UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* CREE, INC.
Patent Owner and Appellant

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Appeal 2014-007890
Reexamination Control No. 90/010,940
Patent 6,600,175 B1[1]
Technology Center 3900

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Before JASON V. MORGAN, HUNG H. BUI, and
MICHELLE N. WORMMEESTER, *Administrative Patent Judges*.

BUI, *Administrative Patent Judge*.

DECISION ON APPEAL

This reexamination proceeding arose from a third-party request for *ex parte* reexamination filed on April 2, 2010 (Control Number 90/010,940). Cree, Inc. (Appellant), the owner of the patent under reexamination,[2] appeals under 35 U.S.C. §§ 134(b) and 306 from an Examiner's final rejection of claims 118, 134–136, 138, and 140.[3]

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[1] The patent involved in this reexamination appeal proceeding (the '175 Patent) issued to Bruce Baretz, and Michael A. Tischler (hereinafter "Baretz et al.") on July 29, 2003.

[2] *See* Patent Assignment Abstract of Title, Reel 015286 /Frame 0635 recorded on May 5, 2004, and entered into the record of Control No. 90/010,940 as "Title Report" on May 18, 2010.

[3] Original claims 1–5, 11–13, 21–24, and 26 are subject to reexamination as per Third Party Request dated April 2, 2010. Claims 6–10, 14–20, and 25

We have jurisdiction under 35 U.S.C. §§ 134(b) and 306. An oral hearing was conducted on November 5, 2014. A transcript of the hearing will be made of record.

We AFFIRM.[4]

## STATEMENT OF THE CASE

### *Related Proceedings*

Appellant has informed the Office that there are no related appeal or interference proceedings.

### *The '175 Patent*

The '175 patent describes a light emitting assembly, shown in Fig. 6, comprising a solid state light emitting diode (LED) which emits a first, relatively shorter wavelength radiation in the form of blue or ultraviolet (UV) light, and a down-converting luminophoric medium which, when impinged by the first, relatively shorter wavelength radiation, is excited to

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are not subject to reexamination. As such, claims 6–10, 14–20, and 25 will remain intact regardless of the outcome of the reexamination. During the reexamination, claims 27–61 were newly added on May 3, 2011, and claims 62–188 were newly added on March 26, 2012. Subsequently, claims 1–5, 11–13, 21–24, 26–117, 119–133, 137, 139, and 141–188 were canceled on August 24, 2012 to reduce the number of issues for consideration on appeal, leaving only six (6) claims pending on this appeal, i.e., claims 118, 134–136, 138, and 140.

[4] Our decision refers to Appellant's Appeal Brief filed on March 20, 2014 ("App. Br."); Reply Brief filed July 9, 2014 ("Reply Br."); Examiner's Answer mailed May 9, 2014 ("Ans."); Final Office Action mailed November 20, 2013 ("Final Rej."); and '175 Patent Specification issued on July 29, 2003 ("Spec.").

emit a second, longer wavelength radiation in the form of white light. '175 patent, 7:8–27 and Abstract.

Fig. 6 of the '175 patent is reproduced with additional marking for illustration.

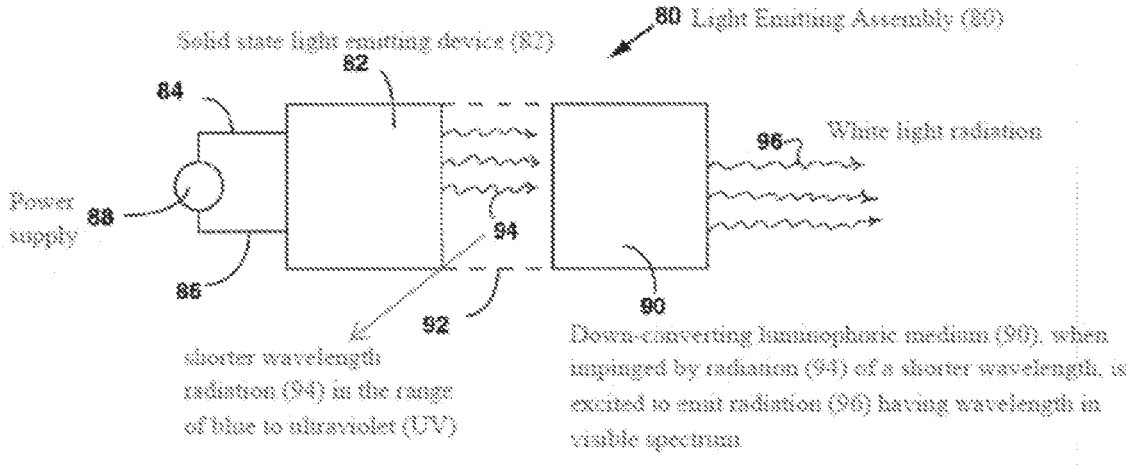


Fig. 6 of the '175 patent is a schematic representation of a light emitting assembly 80 comprising a solid state LED 82 to emit a blue or UV light and a down-converting luminophoric medium 90 to emit white light.

In a specific embodiment, the blue or UV light output from the LED is down-converted to white light by packaging the solid state LED, shown in Fig. 1, with *fluorescent organic and/or inorganic fluorescers or phosphors in a polymeric matrix*. '175 patent, Fig. 1 and Abstract (emphasis added). According to Appellant, the term "luminophoric medium" refers "to a material which in response to radiation emitted by the solid state device emits light in the white visible light spectrum by *fluorescence and/or phosphorescence*." '175 patent, 7:55–58 (emphasis added).

Fig. 1 of the '175 patent is reproduced with additional marking for illustration.

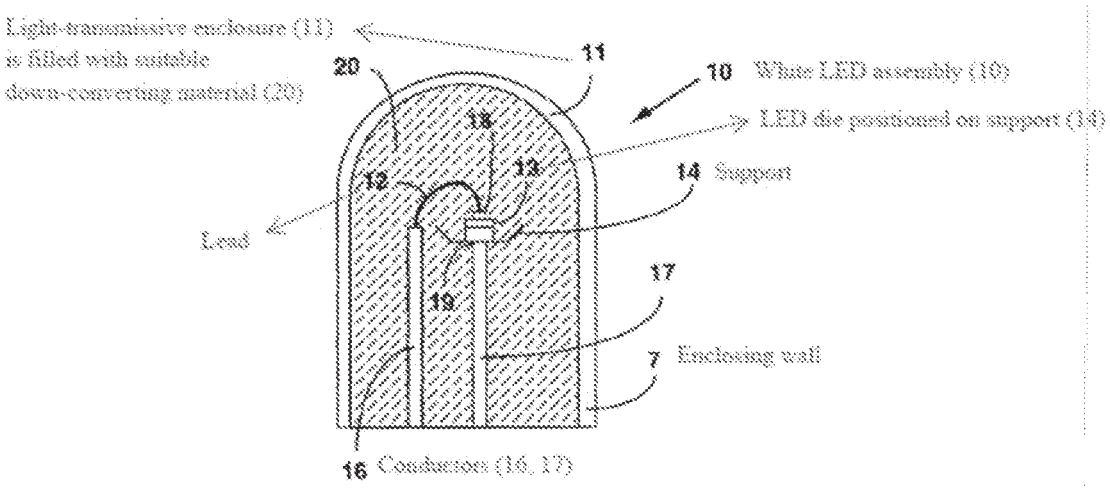


Fig. 1 of the '175 patent is a schematic representation of a white LED assembly 10 comprising a LED die 13 and a down-converting material 20.

As shown in Fig. 1 of the '175 patent, the white LED assembly 10 includes an LED die 13 packaged within a light-transmissive enclosure 11 filled with suitable down-converting material 20, e.g., a down-converting luminophoric medium including fluorescers and/or phosphors to down convert the blue or UV light output from the LED die 13 to white light. '175 patent at 8:58–9:8.

*Claims on Appeal*

Claims 118 and 134 are the only independent claims on appeal and are limited to a single-die gallium nitride (GaN) blue LED to emit blue light (as opposed to blue or UV light as disclosed by the '175 patent). In particular, claims 118 and 134 are directed to light emission devices that include a single-die GaN blue LED in combination with a down-converting

luminophoric medium to produce a white light. App. Br. 7. Representative claims 118 and 134 are reproduced below:

> 118. A light-emission device, comprising *a single-die, two-lead gallium nitride based semiconductor blue light-emitting diode* emitting radiation; and a recipient *down-converting luminophoric medium for down-converting the radiation emitted by the light-emitting diode, to a polychromatic white light*, wherein the luminophoric medium is dispersed in a polymer that is on or about the single-die, two-lead gallium nitride based semiconductor blue light-emitting diode.
>
> 134. A light-emitting device, comprising:
>
> at least *one single-die gallium nitride based semiconductor blue light-emitting diode (LED)* coupleable with a power supply to emit a primary radiation which is the same for each single-die LED present in the device, said primary radiation being a relatively shorter wavelength radiation; and
>
> a *down-converting luminophoric medium* arranged in receiving relationship to said primary radiation, and which in exposure to said primary radiation, is excited to responsively emit a secondary, relatively longer wavelength, polychromatic radiation, with separate wavelengths of said polychromatic radiation mixing to produce *a white light output*,
>
> wherein each of the at least one single-die gallium nitride based semiconductor blue light-emitting diode in interaction with luminophoric medium receiving its primary radiation produces *white light output*, and

wherein *the luminophoric medium is dispersed in a polymer that is on or about the single-die gallium nitride based semiconductor blue light-emitting diode.*

App. Br. 69 (Claims Appendix) (disputed limitations in italics, some paragraphing added).

*Prior Art References & Publications Considered*

| | | | |
|---|---|---|---|
| (1) | Pinnow et al. (Pinnow) | US 3,691,482 | Sept. 12, 1972 |
| (2) | Martic et al. (Martic) | US 3,743,833 | July 3, 1973 |
| (3) | Wanmaker et al. (Wanmaker) | US 3,793,046 | Feb. 19, 1974 |
| (4) | Stevenson et al. (Stevenson) | US 3,819,974 | June 25, 1974 |
| (5) | Abe | US 5,535,230 | July 9, 1996 |
| (6) | Silsby | US 5,563,621 | Oct. 8, 1996 |
| (7) | Nakamura et al. (Nakamura) | US 5,578,839 | Nov. 26, 1996 |
| (8) | Tabuchi et al. (Tabuchi) | JP 50-79379 | Nov. 24, 1973 |
| (9) | Tadasu et al. (Tadasu) | JP 5-152609 | June 18, 1993 |
| (10) | Menda | JP 6-267301 | Sept. 22, 1994 |

(11) Admitted Prior Art in the '175 patent (APA)

(12) CRC HANDBOOK OF CHEMISTRY AND PHYSICS E-201 (63d ed. 1983);

(13) BASF Data Sheet for Lumogen® F Violet 570;

(14) BASF Data Sheet for Lumogen® F Yellow 083;

(15) BASF Data Sheet for Lumogen® F Red 300;

(16) LIST OF LASER TYPES, Wikipedia *available at* http://en.wikipedia.org/wiki/List_of_laser_types (last visited Sept. 20, 2013), Apr. 27, 2013, version *available at* http://en.wikipedia.org/w/index.php?title=List_of_laser_types&oldid=552479686.

(17) Definition of "Resin" from The Free Dictionary *available at* http://www.thefreedictionary.com/resin (last visited Oct. 9, 2013).

(18) Definition of "About" from The Free Dictionary *available at* http://www.thefreedictionary.com/about (last visited Oct. 10, 2013).

*Expert Declarations & Other Exhibits*

Appellant has provided several Declarations under 37 C.F.R. § 1.132 from several researchers and renowned experts in the field of light emitting diodes (LEDs) including Dr. Gerald B. Stringfellow (Exhibits 5–6), Dr. Joan Redwing (Exhibit 11), and Dr. Christian Wetzel (Exhibit 12). These Declarations provide expert testimony regarding: (i) the state of the art regarding LEDs and white light at the time of the invention, including Stevenson's original patent for a bright violet/blue LED, (ii) how the industry was utilizing what is known as a direct-emission "triplet" approach in which individual LEDs that emit three primary colors—red, green, and blue (RGB)—are packaged together and then all the primary (RGB) colors are mixed together to form white light, (iii) how those of ordinary skill in the art including the Declarants would have pursued the RGB "triplet" approach and avoided a "down-conversion" approach in which a phosphor material is used to convert monochromatic light from a blue or ultraviolet (UV) LED to create white light, as disclosed by Appellant's invention, and (iv) how single white LEDs were not possible until after Appellant's invention, i.e., blue LED in combination of "down-conversion" to produce white light as allegedly corroborated with documentary evidence.

In addition, Appellant has provided three (3) Declarations under 37 C.F.R. § 1.132 from Dr. George Brandes (Exhibits 2–4), Director of IP Strategy and Business Development at Cree, Inc., the patentee, to provide testimony of second considerations of non-obviousness, including: (i) evidence of long felt but unsolved need, (ii) unexpected results, (iii) scientific recognition and industry acknowledgement, (iv) licensing, and

(v) commercial success of Appellant's invention. The '175 patent allegedly provides documentary evidence that corroborates the Declarations and support Appellant's arguments. *See*, *e.g.*, App. Br. 6–7 (citing Spec. col. 2, ll. 29–31, 38–51, col. 8, ll. 26–32), 54–55 (citing, e.g., Spec. col. 1, l. 11–col. 5, l. 59); Reply Br. 8–9 (citing Spec. col. 9, ll. 9–18), 11 (citing Spec. col. 8, ll. 26–32), and 19 (citing Spec. col. 1, ll. 32–41).

A complete listing of these Exhibits and alleged corroborating evidence is provided below:

Exhibit 1: *Research News*, FRAUNHOFER GESELLSCHAFT, 1997.
- Submitted as Exhibit A to Response dated Aug. 24, 2012. Entered into record on Nov. 20, 2013.

Exhibit 2: Declaration of Dr. George R. Brandes dated January 6, 2012 (Brandes II[5]).
- Submitted with Response dated Jan. 7, 2012. Entered into the record on Jan. 26, 2012.
- *Cree Licenses Remote Phosphor IP, Launches New LEDs and Services*, LEDS MAGAZINE, INDUSTRY NEWS, Dec. 2011: submitted as Exhibit A.
- *Cree and Nichia Announces White LED Cross-Licensing*, LEDS MAGAZINE, INDUSTRY NEWS, Feb. 2005: submitted as Exhibit B.
- *Toyoda Gosei Announces Patent Agreement with Cree*, Toyoda email announcement, May 2008: submitted as Exhibit C.

[5] For consistency with the Briefs, we retain the Declaration labels used by Appellant and the Examiner. For example, we refer to "Brandes II" even though—because Appellants did not rely on, or submit as an exhibit, the November 19, 2010, Declaration of Dr. Brandes—we do not refer to "Brandes I" in our Decision.

- *Cree and Osram Sign LED Patent Cross-License Agreement*, SEMICONDUCTOR TODAY, INDUSTRY NEWS, April 2011: submitted as Exhibit D.
- *Cree and Phillips Sign Comprehensive LED Patent Cross-License Agreement*, Cree email announcement, July 2010: submitted as Exhibit E.

Exhibit 3: Declaration of Dr. George R. Brandes dated March 26, 2012 (Brandes III).

- Submitted with Response dated March 26, 2012. Entered into the record on May 24, 2012.

Exhibit 4: Declaration of Dr. George R. Brandes dated August 23, 2012 (Brandes IV).

- Previously submitted with Response dated August 24, 2012. Entered into the record on Nov. 20, 2013.

Exhibit 5: Declaration of Dr. Gerald B. Stringfellow dated March 26, 2012 (Stringfellow II).

- Submitted with Response dated March 26, 2012. Entered into the record on May 24, 2012.
- *Research News*, FRAUNHOFER GESELLSCHAFT, 1997: submitted as Exhibit N.

Exhibit 6: Declaration of Dr. Gerald B. Stringfellow dated August 23, 2012 (Stringfellow III).

- Previously submitted with Response dated August 24, 2012. Entered into the record on Nov. 20, 2013.

Exhibit 7: http://www.nichia.co.jp/en/about_nichia/history.html.

- Submitted as Exhibit B with Response dated August 24, 2012. Entered into the record on Nov. 20, 2013.

Exhibit 8: H.P. Maruska & D.A. Stevenson, *Mechanism of Light Production in Metal-Insulator-Semiconductor Diodes; GaN:Mg Violet Light-Emitting Diodes*, 17 SOLID STATE ELECTRONICS 1179 (1974).

- Submitted as Exhibit C with Response dated August 24, 2012. Entered into the record on Nov. 20, 2013.

Exhibit 9: Alfred Vollmer, *White LED Developed Using Luminescence Conversion*, Nikkei Electronic Asia, July 1997.

- Submitted as Exhibit D with Response dated August 24, 2012. Entered into the record on Nov. 20, 2013.

Exhibit 10: Applied Physics Letters 92, 143309 (2008).

- Submitted with Response dated August 24, 2012. Entered into the record on Nov. 20, 2013.

Exhibit 11: Declaration of Dr. Joan M. Redwing dated August 24, 2012.

- Previously submitted with Response dated August 24, 2012. Entered into the record on Nov. 20, 2013.
- Shuji Nakamura et al., THE BLUE LASER DIODE: THE COMPLETE STORY (2000): submitted as Attachment D.
- He Tian et al., *Bichromophoric Rhodamine Dyes and their Fluorescence Properties*, 26 DYES AND PIGMENTS 159 (1994): submitted as Attachment E.
- C.J. Nuese & J.I. Pankove, *Light-Emitting Diodes – LEDs* (unidentified date of publication): submitted as Attachment F.
- Isamu Akasaki & Hiroshi Amano, *Widegap Column – III Nitride Semiconductors for UV/Blue Light Emitting Devices*, 141 J. Electrochemical

Soc'y 2266–2271 (1994): submitted as Attachment G.

- H.P. Maruska & D.A. Stevenson, *Mechanism of Light Production in Metal-Insulator-Semiconductor Diodes; GaN:Mg Violet Light-Emitting Diodes*, 17 SOLID STATE ELECTRONICS 1171-1179 (1974): submitted as Attachment H.

Exhibit 12: Declaration of Dr. Christian M. Wetzel dated August 24, 2012.

- Previously submitted with Response dated August 24, 2012. Entered into the record on Nov. 20, 2013.

*Examiner's Rejections*

A. Stevenson as a primary reference

(1) Claims 118, 134, and 140 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Stevenson, Pinnow, and Nakamura. Ans. 6–18.

(2) Claims 135, 136, and 140 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Stevenson, Pinnow, Nakamura, and Tadatsu. Ans. 18–20.

(3) Claims 138 and 140 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Stevenson, Pinnow, Nakamura, and Tabuchi. Ans. 20–22.

(4) Claims 118 and 134 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Stevenson, APA, Wanmaker, Nakamura, Tabuchi, and Martic. Ans. 22–27.

B. Tabuchi as a primary reference

(5) Claims 118, 134, 138, and 140 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tabuchi, APA, Wanmaker, Nakamura, and Martic. Ans. 27–35.

(6) Claims 118, 134, 138, and 140 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tabuchi, Pinnow, and Nakamura. Ans. 35–40.

(7) Claims 135 and 136 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Tabuchi, Pinnow, Nakamura, and Tadatsu. Ans. 40–42.

*Issues on Appeal*

Based on Appellant's arguments, the dispositive issue on appeal is whether the Examiner erred in rejecting claims 118, 134, and 140 under 35 U.S.C. § 103(a) as being unpatentable over Stevenson, Pinnow, and Nakamura. In particular, the appeal turns on:

(1) Whether the combination of Stevenson, Pinnow, and Nakamura teaches or suggests all limitations of Appellant's claims 118, 134, and 140, including: (i) the use of a blue LED in combination with a down-converting luminophoric medium to produce white light, and (ii) the down-converting luminophoric medium is dispersed in a polymer that is on or about the single-die blue GaN-based LED. App. Br. 15–35; Reply Br. 2–9.

(2) Whether there is an objective reason supported by a rational underpinning to combine the teachings of Stevenson, Pinnow, and Nakamura in order to use a blue LED to create white light via down conversion. App. Br. 4–14; Reply Br. 2–3.

(3) Whether the Examiner has engaged in impermissible hindsight to combine the teachings of Stevenson, Pinnow, and Nakamura in order to use a blue LED to create white light via down conversion. App. Br. 13–14; Reply Br. 1.

(4) Whether the Examiner has accorded proper weight to Appellant's expert testimony in support of the conclusion of obviousness. Reply Br. 8–20.

(5) Whether secondary considerations of non-obviousness such as: (i) evidence of long felt but unsolved need, (ii) unexpected results, (iii) scientific recognition and industry acknowledgement, (iv) licensing, and (v) commercial success are sufficient to overcome strong indications of obviousness. App. Br. 54–67; Reply Br. 17–18.

## ANALYSIS

### *§ 103(a) Rejection of Claims 118, 134, and 140 based on Stevenson, Pinnow, and Nakamura*

Independent claim 118 defines broadly a light-emission device that uses a blue LED in combination with a down-converting luminophoric medium to produce white light. In particular, claim 118 recites a light-emission device comprising:

> a single-die, two-lead gallium nitride based semiconductor *blue* light-emitting diode emitting radiation; and
>
> a recipient down-converting luminophoric medium for down-converting the radiation emitted by the light-emitting diode, to a polychromatic *white light*, wherein the *luminophoric medium is dispersed in a polymer* that is on or about the single-die, two-lead gallium nitride based semiconductor *blue* light-emitting diode.

App. Br. 69 (Claims Appendix) (disputed limitations in italics).

Independent claim 134 is substantially identical to independent claim 118, and further defines: (1) the relationship between the primary radiation (light output from blue LED) and the secondary radiation having a longer wavelength (light output from down-converting luminophoric medium) and (2) at least one single-die GaN-based blue LED (as opposed to merely a single-die GaN-based blue LED as recited in claim 118).

Dependent claim 140 further requires the single-die LED arranged to *directly impinge* radiation to the polymer (emphasis added).

*Obviousness*

> In evaluating whether claims are obvious,
>
> [1] the scope and content of the prior art are to be determined; [2] differences between the prior art and the claims at issue are to be ascertained; and [3] the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.

*Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). However, an obviousness analysis "need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). A prima facie case of obviousness is established when the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art. *In re Rinehart*, 531 F.2d 1048, 1051 (CCPA 1976). The level of ordinary skill in the art is reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978).

The Examiner finds the combination of Stevenson, Pinnow, and Nakamura discloses all limitations of Appellant's claims 118, 134, and 140.

Ans. 6–18. For example, the Examiner finds Stevenson[6] discloses a light-emitting device comprising: (1) a single-die, two lead[7] gallium nitride (GaN)-based semiconductor LED to emit primary radiation in the violet region of the spectrum,[8] and (2) a down-converting luminophoric medium including organic and inorganic phosphors to convert the primary radiation[9]

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[6] Professor David Stevenson along with his doctoral students at Stanford University, Herbert Maruska and Walden Rhines, developed the first violet/ blue LED using magnesium-doped gallium nitride in 1972. Patent No. 3,819,974 was issued on June 25, 1974; however, devices built in early 1970s did not have sufficient light output (brightness level) to be of practical use at least until 1993 when high-power, high-brightness blue LEDs were developed by Dr. Shuji Nakamura of Nichi Corporation making high-power white light sources practical.

[7] By definition, a light emitting diode (LED) is a "two-lead" semiconductor light source. This is because a LED is simply a basic p-n junction diode, which emits light when activated, i.e., when a voltage is applied to the leads forcing electrons and holes to recombine for light emission. *See* "LED" THE AMERICAN HERITAGE SCIENCE DICTIONARY (Houghton Mifflin Company, 2005). As such, the term "two-lead" is inherent in every LED and, does not add patentable weight.

[8] According to the Examiner, Stevenson's peak emission is violet, but both blue and ultraviolet (UV) emissions are included. Ans. 8–9 (citing Stevenson's Fig. 4 in which light emitted from Stevenson's LED ranges from blue to ultraviolet (UV) and centered in violet around 400nm; *see also* col. 1, ll. 10–12, 16–17; col., 3, ll. 24–28). Appellant's experts, Dr. Joan Redwing and Dr. Christian Wetzel, acknowledge Stevenson's emission spectrum contains blue and UV emission. However, the actual emission of blue or UV light is relatively small compared to the violet emission; thus, Stevenson's LED is known as a violet LED and not a blue LED. *See* Redwing Decl. ¶ 25 and Wetzel Decl. ¶ 24.

[9] According to the Examiner, impingement of radiation emitted from LED to the luminophoric medium dispersed in a polymer, *albeit* directly, indirectly or otherwise, is a matter of design choice. Ans. 17.

from the GaN-based LED die to visible light having a longer wavelength.[10] Ans. 6–12 (citing Stevenson, col. 1, ll. 58–64; col. 2, ll. 29–31; col. 3, l. 24–col. 4, l. 7; Fig. 3 and Fig. 4).

Fig. 3 of Stevenson is reproduced below with additional markings for illustration.

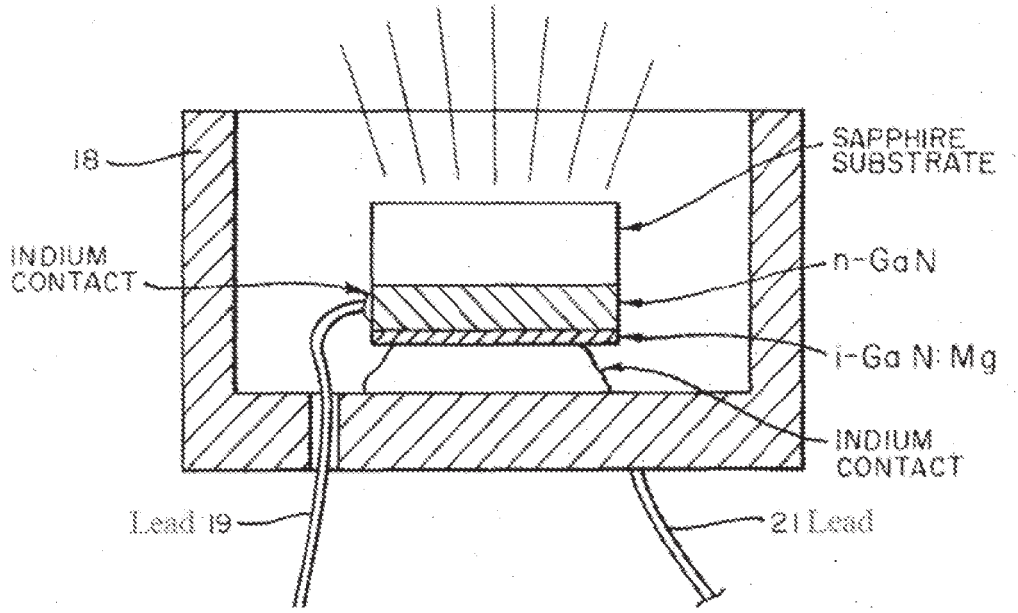


Fig. 3 of Stevenson discloses a single-die, two-lead GaN-based LED to emit primary radiation in the violet region of the spectrum.

The Examiner acknowledges Stevenson does not implicitly disclose the use of blue LEDs and "down-conversion" to produce white light. To the extent necessary, the Examiner relies on (1) Nakamura for disclosing high-power, high-brightness blue LEDs, and (2) Pinnow for explicitly disclosing the "down-conversion" of the primary radiation using a mixture of phosphors to produce white light and the mixture of phosphors is dispersed

[10] According to the Examiner, visible light (light in a spectral range of greater sensitivity for the human eye) also includes white light. Ans. 11 (citing Stevenson, col. 3, l. 24–col. 4, l. 7).

in a polymer that is "about" the primary radiation. *Id.* at 13–17 (citing Nakamura, col. 2, ll. 7–14, 30–33; col. 4, ll. 9–11, ll. 52–59; col. 11, l. 61–col. 12, l. 6; and cols. 13–20 "Examples 1-28 of blue LEDs"; and Pinnow, col. 1, l. 65–col. 2, l. 7, 15–20; col. 3, ll. 24–55; col. 6, ll. 28–30; Fig. 3 and Abstract).

Based on these factual findings and the principles outlined in *KSR*, 550 U.S. at 406, the Examiner concludes the following: First, "[i]t would have been obvious . . . to substitute Stevenson's GaN-based LED with either the known UV light emitting or blue light emitting GaN-based LED disclosed in Nakamura" because such a substitution would be seen as "simple substitution of one known element (Stevenson's GaN-based LED) for another known element (Nakamura's GaN-based LED) to obtain predictable results (as evidenced by Pinnow)." Ans. 14 (emphasis omitted). Second, once the substitution is made [and a blue LED (instead of a violet LED) is placed in a single die as disclosed by Stevenson], a person having ordinary skill in the art[11] would have utilized the same "down-conversion" using a mixture of phosphors to convert the blue or UV light output from the blue LED die to produce white light, as implicitly suggested by Stevenson and expressly disclosed by Pinnow. *Id.* at 17; *see also* Stevenson, col. 3, l. 24–col. 4, l. 7; Pinnow, Abstract.

According to the Examiner, the reason for combining the references is based on the recognition that some *advantage or expected beneficial result* would have been produced by their combination. *In re Sernaker*, 702 F.2d

[11] An artisan of ordinary skill is a hypothetical person who is presumed to know the relevant prior art at the time of Appellant's invention. *In re GPAC*, 57 F.3d at 1579.

989, 994–95 (Fed. Cir. 1983). For example, Nakamura's GaN-based LED is more powerful than Stevenson's GaN-based LED (i.e., Nakamura's GaN-based LED would provide more photons to be down-converted by the phosphors and thereby provide brighter overall light emission from the device) and, as such, there is an "advantage or expected beneficial result" in using the higher-power, high brightness Nakamura LED, specifically brighter emission by the phosphors. Ans. 110. Therefore, an artisan of ordinary skill would have appreciated this benefit and recognized that Nakamura's better and brighter LED would have been an "update" using a "modern electronic component" of Stevenson's older, less-efficient LED. *Id*. (emphasis omitted).

Nevertheless, Appellant contends: (1) the combination of Stevenson, Pinnow, and Nakamura does not teach or suggest the subject matter of Appellant's claims 118, 134, and 140, i.e., the use of a blue LED in combination with a down-converting luminophoric medium to create white light; (2) there is no reason to combine the teachings of Stevenson, Pinnow, and Nakamura and, in the absence of such a reason, and (3) the Examiner has engaged in an impermissible hindsight to combine the teachings of Stevenson, Pinnow, and Nakamura in order to use a blue LED to create white light via down conversion as recited in Appellant's independent claim 118, 134, and 140. App. Br. 4–35; Reply Br. 1–9. In particular, Appellant argues:

> (1) None of the art suggests, let alone teaches, the use of a blue LED and "down-conversion" to create white light because (i) Stevenson only discloses a violet LED, not blue, (ii) Pinnow relies on a blue argon gas laser as a light source, a very different thing from a blue LED, and (iii) Nakamura

teaches a blue LED but provides no teaching or suggestion of "down-conversion" (App. Br. 21–29);

(2) No one skilled in the art would turn to Stevenson if they were considering the creation of white light from an LED because Stevenson's LED is a very low power, MIS type device that was unsuitable for the creation of white light (*id.* at 29–30);

(3) No one skilled in the art would turn to Pinnow if they were considering the creation of white light from an LED because Pinnow relies on an extremely high power laser that is very different from an LED (*id.* at 30–33);

(4) Nakamura fails to suggest using a blue LED and down-conversion to create white light (*id.* at 33–34);

(5) Stevenson and Pinnow, if combined, do not yield white light (*id.* at 35); and

(6) The combination of Stevenson, Pinnow, and Nakamura still fails to teach or suggest "luminophoric medium . . . dispersed in a polymer" (*id.* at 35–36).

In support of these arguments, Appellant relies on expert testimony from Dr. Gerald B. Stringfellow (Exhibits 5–6), Dr. Joan Redwing (Exhibit 11), and Dr. Christian Wetzel (Exhibit 12) to describe: (i) the state of the art regarding LEDs and white light at the time of the invention, including Stevenson's original patent for a violet/blue LED, (ii) how the industry at the time was utilizing what is known as a direct-emission "triplet" approach in which individual LEDs that emit three primary colors—red, green, and blue (RGB)—are packaged together and then all the primary (RGB) colors are mixed together to form white light, (iii) how those of ordinary skill in the art including the Declarants would have pursued the RGB "triplet" approach

and avoided a "down-conversion" approach in which a phosphor material is used to convert monochromatic light from a blue or ultraviolet (UV) LED to create white light, as disclosed by Appellant's invention, and (iv) how single white LEDs were not possible until after Appellant's invention, i.e., blue LED in combination of "down-conversion" to produce white light as corroborated with documentary evidence. Stringfellow II Decl. ¶¶ 38–41 (Exhibit 5); Stringfellow III Decl. ¶¶ 14–28 (Exhibit 6); Redwing Decl. ¶¶ 15–103 (Exhibit 11); and Wetzel Decl. ¶¶ 17–125 (Exhibit 12).

For example, Dr. Stringfellow[12] testifies: (1) during the history of LEDs from 1960s to mid-1990s, researchers directed their efforts to the development of better monochromatic primary color LED devices, via direct-emission "triplet" approach "because researchers believed that if they achieved successful red, green, and blue [(RGB)] monochromatic light sources, then they could create any other color of interest by mixing these monochromatic light sources" (Stringfellow III Decl. ¶ 14); (2) Stevenson discloses the original, seminal work on a bright violet/blue LED in early 1974, known as a "MIS" device, but no work was ever done or proposed to use Stevenson's MIS device to produce white light (*id.* ¶¶ 20–22) and no one of ordinary skill in the art would look to Stevenson for anything to do with production of white light (*id.* ¶ 24); (3) no LED devices would utilize phosphors to produce white light prior to Appellant's invention disclosed in

[12] Dr. Stringfellow is a member of the National Academy of Engineering, a Fellow of the IEEE and a worldwide-recognized expert in the field of LEDs with over 46 years of experience and over 350 peer-reviewed articles. *See* Stringfellow III Decl. ¶¶ 4–5, 10–11. Dr. Stringfellow is well qualified to testify regarding the technology in this re-examination proceeding.

the '175 patent because the industry was focused on using a direct-emission "triplet" approach (*id.* ¶¶ 24–26); and (4) at the time of the invention, there was no focus on the use of "down-conversion" because (a) it would waste energy, (b) it was no longer needed to create primary color, and (c) it entailed increased cost and complexity (*id.* ¶ 26).

Likewise, Dr. Joan Redwing[13] acknowledges light emitted from LEDs can undergo a process known as "down-conversion" where the light is subsequently passed through a layer of phosphors or other luminophoric (i.e., light emitting) material and converted to light having a longer wavelength (Redwing Decl. ¶ 12), but nevertheless testifies that no person of ordinary skill in the art would have used a "down-conversion" process to create white light (*id.* ¶ 15) because: (1) such "down-conversion" process causes energy loss and therefore loss of luminous intensity whereas the production of white light requires a significant amount of power and brightness (*id.* ¶ 16), (2) the blue or violet LEDs in existence *prior* to the 1994–1996 timeframe had very low optical power, and given these disadvantages, and (3) an artisan of ordinary skill would have been dissuaded from considering "down-conversion" and would instead utilize the direct emission RGB "triplet" approach to produce white light (*id.* ¶¶ 16–18).

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[13] Dr. Redwing is the Professor of Materials Science and Engineering, Chemical Engineering & Electrical Engineering, as well as the chair of the Intercollege Graduate Degree Program in Materials Science and Engineering at Pennsylvania State University, an expert in the field of LEDs and GaN-based semiconductor devices with over 240 peer-reviewed articles. *See* Redwing Decl. ¶¶ 4–5, 7. Dr. Redwing is also well qualified to testify regarding the technology in this re-examination proceeding.

Similarly, Dr. Christian Wetzel[14] also testifies: (1) the generally accepted means of obtaining white light was to combine red, green, and blue LEDs (i.e., RGB "triplet" approach) (Wetzel Decl. ¶ 17), and (2) an artisan of ordinary skill would have pursued the use of RGB "triplet" approach to generate white light, and would have been dissuaded from pursuing phosphors "down-conversion" of LED light to white because phosphors were more expensive than other semiconductor materials (*id.* ¶¶ 18–20).

Based on the testimony of three renowned experts in the field of LEDs, each of whom was a person having ordinary skill in the art at the time of the invention and each of whom testified that Appellant's invention, i.e., the use of a blue LED and "down-conversion" to create white light was not obvious and an artisan of ordinary skill would have pursued a direct-emission RGB "triplet" approach using red, green, and blue LEDs, instead of pursuing "down-conversion" with a luminophoric medium, Appellant argues there is no reason to use a blue LED to create white light via down conversion. App. Br. 12–14; Reply Br. 1–5. According to Appellant, the expert testimony is corroborated with contemporaneous documents, including:

(1) Dr. Nakamura[15]—a highly renowned figure in the LED field and a person of extraordinary skill in the art at the

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[14] Dr. Wetzel is the Wellfleet Career Development Constellation Professor, Future Chips at Rensselaer Polytechnic Institute, an expert in the field of LEDs and GaN-based LEDs with over 150 peer-reviewed articles. *See* Wetzel Decl. ¶¶ 5, 7. Dr. Wetzel is also well qualified to testify regarding the technology in this re-examination proceeding.

[15] Dr. Shuji Nakamura "is famous for his work with bright blue LEDs and is a named inventor on two of the references relied on in the Final Office Action: U.S. Patent No. 5,578,839 to Nakamura *et al.* ('Nakamura') and

> time of the invention—characterized the "down-conversion" approach as "impossible" in his book, THE BLUE LASER DIODE: THE COMPLETE STORY 230 (2000) (Exhibit 11 – Attachment D);
>
> (2) Nichia's Executive Vice President, Mr. Tazaki, praised the Appellant's invention as "pioneering." *See* LEDs Magazine, Industry News, Feb. 2005 (Exhibit 2); and
>
> (3) Alfred Vollmer, writing for Nikkei Electronics Asia in 1997, summarized the situation as: "*Single white light-emitting diodes (LEDs) were not feasible* to date as LEDs emit monochromatic light only. *The mixture of colors making up white light was up to now only possible by combining three different diodes*" (Exhibit 9) (emphasis added).

App. Br. 4–10; Reply Br. 3–4.

We do not find Appellant's arguments and proffered evidence persuasive to show reversible error on the part of the Examiner. *In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011) (explaining that even if the examiner had failed to make a prima facie case, the Board would not have erred in framing the issue as one of reversible error because it has long been the Board's practice to require an appellant to identify the alleged error in the examiner's rejections). Rather, we find the Examiner has provided a comprehensive response, supported by a preponderance of evidence, to each of the contentions raised by Appellant and, as such, adopt as our own the

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Japan Patent Application Publication H05-152609 to Tadatsu *et al.* ('Tadatsu')." App. Br. 4 n.3. Dr. Nakamura is one of the three recipients of the 2014 Nobel Prize for Physics "for the invention of efficient blue light emitting diodes, which has enabled bright and energy-saving white light sources." Nobel Prize winners at http://www.nobelprize.org/nobel_prizes/physics/laureates/2014/nakamura-facts.html (last visited Nov. 19, 2014).

Examiner's findings and reasons well-stated in the Examiner Answer at pages 43–134.

Nevertheless, we note Appellant's arguments are predicated upon: (1) multiple attacks of Stevenson, Pinnow, and Nakamura individually, (2) mischaracterization of the Examiner's reliance on these references, and (3) improper bodily incorporation of Pinnow into Stevenson. App. Br. 1–41. For example, Stevenson is not relied upon for disclosing a blue LED (Nakamura is). Ans. 6–13, 67. Nor is Stevenson relied upon for an express disclosure of the creation of white light. *Id.* at 15, 82–85. Likewise, Pinnow, not Stevenson, is relied upon for teaching phosphors dispersed in a polymer. *Id.* at 87–89. Instead, Stevenson is merely relied upon for the general teaching of a two-lead, GaN-based LED on a single die. *Id.* at 6–13. Similarly, Pinnow is not relied upon for disclosing the use of a blue argon gas laser as a light source; rather, a "down-conversion" approach to create white light. *Id.* at 17–19, 24–25, 31–33. And, Pinnow, not Nakamura, is relied upon for utilizing a "down-conversion" approach to create white light. *Id.* at 26–28, 33–34. As such, Appellant's arguments regarding: (1) why Stevenson's LED—a very low power, MIS type device—was unsuitable for the creation of white light, (2) why Pinnow's high power laser was incompatible with LEDs, and (3) Stevenson and Pinnow, if combined, do not yield white light, are misplaced and unpersuasive. App. Br. 29–35.

One cannot show nonobviousness by attacking references individually when the rejection is based on a combination of references. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Each reference cited by the Examiner must be read, not in isolation, but for what it fairly teaches in combination

with the prior art as a whole. *See In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). Nor can nonobviousness be demonstrated by physically combining the references. *In re Sneed*, 710 F.2d 1544, 1550 (Fed. Cir. 1983); *see also In re Nievelt*, 482 F.2d 965, 968 (CCPA 1973) ("Combining the *teachings* of references does not involve an ability to combine their specific structures."). All the features of the secondary reference need not be bodily incorporated into the primary reference, *see Keller*, 642 F.2d at 425, and one having ordinary skill in the art is not compelled to blindly follow the teaching of one prior art reference over the other without the exercise of independent judgment, *see Lear Siegler, Inc. v. Aeroquip Corp.*, 733 F.2d 881, 889 (Fed. Cir. 1984). *See also KSR*, 550 U.S. at 421 ("A person of ordinary skill is also a person of ordinary creativity, not an automaton."). "The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference . . . . Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." *Keller*, 642 F.2d at 425.

Contrary to Appellant's arguments, we agree with the Examiner: (1) Stevenson and Nakamura teach a two-lead, GaN-based blue LED on a single die, (2) Stevenson and Pinnow teach a "down-conversion" via phosphors from LED light, including phosphors dispersed in a polymer located "about" the LED (Ans. 117–121) and, given the presumed knowledge by an artisan of ordinary skill regarding the relevant prior art at the time of Appellant's invention, (3) the combined teachings of Stevenson, Pinnow, and Nakamura would have suggested to an artisan of ordinary skill to use a blue LED on a

single die to create white light via "down-conversion" because Nakamura's blue LED is more powerful than Stevenson's older, less-efficient LED in terms of power and brightness and, as such, is more suitable with a "down-conversion" process to produce white light. Ans. 16–17, 110.

We also do not find Appellant's expert testimony from Dr. Stringfellow (Exhibits 5–6), Dr. Redwing (Exhibit 11), and Dr. Wetzel (Exhibit 12) probative as to the dispositive question of whether an artisan of ordinary skill would have considered "down-conversion" of a blue LED to create white light, not before but after the emergence of high brightness and efficient blue LEDs developed by Dr. Shuji Nakamura in late 1993. Rather, we find the Examiner has provided a comprehensive response, supported by a preponderance of evidence, to each of the contentions raised by Appellant and, as such, adopt as our own the Examiner's findings, considerations of Appellant's expert testimonies and reasons well-stated in the Examiner Answer at pages 43–134.

At the outset, we agree with Appellant that the dispositive issue presented in this appeal is simple and straightforward: was it obvious at the time of the invention to use an LED, in particular a blue LED, to create white light via down-conversion as recited in the claims? Reply Br. 21.

The answer to that question need not require (1) hundreds of pages of briefing, expert testimony from Dr. Stringfellow, Dr. Redwing, and Dr. Wetzel, and corroborating evidence, and (2) in response, a 192-page, single-space Examiner's Answer. Rather, the answer to that question is a simple resounding "yes" particularly, in light of high-power, high-brightness blue LEDs developed by Dr. Shuji Nakamura in late 1993, a major breakthrough

in light technology for which he was awarded the 2014 Nobel Prize for Physics."[16]

In our view, Appellant's invention is nothing more than a new application of a high-power, high-brightness blue LED developed by Dr. Nakamura in late 1993 on a single die, and that application is predictable according to the blue LED's inherent functions, particularly, in view of: (1) the state of the art in LEDs, (2) the market demand for white light and design trends to create white light, (3) a finite number of identified, predictable solutions available to convert light from LEDs into white light (i.e., direct-emission "triplet" approach vs. "down-conversion" approach), (4) advantages and/or disadvantages of utilizing (i) the direct-emission "triplet" approach and (ii) the "down-conversion" approach to create white light, and (5) the sensibility of picking and choosing the "down-conversion" approach over the direct-emission "triplet" approach because light emitted from a single-die blue LED could now be down-converted directly into white light without the need of multiple "RGB" LEDs positioned on the same single die, via direct emission "triplet" approach.

Appellant's experts, Drs. Stringfellow, Redwing, and Wetzel, acknowledge: (1) Stevenson's seminal work on a violet/blue LED in early 1974, and (2) at the time of Appellant's invention in early 1996, there were two known approaches to produce white light from LEDs. One was a direct-emission "triplet" approach in which individual LEDs that emit three primary colors—red, green, and blue (RGB)—are packaged together and

[16] *See* Nobel Prize winners at http://www.nobelprize.org/nobel_prizes/physics/laureates/2014/nakamura-facts.html (last visited Nov. 19, 2014).

then all the primary (RGB) colors are mixed together to form white light. The other was a "down-conversion" approach in which a phosphor material is used to convert monochromatic light from a blue or ultraviolet (UV) LED to create white light, much in the same way a fluorescent light bulb works. *See* Stringfellow Decl. ¶¶ 24–26; Redwing Decl. ¶¶ 12, 16–18; Wetzel Decl. ¶¶ 17–20. We find ample evidence of record supports the Examiner's showing that "it is well within the level of skill of the [artisan of ordinary skill at the time of Appellant's invention] to select a mixture of phosphors (i.e., luminescent materials) to produce white light" upon excitation primary radiation sources emitting blue or UV light, including, for example: (1) Pinnow, col. 1, ll. 51–56; col. 6, ll. 28–30; (2) Appellant's Admitted Prior Art (APA), col. 3, l. 40 – col. 4, l. 42; (3) Tabuchi, pages 3–5; (4) Menda ¶¶ 21–23, and Fig. 4; (5) Abe, col. 2, ll. 20–36; and (6) Appellant's own admitted prior art (APA), '175 patent, col. 10, ll. 41–65. Ans. 44–50, 97–108.

Dr. Redwing and Dr. Wetzel further testify the main reason the "down-conversion" process was not used in connection with the then existing LEDs ***prior*** to the 1994–1996 timeframe was because: (1) such a "down-conversion" process requires a significant amount of power and brightness to create white light, and LEDs available during that timeframe did not have enough power and brightness level, and (2) phosphors were more expensive than other semiconductor materials. *See* Redwing Decl. ¶¶ 16–18 and Wetzel Decl. ¶¶ 18–20 (emphasis added). According to Dr. Redwing and Dr. Wetzel, because of these disadvantages, an artisan of ordinary skill would have been dissuaded from considering "down-

conversion" and would instead utilize the direct emission RGB "triplet" approach to produce white light. Redwing Decl. ¶¶ 16–18.

*Probative Value of Expert Testimony & Corroborating Evidence*

All Appellant's expert testimonies from Drs. Stringfellow, Redwing, and Wetzel are compelling and are considered persuasive relative to: (1) the general state of the art in LEDs, (2) the two primary approaches to produce white light from LEDs available at the time of the invention in early 1996, and (3) the question of whether an artisan of ordinary skill would have been dissuaded from considering "down-conversion" and would instead utilize the direct emission RGB "triplet" approach to produce white light. However, Appellant's expert testimonies do not account for: (1) the design need or market pressure for white light LEDs with sufficient power and brightness, (2) the finite number of solutions to create white light based on LEDs, (3) the level of skill by an artisan of ordinary skill, and (4) the emergence of high-power, high brightness blue LEDs by Dr. Shuji Nakamura in late 1993 and the impact of those bright blue LEDs in creating white light sources.

> When there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense.

*KSR*, 550 U.S. at 402–03.

An artisan of ordinary skill (i.e., a person having ordinary skill in the art) is a hypothetical person who is presumed to know all the relevant prior

art at the time of Appellant's invention (in 1996), including, for example: (1) Stevenson's seminal work on a violet/blue LED, (2) two known approaches to create white light based on LED, and (3) Nakamura's high-power, high-brightness blue LEDs in 1993 using gallium nitride revolutionized LED lighting, making high-power light sources practical. *In re GPAC*, 57 F.3d at 1579. Those persons "must be [also] presumed to know something" about the art "apart from what the references disclose." *In re Jacoby*, 309 F.2d 513, 516 (CCPA 1962). Thus, that person is presumed to have the technical competence and experience of skilled artisans working in the area of the subject invention and of the manner in which problems were solved, including sufficient skill to experiment with known approaches to create white light and decide on the best approach in view of the then newly developed high-power, high-brightness blue LEDs by Dr. Nakamura at the time of Appellant's invention, i.e., '175 patent. Ans. 122–129. Once the high-power, high-brightness blue LEDs developed by Dr. Nakamura became available in late 1993 (two years before Appellant's invention), the disadvantages of the "down-conversion" process using phosphors dissipated and such a process became available as a preferred solution to high-power, high-brightness blue LEDs to create white light.

We have reviewed all Appellant's expert testimonies from Drs. Stringfellow, Redwing, and Wetzel. However, we do not consider these testimonies to be probative as to the question of whether an artisan of ordinary skill would have considered "down-conversion" of a blue LED to create white light, especially after the high brightness and high efficient blue LEDs developed by Dr. Nakamura became available in late 1993. Likewise,

we are not persuaded by corroborating evidence, including: (1) Dr. Shuji Nakamura's Chapter 10.4 of his book, THE BLUE LASER DIODE: THE COMPLETE STORY (2000) in which Appellant has characterized as an acknowledgement the "down-conversion" approach was "impossible" until recently (Exhibit 11 – Attachment D); (2) Nichia's Executive Vice President, Mr. Tazaki, praised Appellant's invention as "pioneering" (*see* LEDS MAGAZINE, INDUSTRY NEWS, Feb. 2005 (Exhibit 2)); and (3) Alfred Vollmer, writing for Nikkei Electronics Asia in 1997, summarized the situation as: "*Single white light-emitting diodes (LEDs) were not feasible* to date as LEDs emit monochromatic light only. *The mixture of colors making up white light was up to now only possible by combining three different diodes*" (Exhibit 9) (emphasis added).

Contrary to Appellant's characterizations, Chapter 10.4 of Dr. Nakamura's book describes the opposite: "it has been impossible to obtain white LEDs until recently due to the lack of highly efficient blue and green LEDs." THE BLUE LASER DIODE: THE COMPLETE STORY 230 (2000). The same chapter also discusses the two approaches to create white light: (1) direct-emission "triplet" approach in which individual LEDs that emit three primary colors—red, green, and blue (RGB)—are packaged together and then all the primary (RGB) colors are mixed together to form white light; and (2) "down-conversion" approach in which a phosphor material is used to convert light from a blue LED to create white light. In fact, Dr. Nakamura concludes the "triplet" approach as more expensive because "RGB" LEDs are required instead of single-color LEDs. As a result, Nakamura suggests fabricating white LEDs using blue LEDs in combination

with "down-conversion" phosphors, *so that only one blue LED chip is required*. (Exhibit 9).

If anything, Dr. Nakamura actually suggests that fabricating white LEDs using blue LEDs in combination with "down-conversion" phosphors, shown, for example, in Fig 10.14 of Dr. Nakamura's book, would have been expected from those skilled in the art as a predictable use of a blue LED chip.[17] Fig. 10.14 of Dr. Nakamura's book is reproduced below:

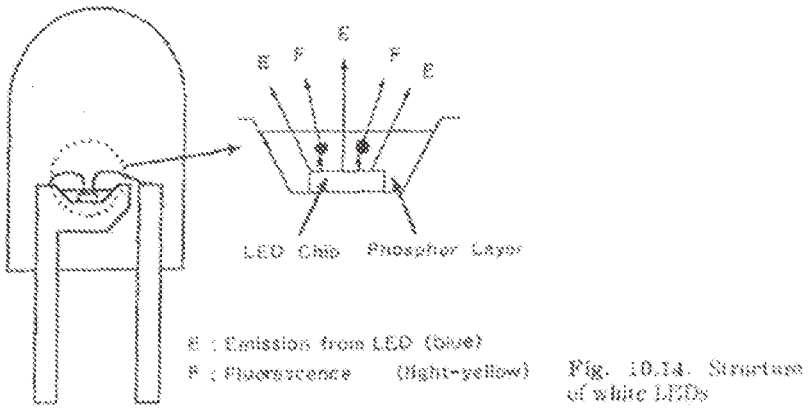


Fig. 10.14 of Nakamura's book shows an example structure of a white LED including a blue LED chip and a down-converting luminophoric medium, i.e., a phosphor layer on top of the blue LED chip to create white light.

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[17] Dr. Nakamura's book, THE BLUE LASER DIODE: THE COMPLETE STORY, does not appear to be prior art against Appellant's invention because its 2nd edition is published after the filing date of March 26, 1996 of the '175 patent. The 1st edition was not published until at least 1997 and, likewise, does not appear to be prior art against Appellant's invention either. http://link.springer.com/book/10.1007%2F978-3-662-03462-0 (last visited Nov. 19, 2014). As such, Chapter 10.4 of Dr. Nakamura's book cannot be used as § 102 prior art against Appellant's independent claims 118 and 134. Nevertheless, because Chapter 10.4 is cited and relied upon by Appellant to show nonobviousness (App. Br. 26–27, 33–34; Reply Br. 14–16), the same information can also be relied upon to show how such white light creation is a predictable use of Nakamura's blue LED chip if down-converted via phosphors consistent with the knowledge and level of those skilled in the art.

Likewise, the Alfred Vollmer article reinforces the teachings of Chapter 10.4 of Dr. Nakamura's book that scientists at the Fraunhofer Institute for Applied Solid State Physics of Freiburg, Germany, developed white LEDs based on Dr. Nakamura's blue LEDs. (Exhibit 9).

Similarly, the praise from Nichia's Executive Vice President, Mr. Tazaki, describing Appellant's invention as "pioneering" is misleading. That article refers to a patent cross-license agreement between Cree and Nichia designed to prevent future litigation and to allow Cree access to Nichia's patents relating to LED technology for solid-state white lighting (Exhibit 2). The word "pioneering" was not specifically used to describe Appellant's invention, but was used in reference to a larger patent portfolio.

*Reason to Combine*

We recognize that the Examiner must articulate some "reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir 2006). The reasoning is important "because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." *KSR*, 550 U.S. at 418–19. However, the Examiner's reasoning need not appear in, or be suggested by, one or more of the references on which the Examiner relies upon. Instead, a reason to combine teachings from the prior art "may be found in explicit or implicit teachings within the references themselves, from the ordinary knowledge of those skilled in the art, or from the nature of the

problem to be solved." *WMS Gaming Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1355 (Fed. Cir. 1999) (citing *In re Rouffet*, 149 F.3d 1350, 1357 (Fed. Cir. 1998)). "Under the correct [obviousness] analysis, any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed." *KSR*, 550 U.S. at 420.

Here, the Examiner has provided a reason showing motivation by a person of ordinary skill in the art to achieve the claimed subject matter, i.e., the advantage using Nakamura's GaN-based blue LED in place of Stevenson's GaN-based LED on a single die in combination of "down-conversion" phosphors to create white light. *See* Ans. 43–50, 110. Appellant has not demonstrated why that reason is erroneous or why a person of ordinary skill in the art *would not* have reached the conclusions reached by the Examiner. *See DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1368 (Fed. Cir. 2006) ("[T]he proper question is whether the ordinary artisan possesses knowledge and skills rendering him *capable* of combining the prior art references."). Consequently, we are not persuaded by Appellant's arguments that the Examiner failed to articulate a rationale for combining Stevenson, Pinnow, and Nakamura.

*Impermissible Hindsight*

We are also not persuaded by Appellant's arguments that the Examiner has engaged in an impermissible hindsight to combine the teachings of Stevenson, Pinnow, and Nakamura to use a blue LED to create

white light via down conversion. App. Br. 12–14; Reply Br. 1–5. We are cognizant that our reviewing courts have not established a bright-line test for hindsight. The U.S. Supreme Court guides that "[a] factfinder should be aware, of course, of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning." *KSR*, 550 U.S. at 421 (citing *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 36 (1966)). Nevertheless, the Court has also qualified the issue of hindsight by stating "[r]igid preventative rules that deny factfinders recourse to common sense, however, are neither necessary under our case law nor consistent with it." *KSR*, 550 U.S. at 421.

In this appeal, we see the hindsight question before us as a *balancing test*, i.e., whether: (1) the Examiner's proffered combination of references is merely "the predictable use of prior art elements according to their established functions" (*KSR*, 550 U.S. at 417), consistent with common sense; or, (2) an artisan would not have reasonably combined the cited references in the manner proffered by the Examiner *but for* having the benefit of the claim to use as a guide (i.e., impermissible hindsight).

After reviewing the respective teachings and suggestions of the cited references, we find weight of the evidence shows the proffered combination is merely a predictable use of prior art elements according to their established functions. Therefore, on this record, we are not persuaded the Examiner engaged in impermissible hindsight, as Appellant contends. App. Br. 12–14; Reply Br. 1–5. Moreover, Appellant has not demonstrated the Examiner's proffered combination of references would have been "uniquely challenging or difficult for one of ordinary skill in the art." *See Leapfrog*

*Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007) (citing *KSR*, 550 U.S. at 418).

*Evidence of Nonobviousness Based on Secondary Considerations*

Factual inquiries for an obviousness determination include secondary considerations based on evaluation and crediting of objective evidence of nonobviousness. *Graham*, 383 U.S. at 17. Notwithstanding what the teachings of the prior art would have suggested to one with ordinary skill in the art at the time of Appellant's invention, the totality of the evidence submitted, including objective evidence of nonobviousness, may lead to a conclusion that the challenged claims would not have been obvious to one with ordinary skill in the art. *In re Piasecki*, 745 F.2d 1468, 1471–72 (Fed. Cir. 1984). Secondary considerations may include any of the following: long-felt but unsolved needs, failure of others, unexpected results, commercial success, copying, licensing, and praise. *See Graham*, 383 U.S. at 17; *Leapfrog Enters.*, 485 F.3d at 1162.

Evidence of nonobviousness must be commensurate in scope with the claimed invention. *In re Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011) (citing *In re Tiffin*, 448 F.2d 791, 792 (CCPA 1971)); *In re Hiniker Co.*, 150 F.3d 1362, 1369 (Fed. Cir. 1998). In that regard, in order to be accorded substantial weight, there must be a nexus between the merits of the claimed invention and the evidence of secondary considerations. *In re GPAC Inc.*, 57 F.3d at 1580. "Nexus" is a legally and factually sufficient connection between the objective evidence and the claimed invention, such that the objective evidence should be considered in determining nonobviousness.

*Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988). The burden of showing that there is a nexus lies with Appellant. *Id.*; *see also In re Paulsen*, 30 F.3d 1475, 1482 (Fed. Cir. 1994).

Appellant argues that there is substantial evidence of nonobviousness based on secondary considerations. In support of these arguments, Appellant relies on three Declarations under 37 C.F.R. § 1.132 from Dr. George Brandes (Exhibits 2–4), a Director of IP Strategy and Business Development at Cree, Inc., to provide testimony of non-obviousness, including: (1) evidence of long felt but unsolved need, (2) unexpected results, (3) scientific recognition and industry acknowledgement, (4) licensing, and (5) commercial success of Appellant's invention also allegedly corroborated with documentary evidence. Again, we are not persuaded, and adopt as our own the Examiner's findings and reasons well-stated in the Examiner Answer at pages 173–191. Nevertheless, for purposes of completeness, the evidence pertaining to each secondary consideration is discussed separately below.

*(1) Long-Felt but Unsolved Need*

Establishing long-felt need requires objective evidence that an art recognized problem existed in the art for a long period of time without solution. In particular, the evidence must show that the need was a persistent one that was recognized by those of ordinary skill in the art. *In re Gershon*, 372 F.2d 535, 539 (CCPA 1967).

Appellant argues the Specification of the '175 patent describes the need for a white light single-die LED that would be useful for application,

and that the white light single-die LED problem eluded solution for a number of years. App. Br. 54 (citing '175 patent at col. 1, l. 11–col. 5, l. 59). In addition, Appellant argues: (1) Stevenson, which issued June 25, 1974, attests to the long-standing character of this long felt but unsolved need, and (2) the 1997 information release of Fraunhofer Institute, Freiberg, Germany, which states that "three years ago [i.e., in 1994] . . . the emission of white light by a single chip LED was still impossible" (Exhibit 5, 16 (citing Attachment N)) and such "information release evidences a time span of 20 years over which 'the emission of white light by a single chip LED was still impossible,[']  []until solved by the present inventors in making the invention disclosed." App. Br. 54–55. Appellant also argues a single die LED white light device remained an elusive goal for many years since the only LED approach was considered viable for white light production was the combination of three LEDs, each of a different primary color (red, blue, green, respectively)—so-called LED "triplets." *Id.* (citing '175 patent, col. 3, ll. 17–28).

We find Appellant's arguments misleading, however. First, nowhere in the '175 patent or Stevenson is there a description of this long felt but unsolved need as Appellant argues. As correctly recognized by the Examiner,

> Stevenson . . . successfully solved the problem in exactly the same manner as claimed: using a luminophor (phosphor) to convert blue-to-UV light from a GaN-based LED to visible light, including white light. That is all that is claimed, and it was successfully done by others (Stevenson . . .) 20 years before the time of the '175 patent. Thus, there is no unsolved need. Instead, that which Appellant and its declarants make clear is that there was a long felt need for a white LED device

> that was **bright** enough to be **commercially viable.** The key to the brightness issue was the invention of a LED emitting sufficiently bright light in the UV-to-blue, or to green, range of the spectrum, and that was done by others, e.g. Nakamura, not by the inventors of the '175 patent. . . .
>
> To the extent that the '175 patent may disclose information directed to making the white LEDs bright enough to be of practical value in commercial applications such as backlights for LEDs (Brief, p. 54), none of this is claimed in the claims at issue in this reexamination, so the point is moot.

Ans. 173 (emphasis added).

Second, the Fraunhofer press release is an advertisement that does not identify any problem existing in the art for a long period of time without solution. *Id.* at 174. Third, and contrary to Appellant's arguments, the direct emission "triplet" approach was not the only approach considered viable for white light production. As testified by Drs. Stringfellow, Redwing, and Wetzel, the "down-conversion" approach was also available for white light production but was not used because LEDs available before the 1994–1996 timeframe did not have enough power and/or brightness level to be practical. *See* Stringfellow Decl. ¶¶ 24–26; Redwing Decl. ¶¶ 12, 16–18; Wetzel Decl. ¶¶ 17–20. Thus, we do not find Appellant's arguments and proffered evidence to be persuasive.

*(2) Unexpected Results*

"[U]nexpected results [relied upon to rebut a prima facie case of obviousness] . . . must be shown to be unexpected compared with the closest prior art." *In re Baxter Travenol Labs*, 952 F.2d 388, 392 (Fed. Cir. 1991)

(citation omitted). Such evidence must be commensurate in scope with the degree of patent protection desired. *In re Grasselli*, 713 F.2d 731, 743 (Fed. Cir. 1983). In addition, the difference in results relied upon to establish nonobviousness must be shown to be truly unexpected by one of ordinary skill in the art. *Pfizer Inc. v. Apotex Inc.*, 480 F.3d 1348, 1371 (Fed. Cir. 2007). Thus, it is not enough to merely show that there is a difference—even a significant difference. Rather, the difference in results must be shown to be unexpected by one of ordinary skill in the art. *In re Harris*, 409 F.3d 1339, 1344 (Fed. Cir. 2005).

In this case, Appellant has not performed any comparison relative to the closest prior art. Nor has Appellant directed us to any evidence indicating that an artisan of ordinary skill would have considered the difference in results to be truly unexpected. Instead, Appellant simply advances two arguments: (1) the invention of a single die white light LED embodied an unexpected result, and (2) the invention was surprisingly found to provide white light LED devices that are in fact capable of producing white light of sufficient uniformity and intensity for general applications. App. Br. 55–56.

While attorney arguments are helpful when directing us to evidence in the record, the arguments themselves do not constitute evidence. Here, Appellant's arguments are speculative and unsupported by objective evidence. Ans. 176. Argument of counsel cannot take the place of evidence lacking in the record. *Meitzner v. Mindick*, 549 F.2d 775, 782 (CCPA 1977); *see also In re Pearson*, 494 F.2d 1399, 1405 (CCPA 1974). As such, these arguments are entitled to little probative value. *In re Geisler*, 116 F.3d

1465, 1470 (Fed. Cir. 1997); *In re De Blauwe*, 736 F.2d 699, 705 (Fed. Cir. 1984). Thus, we find Appellant's arguments and proffered evidence unpersuasive.

*(3) Scientific Recognition and Industry Acknowledgement*

Appellant argues because failure of the art to achieve white light emission from a single LED, and failure of the art to achieve commercially viable organic light emitting devices, Appellant's invention is a remarkable breakthrough in the form of a single LED device for the production of white light. App. Br. 56. In addition, Appellant cites press releases from Nichia in Japan and Fraunhofer Institute in Germany, as evidence of commercial success and/or industry acknowledgement. Appellant further relies on the Declaration of Dr. Brandes (Exhibit 2) to support a claim that the '175 patent has been recognized in the optoelectronics and illumination products industry as a patent claiming a fundamental advance in the field of LED device and display technology.

We do not find Appellant's arguments and proffered evidence persuasive and, as such, adopt the Examiner's response outlined in Examiner's Answer. Ans. 176–178. In particular, Fraunhofer's 1997 release states, *inter alia*:

> This problem was solved by a research team at the Fraunhofer- Institut für Angewandte Festkörperphysik IAF in Freiburg (Germany) and, at the same time, by their colleagues at Nichia Chemical Industries in Japan. Their innovative idea was to generate white light by luminescence conversion. They combined a blue emitting GaN LED with an organic dye or an inorganic phosphor, emitting at longer wavelengths, to synthesise white light by additive colour mixing. Peter

> Schlotter, a member of the IAF research team, points out a further advantage of the new luminescence conversion LEDs (LUCOLEDs): "LUCOLEDs allow to extend the range of colours emitted by LEDs to whatever colour is required, depending on which conversion dyes or phosphors are used. Even purple light, which is impossible to be generated by conventional LEDs, can be emitted by LUCOLEDs." For the invention of the single chip white emitting LED the research team at the IAF was awarded the 1997 Fraunhofer Prize.
>
> This simple but innovative and low cost process, developed in close cooperation with Siemens AG, will enable mass production of white emitting LEDs. Siemens plans to start up production of white light single chip LEDs in 1998.

App. Br. 57–58 (citing Fraunhofer-Gesellschaft: Research News Special 1997) (Exhibit 5) (emphasis added).

As correctly recognized by the Examiner, these praises and acknowledgements are directed to the invention of others, i.e., Nichia and Siemens AG, and not Appellant's invention. Ans. 176. To the extent Appellant intends to argue these belated praises and press releases are directed to Appellant's invention filed in the PTO two (2) years earlier, we see these press releases and praises as strong evidence of obviousness, rather than non-obviousness—in view of blue LEDs available from Dr. Nakamura—the entire industry was adopting the known "down-conversion" process via phosphors to create white light.

*(4) Licensing*

Licensing alone is insufficient for purposes of commercial success. *See EWP Corp. v. Reliance Universal, Inc.*, 755 F.2d 898 (Fed. Cir. 1985)

(evidence of licensing is a secondary consideration which must be carefully appraised as to its evidentiary value because *licensing programs may succeed for reasons unrelated to the unobviousness of the product or process*, e.g., license is mutually beneficial or less expensive than defending infringement suits) (emphasis added). When a license of a patent is presented as evidence of the success of a patent, the patentee must provide additional evidence of the importance of the claimed invention within the license. *Id.* Without a showing of nexus, "the mere existence of . . . licenses is insufficient to overcome the conclusion of obviousness" when there is a strong prima facie case. *SIBIA Neurosciences, Inc. v. Cadus Pharm. Corp.*, 225 F.3d 1349, 1358 (Fed. Cir. 2000). Moreover, evidence of license agreements can also be disregarded if the terms of the licenses or the circumstances under which they were granted are not disclosed. *See Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1324 (Fed. Cir. 2004).

Appellant relies on two (2) Declarations of Dr. George R. Brandes under 37 C.F.R. §1.132 (Brandes Decl. II—Exhibit 2) (Brandes Decl. IV—Exhibit 4) to show the patentee, Cree's licensing and cross-licensing programs as evidence the recognition of the '175 patent by major companies in the optoelectronics and illumination products industry, e.g., Nichia Corp. (Exhibit 2B), Toyota Gosei (Exhibit 2C), Osram GrmbH (Exhibit 2D), Philips (Exhibit 2E), and the royalty-bearing license agreements involving the '175 patent with various companies, including: Aurora Energie, Horner APG, Ledzworld Technology, Vexica Technology, and Wyndsor Light (Exhibit 2A) as well as Stanley, Rohm, Kingbright Electronics Co., Ltd., and

Seoul Semiconductor, Inc. App. Br. 58–60 (citing Brandes Decl. II—Exhibits 2A–E).

However, we note Exhibits 2A–2E are nothing more than press releases and media reports regarding the licensing and cross-licensing between the patentee, Cree and these companies to allow access to each other's patented LED chip and packaged LED technology, including white LED technology without fear of future litigation. Appellants do not show these licensing programs are directed to the subject matter of the '175 patent. In fact, none of these license agreements makes any specific reference to the '175 patent, except for the license issued to Cotco Holdings requiring the mark "Powered by Cree®, U.S. Patent No. 6,600,175" on products produced pursuant to the license. Brandes Decl. IV ¶ 7. Nevertheless, Dr. Brandes testifies that confidential provisions prevent disclosure of particular provisions of these license agreements. *Id.* ¶¶ 7–8.

In the absence of the specific terms of these licenses or the circumstances under which they were granted, we do not see how these licenses are probative of non-obviousness of the '175 patent claims at issue, as correctly observed by the Examiner. Ans. 178–180. As such, we are not persuaded by Appellant's arguments regarding his licensing programs.

*(5) Commercial Success*

Appellant bears the initial burden of proving that there is a nexus between the claimed invention and the commercial success. *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1311–12 (Fed. Cir. 2006).

Appellant relies on a 3rd Declaration of Dr. George R. Brandes under 37 C.F.R. §1.132 (Brandes Decl. III – Exhibit 3) to show commercial success of the invention, via market research data of LED/white light products. App. Br. 60–61 (citing Brandes Decl. III ¶¶ 21–22). Appellant further attempts to show the nexus between the claimed invention and the commercial success, via Dr. Brandes' own characterization of "nexus." *Id.* at 62–65 (citing Brandes Decl. III ¶¶ 24–40).

However, market research data of LED/white light products is not actual sale data; rather, potential sale data. Even if market research data were sale data, such sale data is hardly indicative of the commercial success of the subject matter disclosed in the '175 patent. As correctly recognized by the Examiner, market research data or even sale data does not, in and of itself, establish a nexus between the claimed invention and commercial success. For such a nexus to exist there must be evidence that it was the claimed invention that caused the increased sale. Ans. 181. Dr. Brandes' Declaration does not show a correlation between the claimed invention and the sales numbers, much less that the licensing of the '175 patent had anything at all to do with commercial success. *Id.*

Likewise, Dr. Brandes' own characterization of "nexus" is nothing more than an allegation or a conclusory statement in the form of an affidavit and, as such, does not take the place of *factual* evidence. *See, e.g.*, *In re Lindner*, 457 F.2d 506, 508 (CCPA 1972) ("The affidavit and specification do contain allegations that synergistic results are obtained with all the claimed compositions, but those statements are not supported by any factual evidence . . . . [M]ere conclusory statements in the specification and

affidavits are entitled to little weight when the Patent Office questions the efficacy of those statements.").

We find Appellant's arguments unpersuasive and proffered evidence of commercial success not commensurate in scope with the claims. We also find the evidence is insufficient to exclude the possibility of commercial success due to other factors, and Appellant provides only market research data and does not show commercial success absent evidence as to market share. In our view, the record is completely silent on whether the commercial success was caused by the subject matter of the '175 patent as distinct from the prior art.

Because the evidence of secondary considerations in support of nonobviousness does not outweigh the strong evidence of obviousness, we sustain the Examiner's rejection of claims 118, 134, and 140 under 35 U.S.C. § 103(a) based on Stevenson, Pinnow, and Nakamura. "[E]vidence of secondary considerations does not always overcome a strong prima facie showing of obviousness." *Asyst Techs., Inc. v. Emtrak, Inc.*, 544 F.3d 1310, 1316 (Fed. Cir. 2008).

*§ 103(a) Rejection of Claims 135, 136, and 140 based on Stevenson, Pinnow, Nakamura, and Tadatsu*

Dependent claim 135 further requires the "luminophoric medium dispersed in a polymer" on the single-die GaN-based blue LED. Alternatively, dependent claim 136 requires the polymer as "contiguous to the die side surface" of the single-die GaN-based blue LED. Claim 140 further requires the single-die LED "arranged to *directly impinge* radiation on the polymer" (emphasis added).

The Examiner further relies on Tadatsu for disclosing additional features of claims 135, 136, and 140 in the context of using LEDs to create white light via "down-conversion" phosphors. Ans. 18–29 (citing Tadatsu ¶ 3 and Fig. 2).

Fig. 2 of Tadatsu is reproduced below.

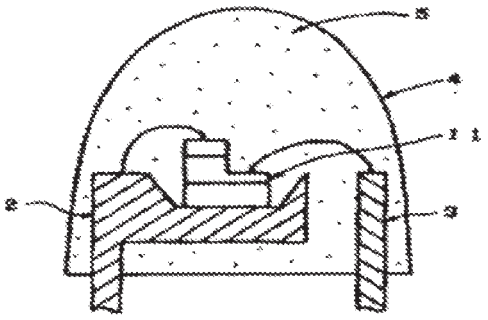

Fig. 2 of Tadatsu shows a luminophoric medium dispersed in a polymer (5) that is positioned on the single-die LED (11) and such a LED (11) is arranged to *directly impinge* radiation to the polymer (5).

Based on these factual findings, the Examiner concludes such features would have been obvious to an artisan of ordinary skill. Ans. 19–20.

Appellant argues Tadatsu only discloses a GaN-based LED that is surrounded by a resin mold that contains a fluorescent dye or pigment that absorbs short wavelength light and emits light having a longer wavelength. App. Br. 37 (citing Tadatsu ¶¶ 7–9). According to Appellant, Tadatsu is about creating a primary color blue LED from a violet LED, which is not perceived well by the human eye. *See* Redwing Decl. ¶¶ 12, 39.

However, we find Appellant's arguments are not commensurate in scope with claims 135, 136, and 140. Appellant's claimed "luminophoric medium dispersed in a polymer" encompasses the fluorescent dye or pigment included in the resin mold that is positioned directly on the single-

die LED and such a single-die LED is able to directly impinge radiation to the polymer in the manner recited in Appellant's claims 135, 136, and 140.

For the reasons set forth above, Appellant has not persuaded us of any error in the Examiner's rejection of claims 135, 136, and 140. Accordingly, we sustain the Examiner's rejection of claims 135, 136, and 140 based on Stevenson, Pinnow, Nakamura, and Tadatsu.

*§ 103(a) Rejection of Claims 138 and 140 based on Stevenson, Pinnow, Nakamura, and Tabuchi*

Dependent claim 138 further requires the polymer as "laterally spaced relationship" to the die side surface of the single-die GaN-based blue LED. Again, claim 140 further requires the single-die LED "arranged to *directly impinge* radiation on the polymer" (emphasis added).

The Examiner further relies on Tabuchi for disclosing additional features of claims 138 and 140 in the context of using LEDs to create white light via "down-conversion" phosphors. Ans. 20–22 (citing Tabuchi 3–5, and Fig. 1).

Figure 1 of Tabuchi is reproduced below with additional markings for illustration.

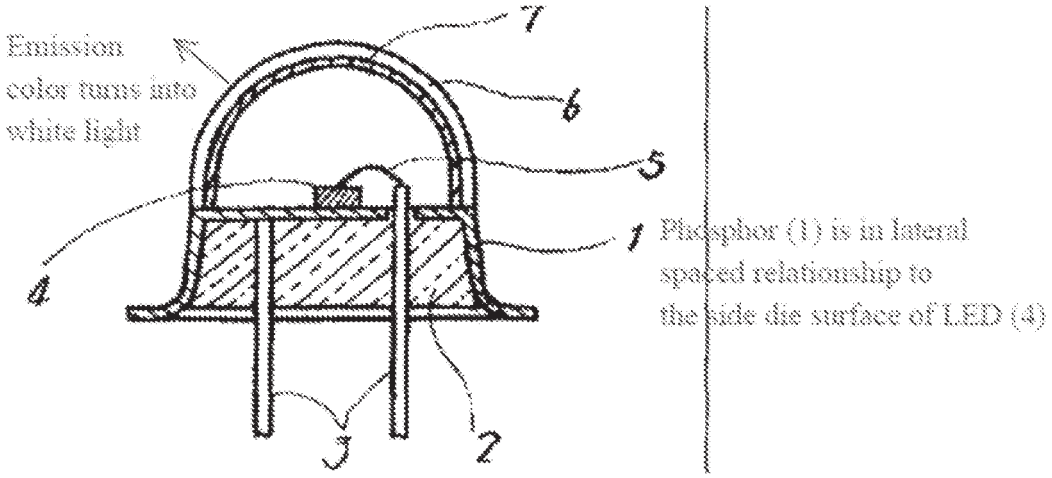


Fig. 1 of Tabuchi shows a luminophoric medium dispersed in a polymer (1) that is positioned in a lateral spaced relationship to side die surface of a single-die LED (4) and such a LED (11) is arranged to *directly impinge* radiation to the polymer (5).

Based on these factual findings, the Examiner concludes such features would have been obvious to an artisan of ordinary skill. Ans. 21–22.

Appellant argues Tabuchi only teaches a phosphor layer that coats the inside surface of the cover and converts UV light emitted to visible light. App. Br. 38 (citing Tabuchi ¶ 2). However, we disagree and adopt the Examiner's finding and response well-stated on pages 139–143 of Examiner's Answer. For the reasons set forth therein, we sustain the Examiner's rejection of claims 138 and 140 based on Stevenson, Pinnow, Nakamura, and Tabuchi.

*§ 103(a) Rejection of Claims 118 and 134 based on Stevenson, APA, Wanmaker, Nakamura, Tabuchi, and Martic*

Claims 118 and 134, as discussed above, are directed to light emission devices that include a blue light-emitting diode in combination with a down-converting luminophoric medium to produce a white light.

Appellant reiterates the same arguments presented against claims 118 and 134 based on deficiencies of Stevenson. App. Br. 38–41. In addition, Appellant argues impermissible hindsight based on the large number of references cited. *Id.* at 41.

We remain unpersuaded. As correctly noted by the Examiner, reliance on a large number of references in a rejection does not, without more, weigh against the obviousness of the claimed invention. *In re Gorman*, 933 F.2d 982, (Fed. Cir. 1991). Moreover, APA is simply cited as an alternative to the teachings of Pinnow, i.e., the same "down-conversion" process via phosphors. Ans. 44–46.

As such, and for the same reasons discussed in connection with the combination of Stevenson, Pinnow, and Nakamura, we also sustain the Examiner's rejection of claims 118 and 134.

## CONCLUSION

On the record before us, we determine that Appellant has failed to demonstrate any error in the Examiner's determination that an artisan of ordinary skill would have found it obvious to use a blue LED to create white light via down-conversion, and that the relied upon rebuttal evidence is insufficient to outweigh the evidence in support of obviousness. Accordingly, we conclude that the Examiner has not erred in rejecting: (1) claims 118, 134, and 140 under 35 U.S.C. § 103(a) as being unpatentable

over Stevenson, Pinnow, and Nakamura; (2) claims 135, 136, and 140 under 35 U.S.C. § 103(a) as being unpatentable over Stevenson, Pinnow, Nakamura, and Tadatsu; (3) claims 138 and 140 under 35 U.S.C. § 103(a) as being unpatentable over Stevenson, Pinnow, Nakamura, and Tabuchi; (4) claims 118 and 134 under 35 U.S.C. § 103(a) as being unpatentable over Stevenson, APA, Wanmaker, Nakamura, Tabuchi, and Martic.

## DECISION

As such, we AFFIRM the Examiner's final rejection of claims 118, 134–136, 138, and 140. Because we have affirmed at least one ground of rejection with respect to each claim on appeal, the Examiner's decision is affirmed. *See* 37 C.F.R. § 41.50(a)(1).

Our affirmance is dispositive as to claims 118, 134–136, 138, and 140. It is not necessary, therefore, to address the other, cumulative grounds of rejection entered by the Examiner, including: (1) whether claims 118, 134, 138, and 140 are patentable under 35 U.S.C. § 103(a) over Tabuchi, APA, Wanmaker, Nakamura, and Martic; (2) whether claims 118, 134, 138, and 140 are patentable under 35 U.S.C. § 103(a) over Tabuchi, Pinnow, and Nakamura; and (3) whether claims 135 and 136 are patentable under 35 U.S.C. § 103(a) over Tabuchi, Pinnow, Nakamura, and Tadatsu. *See In re Hyon*, 679 F.3d 1363, 1367 (Fed. Cir. 2012) (noting that affirmance of rejection of all claims under § 103(a) made it unnecessary to reach other grounds of rejection); *Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (holding that by deciding a single dispositive issue, the ITC was not required to review other matters decided by the presiding officer).

Requests for extensions of time in this *ex parte* reexamination proceeding are governed by 37 C.F.R. § 1.550(c). *See* 37 C.F.R. § 41.50(f).

AFFIRMED

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