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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BYUNGSOO KIM

Appeal 2019-004267
Application 15/198,640
Technology Center 2800

Before LINDA M. GAUDETTE, JAMES C. HOUSEL, and
BRIAN D. RANGE, *Administrative Patent Judges*.

HOUSEL, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE¹

Pursuant to 35 U.S.C. § 134(a), Appellant² appeals from the Examiner's decision to reject claims 1, 2, 4–14, and 21–26 under 35 U.S.C. § 103 as unpatentable over Weaver (US 2013/0320837 A1, pub. Dec. 05,

¹ This Decision refers to the Specification (“Spec.”) filed June 30, 2016, the Non-Final Office Action (“Non-Final Act.”) dated May 2, 2018, the Appeal Brief (“Appeal Br.”) filed December 14, 2018, the Examiner’s Answer (“Ans.”) dated March 8, 2019, and the Reply Brief (“Reply Br.”) filed May 8, 2019.

² We use the word Appellant to refer to “applicant” as defined in 37 C.F.R. § 1.42(a). Appellant identifies the real party in interest as LG Display Co., Ltd. Appeal Br. 3.

2013) in view of Lee (US 2007/0164278 A1, pub. July 19, 2007). We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

CLAIMED SUBJECT MATTER

The invention relates to an organic light emitting device having a structure with a plurality of light emitting units having a combination of dopant materials that reduce color shift caused by variation of viewing angle. Spec. ¶ 2. The plurality of light emitting units may include dopant materials emitting light of different wavelengths such that variation of color and luminance, which a user perceives as viewing angle varies, is reduced. *Id.* ¶ 16. The light emitting units may emit red, green, or blue light, and color shift caused by variation of viewing angle of white emitted light obtained by a mixture of red, green, and blue emitted light from red, green, and blue organic light emitting devices is minimized. *Id.*

In order to accomplish this objective, Appellant discloses selecting different dopant materials for the plurality of light emitting units of the organic light emitting device such that a photoluminance (“PL”) peak of one dopant (“main dopant”) in one of the light emitting units is within the range of 0–15 nm of a PL peak of a second dopant (“auxiliary dopant”) in a second one of the light emitting units. Spec. ¶ 67. In addition, the PL peak of the auxiliary dopant is biased towards a shorter wavelength as compared to the PL peak of the main dopant. *Id.* The main and auxiliary dopants may be selected such that the out-coupling emittance spectrum curve overlaps with or is closer to the PL peak of the main dopant when the viewing angle is 0° (i.e., in the front direction) and overlaps with or is closer to the PL peak of

the auxiliary dopant at a wide viewing angle in a lateral or side direction. *Id.*

¶¶ 68–69.

Claims 1 and 21, reproduced below from the Claims Appendix to the Appeal Brief, are illustrative of the claimed subject matter:

1. An organic light emitting device, comprising:

an anode and a cathode, which are spaced apart from each other to face each other; and

a first light emitting unit including a first organic light emitting layer, a charge generating layer, and a second light emitting unit including a second organic light emitting layer, which are between the anode and the cathode,

wherein a main dopant material is doped on any one of the first organic light emitting layer and the second organic light emitting layer, and an auxiliary dopant material emitting the same colored light as that of the main dopant material is doped on the other one among the first organic light emitting layer or the second organic light emitting layer having the main dopant material doped thereon, and

a photoluminescence (PL) peak of the main dopant material is in the range of 0nm to 15nm from a PL peak of the auxiliary dopant material,

wherein the organic light emitting device emits any one of blue light, green light, and red light, and

wherein a peak of an out-coupling emittance spectrum curve at a viewing angle of 0° of the organic light emitting device is closer to the PL peak of the main dopant material than the PL peak of the auxiliary dopant material.

21. An organic light emitting device, comprising:

an anode and a cathode; and

a first light emitting unit including a first organic light emitting layer and a second light emitting unit including a second organic light emitting layer, the first light emitting unit between the anode and the cathode,

wherein the first organic light emitting layer and the second organic light emitting layer include a main dopant material and an auxiliary dopant material, and

wherein a photoluminescence (PL) peak of an out-coupling emittance spectrum curve according to a viewing angle is alternatively overlapped with a PL peak of the main dopant material and a PL peak of the auxiliary dopant material, and

wherein the organic light emitting device emits any one of blue light, green light, and red light.

OPINION

We review the appealed rejection for error based upon the issues Appellant identifies, and in light of the arguments and evidence produced thereon. *Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential) (cited with approval in *In re Jung*, 637 F.3d 1356, 1365 (Fed. Cir. 2011) (“[I]t has long been the Board’s practice to require an applicant to identify the alleged error in the examiner’s rejections.”). After considering the argued claims and each of Appellant’s arguments, we are not persuaded of reversible error in the appealed rejection.

Appellant argues each of independent claims 1 and 21, as well as dependent claim 4 separately, but does not present separate arguments for the remaining dependent claims. In accordance with 37 C.F.R.

§ 41.37(c)(1)(iv), claims 2, 5–14, and 22–26 stand or fall with their respective independent claim.

Claim 1

The dispositive issue before us with regard to the obviousness rejection of claim 1 is whether Appellant has identified reversible error in the Examiner’s determination that the combination of Weaver and Lee would have suggested the limitation “wherein a peak of an out-coupling emittance spectrum curve at a viewing angle of 0° of the organic light emitting device is closer to the PL peak of the main dopant material than the PL peak of the auxiliary dopant material.” We answer this question in the negative and, therefore, affirm the obviousness rejection of claim 1 for the reasons given in the Non-Final Office Action and the Examiner’s Answer. We add the following primarily for emphasis.

The Examiner finds that Weaver teaches an organic light emitting device having first and second light emitting units disposed between an anode and a cathode, wherein the units are doped with different dopant materials of the same color, respectively, such that the PL peak of one dopant material is at least 4 nm less than the PL peak of a second dopant material. Non-Final Act. 3. Thus, the Examiner finds that Weaver teaches all the features of claim 1 except that the organic light emitting device emits any one of red, green, and blue light.³ *Id.* at 3–4. For this feature, the

³ The Examiner appears to be interpreting claim 1 as excluding an organic light emitting device that emits more than one of red, green, and blue light. However, we see no reason to read claim 1 so narrowly. Instead, we interpret claim 1 to require that the device emits any one of red, green, and blue light, but may emit any two or all three of these colors. This interpretation is consistent with the Specification. *See, e.g.*, Spec. ¶¶ 14, 16,

Examiner finds that Lee teaches an organic light emitting device emitting blue light. *Id.* at 4. The Examiner concludes it would have been obvious to provide that Weaver's organic light emitting device emit blue light in order to provide the brightness and efficiency of the blue emission layers for improving performance and power consumption, as Lee suggests. *Id.*

The Examiner acknowledges that the combination of Weaver and Lee does not expressly disclose that the peak of an out-coupling emittance spectrum curve at a viewing angle of 0° of the organic light emitting device is closer to the PL peak of a main dopant material than the PL peak of an auxiliary dopant material. Non-Final Act. 4. However, the Examiner determines that this feature would have been obvious in Weaver's device in order to improve performance since the general conditions of claim 1 are disclosed therein and discovering the optimum or workable ranges involves only routine skill in the art. *Id.* at 4–5 (citing *In re Aller*, 220 F.2d 454, 456 (CCPA 1955)). In particular, the Examiner finds that, by selecting the dopant materials, the peak of an out-coupling emission spectrum curve at a viewing angle of 0° of Weaver's device would be closer to the PL peak of one of the dopants than of the other.

Appellant argues that the Examiner erred in concluding that the limitation at issue, “wherein a peak of an out-coupling emittance spectrum curve at a viewing angle of 0° of the organic light emitting device is closer to the PL peak of the main dopant material than the PL peak of the auxiliary

26, 27, 29, 71–73, 81, 82, 92–95, 98, 99; Figs. 4A–4C, 5A–5C, 8, 9. Thus, claim 1, when properly interpreted, encompasses a device such as Weaver's which emits red, green, and blue light that are combined to create white light. As such, Lee is not necessary to maintain an obviousness rejection against claim 1.

dopant material,” would have been obvious over the combination of Weaver and Lee. Appeal Br. 6–8. In particular, Appellant contends that the Examiner’s rationale for this obviousness conclusion is based on impermissible hindsight because this rationale is not disclosed in either reference and is derived from Appellant’s Specification. *Id.* at 7–8.

Appellant’s argument is not persuasive of reversible error in the Examiner’s rejection because the limitation at issue is dependent on determining which of Weaver’s two dopant materials is the main dopant material and which is the auxiliary dopant material. We begin, appropriately, with the claim’s words. *See Oakley, Inc. v. Sunglass Hut Int’l*, 316 F.3d 1331, 1339 (Fed. Cir. 2003) (explaining that anticipation and obviousness require comparison of the properly construed claims to the available prior art); *Amazon.com, Inc. v. Barnesandnoble.com, Inc.*, 239 F.3d 1343, 1351 (Fed. Cir. 2001) (“Only when a claim is properly understood can a determination be made . . . whether the prior art anticipates and/or renders obvious the claimed invention.”).

We note that claim 1 recites that the main dopant material may be in either the first or the second organic light emitting layer, and the auxiliary dopant material is in the other of these two layers. In addition, claim 1 recites that the main and auxiliary dopant materials emit the same colored light and have PL peaks within 0–15 nm of each other. Other than the limitation at issue, claim 1 does not otherwise define or distinguish the main and auxiliary dopant materials. The Specification similarly does not define nor distinguish the main and auxiliary dopants other than to disclose that the auxiliary dopant material has a shorter wavelength than the main dopant material. Spec. ¶ 67. *In re ICON Health & Fitness, Inc.*, 496 F.3d 1374,

1379 (Fed. Cir. 2007) (“[T]he PTO must give claims their broadest reasonable construction consistent with the specification . . . Therefore, we look to the specification to see if it provides a definition for claim terms, but otherwise apply a broad interpretation.”). However, the Specification does not define or otherwise require that the auxiliary dopant material has the shorter wavelength emission. As such, claim 1 does not require that the auxiliary dopant has the shorter wavelength emission. *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993) (“[L]imitations are not to be read into the claims from the specification.”).

There is no dispute that Weaver teaches two dopant materials emitting the same colored light, each disposed in a different one of first and second organic light emitting layers, wherein the PL peak of one dopant material is at least 4 nm less than the PL peak of the other dopant material. However, because claim 1 does not specify which of the main and auxiliary dopant materials has the shorter wavelength emission, the main dopant material and the auxiliary dopant material read on either of Weaver’s dopant materials. This interpretation is significant considering that the issue before us depends on which of Weaver’s two dopant materials is the main dopant material and which is the auxiliary dopant material because claim 1 recites that the out-coupling emittance spectrum curve at a 0° viewing angle is closer to the PL peak of the main dopant material than the PL peak of the auxiliary dopant material. Accordingly, claim 1’s main dopant material reads on whichever of Weaver’s two dopant materials has a PL peak closer to the out-coupling emittance spectrum curve at a 0° viewing angle regardless of whether its PL peak is shorter or longer than the other dopant material’s PL peak. As such, Weaver meets the limitation at issue.

Turning to the Examiner's obviousness rationale for modifying Weaver to provide the peak of the out-coupling emittance spectrum curve at a 0° viewing angle that is closer to the PL peak of the main dopant material than the PL peak of the auxiliary dopant material, the Examiner finds, and Appellant does not dispute, that an ordinary artisan would have known that each of these peaks is dependent on the dopant material properties. Ans. 4. The Examiner determines that the ordinary artisan would have selected the dopant materials so as to provide that the out-coupling emittance spectrum curve peak is closer to the longer wavelength dopant than the shorter wavelength dopant in order to improve the organic light emitting device performance. *Id.* at 5. Such a determination is consistent with the fact that it was known that perceived light emitted from an organic light emitting device shifts to lower wavelengths as the viewing angle increases from a front to a lateral direction. Therefore, the peak of the out-coupling emittance spectrum curve also necessarily shifts to lower wavelengths with increasing viewing angle. As such, the ordinary artisan would reasonably expect that the organic light emitting device performance at a 0° viewing angle would improve by ensuring that the out-coupling emittance spectrum curve peak was closer to or even overlaps with the PL peak of the dopant material having the longer wavelength emission. Therefore, the Examiner's rationale for modifying Weaver is based on Weaver and the inherent properties of organic light emitting devices and their dopant materials, rather than Appellant's Specification.

Appellant does not otherwise challenge the Examiner's rejection of claim 1. Accordingly, we sustain the Examiner's obviousness rejection of

claim 1, and dependent claims 2, 5–14, and 26, over the combination of Weaver and Lee.

Claim 21

The dispositive issue before us with regard to the obviousness rejection of claim 21 is whether Appellant has identified reversible error in the Examiner’s determination that the limitation “a photoluminescence (PL) peak of an out-coupling emittance spectrum curve according to a viewing angle is alternatively overlapped with a PL peak of the main dopant material and a PL peak of the auxiliary dopant material” would have been obvious over the combination of Weaver and Lee. We answer this question in the negative and, therefore, affirm the obviousness rejection of claim 21 for the reasons given in the Non-Final Office Action and the Examiner’s Answer. We add the following primarily for emphasis.

The Examiner finds, in relevant part, that Weaver teaches the limitation at issue. Non-Final Act. 5; Ans. 6. More specifically, the Examiner finds that “the wavelength at which an organic emissive layer emits light may generally be readily tuned with appropriate dopants,” i.e., the PL peak of an organic light emitting layer depends on the dopant material. Ans. 7. Therefore, the Examiner finds that given Weaver’s two dopant materials emitting the same colored light but at wavelengths separated by at least 4 nm, Weaver inherently provides a PL peak of an out-coupling emittance spectrum curve according to a viewing angle that alternatively overlaps with the PL peak of the longer wavelength dopant material and a PL peak of the shorter wavelength dopant material. *Id.*

Appellant argues that the Examiner has failed to establish that Weaver inherently teaches the limitation at issue. Appeal Br. 10. Appellant contends

that because the Examiner finds that the three peaks (the out-coupling emittance spectrum curve peak, and the two PL peaks of the dopant materials) depend on the material properties, the Examiner implicitly acknowledges that Weaver fails to actually disclose materials that meet the limitation at issue. *Id.*

Appellant's arguments are not persuasive of reversible error because, in our view, the Examiner has reasonably established that Weaver inherently provides an organic light emitting device whose out-coupling emittance spectrum curve peak alternatively overlaps the PL peaks of the two dopant materials. Similar to claim 1, claim 21 does not require that the main dopant material has a longer wavelength than the auxiliary dopant material, nor does claim 21 limit which dopant is in each of the two organic light emitting layers. Moreover, claim 21 does not specify that the layers are stacked one upon the other, nor which layer is above the other in a light emitting direction.

As indicated above, there is no dispute that Weaver teaches two dopant materials emitting the same colored light, each disposed in a different one of first and second organic light emitting layers, wherein the PL peak of one dopant material is at least 4 nm less than the PL peak of the other dopant material. Indeed, Weaver teaches that the longer wavelength dopant may be in either of the first or the second of two stacked organic light emitting layers. Weaver, Fig. 9. Appellant does not direct us to any difference in structure or material between Weaver and claim 21, nor between Weaver and the disclosed structure. Given that it was known that the perceived light emitted from an organic light emitting device shifts to lower wavelengths as the viewing angle increases from a front to a lateral direction, the peak of the

out-coupling emittance spectrum curve also necessarily shifts to lower wavelengths with increasing viewing angle. Therefore, Weaver's two organic light emitting units, which are structurally identical to that recited in claim 21 and indistinguishable from Appellant's disclosed structure, would necessarily provide an out-coupling emittance spectrum curve peak that alternately overlaps with each of the PL peaks of Weaver's dopant materials.

Appellant does not otherwise challenge the Examiner's rejection of claim 21. Accordingly, we sustain the Examiner's obviousness rejection of claim 21, and dependent claims 22–25, over the combination of Weaver and Lee.

Claim 4

Claim 4 depends from claim 1, and further requires that the out-coupling emittance spectrum curve peak at a 60° viewing angle is closer to the PL peak of the auxiliary dopant material than the PL peak of the main dopant material.

The Examiner finds that the combination of Weaver and Lee fails to explicitly disclose the limitation of claim 4. Non-Final Act. 7. However, the Examiner determines that it would have been obvious to provide Weaver with this feature as a matter of routine optimization in order to improve the organic light emitting device's performance. *Id.*

Appellant argues that the Examiner erred in concluding that the limitation of claim 4 would have been obvious because the Examiner has neither established that "general conditions" of this claim are disclosed in the prior art nor that they are result-effective variables amenable to optimization. Appeal Br. 10–11.

In response, the Examiner finds, and Appellant does not dispute, that an ordinary artisan would have known that each of these peaks is dependent on the dopant material properties. Ans. 8. The Examiner determines that the ordinary artisan would have selected the dopant materials so as to provide that the out-coupling emittance spectrum curve peak is closer to the shorter wavelength dopant than the longer wavelength dopant at a 60° viewing angle in order to improve the organic light emitting device performance. *Id.* As above, such a determination is consistent with the fact that it was known that perceived light emitted from an organic light emitting device shifts to lower wavelengths as the viewing angle increases from a front to a lateral direction, the peak of the out-coupling emittance spectrum curve also necessarily shifts to shorter wavelengths with increasing viewing angle. As such, the ordinary artisan would reasonably expect that the organic light emitting device performance at a 60° viewing angle would improve by ensuring that the out-coupling emittance spectrum curve peak was closer to with the PL peak of the dopant material having the shorter wavelength emission. Therefore, Appellant has not shown error in the Examiner's determination that it would have been obvious to modify Weaver's dopant materials such that the out-coupling emittance spectrum curve peak is closer to the PL peak of Weaver's shorter wavelength dopant at a 60° viewing angle.

Appellant does not otherwise challenge the Examiner's rejection of claim 4. Accordingly, we sustain the Examiner's obviousness rejection of claim 4 over the combination of Weaver and Lee.

CONCLUSION

Upon consideration of the record, and for the reasons given above and in the Non-Final Office Action and the Answer, the Examiner's decision to reject claims 1, 2, 4–14, and 21–26 under 35 U.S.C. § 103 as unpatentable over Weaver in view of Lee is *affirmed*.

DECISION SUMMARY

In summary:

| Claims Rejected | 35 U.S.C. § | Reference(s)/Basis | Affirmed | Reversed |
|------------------------|--------------------|---------------------------|-------------------|-----------------|
| 1, 2, 4–14, 21–26 | 103 | Weaver, Lee | 1, 2, 4–14, 21–26 | |

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED