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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* CHANG-GYUN SHIN, MOON-GYU HAN,  
HONG-SHIK SHIM, and SEOG-JIN JEON

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Appeal 2018-001745  
Application 13/593,167  
Technology Center 2800

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Before JAMES C. HOUSEL, JENNIFER R. GUPTA, and  
JANE E. INGLESE, *Administrative Patent Judges*.

GUPTA, *Administrative Patent Judge*.

DECISION ON APPEAL<sup>1</sup>

Appellants<sup>2</sup> appeal under 35 U.S.C. § 134(a) from the Examiner’s final decision rejecting claims 1–3, 5–8, 10–13, and 15. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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<sup>1</sup> In this Decision, we refer to the Specification filed August 23, 2012 (“Spec.”), the Final Office Action dated January 12, 2017 (“Final Act.”), the Appeal Brief filed June 12, 2017 (“Appeal Br.”), the Examiner’s Answer dated October 5, 2017 (“Ans.”), and the Reply Brief filed December 5, 2017 (“Reply Br.”).

<sup>2</sup> Appellants identify the real party in interest as Samsung Electronics Co. Ltd. Appeal Br. 2.

The subject matter on appeal relates to color image panels that include pixels configured to display a color image where at least one of the pixels includes a tunable photonic crystal filter. Spec. ¶¶ 2, 8. Claim 1, reproduced below from the Claims Appendix, is illustrative of the claims on appeal.

1. A color image panel comprising:
  - pixels configured to display a color image, at least one of the pixels including,
    - a tunable photonic crystal filter configured to reflect light in a wavelength band of a selected color and to transmit light in a wavelength band other than the wavelength band of the selected color, the wavelength band of the selected color being controlled by a stimulus controlling a photonic bandgap of the tunable photonic crystal filter, and
    - a white display unit configured to control saturation and brightness of color displayed by the tunable photonic crystal filter by adding light transmitted via the tunable photonic crystal filter to color light reflected from the tunable photonic crystal filter; and
    - a controller configured to tune the photonic bandgap of the tunable photonic crystal filter in each of the at least one pixels by controlling the stimulus for each of the at least one pixels to vary at least one of a shape, volume, and effective refractive index of photonic crystals in the tunable photonic crystal filter of each of the at least one pixels, the stimulus including at least one of an electrical and a mechanical stimulus,
  - wherein the tunable photonic crystal filter and the white display unit correspond in a one-to-one manner within a single pixel of the at least one of the pixels configured to display the color image such that the color displayed by each of the pixels is determined by the single corresponding tunable photonic crystal filter, and the saturation and the brightness of the color

displayed by each of the pixels is determined by the single corresponding white display unit.

Appeal Br. 14 (Claims App.).

## DISCUSSION

The Examiner maintains the rejection of claims 1, 2, 5–7, and 10–12 under pre-AIA 35 U.S.C. § 103(a) over Okamoto et al. (JP 10-274780, published October 13, 1998) (“Sharp”)<sup>3</sup> in view of Moon et al. (US 7,064,886 B2, issued June 20, 2006). Final Act. 7–15; Ans. 2. The Examiner also maintains the rejection of claims 3, 8, 13, and 15 under pre-AIA 35 U.S.C. § 103(a) over Sharp in view of Moon and Dean (US 2008/0074383, published March 27, 2008). Final Act. 16; Ans. 2.

Appellants do not present any separate patentability arguments regarding the claims subject to the latter § 103(a) rejection over Sharp in view of Moon and Dean. Appeal Br. 12. Thus, we focus on the former § 103(a) rejection over Sharp in view of Moon. Appellants argue claims 1, 5 and 10 separately. Appeal Br. 6, 11–12. We will address Appellants’ arguments regarding each of those claims in turn below. Claims 2, 3, 6–8, 11–13, and 15, which are not separately argued (*see* Appeal Br. 6–13), will stand or fall with claim 1. 37 C.F.R. § 41.37(c)(1)(iv).

After review of the cited evidence in light of the Appellants’ and the Examiner’s opposing positions, we determine that Appellants have not identified reversible error in the Examiner’s rejections. Accordingly, we

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<sup>3</sup> Both the Examiner and Appellants refer to this reference as Sharp based on the name of the Applicant being Sharp Corp. instead of the name of the first named inventor. *See* Final Act. 7–16; *see also* Appeal Br. 6–13. To avoid confusion, we do the same in the Decision.

affirm the rejections for the reasons set forth below, in the Final Office Action, and in the Examiner's Answer.

*Claim 1*

The Examiner finds that Sharp discloses pixels configured to display a color image where at least one of the pixels includes a filter (2) and a white display unit (1, 3, 4), but acknowledges that Sharp does not disclose a tunable photonic crystal filter or a controller configured to tune the photonic bandgap of the tunable photonic crystal filter in each of the at least one pixels by controlling the stimulus for each of the at least one pixels to vary at least one of a shape, volume, and effective refractive index of photonic crystals in the tunable photonic crystal filter of each of the at least one pixels, the stimulus including at least one of an electrical and a mechanical stimulus. Final Act. 7 (citing Sharp ¶ 34; Fig. 4); *see also id.* at 8–12.

The Examiner finds that Moon discloses a filter that is a tunable photonic crystal filter, and the color, which is determined by the wavelength of light, is selected by varying the size of the particles comprising the photonic crystal. Final Act. 8 (citing 3:33–50, 4:29-30; Fig. 3B). In addition, the Examiner finds that Moon discloses a controller 104 capable of controlling the stimulus (Figs. 3A–3C, the signal generated by the controller) to vary at least one of shape, volume and effective refractive index of photonic crystals (varying refractive index disclosed in col. 4, lines 5–10) in the tunable photonic crystal filter of at least one of the pixels (at least one pixel disclosed in Figs. 3A–3C), the stimulus including at least one of an electrical and a mechanical stimulus (controller 104 outputs an electrical stimulus). Final Act. 11–12.

The Examiner concludes that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Sharp to include a tunable photonic crystal filter, the color being selected, a wavelength band of the selected color capable of being controlled by a stimulus that controls a photonic bandgap of the tunable photonic crystal filter, and to include a controller capable of controlling the stimulus to vary at least one of shape, volume, and effective refractive index of photonic crystals in the tunable photonic crystal filter, the stimulus including an electrical stimulus, as disclosed by Moon, “to have a highly tunable filtering device capable of displaying tighter, narrow wavelengths of color to improve color saturation and brightness.” *Id.* at 12.

Appellants’ assertion that the Examiner has not demonstrated that the device of Sharp, as modified by Moon, teaches a controller “configured to tune the photonic bandgap by controlling the stimulus to vary at least one of shape, volume and effective refractive index of photonic crystals in the tunable photonic crystal filter,” as recited in claim 1 (Appeal Br. 7) is not persuasive of reversible error because it is merely attorney argument unsupported by evidence or persuasive technical reasoning that is consistent with the record. *See In re Pearson*, 494 F.2d 1399, 1405 (CCPA 1974) (“Attorney’s argument in a brief cannot take the place of evidence.”). The Examiner explains in detail how Moon’s controller meets claim 1’s controller recitation. Final Act. 10–12; *see also* Moon 4:24–26, Figs. 3A–3C (teaching that Moon’s power supply 104 (controller), capable of controlling the stimulus (the signal generated by the controller) to vary the refractive index of the photonic crystals). Appellants provide no persuasive evidence or explanation as to why the Examiner’s explanation fails to

demonstrate that Moon's controller, when incorporated in Sharp's device, would have been capable of turning the photonic bandgap by controlling the stimulus to vary at least one of shape, volume, and effective refractive index of photonic crystals in the tunable photonic crystal filter. Appeal Br. 7.

Similarly, Appellants' assertion that Sharp teaches away from incorporating Moon's power supply 104 (controller) into Sharp's liquid crystal display device is not persuasive of reversible error (Appeal Br. 7–8) because Appellants fail to point to any disclosure in Sharp or Moon that criticizes, discredits, or otherwise discourages incorporating a power supply into Sharp's liquid crystal display device. *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004). Nor do Appellants argue that incorporating Moon's power supply into Sharp's liquid crystal display device would have been beyond the level of skill and creativity in the art.

Appellants contend that both Sharp and Moon disclose three separate color filters that correspond in a one-to-one manner within a single pixel. Appeal Br. 9 (citing Sharp, Fig. 4; Moon, Fig. 4). Thus Appellants argue that Sharp and Moon, alone or in combination, fail to teach or suggest

wherein the tunable photonic crystal filter and the white display unit correspond in a one-to-one manner within a single pixel of the at least one of the pixels configured to display the color image such that the color displayed by each of the pixels is determined by the single corresponding tunable photonic crystal filter, and the saturation and the brightness of the color displayed by each of the pixels is determined by the single corresponding white display unit,

as recited in claim 1. *Id.*

Appellants' argument is not persuasive of reversible error. Even if Moon's Figure 4 may disclose separate photonic crystal filters for a single

pixel, as Appellants argue, Moon is not limited to Figure 4. That is, Moon's disclosure also includes Figures 3A–3C, which allows for a single photonic crystal filter per pixel. Moon 4:15–30, Figs. 3A–3C.

Appellants argue that the Examiner does not point out where Moon discloses “a tunable photonic crystal filter configured to reflect light in a wavelength band of a selected color and to transmit light in a wavelength band other than the wavelength band of the selected color,” as recited in claim 1. Appeal Br. 10. Therefore, Appellants argue that Sharp and Moon, alone or in combination, fail to teach “pixels configured to display a color image, at least one of the pixels including . . . a tunable photonic crystal filter configured to reflect light in a wavelength band of a selected color and to transmit light in a wavelength band other than the wavelength band of the selected color, the wavelength band of the selected color being controlled based on a stimulus controlling a photonic bandgap of the tunable photonic crystal filter” as recited in claim 1. *Id.*

Appellants' arguments are not persuasive of reversible error because they fail to address or identify error in the Examiner's findings in the Final Office Action regarding Moon. On this record, it is undisputed that Moon teaches a filter that is a tunable photonic crystal filter. *See* Appeal Br. 6–12. Further, the Examiner finds, and Appellants do not dispute, that Moon teaches that its tunable photonic crystal filter in Figure 3B is capable of reflecting light in a wavelength band of a selected color and to transmit light in a wavelength band other than the wavelength band of the selected color. *Compare* Ans. 9–10 (citing Moon 5:7–12, 17–23, Fig. 3B), *with* Reply Br. 4–6.

Appellants' assertion that the Examiner does not provide a clear rationale including articulated reasoning that one of ordinary skill in the art would have been motivated to make the proposed combination of Sharp and Moon (Appeal Br. 10–11) is not persuasive of reversible error. Contrary to Appellants' argument, the Examiner has clearly articulated a reason for one of ordinary skill in the art to combine Sharp and Moon. Final Act. 12. Appellants do not address or identify harmful error in the Examiner's reasoning.

After considering the totality of the appeal record, including due consideration of Appellants' arguments and evidence, a preponderance of the evidence weighs in favor of the Examiner's conclusion of obviousness. Therefore, we sustain the Examiner's rejection of claims 1, 2, 6, 7, 11, 12 under pre-AIA 35 U.S.C. § 103(a) over Sharp in view of Moon.

Appellants simply argue that Dean does not cure the deficiencies of Sharp and Moon with regard to the rejection of claim 1. Appeal Br. 12. Because we do not find any deficiencies in the Examiner's rejection of claim 1 over Sharp and Moon, we likewise sustain the Examiner's rejection of claims 3, 8, 13 and 15 under pre-AIA 35 U.S.C. § 103(a) over Sharp in view of Moon and Dean.

*Claims 5 and 10*

Claims 5 depends from claim 1 and recites “wherein the tunable photonic crystal filter comprises[] a photonic crystal layer containing charged colloid particles dispersed in a solvent.” Appeal Br. 15 (Claims App.). Claim 10, which depends from claim 6, includes this same recitation. *Id.* at 16 (Claims App.).

The Examiner finds that Moon discloses a photonic crystal layer 101 (Fig. 3B) containing charged colloid particles dispersed in a solvent (i.e., an electro-optic material). Final Act. 13 (citing Moon 4:24–29).

Appellants contend that Moon discloses that a photonic bandgap is formed by filling empty space of an opal-structured photonic crystal, i.e., the space among colloidal particles, with an electro-optic material and regulating a difference of refractive indices of the electro-optic material and the colloidal particles. Appeal Br. 12 (citing Moon 3:55–59). Therefore, Appellants argue that Moon fails to teach or suggest “the tunable photonic crystal filter comprises[] a photonic crystal layer containing charged colloid particles dispersed in a solvent.” *Id.* at 11.

Appellants’ argument is not persuasive of reversible error. Although ordinarily the meaning of a solvent is a liquid in which a solute is dissolved, Appellants’ Specification gives no indication that the charged particles of its tunable photonic crystal filter are dissolved in a liquid solvent. Rather, Appellants’ Specification describes the charged colloid particles of its tunable photonic crystal filter as being dispersed in a medium. Spec. ¶ 39; Fig. 2. Thus, when given its broadest reasonable interpretation, we are not persuaded that the Examiner erred in determining that the scope of the claimed “solvent” recited in claims 5 and 10 encompasses a medium, such as an electro-optic material as disclosed in Moon (3:55–59). *In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997) (During prosecution, the PTO gives the language of the proposed claims “the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description

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contained in the applicant's specification.”). Thus, we sustain the Examiner's rejection of claims 5 and 10 under pre-AIA 35 U.S.C. § 103(a) over Sharp in view of Moon.

#### DECISION

The rejections of claims 1–3, 5–8, 10–13, and 15 are affirmed.

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

AFFIRMED