

NOTE: This disposition is nonprecedential.

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

IN RE: URI COHEN,
Appellant

2018-1609

Appeal from the United States Patent and Trademark
Office, Patent Trial and Appeal Board in No. 12/471,557.

Decided: May 1, 2019

JOHN FRANKLIN SUMMERS, Caldwell Cassady & Curry,
Dallas, TX, for appellant. Also represented by HAMAD M.
HAMAD.

THOMAS W. KRAUSE, Office of the Solicitor, United
States Patent and Trademark Office, Alexandria, VA, for
appellee Andrei Iancu. Also represented by KAKOLI
CAPRIHAN, JOSEPH MATAL, ROBERT McBRIDE.

Before PROST, *Chief Judge*, REYNA and STOLL,
Circuit Judges.

PROST, *Chief Judge*.

Dr. Uri Cohen appeals from a decision of the Patent
Trial and Appeal Board (“Board”) affirming the Examiner’s

rejection of claims 3, 7, and 17 of U.S. Patent Application No. 12/471,557 (“the ’557 application”). For the following reasons, we affirm the Board’s decision.

I

The ’557 application “pertains to the field of electroplating metals or alloys for filling high aspect ratio openings, such as trenches and vias, for semiconductor metallization interconnects, thin film heads, or micromachined Microelectromechanical Systems (MEMS) devices.” J.A. 43 ll. 11–14.

Claim 1 of the ’557 application recites:

1. A method for depositing two or more seed layers for electroplating metallic interconnects over a substrate, the substrate having a patterned insulating layer which includes at least one opening and a field surrounding the at least one opening, the at least one opening having top corners, sidewalls, and a bottom, the field and the at least one opening being ready for depositing one or more seed layers, and the method comprising:

Depositing by a CVD technique a continuous first seed layer over the sidewalls and bottom of the at least one opening using a first set of deposition parameters; and

depositing a second seed layer over the first seed layer using a second set of deposition parameters; wherein

(i) the second set of deposition parameters includes at least one deposition parameter which is different from any of the deposition parameters in the first set of deposition parameters, or whose value

is different in the first and second sets of deposition parameters,

(ii) the thickness of the first seed layer is from about 50Å^[1] to not more than 400Å over the field,

(iii) the first and second seed layers are sufficiently thick over the field to enable uniform electroplating across the substrate, and

(iv) after depositing the seed layers, there is sufficient room for electroplating inside the at least one opening.

J.A. 37. The claims at issue in this appeal recite further limitations on the thickness of the first seed layer. Claim 3 recites that the thickness of the first seed layer is “from about 50Å to not more than 300Å over the field.” *Id.* Claims 7 and 17 recite that the thickness of the first seed layer is “from about 50Å to not more than 350Å” over the field. *Id.* at 38–39.

The Examiner rejected claims 3 and 7 as obvious over the combination of U.S. Patent No. 6,187,670 (“Brown”), U.S. Patent No. 6,065,424 (“Shacham-Diamand”), and applicant-admitted prior art, and rejected claim 17 as obvious over the same combination in further view of U.S. Patent No. 6,146,517 (“Hoinkis”). J.A. 1208, 1210–11, 1214–15. As to the applicant-admitted prior art, the “Background of the Invention” section of the specification discloses that it was “typical” to have seed layers deposited by chemical vapor deposition (“CVD”) with thicknesses of about 300Å to about 1000Å over the field. *See* J.A. 47 ll. 24–26 (“On the

¹ Å is the symbol for Angstrom, a unit of length equal to 10⁻¹⁰ meters.

other hand, *the typical thickness of about 300Å to about 1000Å (on the field)*, deposited by the CVD techniques, may not be sufficient.” (emphasis added). The specification further describes CVD layers as “conformal” and as “providing continuous and complete step coverage of the seed layer inside very narrow openings.” See J.A. 48 ll. 2–5. The Examiner found that this applicant-admitted prior art discloses continuous CVD layers as thin as 300Å, which overlapped the thickness ranges claimed in claims 3, 7, and 17, and that “discovering the optimum or working ranges involves only routine skill in the art.” See J.A. 1202, 1208, 1210–11, 1214–15.

The Board affirmed the Examiner’s rejections of claims 3, 7, and 17. The Board agreed with the Examiner that the “applicant-admitted prior art discloses that continuous CVD layers as thin as 300 angstroms were common in the prior art” and that “optimization of the thickness within the range of the prior art was a matter of routine skill in the art.” J.A. 12. The Board concluded that the Examiner did not err in determining that a person of ordinary skill in the art “would have been able to optimize the CVD seed layer thickness within the range that [the applicant] discloses was known in the prior art.” J.A. 13.

Dr. Cohen requested rehearing, but the Board maintained its affirmance of the Examiner’s rejection. See J.A. 27–30. Dr. Cohen timely appealed. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(4)(A).

II

A

Obviousness is a question of law based on underlying factual determinations. *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015). We review the Board’s ultimate obviousness determination de novo and underlying factual findings for substantial evidence. *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir.

2016). Substantial evidence is “more than a mere scintilla” and means “such relevant evidence as a reasonable mind might accept as adequate to support a conclusion.” *Biestek v. Berryhill*, 139 S. Ct. 1148, 1154 (2019) (quoting *Consol. Edison Co. v. NLRB*, 305 U.S. 197, 229 (1938)).

B

Dr. Cohen argues that the admitted prior art does not disclose continuous CVD seed layers having a thickness of less than 375Å over the field. See Appellant’s Br. 5, 9–17. Dr. Cohen acknowledges that his specification discloses that CVD seed layers as thin as 300Å over the field were typical but argues that it does not disclose *continuous* CVD seed layers that thin. *Id.* at 9. For support, Dr. Cohen points to the testimony of Dr. Robin Cheung, who opined that the CVD layer must be 375Å to 500Å over the field to be continuous. *Id.* at 9–10. The Examiner and the Board considered this testimony and determined that it was unpersuasive in light of the admitted prior art. See J.A. 1533 (Examiner’s Answer), J.A. 28–30 (Board Decision on Request for Rehearing). Substantial evidence supports the Board’s finding that the admitted prior art discloses that continuous CVD layers as thin as 300Å were common in the prior art. While the specification teaches that PVD techniques “fail to provide continuous and complete step coverage,” J.A. 47 ll. 28–29, it discloses that CVD techniques *do* provide such coverage: “[t]he conformal CVD or electroless techniques, on the other hand, *while providing continuous and complete step coverage* of the seed layer inside very narrow openings, pinch-off the small openings when used at thicknesses required on the field for a low-resistance electrical path.” J.A. 48 ll. 2–5 (emphasis added).

Next, Dr. Cohen argues that the above disclosure about conformal CVD techniques was ambiguous and that the Board improperly resolved the ambiguity against Dr. Cohen by finding that CVD techniques provide continuous

layers. Appellant's Br. 11–17. According to Dr. Cohen, the disclosed CVD techniques are continuous “only when sufficiently thick to provide a low-resistance electrical path.” *Id.* at 10. Even if there were an ambiguity, if the “evidence in record will support several reasonable but contradictory conclusions, we will not find the Board's decision unsupported by substantial evidence simply because the Board chose one conclusion over another plausible alternative.” *In re Jolley*, 308 F.3d 1317, 1320 (Fed. Cir. 2002). Dr. Cohen concedes that the Board's interpretation of the admitted prior art was grammatically defensible. Appellant's Br. 15 (“Dr. Cohen does not dispute that the Office's interpretation is reasonable, at least in the abstract. . . . [T]he Office's reading may be grammatically defensible . . .”). Moreover, earlier statements in the specification support the Board's interpretation of this disclosure. The prior paragraph explains that seed layers can be deposited by PVD techniques or CVD techniques and lists disadvantages of each. First, the specification states that seed layers deposited by CVD techniques, with a typical thickness of about 300Å to about 1,000Å “may not be sufficient” to ensure a “sufficiently low-resistance seed layer.” J.A. 47 ll. 22–26. The specification does not state that these CVD-deposited seed layers are not continuous. Rather, the following text criticizes *only* the “non-conformal PVD techniques” as “fail[ing] to provide continuous and complete step coverage.” J.A. 47 ll. 27–29. Accordingly, other parts of the specification are consistent with and support the Board's reading of the disputed disclosure.

Finally, Dr. Cohen argues that a person of ordinary skill in the art would not have achieved the continuous CVD seed layers having the claimed thicknesses through routine optimization. *See id.* at 5–9. Specifically, Dr. Cohen contends that “there is nothing in the Examiner's cited references to show that these sub 375 angstrom ranges were known, or the type of mere optimization within the reach of the skilled artisan.” *Id.* at 7. This, however,

overlooks the disclosure in the specification that CVD layers as thin as 300Å were common in the prior art. Substantial evidence supports the Examiner's and the Board's determination that the specification discloses that continuous CVD layers as thin as 300Å were known in the art and that the thickness ranges of claims 3, 7, and 17 overlap with 300Å. Substantial evidence therefore supports the Examiner's and the Board's rejection of these claims over the admitted prior art. *See E.I. DuPont de Nemours & Co. v. Synvina C.V.*, 904 F.3d 996, 1006 (Fed. Cir. 2018) ("For decades, this court and its predecessor have recognized that 'where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.'" (quoting *In re Aller*, 220 F.2d 454, 456 (CCPA 1955))).

We have considered Dr. Cohen's remaining arguments and find them unpersuasive.

III

We hold that substantial evidence supports the Board's conclusion that claims 3, 7, and 17 of the '557 application are unpatentable as obvious over the combined teachings of the cited references and applicant-admitted prior art. We therefore affirm the Board's decision.

AFFIRMED