

NOTE: This disposition is nonprecedential.

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

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**VICOR CORPORATION,**  
*Appellant*

v.

**SYNQOR, INC.,**  
*Appellee*

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2016-2282

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Appeal from the United States Patent and Trademark  
Office, Patent Trial and Appeal Board in No. 95/001,853.

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Decided: August 30, 2017

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MATTHEW A. SMITH, Smith Baluch LLP, Washington,  
DC, argued for appellant. Also represented by ANDREW T.  
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gued for appellee. Also represented by CONSTANTINE L.  
TRELA, JR., BRYAN C. MULDER.

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Before LOURIE, TARANTO, and CHEN, *Circuit Judges*.

CHEN, *Circuit Judge*.

Vicor Corporation (Vicor) appeals from a decision of the Patent Trial and Appeal Board (Board) reversing certain examiner rejections in an *inter partes* reexamination of U.S. Patent No. 7,564,702 (the '702 patent), owned by SynQor Inc. (SynQor). The Board held that the challenged claims of the '702 patent were patentable as non-obvious over Vicor's proposed prior art combinations. Because the Board's factual findings are supported by substantial evidence and the Board's conclusions of non-obviousness are not erroneous, we *affirm*.

#### BACKGROUND

The '702 patent covers direct current-to-direct current (DC-DC) power conversion technology. *See* '702 patent col. 1 ll. 22–25. In particular, the '702 patent claims systems and methods for converting a DC voltage to one or more lower DC voltages by using a non-regulating isolation stage and subsequently regulating the lower voltages using non-isolating switching regulators. *See, e.g., id.* col. 17 ll. 2–39. Claim 1 is representative and recites the following:

A DC-DC power converter system providing plural regulated DC outputs, each having a regulated voltage, comprising:

- (a) a DC input providing an input voltage that varies over a range that is more than plus or minus a few percent;
- (b) a ***non-regulating isolating step-down converter*** through which power from the DC input flows first before flowing through any regulation stage, the non-regulating isolating step-down converter providing a non-regulated, isolated DC output having a non-regulated voltage and comprising:

(i) at least one transformer that is not driven into saturation, the at least one transformer having plural windings including at least one primary winding and at least one secondary winding;

(ii) plural power MOSFET switches in circuit with the at least one primary winding, the plural power MOSFET switches causing power to flow into the at least one primary winding;

(iii) control circuitry coupled to the plural MOSFET switches, the control circuitry determining when the power MOSFET switches are turned on and off in a switching cycle at a switching frequency; and

(iv) ***plural controlled rectifiers*** in circuit with the at least one secondary winding, each having a parallel uncontrolled rectifier, each controlled rectifier being turned on for an on-state time and off for an off-state time in synchronization with a voltage waveform of the at least one primary winding to provide the non-regulated, isolated DC output, the voltage waveform of the at least one primary winding having a fixed duty cycle and transition times which are short relative to the on-state and the off-state times of the controlled rectifiers; and

(c) ***plural non-isolating down-converter switching*** regulators, each receiving power from the non-regulated, isolated DC output and each providing one of the regulated DC outputs having a regulated voltage.

*Id.* (emphases added). All of the claims of the '702 patent at issue in this appeal require the three limitations shown in emphasis in claim 1 above, namely: (1) a non-regulating isolation component, (2) controlled rectifiers (included as part of the non-regulating isolation component), and (3) plural non-isolating switching regulators.

Vicor requested *inter partes* reexamination of the '702 patent on December 14, 2011. J.A. 98–133. The U.S. Patent and Trademark Office granted the request on January 19, 2012. J.A. 135–52. The proposed rejections at issue in this appeal principally relied on three prior art references: Cobos,<sup>1</sup> Pressman,<sup>2</sup> and Kassakian.<sup>3</sup> Two combinations of these references are pertinent to this appeal. The first is Cobos in view of Pressman, which was used to challenge claims 1, 2, 26–29, 53–55, 67–76, 78, 81, 82, 85, 86, and 89 (Cobos-Pressman). J.A. 142 (rejections I–III).<sup>4</sup> The second is Pressman in view of Kassakian,

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<sup>1</sup> J.A. Cobos & J. Uceda, Low Output Voltage DC/DC Conversion, IEEE 20th Int'l Conf. on Indus. Elecs., Control and Instrumentation, at 1676–81 (September 5–9, 1994).

<sup>2</sup> Abraham I. Pressman, Switching and Linear Power Supply, Power Converter Design (1977).

<sup>3</sup> John G. Kassakian & Martin F. Schlecht, High-Frequency High-Density Converters for Distributed Power Supply Systems, 76 Proc. IEEE 362 (Apr. 1988).

<sup>4</sup> The Cobos-Pressman rejections also referenced Milan M. Jovanovic et al., *Distributed Power Systems—Benefits and Challenges*, 77 Int'l J. Electronics 601 (1994)

which was used to challenge claims 1–3, 12–20, 23, 26, 28–30, 39–43, 44–47, 50, 53, 55, 56, 64, 67, 69, 70–76, 78, 80–82, 84–86, 88, and 89 (Pressman-Kassakian). J.A. 143 (rejections VII and VIII). The examiner adopted both sets of rejections.

The Cobos-Pressman rejections relied on Cobos to supply the non-regulating isolation component required by the claims. See J.A. 147 (examiner incorporating by reference Vicor’s proposed rejections (J.A. 114–21)). In response to the rejections, SynQor argued that Cobos did not disclose an unregulated isolation component because the relevant component from Cobos utilized a pulse-width modulated (PWM) topology which incorporated “feedback control circuitry” to regulate output voltage. J.A. 197. Although this feedback control circuitry is not explicitly shown in Cobos, SynQor presented testimony by SynQor’s CEO and the sole inventor of the ’702 patent—Dr. Martin Schlecht—that “such a design would have been inherent in the PWM architecture.” J.A. 198. SynQor also averred that the output voltage of Cobos’s alleged non-regulated isolating component—3.3 volts—was evidence of regula-

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(Jovanovic), as evidence of motivation to combine Cobos and Pressman. The Jovanovic reference is not relevant to the disposition of this appeal, because Cobos—the sole reference relied on for disclosure of a non-regulated isolation component—does not disclose an unregulated isolation component, as discussed below. At oral argument, Vicor argued that Jovanovic could serve as an independent basis for altering Cobos to be non-regulating, even if Cobos were found to be regulating on its face. Oral Argument at 6:01–6:34, *available at* <http://oralarguments.cafc.uscourts.gov/default.aspx?fl=2016-2282.mp3>. This argument was never raised before the Board and was therefore waived. See *In re Baxter Int’l, Inc.*, 678 F.3d 1357, 1362 (Fed. Cir. 2012).

tion, because such a specific voltage level, intended for powering logic boards, would need to be “tightly regulated and not vary more than plus or minus a few percent.” J.A. 197. The Board agreed with SynQor’s positions and reversed the examiner’s rejections. J.A. 26–27.

The Pressman-Kassakian rejections relied on Pressman for both the non-regulating isolation component and the plural non-isolating switching regulators but proposed replacing Pressman’s diode rectifiers with controlled rectifiers as taught by Kassakian. *See* J.A. 44–46. Specifically, the rejections proposed combining a non-regulated DC power source from Pressman Figure 3-3 with switching regulators and other components from Pressman Figure 3-4(B) and, in the process, removing a pre-regulator from Figure 3-4(B) to remove regulation from the isolation stage. *Id.* For the “controlled rectifiers” limitation of the claims, the rejections proposed incorporating Kassakian’s synchronous rectifiers in place of diode rectifiers in the Pressman combination. J.A. 46. SynQor argued to the Board that (1) there was no suggestion in Pressman to make the Pressman combination’s isolation stage non-regulating by removing Figure 3-4(B)’s pre-regulator and (2) incorporating Kassakian’s synchronous rectifiers into Pressman would be “beyond the ordinary skill in the art.” J.A. 554–55. The Board again agreed with SynQor and reversed the examiner’s rejections. J.A. 47.

Vicor timely appealed to this court. We have jurisdiction under 28 U.S.C. § 1295(a)(4)(A).

#### DISCUSSION

We review the Board’s legal determinations *de novo* and its factual findings underpinning those determinations for substantial evidence. *ACCO Brands Corp. v. Fellowes, Inc.*, 813 F.3d 1361, 1365 (Fed. Cir. 2016). “A finding is supported by substantial evidence if a reasonable mind might accept the evidence to support the find-

ing.” *K/S Himpp v. Hear-Wear Techs., LLC*, 751 F.3d 1362, 1364 (Fed. Cir. 2014) (citation omitted). Obviousness “is a question of law based on underlying findings of fact.” *In re Gartside*, 203 F.3d 1305, 1316 (Fed. Cir. 2000) (citation omitted). The factual analysis is framed by the factors set out in *Graham v. John Deere Co. of Kansas City*: (1) “the scope and content of the prior art,” (2) “differences between the prior art and the claims at issue,” (3) “the level of ordinary skill in the pertinent art,” and (4) “secondary considerations” such as “commercial success, long felt but unsolved needs,” and “failure of others.” 383 U.S. 1, 3 (1966).

### I. Cobos-Pressman

Vicor contends that the Board erred in reversing the examiner’s rejections based on the Cobos-Pressman combination, arguing that no substantial evidence supports the Board’s finding that Cobos fails to teach a non-regulated isolation component. In particular, Vicor argues that Dr. Schlecht’s testimony regarding PWM control circuitry “could not have been credited by a reasonable factfinder, because Dr. Schlecht has an interest in the outcome.” Open. Br. 47. SynQor counters that the Board was aware of Dr. Schlecht’s interest in the litigation and that the Board was entitled to weigh his credibility and rely on his testimony, in combination with other evidence such as the specific voltage output of Cobos’s isolation stage, as substantial evidence underpinning the Board’s decision. We agree with SynQor.

“We defer to the Board’s findings concerning the credibility of expert witnesses.” *Yorkey v. Diab*, 601 F.3d 1279, 1284 (Fed. Cir. 2010). The Board expressly acknowledged Dr. Schlecht’s interest in the outcome of the litigation and nevertheless found his testimony to be “reasonable and largely unrefuted by persuasive evidence.” J.A. 26. The Board also took into consideration the evidence regarding Cobos’s 3.3-volt output and found

that Cobos's isolation stage was "generally regulated," as argued by SynQor. These fact findings by the Board constitute substantial evidence which supports the Board's ultimate determination of nonobviousness. Because Cobos is the only reference relied on to supply a non-regulated isolation component in this proposed combination, and because it does not disclose such a component, the Board did not err in reversing the Cobos-Pressman rejections.

## II. Pressman-Kassakian

Vicor argues that the Board erred as a matter of law in holding that it would not have been obvious to combine Pressman Figures 3-3 and 3-4(B) because the Board made factual findings that ineluctably lead to a conclusion that it would be obvious to combine the two figures. We agree with Vicor on this point but, for the reasons below, hold that the Board's error on this issue was harmless. As noted by SynQor, Figure 3-4(B) includes a pre-regulator that renders the depicted embodiment a *regulating* isolation stage. *See* J.A. 851–52. But Pressman contemplates removal of the pre-regulator under the facts as found by the Board. Specifically, the Board found that Figure 3-4(B) was "a modified version of Figure 3-4(A)." This finding is supported by substantial evidence. *See, e.g.,* J.A. 851–52 (depicting Figure 3-4(B) as an extension of Figure 3-4(A) and explaining modifications made to Figure 3-4(A) to arrive at Figure 3-4(B)). This finding is important because Pressman also states that the pre-regulator in Figure 3-4(A), which is inherited by Figure 3-4(B), is *optional*. J.A. 851 ("[E]ach post-regulator [i.e., switching regulator] can give adequately constant voltage *without pre-regulation* and the cost and parts count of the pre-regulator [in Figure 3-4(A)] can be saved." (emphasis added)). Moreover, Pressman states that "[t]he schemes of Figures 3-3 and 3-4 can be used with only one transformer secondary winding and one filter capacitor to generate a multiplicity of different output voltages at high



efficiency as shown in Fig. 3-4(B)” and that “[t]his becomes possible by the use of switching post-regulators.” J.A. 852. Thus, Pressman effectively discloses an alternative embodiment of Figure 3-4(B) which omits a pre-regulator and adopts Figure 3-3’s front end. This alternative embodiment would be a non-regulating isolation stage.

Regarding the proposed incorporation of Kassakian’s synchronous rectifiers into Pressman, Vicor argues that the Board erred by requiring “bodily incorporation” of Kassakian’s synchronous rectifiers into Pressman. Open. Br. at 46 (quoting *In re Keller*, 642 F.2d 413, 425 (CCPA 1981)). We disagree that the Board so required. The Board instead opined that Vicor failed to prove that a person of ordinary skill in the art would be able to incorporate controlled rectifiers into Pressman in view of Kassakian. *See* J.A. 47. This finding is supported by substantial evidence. Kassakian discloses experimental synchronous rectifiers for use in a particular resonant topology without any guidance as to how such rectifiers could be modified for use in a square-wave circuit such as Pressman’s. *See* J.A. 804 (Pressman disclosing square-wave topology); J.A. 2021–23 (Kassakian disclosing experimental resonant topology). Dr. Schlecht, who co-authored the Kassakian reference, explained in testimony submitted to the Board that the Kassakian article “discussed advanced research” conducted by Drs. Kassakian and Schlecht at MIT, and that the “technical discussions therein were not directed to persons having ordinary skill, but to persons highly skilled in the field.” J.A. 1335. There is no evidence in the record that Kassakian’s synchronous rectifiers would be transferrable to a square-wave system. The Board was free to weigh the foregoing evidence and determine that a person of ordinary skill would not know how to combine Kassakian with Pressman. Because this serves as an independent basis to find the combination of Pressman and Kassakian non-obvious,

the Board's error with respect to the combination of Pressman Figures 3-3 and 3-4(B) was harmless, and we affirm the Board's ultimate decision on the Pressman-Kassakian combination.

CONCLUSION

The decision of the Board is *affirmed*.

**AFFIRMED**

COSTS

No costs.