like (AlN) aluminum nitride” and “the like.” EX1008, [0033], [0036], FIG. 3; EX1003 ¶345; §V.A.2.

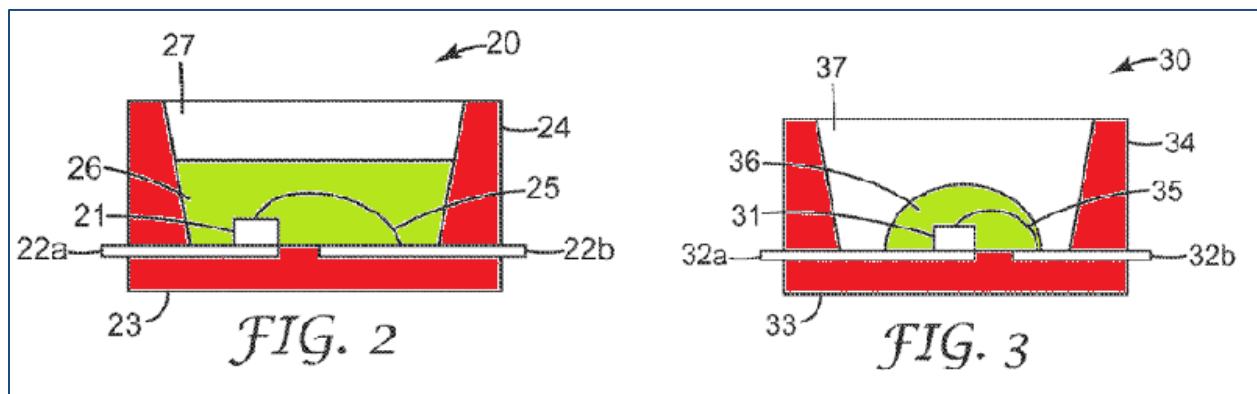
Both metal (such as copper) and a highly thermally conductive ceramic would meet the “metallic package” requirement. EX1003 ¶¶344-345; EX1001, 3:61-64, 6:35-39.

5. Claim 5

“...wherein the phosphor bearing film is at least partially on a surface of the metallic package.”

Thompson discloses claims 1 and 3. §§V.I.1, V.I.3. Thompson alone or in view of Yatsuda also renders obvious claims 1, 3, and 4, *see* §§V.J.2, V.J.4, as well as claim 5. EX1003 ¶¶346-347.

As shown in Figures 2 and 3, the **first encapsulants** are at least partially on a surface of the **packages**. EX1009, [0015], [0058]; EX1003 ¶347; EX1001, 3:1-4.

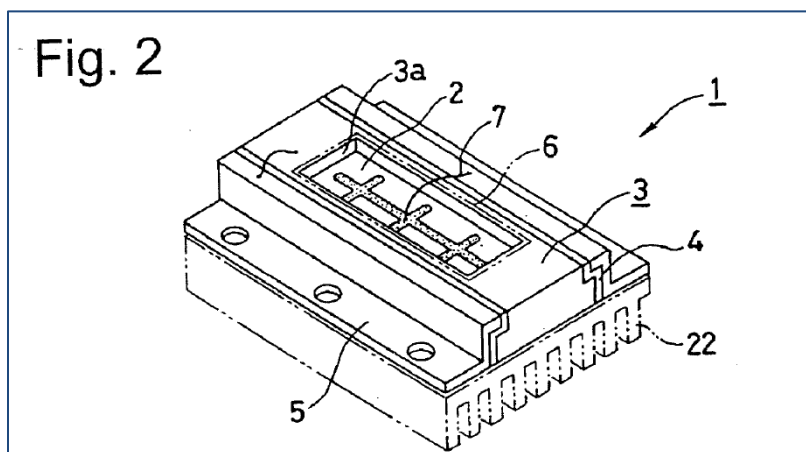


6. Claim 6

“...further comprising a heat sink, wherein the package is on the heat sink.”

Thompson discloses claims 1 and 3. §§V.I.1, V.I.3. Thompson alone or in view of Yatsuda also renders obvious claims 1 and 3-5, *see* §§V.J.2, V.J.4-5, as well as claim 6. EX1003 ¶¶348-351.

Yatsuda teaches that, where the electric current applied to the LED chip is “as much as possible[] to obtain as much amount of light as possible,” the base package on which the LED chip is mounted “should be made of a material being superior in heat conductivity....” EX1008, [0033]; EX1003 ¶349. Yatsuda further teaches that, in such a case, “heat sink 22” can be connected to the base “in its rear surface,” such as in Yatsuda’s Figure 2 (*i.e.*, the package is on the heat sink). EX1008, [0033]; EX1003 ¶¶349-350.



A POSA would have advantageously thought to apply—and had no technical difficulty in applying—the heat sink of Yatsuda to the package of Thompson

because it applies a known technique (the heat sink) to a known device (the package) to yield a predictable improvement (better heat dissipation). EX1003 ¶351; §§V.C.1, V.J.1; *see also* EX1016, [0017], [0024], [0027]-[0028]; EX1030, [0086]-[0087], [0065]-[0066]; EX1014, 192; EX1013, [0117], [0127]-[0128], [0137]-[0138].

7. Claim 9

“...wherein the rigid film comprises a transparent cured silicone film.”

To the extent that Thompson is found not to disclose a *transparent* cured silicone film for its second encapsulant in Figures 2 and 3, it would nonetheless have been obvious to a POSA. EX1003 ¶¶352-353. A POSA would have understood that such silicone encapsulants are typically transparent, and understood the need and desire to make them transparent, including so that they can serve a dual-purpose of protecting the LED and components and enabling the LED package to efficiently emit the maximum amount of light. EX1003 ¶353; EX1008, [0041] (Yatsuda teaching to use transparent hard silicone resin encapsulant); EX1010, [0017]-[0018], [0026] (transparent encapsulant such as silicone seals LEDs and creates lens that minimizes total internal reflection); EX1006, [0010], [0029], [0039]; EX1005, [0005]-[0006], [0012], [0015]; EX1009, [0003]-[0004]; EX1026, [0111]-[0112], cl. 1.

8. Claims 10-12

Claims 10-12 are the same as claims 4-6, and thus claims 10-12 are obvious over Thompson alone or in view of Yatsuda and/or Nii for the same reasons (including the claims from which they depend). EX1003 ¶354.

VI. Conclusion

The challenged claims are unpatentable. Petitioner requests cancellation.

Respectfully submitted,

REICHMAN, JORGENSEN, LEHMAN &
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Dated: March 22, 2024

/Patrick Colsher/
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CERTIFICATE OF COMPLIANCE

I hereby certify that this paper complies with the type-volume limitation of 37 C.F.R. §42.24 (as determined by the Microsoft Word word-processing system used to prepare this paper) because it contains 13,918 words, excluding the parts of the paper exempted by 37 C.F.R. §42.24(a).

REICHMAN, JORGENSEN, LEHMAN &
FELDBERG LLP

Dated: March 22, 2024

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CERTIFICATE OF SERVICE

I hereby certify that the foregoing Petition for *Inter Partes* Review, the Exhibits listed on the List of Exhibits, and Power of Attorney were served on March 22, 2024 pursuant to 37 C.F.R. §§42.6 and 42.105 via Federal Express, upon the following at the correspondence address of record with the Patent Office for Patent

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