

The opinion in support of the decision being entered today was **not** written for publication and is **not** binding precedent of the Board.

Paper No. 16

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte NOBUYUKI KOBAYASHI and TAKUJI HATANO

Appeal No. 2004-0632
Application No. 09/748,312

ON BRIEF

Before KIMLIN, PAK, and WALTZ, Administrative Patent Judges.
WALTZ, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal from the primary examiner's final rejection of claims 1 through 12, which are the only claims pending in this application. We have jurisdiction pursuant to 35 U.S.C. § 134.

According to appellants, the invention is directed to a single liquid crystal element comprising a single liquid crystal layer disposed between a pair of substrates with an electrode and

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a functional thin film formed on at least one of the pair of substrates (Brief, paragraph bridging pages 3-4). Appellants have found that keeping the refractive index differences between 0.0 and 0.3 improves the contrast of the liquid crystal element, where this difference is between the largest refractive index and the smallest refractive index among the at least one of said pair of substrates, said functional thin film, and said electrode (Brief, page 4). Appellants state that claims 1-12 stand or fall together (Brief, page 8) and therefore we select and limit our consideration in this appeal to independent claim 1. See 37 CFR § 1.192(c)(7)(2000). Representative independent claim 1 is reproduced below:

1. A liquid crystal element, comprising:

a liquid crystal layer disposed between a pair of substrates, an electrode and a functional thin film formed on at least one of said pair of substrates,

wherein a refractive index difference between a largest refractive index and a smallest refractive index among refractive indexes of said at least one of said pair of substrates, said electrode formed on said at least one of said pair of substrates and said functional thin film formed on said at least one of said pair of substrates is in a range from 0 to 0.3.

The examiner has relied upon the following references as evidence of obviousness:

Stein et al. (Stein)
(filed Nov. 2, 1998)

6,322,860

Nov. 27, 2001

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Tamura et al. (Tamura) WO 99/44094 Sep. 02, 1999
(published International Patent Application)¹

Claims 1-12 stand rejected under 35 U.S.C. § 103 as unpatentable over Tamura in view of Stein (Answer, page 3, referring to the rejection as set forth in Paper No. 8). We *affirm* this ground of rejection for the reasons set forth below.

OPINION

The examiner finds that Tamura discloses a conventional liquid crystal cell comprising an ITO (indium tin oxide) electrode, a functional layer (transparent insulating layer 27 or the SiN/SiO layer as both are insulative), and an insulating substrate, where the index of refraction for the layers are within 0.2 of each other (Paper No. 8, unnumbered page 3). The examiner further finds that Tamura teaches that it was well known to match the index of refraction of different layers of a liquid crystal cell (*id.*). Furthermore, the examiner finds that the refractive index of the ITO electrode in Tamura is 1.9-2.0 (*id.*, citing Table 1), the refractive index of the gate insulating film is 1.5-1.6, the refractive index of glass is 1.5, and thus Tamura teaches a difference of 0.4 between the largest and smallest refractive indices of the substrate, the electrode (the ITO

¹We rely upon and cite from a full English translation of this document, previously made of record.

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layer) and the functional thin film (the gate insulating film) (Answer, paragraph bridging pages 5-6).² Therefore we determine that the examiner has found every limitation recited in claim 1 on appeal in the disclosure of Tamura, with the exception that the value of refractive indices difference in Tamura is 0.4 while the upper limit recited in claim 1 on appeal is 0.3 (Answer, page 6). These findings support a conclusion of *prima facie* obviousness.³ See *In re Peterson*, 315 F.3d 1325, 1329-30, 65 USPQ2d 1379, 1382 (Fed. Cir. 2003), citing *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). The closeness of the refractive index difference value found in Tamura with the claimed range would have resulted in an expectation of similar properties for the resultant liquid crystal cell. We note that appellants have not

²We note that the examiner's finding is slightly incorrect in that the refractive index of the glass substrate is "About 1.5" (see Tables 1 and 2, underlining added). Therefore the calculated difference in largest and smallest refractive indices between the electrode, substrate and functional thin film would be about 0.4, including values slightly above and below 0.4. See *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

³Accordingly, a discussion of the secondary reference to Stein is unnecessary to our decision.

relied upon any showing of unexpected results for the claimed range.⁴

Appellants argue that, while Tamura discloses ranges of refractive indices of particular materials that fall within the preferred ranges disclosed for similar elements of the present application, this reference, either alone or in combination with Stein, does not disclose or suggest forming the liquid crystal element in such a way as to satisfy the condition of claim 1 (Brief, pages 10 and 12). This argument is not persuasive. While Tamura only teaches a refractive index difference within 0.2 for the first three layers (substrate 21, gate insulating film 23, and transparent insulating film 27),⁵ Tamura discloses embodiments in Table 2 where the aforementioned refractive index differences are 0.4 while teaching that interface reflection at the boundary surface of the various films in a conventional liquid crystal cell is undesired and can be obviated by keeping the refractive indices of the various films within prescribed values (Tamura, page 5, last paragraph; and page 7, first

⁴Appellants have disclosed Comparative Examples 1 and 2 in the specification but have not discussed or relied upon these examples in the Brief (see the specification, pages 60-64).

⁵See Figure 2; page 7, part d); and Table 2, Key 4 (the difference in refractive index is only with the film above it).

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paragraph). Tamura also teaches that it is possible to change the refractive index of the ITO (electrode) film, thus also suggesting the control of this variable (page 6, first paragraph after Table 1).

For the foregoing reasons, we determine that the examiner has established a *prima facie* case of obviousness based on the reference evidence. Based on the totality of the record, including due consideration of appellants' arguments, we determine that the preponderance of evidence weighs most heavily in favor of obviousness. Accordingly, we affirm the examiner's rejection of the claims on appeal under 35 U.S.C. § 103 over Tamura in view of Stein.

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

AFFIRMED

Edward C. Kimlin)	
Administrative Patent Judge)	
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Chung K. Pak)	BOARD OF PATENT
Administrative Patent Judge)	APPEALS AND
)	INTERFERENCES
)	
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Thomas A. Waltz)	
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