

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TETRA TECH CANADA INC.,
Petitioner,

v.

GEORGETOWN RAIL EQUIPMENT COMPANY,
Patent Owner.

IPR2019-00662
Patent 9,441,956 B2

Before HUBERT C. LORIN, BENJAMIN D. M. WOOD, and
KRISTINA M. KALAN, *Administrative Patent Judges*.

KALAN, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision

Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

Granting Patent Owner's and Petitioner's Motions to Seal
37 C.F.R. § 42.54

Dismissing Petitioner's Motion to Exclude
37 C.F.R. § 42.64(c)

I. INTRODUCTION

Tetra Tech Canada Inc. (“Petitioner”) filed a Petition requesting *inter partes* review of claims 21–29 of U.S. Patent No. 9,441,956 B2 (Ex. 1001, “the ’956 patent”). Paper 2 (“Pet.”). Georgetown Rail Equipment Company (“Patent Owner”) filed a Preliminary Response to the Petition. Paper 7 (“Prelim. Resp.”). Pursuant to Board authorization, Petitioner filed a Reply to Patent Owner’s Preliminary Response (Paper 11) and Patent Owner filed a Sur-Reply to Petitioner’s Reply (Paper 12). We instituted an *inter partes* review of claims 21–29 of the ’956 patent on all grounds of unpatentability alleged in the Petition. Paper 13 (“Dec.”).

After institution of trial, Patent Owner filed a Patent Owner Response. Paper 16 (“PO Resp.”). Petitioner filed a Reply. Paper 25 (“Reply”). Patent Owner filed a Sur-Reply (Paper 27), Petitioner filed a Sur-Sur-Reply (Paper 32), and Patent Owner filed a Sur-Sur-Sur-Reply (Paper 36). Patent Owner filed a Motion to Seal (Paper 15), and Petitioner also filed a Motion to Seal (Paper 24). Petitioner filed a Motion to Exclude (Paper 35), to which Patent Owner filed an Opposition (Paper 37), and to which Petitioner filed a Reply (Paper 38). A consolidated oral hearing with related cases IPR2019-00619 and IPR2019-00620 was held on May 18, 2020, and a transcript of the hearing is included in the record. Paper 40 (“Tr.”).

This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a). For the reasons that follow, we determine that Petitioner has established by a preponderance of the evidence that claims 21–29 of the ’956 patent are unpatentable.

A. *Related Proceedings*

The parties identify the following proceeding as involving the ’956

patent: *Georgetown Rail Equipment Company v. Tetra Tech Canada Inc.*, No. 6:18-cv-377 (E.D. Tex.). Pet. 4; Paper 4, 2. The parties also state that the '956 patent is the subject of an additional Board proceeding, IPR2019-00620. Pet. 2; Paper 4, 2.

B. The '956 Patent

The '956 patent, titled “System and Method for Inspecting Railroad Ties,” discloses “systems and methods for inspection and grading of wood railroad ties.” Ex. 1001, code (54), 1:28–29. In particular, the '956 patent describes a “computerized system and method for inspecting railroad tracks, which can both identify and locate railroad ties, tie plates, and appurtenant structures, and also determine condition metrics” of these, and further “can provide a condition grade or score for railroad ties and other features.” *Id.* at 2:15–22. The system can scan and grade the condition of the railroad ties by capturing images of a railroad track and then analyzing those captured images. *Id.* at 14:24–27, 14:42–46. Figures 1 and 2 illustrate an inspection system used to capture images of the railroad track, and are reproduced below.

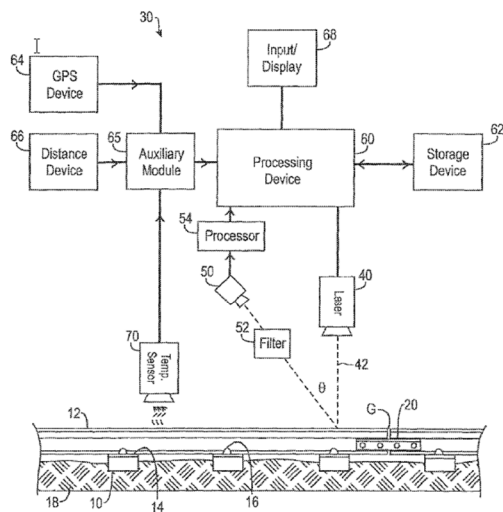


FIG. 1

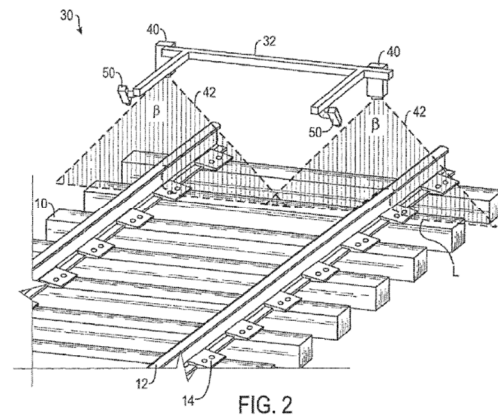


FIG. 2

Figures 1 and 2 show systems for inspecting railroad tracks. *Id.* at 3:24–28. As shown in both figures, “inspection system 30 includes a light generator such as a laser 40” which “projects a beam 42 of laser light at the track bed.” *Id.* at 4:24–25, 4:39–40. As shown in Figure 2, “beam 42 produces a projected line L.” *Id.* at 4:40–41. Projected line L “follows the contours of the surfaces and components of the track bed,” e.g., the “crossties 10, rails 12, tie plates 14, spikes 16, and ballast 18” (*id.* at 4:38–43) and, further, projected line L “is substantially straight and extends substantially across the track bed” (*id.* at 5:11–12). Then, “a device for receiving light reflected from the area to be inspected such as a camera 50” captures “an image of the line L of laser light 42 projected on the track bed.” *Id.* at 4:26–27, 4:43–45. “The camera 50 sends the captured image to the processing device 60 for processing and analysis.” *Id.* at 4:45–46.

The processing and analysis of the captured image provides that “missing tie plates, misaligned tie plates, or sunken tie plates can be detected from the image data.” *Id.* at 11:29–31. Figure 10, reproduced below, shows an image that can be analyzed to determine that a tie plate is missing.

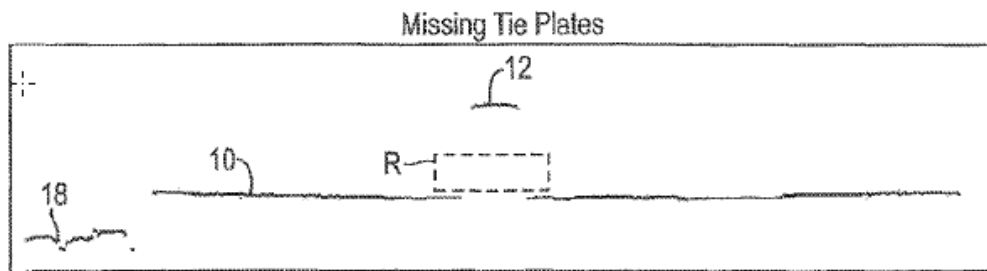


FIG. 10

Figure 10 shows a frame of a railroad track missing a tie plate. *Id.* at 3:50–52. In Figure 10, a “missing or sunken tie plate can be detected . . . by analyzing a region of interest R and determining whether a portion of the

contour representing a tie plate occurs or does not occur within the region R.” *Id.* at 11:33–36.

C. Illustrative Claim

Of challenged claims 21–29, claims 21, 27, and 29 are independent.

Claims 21 and 27 are reproduced below:

21. [pre] A method of inspecting a railroad track, the method comprising:

[a] projecting a beam of light across at least a portion of a component of the railroad track, the beam of light projected with at least one light generator positioned adjacent the railroad track;

[b] capturing an image of the beam of light projected on at least a portion of the component of the railroad track, the image captured with at least one receiver positioned adjacent the railroad track;

[c] determining with a processor whether the captured image contains a tie plate; and if a tie plate is present, determining with a processor whether the tie plate is misaligned or sunken.

Ex. 1001, 25:53–26:8 (bracketed annotations added).

27. [pre] A railroad track inspection system, the system comprising:

[a] at least one light generator positioned adjacent a railroad track bed, the light generator configured to project a beam of light across a portion of the railroad track bed;

[b] at least one light receiver positioned adjacent the railroad track bed, the optical receiver configured to generate an image of the portion of the railroad track bed; and

[c] at least one processor, the processor being configured to determine whether the image contains a tie plate, wherein if the image contains a tie plate the processor being configured to determine a crosstie contour, a tie plate contour, and determine whether the tie plate is misaligned or sunken based on the crosstie contour and the tie plate contour.

Ex. 1001, 26:26–41 (bracketed annotations added).

D. Asserted Grounds of Unpatentability

We instituted *inter partes* review of claims 21–29 of the ’956 patent on the following grounds. Dec. 6, 28.

Reference(s)/Basis	35 U.S.C. § ¹	Claims
Davis, ² Kowalski, ³ Bostrom, ⁴ Kanade ⁵	103	21–29
Holmes, ⁶ Bostrom, Kanade, Davis	103	21–29

Petitioner relies on the Declaration of Dr. Nikos Papanikolopoulos.
Ex. 1004. Patent Owner relies on the Declarations of Dr. Alan Conrad Bovik (Ex. 2001), John Kainer (Ex. 2008), and Gregory T. Grissom (Ex. 2012).

II. ANALYSIS

A. Legal Standards

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious to a person of ordinary skill in the art at the time the invention was made. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). Obviousness is resolved based on

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. § 103, effective March 16, 2013. Because the application from which the ’956 patent issued was filed before this date, the pre-AIA version of § 103 applies.

² D. D. Davis & S. M. Chrismer, *Tie Performance – A Progress Report of the Des Plaines Test Site* (1990) (Ex. 1005).

³ U.S. Pat. No. 7,023,539 B2, issued April 4, 2006 (Ex. 1006).

⁴ U.S. Pat. No. 6,496,254 B2, issued December 17, 2002 (Ex. 1008).

⁵ Takeo Kanade, *Three-Dimensional Machine Vision* (1987) (Ex. 1010).

⁶ U.S. Pat. No. 6,647,891 B2, issued November 18, 2003 (Ex. 1011).

underlying factual determinations, including: (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 art; and (4) objective evidence of nonobviousness, i.e., secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). Secondary considerations may include the following: “commercial success, long felt but unsolved needs, failure of others, etc.” *Id.* The totality of the evidence submitted may show that the challenged claims would not have been obvious to one of ordinary skill in the art. *In re Piasecki*, 745 F.2d 1468, 1471–72 (Fed. Cir. 1984).

Petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). Petitioner must demonstrate unpatentability by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d); *see also Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify “with particularity . . . the evidence that supports the grounds for the challenge to each claim”)). A party that petitions the Board for a determination of obviousness must show that “a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success in doing so.” *Procter & Gamble Co. v. Teva Pharms. USA, Inc.*, 566 F.3d 989, 994 (Fed. Cir. 2009) (quoting *Pfizer, Inc. v. Apotex, Inc.*, 408 F.3d 1348, 1361 (Fed. Cir. 2007)).

B. Level of Ordinary Skill in the Art

Petitioner contends that a person of ordinary skill in the art “would have a bachelor’s degree in electrical engineering, computer engineering, mechanical engineering, computer science, physics, or a related field, and at least four years of experience (or the academic equivalent) in the field of computer or machine vision.” Pet. 19 (citing Ex. 1004 ¶ 42). Patent Owner states that, for purposes of its Response, “Patent Owner does not contest Petitioner’s asserted level of ordinary skill in the art.” PO Resp. 1.

Neither party argues that the outcome of this case would differ based on our adoption of any particular definition of one of ordinary skill in the art. In light of the record now before us, we find that a person of ordinary skill in the art would be an individual with at least a bachelor’s degree in electrical engineering, computer engineering, mechanical engineering, computer science, physics, or a related field, and at least four years of experience (or the academic equivalent) in the field of computer or machine vision. Ex. 1004 ¶ 42. The level of ordinary skill in the art is also reflected by the references themselves. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (“[T]he absence of specific findings on the level of skill in the art does not give rise to reversible error ‘where the prior art itself reflects an appropriate level and a need for testimony is not shown.’”); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (finding that the Board of Patent Appeals and Interferences did not err in concluding that the level of ordinary skill in the art was best determined by the references of record).

C. Claim Construction

We apply the claim construction standard articulated in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc). *See Changes to the*

Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340, 51,358 (Oct. 11, 2018) (amending 37 C.F.R. § 42.100(b) effective November 13, 2018) (now codified at 37 C.F.R. § 42.100(b) (2019)). Under *Phillips*, claim terms are afforded “their ordinary and customary meaning.” *Phillips*, 415 F.3d at 1312. “[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention.” *Id.* at 1313. Only terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

Petitioner proposes constructions for “misaligned” and “image,” and states that the Board should construe “determining,” “crosstie contour,” and “tie plate contour” according to their plain and ordinary meanings. Pet. 20–23. Patent Owner proposes constructions for “misaligned,” “tie plate is . . . sunken,” “across,” and “image,” and agrees with Petitioner that the Board should construe “determining,” “crosstie contour,” and “tie plate contour” according to their plain and ordinary meanings. PO Resp. 1–7.

On the full record now before us, we determine it is not necessary to construe any claim term expressly to resolve the parties’ dispute. *Vivid Techs., Inc.*, 200 F.3d at 803 (“Only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy.”); *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs.* in the context of an *inter partes* review).

D. Prior Art

i. Davis (Ex. 1005)

Davis is a report titled “Tie Performance – A Progress Report of the Des Plaines Test Site.” Ex. 1005, 1.⁷ Davis’s report describes railroad track “performance measurements taken,” which include “plate cutting” measurements. *Id.* at 6. Plate cutting occurs when a “tie plate, under the action of traffic, moves relative to the tie while in contact with the tie;” in this way, the “plate ‘cuts’ through the tie.” *Id.* at 19. A plate cut has been described as a “plate cutting to a depth greater than the plate edge thickness.” Ex. 1044, 15. Davis uses a “plate cutting measuring device” to take “plate cutting measurements.” Ex. 1005, 17. The plate cutting measuring device “works by measuring the difference in elevation between the top of the tie plate at a known distance from the edge and the top surface of the tie adjacent to the plate.” *Id.*

ii. Kowalski (Ex. 1006)

Kowalski is a patent titled “Device for Monitoring the Condition of the Superstructure Especially of Fixed Railroad Tracks.” Ex. 1006, code (54). Kowalski’s device determines “the height position of an anchor clamp and/or of the base of the rail and/or of a railroad tie.” *Id.* at 1:19–21. Kowalski’s device determines the height position of those components by using “height-scanning sensors, preferably a laser scanning system.” *Id.* at 2:20–22. Figures 1 and 2 show the scanning locations on railroad track components and are reproduced below.

⁷ We refer to the page numbers added to Exhibit 1005 by Petitioner, rather than the page numbers included in certain portions of the original text.

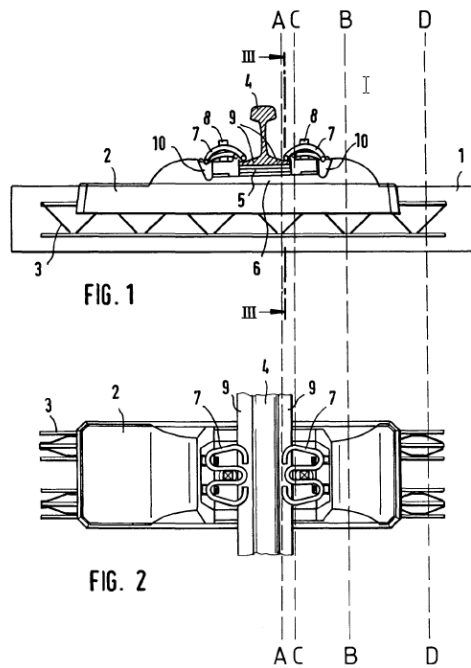


Figure 1 shows a cross section through a fixed railroad track and Figure 2 shows a plan view of the railroad tie section. *Id.* at 1:66–2:2. Kowalski’s laser scanning system scans the height of railroad track components “extend[ing] along the line A–A as well as along the line B–B” (*id.* at 2:20–22), “along the scanning line C–C” (*id.* at 2:40–41), and also “along the line D” (*id.* at 2:58–59).

Kowalski further describes using the sensed heights to monitor a railroad track condition. For example, using the sensed heights along scanning lines, “a loosened anchor clamp [can] be detected rapidly and reliably” based on “an appreciable deviation in height from the nominal value.” *Id.* at 1:31–34; *see id.* at 2:40–50.

iii. Bostrom (Ex. 1008)

Bostrom is a patent titled “Method and Device for Inspecting Objects.” Ex. 1008, code (54). Figure 1 shows an embodiment of Bostrom’s device and is reproduced below.

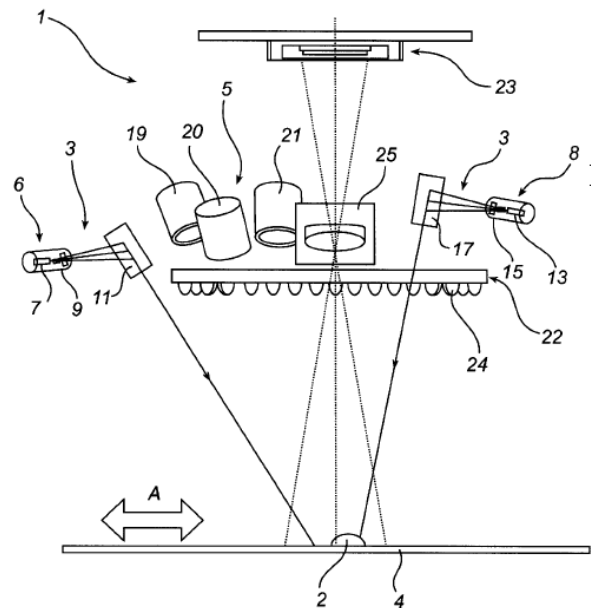


Fig. 1

Figure 1 shows a device for inspecting objects. *Id.* at 4:51–52. As shown in Figure 1, radiation generated by the device’s “radiation generators 6, 8,” e.g., laser sources 7 and 13, is “reflected or reemitted by the object 2” being scanned. *Id.* at 5:20–21, 5:60–63. Then, when the “radiation originating from the object 2 to the sensor 23” is reflected, sensor 23 detects “an image of the object 2.” *Id.* at 5:44–47, 5:57–63. Further, the sensor 23 uses the sensed reflected radiation “for extracting height information.” *Id.* at 7:1–3; *see id.* at 6:60–67.

iv. *Kanade (Ex. 1010)*

Kanade is titled “Three-Dimensional Machine Vision.” Ex. 1010, 2.⁸ Kanade describes vision systems “developed for an automatic inspection task,” in particular, “a 3D assembly robot vision system.” *Id.* at 546, 557.

⁸ We refer to the page numbers appended to Exhibit 1010, rather than the page numbers included in certain portions of the original text of the Exhibit.

Kanade describes that “two-dimensional shape-recognition techniques can be applied to recognize [a] part and to detect its rotation angle” in 3D space. *Id.* at 562; *see id.* at 558.

v. *Holmes (Ex. 1011)*

Holmes is a patent titled “Range-Finding Based Image Processing Rail Way Servicing Apparatus and Method.” Ex. 1011, code (54). Holmes describes a computer “vision system 500” that “identifies features of railway 300” using “a laser emitter 505, an infrared sensor 510 and an image processor.” *Id.* at 3:8, 3:54–56. “Laser emitter 505 emits an amplitude-modulated laser beam B across surface S,” and the surface in turn “radiates some of that energy in the form of infrared electromagnetic waves I.” *Id.* at 3:56–60. “Sensor 510 receives some of the infrared electro-magnetic waves I and transmits a signal corresponding to the phase of the received infrared energy to an image processor” which then “generates a virtual surface which corresponds to the actual surface irradiated by laser beam B.” *Id.* at 3:60–67.

The virtual surface may be a “range-based virtual surface” which “exhibits features that correspond to features of railway 300, for example, rails 305, ties 310 and the underlying railway bed 320.” *Id.* at 5:1–5; *see id.* Fig. 1. Using “image comparison software which permits the image processor to compare the data corresponding to a typical railway with the generated virtual surface,” Holmes’s system can “determine whether the actual railway appears to present a specified feature” and, accordingly, “permits identification of a typical rail, tie, tie plate or other railway features.” *Id.* at 5:12–18.

E. Prior Art Status of the References

A challenge in an *inter partes* review can be raised “only on the basis of prior art consisting patents or printed publications.” 35 U.S.C. § 311(b). To qualify as a printed publication, “a reference ‘must have been sufficiently accessible to the public interested in the art.’” *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1348 (Fed. Cir. 2016) (quoting *In re Cronyn*, 890 F.2d 1158, 1160 (Fed. Cir. 1989)). “Because there are many ways in which a reference may be disseminated to the interested public, ‘public accessibility’ has been called the touchstone in determining whether a reference constitutes a ‘printed publication’” under 35 U.S.C. § 102. *Id.* (quoting *In re Hall*, 781 F.2d 897, 898–99 (Fed. Cir. 1986)). “A reference will be considered publicly accessible if it was ‘disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence, can locate it.’” *Id.* (quoting *Kyocera Wireless Corp. v. Int’l Trade Comm’n*, 545 F.3d 1340, 1350 (Fed. Cir. 2008)).

The Board recently clarified in a precedential opinion that “the petition must identify, with particularity, evidence sufficient to establish a reasonable likelihood that the reference was publicly accessible before the critical date of the challenged patent and therefore that there is a reasonable likelihood that it qualifies as a printed publication,” at the institution stage. *Hulu, LLC v. Sound View Innovations, LLC*, IPR2018-01039, Paper 29 at 13 (PTAB December 20, 2019) (precedential). The Petition asserted that the earliest purported effective filing date of challenged claims 21–29 is June 30, 2004, and that all the relied-upon references are prior art. Pet. 18, 5–6. We determined, at the institution stage, that Petitioner had made the requisite

showing. Dec. 9–13. The same evidence from Petitioner regarding public accessibility is before us on this complete record. *See, e.g.*, Exs. 1010, 1045.

Kanade is a book titled “Three-Dimensional Machine Vision,” published by Kluwer Academic Publishers. Ex. 1010, 2. Petitioner submits, with Kanade, a Declaration of Rosalina Delgado-Jones, Assistant Business Enterprises Officer in the Office of Business Enterprises of the Library of Congress. *Id.* at 1. Ms. Delgado-Jones certifies that Kanade is in the collections of the Library of Congress, and further certifies that Kanade “is marked with a Library of Congress Cataloging-In-Publication stamp that bears the date March 23, 1987.” *Id.* The seal of the Library of Congress is affixed to Ms. Delgado-Jones’s declaration. *Id.* Petitioner also submits a Declaration of Pamela Stansbury, an employee of the Cornell University Library since 1982. Ex. 1045, 1. Ms. Stansbury states that Kanade was “cataloged and publicly available at the Engineering Library, in its public stacks, shelved by its Library of Congress classification system number no later than November 11, 1987” based on “the date stamp inside the volume, and my knowledge of the Library’s standard procedures relevant to date stamping, cataloging, and shelving items.” *Id.*

Patent Owner contends that “Petitioner fails to show that a critical reference—Kanade—is prior art” because Petitioner has failed to “establish that Kanade satisfies every requirement for a prior art printed publication.” PO Resp. 7. Patent Owner argues that Exhibit 1045, Pamela Stansbury’s declaration, “is insufficient to prove that Kanade is a printed publication publicly accessible before the critical date.” *Id.* at 8. Specifically, Patent Owner faults Petitioner for relying on Ms. Stansbury’s declaration because she opines only to “the best [she] can determine” and provides no details on

how “one of skill in the art could access Kanade.” *Id.* at 9. Patent Owner further argues that Ms. Stansbury’s declaration “fails to establish public accessibility because it fails to adequately address whether Kanade was (1) catalogued, shelved, or indexed, or (2) made available such that POSITAs, exercising reasonable diligence, could have located Kanade before June 30, 2004.” *Id.* at 10. Patent Owner faults the declaration of Ms. Delgado-Jones for not discussing “the text of the Kanade article.” *Id.* at 10–11.

Kanade, on its face, has a copyright date of “1987 by Kluwer Academic Publishers” (Ex. 1010, 7), a stamp stating “Library of Congress 5 Mar 23 1987 Copy ___ CIP” (*id.*), publication data (*id.*), a Library of Congress library stamp (*id.* at 3), a Library Catalog Number (*id.* at 7), and additional cataloging notations with the date 1987 (*id.*). There is also a check-out card indicating that Kanade was in fact checked out on multiple occasions between 1987 and 2002 (Ex. 1045, 8). *See Hulu*, Paper 29 at 9–11, 17–19.

Additionally, Petitioner has taken further steps to provide testimony that Kanade was catalogued, shelved, and indexed before the critical date, and made available such that persons of ordinary skill in the art, exercising reasonable diligence, could have located it. Ex. 1010, 1; Ex. 1045. Ms. Stansbury, a librarian since 1982 with the Cornell University Library, provides details regarding her professional background leading to her current position as Administrative Supervisor in the Original Cataloging Unit. Ex. 1045, 1. She testifies that, based on her knowledge, Kanade was “cataloged and publicly available at the Engineering Library, in its public stacks, shelved by its Library of Congress classification system number no later than November 11, 1987.” *Id.* She further testifies that “based on the

date stamp inside the volume, and my knowledge of the Library’s standard procedures relevant to date stamping, cataloging, and shelving items,” she has not seen any indication that Kanade would have been an exception to the Library’s standard practice, and that “any member of the public could have located this item by searching our catalog by subject matter, author, or title.” *Id.* The declaration concludes with an affidavit that Ms. Stansbury is aware that false statements are punishable by fine or imprisonment, or both. *Id.*; 37 C.F.R. § 1.68; 28 U.S.C. § 1746. In our evaluation, Ms. Stansbury provides credible testimony regarding the receipt of Kanade by the Cornell University Library and the cataloging and availability of Kanade. Patent Owner relies on a number of cases to support its argument that multiple PTAB panels “have rejected substantially similar declarations from Ms. Stansbury.” PO Resp. 8. We have reviewed those cases as well as Ms. Stansbury’s declaration in this proceeding, and find this proceeding’s declaration more thorough than the other declarations and sufficient in its own right. *See* Reply 3–5. We, therefore, credit the testimony of Ms. Stansbury supporting Kanade’s public accessibility as of the critical date.

Ms. Delgado-Jones certifies that the Library of Congress contains a copy of Kanade, and the reproduced pages in the record “are a true representation from that work.” Ex. 1010, 1. Ms. Delgado-Jones further testifies that the work is marked with a Library of Congress stamp bearing the date March 23, 1987. *Id.* The testimony of Ms. Stansbury and of Ms. Delgado-Jones, together with the indicia on Kanade itself, credibly support Petitioner’s assertions of Kanade’s public accessibility. *Id.*

Therefore, on this complete record, we are of the opinion that Petitioner provides evidence establishing the public accessibility of Kanade as of a date prior to the critical date.

F. Asserted Obviousness over Holmes, Bostrom, Davis, and Kanade (Ground 2)

Petitioner asserts that claims 21–29 of the ’956 patent are unpatentable as obvious under 35 U.S.C. § 103 over Holmes, Bostrom, Davis, and Kanade. Pet. 59–72.

i. Petitioner’s Arguments

Regarding claim 21, Petitioner alleges that the combination of Holmes, Bostrom, Davis, and Kanade teaches:

21[pre] “A method of inspecting a railroad track, the method comprising” (Pet. 59–60; Ex. 1011, 3:4–41, 4:1–6, 5:2–5, 5:20–23, Figs. 1, 9);

[a] “projecting a beam of light across at least a portion of a component of the railroad track, the beam of light projected with at least one light generator positioned adjacent the railroad track” (Pet. 60–61; Ex. 1011, 3:52–5:2; Figs. 6–7, 9; Ex. 1004 ¶ 110);

[b] “capturing an image of the beam of light projected on at least a portion of the component of the railroad track, the image captured with at least one receiver positioned adjacent the railroad track” (Pet. 61–64; Ex. 1011, 3:52–5:5, Figs. 6–8, 10; Ex. 1008, 5:44–45, 5:47–49; 6:53–58, 7:50–56; 8:56–9:7, 9:30–41; Ex. 1004 ¶¶ 113–117);

[c] “determining with a processor whether the captured image contains a tie plate, and if a tie plate is present, determining with a processor

whether the tie plate is misaligned or sunken” (Pet. 64–68; Ex. 1011, 4:1–6; 5:6–37; Ex. 1005, 17–19; Ex. 1004 ¶ 118–123).

Petitioner argues that it would have been “obvious to implement *Holmes*’ processor with *Davis*’ algorithm measuring and comparing the difference in elevation between the top of the tie plate and the top surface of the tie adjacent to the plate to determine the depth of tie plate cut, further in light of *Kanade*’s image processing techniques.” Pet. 67. Petitioner further argues that the motivation would be that “the degree of tie plate cut provides an important and reliable objective performance measure of crosstie health, which can be used to address and correct (or renew) the crosstie, as taught by *Davis*.” *Id.* This would “provide another tie performance measurement for *Holmes*’ system to automatically identify and correct in furtherance of increasing railroad safety.” *Id.*

Claim 22 further requires that, if a tie plate is present, “determining with a processor a crosstie contour and a tie plate contour, wherein the determining whether the tie plate is misaligned or sunken is based on the crosstie contour and the tie plate contour.” Petitioner argues that Holmes, Bostrom, Davis, and Kanade “render obvious these limitations of claim 22, as discussed in claim 21[c].” Pet. 68 (citing Ex. 1004 ¶ 124).

ii. *Patent Owner’s Arguments*

a. *Claim 21*

Patent Owner does not materially dispute Petitioner’s allegations as to claim 21[a] and [b]. PO Resp. 46. We have reviewed Petitioner’s contentions and evidence regarding whether Holmes, Davis, Kanade, and Bostrom meet the limitations of claim 21[a] and [b], and are persuaded that Petitioner’s uncontested mapping of the limitations is established by a

preponderance of the evidence. Patent Owner focuses its discussion on claim 21[c], which we address below.

1. Manual and Machine Vision

Claim 21[c] requires “determining with a processor whether the captured image contains a tie plate; and if a tie plate is present, determining with a processor whether the tie plate is misaligned or sunken.” Patent Owner argues that “Holmes, Kanade, and Davis do not disclose or suggest element [c].” PO Resp. 47. Relying on Dr. Bovik’s testimony, Patent Owner argues that “there is a vast chasm between Davis’s manual method” and a machine vision system, like in Holmes, and “to write an algorithm to implement a manual method” requires pre-existing “knowledge, invention, and creativity,” because “implementing even simple tasks in machine vision is generally difficult, time-consuming,” and “requires special expertise.” *Id.* at 47–48 (citing Ex. 2003 ¶ 155). Patent Owner further argues that one of ordinary skill in the art “had no reason to believe that Holmes’ sophisticated technique” of employing automated imaging that records multiple images of all heights of every inspected object and surrounding areas and analyzing those images to locate certain objects, such as a crosstie, “should be augmented with Davis’ simple mechanical device and manual technique.” *Id.* at 48 (citing Ex. 2003 ¶ 156).

Petitioner disputes that it would be “generally difficult, time-consuming,” or require “special expertise” to implement Holmes’s automated track inspection system with Davis’s tie plate cut algorithm. Reply 7. Petitioner also argues that the Board has discretion to ignore Patent Owner’s “conclusory opinions without scrutiny,” pointing to Petitioner’s own evidence and declarations to assert that Patent Owner’s statements are

not only conclusory but also incorrect in view of evidence that automating manual inspection tasks was known in the art well before 2004. *Id.* at 8 (citing, *inter alia*, Ex. 1010, 545–546, 73, 107, 248–250, 361, 406; Ex. 1007, 5; Ex. 1012, 15; Ex. 1014, 18; Ex. 1018, 9; Ex. 1019, 6; Ex. 1021, 3; Ex. 1047, 4).

In its Sur-Reply, Patent Owner renews its reliance on Dr. Bovik’s testimony to argue that Petitioner’s position is incorrect. Sur-Reply 6–8 (citing Ex. 2003 ¶¶ 43–45, 155–156).

It appears undisputed that Davis discloses a technique for determining whether a tie plate is misaligned or sunken, and, thus, the question is whether the actual application of using Davis’s technique to improve the Holmes system is beyond the skill of a person of ordinary skill in the art. *See KSR*, 550 U.S. at 417 (“[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.”). Having reviewed the evidence and testimony before us, we determine that it would not have been beyond ordinary skill to automate the task of inspecting tie condition.

Dr. Bovik credibly explains that Holmes provides for a technique that is based on a very high level machine vision, and that Davis’s simple mechanical device and manual technique addresses an “extremely specific task.” Ex. 2003 ¶ 155–156. Patent Owner also provides sufficient reasoning explaining why implementing Holmes’ automated track inspection system with Davis’ tie plate cut algorithm would be difficult and time-consuming. PO Resp. 47–48. However, we are unpersuaded that modifying Holmes’s

automated track inspection system to implement Davis's tie plate cut algorithm would require special expertise.

Even taking into account Patent Owner's allegations of difficulty, amount of time required, or special expertise required, which are based largely on Dr. Bovik's assertions but little other evidence (*see, e.g.*, Ex. 2003 ¶¶ 151–157), Petitioner has provided sufficient evidence and testimony to demonstrate that it would not be beyond the skill of one in the art to combine the art as proposed and accomplish the tasks described in the challenged claims. Reply 7–9; *KSR*, 550 U.S. at 416; *see also Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (a “given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine”). Petitioner demonstrates that others were using known software and tools to automate other defect-measuring tasks in the art. Reply 8–9 (citing Ex. 1019, 3, 6; Ex. 1023, 16–19; Ex. 1012, 19–20, Ex. 1004 ¶¶ 32–33). For example, the paper “A Survey of Automated Visual Inspection,” by Timothy S. Newman, published in 1995, provides a section entitled “General Benefits of Automated Inspection” that explains, *inter alia*, that “[a]utomatic inspection is desirable because human inspectors are not always consistent evaluators of products.” Ex. 1047, 1, 4. Petitioner's expert also attests, with supporting evidence, that the challenged patent as well as “other sheet-of-light range imaging sensor technology would have been well-known and readily available to a person of ordinary skill in the art by 2004.” Ex. 1004 ¶¶ 32–33; *see also* Pet. 13–14. This evidence demonstrates a familiarity by those in the machine vision field with automating manual tasks.

For the foregoing reasons, Patent Owner’s argument is unpersuasive in undermining Petitioner’s position that the proposed combination renders obvious “[c] determining with a processor whether the captured image contains a tie plate; and if a tie plate is present, determining with a processor whether the tie plate is misaligned or sunken.”

2. *Analogous Art*

Patent Owner also argues that one of ordinary skill in the art “would not have looked to Kanade to modify Holmes because their applications are divergent.” PO Resp. 48 (“Holmes applies in an uncontrolled outdoor environment to a railroad track and involves analysis of rather large components. Kanade analyzes solder joints on circuit boards in a controlled indoor environment and involves tiny components.”).

Petitioner argues that “Kanade and the claims overlap in the broader field of machine vision and thus, Kanade is reasonably pertinent to the problem of object recognition.” Reply 9–10 (citing *Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1000–1001 (Fed. Cir. 2016)). Patent Owner replies that Petitioner has mischaracterized Dr. Bovik’s opinion, and maintains that “problems they address are substantively so different” that Kanade’s disclosure is not “reasonably pertinent to the particular problem with which the inventor is involved,” and “Petitioner’s hyper-technical wordsmithing should be rejected.” Sur-Reply 10–11.

Two separate tests define the scope of analogous prior art: “(1) whether the art is from the same field of endeavor, regardless of the problem addressed and, (2) if the reference is not within the field of the inventor’s endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.” *In re Bigio*, 381

F.3d 1320, 1325 (Fed. Cir. 2004). Neither party makes well-developed arguments regarding whether Kanade meets this two-part test. Applying this two-part test to the evidence before us, we find no discrete arguments that Kanade is from the same field of endeavor, which is characterized by the challenged patent as a “system and method for inspecting railroad ties.” Ex. 1001, code (54). We do agree with Petitioner, however, that Kanade, a textbook titled “Three-Dimensional Machine Vision” deals broadly with the field of machine vision. Reply 9–10; Ex. 1010, 2. More particularly, Kanade “discloses image processing applications that evaluate and compare 2D range image contours using various contour parameters.” Ex. 1004 ¶ 92. Kanade’s broad scope and its particular descriptions of 2D imaging and comparing the same are reasonably pertinent to the particular problem with which the inventor is involved, which is the development of “a fully computerized system and method for inspecting railroad tracks” that compares and analyzes the image data to determine “with a processor whether the tie plate is misaligned or sunken.” Ex. 1001, 2:14–15, 26:7–8. Ex. 1004 ¶ 92. Thus, Kanade satisfies the second prong of the test as being “reasonably pertinent to the problem of object recognition.” Reply 10.

We also are not persuaded that the systems used in Holmes and Kanade are so far afield that one of ordinary skill would not look to Kanade to modify the Holmes system, notwithstanding their intended uses are different; that is, to inspect railroad tracks and to solder joints, respectively. “[I]f a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond that person’s skill.” *KSR*, 550 U.S. at 416.

3. *Arguing Individually*

Patent Owner argues that “no reference discloses or suggests ‘determining with a processor whether the tie plate is misaligned or sunken.’” PO Resp. 49 (citing Ex. 2003 ¶ 153). More particularly, Patent Owner argues that Davis cannot determine such misalignments, Kanade “analyzes solder joints, not railroad components,” and Holmes “has no disclosure of determining if tie plates are sunken or misaligned.” *Id.*

Patent Owner also argues that “no reference discloses or suggests making such determinations only if ‘a tie plate is present.’” *Id.* More particularly, argues Patent Owner, Davis does not suggest any procedure that a processor could use for locating a tie plate, Kanade’s process “cannot detect tie plates because it detects only the *existence of a projecting component*, not the *type* of component,” and Holmes “does not teach or suggest the feature of making further determinations only if a tie plate is present.” *Id.* at 49–50.

Petitioner argues that Patent Owner attacks references individually, rather than arguing against Petitioner’s proposed combination. Reply 10–12. Patent Owner’s “individual attacks on Holmes (as purportedly not disclosing determining whether the tie plate is sunken or misaligned), Davis (as purportedly measuring only single point measurements), and Kanade (as purportedly not analyzing railroad components) fail to address the combination as a whole,” and, thus, “fail to rebut the obviousness of the claimed features,” according to Petitioner. *Id.* at 12 (citing *In re Keller*, 642 F.2d 413, 425 (CCPA 1981); *In re Merck & Co., Inc.*, 800 F.2d 1091 (Fed. Cir. 1986)). Petitioner refers to its Petition to argue that it would have been obvious to

implement Holmes' processor to extract tie and tie plate contour information from the scanned railroad track profile and compare the difference in elevation between the top height surface of the tie plate contour and the top height surface of the tie contour adjacent to the plate to determine the depth of tie plate cut (and thus whether tie plate is misaligned or sunken) based on the comparison, as taught by Davis, further in light of Kanade's image processing techniques.

Reply 13 (citing Pet. 67).

Petitioner also alleges that Patent Owner "admits that the combination of Holmes, Kanade, and Davis would yield an algorithm for determining whether the tie plate is 'sunken'—but yet, not whether the tie plate is 'misaligned or sunken.'" *Id.* at 14 (citing PO Resp. 51–52 ("Accordingly, when combined with Holmes (with or without Kanade), the resulting system could achieve an objective of claim 22: 'determining whether the tie plate is . . . sunken.'")). As Petitioner notes, the claim only requires determining whether the tie plate is "misaligned *or* sunken," so Patent Owner's admission indicates that the combination meets one alternative requirement of the claim, i.e., "sunken." *Id.* The claim does not require determining whether the tie plate is misaligned *and* sunken, nor does it "require two separate determinations (i.e., determining whether the tie plate is misaligned and determining whether the tie plate is sunken)." *Id.* Patent Owner replies that it "did not 'admit[] that the combination of Holmes, Kanade, and Davis would yield an algorithm for determining whether a tie plate is 'sunken.'" Sur-Reply 5–6.

We understand the term "misaligned or sunken" to cover either misaligned or sunken. *See* Reply 14; Dec. 24–25. Petitioner sufficiently demonstrates that its proposed combination would at the very least determine the existence of a sunken tie plate. Patent Owner's objection that

it has not made such an admission (Sur-Reply 5–6) does not persuade us that Patent Owner’s statement was taken out of context, when Patent Owner did state that the relied-upon combination of references could determine whether a tie plate is “sunken.” PO Resp. 51–52.

Reviewing again the proposed combination set forth in the Petition, Davis discloses measuring the depth of tie plate cuts into a tie: “To measure tie plate cutting, *Davis* discloses measuring the depth the tie plate has cut into the tie ‘by measuring the difference in elevation between the top of the tie plate at a known distance from the edge and the top surface of the tie adjacent to the plate.’” Pet. 66–67 (citing Ex. 1005, 17). It does not appear to be disputed that, in the scenario addressed by Davis, a tie plate is necessarily present. Holmes discloses a processor (image processor 515) that Petitioner asserts “permits identification and the location of target railway 300 features, including ties 310 and tie plates 315.” Pet. 64. Petitioner then contends that it would have been obvious “to implement *Holmes*’ system to extract tie and tie plate contour information from the profile 720 and compare the tie and tie plate height contour information to determine whether the tie plate is misaligned or sunken based on the comparison.” *Id.* at 66 (citing Ex. 1004 ¶ 120). In other words, Petitioner’s position is that the *combination* of Davis’s measuring elevation differences with well-known systems, such as Holmes’s, to evaluate and compare features of contours of a 2D range image to determine potential defects renders obvious implementing a method using a processor to carry out the steps of the challenged claims. Any argument against each of the references individually does not assess the entirety of the combination proposed by

Petitioner and, therefore, does not persuade us of a deficiency in the proposed combination.

Upon review of the record as a whole, we determine that Petitioner demonstrates that, given Davis and Kanade, it would have been obvious to one of ordinary skill in the art to implement Holmes' processor to meet the limitations of claim 21[c]. We are persuaded by Petitioner that Holmes's disclosure of a processor that compares differences between profiles would have motivated the ordinarily skilled artisan to modify Davis's methods to use Kanade's image processing techniques. Pet. 64–68; Reply 6–14; Ex. 1004 ¶¶ 108–123.

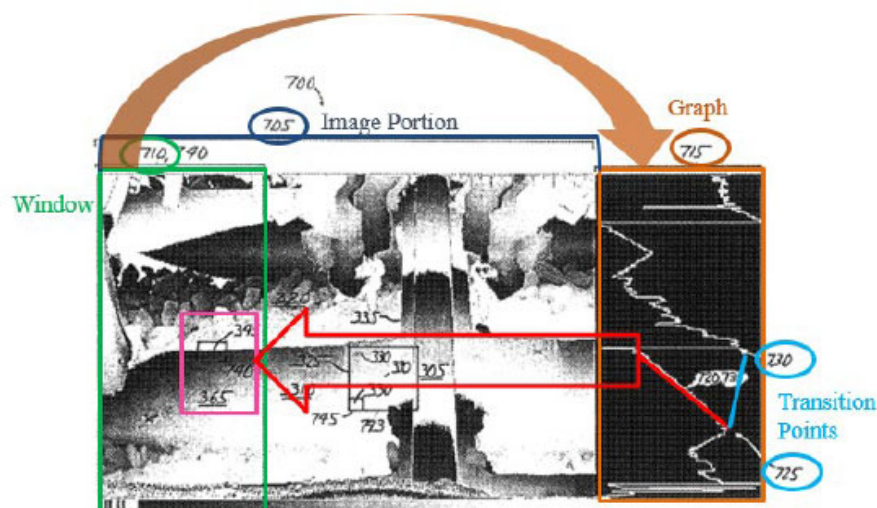
b. Claim 22

Claim 22 depends from claim 21 and further requires “if a tie plate is present, determining with a processor a crosstie contour and a tie plate contour, wherein the determining whether the tie plate is misaligned or sunken is based on the crosstie contour and the tie plate contour.”

Patent Owner argues that Holmes, Davis, and Kanade do not disclose or suggest claim 22's feature of a “processor” used in determining a crosstie contour and a tie plate contour, to determine whether the tie plate is misaligned or sunken. PO Resp. 51. Only Davis discloses a mechanism for determining if a tie plate is improperly positioned, argues Patent Owner, and “the references at most suggest implementing a very different algorithm for determining whether a tie plate is sunken.” *Id.* (citing Ex. 2003 ¶ 161). Even if the proposed combination could determine whether the tie plate is sunken, it would do so “by comparing elevation differences between a single height measurement each on the top surface of a tie plate and adjacent crosstie.” *Id.* at 52 (citing Ex. 2003 ¶ 165). Patent Owner relies on

Dr. Bovik’s testimony to argue that “the references provide no basis to make those further modifications” suggested by Petitioner, because (1) “no reference teaches or suggests track defects based on a ‘processor’ that ‘determin[es]’ ‘a crosstie contour and a tie plate contour’”; and (2) Petitioner cites nothing that discloses or suggests “determining whether the tie plate is misaligned or sunken . . . based on the crosstie and the tie plate contour.” *Id.* at 53–54.

Petitioner replies that these arguments were “duly considered and rejected by the Board at Institution” on the basis that they do “not address Petitioner’s position” or the prior art as a whole. Reply 15 (citing Dec. 25–26). Petitioner argues that Holmes does disclose determining “a ‘crosstie contour and a tie plate contour,’” relying on Figure 8 of Holmes, which “depicts a profile 720 with ‘contours’ of ‘distinguishable’ railroad track bed components, including ties and tie plates.” *Id.* (citing Ex. 1011, 5:25–29 (explaining that graph 715 has profile 720, which has contours that correspond to distinguishable elements in window 710)), 7:15–42).



Petitioner’s annotated version of Fig. 8 of Holmes.

Patent Owner responds that Petitioner admits “that Holmes discloses only determining the ‘contours’ of ‘distinguishable elements’” but “erroneously claims—pointing to Figure 8—that such ‘elements’ include ‘tie plates.’” Sur-Reply 13. According to Patent Owner, “Holmes has no such disclosure.” *Id.* Figure 8 of Holmes is reproduced below:

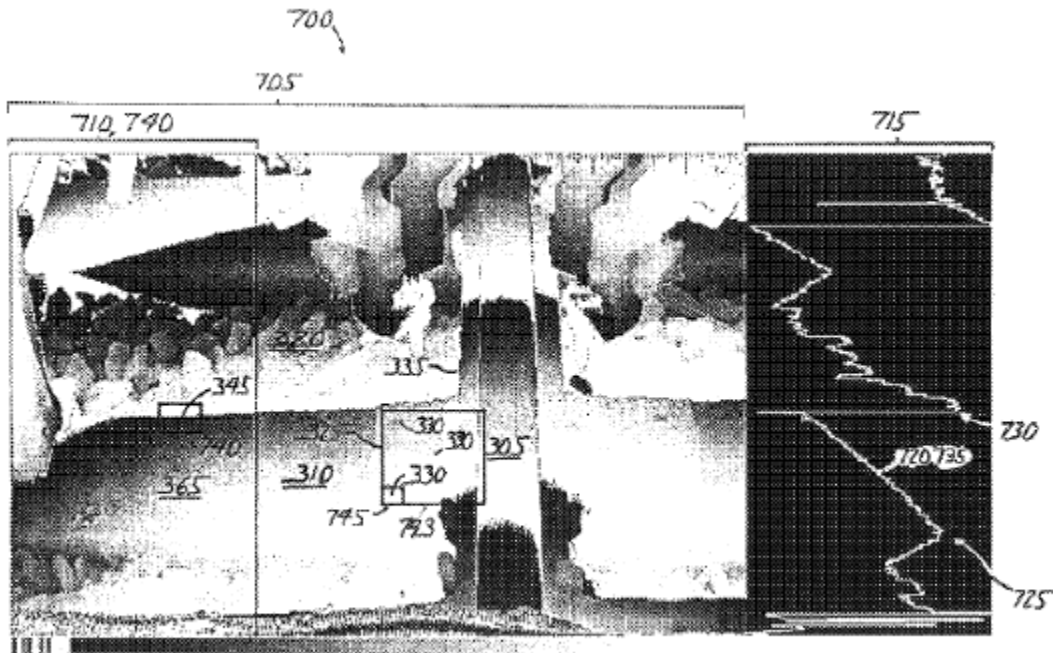


FIG. 8

Patent Owner states that “Figure 8 is a ‘composite’ of a virtual ‘image portion 705’ (the left $\frac{3}{4}$ of the figure) and a processor-generated ‘corresponding graph 715 having a profile 720’ (the right $\frac{1}{4}$ portion).” *Id.* at 14 (citing Ex. 1011, 5:19–21, 5:26–28). According to Patent Owner, Holmes “identifies creating a ‘contour’ only for the crosstie (‘tie 310’). Nowhere in Figure 8 or related text does Holmes disclose creating a graph, profile, and contour for the much smaller tie plate (labeled 325 in Figure 8 and 315 in the text).” *Id.* (citing Ex. 1011, 5:19–37).

Holmes discloses a vision system comprising a laser emitter emitting a laser beam, an infrared sensor and an image processor. The infrared sensor receives some of the resultant infrared electromagnetic waves and transmits a corresponding signal conveying the phase information thereof to an image processor [] which generates a corresponding, range-based virtual surface. With sufficient resolution, the virtual surface exhibits features that correspond to features of railway 300, for example, rails 305, ties 310 and the underlying railway bed 320.

Ex. 1011, 4:65–5:5. The image processor generates a range-based virtual surface of that for which it has received a signal. Holmes specifically identifies “ties 310” as a feature the virtual surface exhibits.

Holmes further explains that the image processor is provided with range-based data corresponding to features of a typical railway or other user-designated features. Such data includes, for example, characteristic range values, like the height of a rail above which no other element of a railway occurs, typical slopes between points of a range-based image, and distances between typical slope changes. The image processor also is provided with image comparison software which permits the image processor to compare the data corresponding to a typical railway with the generated virtual surface to determine whether the actual railway appears to present a specified feature. *Thus, the image processor permits identification of a typical rail, tie, tie plate or other railway features.*

Id. at 5:6–18 (emphasis added).

Accordingly, Holmes discloses that tie plates can be identified via its generated range-based virtual surface. Holmes then turns to Figure 8 to explain the identifying process in more detail: “FIG. 8 shows a composite virtual image and feature analysis graph display 700 of the image processor.” *Id.* at 5:19–20.

Figure 8 as reproduced by the parties depicts a virtual image 700 having a portion 705. It “shows rail 305, extending vertically with respect to the page, tie 310, tie plate 315 [sic, 325] and railway bed 320. Shading of image portion 705 relates to ranges of depicted features from the infrared sensor, as opposed to the luminescence or coloration thereof.” *Id.* at 5:21–25. Figure 8 shows a square placed on the image that identifies tie plate 325 and a window 710⁹ that marks off a region of image 700 within window 710 for further analysis. The analysis yields a graph. The graph has a profile. “The image processor analyzes a window 710 of image portion 705 and generates a corresponding graph 715 having a profile 720.” *Id.* at 5:25–28. “Profile 720 has contours that correspond to distinguishable elements in window 710.” *Id.* at 5:28–29.

It is clear that graph 715 depends on where window 710 is positioned on the composite virtual image. Figure 8 shows where the tie plate 325 is located in the image. It is represented by a square, which also marks a position for “an analysis window 743” (*id.* at 9:12). While it may be true, as Patent Owner argues, that Figure 8 shows creating a profile having contours for a crosstie without expressly showing creating contours for tie plates, this is so only because analysis window 710 is positioned over a location on the image that does not include tie plates.

Holmes does not, however, “identif[y] creating a “contour” *only* for the crosstie (‘tie 310’).” Sur-Reply 14 (emphasis added). In our view, Figure 8 represents an example of a composite virtual image that Holmes’s vision system can generate, and demonstrates how the system can analyze a

⁹ Figure 8 also includes reference numeral “740,” which according to Holmes, refers to “an analysis window 740” (Ex. 1011, 7:54).

portion of the image. Holmes expressly states that “the image processor permits identification of a typical rail, tie, *tie plate* or other railway features” (Ex. 1011, 5:17–18) (emphasis added). One of ordinary skill in the art reading this would understand that Figure 8 is an example of how to apply its analytical technique, which is applicable to identifying tie plates and not, as Patent Owner suggests, limited to large components such as railroad ties.

We find that of ordinary skill in the art would understand from reading Holmes that Figure 8 exemplifies an analytical technique that can be applied to identifying tie plates, given that graph 715 shows a profile 720 having contours “that correspond to distinguishable elements in window 710.” The evidence does not support Patent Owner’s argument that Holmes is concerned only with the edges of the crosstie. PO Resp. 53–54.

Regarding the comparison of contours, Petitioner relies on Davis to show comparing positions or locations of the tie plate and tie. Reply 16 (citing Pet. 66–67) (“Davis teaches that tie plate cut, a well-known objective performance measure of crosstie health, can be determined by measuring elevation differences between the top height surfaces of ties and tie plates.”). As far as evaluating and comparing contours, Petitioner relies on Kanade. *Id.* at 16–17 (citing Pet. 66); *see also id.* at 11 (Kanade evidences “evaluating and comparing features of contours of a 2D range image to determine potential defects through various image processing tools.”). Patent Owner does not appear to dispute that Kanade, for example, evaluates and compares features of contours. Accordingly, Patent Owner’s argument that Holmes does not disclose “comparing” the “contours” of any railway components (PO Resp. 53–54) does not persuasively undermine Petitioner’s position that the proposed combination teaches comparing the tie and tie

plate contours. Moreover, as discussed above, any Patent Owner argument against each of the references individually does not assess the entirety of the combination proposed by Petitioner and, therefore, does not persuade us of a deficiency in the proposed combination. *See Keller*, 642 F.2d at 425; *Merck & Co.*, 800 F.2d at 1091.

For the foregoing reasons, Patent Owner’s argument is unpersuasive in undermining Petitioner’s position that the proposed combination does not disclose the limitations of claim 22.

c. Remaining Challenged Claims

We have also considered Petitioner’s and Patent Owner’s arguments regarding the remainder of the independent and dependent claims challenged under this ground, namely, claims 23–29.

Claim 23 depends from claim 21 and requires “wherein the at least one light generator further comprises at least one laser.” Petitioner, referring to its arguments for claim 21[a], argues that “*Holmes*’ vision system 500 includes a laser emitter 505. *Holmes* thus discloses this additional limitation of claim 23.” Pet. 68 (relying on Ex. 1004 ¶ 125).

Claim 24 depends from claim 21 and requires “wherein the component further comprises a tie.” Petitioner, referring to its arguments for claim 21 and claim 22, argues that “*Holmes*’ vision system 200 projects, and captures an image of, a beam of light across railroad track ties 310.” Pet. 68–69 (citing Ex. 1004 ¶ 126).

Claim 25 depends from claim 21 and requires “wherein the at least one receiver is a camera.” Petitioner, referring to its arguments for claim 21[b], argues that “*Holmes*’ sensor 510 constitutes the claimed at least one receiver” and Bostrom to evidence other machine vision inspection system

processor resources. Pet. 69 (relying on Ex. 1008, 7:17–25, 7:47–56; Ex. 1010, 15–17, 107, 421, 486; Ex. 1039, 5:31–33; Ex. 1027, 153; Ex. 1004 ¶¶ 127–128).

Claim 26 depends from claim 22 and requires “wherein a single processor determines whether the captured image contains a tie plate, determines the crosstie contour and a tie plate contour, and determines whether the tie plate is misaligned or sunken.” Petitioner, relying on its arguments for claim 21[c] and claim 22, argues that “*Holmes*, *Bostrom*, and *Davis* render obvious the processor of claim 21[c] and 22” and that it would have been obvious to one of ordinary skill in the art “to use a single processor of the vision system to perform these limitations” because it is “well-known that the use of a single processor would eliminate the bottleneck that occurs when image data are moved serially.” Pet. 70 (citing Ex. 1004 ¶ 129; Ex. 1012, 90, Ex. 1019, 3).

Independent claim 27, according to Petitioner, “recites features similar to the features recited in claim 21 and 22,” and, thus, “*Holmes*, *Bostrom*, *Davis*, and *Kanade* render obvious the limitations of claim 27.” Pet. 71 (relying on Ex. 1004 ¶ 130).

Claim 28 depends from claim 27 and further requires “wherein the at least one light generator is a laser.” Petitioner, relying on its arguments from claim 21[a] and claim 23, argues that “*Holmes* discloses this additional limitation of claim 28.” Pet. 71 (relying on Ex. 1004 ¶ 131).

Independent claim 29, according to Petitioner, “recites features similar to those recited in claims 21 and 22, and claim 27, except that claim 29 recites the processor determine whether the tie plate ‘is sunken’ instead of

‘misaligned or sunken’” and “*Holmes, Bostrom, Davis, and Kanade* thus render obvious claim 29.” Pet. 71–72 (relying on Ex. 1004 ¶ 132).

Patent Owner does not present substantive arguments directed to claims 23–29, apart from referring back to its arguments for claims 21 and 22. PO Resp. 54–58. As discussed above, Petitioner has shown by a preponderance of the evidence that the combination of *Holmes, Bostrom, Davis, and Kanade* teaches or suggests the claimed subject matter of claims 21 and 22, and has articulated a sufficient rationale for combining the teachings of the references to arrive at the claimed subject matter. Additionally, we considered Patent Owner’s arguments and explained why each did not satisfactorily identify a deficiency in Petitioner’s positions.

We have also reviewed Petitioner’s evidence and arguments regarding claims 23–29. Pet. 68–72. We determine that Petitioner has shown that the combination of *Holmes, Bostrom, Davis, and Kanade* accounts for the limitations of claims 23–29 and that a person of ordinary skill would have been motivated to combine the references in the manner proposed with a reasonable expectation of success.

G. Objective Indicia

Before we make a final obviousness determination, we must consider the evidence of obviousness in light of any evidence of secondary considerations of nonobviousness presented by Patent Owner. *See Graham*, 383 U.S. at 17–18 (“Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy.”); *Transocean Offshore Deepwater*

Drilling, Inc. v. Maersk Drilling USA, Inc., 699 F.3d 1340, 1349 (Fed. Cir. 2012) (“This objective evidence must be ‘considered as part of all the evidence, not just when the decisionmaker remains in doubt after reviewing the art.’” (quoting *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1538–39 (Fed. Cir. 1983))).

Patent Owner argues that a nexus exists in this case, and that long-felt but unresolved need, commercial success, industry skepticism/industry praise, and copying by others demonstrate the nonobviousness of the challenged claims. PO Resp. 58–65; Sur-Reply 15–31; Sur-Sur-Sur-Reply 1–5. Petitioner disagrees. Reply 18–31; Sur-Sur-Reply 1–5.

i. Nexus

Patent Owner argues that a “nexus exists here between the Patent Owner’s ‘Aurora’ track inspection system and the claims.” PO Resp. 59. Specifically, Patent Owner relies on the declaration of John Kainer, which concludes that “Aurora includes every claimed element.” *Id.* at 59–60 (citing Ex. 2008 ¶¶ 4–17, 24–32).

Petitioner argues that Patent Owner “has not attempted to prove nexus directly” but that it “asserts that it is entitled to a presumption of nexus.” Reply 19. This, Petitioner argues, “completely ignores the coextensiveness requirement of a proper presumption of nexus analysis.” *Id.* Petitioner argues that the “Aurora system is not coextensive with the challenged claims because it comprises many different critical components and algorithms, not recited in the challenged claims—but instead claimed in other” patents. *Id.* Moreover, Petitioner argues, the “Aurora system does not even embody the challenged claims.” *Id.* at 26. Finally, Petitioner argues that no direct nexus

exists between Patent Owner's secondary considerations evidence and the challenged claims. *Id.* at 28.

Patent Owner replies that, regardless "of whether a presumption of nexus applies, there is evidence that a direct nexus exists." Sur-Reply 16. Patent Owner reiterates that "direct nexus evidence exists for all GREX's objective indicia." *Id.*

Objective evidence of nonobviousness is relevant only if there is a nexus between the evidence and the claimed invention. *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019). A presumption of nexus applies if the asserted objective evidence "is tied to a specific product and that product 'embodies the claimed features, and is coextensive with them.'" *Id.* (quoting *Polaris Indus., Inc. v. Artic Cat, Inc.*, 882 F.3d 1056, 1072 (Fed. Cir. 2018)). To the extent that a presumption of nexus does not apply, Patent Owner may still prove nexus "by showing that the evidence of secondary considerations is the 'direct result of the unique characteristics of the claimed invention.'" *Id.* (quoting *In re Huang*, 100 F.3d 135, 140 (Fed. Cir. 1996)).

The '956 patent's challenged claims are directed to a method or system "of inspecting a railroad track" that involves determining "whether the captured image contains a tie plate" and ultimately determining "whether the tie plate is misaligned or sunken." *See, e.g.*, Ex. 1001, 25:53–26:9 (claim 21), 26:26–41 (claim 27), 26:44–57 (claim 29). Patent Owner's Aurora system, however, comprises many more features than simply the determination of a sunken or misaligned tie plate, as Petitioner recognizes. Reply 19, 21–25; Sur-Sur-Reply 2–3. For example, in addition to the tie plate determination feature, the Aurora system includes many important

track inspection technologies and algorithms not recited in the challenged claims, including

X-ray technology (which does not use lasers) to image internal defects, such as cracks and decay in wooden ties (Ex-1062, 20:14–21:6, 64:1–18), enhanced GPS technology to better locate track defects (*id.*, 67:9–69:10), algorithms to detect ballast obstruction of ties and tie plates (*id.*, 71:17–72:23), algorithms to calibrate its lasers and cameras (*id.*, 87:18–88:13), and algorithms to detect rail base corrosion (*id.*, 32:7–20, 39:5–17).

Reply 22. According to Petitioner, Patent Owner represents that all these features, which are not necessarily related to the tie plate cut features of the challenged claims, are important to the Aurora system and impact its functionality. *Id.* (citing Ex. 1062, 59:3–11, 64:1–72:23). Moreover, the advertisements for the Aurora system indicate that it uses “25 variables,” of which tie plate cut measurement is only one of the variables. Ex. 2015, 54; Ex. 2017, 18. Petitioner asserts that the other 25 variables pertinent to wooden tie condition assessment include “splitting, warpage, surface roughness, missing fasteners, spike height, skew angle, curvature, decay, cracking, tie length, and tie width, among others.” Reply 23 (citing Ex. 1062, 44:3–45:7, 52:1–54:7, 56:15–60:10; Ex. 1063, 27:20–28:4, 30:15–34:1, 47:19–48:7, 55:19–61:21; *see also* Ex. 1062, 44:3–14, 73:17–74:16, 79:11–18, 81:7–21, 83:15–84:15; Ex. 1063, 30:15–33:23). Some of these features of the Aurora system are covered by other patents owned by Patent Owner, as identified in advertisements for the Aurora system. Ex. 1062, 119:12–120:19; Ex. 1053; *see also Fox Factory*, 944 F.3d at 1377 (“Where a product embodies claims from two patents, a presumption of nexus can be appropriate only if the claims of both patents generally cover the same invention.”).

With the exception of the tie plate cut feature, none of these other features of the Aurora are claimed in the '956 patent, at least not to the level of specificity presented in the advertisements showing these features and their operation. *See* Ex. 2014, 39 (“Analyze the surface of wood ties,” “Assign up to four wood tie grades,” “Measure vertical plate cut,” “Locate rail base corrosion,” “Identify signs of rail seat abrasion,” “Perform virtual track walks safely from your office”); Ex. 2015, 53 (advertising “Rail Seat Abrasion Real Time Processing,” “Wood Tie Grading,” “Rail Base Corrosion,” and “Virtual Track Walk”); Ex. 2016, 2–3 (discussing handling of ballast coverage); Ex. 2017, 38 (advertising “Rail Seat Abrasion,” “Wood Tie Grading,” “Rail Base Corrosion,” and “Virtual Track Walk”). There is no indication in the record of how much if any contribution these features have to the asserted objective indicia of nonobviousness.

A presumption of nexus does not apply “[w]hen the thing that is commercially successful is not coextensive with the patented invention—for example, if the patented invention is only a component of a commercially successful machine or process.” *Polaris Indus.*, 882 F.3d at 1072. Here, the tie plate cut diagnostic system and method of the challenged claims of the '956 patent is merely one of many features of Patent Owner’s Aurora system, and the submitted evidence does not indicate how to allocate objective indicia of nonobviousness to the tie plate cut diagnostics claimed in '956 patent relative to the Aurora system overall.

Accordingly, we do not apply a presumption of nexus that the '956 patent’s claims are linked to the objective indicia of nonobviousness, because Petitioner has successfully shown that the Aurora system is not coextensive with the claims. Even if we did apply the presumption,

however, our result would not be different, because the presumption is rebuttable, and Petitioner has presented sufficient evidence to show that objective indicia of nonobviousness do not outweigh the showing of obviousness, for reasons explained further in the following sections.

ii. Long-Felt but Unresolved Need

Patent Owner contends there was a “long-felt need to automate railroad track bed inspection, including detection of tie plate cutting and misalignment.” PO Resp. 60. This need “included automated evaluation of crosstie condition, which includes tie plate cut and misalignment.” *Id.* (citing Ex. 2017, 16, 20; Ex. 2019, 1, 3, 5; Ex. 2012 ¶¶ 8, 21). Patent Owner further contends “customers had been asking for” the plate-cut measurement feature since about 2006–2007. *Id.* at 61 (quoting Ex. 2020 ¶¶ 31–32. Patent Owner also relies on a competitor’s creation of an automated system for detecting plate cut to address “industry need.” *Id.* at 61–62 (citing Ex. 2018, 4–8).

Petitioner argues that Patent Owner’s evidence “fails to show a specific long-felt but unresolved need for the automated *tie plate cut* algorithm of the challenged claims.” Reply 29. Petitioner criticizes Patent Owner’s evidence as directed to automated track inspection systems in general and not the claimed tie plate cut algorithm. *Id.*; *see also* Tr. 26:23–27:2 (“We don’t have any statements from a single customer saying that there was a long felt need for the tie plate cut and GREX’s Aurora system brought it to be and, you know, saved the world.”).

Patent Owner replies that, specifically, its “customers requested automated tie plate cut measurements” and, when Patent Owner added this technology to its Aurora system, “all the major railroads were interested.”

Sur-Reply 17 (citing Ex. 2020, 23–24, 30–32). Patent Owner also faults Petitioner for not providing rebuttal evidence. *Id.*

Establishing long-felt need requires objective evidence that an art-recognized problem existed in the art for a long period of time without solution. *Newell Cos. v. Kenney Mfg. Co.*, 864 F.2d 757, 768 (Fed. Cir. 1988); *Orthopedic Equip. Co. v. All Orthopedic Appliances, Inc.*, 707 F.2d 1376, 1379 (Fed. Cir. 1983). Establishing long-felt need also requires objective evidence that the invention satisfies the long-felt need. *In re Cavanagh*, 436 F.2d 491, 496 (CCPA 1971). We agree with Petitioner that Patent Owner’s evidence does not show that a long felt need for the particular tie plate cut algorithm of the claims existed for a long period of time without a solution, because the period of time discussed appears to be relatively short, and the evidence of a specific need for automated tie plate cut measurement system is thin. Also, as Petitioner notes, Patent Owner’s evidence in this regard is directed to automated track inspections generally, rather than to any specific algorithm. Reply 29.

Accordingly, the evidence does not show a long-felt but unresolved need existed in the industry for what is claimed in the ’956 patent.

iii. Commercial Success

Patent Owner, relying on confidential revenue figures, argues that the “Aurora system has achieved great commercial success.” PO Resp. 62. Patent Owner presents confidential evidence concerning the amount of revenue generated by the Aurora system between 2009 and September 2019, and the growth of the revenue from 2010–2011 through September 2019. *Id.* (citing Ex. 2012 ¶ 15; Ex. 2013). Patent Owner also argues that it has “dramatically increased its market share because of the Aurora system” and

currently has “inspection contracts with five of the seven Class 1 railroads, and very soon will have a contract with a sixth.” *Id.* at 62–63 (citing Ex. 2012 ¶¶ 16–18).

Petitioner faults Patent Owner for failing “to present any evidence showing that the purported commercial success of the Aurora system is because of the claimed tie plate cut algorithm.” Reply 30. Petitioner further faults Patent Owner for relying on the testimony of its own CEO rather than an independent economics expert. *Id.* Finally, Petitioner argues that none of the evidence or argument “provides any analysis explaining why any apparent commercial success was directly attributable to the tie plate cut algorithm of the challenged claims, as opposed to, e.g., automated machine track inspection, in general, or any one of the many other different unclaimed algorithms and features of Aurora’s track inspection system.” *Id.* at 30–31.

“When a patentee can demonstrate commercial success, usually shown by significant sales in a relevant market, and that the successful product is the invention disclosed and claimed in the patent, it is presumed that the commercial success is due to the patented invention.” *J.T. Eaton & Co. v. Atl. Paste & Glue Co.*, 106 F.3d 1563, 1571 (Fed. Cir. 1997); *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1329 (Fed. Cir. 2016). “[I]f the unclaimed features amount to nothing more than additional insignificant features, presuming nexus may nevertheless be appropriate. Put differently, the degree of correspondence between a product and a patent claim falls along a spectrum.” *Fox Factory*, 944 F.3d at 1374. To establish a proper nexus between a claimed invention and the commercial success of a product, a patent owner must offer proof that the sales were a direct result of the

unique characteristics of the claimed invention, and not a result of economic and commercial factors unrelated to the quality of the patented subject matter. *In re Applied Materials, Inc.*, 692 F.3d 1289, 1299–1300 (Fed. Cir. 2012).

Here, even assuming there is sufficient nexus, we still find Patent Owner’s evidence insufficient to establish commercial success.

Patent Owner presents the revenue figures for its Aurora system, but does not provide sufficient evidence regarding the Aurora system’s market share. While revenue figures may be evidence suggestive of commercial success, here in the absence of a defined market, it is alone inadequate to establish commercial success. *Cf. Ex parte Jellá*, 90 USPQ 1009, 1012 (BPAI 2008) (precedential) (“[G]ross sales figures do not show commercial success absent evidence as to market share . . . or as to the time period during which the product was sold, or as to what sales would normally be expected in the market.”). According to the Federal Circuit, “the more probative evidence of commercial success relates to whether the sales represent ‘a substantial quantity in th[e] market.’” *Applied Materials*, 692 F.3d at 1300 (quoting *Huang*, 100 F.3d at 140). Patent Owner does not make clear what it believes the relevant market to be, nor the size or volume of the relevant market. Instead, Patent Owner presents evidence about its own revenue, but provides no context for its revenue relative to the relevant market. PO Resp. 62–63.

Patent Owner also represents that it had inspection contracts with five or six of the seven Class 1 railroads, but provides no context for the significance of its number and type of contracts relative to the market as a whole. PO Resp. 62–63. Without more information, it is difficult to tell

how significant the number of contracts awarded to Patent Owner is compared to the industry overall.

It is even more difficult to discern what proportion of any commercial success is attributable to inclusion of tie plate cut feature as recited in the '956 patent's claims. Although Patent Owner contends that there is "sufficient record evidence that much of Aurora's commercial success is attributable to its tie plate cut measurement technology, the claimed invention" (Sur-Reply 22), Petitioner argues that Patent Owner's declarant indicated that not only the claimed algorithm, but "all these features are important to the Aurora system," and all are the source of commercial success. Reply 22 (citing Ex. 1062, 59:3–11, 64:1–72:23). We find this evidence persuasive and give it substantial weight. Patent Owner submits no further evidence from consumers indicating that the tie plate cut feature, rather than the totality of the Aurora system features, is the reason for the Aurora system's success. Tr. 45:23–46:4 (Board: "But there's no information in the record from customers otherwise saying the only reason they buy the product is because of the technology we're discussing in the patents at issue today?" Patent Owner: "There's no testimony from customers as to that, no."). Patent Owner also admits that it did not present any sales figures from before the addition of the tie plate cut measurement technology, giving us inadequate basis to determine whether commercial success can be ascribed to this technology. *See id.* at 42:21–43:1 (Board: "Before the tie plate cut measurement feature was added to the Aurora system, were sales substantially less?" Patent Owner: "We didn't go back before that feature was added."). Consequently, from the evidence submitted in this case, we are aware of no way to determine how much if

any commercial success stems from the claimed tie plate cut assessment feature, as opposed to the other features of Patent Owner's Aurora system, or other unrelated factors.

Thus, we determine that the evidence of record fails to show that the commercial success is attributable to what is claimed in the challenged claims of the '956 patent.

iv. Industry Skepticism/Industry Praise

Regarding industry skepticism, Patent Owner contends the "industry was initially skeptical about automated inspection systems, and concerning Aurora's automated plate cut measurement system in particular." PO Resp. 63. Patent Owner relies on a statement by Mr. Turner, Patent Owner's retired Vice President, that in "2005, railroads dismissed as novelty, the thought of using machine vision technology for tie inspection and grading." *Id.* (citing Ex. 2016, 41); *see also* Ex. 2020, 30–33 (Mr. Turner stating that "there were doubters" among the railroads about plate-cutting technology). Patent Owner also relies on a competitor's statement that "automated tie and ballast assessment is going to replace the walking tie and ballast inspectors. It's just a question of when." *Id.* (citing Ex. 2015, 54).

Regarding industry praise, Patent Owner relies on several exhibits to argue that the "Aurora system received praise by being featured in various industry publications." *Id.* at 64 (citing Ex. 2012 ¶ 20; Ex. 2014, 36, 35; Ex. 2015, 52–53; Ex. 2016, 40–42; Ex. 2017, 16).

Petitioner replies that these statements are unreliable hearsay and "also not specific to the claimed tie plate cut algorithm." Reply 31. According to Petitioner, there is "no evidence suggesting that any industry skepticism/praise was directly related to the tie plate cut algorithm." *Id.*

Regarding praise, Petitioner argues that “the mere fact that GREX’s automated system ‘includes’ tie plate cut detection does not show that that particular feature was praised by the industry.” *Id.*

Patent Owner’s “skepticism” argument and evidence is not necessarily directed to skepticism of the claimed invention, but of machine vision technology in general. Sur-Reply 19–20. Moreover, the competitor’s statement relied upon by Patent Owner seems to treat the inevitable developments in machine vision positively, rather than skeptically.

Ex. 2015, 54. Patent Owner’s “praise” evidence seems to be more in the nature of magazine articles and testimony generally describing the Aurora system and its various attributes in the words of Patent Owner’s agents, rather than “praise” of the claimed tie plate cut algorithm by the industry at large. PO Resp. 63; *see also* Tr. 41:1–4 (asked if this evidence could be “separated out in a way that you discern how much of the praise is directed to the plate cut” feature, Patent Owner responding, “No, Your Honor.”). We agree with Petitioner that Patent Owner’s evidence is directed to the Aurora system as a whole, rather than to the tie plate cut algorithm specifically. Reply 31; Ex. 2012 ¶ 20; Ex. 2014, 36, 35; Ex. 2015, 52–53; Ex. 2016, 40–42; Ex. 2017, 16.

Accordingly, the evidence does not show industry skepticism or praise for what is claimed in the ’956 patent.

v. *Copying*

Patent Owner argues that the Aurora system “has been copied.” PO Resp. 64. Pointing to a patent infringement lawsuit concerning a different patent, Patent Owner notes that the court “awarded enhanced damages in part based on finding of ‘strong evidence of copying’ of the Aurora system.”

Id. (citing Ex. 2021, 37–38, 45). Petitioner does not address the evidence of copying in its Reply, which Patent Owner notes. Sur-Reply 22. Petitioner faults Patent Owner for not conducting any analysis to show the required nexus. Sur-Sur-Reply 5.

Copying requires evidence of efforts to “replicate a specific product, which may be demonstrated through internal company documents, direct evidence such as disassembling a patented prototype, photographing its features, and using the photograph as a blueprint to build a replica, or access to the patented product combined with substantial similarity to the patented product.” *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1246 (Fed. Cir. 2010); *accord Tokai Corp. v. Easton Enters., Inc.*, 632 F.3d 1358, 1370 (Fed. Cir. 2011). Case law requires a showing of efforts to replicate a specific product, such as Patent Owner’s Aurora system, and here, Patent Owner does not provide evidence to support such replication. *Id.*; *see also Iron Grip Barbell Co. v. USA Sports, Inc.*, 392 F.3d 1317, 1325 (Fed. Cir. 2004) (“Not every competing product that arguably falls within the scope of a patent is evidence of copying. Otherwise every infringement suit would automatically confirm the nonobviousness of the patent. Rather, copying requires the replication of a specific product.”).

On this record, we are not persuaded by Patent Owner’s argument, and we accord minimal weight to Patent Owner’s evidence of copying. Patent Owner’s evidence indicates that another court in a dispute regarding another patent determined that another competitor copied the Aurora system. Ex. 2021, 37–38, 45. Although we recognize and credit the findings of other courts in certain circumstances, we cannot take this testimony at face value in this instance. We are not presented with any direct evidence of internal

company documents, direct evidence such as disassembling a patented prototype, photographing its features, and using the photograph as a blueprint to build a replica, or access to the patented product combined with substantial similarity to the patented products. The findings presented in the district court's opinion do not let us review or weigh the evidence relied upon, and we cannot independently determine whether copying occurred based on the evidence of copying of a different patent evaluated by the district court. Moreover, the findings of copying of the Aurora system as a whole are not necessarily evidence of copying of the claimed tie plate cut feature. The claims at issue here are not directed to the Aurora system as a whole, but instead are directed to a particular system and method with certain characteristics, and we are not presented with significant evidence regarding copying of this challenged aspect of the Aurora system.

Taking all of these facts into consideration, Patent Owner's evidence of copying is entitled to minimal weight.

H. Conclusions of Obviousness (Ground 2)

We have reviewed Petitioner's obviousness grounds, including proffered evidence, and Patent Owner's arguments and proffered evidence, including evidence of objective indicia, in determining whether claims 21–29 as challenged under Ground 2 are unpatentable by a preponderance of the evidence. On balance, in view of the strength of the evidence in favor of obviousness for each of claims 21–29, and the deficiencies in the evidence relied on as supporting the contended objective indicia of patentability, we determine that Petitioner has established by a preponderance of the evidence that the subject matter of claims 21–29 is unpatentable.

I. Asserted Obviousness over Davis, Kowalski, Bostrom, and Kanade (Ground 1)

Petitioner asserts that claims 21–29 of the ’956 patent are unpatentable as obvious over Davis, Kowalski, Bostrom, and Kanade under 35 U.S.C. § 103. Pet. 24–59. At the institution stage, we were “not persuaded Petitioner has demonstrated a reasonable likelihood of prevailing on its contentions that claims 21–29 of the ’956 patent are obvious over Davis, Kowalski, Bostrom, and Kanade.” Dec. 22. In its Response, Patent Owner presents arguments against Petitioner’s Ground 1 (PO Resp. 13–46). In its Reply, Petitioner does not present any arguments directly addressing Ground 1, nor does Petitioner address any of Patent Owner’s Ground 1 arguments. Reply 5–6 (arguing that “claims 21–29 of the ’956 patent are unpatentable” but moving directly to Petitioner’s Ground 2 arguments). Patent Owner argues in its Sur-Reply that Petitioner “thus effectively relinquishes Ground 1” (Sur-Reply 4), but Petitioner insists that Ground 1 arguments “have not been relinquished whatsoever,” and that “the ground stands and in our reply we actually maintain that they stand.” Tr. 9:13–15.

As explained above, we find that Petitioner has met its burden of showing that claims 21–29 are unpatentable as obvious over Holmes, Bostrom, Davis, and Kanade (Ground 2). We also note that Petitioner has not supplemented or augmented its Ground 1 arguments since we decided, at institution and under a lower standard, that Petitioner had not shown a reasonable likelihood of prevailing on its Ground 1 arguments. Therefore, on the same record, a preponderance of the evidence does not support Petitioner’s position.

Accordingly, having reached a conclusion on obviousness regarding claims 21–29 on the basis of Petitioner’s Ground 2, and having received no

further reasoning or argument to persuade us that we erred in our institution-stage determinations regarding Ground 1, we do not further address Petitioner's arguments regarding obviousness of claims 21–29 over Davis, Kowalski, Bostrom, and Kanade.

III. MOTION TO EXCLUDE

Petitioner moves to exclude Exhibits 2008, 2020, and 2021. (Paper 35, “Mot. Excl.”) 1–7. Patent Owner filed an Opposition (Paper 37, “Opp. Mot. Excl.”) and Petitioner filed a Reply (Paper 38, “Reply Mot. Excl.”).

Exhibit 2008 is the testimony of John Kainer. Petitioner alleges that at “least paragraphs ¶¶ 5 and 16 of Mr. Kainer's testimony are improper lay testimony and/or expert testimony and thus should be excluded because he makes several uncorroborated, conclusory statements about features allegedly included in the Aurora system.” Mot. Excl. 1–2. Patent Owner responds that these paragraphs “contain proper lay testimony and/or expert testimony concerning certain hardware (lasers, cameras, and an encoder) used in GREX's Aurora system.” Opp. Mot. Excl. 1.

Exhibit 2020 is the testimony of Lynn Turner. Petitioner argues that this testimony includes inadmissible hearsay under FRE 801 and 802 and should be excluded. Mot. Excl. 3–4. Patent Owner argues that the exception in FRE 807 applies. Opp. Mot. Excl. 4.

Exhibit 2021 is a Memorandum and Order from a district court case involving U.S. Patent No. 7,616,329, relied upon by Patent Owner to support its assertions of copying. Petitioner argues that Exhibit 2021 is irrelevant under FRE 401 and 402. Mot. Excl. 7. Patent Owner argues that Petitioner fails to prove that Exhibit 2021 is irrelevant. Opp. Mot. Excl. 8.

We need not consider the merits of Petitioner's Motion to Exclude with respect to these exhibits, because even if the disputed evidence is considered, we have accorded it its proper weight and it nevertheless fails to persuade us that Patent Owner has prevailed in its secondary considerations arguments. Thus, Petitioner's Motion to Exclude is dismissed as moot as to Exhibits 2008, 2020, and 2021.

IV. MOTION TO SEAL

Patent Owner and Petitioner each filed Motions to Seal certain papers and exhibits. Paper 15 (Patent Owner); Paper 24 (Petitioner).

In its Motion to Seal, Patent Owner seeks to seal the confidential version of the Patent Owner Response (Paper 16), as well as Exhibit 2008 (Declaration of John Kainer, filed in redacted and unredacted forms), Exhibit 2012 (Declaration of Gregory T. Grissom, filed in redacted and unredacted forms), and Exhibit 2013 (Schedule of Aurora Financial Data 2003–September 2019, filed in redacted and unredacted forms). Paper 15, 1–2. Patent Owner represents that the parties agreed to use the default protective order set forth in the July 2019 update to the Office Patent Trial Practice Guide, and submits a Proposed Stipulated Protective Order as Exhibit 2022. *Id.* at 3.

In its Motion to Seal, Petitioner seeks to seal the confidential versions of Exhibit 1062 (Deposition Transcript of Gregory T. Grissom, filed in redacted and unredacted forms) and Exhibit 1063 (Deposition Transcript of John Kainer, filed in redacted and unredacted forms). Paper 24, 1. Petitioner states that the parties have agreed to use the default protective order set forth in the July 2019 update to the Office Patent Trial Practice Guide (Ex. 2022). *Id.*

“There is a strong public policy for making all information filed in a quasi-judicial administrative proceeding open to the public, especially in an *inter partes* review which determines the patentability of claims in an issued patent and therefore affects the rights of the public.” *Garmin Int’l v. Cuozzo Speed Techs., LLC*, IPR2012–00001, Paper 34 at 1–2 (PTAB Mar. 14, 2013). For this reason, except as otherwise ordered, the record of an *inter partes* review trial shall be made available to the public. *See* 35 U.S.C. § 316(a)(1); 37 C.F.R. § 42.14. The standard for granting a motion to seal is good cause. 37 C.F.R. § 42.54. That standard includes showing that the information addressed in the motion to seal is truly confidential, and that such confidentiality outweighs the strong public interest in having the record open to the public. *See Garmin*, Paper 34 at 2–3.

After having considered the arguments, we determine that the parties establish good cause for sealing the documents identified in the respective Motions. Specifically, the parties demonstrate that the information they seek to seal consists of portions of papers, declarations, and deposition transcripts dealing with confidential technical and financial information about the parties’ products, and exhibits having to do with confidential financial information. *See, e.g.*, Paper 15, 1–2; Paper 24, 1. The parties have also filed publicly available, redacted versions of the documents sought to be sealed. Accordingly, the Motions are *granted* and the Proposed Protective Order (Ex. 2022) is *entered*.

There is an expectation that information will be made public where the information is identified in a final written decision, and that confidential information that is subject to a protective order ordinarily would become public 45 days after final judgment in a trial, unless a motion to expunge is

granted. 37 C.F.R. § 42.56; Patent Trial and Appeal Board Consolidated Trial Practice Guide 21–22 (Nov. 2019), *available at* <https://www.uspto.gov/TrialPracticeGuideConsolidated>; *see also* 84 Fed. Reg. 64,280 (Nov. 21, 2019). A party dissatisfied with the Final Decision may appeal the Decision pursuant to 35 U.S.C. § 141(c), and has 63 days after the date of the Decision to file a notice of appeal. 37 C.F.R. § 90.3(a). Thus, it remains necessary to maintain the record, as is, until resolution of an appeal, if any. In view of the foregoing, the confidential documents filed in the instant proceeding will remain under seal, at least until the time period for filing a notice of appeal has expired or, if an appeal is taken, the appeal process has concluded. The record for the instant proceeding will be preserved in its entirety, and the confidential documents will not be expunged or made public, pending appeal. Notwithstanding 37 C.F.R. § 42.56 and the Consolidated Trial Practice Guide, neither a motion to expunge confidential documents nor a motion to maintain these documents under seal is necessary or authorized at this time. *See* 37 C.F.R. § 42.5(b).

V. CONCLUSION

For the reasons discussed above, we determine Petitioner has proven, by a preponderance of the evidence, that the challenged claims are unpatentable, as summarized in the following table:

Claims	35 U.S.C. §	References/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
21–29	103(a)	Davis, Kowalski, Bostrom, Kanade		21–29

Claims	35 U.S.C. §	References/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
21–29	103(a)	Holmes, Bostrom, Kanade, Davis	21–29	
Overall Outcome			21–29	

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner establishes, by a preponderance of the evidence, that claims 21–29 of U.S. Patent No. 9,441,956 B2 are unpatentable;

FURTHER ORDERED that Petitioner’s Motion to Exclude is *dismissed as moot*;

FURTHER ORDERED that Patent Owner’s and Petitioner’s Motions to Seal are *granted*; and

FURTHER ORDERED that this is a Final Written Decision; therefore, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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