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Paper 87
Entered: November 14, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HILTI, INC. and
SNAP-ON INCORPORATED,
Petitioner,

v.

MILWAUKEE ELECTRIC TOOL CORPORATION,
Patent Owner.

Case IPR2015-01164[1]
Patent 7,554,290 B2

Before GRACE KARAFFA OBERMANN, PATRICK R. SCANLON, and CARL M. DEFRANCO, *Administrative Patent Judges.*

SCANLON, *Administrative Patent Judge.*

FINAL WRITTEN DECISION
*35 U.S.C. § 318(a) and 37 C.F.R. § 42.73*

[1] Case IPR2016-00343 has been joined with this proceeding.

# I. INTRODUCTION

Hilti, Inc. ("Hilti") filed a Petition (Paper 2, "Pet.")[2] requesting an *inter partes* review of claims 1–11 of U.S. Patent No. 7,554,290 B2 (Ex. 1005, "the '290 patent") pursuant to 35 U.S.C. §§ 311–319. Patent Owner, Milwaukee Electric Tool Corporation, filed a Preliminary Response (Paper 8, "Prelim. Resp."). On November 16, 2015, we instituted an *inter partes* review as to all challenged claims under 35 U.S.C. § 103(a) as unpatentable over Takano[3] and Yanai.[4] (Paper 9, "Inst. Dec.").

After institution, Snap-On Incorporated ("Snap-On") filed a Petition and a Motion for Joinder to this proceeding. IPR2016-00343, Papers 2, 3. We granted the Motion for Joinder, and IPR2016-00343 was joined with IPR2015-01164 and terminated. Paper 24, 9. Consequently, Hilti and Snap-On (collectively, "Petitioner") are joined in this proceeding.

Patent Owner filed a sealed Patent Owner Response (Paper 21) and a redacted Patent Owner Response (Paper 22, "PO Resp."). Petitioner filed a sealed Reply (Paper 38, "Reply").[5] Petitioner relies on the Declaration of K. M. Abraham, Ph.D. (Ex. 1011), the Declaration of Quinn C. Horn, Ph.D. (Ex. 1012), the Supplemental Declaration of Quinn C. Horn, Ph.D. (Ex. 1113), the Expert Rebuttal Report of Dr. Gregory K. Leonard (Ex. 1114), and the Declaration of Ulrich von Sacken (Ex. 1117) in support of its contentions. Patent Owner relies on

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[2] Unless indicated otherwise, references to papers and exhibits are to papers and exhibits filed in IPR2015-01164.
[3] U.S. Patent Application Publication No. 2003/0096158 A1, published May 22, 2003 (Ex. 1072, "Takano").
[4] Japanese Patent Application No. 2001-118569 A, published Apr. 27, 2001 (certified English translation) (Ex. 1074, "Yanai").
[5] A redacted version of Petitioner's Reply has been submitted as Exhibit 1365.

the Declaration of Mehrdad (Mark) Ehsani, Ph.D. (Ex. 2105), the Declaration of David Selby (Ex. 2138), the Declaration of George E. Blomgren, Ph.D. (Ex. 2147), and the Declaration of Allan L. Shampine, Ph.D. (Ex. 2163), in support of its contentions.

An oral hearing was held on July 28, 2016. A transcript of the hearing is included in the record. Paper 69 ("Tr.").

We have jurisdiction under 35 U.S.C. § 6(b). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner has not shown, by a preponderance of the evidence, that claims 1–11 of the '290 patent are unpatentable.

## II. BACKGROUND

### *A. Related Matters*

The parties indicate that the '290 patent is at issue in the following civil actions filed on October 16, 2014, in the U.S. District Court for the Eastern District of Wisconsin: *Milwaukee Elec. Tool Corp. v. Chervon N. Am., Inc.*, Case No. 2-14-cv-01289; *Milwaukee Elec. Tool Corp. v. Richpower Indus., Inc.*, Case No. 2-14-cv-01286; *Milwaukee Elec. Tool Corp. v. Hilti, Inc.*, Case No. 2-14-cv-01288; *Milwaukee Elec. Tool Corp. v. Sunrise Global Mktg., LLC*, Case No. 2-14-cv-01290; *Milwaukee Elec. Tool Corp. v. Max USA Corp.*, Case No. 2-14-cv-01292; *Milwaukee Elec. Tool Corp. v. Tooltechnic Sys. LLC*, Case No. 2-14-cv-01294; *Milwaukee Elec. Tool Corp. v. Positec Tool Corp.*, Case No. 2-14-cv-01295; and *Milwaukee Elec. Tool Corp. v. Snap-On Inc.*, Case No. 2-14-cv-01296. Pet. 56–57; Paper 7, 1–2. The '290 patent was also at issue in *Milwaukee Electric Tool Corp. v. Makita Corp.*, Case No. 2-09-cv-00636 (E.D. Wis.), which was dismissed on October 2, 2009, and *Milwaukee Electric Tool Corp. v. Hitachi Ltd.*, Case No.

2-09-cv-00948 (E.D. Wis.), which was dismissed on July 8, 2013. Pet. 57; Paper 7, 2.

An *inter partes* reexamination of the ’290 patent, Reexamination Control No. 95/001,848, resulted in a Reexamination Certificate confirming the patentability of all claims of the ’290 patent. Pet. 6–10; Prelim. Resp. 8–9. In addition, an *ex parte* reexamination of the ’290 patent, Reexamination Control No. 90/012,043, resulted in a Reexamination Certificate confirming the patentability of all claims of the ’290 patent. Pet. 10; Prelim. Resp. 8–9.

At least two other petitions seeking *inter partes* review of the ’290 patent additionally have been filed: IPR2015-00596 and IPR2015-01242. Paper 7, 2–3. On July 28, 2016, we entered a Final Written Decision in IPR2015-00596. IPR2015-00596, Paper 80.

*B. The ’290 Patent*

The ’290 patent, titled “Lithium-Based Battery Pack for a Hand-Held Power Tool,” issued on June 30, 2009. Ex. 1005, (54), (45). The ’290 patent “generally relates to battery packs and, more particularly, to power tool battery packs.” *Id.* at 1:31–32. In particular, battery pack 30 is connectable to cordless power tool 34. *Id.* at 5:42–44, Fig. 11A. Battery pack 30 includes housing 42 supporting battery cells 46. *Id.* at 5:48–50. Battery cells 46 can be connected to give battery pack 30 a variety of nominal voltages, such as 9.6 volts, 12 volts, 14.4 volts, 21 volts, and 24 volts. *Id.* at 5:50–56. The battery cells may be of any chemistry type, including lithium, lithium-ion, or other lithium-based chemistry. *Id.* at 5:62–65. Battery pack 30 can supply an average discharge current that is greater than or equal to approximately 20 amps. *Id.* at 10:23–25.

### *C. Illustrative Claim*

Of the challenged claims, claim 1 is the sole independent claim. Claim 1 recites:

> 1. A battery pack for powering a hand held power tool, the battery pack comprising:
>
> a housing connectable to and supportable by the hand held power tool; and
>
> a plurality of battery cells supported by the housing, the battery cells being capable of producing an average discharge current greater than or equal to approximately 20 amps, the battery cells having a lithium-based chemistry.

Ex. 1005, 12:14–22.

## III. ANALYSIS

### *A. Claim Construction*

In an *inter partes* review, "[a] claim in an unexpired patent shall be given its broadest reasonable construction in light of the specification of the patent in which it appears." 37 C.F.R. § 42.100(b); *see also Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard). There is a presumption that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002); *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Furthermore, only those 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).

The Board, however, may not "construe claims during IPR so broadly that its constructions are *unreasonable* under general claim construction principles. . . . [T]he protocol of giving claims their broadest reasonable interpretation . . . does

not include giving claims a legally incorrect interpretation." *Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015). Rather, "claims should always be read in light of the specification and teachings in the underlying patent," and "[t]he PTO should also consult the patent's prosecution history in proceedings in which the patent has been brought back to the agency for a second review." *Id*.

We construed three claim terms in our Decision to Institute: (1) "hand held power tool," (2) "battery cells being capable of producing an average discharge current greater than or equal to approximately 20 amps," and (3) "nominal voltage." Inst. Dec. 6–12. Neither party has indicated that the interpretations for those phrases were improper, and we do not perceive any reason or evidence that now compels any deviation from our initial determinations. Accordingly, the following interpretations are not in dispute and apply to this Decision:

| Claim Term | Interpretation |
|---|---|
| hand held power tool | a power tool that can be held in and supported by the operator's hand or hands |
| battery cells being capable of producing an average discharge current greater than or equal to approximately 20 amps ("the 20 Amp Limitation") | the battery cells, when configured together in a battery pack, are capable of producing reasonably close to 20 amps of discharge current or greater over the course of delivering their entire rated capacity |
| nominal voltage | an approximate voltage from which the actual voltage may vary |

*B. Asserted Ground Based on Takano and Yanai*

Petitioner challenges claims 1–11 as obvious under 35 U.S.C. § 103 over Takano and Yanai. Pet. 23, 46–52.

*1. Independent Claim 1*

*a) Petitioner's Assertions*

Referring to arguments made in connection with a non-instituted ground of unpatentability, Petitioner argues that Takano discloses all of the elements of claim 1 other than the 20 Amp Limitation (i.e., "the battery cells being capable of producing an average discharge current greater than or equal to approximately 20 amps"). Pet. 46. In particular, Petitioner argues that Takano discloses a battery pack used as the power source for a cordless power tool. *Id.* at 28 (citing Ex. 1072 ¶ 2). Petitioner further argues that Takano discloses a battery pack including a plurality of battery cells 11–18 that are identified as lithium-ion cells with a voltage of 3.6 volts per cell. *Id.* at 29 (citing Ex. 1072 ¶¶ 4, 26, 48, 49, Abstract, Fig. 2). In addition, Petitioner argues that Takano discloses that battery packs are normally mounted in the power tool, and one of ordinary skill in the art would understand that a battery pack for a cordless power tool typically would have a housing connectable to and supportable by the power tool. *Id.* at 29–30 (citing Ex. 1072 ¶ 4; Ex. 1005, 1:44–65, 2:10–17; Ex. 1011 ¶ 96).

Regarding the 20 Amp Limitation, Petitioner asserts that Yanai discloses a battery cell (cell 1-4) "having a high current discharge-capable positive electrode active material that is capable of producing current discharge rates of up to 15 C." *Id.* at 46–47 (citing Ex. 1074 ¶¶ 17–19; Ex. 1011 ¶¶ 203–209). Petitioner then asserts that "Yanai provides sufficient *specific battery cell material data* that, when combined with *common knowledge in the art* with respect to battery cell parameters, a reliable estimation of the amount of current a Yanai-based battery cell in industry-standard sizes would have generated may be made." *Id.* at 47 (emphases added) (citing Ex. 1074 ¶¶ 15, 17–19, 22, Table 1; Ex. 1011 ¶¶ 205–225; Ex. 1012 ¶ 49). Relying upon the testimony of Dr. Abraham, Petitioner

specifically argues that "an 18650 battery cell containing the Yanai cell no. 1-4 positive electrode active material being discharged at a 15 C rate would generate 10.4 A," and "one of ordinary skill [in the art] would have recognized that two such industry-standard size 18650 lithium-based chemistry cells in parallel would produce greater than 20 A." *Id.* (citing Ex. 1011 ¶¶ 83, 217–219, 241).

Alternatively, Petitioner asserts that one of ordinary skill in the art would have recognized that a single industry standard 26650-size cell, containing Yanai's positive electrode active material, would produce a discharge current of 22.8 amps by itself. *Id.* (citing Ex. 1011 ¶¶ 220–223).

Petitioner also argues that one of ordinary skill in the art would have been led to combine Takano and Yanai because:

> In addition to being motivated by Takano's express disclosure of using lithium-ion batteries in its battery pack (Ex. 1072, Takano, at ¶¶ [0004], [0048]–[0049]), one of ordinary skill in the art would have been motivated to use battery cells containing the high discharge rate-capable Yanai cell no. 1-4 lithium-manganese material in the battery pack of Takano in light of the known demand for higher power in power tool applications. (Ex. 1011, Abraham, at ¶ 227; Ex. 1012, Horn, at ¶¶ 27–32, 51–56).

Pet. 48.

*b) Dr. Abraham's Testimony*

Petitioner's assertion that the 20 Amp Limitation would have been obvious is based in large part on Dr. Abraham's testimony, in particular, Dr. Abraham's analysis of the "specific battery cell material data" of Yanai combined with "common knowledge in the art." Dr. Abraham begins the analysis by opining that Yanai's cell 1-4 would be capable of meeting the 20 Amp Limitation and one of ordinary skill in the art "would choose a battery cell containing the no. 1-4 positive electrode material in view of its lower production cost, high power density and

high efficiency when producing high current discharge rates." Ex. 1011 ¶¶ 205, 210.

Having selected Yanai's cell 1-4, Dr. Abraham states "it is a matter of routine calculation to establish the . . . current discharge capability of industry-standard battery cells containing Yanai's no. 1-4 active material" using information from Yanai's disclosure. *Id.* ¶ 211. First, to obtain a "reliable estimate" of the surface area of the positive electrode in a Yanai cell, Dr. Abraham states: "I am aware of the typical electrode area in high power Lithium-based battery cells at the time of Yanai, and note that the amount of electrode area identified in the industry-standard 18650-size battery cells disclosed in the Adachi[6] prior art is typical of the art at the time." *Id.* ¶ 212 (footnote added). Dr. Abraham testifies that Adachi discloses an 18650-size cell positive electrode surface area of 400–680 $cm^2$. *Id.* (citing Ex. 1073 ¶ 42). Dr. Abraham then assumes a surface area of 540 $cm^2$ (which is the midpoint of the range disclosed by Adachi) and multiplies this value by 19 $mg/cm^2$, the mass per-unit-area of positive electrode active material disclosed by Yanai for cell 1-4 (Ex. 1074 ¶ 18 (Table 1)), to obtain a mass of 10.3 grams of positive electrode active material. Ex. 1011 ¶ 214.

Next, Dr. Abraham notes that Yanai discloses using an aluminum foil as its current collector and testifies, "I am aware that Aluminum foil has been used as a current carrier for a Li battery cell cathode electrode for decades, and further I am aware that 15 micrometers has been a common foil thickness." *Id.* ¶ 215 (citing Ex. 1074 ¶ 15). Based on this knowledge, Dr. Abraham calculates the volume of the current collector by multiplying the thickness of 15 micrometers by the surface area of 540 $cm^2$, and then multiplies the calculated volume by the density of

[6] Japanese Patent Application No. P2000-90982 A, published Mar. 31, 2000 (certified English translation) (Ex. 1073, "Adachi").

aluminum (2.7 g/cm$^3$) to obtain an estimated mass of the current collector of 2.2 grams. *Id.* Dr. Abraham then estimates the total electrode mass to be 13.5 grams by adding the calculated mass of the active material (10.3 grams) and the calculated mass of the current carrier (2.2 grams).[7] *Id.*

Dr. Abraham then multiplies the calculated electrode mass of 13.5 grams by 2770 W/Kg, the positive electrode power density disclosed by Yanai for cell 1-4 (Ex. 1074 ¶ 18 (Table 1)), to obtain a power of 37.4 watts. Ex. 1011 ¶ 216. Dr. Abraham testifies that "I am aware that it was known at the time that a Lithium-Manganese battery cell (a cell with a fully charged voltage of 4.2 V) that is discharged at a high current discharge rate would have an operating voltage averaging on the order of 3.5 V–3.6 V." *Id.* ¶ 217. Then, assuming an average discharge voltage of 3.6 volts, Dr. Abraham divides the calculated power by the assumed voltage (37.4 watts divided by 3.6 volts) to determine that "a Yanai 18650-size battery cell" would have been capable of producing 10.4 amps. *Id.*

Dr. Abraham testifies further that one of ordinary skill in the art would know that Lithium-based battery cells "may be connected in series and/or in parallel as needed to provide whatever target voltage and amperage is desired for a particular application," and contends that this statement is confirmed by the disclosure at column 5, lines 57–61 of the '290 patent. *Id.* ¶ 218. Last, Dr. Abraham testifies that "[t]wo industry-standard size 18650 cells containing the Yanai no. 1-4 cell's positive electrode active material connected in parallel would have been capable of producing greater than the 20 A required by [the 20 Amp Limitation], specifically 10.4 A/cell x 2 cells = 20.8 A." *Id.* ¶ 219.

[7] As discussed below, this calculation contains an error in addition because 10.3 plus 2.2 is 12.5 rather than 13.5.

For Petitioner's alternative theory, which is based on a 26650-size cell, Dr. Abraham states that a 26650-size cell has a physical volume that is 2.25 times the physical volume of an 18650-size cell, and this size ratio is consistent with the mass ratio between 18650-size and 26650-size cells disclosed in Linden.[8] *Id.* ¶ 221. Specifically, Dr. Abraham testifies that Linden discloses that a 26650-size Lithium-Cobalt cell has a mass of 93 grams and an 18650-size Lithium-Cobalt cell has a mass of 42 grams, which is a ratio of 2.21:1. *Id.* (citing Ex. 1076, Table 35.12). Dr. Abraham also testifies that "I am aware that the masses of Lithium-Cobalt and Lithium-Manganese cells are very similar, and in my opinion this mass ratio comparison is a useful confirmation of the relative sizes of 18650 and 26650 battery cells." *Id.*

Next, "assuming a 26650-size battery cell is 2.2 times the size of an 18650-size battery cell, and assuming approximately linear scaling of material content," Dr. Abraham testifies "a Yanai 26650-size high power cell containing the no. 1-4 positive electrode active material would produce a current of 10.4 A x 2.2 = 22.8 A," and concludes "a single industry-standard size 26650 cell containing the Yanai no. 1-4 cell's positive electrode active material would have been capable of producing greater than" 20 amps, as required by the 20 Amp Limitation. *Id.* ¶¶ 222, 223.

*c) Discussion*

We focus our discussion on Petitioner's assertion that the 20 Amp Limitation would have been obvious in view of Takano and Yanai. As noted above, the Petition relies heavily on Dr. Abraham's testimony to support the

[8] HANDBOOK OF BATTERIES (David Linden & Thomas B. Reddy eds., 3d ed. 2001) (Ex. 1076, "Linden").

assertion of obviousness. Dr. Abraham's analysis, however, is flawed in many respects, which we discuss below.

*i. Electrode Surface Area*

Dr. Abraham refers to Adachi to determine that 540 $cm^2$ is a "reliable estimate" of the surface area of the positive electrode in a Yanai cell. Ex. 1011 ¶¶ 212–214. Patent Owner argues that "Petitioner actually modifies Yanai in view of Adachi for the 20 Amp Limitation," but "fails to provide any reason or motivation for combining these two references or for combining Adachi with the combination of Takano and Yanai." PO Resp. 9. Patent Owner further argues that the surface area of the positive electrode is a critical variable in Dr. Abraham's calculations, but because Yanai does not disclose electrode surface areas, Dr. Abraham cites Adachi "for its disclosure of '[a] surface area of the positive electrode active substance layer of . . . 400 to 680 $cm^2$,' from which he selects a surface area of 540 $cm^2$." *Id.* at 11–12 (quoting Ex. 1011 ¶ 212) (alterations in original). In addition, Patent Owner argues that Dr. Horn confirms that Dr. Abraham relied on Adachi by stating that the size of the positive electrode is a "key number that one needs to know," and to obtain this key number, "the convenient reference that Dr. Abraham uses is Adachi." *Id.* at 12–13 (quoting Ex. 2167, 85:15–22).

Patent Owner also argues that Petitioner's argument is "incurably tainted by hindsight" because Petitioner "cherry-picks" the 540 $cm^2$ value "from a range of values disclosed in Adachi, without adequately explaining why one of ordinary skill in the art would have been motivated to use this particular value, or would even look to Adachi." *Id.* at 23–24 (citing Ex. 1011 ¶ 214). Patent Owner contends that "Dr. Abraham admits that he performed calculations with other surface-area values, but chose not to provide the results of those calculations;

instead, he selectively chooses the 540 $cm^2$ value — a value that conveniently leads to his desired result." *Id.* at 24 (citing Ex. 2166, 178:7–12).

In response, Petitioner argues that it does not propose to modify the combination of Takano and Yanai with Adachi, as argued by Patent Owner. Reply 3. Instead, Petitioner asserts that Dr. Abraham "relies on the background knowledge in the art, noting only that Adachi's range is consistent with 'the typical electrode area in high power Lithium-based battery cells at the time of Yanai.'" *Id.* (quoting Ex. 1011 ¶ 212). In other words, Petitioner argues that Dr. Abraham "properly relied on the general knowledge in the field" and "does not take the surface area value from Adachi." *Id.* at 4, 9. Petitioner also denies relying on hindsight, asserting that Dr. Blomgren acknowledges that electrode surface area is a design element "well within the skill level of a person having ordinary skill in the art and could be selected/determined by those skilled in the art without undue experimentation." *Id.* at 11 (citing Ex. 1119 ¶¶ 21–27, 31–33, 39, 41; Ex. 1118, 72:5–8, 94:25–95:15, 127:25–129:14, 130:8–19; Ex. 1113 ¶¶ 12, 13, 24–27).

We find Patent Owner's arguments persuasive. In Adachi, "the present invention is described specifically by means of working examples." Ex. 1073 ¶ 29. Adachi describes three such working examples. *Id.* ¶¶ 29–43. The working example relied on by Petitioner and Dr. Abraham (working example 3) is disclosed to have a surface area of the positive electrode active substance layer in the range of 400–680 $cm^2$.[9] *Id.* ¶ 42. In contrast, Adachi's working example 1 is described as having a positive electrode surface area of 10,200 $cm^2$ (*id.* ¶ 37), and working example 2 is described as having a positive electrode surface area of 6,700 $cm^2$ (*id.*

[9] We note that the battery of this working example is also disclosed as having a maximum current value of 8–12.4 amps and an output density value of 608–960 W/kg. Ex. 1073 ¶¶ 42, 43.

¶ 40). This wide variance in the surface areas disclosed by Adachi suggests that the working examples are specific embodiments and not indicative of "common knowledge" in the field. Moreover, we are not persuaded that the range of 400–680 $cm^2$ is an industry standard surface area for 18650-size cells or that one of ordinary skill in the art necessarily would consider a value in this range to be a typical or likely choice of surface area for any 18650-size cell.

Accordingly, the only basis to assert that it would have been obvious to select a positive electrode surface area of 540 $cm^2$ for Yanai's cell 1-4 would be to rely on the disclosure of Adachi; that is, to assert that it would have been obvious to one of ordinary skill in the art to modify the combination of Takano and Yanai with the teaching of Adachi. Petitioner, however, has repeatedly argued that this is not what it proposes. Reply 3; Tr. 22:22–23:4. Furthermore, we agree with Patent Owner that the Petition does not provide an adequate reason to combine Adachi with Takano and Yanai.

*ii. Foil Thickness*

Dr. Abraham's selection of 15 micrometers for the foil thickness of Yanai's aluminum current collector is based solely on his statement that "I am aware that 15 micrometers has been a common foil thickness." Ex. 1011 ¶ 215. Patent Owner argues that using a 15-micrometer thickness for the aluminum foil current carrier is not found in either Takano or Yanai, and the selection of this value is hindsight. PO Resp. 23–24. Petitioner counters that there is no hindsight because Dr. Blomgren acknowledges that foil thickness is a design element "well within the skill level of a person having ordinary skill in the art and could be selected/determined by those skilled in the art without undue experimentation." Reply 11 (citing Ex. 1119 ¶¶ 21–27, 31–33, 39, 41; Ex. 1118, 72:5–8, 94:25–95:15, 127:25–129:14, 130:8–19; Ex. 1113 ¶¶ 12, 13, 24–27).

Dr. Abraham's statement regarding 15 micrometers having been a common foil thickness, however, is not supported adequately. Furthermore, Dr. Blomgren's testimony that Dr. Abraham picked "a known foil thickness, maybe not the most common one, but a known foil thickness" (Ex. 1118, 72:5–8) and "[g]iven cell chemistry, cell geometry, and cell size, all other individual cell design considerations would be well within the skill level of a person of ordinary skill in the art" (*id.* at 94:25–95:15) does not establish that one of ordinary skill in the art would have a reason to choose a foil thickness of 15 micrometers *for Yanai's cell 1-4*. Therefore, we are not persuaded that a sufficient rationale is given for why one of ordinary skill in the art would select this value for Yanai's cell 1-4.

*iii. Addition Error*

Dr. Abraham's calculations contain an addition error. Specifically, Dr. Abraham calculates the total electrode mass to be 13.5 grams by adding the calculated mass of the active material (10.3 grams) and the calculated mass of the current carrier (2.2 grams). Ex. 1011 ¶ 215. The sum of 10.3 and 2.2 is 12.5, however, not 13.5. Patent Owner argues that this mistake overestimates the calculated discharge current by 8%. PO Resp. 16 (citing Ex. 2147 ¶ 88). Dr. Blomgren testifies that using the correct total electrode mass of 12.5 grams in Dr. Abraham's subsequent calculations results in a calculated discharge current of 9.6 amps rather than 10.4 amps. Ex. 2147 ¶ 88. Thus, two such cells connected in parallel, as proposed by Petitioner, would produce 19.2 amps, which is of course less than 20 amps. Tr. 26:7–11.

In response, Petitioner argues that Dr. Abraham's calculations are based on "a set of very conservative assumptions," and as a result, "any small change in [Dr.] Abraham's calculated discharge current does not detract from the fact that Yanai fully discloses lithium-ion cells that, when configured in a pack, satisfy the

[20 Amp Limitation]." Reply 5–6 (citing Ex. 1113 ¶¶ 18, 19, 21, 22). Petitioner also argues that our construction of the 20 Amp Limitation requires a discharge current of reasonably close to 20 amps and that 19.2 amps, which is 96% of 20 amps, is reasonably close to 20 amps. Tr. 26:13–15. In addition, Petitioner argues that "three Yanai-based 18650 cells in parallel would satisfy the [20 Amp Limitation], and Patent Owners make no attempt to explain why it wouldn't have been just as obvious for [one of ordinary skill in the art] to provide a Takano battery pack having three such Yanai-based cells in parallel." Reply 6 n.5 (citing Ex. 1113 ¶ 20; Ex. 1118, 168:5–7).

We do not find any of these arguments persuasive. First, that Dr. Abraham's assumptions may have been "conservative" does not make the calculations based on the erroneous addition obvious. Petitioner's implication seems to be that using less conservative assumptions would have been reasonable, and if such assumptions had been used, then the calculated discharge current for two parallel 18650-size cells would have exceeded 20 amps even when the addition error was corrected. We are not directed, however, to where the Petition (or Dr. Abraham) indicates using less conservative assumptions or what these less conservative assumptions might be. Moreover, Petitioner does not explain sufficiently why one of ordinary skill in the art would consider using such assumptions.

Second, other than noting that 19.2 is 96% of 20, Petitioner does not explain why 19.2 amps should be construed as "reasonably close" to 20 amps in the context of claim 1. Petitioner's assertion, made at oral hearing, that 19.2 amps is "reasonably close" to 20 amps is merely attorney argument, devoid of evidentiary support, and is entitled to little or no weight. *See Gemtron Corp. v. Saint-Gobain Corp.*, 572 F.3d 1371, 1380 (Fed. Cir. 2009) ("[U]nsworn attorney argument . . . is not evidence."); *Enzo Biochem, Inc. v. Gen-Probe, Inc.*, 424 F.3d 1276, 1284 (Fed.

Cir. 2005) ("Attorney argument is no substitute for evidence."). We are not directed to any analysis in either the Petition or the supporting evidence as to why 19.2 amps should be so construed.

Third, we agree with Patent Owner that Petitioner's argument that "three Yanai-based 18650 cells in parallel" would satisfy the 20 Amp Limitation is a new argument. Paper 60, 2. In our view, this argument does more than merely address Patent Owner's argument regarding Dr. Abraham's addition error. Rather, by relying on three cells instead of two, Petitioner attempts to provide a new theory as to why the combination of Takano and Yanai renders the challenged claims obvious that was not set forth clearly in the Petition. Because Petitioner waited until the Reply to make this argument, Patent Owner did not have an opportunity to respond to Petitioner's new argument. We thus decline to consider Petitioner's new argument as it is an improper reply. Furthermore, Petitioner's assertion that Patent Owner made no attempt to explain why using three cells would have been just as obvious as using two cells is an improper attempt to shift the burden of proof with respect to obviousness to Patent Owner.

For these reasons, we are not persuaded that an 18650-size cell containing the positive electrode active material of Yanai's cell 1-4 would meet the 20 Amp Limitation despite Dr. Abraham's addition error.

*iv. Average Discharge Voltage*

To determine the discharge current of an individual "Yanai 18650-size battery cell," Dr. Abraham assumes an average discharge voltage of 3.6 volts. Ex. 1011 ¶ 217. This assumption is based solely on the statement that "I am aware that it was known at the time that a Lithium-Manganese battery cell (a cell with a fully charged voltage of 4.2 V) that is discharged at a high current discharge rate would have an operating voltage averaging on the order of 3.5 V–3.6 V." *Id.* This

statement, however, is not sufficiently supported. As such, neither the Petition nor the evidence adequately explains why an 18650-size cell containing the positive electrode active material of Yanai's cell 1-4 necessarily would have an average discharge voltage of 3.6 volts.

*v. Two Battery Cells Connected in Parallel*

Dr. Abraham testifies that "[t]wo industry-standard size 18650 cells containing the Yanai no. 1-4 cell's positive electrode active material connected in parallel would have been capable of producing greater than the 20 A required by [the 20 Amp Limitation]." *Id.* ¶ 219. To support this assertion, Dr. Abraham states that one of ordinary skill in the art would know that Lithium-based battery cells "may be connected in series and/or in parallel as needed to provide whatever target voltage and amperage is desired for a particular application," and contends that this statement is confirmed by the disclosure at column 5, lines 57–61 of the '290 patent. *Id.* ¶ 218.

Takano, however, discloses a battery having a plurality of cells connected in series. Ex. 1072 ¶¶ 4, 11, 26. Although we do not question that connecting battery cells in series and/or parallel is known generally in the art, Petitioner does not provide adequate specific reasoning as to why one of ordinary skill in the art would have been led to modify Takano to connect cells in parallel when Takano clearly discloses a series connection. Dr. Abraham's testimony that the type of connection would be chosen "as needed to provide whatever target voltage and amperage is desired for a particular application," by itself, does not provide a sufficient reason to modify Takano's series connection. Petitioner does not explain how the prior art discloses a desired voltage or amperage that would cause one of ordinary skill in the art to modify Takano in the manner proposed. In this case, the only teaching of a desired amperage comes from the '290 patent itself.

Furthermore, Dr. Abraham's reliance on the disclosure at column 5, lines 57–61, of the '290 patent as supporting the alleged obviousness of combining two cells in parallel is improper. This passage of the '290 patent describes alternative configurations of the *patentees' own invention*; it is not describing prior art. Relying on knowledge gleaned only from the challenged patent's disclosure is impermissible hindsight. *Cf. In re McLaughlin*, 443 F.2d 1392, 1395 (CCPA 1971) (As long as a judgment on obviousness "takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made and does not include knowledge gleaned only from applicant's disclosure, such a reconstruction is proper.").

*vi. Proposed 26650-Size Cell*

As discussed above (*see supra* Section III.B.1.a), Petitioner asserts, as an alternative to two Yanai-based 18650-size cells connected in parallel, that a single 26650-size cell, containing Yanai's positive electrode active material, would satisfy the 20 Amp Limitation. Pet. 47 (citing Ex. 1011 ¶¶ 220–223). Dr. Abraham's testimony in support of this theory relies on two assumptions:
(1) that a 26650-size cell is 2.2 times the size of an 18650-size cell, and
(2) "approximately linear scaling of material content" (presumably between 18650-size and 26650-size cells). Ex. 1007 ¶ 222. Both assumptions, however, are flawed.

Dr. Abraham bases his first assumption on Linden disclosing that a 26650-size Lithium-Cobalt cell has a mass of 93 grams and an 18650-size Lithium-Cobalt cell has a mass of 42 grams, which is a ratio of 2.21:1. Ex. 1011 ¶ 221 (citing Ex. 1076, Table 35.12). But because Linden's disclosure relates to a lithium-cobalt cell chemistry, rather than the lithium-manganese cell chemistry disclosed by Yanai, Dr. Abraham also testifies that "I am aware that the masses of Lithium-

Cobalt and Lithium-Manganese cells are very similar, and in my opinion this mass ratio comparison is a useful confirmation of the relative sizes of 18650 and 26650 battery cells." *Id.* This contention by Dr. Abraham, however, is a conclusory statement not supported sufficiently by any objective evidence or analysis and, thus, is not persuasive. *See Perreira v. Sec'y of Dep't of Health & Human Servs.*, 33 F.3d 1375, 1377 n.6 (Fed. Cir. 1994) ("An expert opinion is no better than the soundness of the reasons supporting it.").

Similarly, Dr. Abraham's second assumption is not supported sufficiently by any objective evidence or analysis. Furthermore, even if 26650-size cells did scale linearly to 18650-size cells, Dr. Abraham calculates the discharge current for the proposed 26650-size cell by multiplying the calculated discharge current for the proposed 18650-size cell by the assumed ratio. The calculated discharge current for the proposed 18650-size cell, however, is flawed for several reasons discussed above (even when ignoring the addition error, which does not adversely impact the analysis of the 26650-size cell (*see* Reply 6; Ex. 1113 ¶ 21)). As such, Dr. Abraham's calculation of the discharge current for the proposed 26650-size cell is also flawed.

*vii. Conclusion*

For the reasons discussed above, Dr. Abraham's analysis of the proposed 18650-size and 26650-size cells is flawed and thus fails to support Petitioner's assertion that claim 1 would have been obvious over the combination of Takano and Yanai.

Furthermore, Petitioner's obviousness analysis relies on (1) selecting an 18650-size or 26650-size cell; (2) estimating the positive electrode surface area to be 540 $cm^2$; (3) selecting a foil thickness of 15 micrometers; (4) selecting an average discharge voltage of 3.6 volts; and (5) for 18650-size cells, connecting two

in parallel. Petitioner fails to point out how the prior art indicates that using all of these particular values in combination would be desirable for a lithium-based battery pack when several other possible values could have been selected. Where "'the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful,' courts should reject 'hindsight claims of obviousness.'" *In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Patent Litig.*, 676 F.3d 1063, 1070–71 (Fed. Cir. 2012) (quoting *In re Kubin*, 561 F.3d 1351, 1359 (Fed. Cir. 2009)). Accordingly, we agree with Patent Owner that Petitioner's obviousness analysis relies on impermissible hindsight.

*d) Additional Petitioner Reply Arguments*

In its Reply, Petitioner argues:

> Patent Owners' acknowledgment of what is generally known in the art of lithium-ion cell design—as contrasted against their argument that Yanai's disclosure is somehow deficient—can only be explained by Patent Owners' fundamental failure to understand the close relationship between enablement and obviousness in attempting to circumvent, in these proceedings, the very knowledge that they relied on during prosecution to prop up the '290 patent's thin disclosure.

Reply 10 (citing Ex. 1118, 102:23–103:23). Petitioner further argues that "the Courts hold applicants to their enablement arguments when later considering issues of obviousness." *Id.* (citing *Sciele Pharma Inc. v. Lupin Ltd.*, 684 F.3d 1253, 1262–63 (Fed. Cir. 2012)). This argument refers to Petitioner's contention that Patent Owner's arguments against obviousness are contradicted by its purported admission during reexamination that the cells claimed in the '290 patent were enabled by information generally known in the art. Tr. 13:21–14:1.

Patent Owner argues that "[e]nablement and obviousness are two different legal theories." Tr. 39:17. According to Patent Owner, "[u]nder enablement you start with the claims [and] you start with the specification" to determine whether the "claims and specification enable a person of skill in the art to make and use the invention." *Id.* at 39:18–21. In contrast, with obviousness, "[y]ou start with the prior art." *Id.* at 40:7–8.

We are not persuaded by Petitioner's argument. The *Sciele* case involved a patent that "describes and claims, *inter alia*, dosage forms with 'a mean time to maximum plasma concentration ($T_{max}$) of the drug which occurs at 5.5 to 7.5 hours after oral administration on a once-a-day basis to human patients.'" *Sciele*, 684 F.3d at 1256. The validity of the asserted claims was challenged as being obvious over two references, Cheng and Timmins. *Id.* at 1261. The party challenging the claims argued "Cheng discloses all of the limitations of the asserted claims except for the $T_{max}$ range of 5.5 to 7.5 hours" and "Timmins discloses a $T_{max}$ within the range recited in the asserted claims." *Id.* The court noted that "[d]uring prosecution the applicant indicated 'that one skilled in the art would be able to manipulate the processes and formulations of the [prior art] by other methods to obtain the claimed pharmacokinetic parameters of the present invention by routine experimentation.'" *Id.* at 1262–63. Responding to an argument that this statement applies only to enablement, the court stated "we are hard pressed to understand this distinction" and "*[c]oupled with the motivation to lower the $T_{max}$*, as disclosed in Timmins, the applicant's characterization of the predictability and skill in the art during prosecution provides further evidence that it would have been a routine and obvious design choice to make an extended release dosage form with a lower $T_{max}$." *Id.* at 1263 (emphasis added).

Thus, the present case can be distinguished from *Sciele* because Petitioner has not established a motivation or reason to obtain the 20 Amp Limitation. Accordingly, we agree with Patent Owner's argument that a distinction can be made between enablement and obviousness in this case because enablement is based on what is disclosed in the specification and claims, while an obviousness analysis is limited to the teachings of the prior art.

*e) Secondary Considerations*

Patent Owner argues that "[n]umerous secondary considerations strongly favor the patentability of the challenged claims." PO Resp. 26–59. Because we are not persuaded Petitioner has demonstrated sufficiently that the combination of Takano and Yanai render claim 1 obvious, we need not reach Patent Owner's assertions regarding secondary considerations.

*f) Conclusion*

On the full record before us, we determine that Petitioner has not demonstrated, by a preponderance of the evidence, that claim 1 is unpatentable under 35 U.S.C. § 103 as directed to subject matter that would have been obvious to a person of ordinary skill in the art in light of Takano and Yanai.

*2. Dependent Claims 2–11*

Claims 2–11 all depend from claim 1 and, thus, contain all the limitations of claim 1. Accordingly, we also determine that Petitioner has not demonstrated, by a preponderance of the evidence, that claims 2–11 are unpatentable under 35 U.S.C. § 103 as directed to subject matter that would have been obvious to a person of ordinary skill in the art in light of Takano and Yanai.

## IV. MOTIONS TO EXCLUDE

### *A. Petitioner's Motion to Exclude*

Petitioner filed a Motion to Exclude (Paper 49) certain Exhibits submitted during this proceeding. Patent Owner filed an Opposition to this Motion to Exclude (Paper 54), and Petitioner filed a Reply (Paper 57). Petitioner moves to exclude portions of Exhibits 2001, 2002, 2105, 2138, and 2215 (public version of Ex. 2138). Paper 49, 1. We do not rely, however, on any of these exhibits in rendering our decision. Therefore, we *dismiss* Petitioner's Motion to Exclude as moot.

### *B. Patent Owner's Motions to Exclude*

Patent Owner filed a Motion to Exclude (Paper 47), to which Petitioner filed an Opposition (Paper 52), and Patent Owner filed a Reply (Paper 58). Patent Owner also filed a Supplemental Motion to Exclude (Paper 67), to which Petitioner filed an Opposition (Paper 68). Between the two motions, Patent Owner moves to exclude Petitioner's Exhibits 1103, 1117, 1132, 1148, 1149, 1210, and 1301–1354. Papers 47, 67. We do not rely, however, on any of these exhibits in rendering our decision. Therefore, we *dismiss* both of Patent Owner's Motions to Exclude as moot.

## V. MOTIONS TO SEAL

The parties filed several unopposed motions to seal. Paper 20; Paper 35; Paper 71; Paper 79. Generally, where appropriate, redacted public versions of the documents sought to be sealed, containing both parties' assertions of confidential information, have been filed. *See* Paper 71, 3 n.2.

There is a strong public policy that favors making information filed in an *inter partes* review open to the public. *Garmin Int'l, Inc. v. Cuozzo Speed Techs.*

*LLC*, IPR2012-00001, slip op. at 1–2 (PTAB Mar. 14, 2013) (Paper 34). 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*, IPR2012-00001, slip op. at 2–3.

We have considered the arguments presented by both parties and determine that both have established good cause for sealing the documents identified their respective Motions to Seal. Specifically, the parties demonstrate that the information sought to be sealed reflects confidential business information owned by Patent Owner, Petitioner, or a third party. Paper 20; Paper 35; Paper 71; Paper 79. Accordingly, we *grant* the parties' Motions to Seal.

The record will be maintained undisturbed pending the outcome of any appeal taken from this decision. At the conclusion of any appeal, or if no appeal is taken, the documents may be made public. *See* Trial Practice Guide, 77 Fed. Reg. 48,756, 48,761 (Aug. 14, 2012). Further, either party may file a motion to expunge sealed documents from the record pursuant to 37 C.F.R. § 42.56. Any such motion will be decided after the conclusion of any appeal or the expiration of the time period for appealing.

## VI. MOTION TO DISMISS

On October 21, 2016, Patent Owner filed a Motion to Dismiss. Paper 84. Patent Owner requests that Hilti be dismissed as a petitioner in this proceeding because Hilti is also a party to IPR2015-00596, which also challenged claims 1–11 of the '290 patent, and in which we entered a Final Written Decision on July 28, 2016. *Id.* at 1. Patent Owner filed the Declaration of Mark R. O'Donnell (Ex. 2243) in support of its Motion to Dismiss.

Patent Owner waited nearly three months from the date of the Final Written Decision in IPR2015-00596 to file its Motion to Dismiss. More importantly, the Motion to Dismiss was filed less than four weeks before the statutory deadline for rendering a final written decision in this proceeding. Filing the Motion to Dismiss at this late stage of the proceeding did not afford sufficient time for the issue to be fully briefed prior to us rendering our decision, especially in view of Patent Owner's reliance on new testimonial evidence. Accordingly, in view of this Decision, we *dismiss* Patent Owner's Motion to Dismiss as moot.

## VII. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–11 of the '290 patent are held not to be unpatentable over Takano and Yanai;

FURTHER ORDERED that Petitioner's Motion to Exclude (Paper 49) is *dismissed*;

FURTHER ORDERED that Patent Owner's Motion to Exclude (Paper 47) and Supplemental Motion to Exclude (Paper 67) are both *dismissed*;

FURTHER ORDERED that the parties' Joint Motion to Seal (Paper 20) is *granted*;

FURTHER ORDERED that the parties' Joint Motion to Seal (Paper 35) is *granted*;

FURTHER ORDERED that Petitioner's Motion to Seal (Paper 71) is *granted*;

FURTHER ORDERED that Patent Owner's Motion to Seal (Paper 79) is *granted*;

FURTHER ORDERED that Patent Owner's Motion to Dismiss (Paper 84) is *dismissed*; and

FURTHER ORDERED that, because this is a Final Written Decision, any party 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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