United States Court of Appeals for the Federal Circut

IN RE: CREE, INC.,
Appellant

2015-1365

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. 90/010,940.

Decided: March 21, 2016

WILLIAM F. LEE, Wilmer Cutler Pickering Hale and Dorr LLP, Boston, MA, argued for appellant. Also represented by SYDENHAM B. ALEXANDER, III, PETER M. DICHIARA, MARK CHRISTOPHER FLEMING, CYNTHIA D. VREELAND; BRITTANY BLUEITT AMADI, HEATHER M. PETRUZZI, Washington, DC.

PHILIP J. WARRICK, Office of the Solicitor, United States Patent and Trademark Office, Alexandria, VA, argued for appellee Michelle K. Lee. Also represented by THOMAS W. KRAUSE, STACY BETH MARGOLIES, ROBERT J. MCMANUS.

Before CHEN, CLEVENGER, and BRYSON, *Circuit Judges.*

BRYSON, *Circuit Judge.*

This is an appeal from a decision of the Patent Trial and Appeal Board in an *ex parte* reexamination proceeding. The Board held various claims of a patent owned by Cree, Inc., to be unpatentable as obvious. We affirm.

I

The patent in suit, Cree's U.S. Patent No. 6,600,175 ("the '175 patent"), filed in 1996, is entitled "Solid State White Light Emitter and Display Using Same." The claims at issue in this appeal are directed to the production of white light through the "down-conversion" of blue light from light-emitting diodes ("LEDs"). Down-conversion is the process in which high-energy (shorter wavelength) light is absorbed by a material and then re-emitted as lower energy (longer wavelength) light. By choosing the particular absorbing material, light at a desired wavelength (and thus a desired color) can be produced.

The examiner rejected six claims added during reexamination of the '175 patent as obvious under multiple combinations of prior art references, including the combination of U.S. Patent No. 3,691,482 ("Pinnow"), U.S. Patent No. 3,819,974 ("Stevenson"), and U.S. Patent No. 5,578,839 ("Nakamura"). The Board upheld the rejection based on that combination of references, among others.

Claim 118, added during reexamination of the '175 patent, is representative of the six rejected claims. It 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.

The patent defines the term "luminophoric medium" to mean "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." In the context of lamps and other lighting applications, luminophoric materials are called phosphors; such phosphors emit light through either fluorescence or phosphorescence.[1] Fluorescence and phosphorescence are examples of down-conversion. In both cases, the essential principle is that light of short wavelength, such as blue or ultraviolet light, is absorbed by a phosphor and later re-emitted in the form of light with a longer wavelength. Different phosphors emit light of different colors, and phosphors can be combined to produce a range of colors.

Down-conversion has a long history as a source of light of various colors, including white light. For example, fluorescent lamps create white light by down-converting the ultraviolet light emitted by excited mercury gas. Fluorescent lamps are well known in the art and have been commercially available since the 1930s.

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[1] In both phosphorescence and fluorescence, the luminescent material absorbs a photon that excites an electron. In fluorescence, the electron quickly (on the order of 10^{-9} seconds) returns to the ground state and emits a photon having a wavelength equal to or longer than that of the absorbed photon. Peter Pringsheim, Fluorescence and Phosphorescence 2-5 (1949). In phosphorescence the process is much slower, and the light emission can occur long after absorption. That property accounts for glowing wristwatch hands and glow-in-the-dark toys that can emit light in a dark room.

The ’175 patent recites the use of down-conversion to create white light with an LED. In one embodiment described in the ’175 patent, a blue LED commercially available from Nichia Chemical Industries, Ltd., is used with three commercially available phosphors—a blue phosphor (Lumogen® F Violet 570), a green-yellow phosphor (Lumogen® F Yellow 083), and a red phosphor (Lumogen® F Red 300). The combination of those colors results in the production of light that is perceived as white.

The Pinnow patent, published in 1972, discloses a display system that creates black and white images using a combination of a blue laser and appropriate phosphors. It also provides a detailed disclosure of the necessary conditions to create white light through the process of down-conversion.

In particular, Pinnow teaches that a blue argon-ion laser can produce white light by down-conversion of short wavelength laser light to combinations of longer wavelength light emitted by various phosphors. Pinnow explains that “a necessary condition for achieving a true white is that the illuminating laser beam have a wavelength of approximately 4,950 Å or shorter,” which is in the blue to violet range of the visible spectrum.

The Stevenson patent, published in 1974, discloses a type of gallium nitride LED. Stevenson’s LED emits light in the violet region of the spectrum and “may be converted to lower frequencies (lower energy) with good conversion efficiency using organic and inorganic phosphors.” Stevenson notes that with the “use of different phosphors, all the primary colors may be developed from this same basic device.”

Finally, the Nakamura patent, which was published in Japan in 1993, discloses a gallium nitride LED that emits blue light. The Nakamura LED was much brighter than other similar LEDs previously developed, and it was widely recognized as a major breakthrough, earning Dr. Nakamura the 2014 Nobel Prize in Physics.

Based on those references, the examiner found that "[i]t would have been obvious to one of ordinary skill in the art, at the time of the invention to substitute Stevenson's GaN-based LED with either the known UV light emitting or blue light emitting GaN-based LED disclosed in Nakamura." The examiner further found that the combination was a "simple substitution of one known element (Nakamura's GaN-based LED) for another known element (Stevenson's GaN-based LED) to obtain predictable results." The examiner explained that the reason to combine the references was the "advantage or expected beneficial result" that would result from replacing Stevenson's LED with the more powerful Nakamura LED. The examiner concluded that, because Nakamura's LED "would provide more photons to be down-converted by the phosphors and thereby provide brighter overall light emission from the device," the advantage of brighter emission by the phosphors would be readily apparent to a person of ordinary skill in the art.

The Board upheld the examiner's rejection in view of the combination of Pinnow, Stevenson, and Nakamura. The Board agreed with the examiner's reasoning, incorporating 109 pages of the examiner's answer into its own opinion.[2] In summarizing the grounds for its decision, the Board stated:

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[2] Cree suggests that it was improper under the Administrative Procedure Act for the Board to incorporate substantial portions of the Examiner's Answer into its opinion. There is no force to that argument. It is commonplace in administrative law for a reviewing body within an agency to adopt a fact-finding body's findings. On judicial review, the adopted material is treated as if it

> (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

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were part of the reviewing body's opinion. *See, e.g.*, *DHL Express, Inc. v. NLRB*, Nos. 12-1072, -1143, 2016 WL 278075, at *8 (D.C. Cir. Jan. 21, 2016); *Sanchez-Robles v. Lynch*, 808 F.3d 688, 692 (6th Cir. 2015); *Mike-Sell's Potato Chip Co. v. NLRB*, 807 F.3d 318, 321 (D.C. Cir. 2015).

This court does the same in the case of Board opinions adopting patent examiners' findings. *See In re Brana*, 51 F.3d 1560, 1564 n.13 (Fed. Cir. 1995) ("The Board's decision did not expressly make any independent factual determinations or legal conclusions. Rather, the Board stated that it 'agree[d] with the examiner's well reasoned, well stated and fully supported by citation of relevant precedent position in every particular, and any further comment which we might add would be redundant.' Therefore, reference in this opinion to Board findings are actually arguments made by the examiner which have been expressly adopted by the Board.") (internal citations omitted).

Contrary to Cree's suggestion, this court in *In re Lee*, 277 F.3d 1338 (Fed. Cir. 2002), did not vacate the Board's decision on the ground that the Board adopted some portions of the examiner's answer as its own opinion. Instead, we vacated the Board's decision because "neither the examiner nor the Board adequately supported" the rejection.

> 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.

In the Board's view the invention was "nothing more than a new application of a high-power, high-brightness blue LED developed by Dr. Nakamura in late 1993." The Board found that the new application was predictable in view of the state of the art in LEDs, the market demand for white light devices, the finite number of identified means to convert light from LEDs into white light, and the advantages of using the down-conversion approach.

II

A

On appeal, Cree first argues that the Board erred by assuming that it was known in the prior art to make white light from a monochromatic LED through down-conversion. In Cree's view, "[t]he Board ruled that it was obvious to use down-conversion to create white light from LEDs because it was (according to the Board) not merely obvious, but actually already known." Cree bases this argument on a passage from the Board's opinion in which the Board stated the following:

> 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 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.

Cree infers that the Board's use of the word "known" in that passage indicates that the Board erroneously concluded that a single reference disclosed down-conversion from blue LED light to white light. We do not read the Board's use of the term "known" in that fashion.

The Board's opinion makes clear that the Board focused on the general disclosure of the process of down-conversion, rather than any disclosure of down-conversion limited to a particular source, i.e., an LED. The Board explained that Pinnow discloses "a 'down-conversion' approach to create white light," and that nothing in Pinnow suggests that the particular source of primary radiation is important to the down-conversion process.

The examiner noted that Pinnow discusses down-conversion generally, not the specific down-conversion of blue LED light to white light. The examiner characterized the source of the primary radiation as unimportant "because it is the wavelength of the source that matters not the source itself." In the portion of his answer that the Board adopted, the examiner stated that a person of ordinary skill in the art "is not going to fail to appreciate the other teachings in Pinnow simply because a laser is used as the primary light source, because the phosphors cannot tell from what light source a wavelength of light comes. Rather, they can only absorb or not absorb a given wavelength." The examiner also stated that "it does not matter that Pinnow uses a laser, it only enhances the point that a [person having ordinary skill in the art] is aware of a variety of UV to blue radiation sources that are capable of being used to produce light of various colors, including white, by down-converting the primary radiation to longer-wavelength visible light using a mixture of phosphors in a single medium."

In context, it is clear that the Board was not using the word "known" to mean "disclosed in a single reference." Instead, the Board's statement that down-conversion was a known approach for creating white light from an LED is best understood to mean that persons of skill in the art were aware that down-conversion could be used to make white light out of blue light, regardless of the source of the light.

The Board found that Pinnow teaches a down-conversion process for creating white light that would work with blue light of any source, including the blue LEDs disclosed in Nakamura. That was an entirely reasonable conclusion to draw from Pinnow. Therefore the Board was correct when it said that it was "known" to create white light from LEDs using down-conversion, as Pinnow teaches a down-conversion process that was understood to be equally applicable when used with an LED light source as with the laser source specifically used in Pinnow.

B

Cree next argues that the Board reached its conclusion that down-conversion was "known" by misreading the declarations of Cree's experts, Drs. Stringfellow, Redwing, and Wetzel. We agree with the Board that Cree's experts testified that down-conversion from blue LED to white light was a known, but disfavored, option prior to the availability of high intensity blue LEDs such as Nakamura's. Dr. Wetzel stated that "[d]own conversion of LED light had been considered, but was discredited due to the loss of energy and light brightness during the down-conversion process." He then went on to explain why persons in the art would prefer to generate white light by mixing the output of three primary colored LEDs in a triplet format. In saying that down-conversion was a discredited solution to the problem of generating white light from LEDs, Dr. Wetzel in effect acknowledged that down-conversion of LED light was at least known to those in the art. Thus, Dr. Wetzel's testimony cuts against Cree's contention that generating white light from blue LEDs was unknown.

Dr. Redwing stated in her declaration that "down conversion of LED light was known and had been used in very select and rare occasions." She added, however, that down-conversion would not be used as a practical source of white light, because white light applications would have "required a significant amount of power and brightness," and "[l]ow illumination, as might be the case for an indicator light or a calculator, would clearly be insufficient for white light in these applications."

Dr. Redwing's statement addressed the question whether, before the Nakamura LED, a person of skill in the art would reject the down-conversion approach for practical applications. As in the case of Dr. Wetzel, however, her discussion of the competing technologies clearly reveals that down-conversion was a known method of creating white light prior to the '175 patent. We therefore reject Cree's suggestion that it was error for the Board to cite Dr. Redwing's testimony as support for its finding that down-conversion to create white light from LEDs was a known option prior to the '175 patent.

Finally, Dr. Stringfellow stated that at the time of the '175 patent, "the industry was focused on LEDs that directly emitted the color of interest and 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 colors; and (c) it entailed increased cost and complexity." Again, his testimony simply establishes that the use of down-conversion was not a preferred option for practical reasons. It does not show that down-conversion from

LEDs was unknown or could not have practical applications if a sufficiently powerful LED were available (such as the one invented by Nakamura). Because it was reasonable for the Board to draw the conclusion from Dr. Stringfellow's testimony that down-conversion was a known solution for generating white light from a blue LED, the Board's decision is supported by substantial evidence. *See In re Jolley*, 308 F.3d 1317, 1329 (Fed. Cir. 2002) ("[W]here two different, inconsistent conclusions may reasonably be drawn from the evidence in record, an agency's decision to favor one conclusion over the other is the epitome of a decision that must be sustained upon review for substantial evidence.").

C

Cree next takes issue with the Board's analysis of the motivation to combine. In particular, Cree argues that "neither the Examiner nor the Board articulated any rational motivation for why a skilled artisan would have combined the teachings of Pinnow—which discloses the projection of a large, high-powered, gas laser beam through a modulator and a deflector and onto a phosphor screen to display a white image—with the teachings of Stevenson and Nakamura, which disclose violet and blue LEDs."

Contrary to Cree's contention, the Board provided a sufficient, non-hindsight reason to combine the references. The Board found that a person of ordinary skill in the art would realize that Nakamura (a brighter LED) would be an upgrade over the LED of Stevenson for use with down-conversion and that the Nakamura LED would therefore be suitable to produce white light based on the teachings of Pinnow. The availability of the high-powered Nakamura LED thus provided the motivation to combine Stevenson's use of LEDs to create primary colors with Pinnow's use of a short-wavelength light source to create white light.

Cree's quarrels with the Board's analysis of the motivation to combine are without merit. Cree argues that because a laser generates more output power than an LED, a person of ordinary skill would fail to appreciate that Pinnow's teachings on down-conversion would be applicable to LEDs as well. However, the examiner pointed to ample evidence that Pinnow's teachings are applicable to LEDs. In a portion of the examiner's answer adopted by the Board, the examiner explained that "the phosphors' ability to convert the UV-to-blue light is predicated only on whether or not it can absorb a given wavelength of light, not on which kind of light source a particular wavelength of light is emitted, laser, LED, or otherwise, as a [person of ordinary skill in the art] would readily appreciate." In other words, a phosphor does not care how an incident photon of light at a particular wavelength was generated.

Cree also argues that color mixing and phosphor selection are more difficult when using a source with a broader emission spectrum, such as an LED, than one with a narrower emission spectrum, such as a laser. The examiner (in a portion of his answer adopted by the Board) also addressed that issue: He stated that "the issue of phosphor selection for UV-to-blue radiation was successfully addressed in the 1930's. While the exact same phosphor mixture as used in fluorescent bulbs might not be used with a GaN-based LED of Stevenson or Nakamura, it certainly is factual evidence that those of skill in the art have sufficient understanding of the scientific and engineering principles to choose phosphors for a broadband, UV-to-blue primary radiation source." The examiner and the Board thus based the rejection on sufficient evidence that a person of ordinary skill in the art would have had a reason to combine the references.[3]

III

Cree's final argument is that the Board improperly rejected Cree's proffered secondary evidence of nonobviousness. Cree points to three categories of secondary evidence that, according to Cree, the Board improperly discounted: evidence of industry praise; evidence of licensing; and evidence of the commercial success of white LED

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[3] Cree argues that the Board's rejection was based on "impermissible hindsight." That argument, however, is essentially a repackaging of the argument that there was insufficient evidence of a motivation to combine the references. It is fully answered by the Board's observation that "the weight of the evidence shows that the proffered combination is merely a predictable use of prior art elements according to their established functions."

Cree also asserts that the Board improperly shifted the burden to Cree to show that the claims at issue would not have been obvious. That argument, too, lacks merit. The Board stated that the examiner had provided "a reason showing motivation by a person of ordinary skill in the art to achieve the claimed subject matter." Immediately thereafter, in the passage quoted by Cree, the Board stated that Cree "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" (emphasis in original). In context, it is clear that the sentence quoted by Cree simply states that Cree failed to show why the examiner's finding was incorrect. In short, the Board held that the examiner carried his burden on the issue of obviousness, and Cree failed to offer any convincing reason to find otherwise. That is not burden-shifting. *See Belden, Inc. v. Berk-Tek LLC*, 610 F. App'x 997, 1004-05 (Fed. Cir. 2015).

products. The Board analyzed each of the claimed secondary considerations and concluded that the evidence of secondary considerations "does not outweigh the strong evidence of obviousness."

A

Cree first points to two press releases from the Fraunhoffer Institute and contends that those press releases support the inference of non-obviousness. The press releases describe the down-conversion of blue LED light to produce white light as a "breakthrough" and an "innovative idea." The Board, however, found the press releases unpersuasive as secondary evidence, because the praise was directed to the Fraunhoffer Institute's own work, not the work of the inventors of the '175 patent.

Cree faults the Board for discounting that evidence. In Cree's view, even though the press releases were directed to the work of others, the praise for the concept still had the requisite nexus to the claimed invention.

We agree with the Board's treatment of this evidence. While "praise in the industry for a patented invention, and specifically praise from a competitor tends to 'indicate that the invention was not obvious,'" self-serving statements from researchers about their own work do not have the same reliability. *Power-One v. Artesyn Techs., Inc.*, 599 F.3d 1343, 1352 (Fed. Cir. 2010) (quoting *Allen Archery, Inc. v. Browning Mfg. Co.*, 819 F.2d 1087, 1092 (Fed. Cir. 1987)). The Board thus permissibly concluded that the press releases were unpersuasive and, if anything, showed that down-conversion was the logical next step after the development of the Nakamura LED.

B

Cree next points to evidence of licensing. During the reexamination proceedings, Cree put forward declaration testimony and press releases describing certain licensing transactions. The Board found the evidence of licensing unpersuasive for failing to show a sufficient nexus to the '175 patent.

Our cases "specifically require affirmative evidence of nexus where the evidence of commercial success presented is a license, because it is often 'cheaper to take licenses than to defend infringement suits.'" *Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1324 (Fed. Cir. 2004) (quoting *EWP Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 908 (Fed. Cir. 1985)). When the specific licenses are not in the record, it is difficult for the court to determine if "the licensing program was successful either because of the merits of the claimed invention or because they were entered into as business decisions to avoid litigation, because of prior business relationships, or for other economic reasons." *In re Antor Media Corp.*, 689 F.3d 1282, 1294 (Fed. Cir. 2012). That is the situation here. Cree has provided press releases evidencing that it has entered into licensing transactions, but has not shown that the licenses were based on the merits of the '175 patent.

Additionally, the press releases indicate that some of the licenses were broad cross-licenses (such as the licenses to Nichia, Toyoda Gosei, Osram, and Phillips) or were intended to resolve litigation (such as the license to Nichia). Some of the press releases on which Cree relies define the scope of the licensing transactions as "broad and substantial," "comprehensive [and] worldwide," and "cover[ing] patents from both parties in the fields of blue LED chip technology, white LEDs and phosphors (including remote phosphors), control systems, LED luminaries and lamps as well as LED backlighting of liquid crystal displays (LCDs) and patents in Phillips LED Luminaire Licensing Program." In light of the lack of specificity in that evidence, it was reasonable for the Board to find that the licenses were not shown to have a sufficient nexus to the '175 patent to require a finding of non-obviousness.

C

The final piece of secondary evidence on which Cree relies is evidence of commercial success. Cree put forward evidence in the form of a declaration by Dr. Brandes, who presented sales figures showing the growth of the white LED market and stated that in his opinion there is a nexus between the sales figures and the '175 patent. The Board found that "Dr. Brandes' declaration [did] not show a correlation between the claimed invention and the sales numbers," and that his characterization of a nexus "is nothing more than an allegation or a conclusory statement."

When commercial success is cited as a basis for inferring non-obviousness, a nexus must be shown between the commercial success and the claimed features of the patent. *In re Huang*, 100 F.3d 135, 139-40 (Fed. Cir. 1996).

We agree with the Board that Dr. Brandes' declaration merely repeats, in conclusory fashion, that there is a nexus between the success of white LEDs and the claimed invention. The Board found that the evidence showed sales of white light products using LEDs with luminophoric substances, such as consumer products incorporating white LED backlit LCD displays, but that there was no sufficient showing of a nexus between those sales and the invention.

In a portion of the examiner's answer that was adopted by the Board, the examiner found that the commercial success of white LEDs "cannot be due to simply making a single-die semiconductor LED that emits white light," because if that were so, "then the commercialization could have started back in 1973." Instead, the examiner found, "it appears that Wetzel, Redwing, and Stringfellow all acknowledge the invention of a GaN LED with sufficiently high light output, somewhere in the UV to blue region of the spectrum was the thing that made the down-converting device of Stevenson . . . commercial[ly] successful."

Cree has failed to rebut the Board's finding of a lack of nexus between the invention and the commercial success of white light LEDs. As the Board found, "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." For that reason, we sustain the Board's conclusion that the evidence of commercial success did not outweigh the strong prima facie showing of obviousness.

We therefore uphold the Board's decision rejecting the disputed claims of the '175 patent.

AFFIRMED