

NOTE: This disposition is nonprecedential.

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

WAVETRONIX LLC,
Appellant

v.

SMART MICROWAVE SENSORS GMBH,
Appellee

2017-2328

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board in No. IPR2016-00488.

Decided: August 31, 2018

BRENT P. LORIMER, Workman Nydegger, Salt Lake City, UT, argued for appellant. Also represented by DAVID P. JOHNSON, DAVID R. TODD, THOMAS R. VUKSINICK.

ANDREW M. CALDERON, Roberts Mlotkowski Safran Cole & Calderon, P.C., McLean, VA, argued for appellee. Also represented by ANDREW D. WRIGHT.

Before LOURIE, O'MALLEY, and WALLACH, *Circuit Judges*.

LOURIE, *Circuit Judge*.

Wavetronix LLC appeals from the final written decision of the United States Patent and Trademark Office Patent Trial and Appeal Board (“the Board”) in an *inter partes* review determining that claims 9, 10, 12, 13, 22, 23, and 25 of U.S. Patent 6,693,557 are unpatentable as anticipated or obvious, or both. *See generally Smart Microwave Sensors GmbH v. Wavetronix LLC*, No. IPR2016-00488, 2017 WL 3034507 (P.T.A.B. July 17, 2017) (“*Decision*”). Because the Board did not err in its decision, we *affirm*.

BACKGROUND

Wavetronix owns the ’557 patent directed to a traffic sensor for detecting and monitoring vehicles on a roadway. *See* ’557 patent Abstract. The specification explains that the “science and engineering of traffic planning and control has long relied on the use of sensor devices designed” for use in “urban planning, public safety and traffic control.” *Id.* col. 1 ll. 23–27. The present sensor invention employs an improved “planar design,” which is the “result of controlled manufacturing processes for forming controlled interconnects and structures on replicable circuit boards.” *Id.* col. 2 ll. 53–57. The circuit board includes “transmit and receive antennas for radiating a signal toward a vehicular target and for receiving the signal as reflected from the vehicular target.” *Id.* col. 2 ll. 62–65; *see also id.* fig. 1. The reflected signals may then be filtered, amplified, and converted to digital signals, *see id.* col. 9 l. 3–col. 10 l. 6, for generating “the desired traffic statistics for use in traffic analysis, control, and forecasting,” *id.* col. 10 ll. 11–15.

Independent claim 9 is representative and reads as follows:

9. An above-ground traffic sensor for detecting vehicles traveling on a roadway, the traffic sensor comprising:

a radio frequency circuit board including:

a transmit portion that includes:

a digitally generated modulated signal generator that digitally generates a signal that is transmitted by a transmitter towards vehicles traveling on a roadway; and

a receiver portion that *detects a reflected signal from the vehicles traveling on the roadway* and that generates a data signal that represents *traffic data* from the reflected signal.

Id. col. 11 ll. 21–32 (emphases added).

Smart Microwave Sensors GmbH (“SMS”) filed a petition for *inter partes* review of claims 9, 10, 12, 13, 22, 23, and 25 of the ’557 patent. Claim 22, the only other independent claim challenged, is substantively the same as claim 9 except that it does not require the sensor to comprise a single “radio frequency circuit board.” *Compare id.* col. 11 ll. 21–32 (claim 9), *with id.* col. 12 ll. 49–61 (claim 22). Claims 10, 12, 13, 23, and 25 are not separately argued on appeal. *See* Appellant’s Br. 49.

SMS asserted multiple grounds of unpatentability and the Board instituted review on all the challenged claims and grounds. SMS first alleged that U.S. Patent 5,506,584 (“Boles”) anticipated claim 22 and U.S. Patent 6,085,151 (“Farmer”) anticipated claims 22, 23, and 25. Boles teaches a radar sensor that can measure a vehicle’s range and speed. *See* Boles Abstract, col. 2 ll. 6–11. Farmer discloses a radar sensor for use in collision avoidance systems that estimates the time to impact of an

object colliding with a host vehicle. *See* Farmer col. 4 ll. 12–14. Farmer also discloses the use of a “direct digital synthesizer (DDS)” for generating signals. *Id.* col. 8 ll. 13–16.

SMS next asserted several obviousness grounds relying on Boles, Farmer, and U.S. Patent 5,008,678 (“Herman”) as the primary references. SMS asserted that (1) claim 9 would have been obvious over Boles in view of Herman or U.S. Patent 5,423,080 (“Perret”); (2) claims 9 and 12 would have been obvious over Farmer in view of Herman; and (3) claims 9 and 22 would have been obvious over Herman in view of Farmer. Both Herman and Perret disclose the advantages of fabricating devices on a single printed circuit board. Herman teaches a radar sensor that generates a signal of “any desired type” for sensing objects in proximity to a vehicle, including the vehicle’s blind spot. *See* Herman Abstract, col. 3 ll. 34–39. Herman’s sensor is preferably fabricated on “a single printed circuit board” to “facilitate the manufacture of the [] sensor . . . at low cost on a commercial production basis.” *Id.* col. 4 ll. 21–29; *see also id.* col. 2 ll. 6–11. Perret discloses a microwave circuit that is mounted to a single printed circuit board. *See* Perret Abstract, col. 1 ll. 53–55. It notes that one of the benefits of a single circuit board is reducing the “substantial risks of microwave leakage.” *Id.* col. 1 ll. 45–46; *see also id.* col. 1 ll. 52–60.

SMS also asserted obviousness against claims 10, 12, and 13 based on the above three combinations in further view of additional references.¹ However, on appeal, Wavetronix does not challenge the Board’s findings with respect to the teachings of those additional references or

¹ U.S. Patent 6,373,427 (“Hohne”); Ken Gentile & Rick Cushing, Analog Devices, Inc., *A Technical Tutorial on Digital Signal Synthesis* (1999) (“Analog Devices”); U.S. Patent 6,061,035 (“Kinasewitz”).

their combinability with the three combinations listed above.

In its final written decision, the Board concluded that all of the challenged claims were unpatentable as anticipated or obvious, or both. *See Decision*, 2017 WL 3034507, at *25. The Board construed “traffic data,” a term present in both challenged independent claims, to mean “any data generated or produced from a signal reflected off vehicles on a roadway.” *Id.* at *7. The Board based its construction on the claim language in light of the specification. *See id.* at *4–5. The Board declined to adopt either parties’ construction because neither party properly accounted “for the plain meaning . . . in the context of surrounding claim language.” *Id.* at *4. Specifically, the Board rejected Wavetronix’s arguments that the construction must include data of “all or substantially all of the vehicles” and that it be linked to a “particular section of the roadway,” because it found that the specification did not support such a construction. *See id.* at *4–5. Additionally, the Board found the testimony of Dr. Hawkins, Wavetronix’s expert, unpersuasive because he admitted that there was no widely accepted industry definition of “traffic data.” *See id.* at *5.

Based on its construction, the Board determined that both Boles and Farmer taught “traffic data.” Specifically, the Board found that Boles discloses detecting the excessive speed of a single vehicle. *See id.* at *16. The Board also found that Farmer taught a radar system that detects “objects (including vehicles) on the roadway proximate” to a host vehicle. *Id.* at *19. Based in part on those findings, the Board concluded that claim 22 was anticipated by Boles, and claims 22, 23, and 25 were anticipated by Farmer. *See id.* at *16, *19.

The Board also determined that the challenged claims would have been obvious over the asserted combinations of prior art references, relying on Boles, Farmer, and

Herman as primary references. First, the Board concluded that claim 9 would have been obvious over Boles in view of Herman or Perret. *See id.* at *18. The Board found that both Herman and Perret expressly taught the advantages of a single circuit board, which is a disclosure that is missing from Boles and required by claim 9. *See id.* at *17. According to the Board, a person of ordinary skill in the art would have been motivated to combine Boles with either Herman or Perret to obtain the “express benefits of a single circuit board,” *id.*, and avoid the drawbacks such as the “risks of microwave leakage” as discussed in Perret, *see* Perret col. 1 ll. 45–46.

Second, the Board concluded that claims 9 and 12 would have been obvious over Farmer in view of Herman. Once again, the Board found that an ordinarily skilled artisan would have been motivated to combine the references to “achieve the well-known benefits of integrated manufacturing and associated lower costs” of the single circuit board disclosed in Herman, but missing in Farmer. *See Decision*, 2017 WL 3034507, at *20. On appeal, Wavetronix does not separately argue claim 12.

Third, the Board concluded that claims 9 and 22 would have been obvious over Herman in view of Farmer. The Board found that Herman taught a transmitter that generates a signal of “any desired type”; although it failed to disclose its details, Farmer discloses the details of a direct digital synthesizer (“DDS”), which is a type of digital transmitter. *See id.*

Based in part on those findings, the Board concluded that the asserted prior art combinations using Boles, Farmer, or Herman as the primary references rendered claims 9, 10, 12, 13, and 22 obvious. *See id.* at *18–22. In conjunction with its determination that claims 22, 23, and 25 were anticipated, the Board concluded that all the challenged claims were unpatentable. *See id.* at *25.

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

DISCUSSION

We review the Board’s legal determinations *de novo*, *In re Elsner*, 381 F.3d 1125, 1127 (Fed. Cir. 2004), and the Board’s factual findings underlying those determinations for substantial evidence, *In re Gartside*, 203 F.3d 1305, 1316 (Fed. Cir. 2000). A finding is supported by substantial evidence if a reasonable mind might accept the evidence to support the finding. *Consol. Edison Co. v. NLRB*, 305 U.S. 197, 229 (1938). We review the Board’s claim constructions *de novo* “and its underlying factual determinations involving extrinsic evidence for substantial evidence.” *Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1297 (Fed. Cir. 2015) (citing *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 135 S. Ct. 831, 841–42 (2015)).

“Anticipation is a question of fact reviewed for substantial evidence.” *In re Rambus, Inc.*, 753 F.3d 1253, 1256 (Fed. Cir. 2014). Obviousness is a question of law based on underlying factual findings, including “the scope and content of the prior art, differences between the prior art and the claims at issue, the level of ordinary skill in the pertinent art, and any objective indicia of non-obviousness.” *Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013) (citing *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007)). Whether a person of ordinary skill in the art would have been motivated to combine the prior art is a question of fact that we review for substantial evidence. *See In re NuVasive, Inc.*, 842 F.3d 1376, 1381–82 (Fed. Cir. 2016).

I. Claim Construction

Wavetronix first argues that the Board erred in its construction of “traffic data.” According to Wavetronix, the Board’s construction, which incorporates the phrase “any data,” is unreasonably broad because it reads out the

word “traffic.” Additionally, Wavetronix contends that the Board’s construction is not reasonable in light of the specification. Specifically, Wavetronix argues that the specification describes the field of invention as traffic engineering, and the proper construction of “traffic data” must therefore be relevant to traffic engineering. According to Wavetronix, the proper construction is “data about the movement of *all or substantially all of the vehicles on a fixed section of the roadway*, generated from signals reflected off the vehicles.”² Appellant’s Br. 30 (emphases added). Without these attributes, Wavetronix argues that the data would be “useless for purposes of traffic analysis and traffic control.” Appellant’s Br. 32.

SMS responds that the Board’s construction of “traffic data” was proper under the broadest reasonable interpretation standard. According to SMS, the specification did not set forth a clear definition of “traffic data,” and the Board’s construction was the broadest reasonable interpretation that was consistent with the specification. Specifically, SMS points to the Summary of the Invention cited by the Board, which broadly describes a “vehicle sensor for detecting and monitoring vehicular targets.” Appellee’s Br. 13 (quoting ’557 patent col. 2 ll. 51–57). Moreover, the term “traffic data,” SMS contends, is not limited in the specification, and it would not be appropriate to add limitations regarding “how many vehicles are included in traffic data; how the traffic data [are] derived

² We note that Wavetronix argues a different claim construction on appeal from what it argued before the Board, changing, for example, the word “particular” to “fixed.” *Compare* Appellant’s Br. 30, *with* J.A. 1384. However, because we ultimately do not agree with either one of Wavetronix’s proposed claim constructions, the differences in its proposed claim constructions do not impact the outcome.

from the reflected signal; where the traffic data [are] obtained; and any degree of quality and/or usefulness of the traffic data.” *Id.* at 14. SMS also highlights the testimony of Dr. Hawkins, Wavetronix’s expert, who conceded that a standard definition of “traffic data” does not exist.

We agree with SMS that the Board’s construction of “traffic data” as “any data generated or produced from a signal reflected off vehicles on a roadway” was not unreasonable. *See Decision*, 2017 WL 3034507, at *4; *see also* J.A. 1048–49. In an *inter partes* review, claims are given their “broadest reasonable interpretation in light of the specification of the patent in which it appears.” 37 C.F.R. § 42.100(b); *see also Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142–46 (2016). “[B]ecause patentees frequently use terms idiosyncratically, the court looks to” sources including “the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1314 (Fed. Cir. 2005) (en banc) (internal citations omitted). From this list of sources, “the claims themselves provide substantial guidance as to the meaning of particular claim terms.” *Id.* (internal citations omitted). Additionally, the claims, which are part of “a fully integrated written instrument . . . consisting principally of a specification that concludes with the claims,” must also “be read in view of the specification.” *Id.* at 1315 (internal quotation marks and citations omitted). Accordingly, the specification “is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.” *Id.* (quoting *Vitronics Corp. v. Conception, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996)).

Beginning with the claim language, claim 9 recites “a receiver portion that detects a *reflected signal from the*

vehicles traveling on the roadway,” which “represents *traffic data.*” ’557 patent col. 11 ll. 29–32 (emphases added). Claim 22 similarly recites “a receiver portion . . . receiving *reflections of the modulated signal from vehicles on the roadway,*” which “are processed to produce *traffic data.*” *Id.* col. 12 ll. 56–61 (emphases added). Both claims expressly define “traffic data” in terms of the reflected signals from the “vehicles traveling on the roadway.” *See id.* col. 11 ll. 29–32, col. 12 ll. 56–61. The claims do not recite any specifics regarding how many vehicles must be included nor do they limit the roadway to any fixed section.

The written description further supports this construction. The written description broadly describes the invention as a “vehicle sensor for detecting and monitoring vehicular targets,” *id.* col. 2 ll. 52–53, and neither expressly defines “traffic data” nor provides any disclosure that requires the construction to include “all or substantially all of the vehicles” or be tied to a “fixed section of the roadway.” Traffic can include many vehicles or fewer vehicles, or, in the latter case, only one vehicle. In fact, Wavetronix conceded during the oral hearing before the Board that data on one vehicle could still be considered “traffic data.” *See Decision*, 2017 WL 3034507, at *5–6 (citing J.A. 3401, 3405–06).

Wavetronix’s argument that the claim construction must include “all or substantially all of the vehicles” or be tied to a “fixed section of the roadway” so that it is useful to traffic engineers is unconvincing. While the specification does mention the use of sensors in the “science and *engineering* of traffic planning and control,” ’557 patent col. 1 l. 24 (emphasis added), that is the only time “engineering” is mentioned in the entire specification. We have held that a claim construction that does not account for repeated and consistent descriptions of an invention may be unreasonably broad. *See In re Smith Int’l, Inc.*, 871 F.3d 1375, 1382–83 (Fed. Cir. 2017). However, this is not

such a case. Here, the specification describes the invention within the context of traffic engineering only once. That is not the repeated consistency required to endow the claims with traffic engineering meaning. *Cf. In re Am. Acad. of Sci. Tech Ctr.*, 367 F.3d 1359, 1369 (Fed. Cir. 2004) (“We have cautioned against reading limitations into a claim from the preferred embodiment described in the specification, even if it is the only embodiment described, absent clear disclaimer in the specification.” (internal citations omitted)). The Board thus properly declined to limit the claims to the field of traffic engineering.

The Board additionally considered extrinsic evidence—the testimony of Dr. Hawkins, Wavetronix’s expert. Generally, we have viewed extrinsic evidence as “less reliable” than intrinsic evidence. *See Phillips*, 415 F.3d at 1318. Dr. Hawkins testified that the definition of “traffic data” must relate to the movement of vehicles on a *particular* section of the roadway and must include *all or substantially all of the vehicles* to incorporate the essential attributes of traffic data in the context of traffic engineering. *See Decision*, 2017 WL 3034507, at *5 (citing J.A. 1848–54). However, Dr. Hawkins also admitted during his deposition that his definition was likely not the only possible definition and that there could be “multiple definitions” of the term. *Id.* (quoting J.A. 2967). As a result, the Board determined that there was no widely accepted industry definition of “traffic data” and that it is unclear whether a person of ordinary skill in the art would have even agreed with Dr. Hawkins’s definition. *See id.* The Board thus found this testimonial evidence insufficient to support Wavetronix’s proposed construction. *See id.* at *5–6. As we give deference to “the Board’s findings concerning the credibility of expert witnesses,” *Yorkey v. Diab*, 601 F.3d 1279, 1284 (Fed. Cir. 2010) (internal citations omitted), we see no error in the Board’s decision not to rely on Dr. Hawkins’s inconclusive testi-

mony in construing “traffic data,” *see Phillips*, 415 F.3d at 1318 (stating that “conclusory, unsupported assertions by experts as to the definition of a claim term are not useful to a court”).

Based on the foregoing, we conclude that the Board’s construction of “traffic data” was not unreasonable.

II. Unpatentability

On appeal, Wavetronix’s only arguments regarding the teachings of the prior art references are that they do not disclose “traffic data.” However, because all of those arguments are predicated on its proposed construction of “traffic data,” and we have concluded that the Board’s construction was not unreasonable, Wavetronix’s arguments regarding the teachings of the prior art references are moot. We therefore decline to reach those arguments and affirm the Board’s findings that claim 22 was anticipated by Boles and claims 22, 23, and 25 were anticipated by Farmer.

Additionally, it follows that Wavetronix’s arguments regarding the prior art references’ lack of disclosure of “traffic data” cannot form the basis for rejecting the obviousness challenges. Therefore, Wavetronix’s only remaining arguments are that the Board’s findings regarding a motivation to combine the prior art references were not supported by substantial evidence. We address those arguments next.

Wavetronix first argues that substantial evidence does not support the Board’s finding that a skilled artisan would have been motivated to combine Boles with either Herman or Perret, because the Board failed to provide details as to how the “strong leakage levels” from Boles’s sensor could be accommodated by the single circuit board in Herman or Perret. SMS responds that the motivation existed because both references teach the express benefits of mounting a sensor device on a single circuit board.

SMS also argues that the “strong leakage problem” identified in Boles is addressed by Perret, because Perret discloses that one of the benefits of the single circuit board design is reducing the risk of leakage. *See* Perret col. 1 ll. 42–46, 52–60.

We agree with SMS that the Board did not err in concluding that a skilled artisan would have been motivated to combine Boles with either Herman or Perret. Both Herman and Perret expressly teach the benefits of a sensor device mounted on a single circuit board. *See* Herman col. 4 ll. 21–29; Perret Abstract; *see also* Herman col. 2 ll. 6–11. As the Board found, the express benefits of a single circuit board would have suggested to a skilled artisan that the same benefit could be achieved in combination with Boles. *See Decision*, 2017 WL 3034507, at *17. Additionally, the leakage problem identified in Boles is also expressly addressed in Perret, which discloses that a benefit of the single circuit board design is to reduce the risk of leakage. *See* Perret col. 1 ll. 42–46, 52–60. The above findings constitute substantial evidence. We therefore conclude that the Board’s finding of a motivation to combine Boles with either Herman or Perret was supported by substantial evidence.

Wavetronix rehashes some of those same arguments in contending that the Board failed to explain why a skilled artisan would have been motivated to mount Farmer’s sensor on a single circuit board as taught in Herman. SMS again responds, and we agree, that the Board found that the motivation is provided in Herman’s express disclosure regarding the benefits of mounting a sensor on a single circuit board to “facilitate manufacture” of the sensor “at low cost on a commercial production basis.” Herman col. 4 ll. 21–29; *see also Decision*, 2017 WL 3034507, at *20. We thus determine that the Board’s finding was supported by substantial evidence.

Wavetronix finally contends that the more sophisticated digital signal generator in Farmer is not required for the sensor in Herman to function for its intended purpose, and thus the Board’s finding that a person of ordinary skill in the art would have been motivated to combine Herman with Farmer is flawed. SMS responds, and we agree, that the Board properly found that a skilled artisan would have been motivated to combine Herman with Farmer. *See Decision*, 2017 WL 3034507, at *20. Herman discusses a sensor that can generate a signal of “any desired type,” *see* Herman col. 3 ll. 34–39, and Farmer discloses the details of a sensor with a digital signal generator, a DDS, as required by the claims, *see* Farmer col. 8 ll. 13–16. Those express disclosures constitute substantial evidence to support the Board’s finding of a motivation to combine.

We therefore determine that the Board’s motivation to combine findings were supported by substantial evidence. Accordingly, we conclude that the Board did not err in determining that claims 9, 10, 12, 13, and 22 would have been obvious over the combinations of prior art relying on Boles, Farmer, and Herman as primary references. As we have affirmed the Board’s findings that claims 22, 23, and 25 were anticipated, we conclude that the Board properly determined that all challenged claims are unpatentable.

We have considered Wavetronix’s remaining arguments, but find them unpersuasive.³

³ Because we have determined that all of the challenged claims are unpatentable, we decline to reach SMS’s superfluous arguments regarding whether the Board erred in finding that three other references were not prior art printed publications.

CONCLUSION

For the foregoing reasons, we *affirm* the decision of the Board.

AFFIRMED