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Paper 52
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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TOSHIBA MEMORY CORPORATION,
Petitioner,

v.

ANZA TECHNOLOGY INC.,
Patent Owner.

Case IPR2018-01598
Patent 6,651,864 B2

Before GEORGE C. BEST, CHRISTOPHER L. CRUMBLEY, and MICHELLE N. ANKENBRAND, *Administrative Patent Judges*.

CRUMBLEY, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining Challenged Claim Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

We have jurisdiction to hear this *inter partes* review under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed herein, Petitioner has shown by a preponderance of the evidence that claim 28 of U.S. Patent No. 6,651,864 B2 (Ex. 1001, "the '864 patent") is unpatentable.

A. Procedural History

Toshiba Memory Corporation ("TMC") filed a Petition requesting an *inter partes* review of claim 28 of the '864 patent. Paper 1 ("Pet."). Anza Technology Inc., identified as the real party in interest to the '864 patent, filed a Preliminary Response to the Petition. Paper 7 ("Prelim. Resp."). We authorized additional briefing, after which TMC filed a Reply (Paper 9) and Anza filed a Sur-Reply (Paper 11). On March 14, 2019, upon consideration of the preliminary briefing and the parties' evidence, applying the standard set forth in 35 U.S.C. § 314(a), we instituted an *inter partes* review of claim 28 on all grounds asserted. Paper 12 ("Dec.").

In our institution decision, we determined that TMC had not identified all of the real parties in interest. *Id.* at 7–9. In particular, we determined that TMC failed to establish that Toshiba Corporation was not a real party in interest. *Id.* In view of this determination, we authorized TMC to file a motion to amend the mandatory disclosures in its Petition to add an identification of Toshiba Corporation as a real party in interest. *Id.* (citing *Proppant Express Invs., LLC v. Oren Techs., LLC*, IPR2017-01917, Paper 86 (PTAB Feb. 13, 2019) (precedential).

TMC filed a motion to amend the mandatory disclosures, which Anza opposed. Papers 15, 18. Upon consideration, we granted TMC's motion to amend its mandatory disclosures. Paper 32.

Following institution of trial, Anza filed a Patent Owner Response (Paper 33, "PO Resp."), TMC filed a Reply (Paper 38, "Pet. Reply"), and Anza filed a Sur-Reply (Paper 43, "Sur-Reply").

TMC relies on the testimony of Dr. John Bravman, and supported the Petition with Dr. Bravman's Declaration. Ex. 1003. After institution of trial, Anza cross-examined Dr. Bravman via deposition, and submitted the deposition transcript along with its Patent Owner Response. Exs. 2045–47.

For its part, Anza relies on the testimony of two witnesses: the Declaration of Dr. Bruce Kim (Ex. 2048) and the Declaration of Stephen F. Reiber (Ex. 2028). Both of these declarations were submitted in support of Anza's Patent Owner Response. TMC cross-examined the witnesses via deposition, and submitted the transcripts with its Reply. Exs. 1051, 1052, 1054, 1056.

An oral hearing was held on November 20, 2019, and a transcript of the hearing is included in the record (Paper 51, "Tr.").

We issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed below, TMC has shown by a preponderance of the evidence that claim 28 of the '864 patent is unpatentable. *See* 35 U.S.C. § 316(e).

B. Related Proceedings

TMC and Anza have identified the following related matters. *See* Pet. iii–iv; Paper 4, 2–3; Paper 6, 2–3.

1. *District Court Proceedings*
    a. *Reiber v. Western Digital Corp.*, No. 2:07-cv-01874 (E.D. Cal.)
    b. *CoorsTek, Inc. v. Reiber*, No. 1:08-cv-01133 (D. Colo.)
    c. *Reiber v. TDK Corp.*, No. 2:11-at-00570 (E.D. Cal.)
    d. *Reiber v. TDK Corp.*, No. 2:11-cv-01057 (E.D. Cal.)
    e. *Reiber v. Western Digital Corp.*, No. 2:14-cv-00763 (E.D. Cal.)
    f. *Anza Technology, Inc. v. Xilinx, Inc.*, No. 3:16-cv-06302 (N.D. Cal.)
    g. *Anza Technology, Inc. v. Xilinx, Inc.*, No. 1:17-cv-00687 (D. Colo.)
    h. *Anza Technology, Inc. v. Toshiba America Electronic Components, Inc.*, No. 5:17-cv-07289 (N.D. Cal.)
    i. *Anza Technology, Inc. v. Mushkin, Inc.*, No. 1:17-cv-03135 (D. Colo.)
    j. *Anza Technology, Inc. v. Avant Technology, Inc.*, No. 1:17-cv-01193 (W.D. Tex.)
    k. *Atkin v. Reiber*, Nos. 2:09-2017, -3483 (E.D. Cal.)
2. *Patent & Trademark Office Proceedings*
    a. *Inter Partes* Reexamination No. 95/002,283
    b. *Inter Partes* Reexamination No. 95/002,295
    c. *Xilinx, Inc. v. Anza Technology, Inc.*, IPR2018-00527, filed January 25, 2018
    d. *Xilinx, Inc. v. Anza Technology, Inc.*, IPR2018-00528, filed January 25, 2018
    e. *Toshiba Memory Corp. v. Anza Technology, Inc.*, IPR2018-01597, filed September 11, 2018.
3. *Other Administrative Proceedings*
    a. *In re Hard Drives, Components Thereof, and Products Containing the Same*, No. 337-TA-616 (Int'l Trade Comm'n)

We note that, subsequent to the filing of the instant Petition, another petition requesting an *inter partes* review of the '864 patent was filed before the Board: *Avant Technology Inc. v. Anza Technology, Inc.*, IPR2019-00045. The Board denied institution of trial in that case.

C. The '864 Patent (Ex. 1001)

The '864 patent, entitled Dissipative Ceramic Bonding Tool Tip, issued November 25, 2003, claims priority to provisional applications 60/288,203 (filed on May 1, 2001) and 60/121,694 (filed on Feb. 25, 1999). Ex. 1001, at [10], [45], [54], [60]. The '864 patent's written description describes bonding tool tips, particularly ceramic tips for bonding tools that fabricate electrical connections between semiconductor components. *Id.* at 1:11–13. As the patent explains:

> Integrated circuits are typically attached to a lead frame, and individual leads are connected with wire to individual bond pads on the integrated circuit. The wire is fed through a tubular bonding tool tip having a bonding pad at the output end. These tips are called capillary tips. An electrical discharge at the bonding tool tip Supplied by a separate Electronic Flame Off (EFO) device melts a bit of the wire, forming a bonding ball . . . .
>
> When the bonding tool tip is on the integrated circuit die side of the wire connection, the wire will have a ball formed on the end of the wire, as above, before reaching the next die bonding pad. The ball then contacts the film formed on the die pad on the integrated circuit. The bonding tool tip is then moved from the integrated circuit die pad, feeding out gold wire as the tool is moved, onto the bond pad on the lead frame, and then scrubbed laterally by an ultrasonic transducer. Pressure from the bonding tool tip and the transducer, and capillary action, causes the wire to "flow" onto the bonding pad where molecular bonds produce a reliable electrical and mechanical connection.
>
> Bonding tool tips must be sufficiently hard to prevent deformation under pressure, and mechanically durable so that

> many bonds can be made before replacement. Prior art bonding tool tips were made of aluminum oxide, which is an insulator that is durable enough to form thousands of bonding connections. Bonding tool tips must also be designed to produce a reliable electrical contact, yet prevent electrostatic discharge damage to the part being bonded. Certain prior art devices emit one or more volts when the tip makes bonding contact. This could present a problem, as a one volt static discharge could cause a 20 milliamp current to flow, which, in certain instances, could damage the integrated circuit or magnetic recording head.

Id. at 1:23–62.

According to the patent, the problems created by electrostatic discharge can be avoided by using a bonding tool tip that conducts electricity at a rate sufficient to prevent charge buildup, but not at so high a rate as to overload the device being bonded. *Id*. at 2:10–13. "In other words, it is desirable for the bonding tip to discharge slowly. The tip needs to discharge to avoid a sudden surge of current that could damage the part being bonded." *Id*. at 2:20–23.

D. Challenged Claim

Claim 28, the sole claim challenged, reads as follows:

> 28. A method of using an electrically dissipative bonding tool tip, having a resistance in the range of 10^5 to 10^{12} ohms, comprising:
>
> providing the electrically dissipative bonding tool tip;
>
> bonding a material to a device;
>
> allowing an essentially smooth current to dissipate to the device, the current being low enough so as not to damage said device being bonded and high enough to avoid a build up of charge that could discharge to the device being bonded and damage the device being bonded.

Id. at 14:27–38.

E. Instituted Grounds of Unpatentability

We instituted trial on the following grounds of unpatentability (Dec. 6, 23):

Reference(s)	**Basis**[1]
Mikaki[2]	§ 102(e)
Mikaki and Linn[3]	§ 103
Alfaro[4] and Shikata[5]	§ 103
Popp[6]	§ 103
Popp and Schneider[7]	§ 103

TMC asserts that Mikaki is prior art to the '864 patent under 35 U.S.C. § 102(e) (Pet. 30), whereas Linn, Alfaro, Popp, and Schneider are

[1] The relevant sections of the Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112–29, took effect on March 16, 2013. Because the application to which the '864 patent claims priority was filed before that date, our citations to Title 35 are to its pre-AIA version.

[2] U.S. Patent No. 6,274,524 B1 to Shinji et al., issued Aug. 14, 2001 (Ex. 1022). The first-named inventor is listed on the patent as "Mikaki Shinji," but Mikaki appears to be the inventor's surname. *See* Ex. 1023, 2 (inventor listed on PCT counterpart as "MIKAKI, Shunji"). We follow our established practice and refer to the reference by the surname of the first-named inventor.

[3] U.S. Patent No. 5,816,472 to Linn et al., issued Oct. 6, 1998 (Ex. 1037).

[4] U.S. Patent No. 4,974,767 to Alfaro et al., issued Dec. 4, 1990 (Ex. 1024).

[5] U.S. Patent No. 5,830,819 to Shikata et al., issued Nov. 3, 1998 (Ex. 1025).

[6] German Patent DE 3,743,630 to Popp, published Mar. 16, 1989 (Ex. 1026). The exhibit contains both the original German-language reference (*id*. at 5–7) and a certified translation (*id*. at 1–4).

[7] U.S. Patent No. 5,610,442 to Schneider et al., issued Mar. 11, 1997 (Ex. 1027).

prior art under §§ 102(a), (b), and (e) (*id.* at 40, 47, 61, 67), and Shikata is prior art under §§ 102(a) and (e) (*id*. at 48). Anza disputes whether Mikaki is prior art to the '864 patent, as we discuss below. Otherwise, Anza does not challenge the prior art status of any other reference. *See* Paper 13 (Scheduling Order cautioning Anza that any arguments for patentability not preserved in the Patent Owner Response may be considered waived).

II. ANALYSIS

A. Burden of Proof

In an *inter partes* review, the petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to the patent owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail in this proceeding, Petitioner must support its challenges by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). Accordingly, all of our findings and conclusions are based on a preponderance of the evidence.

B. Real Party in Interest and Privity

In its Preliminary Response, Anza argued that institution of trial was barred for two reasons stemming from theories of real party in interest and privity. First, Anza contended that two companies related to TMC, Toshiba Corporation and Toshiba America Information Systems ("TAIS") should have been named in TMC's mandatory notices as real parties-in-interest. Prelim. Resp. 1. Second, Anza contended that TAIS was either a real party in interest or privy of TMC, and as such, a prior complaint alleging infringement of the '864 patent by TAIS more than one year prior to the Petition barred institution of trial under 35 U.S.C. § 315(b). *Id*.

We reviewed these allegations in our institution decision, and held that TMC had failed to establish that Toshiba Corporation was not a real party in interest, and as such, and should have been named in the Petition. Dec. 7. As noted above, we permitted TMC a short period to file a motion to amend its mandatory disclosures, and subsequently granted TMC's motion to amend. Paper 32.[8]

As to TAIS, however, we determined that TMC had shown sufficiently that TAIS was not a real party in interest to this proceeding. Dec. 7–8. We also held that TAIS had not been shown to be in privity with TMC. *Id*. As such, the fact that TAIS was not named as a real party in interest did not bar institution of trial, nor did the prior complaint against TAIS more than a year prior to the Petition invoke the statutory bar of § 315(b).

During the instituted trial, Anza renewed its arguments regarding TAIS and its relationship to this proceeding and TMC. Specifically, Anza argues that evidence developed during trial calls into question our

[8] In its Patent Owner Response, Anza argues that the Motion to Amend was made in bad faith and should not have been granted. PO Resp. 10–16. Anza bases this argument on its evaluation of the testimony of TMC's witness Scott Nelson, and in particular certain testimony developed during cross-examination that allegedly shows that Nelson was not competent to testify as to the matters in his Declaration. *Id*. (citing Ex. 2026). We have reviewed this evidence and find no support for Anza's claim of bad faith, and find that Mr. Nelson was competent to provide the testimony in his Declaration. In any event, our decision to grant the Motion to Amend considered whether TMC's original real party-in-interest *identification* was made in bad faith, *not* whether the Motion itself was in bad faith. Paper 32, 4–5 ("it does not appear that TMC acted in bad faith in omitting Toshiba Corp. as a real party in interest"). Anza's arguments regarding Mr. Nelson's testimony do not call that original determination into question.

preliminary determination at institution that TAIS is not a real party in interest.[9] PO Resp. 5–9. We have reconsidered our determination in light of the full record, including evidence developed during trial, and provide the following discussion.

1. Legal Standards

"A petition filed under section 311 may be considered only if . . . (2) the petition identifies all real parties in interest." 35 U.S.C. § 312(a); *see also* 37 C.F.R. § 42.101(b) ("A person . . . may file with the Office a petition to institute an *inter partes* review of the patent" unless the petition "is filed more than one year after the date on which the petitioner, the petitioner's real party in interest, or a privy of the petitioner is served with a complaint alleging infringement of the patent.").

A petitioner bears the ultimate burden of persuasion in establishing that all real parties in interest have been named. *Worlds Inc. v. Bungie, Inc.*, 903 F.3d 1237, 1242 (Fed. Cir. 2018). Absent a challenge from the patent owner, we accept the petitioner's identification of the real parties in interest as correct. *See id.* ("[A]n IPR petitioner's initial identification of the real parties in interest should be accepted unless and until disputed by a patent owner."). If a patent owner alleges that the petitioner omitted a real party in interest and produces some evidence to support its argument, the petitioner

[9] On occasion, Anza uses the term "privity" instead of "real party in interest," but both of its merits briefs following institution focus on the argument that TAIS is a real party in interest. PO Resp. 5 ("TAIS is a Real Party in Interest"); Sur-Reply 20 (same). The briefs do not address our determination regarding privity; we consider that matter settled at this point and do not re-evaluate it here.

bears the ultimate burden of persuasion to show patent owner's allegations are incorrect. *Id.*

The Federal Circuit has found that "Congress intended that the term 'real party in interest' have its expansive common-law meaning." *Applications in Internet Time, LLC v. RPX Corp.*, 897 F.3d 1336, 1351 (Fed. Cir. 2018) ("*AIT*"). Whether a non-party is a "real party-in-interest" for the purposes of an IPR is a "highly fact-dependent question" that takes into account how courts generally have used the term to "describe relationships and considerations sufficient to justify applying conventional principles of estoppel and preclusion." Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,759 (August 14, 2012) ("Trial Practice Guide"); *see* Consolidated Trial Practice Guide 13 (Nov. 2019).[10] As the Federal Circuit has noted, the Trial Practice Guide "explain[s] that the two questions lying at its heart of the inquiry are whether a non-party 'desires review of the patent' and whether a petition has been filed at a non[-]party's 'behest.'" *AIT*, 897 F.3d at 1351. Determining whether a non-party is a real party in interest requires analysis of a wide range of both equitable and practical considerations. *Id.*

Depending on the circumstances, various factors may be considered, including whether the non-party "exercised or could have exercised control over [the petitioner's] participation in [the] proceeding," the non-party's "relationship with the petitioner," the non-party's "relationship to the petition itself, including the nature and/or degree of involvement in the filing," and "the nature of the entity filing the petition." Trial Practice Guide, 77 Fed. Reg. at 48,759–60; *see also AIT*, 897 F.3d at 1351. A

[10] Available at https://www.uspto.gov/TrialPracticeGuideConsolidated.

potentially relevant factor is whether the non-party is funding or directing the proceeding. Trial Practice Guide, 77 Fed. Reg. at 48,760. For example, "a party that funds and directs and controls an IPR . . . petition or proceeding constitutes a 'real party-in-interest,' even if that party is not a 'privy' of the petitioner." *Id*. Complete funding or control is not required for a non-party to be considered a real party in interest; the exact degree of funding or control necessary to support a finding that a non-party is a real party in interest depends upon consideration of all of the pertinent facts. *Id.*

2. Determination at Institution

We first summarize the factual background provided at the time of institution, and our reasoning that TAIS was not a real party in interest to this proceeding.

Prior to institution, TMC submitted the declaration of Scott Nelson, the Senior Vice President of the Memory Business Unit at TMA. Ex. 1040. The declaration includes a pair of organization charts, reproduced below, showing the relevant portions of the Toshiba corporate family structure both before and after a 2017 corporate reorganization.

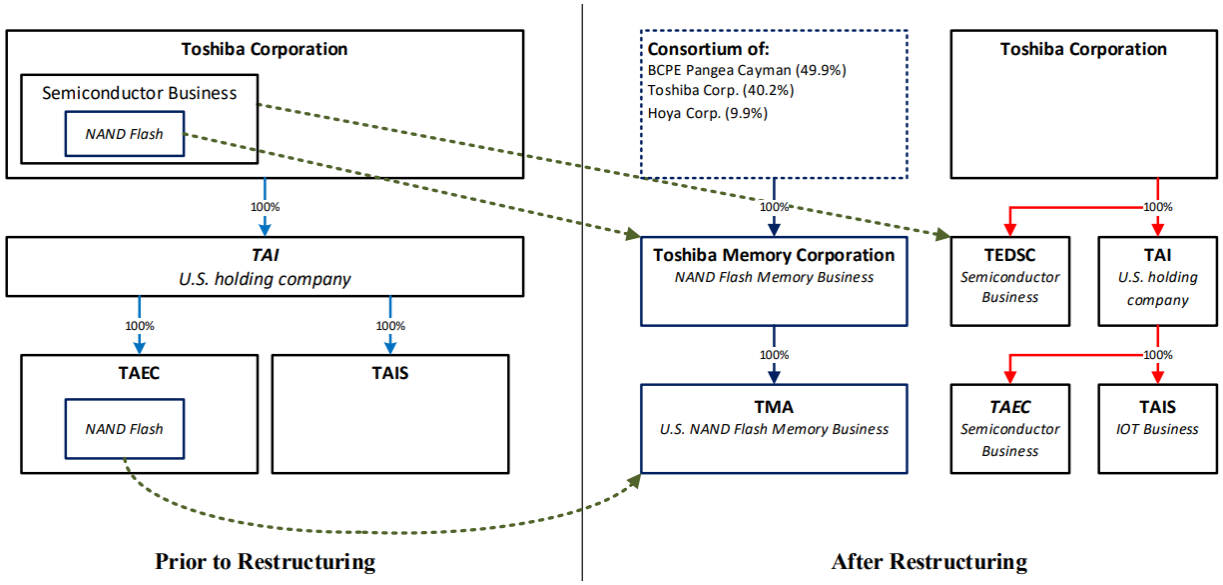

Illustration of relevant portions of Toshiba corporate structure before and after 2017 corporate restructuring. *Id.* ¶ 17.

The evidence showed that Toshiba Corporation is a Japanese company with a wholly-owned U.S. holding company subsidiary, Toshiba America, Inc. ("TAI"). *Id.* ¶ 5. Prior to 2017, TAI had at least two wholly-owned subsidiaries: TAEC and TAIS. *Id.* ¶¶ 12–13, 16–17.

Prior to April 1, 2017, Toshiba Corporation had several internal business units, including a semiconductor business that manufactured, *inter alia*, NAND flash memory devices. *Id.* ¶¶ 8–10; Ex. 2002, 6. TAEC was responsible for U.S. sales of the NAND flash memory devices and other semiconductor products. Ex. 1040 ¶¶ 12–13.

On April 1, 2017, Toshiba Corporation spun out its Japanese NAND flash memory business to TMC, a wholly-owned subsidiary. Prelim. Resp. 6; Ex. 2001, 4. In a transaction that closed June 1, 2018, Toshiba Corporation sold all of the shares of TMC to K.K. Pangea and, in return, received cash and 40.2% ownership in K.K. Pangea. Prelim. Resp. 6;

Ex. 2005. Due to a subsequent merger between K.K. Pangea and TMC, Toshiba Corporation now owns 40.2% of TMC. Exs. 2007, 2010. Toshiba Corporation recognizes TMC as "an affiliate accounted for by the equity method" in Toshiba Corporation's annual reports. Ex. 2002, 17 n.2. On October 1, 2017, the NAND flash memory device business unit of TAEC was spun out as TMA, which is a wholly-owned subsidiary of TMC. Ex. 1040 ¶ 4.

Relying on "equitable and practical considerations," we determined that TAIS is not a real party in interest to this proceeding. Dec. 7–8 (incorporating by reference analysis from *Toshiba Memory Corp. v. Anza Tech. Inc*., Case IPR2018-01597 (PTAB Mar. 12, 2018) (Paper 12)). Applying the reasoning set forth by the Federal Circuit in *AIT*, we found that:

> Anza's only argument that there is a pre-existing established relationship between TAIS and TMC is the use of a collective shorthand term—"Toshiba entities"—in a court filing by a third corporate entity, TMA. Anza's argument is without merit. As TMC points out, "TAIS is ***at most*** simply a cousin corporation of TMC, twice removed." Paper 9, 10. In addition, this is not a situation where two "corporate cousins" are both wholly owned under the same corporate umbrella; rather, Toshiba Corporation, the grandparent corporation to TAIS, is only a minority shareholder in TMC. And the record contains no evidence that this tenuous relationship has any connection to the [challenged] patent, or patents in general, unlike the relationship examined in *AIT*.

IPR2018-01597, Paper 12 at 15–16. We rejected Anza's argument, which essentially advocated a standard that "any entity that is part of an extended corporate family is a real party in interest to any IPR brought by any other

member of the corporate family, if that entity could conceivably benefit in any way from the results of the IPR." *Id*. at 16.

3. Evidence During Trial

Following institution of trial, Anza cross-examined Mr. Nelson via deposition, and submitted the transcript with its Response. Ex. 2026. Anza claims that this newly-developed evidence calls into question our determination that TMC is not a real party in interest to this proceeding. PO Resp. 5–9.

Anza's evidence primarily focuses on the fact that, at the time of the Petition, various entities within the Toshiba corporate structure were in the business of selling NAND flash memory products, which are also the products at issue in the copending district court infringement proceeding. *Id*. at 6–7. According to Anza, Toshiba Corporation supplied NAND memory to these various entities, including TAIS. *Id*. at 7. And following the corporate reorganization, TMC received the NAND flash memory business of Toshiba Corporation. *Id*. at 8. Anza concludes from this that "Toshiba Corp., TAEC, and TAIS were all closely involved in the manufacture, importation, and sale of non-volatile flash memory that is at issue. And not just *any* flash memory—but certain of the very flash memory accused of infringement in the district court." *Id*. at 7–8.

Upon evaluating these arguments in light of the record as a whole, we cannot conclude that the information regarding the sales of NAND flash memory is new evidence that should change our determination at institution that TAIS is not a real party in interest. As summarized above, we were aware at the time of institution that Toshiba Corporation had various sub-entities, some of which were involved in selling NAND flash memory

products. The only "new" evidence that Anza directs us to is the cross-examination of Mr. Nelson, but his testimony primarily provides the additional fact that Toshiba Corporation's NAND flash memory business (subsequently spun off into TMC) supplied NAND flash memory products to TAIS. Ex. 2026, 32–34, 91. At best, this establishes a sort of customer-supplier relationship between, as we have previously termed it, "corporate cousins." But customer-supplier relationships, without more, are insufficient to establish the requisite "close relationship" required to find that a party is a real party in interest. *See Samsung Elecs. Co. Ltd. v. Seven Networks, LLC*, IPR2018-01108, Paper 31 at 11 (PTAB Nov. 28, 2018) ("Samsung and Google have a standard customer-supplier relationship, which by itself does not make Google an RPI."); *see also WesternGeco LLC v. ION Geophysical Corp*., 889 F.3d 1308, 1321 (Fed. Cir. 2018) ("ION and PGS had a contractual and fairly standard customer-manufacturer relationship regarding the accused product," which "does not necessarily suggest that the relationship is sufficiently close . . . that the parties were litigating . . . the IPRs as proxies for the other."). Nor does the fact that the customer and supplier are in separate branches of a corporate family tree, without any evidence of ownership, control, or other imbricated financial relationship, suffice.

Anza cites the Board's precedential decision in *Ventex Co. Ltd. v. Columbia Sportswear North America, Inc*., IPR2017-00651, Paper 148 at 8 (PTAB Jan. 24, 2019) (precedential), as supporting the conclusion "that the parties had a mutual interest in the continuing commercial and financial success of each other." Sur-Reply 21. But *Ventex* is, in our view, distinguishable from the present case. *Ventex* involved two parties, Ventex

and Serius, that had a customer-supplier relationship. IPR2017-00651, Paper 148 at 7. But the record also contained two contracts between the parties that required exclusivity and contained indemnification provisions. *Id*. The Board there held that the contracts between the parties "incentivize[] both parties to invalidate claims of the '119 and '270 patents." *Id*. at 8. And the panel cited additional evidence that Ventex had sought to invalidate the subject patents to "aid prospective buyers of its products" and its actions were "grounded in concern of potential legal jeopardy for its customers and prospective buyers." *Id*. (internal quotations omitted). The panel concluded that the "exclusive business relationship between Ventex and Seirus relating to the accused Heatwave fabric, and Ventex's express desire to shield its customers and potential buyers from infringement lawsuits by Columbia strongly suggest that Ventex filed the Petition, at least in part, on Seirus's behalf." *Id*. at 9.

The present case is lacking most of the facts that led the *Ventex* panel to its conclusion. There is no evidence of any exclusivity agreement between Toshiba Corporation and TAIS as to the NAND memory, and the record does not contain any contracts between the entities that might show indemnity.[11] Nor does the record contain evidence that TMC's reason for filing the instant Petition was to shield TAIS, rather than to protect itself.

For these reasons, we conclude that the evidence adduced during trial is insufficient to alter our prior determination that TAIS is not a real party in

[11] Anza alleged that Toshiba Corporation has agreed to indemnify TMC for losses incurred as a result of patent infringement. Prelim. Resp. 9. But there is no similar allegation regarding TMC and TAIS, which is the relevant corporate relationship for our determination here.

interest to this proceeding. Upon reviewing the record as a whole, TMC and TAIS are "corporate cousins, twice removed" that have no ownership in or control over one another, and there is no additional evidence beyond a customer-supplier relationship that would establish that TMC is pursuing this *inter partes* review on behalf of TAIS.

C. The Person of Ordinary Skill in the Art

When considering a proposed ground of unpatentability, we must view the prior art from the perspective of the hypothetical person having ordinary skill in the art. *Sundance, Inc. v. DeMonte Fabricating Ltd.*, 550 F.3d 1356, 1361 n.3 (Fed. Cir. 2008) ("What a prior art reference discloses or teaches is determined from the perspective of one of ordinary skill in the art.") (citing *Scripps Clinic & Research Found. v. Genentech, Inc.,* 927 F.2d 1565, 1576 (Fed. Cir. 1991)). In addition, when considering whether a claim would have been obvious, we must ask whether there is a "reason[] one of ordinary skill in the art would have been motivated to select the references and to combine them to render the claimed invention obvious." *In re Rouffet*, 149 F.3d 1350, 1359 (Fed. Cir. 1998). We must, therefore, first consider who is the person of ordinary skill in the art of the '864 patent.

TMC defines the person of ordinary skill in the art at the time of the invention as having:

> a bachelor's degree in electrical engineering, mechanical engineering, materials science, physics, or a similar field, and one to two years of experience in semiconductor device fabrication and packaging. Relevant practical or educational experience in other subject areas that allow a person to gain knowledge of semiconductor device fabrication and packaging also may suffice to qualify that person as a POSITA.

Pet. 6 (citing Ex. 1003 ¶ 46).

Anza does not agree with TMC's proposed definition of the level of ordinary skill in the art. PO Resp. 16. Rather, Anza argues that a person of ordinary skill in the art at the time of the invention claimed in the '864 patent

> is one who holds a Ph.D. in Material Science and Engineering, and 4-5 years of experience in the field of electronic packaging technology in electrostatic discharge ("ESD"). Ex.2048 at ¶43. Alternatively, one skill[ed] in the art would have at least a Master's degree in Physics, Material Sciences and/or Electrical Engineering and also have at least 5-7 years of experience in the field. *Id.* Additional education might substitute for some of the experience[,] and substantial experience might substitute for some of the educational background. *Id.*

Id. (citing Ex. 2048 ¶ 42).

Neither party identifies any instance in which the difference between their proposed definitions affects either a factual or a legal determination. Nor do we see any instance in which the difference in the proposed definitions would have an effect on the outcome of this proceeding. To the extent that it is important to select one or the other of the proposed definitions, we determine that the parties agree that the level of skill is at least as much as TMC's proposal. This lower level of skill is consistent with the level of ordinary skill in the art reflected in the prior art and the '864 patent. Accordingly, we adopt this definition for the purpose of this decision.

D. Claim Construction

To compare prior art with the claim at issue properly, we must construe the disputed claim terms to ascertain their scope and meaning. *In re Paulsen*, 30 F.3d 1475, 1479 (Fed. Cir. 1997). Before we do so, however,

we must determine whether to apply the broadest reasonable interpretation in view of the '864 patent's specification or a district court-type claim interpretation.

1. A District Court-Type Claim Construction Applies

In an *inter partes* review filed before November 13, 2018, we ordinarily give claim terms in an unexpired patent their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b) (2017).[12] Section 42.100(b) provides that

> A party may request a district court-type claim construction approach to be applied if a party certifies that the involved patent will expire within 18 months from the entry of the notice of filing date accorded to the petition. *The request, accompanied by a party's certification, must be made in the form of a motion under § 42.20, within 30 days from the filing of the petition.*

37 C.F.R. § 42.100(b) (emphasis added).

In this case, neither TMC nor Anza filed the requisite motion seeking application of the district court-type claim construction standard. The parties, however, both agree that the '864 patent will have expired before the date of this final written decision.[13] Pet. 10; PO Resp. 17. Both the Petition

[12] A recent amendment to this rule does not apply here because the Petition was filed before November 13, 2018. *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 (October 11, 2018) (to be codified at 37 C.F.R. part 42). We, therefore, only cite the 2017 version of this regulation.

[13] The parties, however, do not agree upon the expiration date of the '864 patent. TMC states that the '864 patent expired on February 2, 2020. Pet. 10. Anza, on the other hand, asserts that February 25, 2020 was the

and the Response, therefore, request that we apply the district court-type claim construction standard under *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312, 1327 (Fed. Cir. 2005). Pet. 10; PO Resp. 17.

We do not regard this statement as the functional equivalent of the required motion and accompanying certification. Nevertheless, we apply the district court-type claim construction out of an abundance of caution regarding the date of issuance of this final written decision relative to the expiration date of the '864 patent. In any event, at oral hearing, both TMC and Anza agreed that applying either the broadest reasonable interpretation or the *Phillips* claim interpretation standard would result in the same construction for each of the disputed claim terms. Tr. 7, 48.

2. Claim Construction under Phillips

Under *Phillips*, claim terms are accorded "their ordinary and customary meaning." *Phillips*, 415 F.3d at 1312. "[T]he ordinary and customary meaning of the 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 then 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).

In the Petition, TMC asked that we construe five claim terms: 1) *bonding*; 2) *bonding tool tip*; 3) *resistance*; 4) *electrically dissipative*; and 5) *allowing an essentially smooth current to dissipate to the device, the current*

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expiration date. PO Resp. 17. For the purposes of our decision, we need not resolve this discrepancy.

being low enough so as not to damage said device being bonded and high enough to avoid a build up of charge that could discharge to the device being bonded and damage the device being bonded. Pet. 11–30. Anza in its Response only addressed the latter three terms, while noting that construction of the first two terms is not required to resolve the dispute between the parties. PO Resp. 21–35. We agree with Anza on the second point, and address only the construction of *resistance*, *electrically dissipative*, and the *essentially smooth current* phrase below.

3. resistance

TMC argues that the claim term *resistance* as used in claim 28 is indefinite. Pet. 18–24. In particular, TMC argues that claim 28 refers to the resistance of a material which, according to TMC, is not a physical property that can be determined unless one knows the dimensions of the overall object. *Id.* at 19. According to TMC, resistance is an electrical property of an object, while resistivity is an electrical property of a material. *Id.* at 19 (citing Ex. 1003 ¶¶ 71–72). Moreover, resistivity can refer to two different properties of a material: surface resistivity or volume resistivity. TMC, therefore, proposes multiple constructions of the term *resistance* and argues that claim 28 is invalid under each of its proposed constructions. Pet. 23–24; Pet. Reply 2–3.

Anza argues that we should adopt the interpretation of the term *resistance* set forth in the district court's claim construction memorandum in *CoorsTek, Inc. v. Steven F. Reiber*, No. 08-cv-01133-KMT-CBS, slip op. (D.

Colo. May 2, 2011).[14] In that case, the district court construed the term *resistance* to mean "opposition to electrical current flow." Ex. 1018, 44; PO Resp. 23–25. The district court, however, did not conduct a detailed analysis as to whether or not this construction was appropriate because the *CoorsTek* parties stipulated to this construction. Ex. 1018, 14–15.

As discussed above, the terms used in a claim are normally given "their ordinary and customary meaning." *Phillips*, 415 F.3d at 1312. "[T]he ordinary and customary meaning of the 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.

In this case, the '864 patent repeatedly uses the term *resistance* and refers to measuring the resistance in ohms. *See, e.g.*, Ex. 1001, 2:9–10, 4:9–14. Neither the term resistivity nor the units used to measure surface resistivity (ohms per square) appear in the Specification. We, therefore, determine that a person of ordinary skill in the art at the time of the invention would have understood *resistance*, as it is used in the claims of the '864 patent, to have its plain and ordinary meaning of "opposition to the flow of electrical current." This is consistent with the patent's repeated statement that "[f]or best results, a resistance in the tip assembly itself should range from $10x10^4$ or 10^5 to 10^{12} ohms." *See, e.g.*, Ex. 1001, Abstract, 2:23–25, 5:26–28. In other words, the '864 patent uses resistance to refer to an electrical property of an object, not an electrical property of a material.

[14] A copy of the district court's claim construction opinion appears in the record of this IPR as Exhibit 1018.

TMC argues that people of ordinary skill in the art sometimes use the term "resistance" interchangeably with the term "surface resistivity." Pet. 22–23; Ex. 1003 ¶ 75. TMC, however, relies upon extrinsic evidence to support this argument. *Id.* Because we believe that the '864 patent is unambiguous in its use of the term *resistance* to mean "opposition to the flow of electrical current," we do not believe that resort to extrinsic evidence is either necessary or proper in this instance.

For the reasons set forth above, we construe the term resistance to mean "opposition to the flow of electric current."

4. electrically dissipative

Claim 28 requires that the bonding tool tip is *electrically dissipative*. TMC contends that this should be construed to mean "an electrical resistivity between 10^5 and 10^{12} ohms (per square), or between 10^4 ohm·cm and 10^{11} ohm·cm." Pet. 24. TMC observes that the '864 patent states that "[f]or best results, a resistance in the tip assembly itself should range from $5x10^4$ or 10^5 to 10^{12} ohms," and that the claim should be construed to cover this preferred embodiment. *Id*. (quoting Ex. 1001, 2:26–28). Relying on the testimony of Dr. Bravman, TMC contends that resistivity may be measured as surface resistivity (ohms per square) or volume resistivity (ohm·cm), but the patent does not specify which measurement is correct. Pet. 25 (citing Ex. 1003 ¶ 80). TMC cites a JEDEC standard that lists both surface and volume resistivity ranges for dissipative materials, respectively, as 10^5 and 10^{12} ohms (per square), or between 10^4 ohm·cm and 10^{11} ohm·cm. *Id*. (citing Ex. 1038).

TMC also notes that Anza previously contended in district court that *electrically dissipative* means an electrical resistance between that of

insulative and conductive materials, and that the district court largely adopted this construction. *Id*. (citing Ex. 1018, 19). TMC argues that a quantitative definition of the term is required, however, because the meaning of "insulative" and "conductive" has changed over time. *Id*. at 25–26.

Anza responds that reading a numeric limitation into the meaning of *electrically dissipative* is error, and notes that the district court in the *CoorsTek* litigation rejected such a construction. PO Resp. 25–28. Anza urges us to adopt the same construction as the district court, namely "having electrical resistance in the range between completely insulative and completely conductive, excluding both endpoints." *Id*. To support this construction, Anza indicates portions of the '864 patent that describe a resistance such that the material is neither an insulator nor a conductor. *Id*. at 26 (quoting Ex. 1001, 5:13–26). Anza argues that construing *electrically dissipative* using numerical boundaries would limit the claim term to preferred embodiments, because the portions of the written description relied on by TMC for those numerical boundaries state that they are "for best results," not mandatory. PO Resp. 26. And Anza responds to TMC's argument that the meaning of "insulative" and "conductive" has changed over time by noting that claim terms are to be construed as of the time of invention; it does not matter that the meaning changed after that point. *Id*. at 27.

We agree with Anza that adopting strict numerical resistance values as the boundaries for *electrically dissipative* would not be the correct construction of the claim term, and would import a preferred embodiment into the claim. We, therefore, interpret the term as Anza proposes, as covering a material "having electrical resistance in the range between

completely insulative and completely conductive, excluding both endpoints." We note, however, that this range of electrical resistance should encompass the resistance range identified by TMC in its construction, as the '864 patent indicates that this is a preferred embodiment of the invention. A claim construction that excludes a preferred embodiment is rarely, if ever, correct. *See InterDigital Commc'ns, LLC v. U.S. Int'l Trade Comm'n*, 690 F.3d 1318, 1326 (Fed. Cir. 2012) (citing *Pfizer, Inc. v. Teva Pharm., USA, Inc.*, 429 F.3d 1364, 1374 (Fed. Cir. 2005); *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1583 (Fed. Cir. 1996)).

> 5. *allowing an essentially smooth current to dissipate to the device, the current being low enough so as not to damage said device being bonded and high enough to avoid a build up of charge that could discharge to the device being bonded and damage the device being bonded*

We noted in our institution decision that TMC divides its analysis of this claim phrase in two, discussing *essentially smooth current* (Pet. 27–28) separately from the remainder of the phrase (*id*. at 29–30). With regard to the former, TMC asserted that the term was indefinite because the '864 patent does not indicate how much fluctuation in the current is permitted. *Id*. at 27 (citing Ex. 1003 ¶ 84). Citing a finding by the Examiner during an *inter partes* reexamination of the '864 patent, TMC argues that *essentially smooth current* is satisfied by any current that also satisfies the rest of the claim phrase—namely, one that is low enough to avoid damage while also being high enough to avoid a buildup of charge. *Id.* at 28 (citing Ex. 1007, 7).

With respect to the latter part of the claim phrase, TMC observes that the '864 patent describes a preferred embodiment that has a resistance low

enough to not be an insulator, but high enough not to be a conductor. *Id.* at 29 (citing Ex. 1001, 5:22–26). According to TMC, the claim phrase *low enough so as to not damage said device being bonded and high enough to avoid a build up of charge* should at least cover this preferred embodiment. *Id*. As a result, TMC argues, the limitation is met whenever a bonding tool tip is electrically dissipative, i.e., neither a conductor nor an insulator. *Id.* at 30.

Anza responds that the term is not indefinite, and asks that we adopt the same construction of *essentially smooth current* the district court in the *CoorsTek* litigation adopted, namely "a discharge of electrical current that avoids sudden surges." PO Resp. 29.[15] According to Anza, TMC's construction that *essentially smooth current* is satisfied by anything meeting the rest of the claim phrase (*low enough/high enough*) "conflates the meaning of a term with what activity falls within the meaning of the term." *Id*. at 30.

We have given due consideration to the parties' arguments, as well as the district court's decision construing the term. Ex. 1018, 40. Although we agree with the district court and Anza that a "discharge of electrical current that avoids sudden surges" would be an *electrically smooth current*, we see no need to adopt this express construction, as it adds nothing to the meaning of the claim term beyond its express language.

Nor are we persuaded by Anza's argument that *electrically smooth current* should not be defined by the remainder of the claim phrase, in

[15] Anza does not provide a construction for the *low enough*/*high enough* claim phrase, other than stating that it should be given its "plain and ordinary meaning." PO Resp. 28–29.

particular, *current . . . high enough to avoid a build up of charge that could discharge to the device being bonded*. A charge that builds up in the bonding tool tip and then discharges to the device being bonded is, by definition, not smooth; therefore, a current that is high enough to *avoid* such a build up is, again by definition, smooth. We are cognizant of the general rule that "[a] claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so." *Merck & Co. v. Teva Pharm. USA, Inc.*, 395 F.3d 1364, 1372 (Fed. Cir. 2005). Here, however, neither party presents us with such a construction. Even Anza's proposed construction, as noted above, essentially restates the claim language, and it is unclear why a current that meets the remainder of the claim phrase would not also satisfy that construction.

We also find it relevant that the '864 patent provides no discussion in the written description of what defines an *electrically smooth current*; in fact, the term does not appear outside of claim 28. In this respect, we agree with the reexamination Examiner's assessment of the claim term, that "[o]ne can simply conclude, based on claim 28, that the current must be low enough to avoid damage to the device being bonded and high enough to avoid a build up of charge." Ex. 1007, 7.

Finally, we need not provide an express construction of the *low enough/high enough* claim phrase, as we agree with Anza that the language itself is clear on its face. But we also agree with TMC that the '864 patent provides scant guidance as to what level of current is neither too high nor too low. The written description of the patent appears to link the appropriate

current to a resistance of the bonding tool tip that is also neither too high nor too low:

> The resistance should be low enough that the material is not an insulator that does not allow charge dissipation, and high enough that it is not a conductor *allowing a current flow* that is damaging to the device being bonded.

Ex. 1001, 5:22–26 (emphasis added).

Therefore, although we need not set the precise boundaries for a current that is neither too high nor too low to satisfy claim 28, and although materials may exist that are not *electrically dissipative* that may nevertheless provide such a current, we can conclude from the '864 patent that if a material is *electrically dissipative* it also produces a current that is not damaging, and therefore, meets the *low enough/high enough* limitation of claim 28.

E. Anticipation by Mikaki

TMC asserts that claim 28 of the '864 patent is unpatentable as anticipated by Mikaki. Pet. 30–40.

1. Mikaki

Mikaki discloses a semiconductive zirconia sintering body that may be used in a wire bonding tool. Ex. 1022, [86], Abstract. We reproduce Mikaki's Figure 8 below.

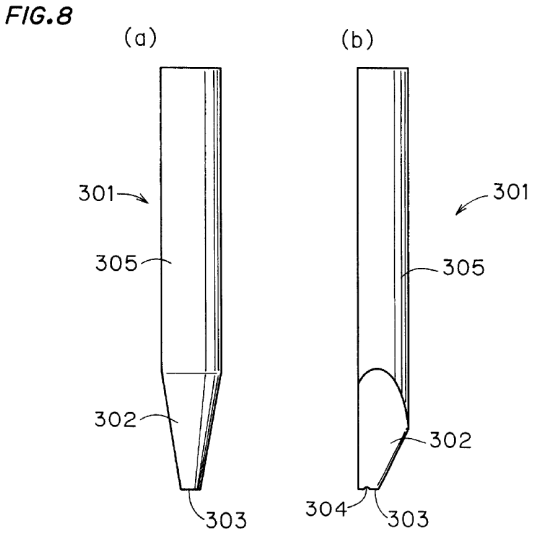

Figure 8 shows one embodiment of a wire bonding tool described in Mikaki. Ex. 1022, 15:24–25.

Wire bonding tool 301 shown in Figure 8 consists of body portion 305 and end tip portion 302. Ex. 1022, 15:30–33. In use, bonding tool 301 guides a wire to a predetermined joining position. *Id.* at 15:48–57 (citing Figure 11(a)–11(c)). When the wire reaches the predetermined joining position, tip 302 of bonding tool 301 presses the wire into place. *Id.* Ultrasonic vibrations are applied to the wire while the wire is held in place "so that the wire [] is strongly pressed and attached to the predetermined position." *Id.*; *see also* Pet. 32–33; Ex. 1003 ¶¶ 97–98.

According to TMC, Mikaki's bonding tool has a volume resistivity between 10^5 and 10^9 ohm·cm. *Id.* at 36–37; Ex. 1003 ¶ 105. TMC also contends that Mikaki's bonding tip is electrically dissipative. *See* Pet. 33–36; Ex. 1022, 4:66–5:63, 7:56–65; Ex 1003 ¶¶ 100–103. For example, in one embodiment, Mikaki discloses a bonding tool made by mixing zirconia with between 10 and 40% iron oxide. Ex. 1022, Table I. Mikaki states that "the static electricity can be escaped at a suitable speed" when its tool has a resistivity between 10^5 to 10^9 ohm·cm. *Id*. at 7:33–39. TMC contends that

Mikaki's tool would be considered electrically dissipative under any proposed construction of the term. Pet. 33–34.

TMC also argues that Mikaki's bonding tool made from zirconia and iron oxide allows an essentially smooth current to dissipate to the device, the current being low enough so as not to damage said device being bonded and high enough to avoid a buildup of charge that could discharge to the device being bonded and damage the device being bonded. Pet. 39–40.

2. Analysis

As noted above, TMC points out that Mikaki's bonding tool has a volume resistivity between 10^5 and 10^9 ohm·cm. *Id.* at 36–37. Claim 28, however, requires that the tool tip have a *resistance* between 10^5 to 10^{12} ohms. As discussed above, "resistance" is not the same thing as "volume resistivity." *See supra* § II.D.3. TMC's analysis is premised upon our construing the claim term *resistance* as referring to the volume resistivity of the material. *See* Pet. 36–37. At oral argument, TMC's counsel acknowledged that if we did not construe *resistance* to refer to the volume resistivity of the material, its anticipation analysis would fall short. Tr. 9–10. As discussed above, we have construed *resistance* to have its plain and ordinary meaning of "opposition to the flow of electric current" referring to an object as a whole, and as distinct from "volume resistivity." We, therefore, need not address TMC's argument in detail. We conclude that TMC has not shown by a preponderance of the evidence that claim 28 is unpatentable as anticipated by Mikaki.

F. Obviousness over Mikaki and Linn

In the alternative, TMC contends that if Anza were to argue that Mikaki does not disclose resistance in the range of 10^5 to 10^{12} ohms because

we construe *resistance* to refer to the resistance of the bonding tool tip overall (as opposed to volume resistivity), claim 28 is unpatentable under 35 U.S.C. § 103(a) as having been obvious over the combined disclosures of Mikaki and Linn. Pet. 42. Specifically, TMC argues that if we were to determine that the claimed resistance range refers to the bonding tool tip as a whole, Linn discloses a bonding tool tip with specific dimensions that may be used to calculate the resistance of the overall bonding tool tip. *Id*. Linn, in particular, discloses a bonding tool made of substantially pure sintered aluminum oxide ceramic, having a diameter of approximately 0.0624±0.0001 inches and a conical end portion terminating at a contact end surface, which has a diameter of approximately 0.004±0.0003/-0 inches. Ex. 1037, 3:34–46. The entire length of Linn's bonding tool is approximately 0.470±0.005 inches. *Id*. Dr. Bravman provides calculations based on Linn's tool dimensions and Mikaki's volume resistivity to determine a range of resistance for the overall bonding tool tip. Ex. 1003 ¶¶ 118–126. These calculations result in a resistance in the range of $1.56x10^{7}$–$1.56x10^{11}$ ohms if calculated over the entire bonding tool, or in the range of $1.02x10^{7}$–$1.02x10^{11}$ ohms if calculated for only the conical tip of the tool. *Id*. ¶ 126. TMC indicates that both of these ranges fall within the resistance range of claim 28. Pet. 45–46.

TMC contends that a person of ordinary skill in the art would have had reason to apply Linn's bonding tool dimensions to the disclosure of Mikaki, to achieve compatibility with existing bonding tools and machines. Pet. 46–47 (citing Ex. 1003 ¶¶ 129–130; Ex. 1037, 3:37–40).

Anza responds that this ground of alleged unpatentability is inadequate for three reasons: (1) Mikaki is not prior art to the '864 patent,

(PO Resp. 36–41); (2) the combination of Mikaki and Linn is inoperable (*id.* at 49–51); and (3) Mikaki does not disclose an *essentially smooth current* as required by the claim (*id.* at 45–46). Anza does not argue that, assuming Mikaki is available as prior art, the combination of Mikaki and Linn fails to teach or suggest any other limitation. *Id.* at 49–52; *see* Tr. 54.

We address each of these arguments below. For the following reasons, we determine that claim 28 of the '864 patent is unpatentable as having been obvious over the combined disclosures of Mikaki and Linn.

1. Prior Art Status of Mikaki

Before we address the parties' arguments regarding whether the combination of Mikaki and Linn would have rendered the subject matter of claim 28 of the '864 patent obvious, we must determine whether Mikaki is prior art to the '864 patent. TMC argues that Mikaki's priority date for the purposes of 35 U.S.C. § 102(e) is December 24, 1998, which is the filing date of Mikaki's US patent application. Pet. 30. This is consistent with the face of Mikaki, which states that its § 102(e) date is December 24, 1998. Ex 1022, at [86].

To antedate Mikaki, Anza must establish either (1) prior reduction to practice of the claimed invention or (2) prior conception coupled with reasonable diligence from just prior to Mikaki's priority date until reduction to practice or constructive reduction to practice. *See ATI Techs ULC v. Iancu*, 920 F.3d 1362, 1369 (Fed. Cir. 2019). Anza does not assert a date for the reduction to practice of the inventions of the '864 patent prior to Mikaki's priority date of December 24, 1998. *See* PO Resp. 38.

Rather, Anza asserts that the '864 patent's inventors, Steven Frederick Reiber and Mary Louise Reiber, conceived the claimed invention no later

than December 4, 1998, and exercised reasonable diligence in reducing the invention to practice during the legally relevant period, i.e., until the invention was constructively reduced to practice by filing the application that became the '864 patent. *See* PO Resp. 37. To support this contention, Anza relies upon the Declaration of Steven F. Reiber. Ex. 2028. In his declaration, Mr. Reiber testifies that "[n]o later than December 4, 1998, we [referring to the inventors] disclosed each element of our claimed invention to our patent lawyers in order to facilitate a prior art search to determine novelty and patentability." *Id.* ¶ 18; *see also id.* ¶ 15 (Mr. Reiber's testimony that he and Ms. Reiber "conceived the invention at least by December 4, 1998).

Conception is the formation, in the mind of the inventor, of a definite and permanent idea of the complete and operative invention, as it is thereafter to be applied in practice. *Kolcraft Enters., Inc. v. Graco Children's Prods., Inc.*, 927 F.3d 1320, 1324 (Fed. Cir. 2019). "[C]onception is established when the invention is made sufficiently clear to enable one skilled in the art to reduce it to practice without the exercise of extensive experimentation or the exercise of inventive skill." *Hiatt v. Ziegler*, 179 USPQ 757, 763 (Bd. Pat. Inter. 1973).

An inventor's testimony regarding conception must be corroborated by other, independent information. *Apator Miitors ApS v. Kamstrup A/S*, 887 F.3d 1293, 1295 (Fed. Cir. 2018). The existence of sufficient evidence to corroborate the inventor's testimony is governed by a "rule of reason" analysis, which requires consideration of all pertinent evidence to determine whether the inventor's testimony is credible. *In re NTP, Inc.*, 654 F.3d 1279, 1291 (Fed. Cir. 2011). Conception is a question of law premised on

underlying factual findings. *In re VerHoef*, 888 F.3d 1362, 1365 (Fed. Cir. 2018). The existence of sufficient corroboration is one of these factual findings. *REG Synthetic Fuels, LLC v. Neste Oil Oyj*, 841 F.3d 954, 958 (Fed. Cir. 2016).

As the Federal Circuit has explained:

> When the issue of priority concerns the antedating of a reference, the applicant is required to demonstrate, *with sufficient documentation,* that the applicant was in possession of the later-claimed invention before the effective date of the reference. *Demonstration of such priority requires documentary support, from which factual findings and inferences are drawn, in application of the rules and law of conception, reduction to practice, and diligence.* The purpose is not to determine priority of invention . . . but to ascertain whether the applicant was in possession of the claimed invention sufficiently to overcome the teachings and effect of an earlier publication of otherwise invalidating weight.
>
> Thus, the facts and law of conception focus on whether the evidence presented by the applicant demonstrates that the inventor had a definite idea of the invention, as it would thereafter be applied in practice. The principles are legal, but the conclusions of law focus on the evidence, for which the Board's factual findings are reviewed for support by substantial evidence.

In re Steed, 802 F.3d 1311, 1316–17 (Fed. Cir. 2015) (emphasis added).

Anza contends that a December 4, 1998 letter from Mr. Reiber's attorney requesting a prior art search on behalf of the inventors corroborates Mr. Reiber's Declaration testimony. PO Resp. 39 (citing Ex. 2028, ¶ 19; Ex. 2031). In particular, Mr. Reiber's Declaration asserts that two portions of the December 4, 1998 letter to the prior art searcher corroborate the inventors' conception of the limitations recited in claim 28. Ex. 2028, ¶ 19; *see* Sur-Reply 6–8.

Claim 28 requires *an electrically dissipative bonding tool tip, having a resistance in the range of 10^5 to 10^{12} ohms*. Ex. 1001, 8:54–59.

Mr. Reiber's Declaration asserts that the following passages of the letter corroborate conception of this limitation.

> The invention also includes the use of a dissipative ceramic to fabricate bonding tool tips or bonding tool tip coatings for wire-bonding electrical connections to bonding pads on integrated circuits.

Ex. 2031, 1 (quoted by Exhibit 2028 ¶ 19).

> Bonding tool tips must also be electrically designed to produce a reliable electrostatic discharge to form the bonding ball properly, yet to prevent electrostatic discharge damage to the integrated circuit.

Ex. 2031, 2 (quoted by Exhibit 2028 ¶ 19).

We have serious doubts that the general statements contained in the December 4, 1998 letter provide sufficient corroboration for Mr. Reiber's testimony regarding conception, as there is little in the letter specific enough to show possession of the various limitations of the challenged claims. But even if the December 4, 1998 letter were sufficient corroboration of the conception of the subject matter of claim 28, Anza's attempt to antedate Mikaki fails. Anza has not proven reasonable diligence on the part of the inventors for the period between December 4, 1998 and the constructive reduction to practice on February 25, 1999.

"An inventor's testimony regarding his reasonable diligence must be corroborated by evidence." *Perfect Surgical Techniques, Inc. v. Olympus Am., Inc.*, 841 F.3d 1004, 1007 (Fed. Cir. 2016) (citing *Brown v. Barbacid*, 436 F.3d 1376, 1380 (Fed. Cir. 2006)); *see also Price v. Symsek*, 988 F.2d

1187, 1196 (Fed. Cir. 1993) (citing *Kendall v. Searles*, 173 F.2d 986, 993, 81 USPQ 363, 368–69 (CCPA 1949)).

We begin by noting that we only have testimony from one of the inventors of the '864 patent—Steven F. Reiber. Although Mr. Reiber sometimes mentions in passing activities toward reduction to practice he undertook with his co-inventor, Mary L. Reiber, Anza has not provided a detailed account of her activities during the relevant time period. Nor has Anza provided any evidence corroborating any actions Ms. Reiber may have taken toward reducing the subject matter of claim 28 to practice. Indeed, Anza's briefing does not attempt to rely upon any independent actions of Ms. Reiber to show reasonable diligence between the alleged date of conception and the construction reductive practice.[16] Thus, the issues before us are whether Mr. Reiber's actions alone and/or in concert with Ms. Reiber's actions constitute reasonable diligence and whether the evidence of record sufficiently corroborates Mr. Reiber's testimony.

Mr. Reiber's testimony concerning reasonable diligence is set forth in paragraphs 20–28 of his declaration. Ex. 2028, ¶¶ 20–28. Mr. Reiber's declaration cites Exhibits 2031–2038 as corroborating evidence. *Id.* For the following reasons, we determine that Anza has not proven reasonable diligence on the part of the inventors during the period from alleged conception, no later than December 4, 1998, through the February 25, 1999 constructive reduction to practice.

[16] We note that TMC does not argue that Anza's failure to account for Ms. Reiber's activities is evidence that the inventors failed to exercise reasonable diligence during the relevant time period. Because TMC has not raised this issue, we do not consider it *sua sponte*.

First, Mr. Reiber's Declaration does not provide any description of Mr. Reiber's job duties during the relevant time period. The Declaration only states that Mr. Reiber had been working at Anza since 1995. Ex. 2028 ¶ 9. Nor does the Declaration contain any testimony regarding the typical number of hours Mr. Reiber worked at his full-time job with Anza. Similarly, the Declaration does not identify how many days of vacation time Mr. Reiber took during the relevant time period.[17] Without this information, we lack a sufficient basis to judge whether the amount of time Mr. Reiber spent working on the reduction to practice of the subject matter of claim 28 is reasonable in light of all the circumstances.

Second, Mr. Reiber's testimony is unclear as to whether his work on the subject matter of claim 28 was within the scope of his duties at Anza or work performed for the benefit of another company. At several points in his Declaration, Mr. Reiber suggests that his efforts to reduce the subject matter of claim 28 to practice were a side project in addition to his full-time job at Anza:

> From the time we received the results from the patentability search, on or around December 17, 1998, through mid-February 1999, Ms. Reiber and I continued to diligently consider the prior art and prepare a thorough invention disclosure in order to draft the specification during our spare time when we were not working full time, traveling for work, and celebrating the holidays.

Ex. 2028 ¶ 22; *see also id.* ¶ 20 ("I was working a full[-]time job at Anza."). Moreover, some of the corroborating evidence suggests that work related to the reduction to practice of claim 28 was performed on behalf of the

[17] The Declaration states that Mr. Reiber did take time off to celebrate the holidays. Exhibit 2028 ¶¶ 20, 22.

company called SJM Technology Inc.[18] For example, on December 17, 1998, Mr. Reiber's patent attorneys sent a letter summarizing the results of the prior art search to Ms. Reiber at SJM Technology. Ex. 2033. Similarly, Mr. Reiber testifies that the co-inventors twice visited PE Ceramics for assistance in writing standard firing profiles necessary for making ceramics for dissipative materials. Ex. 2028 ¶ 23. Mr. Reiber points to a Non-Disclosure Agreement between SJM Technology and PE Ceramics as corroborating evidence. *Id.* (citing Ex. 2034).

On the other hand, Mr. Reiber also testifies that he traveled to the Philippines, Hong Kong, Tokyo, and Seoul to attend meetings "with engineers to develop processes to resolve electrostatic discharge (ESD) issues." *Id.* ¶ 20. He states that these trips were taken on behalf of Anza. *Id.* Controlling electrostatic discharge is the subject matter of the '864 patent. Furthermore, Mr. Reiber corresponded with the attorneys who prosecuted the '864 patent using his Anza email address. *See* Ex. 2036; Ex. 2038. He also met with these attorneys at Anza. *See* Ex. 2037.

This lack of clarity as to Mr. Reiber's employment and activities makes it impossible for us to determine whether Mr. Reiber's efforts amounted to reasonable diligence under all of the circumstances. If Mr. Reiber's efforts were undertaken on behalf of SJM Technology, we would need to understand Mr. Reiber's role at SJM Technology and how much time he spent working for SJM Technology during a typical week. If, on the

[18] According to Anza, Mr. Reiber sometimes referred to SJM Technology as "MSJ Company." Paper 46, 8, n.6. Thus, we understand the references to MSJ in Exhibit 2028 ¶ 23 and Ex. 2034 to be references to SJM Technology. For the sake of simplicity, we shall refer to both SJM Technology and MSJ Company as "SJM."

other hand, Mr. Reiber's efforts were undertaken on behalf of Anza, we have already discussed why Mr. Reiber's testimony lacks sufficient detail for us to determine whether his efforts amounted to reasonable diligence.

Third, there is insufficient evidence to corroborate Mr. Reiber's testimony regarding his activity between December 7, 1998 and January 3, 1999. According to Mr. Reiber,

> from December 7, 1998 through January 3, 1999, I took a trip overseas for the Christmas and New Year holidays and I was working a full[-]time job at Anza. *See* Ex.2035. The images below are from my passport proving that I was traveling during December 1998 and January 1999 for work on behalf of Anza. . . . For example, I traveled to the Philippines, Hong Kong, Tokyo, and Seoul, Korea for work to meet with the companies that Anza does business with designing and building bonding machines. During my travels in December 1998 and January 1999, I was busy attending meetings with engineers to develop processes to resolve electrostatic discharge (ESD) issues.

Ex. 2028 ¶ 20.

In his Declaration, Mr. Reiber includes copies of six pages from his passport that are alleged to corroborate this testimony. *Id.* He has annotated these images to identify four dates indicating where he traveled for work. *See id.*; *see also* Ex. 2035 (unannotated images).

A closer examination of the images, however, shows that they only partially corroborate Mr. Reiber's testimony and call into question the reliability of his memory of the events from approximately 20 years ago. The annotated entries Mr. Reiber identifies show that he arrived in the Philippines on December 7, 1998, arrived in Hong Kong on December 10, 1998, and arrived in Seoul on December 14, 1998. *Id.* The fourth entry Mr. Reiber identifies in his Declaration does not appear to corroborate his

assertion that he traveled to Tokyo within the relevant time period. For ease of reference, we reproduce Mr. Reiber's annotated image from Exhibit 2028 below.

The image reproduced above shows an annotated image of two pages from Mr. Reiber's passport.

In the upper right-hand corner of the image, Mr. Reiber has circled a stamp showing a date of December 11, 1998. This stamp is insufficient to corroborate Mr. Reiber's testimony that he traveled to Tokyo. The left side of this passport image includes stamps showing arrival and departure from Tokyo's Narita Airport in September 1998. These stamps look nothing like the stamp Mr. Reiber identifies in the upper right-hand corner of the image.

Furthermore, the corroborating evidence provided does not account for the entirety of the December 7, 1998 through January 3, 1999 time period. The passport pages show that Mr. Reiber returned to the United

States on December 17, 1998. Ex. 2035, 2. Anza has not provided any evidence that corroborates Mr. Reiber's testimony that he was out of the country for the Christmas and New Year's holidays. Nor does Mr. Reiber provide any testimony regarding how long his vacation was. We, therefore, have no way to determine what portion of the time between December 17, 1998 and January 3, 1999 Mr. Reiber was working or on vacation, and have no basis for determining whether he was reasonably diligent during that time period.

Also, Mr. Reiber testifies that he traveled on behalf of Anza in December 1998 and January 1999 "to meet with the companies that Anza does business with designing and building bonding machines and to meet with engineers to develop processes to resolve ESD issues." Ex. 2028 ¶ 20. There is no record evidence to corroborate this testimony regarding the purpose of his travel, let alone whether there were meetings regarding ESD issues. Indeed, the only evidence Mr. Reiber provides is the passport stamps, which, alone, only corroborate *that* Mr. Reiber traveled, not what he did during those travels.

Fourth, as discussed above, Mr. Reiber testifies that he and Mrs. Reiber visited Auburn, California to meet with PE Ceramics for assistance in writing standard firing protocols for making ceramics for dissipative materials. Ex. 2028 ¶ 23. Mr. Reiber cites a nondisclosure agreement between SJM and PE Ceramics as corroborating evidence for this testimony. *Id.* The NDA, however, does not state in any detail the subject matter of the interaction between SJM and PE Ceramics. *See* Ex. 2034. Nor is there any evidence that corroborates Mr. Reiber's testimony regarding the trips to PE Ceramics.

Fifth, Mr. Reiber testifies that between mid-December 1998 and mid-February 1999, he and Ms. Reiber prepared drawings and provided information to their attorneys to prepare a provisional patent application. Ex. 2028 ¶ 24. He further testifies that from mid-February 1999 until February 24, 1999, he and Ms. Reiber reviewed and revised four drafts of the provisional application prior to its filing on February 25, 1999. *Id.* ¶¶ 25–27.

Mr. Reiber cites Exhibits 2036–2038 as corroborating evidence of these activities. These exhibits reflect some degree of communication between Mr. Reiber and Ms. Reiber and their attorneys. They, however, are weak corroborating evidence because they do not contain any indication of how much time or effort Mr. Reiber or Ms. Reiber put into the sorts of activities Mr. Reiber describes in his testimony. For example, Exhibits 2036–2038 do not provide any evidence to corroborate Mr. Reiber's testimony that he reviewed four drafts of the provisional patent application.

In view of the foregoing, we determine that Anza has not established reasonable diligence between December 4, 1998 and the February 25, 1999 constructive reduction to practice. We, therefore, conclude that Mikaki is available as prior art to the '864 patent.

2. Inoperability of the Combination of Mikaki and Linn

Anza argues that the combination of Mikaki and Linn is inoperable. PO Resp. 49–51. In particular, Anza argues that the combination of Mikaki and Linn is inoperable because Mikaki is not enabled. *Id.* (incorporating arguments appearing at PO Resp. 46–48). In support of these arguments, Anza relies upon Mr. Reiber's Declaration and supporting exhibits. *Id.* (citing Ex. 2028 ¶¶ 29–37; Exs. 2039–2042).

Printed publication and patent prior art references are generally presumed to be enabled. *In re Antor Media Corp.*, 689 F.3d 1282, 1289, 1292 (Fed. Cir. 2012) (printed publications); *Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1355 (Fed. Cir. 2003) (patents). The record in this case does not overcome the presumption that Mikaki is enabled.

In his Declaration, Mr. Reiber asserts that he is "very familiar with the technology described in Mikaki." Ex. 2028 ¶ 29. Mr. Reiber says that he gained his familiarity with the material described in Mikaki because he worked with Mikaki's assignee, Kyocera Corp. *Id.* ¶ 30. According to Mr. Reiber, the material described in Mikaki would not function in any type of wire binder because the material has micro fractures and is not homogeneous. *Id.* ¶ 29.

Mr. Reiber testifies that he had a great deal of difficulty machining the material he received from Kyocera into bonding tool tips. *Id.* ¶ 31. According to Mr. Reiber, he "was unable to even successfully use one bonding tip [made from the material provided by Kyocera] with the bonder apparatus." *Id.*[19] Mr. Reiber's testimony is the only evidence that the material provided by Kyocera was unsuitable for the manufacture of

[19] This testimony is ambiguous at best. Mr. Reiber's testimony could be that he was only able to manufacture one bonding tip from the material provided by Kyocera and that bonding tip could not be used in the bonder apparatus. On the other hand, Mr. Reiber's testimony could be understood as saying that one of the bonding tips he was able to make from Kyocera's material could not be used with the bonder apparatus. For the purpose of this opinion, we shall assume that Mr. Reiber intended for us to interpret his testimony in the former sense, which we understand to be more favorable to Anza's position.

bonding tool tips, but his declaration is unsupported by any documentary evidence such as test results. Ex. 2028 ¶¶ 30–31.

Furthermore, Mr. Reiber's hearsay testimony[20] is the only evidence the ties Kyocera's material to Mikaki: "I understood through discussions with Mr. Williams [Vice President of Kyocera Industrial Ceramics Corp.] that this material was what Kyocera believed was covered by its Mikaki patent and Shikata patent." *Id.* ¶ 30. In support of his assertion, Mr. Reiber points to emails that he received from David Williams of Kyocera. *Id.* (citing Ex. 2039). These emails, however, do not tie the material provided by Kyocera to either Mikaki or Shikata. Ex. 2039. Rather, the emails identify the material Kyocera actually provided as "Z21H05." *Id.* Exhibit 2039 also suggests that Kyocera may have provided a material identified as "Z21H04" to Mr. Reiber. *Id.*

Mr. Reiber also points to Exhibit 2041 as supporting his testimony. Ex. 2028, ¶ 32 (citing Ex. 2041). According to Mr. Reiber, Kyocera provided the photographs comprising Exhibit 2041. These photographs purportedly are magnified views of materials described in the '864 patent and materials from Mikaki and Shikata. *Id.* Mr. Reiber's testimony, however, is the only basis for the identification of the particular materials shown in these photographs. *Id.*

Finally, Mr. Reiber asserts that Kyocera attempted to license the '864 patent. Ex. 2028 ¶¶ 34–36 (citing Exs. 2042, 2043). Although Exhibits 2042 and 2043 support Mr. Reiber's testimony that Kyocera wished to acquire certain assets from SJM, including patent rights, they do not provide

[20] TMC did not object to this testimony as hearsay.

any support for his assertion that the reason Kyocera wished to make this acquisition was because Mikaki was not enabled or that "Kyocera preferred to use my materials rather than theirs." Ex. 2028 ¶ 35.

In sum, Anza's evidence that Mikaki is not enabled rests on Mr. Reiber's largely uncorroborated testimony. We are not are not aware of any requirement that evidence of nonenablement be corroborated; nor do we seek to impose any such requirement. Mr. Reiber, however, is an interested witness testifying about work that he performed in 2002. The lack of any corroboration, combined with Mr. Reiber being an interested witness, leads us to accord his testimony less weight. Finally, even if we were not to give Mr. Reiber's testimony less weight, we note that his testimony on its face fails to persuasively establish any link between the materials he received from Kyocera and the materials described in Mikaki. For example, Mr. Reiber does not explain why he believes the materials he received are the same as those in Mikaki, relying only on a bare assertion that it is, which itself is grounded only in a hearsay statement from a Kyocera employee; nor does Mr. Reiber give any reason we should conclude that the materials he received are representative of the entire scope of materials disclosed in Mikaki.

For the reasons set forth above, we determine that the full record does not demonstrate nonenablement of Mikaki. We, therefore, do not find that Anza has not demonstrated that the combination of Mikaki and Linn would have been inoperable.

3. Obviousness Analysis

As noted above, TMC sets forth why a person of ordinary skill in the art would have applied Linn's bonding tool dimensions to the disclosure of

Mikaki, i.e., to achieve compatibility with existing bonding tools and machines. TMC also contends that the combined disclosures of Mikaki and Linn teach each element of claim 28. Pet. 31–40, 42–46. With one exception we discuss below, Anza does not challenge these assertions. *See generally* PO Resp. We have reviewed TMC's contentions on these matters and agree that a person of ordinary skill in the art would have had reason to apply Linn's bonding tool dimensions in making the tool tip of Mikaki, as Mikaki itself is silent as to the dimensions of the tool tip it describes. We also agree with TMC's undisputed contentions regarding the combined disclosures of Mikaki and Linn, and that the combined references teach each element of claim 28 that Anza does not dispute.

Anza focuses its arguments on whether the combined prior art discloses *allowing an essentially smooth current to dissipate to the device*, as claim 28 requires. PO Resp. 51–52 (referring to *id.* at 45–46). Anza argues that TMC's contentions are based on the theory that an essentially smooth current is inherent in any device where "the current [is] low enough so as not to damage said device being bonded and high enough to avoid a build up of charge that could discharge to the device being bonded and damage the device being bonded." *Id*. at 45–46. Relying on Mr. Reiber's testimony, Anza argues that Mikaki's material is not homogeneous, and the distance between the grain boundaries causes problems with capacitance that leads to large surges of current. *Id*. (citing Ex. 2028 ¶ 29).

On this record, we find that Mikaki teaches a tool tip that would allow an *essentially smooth current* to dissipate to the device. As TMC persuasively argues, and as Anza does not contest, Mikaki discloses a dissipative material that, when formed in the dimensions of Linn's tool, falls

within the resistance range of 10^5 to 10^{12} ohms that claim 28 requires. Pet. 42–46. As we have interpreted the claim language above, a resistance falling within the claimed range would be *electrically dissipative* as claim 28 requires, and TMC contends that such a tool would necessarily satisfy both the *low enough/high enough* and *essentially smooth current* limitations of the claim. *Id*. at 39–40. Notably, Anza only disputes presence of the last of these limitations in the combination of Mikaki and Linn.

Anza's criticism that TMC relies only on whether the *low enough/high enough* limitation has been met, and does not separately analyze the *essentially smooth current* limitation, is not persuasive. As discussed above, *see supra* § II.D.5, the two terms are closely linked, and Anza fails to provide any persuasive argument that a current that is *high enough to avoid a buildup of charge* would not also be an *essentially smooth current*.

Nor do we find Anza's arguments based on Mr. Reiber's testimony to be persuasive. We find it significant that Anza's expert, Dr. Kim, provided a Declaration that expressed his opinion why every ground that we found reasonably likely to succeed during trial failed to demonstrate unpatentability of claim 28, *except the Mikaki/Linn obviousness ground*. *See* Ex. 2048 ¶¶ 56–79 (addressing Mikaki, Alfaro/Shikata, and Popp/Schneider grounds). And Mr. Reiber's testimony—that Mikaki has large distances in its grain boundaries that would have caused large surges of current (Ex. 2028 ¶ 29)—appears to be based entirely on his experience with the material Kyocera supplied to him discussed above in the context of Anza's inoperability argument. *Id*. ¶ 30. As we discuss above, Mr. Reiber's testimony and supporting exhibits fail to persuasively establish any link

between the material he received from Kyocera and the materials described in Mikaki. Even if we were to accept his bare, conclusory testimony regarding the problems with the materials he received from Kyocera in 2002, we cannot draw a sufficient link between these materials and those described in Mikaki.

In sum, we find that Mikaki describes a material that, when used in a bonding tool having Linn's dimensions, would result in a tool having a resistance within the range of claim 28. We also find that this tool would satisfy the *electrically dissipative, low enough/high enough*, and *essentially smooth current* limitations as TMC sets forth. For these reasons, TMC has proven that a person of ordinary skill in the art would have combined the disclosures of the references, and these disclosures teach each and every limitation of claim 28. We conclude that claim 28 would have been obvious over the combined disclosures of Mikaki and Linn.

G. Obviousness Over Alfaro and Shikata

TMC contends that claim 28 would have been obvious over the combined disclosures of Alfaro and Shikata. Pet. 47–61. Alfaro, issued in 1990, describes a wire bonding capillary and a method for its use. Ex. 1024, 1:18–62, 2:65–68, Figures 1–3. Alfaro's bonding tip is formed of aluminum oxide. *Id*. at 2:65–68. Alfaro describes a method of using its tool to bond wire to a pad on a semiconductor device. *Id*. at 1:18–61.

Shikata, issued in 1998, discloses that components used for handling and producing semiconductor components may consist of an aluminous sintered product comprising 70–96% by weight alumina and 4–30% by weight of a group 5a metal oxide. Ex. 1025, 2:52–64. Doping the alumina with the metal oxide creates a material having a volume resistivity which

lies between that of an insulator and that of an electric conductor. *Id*. at 3:66–4:1. Specifically, Shikata's aluminous sintered product has a volume resistivity ranging from 10^7 ohm·cm to 10^{13} ohm·cm. *Id*. at 6:12–15.

TMC contends that a person of ordinary skill in the art would have had reason to modify Alfaro's bonding tip and bonding process to use Shikata's metal oxide doped alumina, in order to control electrostatic discharge as described in Shikata. Pet. 59–61 (citing Ex. 1025, 4:20–35; Ex. 1003 ¶ 160). The resulting modified bonding tip, according to TMC, would have a resistivity that overlaps the claimed range of 10^5 to 10^{12} ohms. *Id*. at 53–54 (citing Ex. 1003 ¶ 143).

Again, TMC's analysis is premised upon our construing the claim term *resistance* as referring to the volume resistivity of the material. *See* Pet. 53–55. At oral argument, TMC's counsel acknowledged that if we did not construe *resistance* to refer to the volume resistivity of the material, its argument that claim 28 is unpatentable as having been obvious over Alfaro and Shikata would fall short. Tr. 9–10. As discussed above, we have construed *resistance* to have its plain and ordinary meaning of "opposition to the flow of electric current" referring to an object as a whole, and as distinct from "volume resistivity." We, therefore, need not address TMC's argument in detail. We conclude that TMC has not shown by a preponderance of the evidence that claim 28 is unpatentable as having been obvious over the combined disclosures of Alfaro and Shikata.

H. Obviousness over Popp Alone, or Popp and Schneider

TMC contends that claim 28 would have been obvious over Popp. Pet. 61–66. Popp, published in 1989, describes devices for holding electrostatically sensitive components. Ex. 1026, 2. Popp states that an

exemplary embodiment of its invention is "tweezers as a tool for manipulating semiconductor components." *Id.* at 3, col. 2. TMC admits that Popp only describes a bonding tip under the most expansive interpretation of that term that only requires the ability to pick up and place semiconductor components. Pet. 62. At institution we found that the written description of the '864 patent does not support such a construction, and could not conclude Petitioner demonstrated a reasonable likelihood that Popp alone would have rendered claim 28 obvious. Dec. 21–22. Following institution, TMC did not address our determination or present further argument regarding obviousness over Popp alone. Accordingly, we conclude that TMC has not shown by a preponderance of the evidence that claim 28 is unpatentable as having been obvious over Popp.

In the alternative, TMC contends that claim 28 would have been obvious over the combined disclosures of Popp and Schneider. Pet. 67–70. Schneider, issued in 1997, describes a method of using a bonding tip comprising bonding a device using a bonding tip. Ex. 1027, 2:67–3:2, 6:37–52; Ex. 1003 ¶ 184. As a result, TMC asserts, Schneider remedies any potential deficiency in Popp, specifically Popp's lack of disclosure of a bonding tool. Pet. 68.

Regardless of whether Schneider remedies Popp's failure to disclose a bonding tool, however, Popp only describes a ceramic material having a *surface resistivity* between 10^5 and 10^{12} ohms. Ex. 1026, 2; Ex. 1003 ¶ 172. TMC's obviousness analysis is premised upon our construing the claim term *resistance* as referring to the surface resistivity of the material. *See* Pet. 65. At oral argument, TMC's counsel acknowledged that if we did not construe *resistance* to refer to the surface resistivity of the material, the argument that

claim 28 would have been obvious over Popp and Schneider would fall short. Tr. 9–10. As discussed above, we have construed the claim term *resistance* to have its plain and ordinary meaning of "opposition to the flow of electric current" referring to an object as a whole, and as distinct from "surface resistivity." We, therefore, need not address TMC's argument in detail. We conclude that TMC has not shown by a preponderance of the evidence that claim 28 is unpatentable as having been obvious over the combined disclosures of Popp and Schneider.

IV. CONCLUSION

We conclude that TMC has satisfied its burden of demonstrating, by a preponderance of the evidence, that claim 28 of the '864 patent is unpatentable.

Claim	35 U.S.C. §	Reference(s)	Claim Shown Unpatentable	Claim Not shown Unpatentable
28	102(e)	Mikaki		28
28	103(a)	Mikaki and Linn	28	
28	103(a)	Alfaro and Shikata		28
28	103(a)	Popp		28
28	103(a)	Popp and Schneider		28
Overall Outcome			28	

V. ORDER

Accordingly, it is:

ORDERED that Petitioner has established, by a preponderance of the evidence, that claim 28 of the '864 patent is unpatentable; and

FURTHER ORDERED that because this is a final written decision, parties to the proceeding seeking judicial review must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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