

NOTE: This disposition is nonprecedential.

**United States Court of Appeals  
for the Federal Circuit**

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**THE REGENTS OF THE UNIVERSITY OF  
CALIFORNIA,**  
*Appellant*

v.

**SATCO PRODUCTS, INC.,**  
*Appellee*

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2023-1356

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Appeal from the United States Patent and Trademark  
Office, Patent Trial and Appeal Board in No. IPR2021-  
00662.

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Decided: December 4, 2024

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Before DYK and STOLL, *Circuit Judges*, and MURPHY,  
*District Judge*.<sup>1</sup>

STOLL, *Circuit Judge*.

Appellee Satco Products, Inc. (“Satco”) successfully petitioned for inter partes review (IPR) of claims 1 and 2 of U.S. Patent No. 10,644,213, owned by Appellant Regents of the University of California (the “Regents”). The Regents appeal the Patent Trial and Appeal Board’s Final Written Decision holding claims 1 and 2 unpatentable for obviousness under 35 U.S.C. § 103. For the reasons that follow, we affirm-in-part, vacate-in-part, and remand.

#### BACKGROUND

As the parties are familiar with the facts of this case, we recite here only those facts necessary to frame and decide the issues presented on appeal.

#### I

The ’213 patent, titled “Filament LED Light Bulb,” is directed to:

A transparent light emitting diode (LED) [that] includes a plurality of III-nitride layers, including an active region that emits light, wherein all of the layers except for the active region are transparent for an emission wavelength of the light, such that the light is extracted effectively through all of the layers and in multiple directions through the

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<sup>1</sup> Honorable John F. Murphy, District Judge, United States District Court for the Eastern District of Pennsylvania, sitting by designation.

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layers. Moreover, the surface of one or more of the III-nitride layers may be roughened, textured, patterned or shaped to enhance light extraction.

U.S. Patent No. 10,644,213 Abstract. Independent claim 1 and dependent claim 2 of the '213 patent recite the following:

1. A light bulb, comprising at least one light emitting device, the at least one light emitting device each further comprising:

*a sapphire plate, a cathode on a first end of the sapphire plate and an anode on a second end of the sapphire plate, wherein the cathode and anode provide structural support to the sapphire plate [the “cathode/anode limitation”] and are adapted to provide an electrical connection between the light emitting device and a structure outside the light emitting device;*

*at least one III-nitride light emitting diode (LED) comprising a sapphire growth substrate [the “sapphire growth substrate limitation”], the sapphire growth substrate in mechanical communication with the sapphire plate, and the LED and sapphire plate configured to extract light emitted by the LED through the sapphire plate; and*

*a molding comprising a phosphor and surrounding the LED, the molding configured to extract light from both a front side of the light emitting device and a back side of the light emitting device.*

2. The light bulb of claim 1, wherein the sapphire growth substrate is a patterned sapphire substrate (PSS).

'213 patent cols. 21–22 (insertions and emphasis added to highlight disputed limitations).

## II

In its Final Written Decision, the Board concluded that Satco showed by preponderant evidence that “claims 1 and 2 of the ’213 patent would have been obvious, respectively, over the combined disclosures of Yamazaki and Schubert, and the combined disclosures of Yamazaki, Schubert, and Tadamoto.” J.A. 24.

Yamazaki is a Japanese patent publication titled “Semiconductor Light-Emitting Device.” J.A. 36; J.A. 1132. Schubert (or “Schubert-2003”) is a book published in 2003 titled “Light-Emitting Diodes” and authored by Dr. E. Fred Schubert, the Regents’ expert. J.A. 37; J.A. 1139. Tadamoto is an article titled “High Output Power Near-Ultraviolet and Violet Light-Emitting Diodes Fabricated on Patterned Sapphire Substrates Using Metalorganic Vapor Phase Epitaxy.” J.A. 38; J.A. 1508.

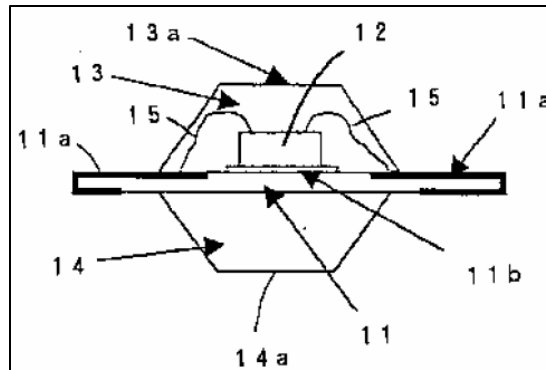
In post-Institution briefing, the parties disagreed over whether the term “phosphor,” as recited in the final limitation of claim 1 above, includes “fluorescent material.” J.A. 25. In its Petition, Satco asserted that Yamazaki discloses the claim 1 limitation “a molding comprising a phosphor,” explaining that Yamazaki uses the word “phosphor” when discussing the transparent resin of the light-emitting device. The Regents responded that the official translation of Yamazaki does not use the word “phosphor” and instead uses the words “fluorescent material.” Satco replied, conceding that the quotation of Yamazaki in its Petition was an inadvertent error, and that it was from “a version of Yamazaki that was produced in related [International Trade Commission] cases.” J.A. 27 (quoting J.A. 695). The Board ultimately construed “phosphor” to include “fluorescent material.”

The object of the invention disclosed in Yamazaki “is to provide a semiconductor light-emitting device that emits light in a plurality of directions through a simple structure.” J.A. 1132. Figure 1 of Yamazaki, described as a

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“schematic cross-sectional drawing depicting one embodiment of a semiconductor light-emitting device according to the present invention,” J.A. 1136, is relevant on appeal:



J.A. 1137, Fig. 1. “The chip substrate 11 is structured as a flat chip substrate . . . and an electrically conductive pattern 11a is provided on the surface thereof.” J.A. 1135 ¶ 26.

Relying on Figure 1, the Board found that Yamazaki teaches the cathode/anode limitation of claim 1. The Board observed that, in Yamazaki’s Figure 1, “the lines depicting [elements] 11a are bolded—the only bolded feature shown in *any* of the four figures of Yamazaki—in such a way as to appear to emphasize the wrap-around nature of the pattern.” J.A. 42. The Board did “not agree with [the Regents] that Figures 2 and 3 would lead a person of ordinary skill in the art to ignore the plain disclosure of Figure 1.” *Id.* The Board acknowledged that “Yamazaki’s figures do not define the precise proportions of the elements” but nonetheless “note[d] that Yamazaki emphasizes elements 11a in bold, indicating the elements’ thickness relative to other portions of Figure 1.” J.A. 45. Because, as the Board explained, “Figure 1 emphasizes the thickness of element 11a in relation to chip 11,” the Board found, *inter alia*, that “a person of ordinary skill in the art would have understood Yamazaki to teach the use of relatively thick j-lead metal leads that provided structural support.” *Id.*

The Board also determined that Satco “establishe[d] by a preponderance of the evidence that an ordinarily skilled artisan would have found the sapphire growth substrate [limitation] obvious in light of Yamazaki’s disclosure.” J.A. 48–49. The Board explained that because Satco “cites Schubert to provide evidence of what a person of ordinary skill in the art would understand Yamazaki’s disclosure to teach,” J.A. 50—that “conventional blue LEDs were III-nitride-based LEDs that commonly included sapphire growth substrates,” J.A. 49 (quoting J.A. 257–58)—Satco did not need to “demonstrate a sufficient motivation to combine the two references.” J.A. 50 (quoting *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1372–73 (Fed. Cir. 2019)).

With respect to claim 2, the Board found that “the combination of Yamazaki, Schubert, and Tadatomo teaches each limitation . . . and that an ordinarily skilled artisan would have had reasons, with rational underpinning, to combine the references, and the skilled artisan would have had a reasonable expectation of success.” J.A. 54.

In its Final Written Decision, the Board also denied the Regents’ motion to exclude certain portions of Dr. Schubert’s testimony under Federal Rule of Evidence 611(b), which provides that “[c]ross-examination should not go beyond the subject matter of the direct examination and matters affecting the witness’s credibility.”

The Regents appeal. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(4)(A).

#### DISCUSSION

Our court reviews “the Board’s obviousness determination *de novo*, but its factual findings for substantial evidence.” *Volvo Penta of the Americas, LLC v. Brunswick Corp.*, 81 F.4th 1202, 1208 (Fed. Cir. 2023). “The substantial evidence standard asks ‘whether a reasonable fact finder could have arrived at the agency’s decision,’ and

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‘involves examination of the record as a whole, taking into account evidence that both justifies and detracts from an agency’s decision.’” *TQ Delta, LLC v. Cisco Sys., Inc.*, 942 F.3d 1352, 1358 (Fed. Cir. 2019) (quoting *In re Gartside*, 203 F.3d 1305, 1312 (Fed. Cir. 2000)). What a reference teaches is a question of fact. *TriMed, Inc. v. Stryker Corp.*, 608 F.3d 1333, 1341 (Fed. Cir. 2010). We review whether an agency action complied with the Administrative Procedure Act, 5 U.S.C. § 551 *et seq.*, de novo. *Pfizer Inc. v. Sanofi Pasteur Inc.*, 94 F.4th 1341, 1353 (Fed. Cir. 2024). “Claim construction is ultimately a question of law, decided de novo on review . . . [b]ut we review any underlying fact findings about extrinsic evidence . . . for substantial-evidence support when the appeal comes from the Board.” *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 808 (Fed. Cir. 2021). Finally, we review “evidentiary rulings under the abuse of discretion standard.” *Bosch Auto. Serv. Sols., LLC v. Matal*, 878 F.3d 1027, 1037 (Fed. Cir. 2017).

## I

We begin with the Regents’ argument that the Board erroneously found that Yamazaki discloses the cathode/anode limitation based on its purported teaching “of relatively thick j-lead metal leads.” Appellant’s Br. 38 (emphasis omitted) (quoting J.A. 45). For the following reasons, we agree with the Regents in this respect.

As noted above, in reaching its fact finding about whether Yamazaki discloses the cathode/anode limitation, the Board agreed with Satco that element 11a represents a j-lead supporting the substrate rather than depositing/etching, as urged by the Regents. Specifically, the Board explained that “Figure 1 emphasizes the thickness of element 11a” in “bold,” and thus “a person of ordinary skill in the art would have understood Yamazaki to teach the use of relatively thick j-lead metal leads that provided structural support.” J.A. 45. The Board accordingly rejected the Regents’ argument that the electrically

conductive patterns 11a would have been understood by a person of ordinary skill in the art to have been deposited or etched.

As we have previously explained, patent drawings may be useful in shedding light about the general shapes and relative sizes of elements of the claimed invention, as well as their spatial relations to one another. *See, e.g., Synopsys, Inc. v. ATopTech, Inc.*, 685 F. App'x 951, 954 (Fed. Cir. 2017) (discussing the layout of elements in a patent drawing); *Monterey Rsch., LLC v. STMicroelectronics, Inc.*, Nos. 2022-1411 & -1770, 2023 WL 7037383, at \*3 (Fed. Cir. Oct. 26, 2023) (finding no error in Board's reliance on patent drawings for the "general shapes of the claimed active regions"). It is "well established," however, "that patent drawings do not define the precise proportions of the elements and may not be relied on to show particular sizes if the specification is completely silent on the issue." *Hockerson-Halberstadt, Inc. v. Avia Grp. Int'l, Inc.*, 222 F.3d 951, 956 (Fed. Cir. 2000). In other words, "figures in a patent are not drawn to scale unless otherwise indicated." *Id.* "[A]rguments based on drawings not explicitly made to scale in issued patents" are thus "unavailing." *Nystrom v. TREX Co.*, 424 F.3d 1136, 1149 (Fed. Cir. 2005). Here, nothing in the Yamazaki reference indicates that its figures are drawn to scale. *See* J.A. 1132–37.

We think that this is not a case in which the boldness of certain lines can be read as disclosing relative thickness, since the figures could just as well demonstrate only the existence of a separate structure. *See, e.g., Prima Tek II, LLC v. Polypap, SARL*, 412 F.3d 1284, 1290 (Fed. Cir. 2005) (discussing structural features disclosed by patent drawing). There is other evidence as well that the bolded lines do not show relative proportions. As shown above, Yamazaki's Figure 1 depicts conductive pattern 11a as having the same or similar thickness as adhesive layer 11b. The specification describes adhesive layer 11b in Figure 1 as follows:



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[A]fter a transparent adhesive agent [11b] is coated in the vicinity of the center of the chip mounting region 11c of the surface of the chip substrate 11, the light-emitting chip 12 is placed on the chip mounting region 11c. Given this, the light-emitting chip 12 is pressed against the surface of the chip substrate 11, to cause the *transparent adhesive* to be pushed out and *spread thinly . . . .*

J.A. 1135 ¶ 31 (emphasis added); *see* J.A. 1135 ¶ 26. That the drawing of conductive pattern 11a has approximately the same thickness as a thinly spread transparent adhesive 11b reinforces that Figure 1 is not drawn to scale. Dr. Schubert explained, unrebutted, that “[i]n real applications,” the “adhesive between the LED chip and supporting substrate would be approximately 1 micron to 10 microns thick.” J.A. 9781 ¶ 181. Logically, Yamazaki’s figures are drawn to illustrate the LED semiconductor chip’s layers and their arrangement. If they were drawn to scale and disclosed relative proportions, one would hardly be able to see at least some of the layers. Satco provides no response to this point on appeal.

The Board’s improper reliance on the figures is not necessarily fatal to its ultimate conclusion that Figure 1 shows j-leads, not depositing/etching. We acknowledge, as the Board did, that Satco and its expert Dr. Russell Dupuis relied on additional facts to support a finding that Yamazaki’s element 11a provides structural support. *See* J.A. 39. Dr. Dupuis testified that “[F]igure] 1 of Yamazaki depicts metallic portions that are thick in relation to the plate, cover portions of the top and bottom of the plate, and wrap around opposite edges, all of which show that the leads provide structural support to the plate.” J.A. 6663–64 ¶ 246. We cannot, however, separate out the Board’s reliance on what it perceived as “elements’ [11a] thickness relative to other portions of Figure 1” from its finding regarding element 11a’s provision of structural support. J.A. 45. Indeed, the Board seems to have relied primarily

on the thickness of the bold lines depicting elements 11a in Figure 1 to find that “a person of ordinary skill in the art would have understood Yamazaki to teach the use of relatively thick j-lead metal leads that provided structural support.” *Id.* Under our court’s precedent, because Yamazaki is not drawn to scale and does not show relative proportions, the Board erred by relying on the bold lines in Figure 1 to make findings regarding the thickness of (and thus the structural support provided by) element 11a.

For the reasons explained above, we vacate the Board’s decision with respect to the cathode/anode limitation and remand for the Board to assess whether Yamazaki teaches the cathode/anode limitation of claim 1 without reliance on the relative thickness of the bolded lines in Yamazaki’s Figure 1.

## II

Having addressed independent claim 1’s cathode/anode limitation, we now turn to the other issues raised by the Regents, including claim 1’s limitation containing the term “phosphor,” claim 1’s sapphire growth substrate limitation, and dependent claim 2.

The Regents argue that the Board erred in finding that Yamazaki teaches claim 1’s limitation containing the term “phosphor” because: (1) it improperly allowed new argument and evidence in Satco’s reply, (2) its *sua sponte* construction of “phosphor” is improper and not supported by substantial evidence, and (3) it improperly refused to exclude impermissible cross-examination testimony. None of these arguments persuades us. First, we agree with the Board that Satco’s reply concerning the translation of Yamazaki was responsive to the Regents’ arguments and thus properly considered under Board’s rules. Second, the Regents had multiple opportunities to discuss whether the ordinary meaning of “phosphor” includes “fluorescent material,” and substantial evidence in the form of prior art patents supports the Board’s fact finding regarding the

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ordinary meaning of “phosphor” at the time of the invention. As such, we agree with the Board’s analysis and adopt its construction of “phosphor.” Third, the expert testimony that the Regents sought to exclude was properly within the scope of cross-examination because it had a sufficient underlying basis in the direct testimony provided in the witness’s declaration.

Turning to the next limitation at issue, the Regents argue that the Board erred in finding that Yamazaki teaches claim 1’s sapphire growth substrate limitation because: (1) Schubert-2003 does not disclose the use of III-nitride based LEDs including sapphire growth substrates, and (2) Satco expressly relied on Schubert-2003 as teaching the sapphire growth substrate limitation and thus Satco needed to demonstrate a sufficient motivation to combine the two references. Again, we are unpersuaded. First, Dr. Dupuis testified that “III-nitride LEDs are often described . . . by referring to the semiconductor layers of the LED . . . such as ‘GaN’ [(gallium nitride)],” J.A. 6587 ¶ 83, and Schubert-2003 explains, among other things, that the “first GaN” LED, which emitted light in the ultraviolet and blue spectral range, “was grown on a sapphire substrate.” J.A. 1164; J.A. 1314 (describing sapphire substrate as “commonly used”). Second, the Board was correct in stating that Satco relied on “Schubert to provide evidence of what a person of ordinary skill in the art would understand Yamazaki’s disclosure to teach,” not as a secondary reference relied on for a proposed modification of Yamazaki. J.A. 50.

We need not reach the Regents’ final argument that the Board erred in finding dependent claim 2 obvious over Yamazaki, Schubert, and Tadatomo because we vacate and remand the Board’s decision with respect to the cathode/anode limitation, which is incorporated into dependent claim 2.

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### CONCLUSION

For the foregoing reasons, we conclude that the Board erred in relying on the relative thickness of conductive pattern 11a in Yamazaki's Figure 1 to find that Yamazaki teaches the cathode/anode limitation of claim 1 of the '213 patent. We conclude that the Board did not err in its analysis of claim 1's limitation containing the term "phosphor" or claim 1's sapphire growth substrate limitation. We thus affirm-in-part, vacate-in-part, and remand.

**AFFIRMED-IN-PART, VACATED-IN-PART, AND  
REMANDED**

### COSTS

No costs.