

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SOLAREEDGE TECHNOLOGIES LTD.,
Petitioner,

v.

KOOLBRIDGE SOLAR, INC.,
Patent Owner.

IPR2022-00010
Patent 8,937,822 B2

Before THU A. DANG, BRIAN J. McNAMARA, and
PATRICK M. BOUCHER, *Administrative Patent Judges*.

DANG, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. Background

SolarEdge Technologies Ltd. (“Petitioner”) filed a Petition requesting an *inter partes* review of claims 14–19 (the “challenged claims”) of U.S. Patent No. 8,937,822 B2 (Ex. 1401, “the ’822 patent”). Paper 2 (“Pet.”). Koolbridge Solar, Inc. (“Patent Owner”) filed a Preliminary Response. Paper 7 (“Prelim. Resp.”).

Under 37 C.F.R. § 42.4(a), the Board has authority to determine whether to institute an *inter partes* review. Applying the standard set forth in 35 U.S.C. § 314(a), which requires demonstration of a reasonable likelihood that Petitioner would prevail with respect to at least one challenged claim, we grant Petitioner’s request and institute an *inter partes* review of all challenged claims.

B. Related Proceedings

Petitioner identifies the ’822 patent as the subject of *Koolbridge Solar, Inc. v. SolarEdge Technologies, Inc.*, No. 1:20-cv-01374-MN (D. Del.), which has been “voluntarily dismissed . . . without prejudice.” Pet. vii. According to Patent Owner, “the parties resolved the suit by stipulated dismissal in May [2021].” Prelim. Resp. 4 (citing Exs. 2002 (Complaint), 2003 (Stipulation of Dismissal)).

Petitioner also identifies the ’822 patent as the subject of IPR2022-00007 (“Petition 1”), IPR2022-00008 (“Petition 2”), IPR2022-00009 (“Petition 3”), IPR2022-00011 (“Petition 5”), and IPR2022-00012 (“Petition 6”). Paper 3, 1 (“Petitioner’s Petition Ranking” or “Ranking”).

C. The '822 Patent

The '822 patent, titled “Solar Energy Conversion and Utilization System,” issued on January 20, 2015, from Application No. 13/103,070, with a filing date of May 8, 2011. Ex. 1401, codes (54), (45), (21), (22). The '822 patent discloses an electrical installation employing a load inverter implementation to provide a household with solar-generated alternating current (“AC”) power. *Id.* at 30:36–38.

An illustration of an embodiment of the '822 patent's electrical installation is depicted in Figure 18, reproduced below:

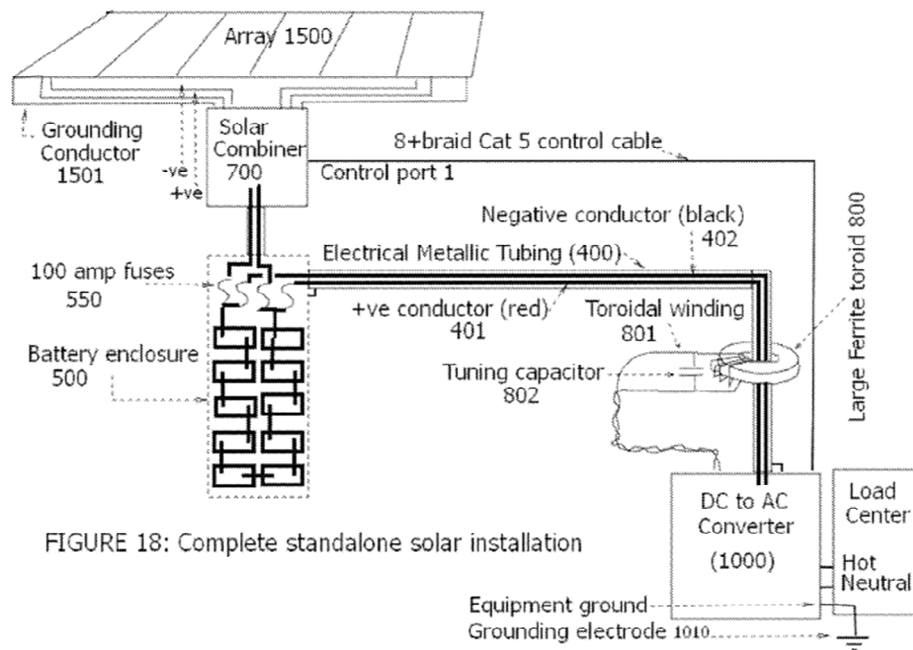


Figure 18 is a block diagram of an electrical installation with a solar array comprising one or more strings of solar panels installed on a south-facing roof, for example, wherein any exposed metallic parts other than its electrical terminals shall be returned to ground via a grounding conductor to give some degree of protection against thunderstorm transients. *Id.* at 30:38–43. In the electrical installation shown in Figure 18, solar combiner 700 selectively combines the currents from multiple strings of solar panels in

array 1500 according to relay control signals presented to control port 1. *Id.* at 31:1–4. Standalone inverter (shown as “DC to AC converter”) 1000 is connected to control port 1 via 8-conductor-plus-braid Cat 5 cable, and controls the string selection in order to maintain the voltage of battery 500 within desired limits. *Id.* at 31:4–8. The combined current from the selected strings is routed from solar combiner 700 to battery 500 to maintain a coaxial path. *Id.* at 31:39–41.

As shown in Figure 18, metallic conduit 400 is used to route wires from battery 500 through the ground leak detector comprised of ferrite toroid 800, toroidal winding 801, and tuning capacitor 802, to inverter 1000. *Id.* at 31:65–32:1. Metallic conduit 400 and its enclosed positive, negative and ground conductors pass in their entirety through ferrite toroid 800 which senses any unusual ground leak current, and outputs a corresponding voltage to inverter 1000. *Id.* at 32:1–27. An amplifier inside inverter 1000 amplifies this voltage and compares it to a threshold, wherein, if the voltage exceeds the threshold, inverter 1000 executes a shutdown, controlling solar combiner 700 to the direct current (“DC”) disconnect state and opening both the inverter AC output relays and the DC input power and start-up relays. *Id.* at 32:27–32. This completely isolates array 1500 from battery 500 and ground and battery 500 from inverter 1000 and ground, thus preventing any further ground leakage current. *Id.* at 32:32–35.

D. The Challenged Claims

Of the challenged claims (claims 14–19), claim 14 is independent, and is reproduced below:

14. In a Solar energy installation comprising a photovoltaic solar array and a DC to AC converter having a DC input with positive and negative conductors routed in parallel

with an array grounding conductor and an AC output having an output waveform with an output repetition frequency, a method of detecting a ground leak in the DC wiring to the solar array, comprising:

creating a common-mode AC probe signal waveform from said DC to AC converter at a characteristic repetition frequency that is in phase on both said DC positive and negative input conductors;

passing said positive and negative conductors from the array through a detector adapted to detect an unusual current with said common mode waveform at said characteristic repetition frequency and upon detection of said unusual current providing an indication of the presence of an unwanted ground leak.

Ex. 1401, 43:21–37.

E. Asserted Grounds of Unpatentability

Petitioner challenges the patentability of claims 14–19 of the '822 patent on the following grounds (Pet. 21):

Claim(s) Challenged	35 U.S.C. §¹	Reference(s)/Basis
14, 15, 18	103	Suzui ² , Boniface ³ , Gilmore ⁴

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112-29, 125 Stat. 284, 287–88 (2011), amended 35 U.S.C. §§ 102, 103, effective March 16, 2013. Because the application from which the '822 patent issued was filed before this date, the pre-AIA versions of §§ 102, 103 apply.

² U.S. Patent No. 6,927,955 B2, issued August 9, 2005, filed September 24, 2002 (Ex. 1406, “Suzui”).

³ U.S. Patent Publication No. 2009/0297543 A1, published August 20, 2009, filed December 18, 2008 (Ex. 1424, “Boniface”).

⁴ U.S. Patent Publication No. 2009/0190275 A1, published July 30, 2009, filed January 29, 2008 (Ex. 1460, “Gilmore”).

Claim(s) Challenged	35 U.S.C. § ¹	Reference(s)/Basis
16	103	Suzui, Boniface, Gilmore, Dubovsky ⁵
17	103	Suzui, Boniface, Gilmore, Mori ⁶
19	103	Suzui, Boniface, Gilmore, Endo ⁷

Petitioner relies on the Declaration of Dr. R. Jacob Baker, Ph.D. (Ex. 1402) in support of its unpatentability contentions.

II. ANALYSIS

A. *Discretionary Denial Under 35 U.S.C. § 314(a)*

Patent Owner argues that the Petition should be denied under 35 U.S.C. § 314(a) as “duplicative and insufficiently tailored to meet the standards of institution.” Prelim. Resp. 2. In particular, Patent Owner asserts that Petitioner has filed the instant Petition “and five other co-pending petitions against the same ’822 patent, a patent having only three independent and 20 total claims.” *Id.* (citing IPR2022-00007 through IPR2022-00012).

We do not agree with Patent Owner’s contention that discretionary denial is warranted. Prelim. 2. Here, all six petitions IPR2022-00007 through IPR2022-00012 concern different prior art combinations, with the

⁵ U.S. Patent No. 6,949,843 B2, issued September 27, 2005, filed September 22, 2003 (Ex. 1459, “Dubovsky”).

⁶ Japanese Patent Publication No. 2006-238630, published September 7, 2006, filed February 25, 2005 (Exs. 1404 (English translation), 1420, “Mori”).

⁷ Japanese Patent No. H11-136852, published May 21, 1999, filed October 27, 1997 (Exs. 1461, 1462 (English translation), “Endo”).

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instant Petition along with IPR2022-00011 and IPR2022-00012 being directed to claims 14–19 of the ’822 patent (“Group 2”), while IPR2022-00007 through IPR2022-00009 are directed to claims 1–13 and 20 of the ’822 patent (“Group 1”). *See* Ranking 1. We do not agree that the instant petition in Group 2, directed to claims 14–19 claiming a method of “detecting a ground leak in the DC wiring to the solar array” (*see* Ex. 1401, 43:21–44:24) is duplicative of, for example, co-pending petitions IPR2022-00007, IPR2022-00008 or IPR2022-00009 in Group 1, directed to claim 1–13, and 20 claiming an apparatus and method of “converting power from a DC source.” *See*, for example, IPR2022-00007, Ex. 1001, 43:2–24. The instant petition and petitions in Group 1 advance distinct unpatentability arguments. Compare Pet. i–ii (Table of Contents) with, for example, IPR2022-00007, Paper 2, i–ii.

In the instant petition, Suzui is central to Petitioner’s arguments as to all of the four grounds of unpatentability asserted, but is not asserted, even as a secondary reference, in IPR2022-00007 or IPR2022-00008, and only asserted as a secondary reference in one ground against two dependent claims in IPR2022-00009. *Compare* Pet. 21 *with* IPR2022-00007, Paper 2, 16; IPR2022-00008, Paper 2, 16–17; IPR2022-00009, Paper 2, 15. Furthermore, Boniface and Gilmore, which is each asserted in all four grounds at issue in this proceeding, are excluded from assertions in IPR2022-00007 through IPR2022-00009. *Id.*

We are mindful of the guidance concerning parallel petitions challenging the same patent provided in the Consolidated Office Trial Practice Guide, 84 Fed. Reg. 64,280 (Nov. 19, 2019) (“Consolidated Trial Practice Guide”), <https://www.uspto.gov/sites/default/files/documents/tpgnov.pdf?MURL=>.

Even though it explains that parallel petitions challenging the same patent are generally disfavored, the consolidated Trial Practice Guide nevertheless recognizes that there may be “rare” circumstances in which more than one petition may be necessary, and that the panel has discretion to review whether fairness warrants allowing multiple petitions by a single petitioner. Consolidated Trial Practice Guide, 59. In particular, petitioners are required to file lengthy petitions that fully elaborate their arguments for canceling the challenged patent. 37 C.F.R. § 42.22(a)(2); *see also id.* § 42.21(a), (c); 35 U.S.C. § 312(a)(3) (“A petition ... may be considered only if ... the petition identifies, in writing and with particularity, each claim challenged, the grounds on which the challenge to each claim is based, and the evidence that supports the grounds for the challenge to each claim”). Thus, the Board recognizes that, with the strict limits set on the length of petitions (*see* 37 C.F.R. § 42.24(a)(1)), in some cases, it may be impossible to adequately present all legitimate grounds for cancelation in a single petition.

Here, petitions in Group 2 challenge different claims from the petitions in Group 1, wherein the claims in Group 2 are directed to different subject matter from those in Group 1. Thus, we are not persuaded that Petitioner should be able to adequately present all legitimate grounds for cancelation of both sets of claims directed to different subject matter in a single petition. In this case, we are not persuaded that the petitions between the two groups are considered “parallel” petitions that would provide the Petitioner more than one bite at the apple. That is, we are not persuaded that the filing of the two separate groups of petitions directed to different subject matter involve an abusive attempt to get more than one bite at the apple.

On this record, we accept Petitioner’s argument that more than one petition is necessary to address the subject matter in the two separate groups of petitions.

Nevertheless, as to the petitions in Group 2, we agree with Patent Owner that the petitions within this same group, challenging the same claims, are “duplicative and insufficiently tailored to meet the standards of institution.” Prelim. Resp. 2. Although the Board recognizes that there may be rare circumstances in which two petitions by a petitioner may be needed, we find that “it unlikely that circumstances will arise where three or more petitions by a petitioner with respect to a particular patent will be appropriate.” *See Consolidated Trial Practice Guide*, 59.

The instant Petition contends that the challenged claims are unpatentable based on obviousness grounds. Pet. 21. Petitioner also contends that the challenged claims are also unpatentable in the petition in IPR 2022-00011, i.e., Petition 5, and the petition in IPR 2022-00012, i.e., Petition 6, on other obviousness grounds. Ranking 1.

Petitioner contends that the question of which of the petitions is most paramount could depend upon the constructions applied to the claims, particularly if the claims are construed to include means-plus-function limitations. Ranking 5. As an example, Petitioner argues that, if “detector” in independent claim 14 is construed as a means-plus-function term, Mirafzal (Petition 6) “may be the strongest” but “is not specific to a solar energy installation.” *Id.*

We decline Petitioner’s invitation to provide advisory opinions by entertaining different Petitions advancing alternative claim constructions. We find that the variations described by Petitioner on this record do not meet the “rare” exceptions contemplated by the Trial Practice Guide. As

Petitioner has expressed its preference for the instant Petition, i.e., Petition 4, which cites Suzui, Bonniface and Gilmore as the primary references, we exercise our discretion to entertain the instant Petition. We decline to institute *inter partes* review based on Petitions 5 and 6.

To summarize, we evaluate below whether Petitioner's highest-ranked petition demonstrates a reasonable likelihood of prevailing on the merits, but we otherwise exercise our discretion under 35 U.S.C. § 314(a) to deny the additional petitions challenging the '822 patent.

B. Claim Construction

We construe each claim “in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.” 37 C.F.R. § 42.100(b) (2020). Under this standard, claim terms are generally given their plain and ordinary meaning as would have been understood by a person of ordinary skill in the art (POSITA) at the time of the invention and in the context of the entire patent disclosure. *See Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc).

Petitioner proposes construction for “DC to AC converter” and “detector.” Pet. 22–23. At this stage of the proceeding, Patent Owner does not propose any claim construction. *See generally* Prelim. Resp.

At this stage of the proceeding, we do not perceive a need to construe any claim terms of the '822 patent for purposes of determining whether to institute trial. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (holding that “only those terms need to be construed that are in controversy, and only to the extent necessary to resolve the controversy”); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean*

Motor Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs.* in the context of an *inter partes* review).

C. Principles of Law

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, “would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of non-obviousness.⁸ See *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

D. Obviousness of Claims 14–19

Petitioner contends that claims 14, 15, and 18 of the ’822 patent would have obvious over by Suzui, Boniface, and Gilmore (Pet. 25–47); that claim 16 of the ’822 patent would have obvious over by Suzui, Boniface, and Gilmore in further view of Dubovsky (*id.* at 47–52); that claim 17 of the ’822 patent would have obvious over by Suzui, Boniface, and Gilmore in further view of Mori (*id.* at 52–61); and that claim 19 of the ’822 patent would have obvious over by Suzui, Boniface, and Gilmore in further view of Endo (*id.* at 61–65).

⁸ Neither party presents evidence or arguments regarding objective evidence of non-obviousness in the instant proceeding at this time.

1. Suzui

Suzui, titled “Apparatus and Method of Detecting Ground Fault in Power Conversion System,” issued on August 9, 2005, with a filing date of September 24, 2002. Ex. 1406, codes (54), (45), (22). Suzui discloses a ground fault detection apparatus in a power conversion system, which can detect a DC ground fault without stopping the operation of an inverter. *Id.* at 2:21–24. An illustration of Suzui’s solar power generation system using an inverter is depicted in Figure 2, reproduced below.

FIG. 2

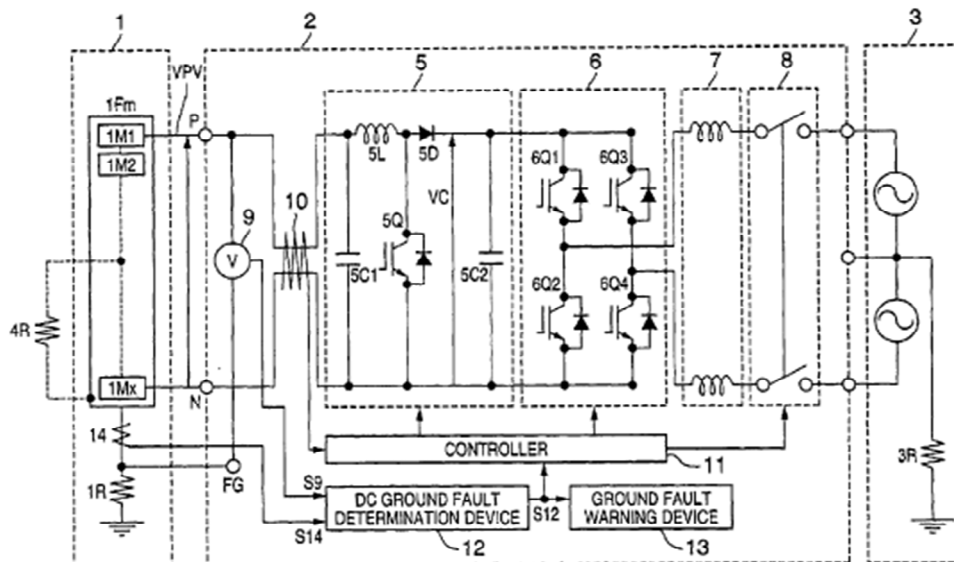


Figure 2 shows a schematic arrangement of a solar power generation system. *Id.* at 4:59–60. As shown in Figure 2, the circuit arrangement employs system interconnection inverter 2 which converts DC power output from solar battery 1 into AC power, and outputs the AC power to commercial power system 3. *Id.* at 4:61–65. Voltage detector 9 detects the voltage between the frame ground terminal of inverter 2 connected to the ground of solar battery 1 and the positive terminal of the DC input portion of inverter 2, and outputs voltage signal S9 to DC ground fault determination device 12.

Id. at 5:41–46. Current detector 10 detects the zero-phase current of the DC circuit of inverter 2 and outputs ground fault signal S10 at a predetermined threshold value or more. *Id.* at 5:47–51.

2. Boniface

Boniface, titled “System and Method for Fault Detection and Hazard Prevention in Photovoltaic Source and Output Circuits,” published on August 20, 2009, with a filing date of December 18, 2008. Ex. 1424, codes (54), (43), (22). Boniface discloses a fault detect system that comprises a photovoltaic (PV) source responsive to incident sunlight to generate output power along output conductors. *Id.* at code (57). An illustration of Boniface’s PV system is depicted in Figure 1, reproduced below.

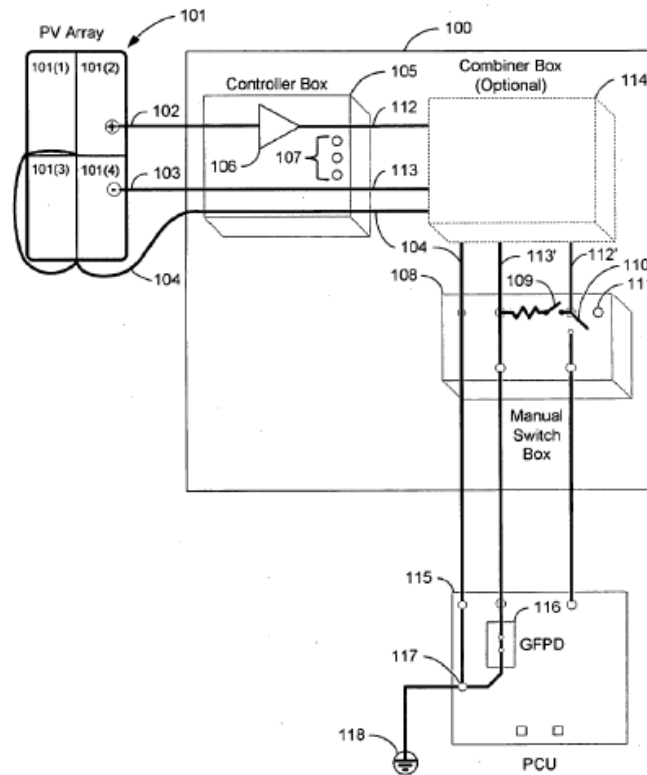


Fig. 1

Figure 1 is an illustration of an entire controlled PV system showing connections between a PV array, a controller, a manual switch, and a power

conditioning unit (PCU). *Id.* ¶ 12. As shown in Figure 1, complete PV control system 100 comprises controller 105, combiner 114, manual switch 108, and proper connective wiring. *Id.* ¶ 37. Combiner 114 connects multiple controllers in various series or parallel connection arrangements, the single combined output is then fed from combiner 114 to manual switch 108, and the output conductors of switch assembly 108 is then fed into PCU 115. *Id.* ¶ 38.

3. Gilmore

Gilmore, titled “System and Method for Ground Fault Detection and Interruption,” published on July 30, 2009, with a filing date of January 29, 2008. Ex. 1460, codes (54), (43), (22). Gilmore discloses a ground fault detector and interrupter for a PV energy conversion system. *Id.* at code (57). An illustration of Gilmore’s ground fault detector and interrupter is depicted in Figure 2, reproduced below.

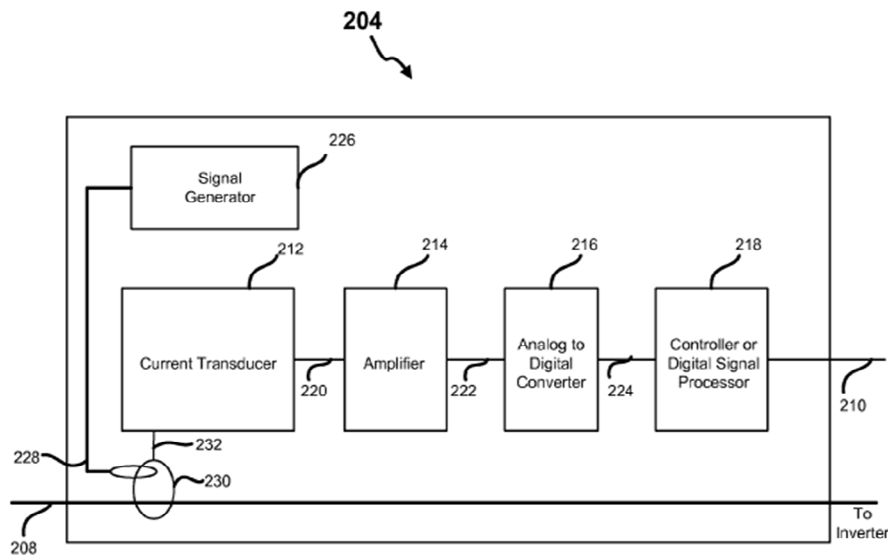


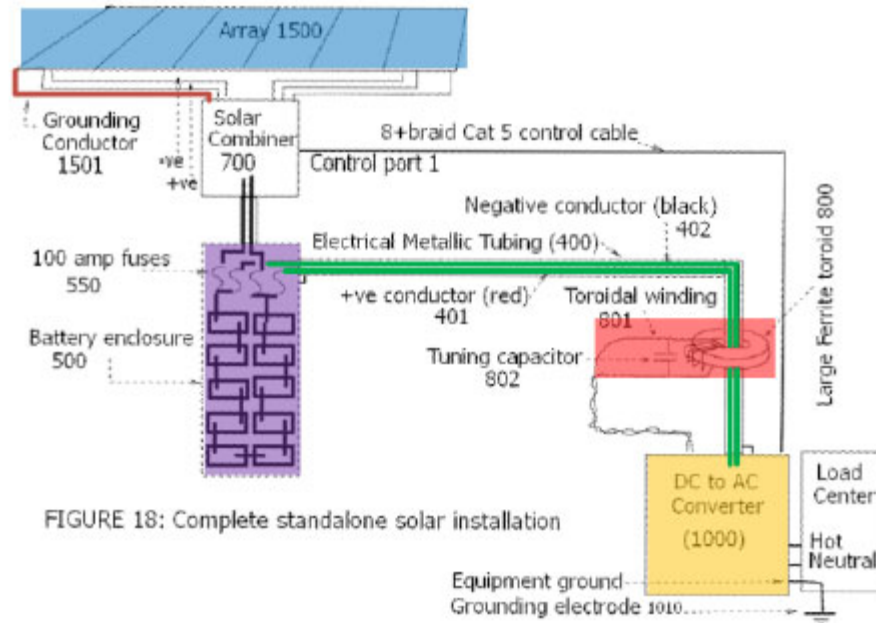
FIG. 2

Figure 2 is a block diagram of ground fault detector and interrupter 204, wherein input lines 208 from a PV array are coupled to DC current

transducer 212, input lines 208 corresponding to the positive and neutral (tied to ground) connections to the PV array. *Id.* ¶ 22. As shown in Figure 2, ground fault detector and interrupter 204 comprises amplifier 214, analog-to-digital (A/D) converter 216, and controller or digital signal processor 218. *Id.* ¶ 23. DC current transducer 212 is coupled to amplifier 214 by connector lines 220, amplifier 214 is coupled to A/D converter 216 by connector lines 222, A/D converter 216 is coupled to controller or digital signal processor 218 by connector lines 224, and ground fault detector and interrupter 204 is coupled to a disconnect module of a PV energy conversion system by lines 210. *Id.* When a ground fault condition arises in the PV array, more current flow will flow on one of input lines 208 than the other input line, and a current will be induced in coil 230 of current transducer 212 so as to create a fault signal that is fed to input 232 of current transducer 212. *Id.* ¶ 24.

4. Analysis

Petitioner contends that the '822 patent is directed to a solar energy installation implemented with a ground leak detector. Pet. 2. Petitioner provides an annotated Figure 18 of the '822 patent, shown below, to illustrate its contentions.



Ex. 1401, Fig. 18 (annotated).

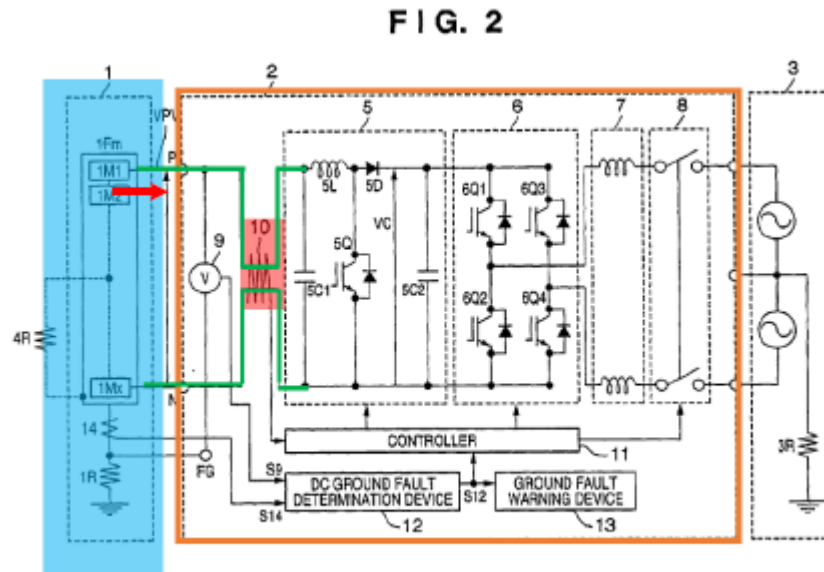
Annotated Figure 18 of the '822 patent in the Petition, according to Petitioner, illustrates a “solar energy installation,” which comprises “a solar array 1500 (blue) and a battery 500 (purple) connected to positive and negative DC input conductors (green) of a DC to AC converter 1000 (orange).” Pet. 2–3 (citing Ex. 1401, 5:4–6, 30:36–67, 31:35–47, 31:65–67, 35:43–36:9, 36:30–35, 36:49–51, 40:1–9, Fig. 18). Petitioner contends that, in the '822 patent, “[t]he positive and negative DC input conductors are routed from battery 500 and array 1500 (via solar combiner 700) through the ground leak detector (800, 801) (red) and to the inverter 1000.” *Id.* at 3 (citing Ex. 1402 ¶¶ 75–77). According to Petitioner, toroid 800 “senses an unusual ground leak current from the common-mode waveform on the positive and negative input conductors, and if the ground leak current exceeds a threshold, the inverter 1000 executes a shutdown,” thus, “preventing any further ground leakage current.” *Id.* at 3–4 (citing Ex. 1401, 32:26–32, 35:65–36:3, 36:30–35, 40:29–35; Ex. 1402 ¶¶ 76–77).

- i. *Preamble, “In a solar energy installation comprising a photovoltaic solar array and a DC to AC converter having a DC input with positive and negative conductors routed in parallel with an array grounding conductor and an AC output having an output waveform with an output repetition frequency, a method of detecting a ground leak in the DC wiring to the solar array” (claim 14)*

Petitioner contends that, “[t]o the extent that the preamble is limiting, Suzui discloses it.” Pet. 25. In particular, Petitioner contends that “Suzui describes a solar power generation system (the claimed ‘solar energy installation’) including a solar battery formed as a string of series-connected solar battery modules,” the solar power generation system comprising “plurality of the solar battery strings connected in parallel (the claimed ‘photovoltaic solar array’).” *Id.* (citing Ex. 1406, 4:59–5:6, Figs. 2, 8; Ex. 1402 ¶¶ 184–187). According to Petitioner, Suzui’s solar power generation system “includes an inverter 2 that ‘converts a DC power output from a solar battery 1 into an AC power and outputs the AC power to a commercial power system 3’ (the claimed ‘DC to AC converter’).” *Id.* (citing Ex. 1406, 3:26–30, 4:60–65, 5:15–20, Fig. 2; Ex. 1402 ¶ 188). Petitioner contends that “Suzui’s inverter 2 meets the function of ‘[having] an AC output having an output waveform with an output repetition frequency’ because it outputs a single phase voltage at a commercial frequency.” *Id.* at 25–26 (citing Ex. 1406, 3:26–30, 4:60–65, 5:15–20, 7:46–60, Fig. 2; Ex. 1402 ¶¶ 189, 192).

Petitioner then contends that “Suzui also discloses ‘a method of detecting a ground leak in the DC wiring to the solar array.’” Pet. 27 (citing

Ex. 1402 ¶ 189). Petitioner provides an annotated Figure 2 of Suzui, shown below, to illustrate its contentions.



Ex. 1406, Fig. 2 (annotated).

Annotated Figure 2 of Suzui in the Petition, according to Petitioner, illustrates “inverter 2 (orange) [that] receives, as input, a DC voltage (VPV) from solar battery 1 (blue) via positive and negative conductors (green) attached to respective input terminals [P, N] of the inverter,” i.e., “the claimed ‘DC to AC converter having a DC input with positive and negative conductors’.” *Id.* (citing Ex. 1402 ¶¶ 184–187, 191; Ex. 1406, 5:21–36, 6:58–64, Fig. 2). Petitioner contends that “Suzui’s inverter converts the DC voltage output from the solar battery to a 60 Hz, sine-shaped alternating current,” i.e., “the claimed ‘AC output having an output waveform with an output repetition frequency’” that is “received by Suzui’s single-phase three-wire commercial power system 3.” *Id.* According to Petitioner, “[t]he positive and negative conductors (annotated in green), connecting Suzui’s inverter to the solar battery, run parallel alongside a frame ground conductor

connecting the inverter's frame ground terminal [FG] to a ground of the solar battery.” *Id.* (citing Ex. 1406, 5:41–44, Fig. 2; Ex. 1402 ¶ 193).

Petitioner further contends that “routing wires in parallel (for instance in the same conduit) was a well-known wiring technique,” wherein Boniface teaches “routing the positive and negative conductors ‘in parallel with an array grounding conductor.’” Pet. 29 (citing Ex. 1402 ¶¶ 193–196).

Petitioner provides an annotated Figure 1 of Boniface, shown below, to illustrate its contentions.

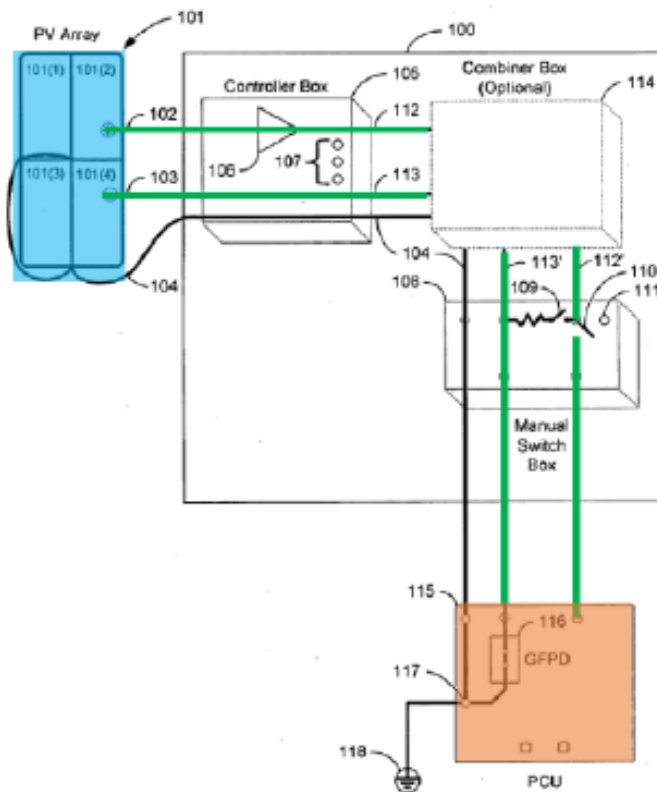


Fig. 1

Ex. 1424, Fig. 1 (annotated).

Annotated Figure 1 of Boniface in the Petition, according to Petitioner, illustrates “a fault detection system comprising a photovoltaic solar array 101 (blue) connected to a power conditioning unit, e.g., inverter

115 (orange) via connective wiring.” Pet. 29 (citing Ex. 1424 ¶ 37; Ex. 1402 ¶ 194). Petitioner contends that Boniface discloses that “a photovoltaic source positive conductor (102/112/112’) and a negative conductor (103/113/113’) (green) are routed in parallel with an equipment ground conductor 104 connected to earth ground system 118.” *Id.* (citing Ex. 1424, ¶¶ 37–39, 48, Figs. 1, 2, 6, 8; Ex. 1402 ¶ 194). According to Petitioner, a POSITA would have been motivated to implement Suzui’s system, in view of Boniface’s teaching, “to route Suzui’s positive and negative conductors in parallel with Suzui’s frame grounding conductors . . . to prevent shock hazards and improve safety,” and additionally “because routing the wires in parallel (e.g., in the same conduit) would also be easier and more convenient.” *Id.* at 31 (citing Ex. 1424 ¶ 2; Ex. 1402 ¶ 195).

At this stage of the proceeding, Patent Owner does not present arguments in the Preliminary Response addressing the specific merits of Petitioner’s contentions with respect to the preamble. *See generally* Prelim. Resp.⁹

Having reviewed all of Petitioner’s assertions regarding this claim limitation, as well as the supporting evidence, we determine on this record that Petitioner has demonstrated a reasonable likelihood that it will prevail on its assertion that the combination of Suzui, Boniface and Gilmore teaches

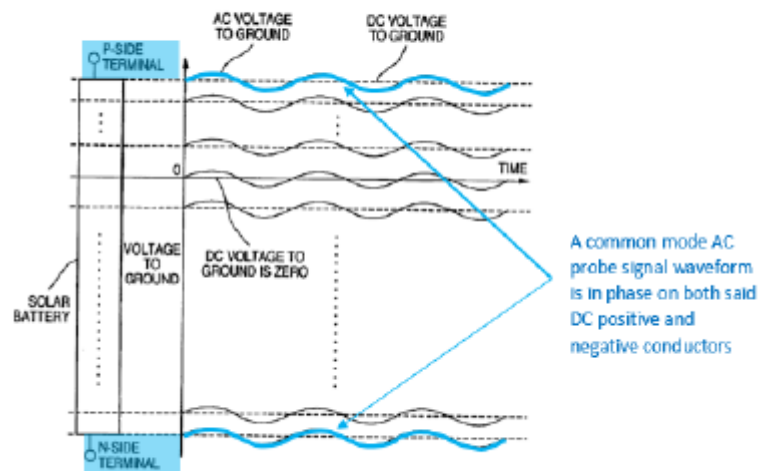
⁹ The issue of whether the preamble is limiting need not be resolved at this stage of the proceeding because, regardless of whether the preamble is limiting, Petitioner shows sufficiently for purposes of institution, and Patent Owner does not dispute, that the combination of Suzui, Boniface and Gilmore teaches a “method of detecting a ground leak in the DC wiring to the solar array,” as recited in the preamble. *See Nidec*, 868 F.3d at 1017 (noting that “we need only construe terms ‘that are in controversy’” (quoting *Vivid*, 200 F.3d at 803)).

“[i]n a solar energy installation . . . , a method of detecting a ground leak in the DC wiring to the solar array.”

- ii. *“creating a common mode AC probe signal waveform from said DC to AC converter at a characteristic repetition frequency that is in phase on both said DC positive and negative input conductors” (claim 14)*

Petitioner contends that “Suzui’s inverter 2 creates an AC voltage to ground on the DC inputs,” which a POSITA “would have understood to be the ‘creating a common mode AC probe signal waveform from said DC to AC converter.’” Pet. 34 (citing Ex. Ex. 1406, 4:28–47, 5:41–51, Figs. 2, 10; Ex. 1402 ¶¶ 198–199). According to Petitioner, Suzui depicts “the AC voltage to ground—which is generated on the positive and negative conductors leading from the DC power supply (the claimed ‘DC positive and negative input conductors’),” by “the switching arrangement of Suzui’s inverter—operating with symmetrical, time-synchronized behavior . . . (the claimed ‘at a characteristic repetition frequency that is in phase on both said DC positive and negative input conductors’).” *Id.* at 35 (citing Ex. 1406, 4:28–40, 5:32–46, 5:61–67, 7:46–60, Figs. 2, 10; Ex. 1402 ¶¶ 200–201). Petitioner provides an annotated Figure 10 of Suzui, shown below, to illustrate its contentions.

FIG. 10



Ex. 1406, Fig. 10 (annotated).

Annotated Figure 10 of Suzui in the Petition, according to Petitioner, illustrates “a common-mode AC probe signal waveform.” Pet. 35 (citing Ex. 1406, Fig. 10; Ex. 1402 ¶¶ 201–202). In particular, Petitioner contends that “this waveform generated by Suzui would be understood by a POSITA to be a common-mode voltage, which is defined as ‘[t]he voltage that, at a given location, appears equally and in phase from each signal conductor to ground.’” *Id.* (citing Ex. 1443, 4; Ex. 1442, 4; Ex. 1436, 4; Ex. 1402 ¶ 201).

At this stage of the proceeding, Patent Owner does not present arguments in the Preliminary Response addressing the specific merits of Petitioner’s contentions with respect to this claim limitation. *See generally* Prelim. Resp.

Having reviewed all of Petitioner’s assertions regarding this claim limitation, as well as the supporting evidence, we determine on this record that Petitioner has demonstrated a reasonable likelihood that it will prevail on its assertion that the combination of Suzui, Boniface, and Gilmore teaches “creating a common mode AC probe signal waveform from said DC

to AC converter at a characteristic repetition frequency that is in phase on both said DC positive and negative input conductors.”

- iii. *“passing said positive and negative conductors from the array through a detector adapted to detect an unusual current with said common mode waveform at said characteristic repetition frequency” (claim 14)*

Petitioner contends that, in Suzui’s annotated Figure 2 described above, “the positive and negative conductors (green) from Suzui’s solar battery 1 are passed through current detector 10 (red),” which is “the claimed ‘passing said positive and negative conductors from the array through a detector.’” Pet. 36 (citing Ex. 1402 ¶ 204; Ex. 1406, 1:56–61, 5:47–51, Figs. 2, 9B). According to Petitioner, “Suzui’s current detector 10 detects an imbalance between the currents flowing in the positive and negative DC conductors (zero-phase current) of the inverter (the claimed ‘a detector adapted to detect an unusual current’),” which “is generated by the 120 Hz AC voltage to ground (the claimed ‘with said common mode waveform at said characteristic repetition frequency’).” *Id.* at 37 (citing Ex. 1406, 5:47–51, 7:46–61, Fig. 2; Ex. 1402 ¶ 205).

Petitioner then contends that Gilmore discloses “passing [] positive and negative conductors from the array through a detector.” Pet. 38. In particular, Petitioner contends that “Gilmore discloses a ground fault detector—like Suzui’s current detector 10—that detects unsafe ground fault conditions based on levels of current flowing between a PV array and ground.” *Id.* (citing Ex. 1460 ¶¶ 20, 24, 26; Ex. 1402 ¶ 206). Petitioner provides an annotated Figure 2 of Gilmore, shown below, to illustrate its contentions.

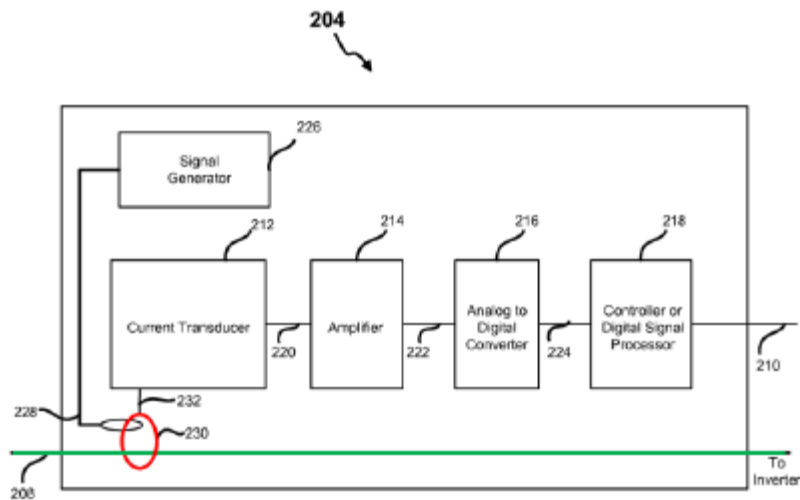


FIG. 2

Ex. 1460, Fig. 2 (annotated).

Annotated Figure 2 of Gilmore, as discussed in the Petition, shows “the positive and negative conductors (green)—shown as input lines 208 from Gilmore’s PV array 102—pass through current transducer coil 230 (red), which is coupled to a DC current transducer 212.” *Id.* (citing Ex. 1402 ¶ 206; Ex. 1460 ¶¶ 22, 24, Fig. 2). Petitioner contends a POSITA would have implemented the system of Suzui and Boniface in view of Gilmore’s teaching “to pass the positive and negative conductors—from the output of the Suzui-Boniface solar battery 1—through a current transducer coil that determines ground faults by detecting differences in current on the conductors.” *Id.* at 40 (citing Ex. 1402 ¶ 208).

At this stage of the proceeding, Patent Owner does not present arguments in the Preliminary Response addressing the specific merits of Petitioner’s contentions with respect to this claim limitation. *See generally* Prelim. Resp.

Having reviewed all of Petitioner’s assertions regarding this claim limitation, as well as the supporting evidence, we determine on this record

that Petitioner has demonstrated a reasonable likelihood that it will prevail on its assertion that the combination of Suzui, Boniface and Gilmore teaches “passing said positive and negative conductors from the array through a detector adapted to detect an unusual current with said common mode waveform at said characteristic repetition frequency.”

iv. *“upon detection of said unusual current providing an indication of the presence of an unwanted ground leak” (claim 14)*

Petitioner contends that Suzui describes that, “after detecting a current exceeding a predetermined threshold value, current detector 10 outputs a ground fault signal [S10] to controller 11 indicating the presence of a DC ground fault,” thereby “causing the inverter to disconnect from commercial system 3.” Pet. 43 (citing Ex. 1406, 5:47–62, 1:8–14, 1:34–38, 1:56–61, Fig. 2; Ex. 1402 ¶¶ 211–213).

At this stage in the proceeding, Patent Owner does not address separately Petitioner’s explanations and supporting evidence regarding the this claim limitation. *See generally* Prelim. Resp.

Having reviewed Petitioner’s arguments and supporting evidence in the present record, we determine Petitioner has demonstrated a reasonable likelihood that it will prevail on its assertion that the combination of Suzui, Boniface and Gilmore teaches “upon detection of said unusual current providing an indication of the presence of an unwanted ground leak.”

v. *Claims 15–19*

Petitioner provides detailed explanations as to how 1) the combination of Suzui, Boniface and Gilmore renders the limitations as recited in claims 15 and 18 as obvious, 2) the combination of Suzui, Boniface and Gilmore in further view of Dubrovsky renders the limitations as recited in claim 16 as

obvious, 3) the combination of Suzui, Boniface and Gilmore in further view of Mori renders the limitations as recited in claim 17 as obvious, and 4) the combination of Suzui, Boniface and Gilmore in further view of Endo renders the limitations as recited in claim 19 as obvious, citing Dr. Baker's testimony for support. Pet. 43–65 (citing Ex. 1403, 5:35–55; Ex. 1404 ¶¶ 2–16, 19–22, 34, Figs. 1–3, 6; Ex. 1406, 1:8–14, 1:16–4:26, 4:28–40, 4:59–5:6, 5:21–24, 5:32–67, 7:43–61, 9:58–60, Figs. 2, 8, 9B, 10; Ex. 1415, 3121, Fig. 5; Ex. 1419, 22–25; Ex. 1459, 2:12–16, 10:45–11:3, 11:30–32, 12:54–61, 13:8–20, Fig. 1; Ex. 1460 ¶¶ 22, 24, 28, Fig. 2; Ex. 1461 ¶¶ 6, 8; Ex. 1462 ¶¶ 6, 8; Ex. 1464, 51–57, 302–310; Ex. 1465, 51–57, 323–337, 385–398; Ex. 1402 ¶¶ 68, 134–142, 157–158, 171–174, 192, 200, 204–210, 214–249).

At this stage in the proceeding, Patent Owner does not address separately these explanations and supporting evidence by Petitioner regarding claims 15–19. *See generally* Prelim. Resp.

Having reviewed Petitioner's arguments and supporting evidence in the present record, we determine Petitioner has demonstrated a reasonable likelihood that it will prevail on its assertion that claims 15 and 18 would have been obvious over the combination of Suzui, Boniface and Gilmore; that claim 16 would have been obvious over the combination of Suzui, Boniface, Gilmore and Dubrovsky; that claim 17 would have been obvious over the combination of Suzui, Boniface, Gilmore; and that claim 19 would have been obvious over the combination of Suzui, Boniface, Gilmore and Endo.

III. CONCLUSION

Because we determine that Petitioner has demonstrated a reasonable likelihood that it would prevail in showing at least one of the challenged

claims is unpatentable, we institute *inter partes* review as to all challenged claims and grounds presented in the Petition. 37 C.F.R. § 42.108(a) (2020). At this stage of the proceeding, we have not made a final determination as to the patentability of any of these challenged claims.

IV. ORDER

For the reasons given, it is

ORDERED that pursuant to 35 U.S.C. § 314, an *inter partes* review is instituted as to claims 14–19 of the ’822 patent to determine whether:

1) claims 14, 15, and 18 are unpatentable under 35 U.S.C. § 103 as obvious over Suzui, Boniface, and Gilmore;

2) claim 16 is unpatentable under 35 U.S.C. § 103 as obvious over Suzui, Boniface, Gilmore, and Dubovsky;

3) claim 17 is unpatentable under 35 U.S.C. § 103 as obvious over Suzui, Boniface, Gilmore, and Mori;

4) claim 19 is unpatentable under 35 U.S.C. § 103 as obvious over Suzui, Boniface, Gilmore, and Endo; and

FURTHER ORDERED that pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial, which commences on the entry date of this Decision.

IPR2022-00010
Patent 8,937,822 B2
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