UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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AFFORDABLE WIRE MANAGEMENT, LLC,
Petitioner,

v.

CAMBRIA COUNTY ASSOCIATION FOR THE BLIND AND HANDICAPPED, INC.,
Patent Owner.

_____

IPR2024-00139
U.S. Patent No. 10,177,551 B1

_____

DECLARATION OF JOSHUA PHINNEY, Ph.D. IN SUPPORT OF PATENT OWNER'S RESPONSE

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I, Joshua Phinney, Ph.D., of Garden City, NY declare that:

I. ASSIGNMENT

1. I have been retained on behalf of Cambria County Association for the Blind and Handicapped, Inc. ("CAB" or "Patent Owner"). I understand that the Patent Trial and Appeal Board ("PTAB" or "Board") has instituted an *inter partes* review ("IPR") of U.S. Patent No. 10,177,551 ("the '551 patent") (EX1001), issued to CAB on January 8, 2019, (Paper 21 – the "Institution Decision") based on a petition filed by Affordable Wire Management, LLC ("AWM" or "Petitioner") (Paper 1 – the Petition).

2. I have been asked to analyze the assertions of invalidity of claims 1-19 of the '551 patent made by Petitioner in its petition and by Dr. Omid Beik in his declaration submitted in support of the petition (EX1002) and in his deposition (EX2004) as well as to analyze the Institution Decision, and to render my opinions in response to Petitioner's and Dr. Beik's assertions. I understand that CAB is submitting my declaration in support of its Patent Owner Response to AWM's petition.

3. I am being compensated for my work as an expert with respect to this *inter partes* review at the rate of $725 per hour, but my compensation is not contingent in any way on the content of my opinions or the outcome of this proceeding.

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4. My findings, as explained below, are based on my study, experience, and background in the field of power systems, informed by my education in electrical engineering, and my experience in the design and analysis of mechanical and electrical systems. In preparing this declaration, I have considered the claims, specification, and prosecution history of the '551 patent. In addition, I have relied on my review and analysis of the prior art as well as other materials submitted to the Board in support of AWM's petition. I have also relied on my review and analysis of the exhibits submitted with CAB's Patent Owner Response.

5. I have also considered the various documents referenced in my declaration and other information provided to me in connection with this case.

6. My opinions are also based on the knowledge I have accumulated over my years of experience as outlined below.

II. QUALIFICATIONS

7. My complete qualifications and professional experience are described in my *Curriculum Vitae*, EX2065. The following is a brief summary of my relevant qualifications and professional experience.

8. I am a Principal Engineer in the Electrical Engineering and Computer Science practice at Exponent, an engineering and scientific consulting firm headquartered at 149 Commonwealth Drive, Menlo Park, California 94025.

9. I received a Ph.D. in Electrical Engineering from the Massachusetts

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Institute of Technology ("MIT") in 2005. I also earned S.M. and B.S. degrees in Electrical Engineering from MIT and the University of Illinois, Chicago ("UIC"), respectively.

10. While at MIT, I worked at the interface of power electronics and electromechanics. I designed inverters and rectifiers for rotating machines, including automotive alternators and induction generators in the MIT Microengine Project.

11. As part of my graduate work for the MIT/Industry Consortium on Advanced Electrical/Electronic Components and Systems, I measured and modeled the chassis-ground impedance in automobiles equipped with 42 V electrical systems.

12. In my Master's Thesis I designed, built, and tested filters to suppress electromagnetic interference ("EMI filters") that are used when powering circuity from an AC utility source.

13. At MIT I also worked on the Laser Interferometric Gravitational Wave Observatory (LIGO) experiment, where I designed and tested low-turbulence hydraulic systems for seismic isolation of the experimental apparatus. My job responsibilities included the design and testing of a hydraulic manifold and pressure control system, as well as the selection and testing of the sensors and actuators that were parts of the position control system.

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14. My doctoral work at MIT centered on power electronics and magnetics. As part of my doctoral work, I constructed and modeled filters, including filters with magnetically coupled coils.

15. While at MIT, I taught magnetics design and magnetic-circuit analysis to both undergraduate and graduate students.

16. I have authored papers in the areas of power electronics and magnetics, and am a co-inventor on patents for improving the performance of capacitors, EMI filters, and common-mode chokes.

17. For my publications related to both my Master's and Ph.D. thesis, I received the William M. Portnoy Prize Paper Award (2003) and the IEEE Power Electronics Society Transactions Prize Paper Award (2004).

18. After earning my Ph.D., I joined Exponent where I lead technical investigations pertaining to electronics, microcomputers, and electromechanical systems. My job functions include analyzing hardware and software of these devices to understand their modes of failure and testifying regarding these devices in legal matters involving patents and trade secrets. I have led Exponent's technical investigation of large generation failures, including grid-scale photovoltaic facilities and the Ravenswood U30 generator loss. In addition at Exponent, I have worked on commissioning and failure analysis of HVDC converter stations as well as emergency power systems (including uninterruptible

power supplies) in hospitals, data centers, emergency-response centers, and military installations. These investigations encompassed distribution and substation automation of the serving utility.

19. Throughout the last 18 years at Exponent, I have performed electromagnetic assessments of utility and communication infrastructure. These issues include permitting, interference, and environmental impact of radar, AC and HVDC transmission lines, substations, photovoltaic installations, generators, broadcast antennas, and electrified mass transit systems. As part of this work, I calculate electric- and magnetic-field profiles – as well as profiles of audible noise and radio noise – along transects perpendicular to the path of transmission and distribution lines. For overhead lines, calculation of profiles is preceded by sag calculations, i.e., predicting the ground clearance of conductors at their lowest point, for a given temperature and attachment height at the structure. I have formalized this prediction of conductor position as part of a tool suite at Exponent to predict the likelihood of flashover. These tools used assist transmission-line operators manage the risk associated with wilderness fires.

20. In addition to the foregoing, I have advised clients on RF safety and grounding practices in the vicinity of commercial radio transmitters and high-voltage transmission lines. This work includes advising manufacturers and operators of hoists, cranes, pipelines, and hydrogen-handling facilities regarding

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mitigation of touch potentials, nuisance shocks, and electromagnetic interference around high electric fields. I have also performed stray-current measurements and grounding-system assessments in high-voltage DC converter stations, substations, marinas, and dairies. Here, stray currents were from conducted sources, rather than induced by radiated sources.

21. I have also testified regarding the faults that occur in electrical systems, e.g., detection and ride-through of ground faults in grid-connected wind turbines, as well as mitigation of electrical hazards to installers of commercial lighting. In the context of mediation, I have opined regarding specification compliance and National Electric Code (NEC) compliance in the emergency-power and power-distribution systems of data centers. In addition, I have taught electricians and engineers-in-training and as part of the Professional Engineering Review Course at Hofstra University, to prepare students for NEC questions on the Professional Engineering exam.

22. Regarding solar projects, I have assisted with permitting of grid-scale solar facilities (30-300 MW) in Kern County, CA, Arizona, and Texas, and led failure root-cause analysis (RCA) efforts in solar power plants. Some of the RCA projects involve failure of particular components, e.g., panels and combiner boxes. More complicated RCA projects included inverter fires and generator-step-up transformer failures. As part of these failure studies, I have modeled the

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dynamics of grid-scale solar power plants, including the collector system, inverters, generator step-up transformers, and main step-up transformers.

23. I also testified before the Kern County Board of Supervisors on behalf of Sempra Generation regarding their solar generation projects in Antelope Valley.

III. LEVEL OF ORDINARY SKILL IN THE ART

24. I understand there are multiple factors relevant to determining the level of ordinary skill in the pertinent art, including (1) the educational level of the inventor; (2) type of problems encountered in the art; (3) prior art solutions to those problems; (4) rapidity with which innovations are made; (5) sophistication of the technology; and (6) educational level of active workers in the field.

25. I understand that '551 patent was filed as U.S. Patent Application No. 15/725,668 (the "'668 application") on October 5, 2017, and does not claim priority to any earlier-filed applications.

26. As discussed further below, the '551 patent relates to a "grounding system, structured to ground a number of cables supported by a support assembly," and that "includes a multi-function line assembly [including a multi-function line] and a number of conductive mounting assemblies," each of which is "structured to be coupled to the multi-function line and to a conductive pile." EX1001, Abstract.

27. The specification further explains that the claimed invention "relates to a grounding system for a suspended cable assembly and, more particularly, to a

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grounding system that includes conductive elements whereby grounding cables do not need to be spliced into a conductor wire disposed adjacent a messenger wire. EX1001, 1:7-13. The multi-function line "supports the cable hangers, as a messenger wire, and provides a current path, as a grounding conductor." EX1001, 2:35-37.

28. Based on my understanding of the technology, education, and experience level of those working in this field, it is my opinion that a person of ordinary skill in the art ("POSITA") working in the field of the '551 Patent *circa* 2017 would have an associate's degree in an engineering discipline, and 1-2 years' experience in electrical power systems. Lack of work experience can be remedied by additional education, and vice versa.

29. At ¶32, Dr. Beik opines "that a POSITA working in the field of the '551 Patent at the relevant time would have had a bachelor's degree in a pertinent discipline, such as electrical engineering, civil engineering, mechanical engineering or equivalent with 2-3 years of experience in electrical power systems, planning, and design, with the understanding that the number of years of

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experience could be higher or lower given the level of education and vice versa."[1]

30. I have considered the level of ordinary skill offered by Dr. Beik and it is my opinion that he (and Petitioner) propose a level of skill that is too high. In my opinion, a POSITA working in the field of the '551 patent could have the work experience Dr. Beik and Petitioner proposes, but with far less education. I base this opinion on my experience and interactions with electricians and engineers-in-training, many of whom did not have a bachelor's degree in an engineering discipline, but nevertheless would be considered to be skilled artisans in the field of the '551 invention.

31. I understand that in its Institution Decision, the Board did not "discern a meaningful difference between the parties' positions regarding the level of ordinary skill in the art, and . . . preliminarily determine[d] a person of ordinary skill in the art would have had a bachelor's degree in an engineering discipline and two years of experience in electrical systems." Paper 21, Institution Decision, 6. Therefore, for purposes of my analysis, I have assumed the Board's articulation regarding the level of ordinary skill in the art.

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[1] While Dr. Beik refers to the 2-3 years' experience level being in "electrical power systems," Petitioner in its Petition refers to 2-3 years experience in "electrical utility systems." Petition, 23.

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IV. RELEVANT LEGAL STANDARDS

32. In preparing and expressing my opinions and considering the subject matter of the ’551 patent, I am relying on certain basic legal principles that counsel have explained to me. These principles are discussed below.

33. I understand that prior art to the ’551 patent includes patents and printed publications in the relevant art that predate the priority date of the inventions recited in the ’551 patent.

34. I have been informed that a claimed invention is unpatentable under 35 U.S.C. § 103 if the differences between the invention 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 the subject matter pertains. I have also been informed by counsel that the obviousness analysis takes into account factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed subject matter.

35. I have also been informed that when asserting obviousness under § 103 based on a single prior art reference, a petitioner must articulate a reason, with rational underpinnings, why a POSITA would have been motivated to modify that single prior art reference to arrive at the claimed invention.

36. I have been informed that the Supreme Court has recognized several

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rationales for combining references or modifying a reference to show obviousness of claimed subject matter. Some of these rationales include the following: (a) combining prior art elements according to known methods to yield predictable results; (b) simple substitution of one known element for another to obtain predictable results; (c) use of a known technique to improve a similar device (method, or product) in the same way; (d) applying a known technique to a known device (method, or product) ready for improvement to yield predictable results; (e) choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success; and (f) some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

37. I have also been informed by counsel that, in addition to considering factual inquiries including the level of ordinary skill in the art, the scope and content of the prior art, and the differences between the prior art and the claimed subject matter, the obviousness inquiry also must take into account secondary considerations such as commercial success, long-felt need, failed attempts, copying, unexpected results, praise of the invention, expressions of skepticism in the industry, and the patent owner proceeding contrary to accepted wisdom of the prior art.

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V. BRIEF TUTORIAL ON GROUNDING SYSTEMS

38. Before the time of the invention, safety benchmarks such as NFPA 70 and the National Electrical Code (NEC), included a requirement that non-current-carrying metal components of an electrical power system (such as metallic supports, raceways, and enclosure) be bonded to one another, and also be grounded through the use of a grounding conductor.

39. Grounding and bonding practices are important and required per NEC because they protect personnel from electrical shock hazards and protect against faults. These practices:

(a) keep equipment enclosures and other exposed metal parts well-defined (i.e., near ground potential) and therefore, safe to touch;

(b) limit unintended voltage on the electrical system imposed by lightning or short circuits;

(c) bond electrical equipment together to establish a low-impedance path (an "effective ground-fault current path") from the fault location back to supply to facilitate the operation of overcurrent protection devices.

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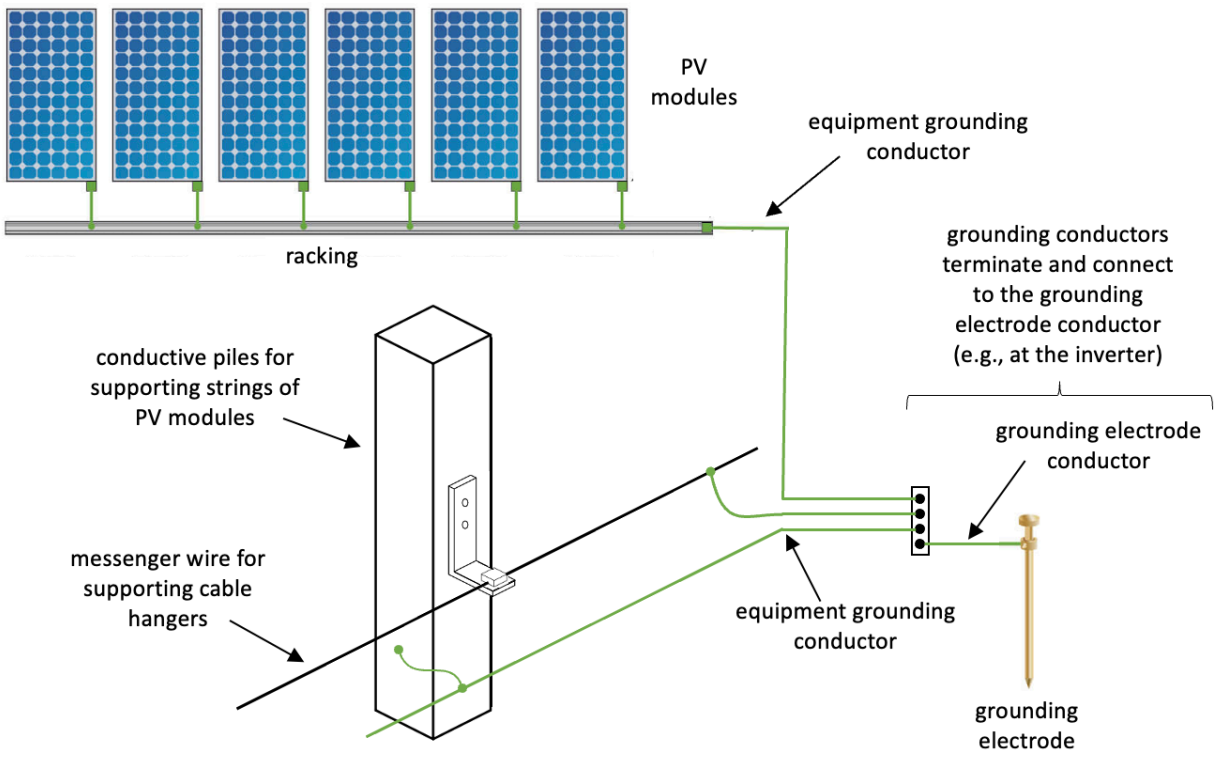
A. GROUNDING

40. In photovoltaic (PV) systems,[2] exposed metal parts of equipment like PV-module frames, racking, piles, and raceways must all be grounded. *See* EX1007, 2008 NEC, Art. 690.43, 587.



41. The racking, piles, bracket hardware and messenger wire illustrated

[2] While the claims of the '551 patent are not limited to grounding systems and components in solar PV installations, given the prior art references at issue in this IPR proceeding, particularly CAB Website (EX1005), CAB Whitepaper (EX1006) and Grushkowitz (EX1003), my tutorial focuses on grounding systems in a solar PV installation.

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above serve a ***support function*** and do not normally carry current, though they are likely to become energized in the event of a fault. This support equipment is ***not*** grounded by virtue of resting on the earth, or by being embedded into the earth (in the case of conductive piles). Rather, the equipment shown above is grounded by being connected through ***grounding conductor(s)*** to a ***grounding electrode***.

42. NEC Article 690.43 requires that exposed non-current-carrying metal parts in a PV array be grounded regardless of voltage, and regardless of whether any of the current-carrying conductors from the PV array are grounded. *See* EX1007, 2008 NEC, Art. 690.43, 587.

1. Grounding conductors

43. The NEC provides two types of grounding conductor, the "grounding electrode conductor" (GEC) and the "equipment grounding conductor" (EGC). Both the GEC and EGC, which is ramified to interconnect exposed non-current-carrying metal parts of equipment, are depicted in the diagram above.

44. ***Grounding Electrode Conductor***. A grounding electrode is an electrically conductive solid rod or other structure whose size and surface area are sufficient to permit adequate contact with the earth in which it is buried or driven. A wire called the "Grounding Electrode Conductor" ("GEC") connects to the grounding electrode. As depicted in the figure above, the GEC and its grounding

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electrode are located at the inverter that serves strings of PV modules in the array.[3]

45. ***Equipment Grounding Conductor***. An "equipment grounding conductor" ("EGC") is the conductive path installed to connect normally non-current-carrying metal parts of equipment together and to the system grounded conductor (a system or circuit conductor that is intentionally grounded) or to the grounding electrode conductor, or both. *See* EX1007, 2008 NEC, Art. 100 – Definitions, 31.

46. The EGC does not normally carry current, and is not intended to carry current, when the electrical system is properly functioning. In the event of a ground-fault, however, the equipment grounding conductor is designed to provide an effective, low-impedance ground-fault current path from the point of a ground-fault on the wiring system to the electrical supply source in order to cause an overcurrent protection device to open the circuit and to clear the fault. This path provided by the EGC is referred to as an "effective ground fault current path," and is an intentionally constructed path that facilitates the operation of the overcurrent protective device or ground-fault detectors on high impedance grounded systems. EX1007, 2008 NEC, Art. 250.2, 99.

[3] The inverter in a solar power plant converts DC voltage (generated by strings of PV modules connected in series) into AC voltage for use in the electric power grid.

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47. In his deposition, Dr. Beik acknowledged that "[a] POSITA would know an effective ground fault current path is the one that provides a low resistance. It has the mechanical considerations from the point of that element to the end." EX2004, 22:14-17[4]. Dr. Beik also acknowledged that the low resistance (or low impedance) path that facilitates the operation of the overcurrent device or ground-fault detector as provided in the NEC. *Id*., 22:18-23:24 (referring to EX1007, 2008 NEC Art. 250.4(A)(5), 99).

48. An example of an effective ground fault current path for a PV system is shown in the figure below. The red (positive) dashed line shows the path that ground-fault currents take ***through equipment grounding conductor(s)***, to the

[4] I have been informed by counsel that Dr. Beik was deposed on July 9, 2024 in IPR2024-00178, and July 11, 2024 in IPR2024-00139. I have also been informed by counsel that during the deposition of Dr. Beik on July 9, 2024, counsel for the parties stipulated that EX2004 would include the transcripts of both days of testimony. As a result, I understand that EX2004 contains the transcript from July 9, 2024 (Volume I, stamped pages 1-216) and the transcript from July 11, 2024 (Volume II, stamped pages 217-410). For ease of reference by the Board, all citations in this declaration to EX2004 are to the page and line numbers of the transcript for Volume II, which begins on stamped page 217.

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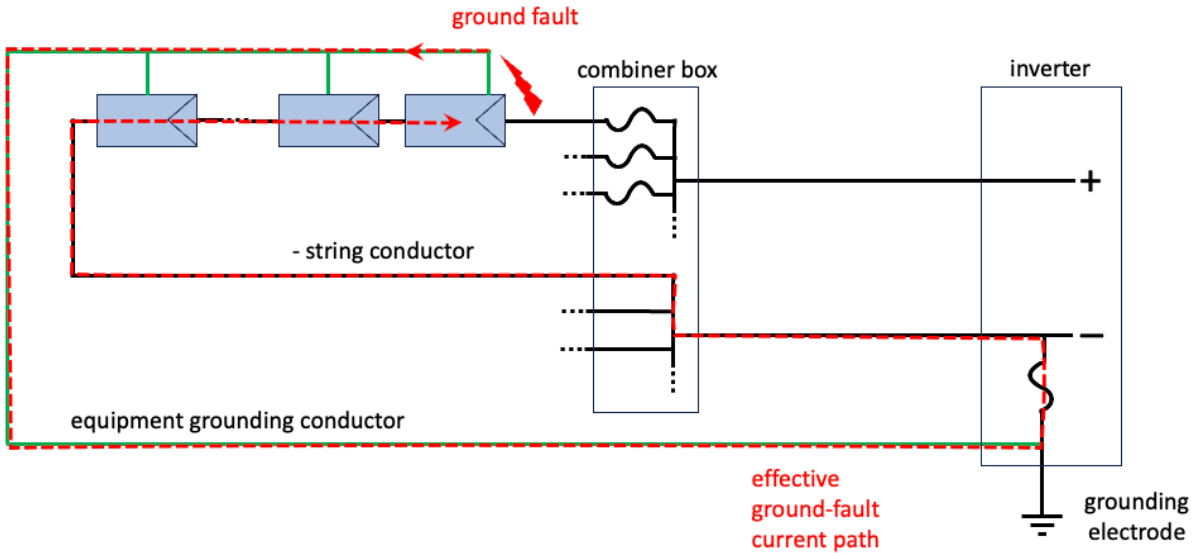
inverter, and back to the source. This particular system is a grounded system and the negative PV-array conductor is the grounded circuit conductor. In this case, all ground-fault currents pass through the DC system bonding connection (a fuse through which the negative conductor is grounded) at the inverter. It is here, at the inverter, where the ground-fault protection device (GFPD) is located. Alternatively, protection devices such as an insulation-monitoring device can monitor the impedance between isolated DC array conductors and the EGC at the inverter. E.g., NEC Art. 690.35. *Id.* 587.



See p. 22 of the Solar America Board for Codes and Standards (Solar ABCs) report *Photovoltaic System Grounding*, prepared by John C. Wiles, Jr., New Mexico State University, College of Engineering, October 2012. A copy of the report may be downloaded at www.solarabcs.org/systemgrounding. *See also* Brooks, B. (2012), *The ground-fault protection blind spot: Safety concern for larger PV systems in the*

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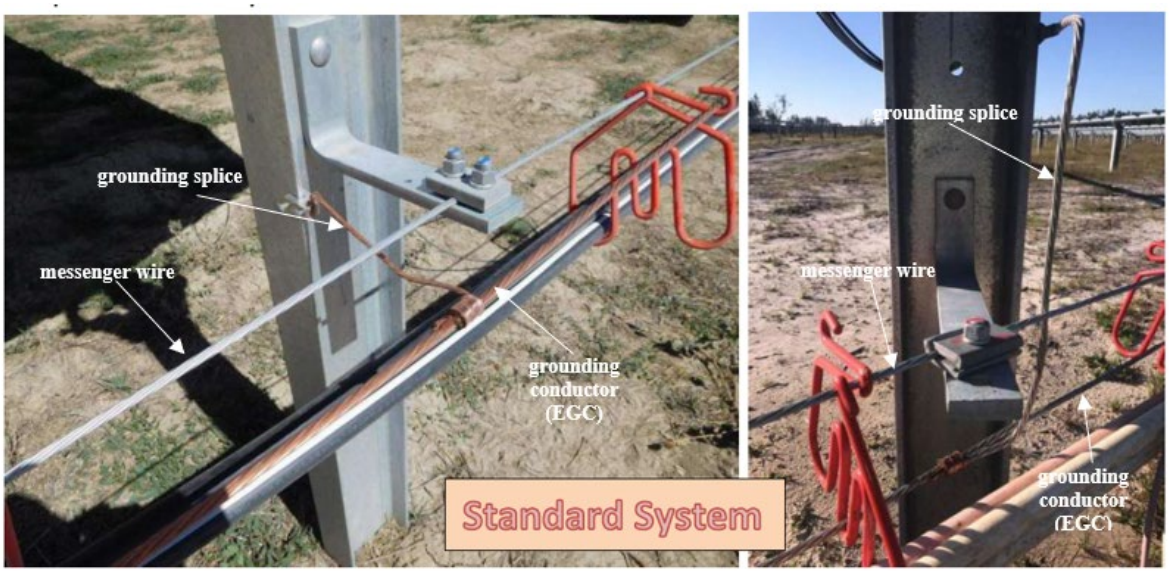
U.S. Solar ABCs. www.solarabcs.org/blindspot.

49. In PV generation facilities, the NEC requires that an EGC be installed between a PV array and other equipment (such as an inverter), and must run with the PV-circuit conductors where they leave the vicinity of the PV array. EX1007, 2008 NEC, Art. 690.43, 587; *see also* EX1001, 1:65-2:16 (discussing equipment grounding conductors). These PV conductors (e.g., positive and negative DC cables from strings of PV modules), typically run with the EGC in a raceway or conduit to the inverter. The NEC requires that the EGC, in keeping with its electrical function, be sized for the largest overcurrent device protecting other conductors in the raceway. EX1007, 2008 NEC, Art. 250.122, 690.45, 120, 588.

2. Messenger wire

50. To organize the myriad of high-ampacity conductors in commercial PV installations before the time of the invention claimed in the '551 patent, CAB sold an above-ground cable management system that used cable hangers suspended from a steel ***messenger wire***. EX2061, ¶¶5-6, 13-14, 21-32, 36-40, 45-47, 54-55, 57-58, 62-64. In this system, designated by CAB as its "Standard System," the messenger wire performed a mechanical function but not an electrical function, and was separate from the grounding conductor. CAB's Standard System requires the separate installation of a separate grounding conductor that is typically installed parallel to the messenger wire with grounding splices to the piles. EX2061, ¶67.

This installation of a separate grounding conductor and grounding splices is shown below in a photo excerpted from CAB's Installation Guide, EX2041, 2. This grounding conductor performs an electrical function and is appropriately sized to ground equipment and satisfy NEC requirements as an EGC.



EX2041, 2.

51. In keeping with its mechanical function, and since it not designed to carry current, the messenger wire depicted above is just another piece of metal equipment ***that must be grounded***. A POSITA would understand that a messenger wire is an exposed metal part that may become energized, particularly when it supports power cables. As such, a messenger wire (as with all other exposed metal parts, like enclosures) must be grounded. NEC Article 396.60 includes this specific requirement. EX1007, 2008 NEC, Art. 396.30, 241.

52. Prior to 2020, "messenger wire" was not a defined term in the NEC.

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A POSITA at the time of the invention, however, would have understood that messenger wires utilized in electrical power systems, such as in PV solar installations, were made of metal (typically steel) and provided support for other electrical cables. In addition, a POSITA would understand that, while made of metal and conductive, messenger wires were selected for their strength. In other words, messenger wires were not structured to carry a current or to provide a current path and were not sized for their ampacity.

53. Indeed, as shown in the photo above, CAB's Standard System relied on a parallel grounding conductor for these electrical functions, sized according to the overcurrent devices protecting the bundled cables. EX1007, 2008 NEC, Art. 250.122, 690.45, 120, 588.

54. In the 2020 NEC, messenger wire was defined for the first time as "a wire that is run along with or integral with a cable or conductor to provide mechanical support for the cable or conductor." *See* "Article 100 Messenger or Messenger Wire" retrieved from https://www.electricallicenserenewal.com/Electrical-Continuing-Education-Courses/NEC-Content.php?sectionID=791.0 Both as understood by a POSITA at the time of the invention, and as defined even subsequently in the 2020 NEC, a messenger wire had a strict mechanical role– i.e., it was not structured to carry current or to provide a current path.

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55. Following the filing of the ‘551 patent, CAB began to sell its “Integrated Grounding System,” covered by and coextensive with the ’551 Patent claims as I analyze in Section IX.A, below, to customers that wanted to reduce the labor and material costs of installing splices into a separately dedicated grounding conductor and to each metal pile. The value proposition of the ’551 Patent claims, as I explain in more detail below, is that this prior-art messenger wire (with a support function only) is replaced by a “multi-function line” (with both support and electrical functions). The multi-function line has additional conductive strands compared to the prior-art messenger wire that allow it to serve as an EGC. This electrical role (as a grounding wire) eliminates the need for an EGC running adjacent to the prior-art messenger wire.

B. BONDING

56. Bonding means connecting metallic parts in order to establish electrical continuity and conductivity. EX1028, 85; EX1032, 100. By permanently joining metallic parts to form an electrically continuous path, bonding ensures that currents likely to be imposed on metallic parts are conducted safely. Properly bonded systems are at the same potential as the grounding portion of the electrical system.

57. Bonded metal parts are not intended to carry current as part of the electrical power system but they must be able to safely do so in the event that

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current is imposed on them. In general, an abnormal current on any one metal part (e.g., from a phase-to-case fault) will flow on different parts of the bonded metal parts because they are connected. Bonding, however, minimizes the voltage difference between the different conductive components in the system under such atypical operating conditions. EX1028, 93.

58. Bonding also ensures that current from a ground fault, no matter where it occurs in a raceway, support, enclosure, or similar bonded metal parts, returns to the electrical supply source via an "effective ground-fault current path." The effective ground-fault current path must have sufficiently low impedance (i.e., electrical resistance) to the supply source so fault current will quickly rise to a level that will open the circuit overcurrent protection device. EX1007, 2008 NEC, Art. 250.2, 99.

59. Proper bonding of the metallic non-current-carrying parts, ***in conjunction with the grounding conductor***, establishes the effective ground-fault current path (as discussed above) to detect and/or clear faults. NEC Art. 250.4(A)(3)-(4) (which Dr. Beik also references at ¶38 of his declaration (EX1002)) describes this fundamental concept:

> **(3) Bonding of Electrical Equipment.** Normally non-current-carrying conductive materials enclosing electrical conductors or equipment, or forming part of such equipment, shall be connected

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together ***and to the electrical supply source in a manner that establishes an effective ground-fault current path.***

(4) Bonding of Electrically Conductive Materials and Other Equipment. Normally non-current-carrying electrically conductive materials that are likely to become energized shall be connected together ***and to the electrical supply source in a manner that establishes an effective ground-fault current path.***

EX1007, 2008 NEC, Art. 250.4(A)(3)-(4), 99 (emphases added). *See also id*., Art. 100, where the NEC states in FPN No. 1: "***It is recognized that the equipment grounding conductor also performs bonding.***" (emphasis added).

60. NEC Article 250.2 provides the definition of "effective ground-fault current path:"

Effective ground-fault current path. An intentionally constructed, low-impedance electrically conductive path designed and intended to carry current under ground-fault conditions from the point of a ground fault on a wiring system to the electrical supply source and that facilitates the operation of the overcurrent protective device or ground fault detectors on high impedance grounded systems.

Id., Art. 250.2, 99. As stated above, Dr. Beik acknowledges this definition, and purpose, of the effective ground fault current path. EX2004, 22:14-17; 22:18-23:24; 26:22-28:9.

61. To be clear, the conductive piles in the forgoing examples of PV systems can be part of a conductive path to the earth for lightning-strike current.

However, a POSITA would recognize that that path to the earth through the conductive piles is not the required effective ground fault current path. The required effective ground fault current path can only be provided by the EGC properly bonded with other metallic parts of the system.

62. The objective of the ’551 Patent claims is to eliminate the need for a ***separate*** EGC and associated grounding splices. These benefits – which are savings to both material and installation costs – are realized both by the multi-function line and the multi-function line couplings, which are part of the conductive mounting assembly and define a conductive path. In this manner, the multi-function line and its couplings provide the effective ground-fault current path that would otherwise be provided by grounding splices to an adjacent EGC. Ex. 1001, 1:67-2:16.

VI. OVERVIEW OF THE ’551 PATENT

63. The ’551 patent relates to a grounding system having a “multi-function line” that serves a dual purpose of (1) physically supporting cable hangers that in turn support electric cables; and (2) serving as an equipment grounding conductor (a type of grounding conductor) for the system. “That is, a single multi-function line supports the cable hangers, as a messenger wire, and provides a current path, ***as a grounding conductor***.” EX1001, 2:33-37 (emphasis added). The multi-function line shown in Fig. 7 of the ‘551 patent, reproduced below

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(EX1001, FIG. 7), includes conductive copper and copper-clad steel strands. *Id.* 8:67-9:6. Thus, the multi-function line shown in Fig. 7 is sufficiently strong to support cable hangers and electrical wires, and is also sufficiently conductive to act as an equipment grounding conductor.

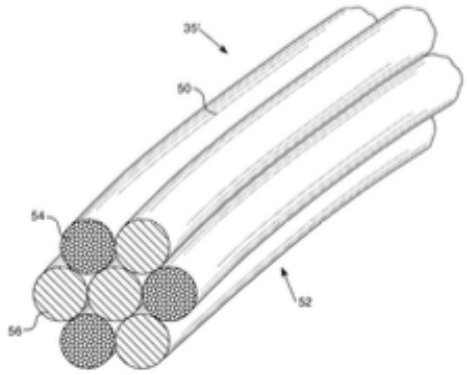

FIG. 7

64. The ’551 patent specifies that the multi-function line is a “tension member.” As shown in Fig. 1 of the ’551 patent (EX1001, FIG. 1), conductive terminal supports (item 44) are used to couple the multi-function line to a support (e.g., a pile) and “draw the multi-function line 35 taut.” *Id*. 7:17-23.

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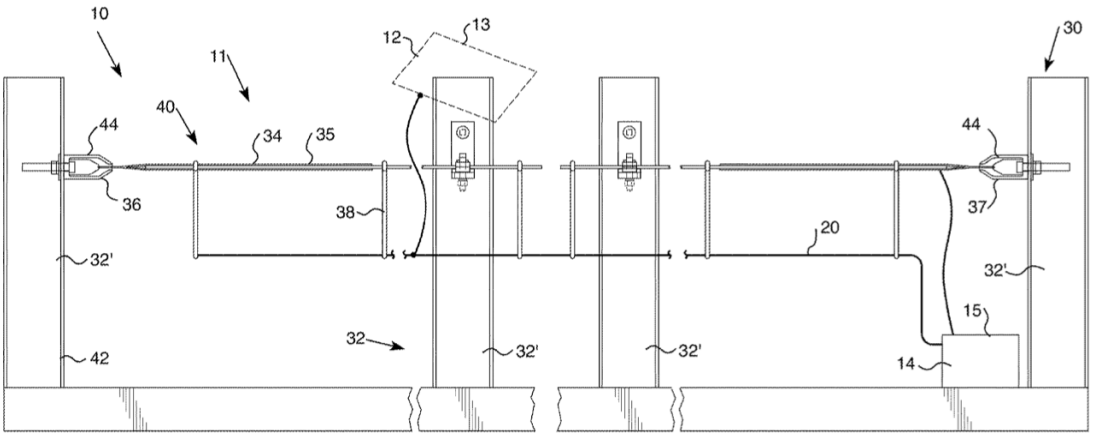

FIG. 1

65. The disclosed and claimed grounding system is structured to ground a number of cables supported by a support assembly. EX1001, 2:24-27; 12:12-23; 13:16-31. The grounding system includes a multi-function line assembly (including a multi-function line) and a number of conductive mounting assemblies. *Id.*, 2:27-29; 12:15-20. Each conductive mounting assembly is coupled to the multi-function line and to a conductive pile. *Id.*, 2:29-31; 12:17-20.

66. The multi-function line acts as the grounding conductor, as discussed above in my tutorial section. It is an intentionally constructed, low-impedance electrically conductive path designed and intended to carry current under ground-fault conditions. In the event of a ground fault, the multi-function line provides a path to ground for a current in the multi-function line assembly. *Id.*, 2:31-33.

67. As discussed above in my tutorial section, a POSITA would readily understand that the multi-function line must provide an effective ground fault

current path from the point of a ground-fault on the wiring system to the electrical supply source in order to cause an overcurrent protection device to open the circuit and to clear the fault. While the '551 patent refers to conductive mounting assemblies that are coupled to the multi-function line and to a conductive pile in a configuration that provides a path to ground (EX1001, 2:27-33), as discussed above, a POSITA would understand that a path to the earth through the conductive pile would not be the effective ground fault current path required by the NEC for grounding the system. As Dr. Beik agreed in his deposition, the earth may not be used as the sole EGC fault current path. EX2004, 26:13-21 (referring to Section 2.1.2 of the 2007 IEEE Green Book, excerpted from EX1028). Again, it is only the EGC that provides the necessary effective ground fault current path "from the point of a ground fault on a wiring system to the electrical supply source and that facilitates the operation of the overcurrent protective device or ground fault detectors . . . ." EX1007, 2008 NEC, Art. 250.2, 99.

68. Further, the multi-function line supports the cable hangers, which support the current wires, data wires and other wires. *Id.*, 2:33-35. That is, a single multi-function line supports the cable hangers, ***as a messenger wire***, and provides a current path, ***as a grounding conductor***. *Id.*, 2:35-37 (emphases added).

69. The '551 Patent provides technological solutions to various

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deficiencies in the prior art. As stated in the Field of the Invention section of the '551 Patent specification:

> The disclosed and claimed concept relates to a grounding system for a suspended cable assembly and, more particularly, to a grounding system that includes conductive elements whereby grounding cables do not need to be spliced into a conductor wire disposed adjacent a messenger wire, and, to a system wherein a multi-function line provides support and a current path.

EX1001, 1:7-14.

70. As further discussed in the Background Information section of the '551 Patent specification:

> While the messenger wire is not structured to carry a current, there are instances wherein the messenger wire does carry a current. For example, lightning is known to strike the messenger wires, the current wire(s), the solar electrical equipment, the support piles, or any other construct coupled to these elements. Further, a current wire, or any other wire carrying a current can fail creating a short or other undesirable current in the supported bundle of wires. This is why a conductor or grounding wire is disposed adjacent the messenger wires; hereinafter, such a wire is identified as a "grounding conductor." The grounding conductor must be coupled to a current path to the ground. Further, many regulations require that the grounding conductor be grounded at each pile. Presently, the grounding conductor is grounded by splicing a conductor, such as, but not limited to, a copper wire into the grounding conductor and

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> coupling the copper wire to a grounding cable or, if the piles are conductive, to each pile. That is, the copper wire must be spliced into the grounding conductor, i.e., a "grounding splice," and, then electrically coupled to the pile or a ground cable. The process of installing the conductors, i.e., splicing the copper wire into the grounding conductor and making an electrical coupling with the pile is difficult, time consuming and expensive. These are problems of the known art.

Id., 1:60-2:16 (emphasis added).

71. In the context of a solar power plant as discussed in the specification, a POSITA would understand that the "regulations" referenced in the '551 patent specification above would have included NEC Article 690.43, which requires that exposed non-current-carrying metal parts in a PV array must be grounded regardless of voltage, and regardless of whether any of the current-carrying conductors from the PV array are grounded. *See* EX1007, 2008 NEC Art. 690.43, 588.

72. In his deposition, Dr. Beik agreed that a POSITA reading the '551 patent specification would understand that the referenced "regulations" include provisions of the NEC. EX2004, 46:20-47:1; *see also id*., 10:17-21 (agreeing that the grounding system of the '551 patent must be compliant with "relevant standards" including NEC requirements).

73. As the specification explains, the grounding conductor (equipment

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grounding conductor) was bonded to the conductive pile in the prior art by splicing, for example, a copper wire to the equipment grounding conductor and coupling the copper wire to each conductive pile. EX1001, 1:67-2:10. Bonding the equipment grounding conductor to the conductive pile in this manner establishes an effective ground-fault current path as defined in the NEC. *See* photo of CAB's Standard System, excerpted from EX2041, 2, discussed and illustrated in Section V.A.2 above.

74. As can be seen below in annotated FIGS. 8A, 8B and 8C of the '551 patent, the claimed grounding system replaces the separate grounding conductor and splices with a multi-function line and conductive mounting assemblies that include multi-function line couplings, to provide the necessary effective ground fault current path.

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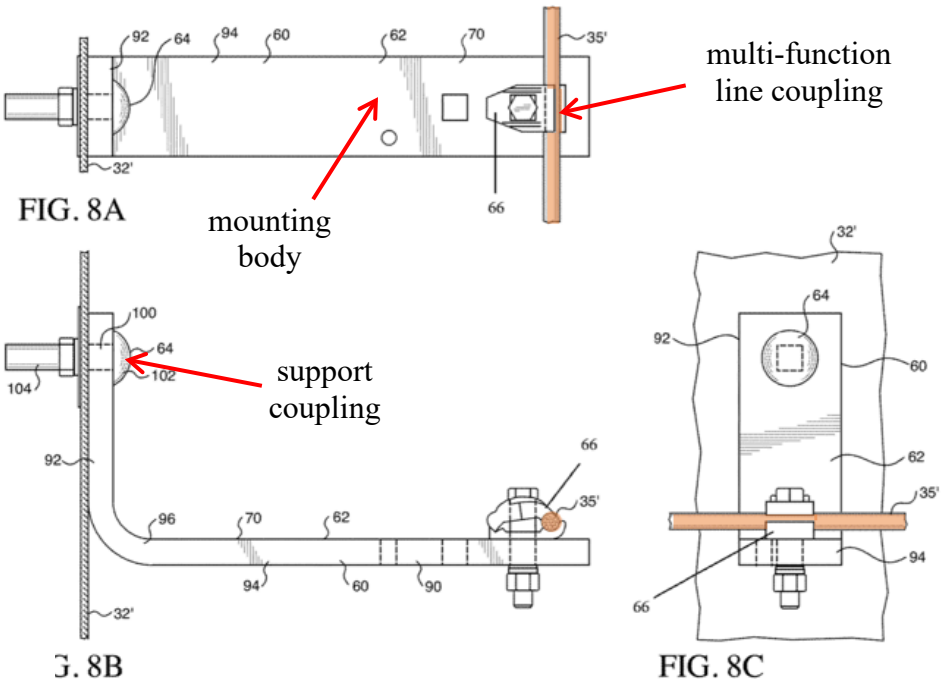

EX1001, Figs. 8A-8C (annotated); 9:60-10:50.

75. An illustration of the grounding system claimed in the '551 patent is shown in the photo below that is further excerpted from CAB's Installation Guide (EX2041, 2) and that compares CAB's commercialized Integrated Grounding System, which embodies and is coextensive with the claims of the '551 patent, with CAB's Standard System which I discuss and illustrate above in Section V.A.2.

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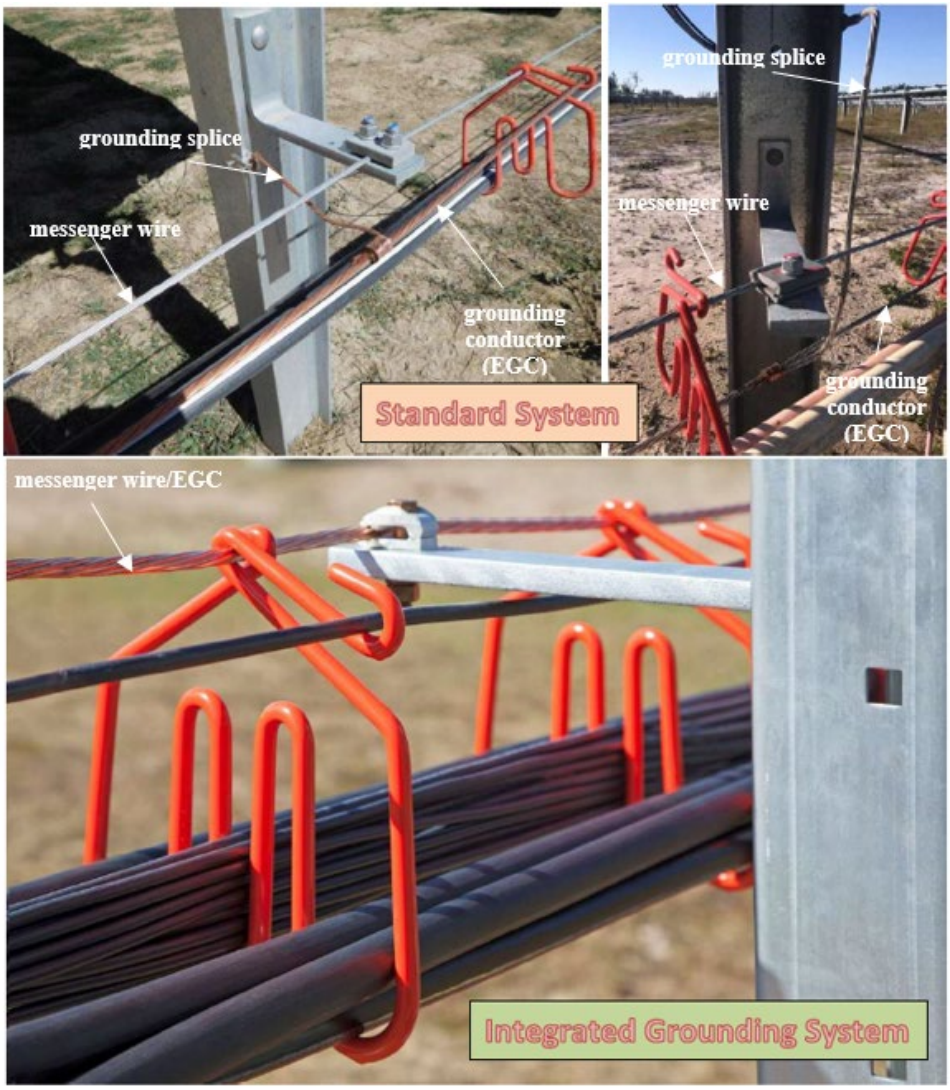

EX2041, 2.

76. Since it is structured to provide an effective ground fault current path, the claimed multi-function line and conductive mounting assembly replace the separate grounding conductor and medial grounding splices used in the prior art. That is, a POSITA would appreciate after reading the disclosure of the ’551 patent that the patent dispenses with the need for a dedicated equipment grounding conductor adjacent to the prior-art messenger wire and splices from the equipment

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grounding conductor to the piles.

77. A POSITA would further appreciate that in order to effectively replace the prior art's usage of a separate equipment grounding conductor, the multi-function line cannot simply be any metal cable.

78. Rather, as the NEC requires, equipment grounding conductors must be constructed in a manner that provides low impedance for an effective ground fault current path. *See* EX1007, 2008 NEC, Art. 250.118, 118. Further, a POSITA would appreciate that the conductive mounting assemblies, including multi-function line couplings, must also have sufficiently low impedance to define a current path for the multi-function line. In addition to the impedance requirements, the multi-function line must, at the same time, have sufficient strength to support the cable hangers and current wires.

79. Thus, as would be understood by a POSITA, the multi-function line of the '551 patent performs the dual function of supporting the cable hangers, as a messenger wire, and providing an effective ground fault current path, as a grounding conductor. *See id*., 2:35-37.

80. Contrary to Petitioner's assertion (Petition at 4, and unsupported by Dr. Beik), the novelty of the '551 invention is not limited to the claimed multi-function line. Rather, the novelty of the '551 patent is the claimed grounding system as a whole.

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VII. CLAIM INTERPRETATION - "MULTI-FUNCTION LINE"

81. It is my understanding that in order to properly evaluate the '551 patent, the terms of any disputed claims must first be interpreted. It is my understanding that for the purposes of this *inter partes* review, the claims are to be construed under the so-called *Phillips* standard, under which claim terms are given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in light of the specification and prosecution history, unless the inventor has set forth a special meaning for a term in the specification and/or prosecution history.

82. In my opinion, a POSITA would understand the term "multi-function line" (recited in each of the claims of the '551 patent) to mean "a tension member that supports current wires and/or cable hangers, as a messenger wire, and which provides a current path, as a grounding conductor."

83. Citing EX1001, 2:37-40, Dr. Beik stated in his declaration at ¶69 that "[t]he '551 Patent defines 'multi-function line' as a tension member that supports current wires and/or cable hangers, and, which is conductive." Petitioner sets forth this same construction in the Petition. Petition, 23-24. Petitioner understands from this definition that "the multi-function line is something that is under tension, made of a material capable of conducting electricity (e.g. steel), and supports power lines or power line hangers." *Id.*, 2-3. I disagree both with Petitioner's proposed

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construction, and with what Petitioner understand its construction to mean.

84. I note that in his deposition, notwithstanding the construction proposed by Dr. Beik in his declaration, he now agrees that the multi-function line must act as a grounding conductor, in addition to supporting cable hangers. EX2004, 67:10-68:12. Dr. Beik does not dispute throughout his deposition that a grounding conductor provides an effective ground fault current path. *See e.g.,* EX2004, 148:5-9; *see also id*., 22:6-23:24.

85. In my opinion, Petitioner's proposed construction that would only require the multi-function line to be "conductive" is based on selective quotation of the '551 patent specification language and ignores crucial context provided by the specification. First, the '551 patent specification defines a "messenger wire" as "a robust cable structured to support a number of other wires . . . and which is not structured to carry a signal or power." *Id.*, 1:24-25. A POSITA would readily understand that messenger wires utilized in suspended cable assemblies, including messenger wire as defined in the '551 specification, are constructed of metal. As the '551 patent makes clear, however, such a messenger wire, without more, is not a "multi-function line." *Id.*, 2:40-41.

86. In other words, a messenger wire that only provides a support function but is not sufficiently conductive to act as a grounding conductor for the system, is not a "multi-function line." Furthermore, "a conductor that does not support other

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constructs is not a 'multi-function line.'" *Id.*, 2:41-42.

87. A POSITA would recognize that a required feature of the claimed "multi-function line" is not merely that it is made of metal and thus conductive, but that it is sufficiently conductive to serve as a grounding conductor that provides an ***effective ground fault current path*** for grounding the system. In this way, the multi-function line not only "supports the cable hangers, as a messenger wire," but also "provides a current path, ***as a grounding conductor***." EX1001, 2:35-37 (emphasis added).

88. While a messenger wire that only supports cable hangers and electrical cables may have a current imposed on it in the event of a lightning strike, for example, that does not mean it is a grounding conductor that is capable of providing an effective ground fault current path. *Id.*, 1:60-65. This is why in the prior art, as explained by the '551 patent specification and as understood by a POSITA, a separate grounding conductor, which provided an effective ground fault current to electrically ground the system, was disposed adjacent to the messenger wire. *Id.*, 1:67-2:3.

89. Petitioner's proposed construction of "multi-function line" includes only the last sentence of the definitional language in the specification, but ignores important context and additional definitional language that immediately precedes that last sentence. The relevant language of the specification is as follows:

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> The grounding system includes a multi-function line assembly and a number of conductive mounting assemblies. Each conductive mounting assembly is structured to be, and is, coupled to the multi-function line and to a conductive pile. This configuration provides a path to ground for a current in the multi-function line assembly. Further, the multi-function line supports the cable hangers (which support the current wires, data wires and other wires). That is, a single multi-function line supports the cable hangers, ***as a messenger wire, and provides a current path, as a grounding conductor***. ***Accordingly, as used herein***, a "multi-function line" means a tension member that supports current wires and/or cable hangers, and, which is conductive.

EX1001, 2:27-40 (emphases added).

90. Petitioner (and initially Dr. Beik in his declaration) ignore the language "***Accordingly, as used herein***" that begins the last sentence on which they base their proposed construction. "Accordingly, as used herein," however, clearly incorporates the structure and two functions described in the immediately previous sentence, i.e., (i) supports cable hangers, ***as a messenger wire***; and (ii) provides a current path, ***as a grounding conductor***. *Id.*, 2:35-37. This is precisely how a POSITA would understand "multi-function line" in light of the specification.

91. Further, the '551 patent states that the multi-function line is a "tension member." *Id.*, 2:37-39. The plain and ordinary meaning of "tension member," as understood by a POSITA in light of the specification and prosecution history,

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would be a cable or wire. *See* Paper 21, Institution Decision, 9.

92. The Background Information of the '551 patent begins by defining a "messenger wire" as "a robust cable." *Id.*, 1:24-25. The Summary of Invention further states that "a single multi-function line supports the cable hangers, ***as a messenger wire***, and provides a current path, as a grounding conductor." *Id.*, 2:35-37 (emphasis added).

93. In addition, the multi-function line is described throughout the '551 patent as "copper wire or a copper cable, i.e., copper wires twisted together or about a copper core" *Id.*, 8:60-62; "a cable that includes conductive strands and non-conductive strands" *Id.*, 9:6-8; and "strands…selected from the group consisting of: copper strands, copper-clad steel strands, galvanized steel strands, a conductive alloy strands, partially conductive, alloy strands, or are a composite of strands." *Id.*, 9:12-16. And, as described above, the specification describes the multi-function line as being ***"drawn taut."*** *Id*., 7:17-23 (emphasis added). From reading the specification, therefore, a POSITA would understand that a multi-function line consisting of a "tension member" is a flexible, cable-like structure that can be stretched taut.

94. My review of the prosecution history further supports this understanding of a "tension member" by a POSITA. Specifically, during prosecution, the Examiner issued a Final Office Action rejection of the grounding-

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system claims of the Application, determining that certain claims were anticipated under 35 U.S.C. §102(a)(2) over Korman (U.S. Patent Publication No. 2012/0024563), and that the remaining claims were obvious under 35 U.S.C. §103 over Korman in combination with other references. EX1037, 124-133. In rejecting the claims, the Examiner identified Korman's pin 60 and the male/female plug-and-play connectors 42 and 43 as the "multi-function line assembly," and pin 60 as the "multi-function line." *Id.*, 127.

95. In response, the Applicant argued, among other things, that "Korman discloses a system wherein metal frames and metal units coupled to the frame are in electrical communication via electrical couplings, *i.e.* plugs. Simply put, the Korman system does not include any ***cables, wires or any other tension member***." *Id.*, 141 (emphasis added).

96. Subsequently, in its appeal brief to the Patent Trial and Appeal Board, the Applicant explained that the term "tension member is not defined, but is used to mean a construct that has a maximum length when exposed to tension, but is otherwise substantially flexible, such as, but not limited to, a chain or a cable." *Id.*, 173.

97. The Applicant argued that Korman's pin 60 is a rigid construct, and that the male/female plug-and-play connectors 42 and 43 are rigid elements, as well as the metallic rail 48 that forms the ground path. None of those rigid

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elements are a "cable or rope-like construct" that can be drawn taut. *Id.*, 178-180. Following the submission of Applicant's appeal brief, the Examiner then allowed all claims, determining that the claim limitations were not taught or disclosed in the prior art. *Id.* 207-210.

98. In his deposition, Dr. Beik testified that in his opinion the reason why Korman did not meet the claimed multi-function line was because Korman's pin 60 did not provide the "support functionality" required by the definition of a multi-function line. EX2004, 159:3-13. The focus of Applicant's argument during prosecution, however, and the sole basis for the Examiner's rejection, related to whether Korman disclosed a "tension member." *See* EX1037, 131, 141-143. Dr. Beik's opinion as to why Korman did not disclose the claimed multi-function line, therefore, is disconnected from the prosecution history itself.

99. In sum, a POSITA would understand the term "multi-function line" to mean "a tension member that supports current wires and/or cable hangers, as a messenger wire, and which provides a current path, as a grounding conductor." Further, a POSITA would understand the term "tension member," used to describe the multi-function line, as a flexible, cable-like structure.

VIII. DISCUSSION OF ALLEGED GROUNDS OF UNPATENTABILITY

100. I understand Petitioner has raised five grounds of unpatentability, arguing that certain references, alone or in combination, render the claims of the

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’551 patent obvious. Relying on the opinions of Dr. Beik (EX1002), Petitioner asserts that following grounds of unpatentability:

1) Ground 1 – Claims 1-12 and 18-19 as allegedly being unpatentable as obvious over Grushkowitz in view of the knowledge of a POSITA;
2) Ground 2 – Claims 1-19 as allegedly being unpatentable as obvious over CAB Website and CAB Whitepaper in view of the knowledge of a POSITA;
3) Ground 3 – Claims 1-19 as allegedly being unpatentable as obvious over Petersen in view of the knowledge of a POSITA;
4) Ground 4 – Claims 13-17 as allegedly being unpatentable as obvious over Petersen and MacLea*n* in view of the knowledge of a POSITA; and
5) Ground 5 – Claims 13-17 as allegedly being unpatentable as obvious over CAB Website, CAB Whitepaper, and MacLean in view of the knowledge of a POSITA.

Petition, 24.

101. I understand that as for Ground 1, the Board “preliminarily agree[d] with Patent Owner that Grushkowitz . . . does not teach or reasonably suggest the claimed ‘multi-function line’ [recited in each of the claims of the ‘551 patent] as that term is understood in light of the claim language and intrinsic record.”

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Institution Decision at 16. As for the Grounds based on Petersen (Grounds 3 and 4), the Board "preliminarily agree[d] with Patent Owner that Petersen . . . does not teach or reasonably suggest the claimed 'multi-function line' [recited in each of the claims of the '551 patent] . . . ." *Id.*

102. As for Ground 2, the Board found that "Petitioner ha[d] shown reasonable likelihood of prevailing in its challenge to claim 1 as unpatentable based on the CAB Website and the CAB Whitepaper." *Id.*, 14. The Board, however, "question[ed] whether Petitioner ha[d] adequately advanced arguments for combining the teachings of the CAB Website and the CAB Whitepaper." *Id.*, n.8.

103. As explained in detail below, I disagree with Dr. Beik that the claims of the '551 patent would have been obvious in view of any of the asserted grounds of unpatentability.

A. DESCRIPTION OF PRIOR ART REFERENCES

1. CAB Website

104. The CAB Website, EX1005, is the printout of a 2015 webpage titled "CAB Cable Rings and Saddles for Solar Cable Management," which Petitioner states was accessible at http://www.cabproducts.com/cable-rings-solar/ at least as early as February 4, 2015.

105. The CAB Website showcases the benefits of "CAB Cable Rings and

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Saddles" including: "strong and durable cable support," "Quick and Easy Installation," "strength and corrosion resistance," as well as a flame-retardant PVC coating for high dielectric strength, abrasion resistance, and grip. The CAB Website includes the photo reproduced below, intended solely to illustrate the use of CAB's Cable Rings and Saddle Hangers, suspended from what is intended solely to be illustrated as a messenger wire, to support what is intended solely to be illustrated as electrical cables.

EX1005, 3, 5.

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106. The CAB Website focuses on CAB's Cable Rings and Saddles for the purpose of supporting electrical cables in a solar array. The CAB Website includes links to download product data and sales information related exclusively to CAB's Cable Rings and Saddles hangers. *Id*., 5. The CAB Website makes no reference to a grounding conductor or a grounding system, and, in fact, does not use the words "ground" or "grounding." *See generally* EX1005; *see also* EX2061 (Allen Garrett Smith Declaration), ¶¶18-19. Neither does the CAB Website include or link to any information relating to components of a grounding system.

107. The CAB Website emphasizes (1) the properties of CAB Cable Rings and Saddles themselves – their strength, safety, and coatings; (2) the value proposition of a messenger-wire supported system from the standpoint of material, installation, and maintenance costs; and (3) the acceptability of CAB Rings and Saddles for exposed cable management in view of NEC and industry installation standards. *See generally* EX1005.

108. These topics reflect the marketing challenge for CAB Rings and Saddles *circa* 2015, namely whether an exposed cable-management solution using an above-ground messenger suspended cable management system would be competitive with buried cables or cables placed in cable trays in solar power plants, and whether such a cable-management solution would be accepted by the solar power industry at large in light of NEC requirements. EX1005, 3-4; *see also*

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EX2061, ¶¶18-19. These marketing challenges are further addressed in the CAB Whitepaper.

2. CAB Whitepaper

109. The CAB Whitepaper," titled "Cable Management in Solar PV Arrays: A Review of Requirements in the National Electrical Code and how CAB Cable Rings and Saddles Meet These Requirements," was expressly prepared for CAB by Bill Brooks of Brooks Engineering and bears the date September 18, 2014 (Version 1.3). EX1006; *see also* EX2033 (William F. Brooks Declaration), ¶¶43-49.

110. Mr. Brooks is a leading consultant in the PV industry, including specifically for the purpose of evaluating NEC compliance for PV solar plant wiring and maintenance. Professionals from all across the solar industry have attended his courses and recognize his expertise in the field. *See* EX2061, ¶22; EX2028, ¶43; EX2059, ¶50; EX2033, ¶¶2, 26.

111. The CAB Whitepaper picks up on the marketing challenges of using CAB's Cable Rings and Saddles hangers suspended from an above-ground messenger wire to support electrical cables in a PV system. It specifically "focus[es] on the installation of the CAB Cable Rings and Saddles used for cable management in a solar PV array." EX1006, 8; *see also* EX2033, ¶¶44-46. The CAB Whitepaper was intended to provide assurance to the solar industry that

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CAB's Cable rings and Saddles can be installed in a manner that complies with NEC requirements. EX2061, ¶22; EX2033, ¶43.

112. The CAB Whitepaper "lay[s] out the basic requirements found in the 2014 NEC and relate[s] those requirements to Cable Rings and Saddles manufactured by the company CAB that are relevant to the NEC requirements and industry standard installation practices." EX1006, 7. In the Whitepaper, Mr. Brooks concluded that CAB's above-ground cable management system was compliant with the NEC and other industry-standard installation practices. *See generally* EX1006; *see also* EX2033, ¶¶45-46, 48.

113. The CAB Whitepaper refers to CAB's Cable Rings and Saddles being in full contact with a "grounded steel messenger wire." EX1006, 14. This statement is in the context of the electrical industry's concern with exposed metal parts being in contact with conductors having damaged insulation. *Id*. Mr. Brooks concluded that even if the conductor insulation were to be damaged, the hangers would still remain at or near ground potential since they are in full contact with the grounded messenger wire. *Id*. This portion of the CAB Whitepaper says nothing about the messenger wire acting as a grounding conductor, or anything else about a grounding system or the use of grounding conductors. EX2033, ¶56.

3. U.S. Patent No. 10,003,298 ("Grushkowitz")

114. U.S. Patent No. 10,003,298 ("Grushkowitz") issued on June 19, 2018,

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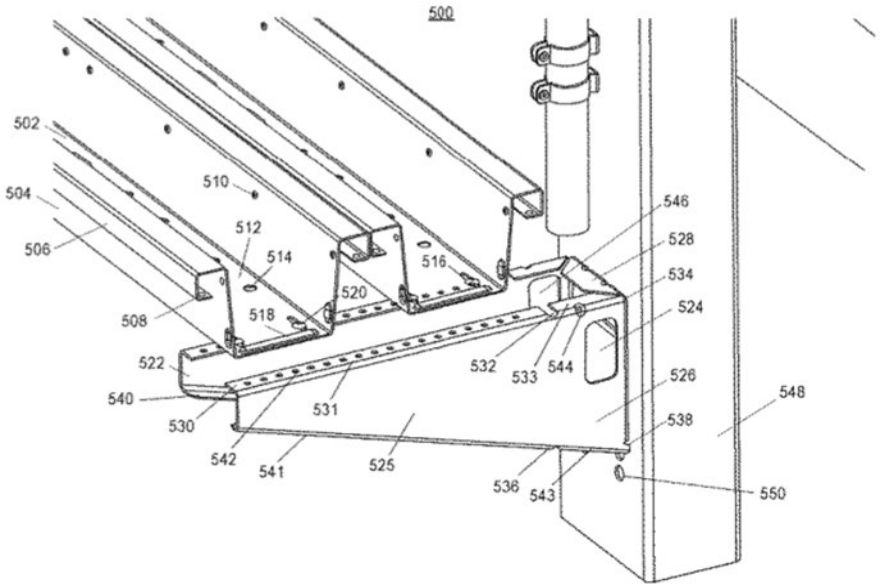
and is titled "Solar Collector Cable Support Tray and Support System."

115. The system of Grushkowitz is depicted in Figure 5, shown below, which shows two cable trays (one tray labeled 502), a mounting bracket (labeled 522), and a vertically-oriented pile (labeled 548).



EX1003, FIG. 5.

116. Grushkowitz is directed to a cable-tray and support system that "facilitates cable management in a solar energy collector system at reduced cost." EX1003, Abstract. The cable tray and support system comprises rigid cable trays, mounting brackets, and vertically-oriented piles. *Id*.

117. Grushkowitz does not disclose a cable or wire that supports cable hangers and current wires, and that also serves as a grounding conductor.

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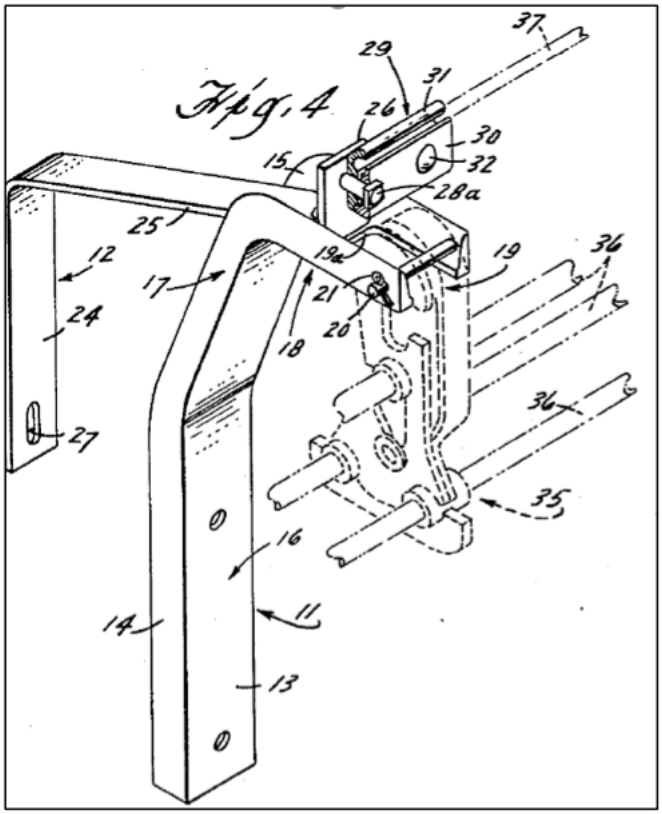
4. U.S. Patent No. 3,001,749 ("Petersen")

118. U.S. Patent No. 3,001,749 ("Petersen") issued on September 26, 1961, and is titled "Pole Top Extension for Aerial Cable."

119. Petersen generally relates to pole top extensions for aerial cables (conductors), and specifically to a horizontally offset extension specially adapted to be attached to the top of a wooden utility pole. EX1004, 1:9-21. This type of pole-top extension addresses a need *circa* 1961 to obviate the use of crossarms in aerial cable suspension systems. *Id.*, 1:13-15.

120. Petersen's pole-top extension bracket includes two pieces: a channel support means (item 11, below), and a brace member (item 12) below.



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EX1006, Fig. 4; 1:50-55. In use, Petersen's pole-top extension bracket supports an insulating aerial cable holder, shown holding three conductors in Petersen's Fig. 4, above. *Id.*, 2:41-47.

121. Petersen discloses that brace means 12 is formed of a strap material and is surmounted by a vertical extending end portion 26 "for supportingly engaging [a] neutral messenger cable." *Id.*, 2:1-8. Attached to the vertical extending portion is a "ground clamp means" comprised of "two clamping jaw members" that keep the neutral messenger wire in place. *Id*., 2:34-40.

122. In addition, Petersen's claims recite a "neutral messenger wire clamp means" (*Id.,* 3:33-34) and a "neutral messenger wire support" (*Id.,* 4:6-7).

123. Petersen does not disclose that its neutral messenger cable 37 supports cable hangers and electrical cables. Petersen's aerial cable holder 35 is supported on the clevis 19, which is part of the pole-top extension, separate and apart from neutral messenger cable 37.

5. MacLean

124. MacLean Power Systems' "Pole Line Hardware Catalog" ("MacLean") states that "[t]his catalog section includes our standard line of Pole Line Hardware – those items commonly used by electric and telephone utilities and CATV systems." EX1027, 1. MacLean bears the "issue date" May 2010 on most of its pages. *Id.*, 2-139.

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125. In its "bolts" section, MacLean discloses a thimble-eye bolt, made of galvanized steel, that "provides an excellent attachment point to deadened or guy messenger wire, guy strand or formed wire grips." EX1027, 14.

B. RESPONSE TO ASSERTED INVALIDITY GROUNDS UNDER 35 U.S.C. §103

1. Alleged Obviousness of Claims 1-19 Over CAB Website and CAB Whitepaper

126. At the outset, Dr. Beik argues in ¶168 of his declaration (EX1002) that a POSITA at the time of the invention would have been motivated to combine the teachings of the CAB Website and CAB Whitepaper, "because both references are concerned with the same subject matter (cable management systems for solar arrays), discuss the same company's products, and because the CAB Website expressly references by name and date, excerpts from, and encourages CAB Website visitors to download the CAB Whitepaper. . . ." *See also* Petition, 47.

127. I understand Dr. Beik to be saying that a POSITA would have been motivated to combine these references because they relate to the same subject matter, and that the CAB Website would have encouraged visitors to the website to read the CAB Whitepaper.

128. Dr. Beik fails to show with any specificity, however, why the POSITA would have been motivated to ***combine*** the references in a way that would achieve the claimed invention. In fact, Dr. Beik's opinion appears not to

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even be based on a combination of the references. Instead, Dr. Beik appears to opine that ***each*** of the CAB Website and CAB Whitepaper discloses the limitations of the claim, without any need to combine those references. For each claim element, Dr. Beik asserts that both references disclose that claim element. *See* EX1002, ¶¶112, 116, 119, 120, 121.

129. Dr. Beik confirmed in his deposition that in his opinion, each of the CAB Website and CAB Whitepaper individually discloses all of the limitations of the challenged claims of the '551 patent. Specifically, Dr. Beik stated that each of the CAB Website (EX1005) and CAB Whitepaper (EX1006), with the knowledge of a POSITA, discloses all of the claim limitations. EX2004, 101:5-19. Nowhere does Dr. Beik purport to combine the CAB Website with the CAB Whitepaper in a way that one reference discloses a limitation that the other reference does not.

130. Similarly, Dr. Beik opines at ¶169 of his declaration (EX1002) that a POSITA "would have a reasonable expectation of success in combining the teachings of the two references because both references are discussing the same cable management systems and corresponding components." Dr. Beik goes on to state that the CAB Website depicts and describes the parts of the CAB system, and that a POSITA "would be encouraged to check the details of the parts and to ensure that CAB products satisfy NEC codes." *See also* Petition, 47-48.

131. Again, in offering his opinion on reasonable expectation of success,

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Dr. Beik does not suggest anything about combining the CAB Website and CAB Whitepaper in the first instance, let alone with a reasonable expectation of success. Beyond opining that a POSITA would have been "encouraged" to make sure the CAB part numbers satisfy NEC requirements, he offers no opinion of how a POSITA would combine the disclosures of the references in a manner that would achieve the claimed invention with a reasonable expectation of success.

132. In my opinion, for the reasons stated below, the purported combination of the CAB Website and the CAB Whitepaper do not render obvious Claims 1-18.

a. CAB Website and CAB Whitepaper Do Not Render Obvious Claims 1-18 of the '551 Patent

133. Below I provide the language of independent Claim 1 of the '551 Patent:

> **1.** A grounding system structured to ground a number of cables supported by a support assembly, said support assembly including a plurality of spaced, conductive piles, said grounding system comprising:
>
> a multi-function line assembly including a multi-function line;
>
> a number of conductive mounting assemblies, each said conductive mounting assembly structured to be coupled to said multi-function line and to a conductive pile; and
>
> wherein said multi-function line assembly is coupled to, and in electrical

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communication with, said number of conductive mounting assemblies.

EX1001, 12:11-23.

i. CAB Website and CAB Whitepaper do not disclose the claimed "multi-function line"

134. In his declaration, Dr. Beik's opinion that the CAB Website and CAB Website disclose the claimed grounding system of the '551 patent is based solely on his assertion that a messenger wire that supports current carrying cables and that is attached to spaced metal piles with metal clamps – i.e., merely metal-to-metal contact – achieves a grounding system. Throughout his element-by-element analysis, Dr. Beik relies on images included in the CAB Website, and repeated in the CAB Whitepaper, that show nothing more than metal-to-metal connections. *See*, e.g., EX1002, ¶¶117, 120.

135. From these depictions of metal parts in contact with each other, Dr. Beik concludes in his declaration:

> The metal messenger wire is coupled to a number of spaced metal piles with metal brackets, as depicted above. A grounding system is achieved in the image above because all of the components are in contact with each other and are made of metal which is conductive. Accordingly, the CAB Website discloses a grounding system structured to ground a number of cables supported by a support assembly.

EX1002, ¶108.

136. In his deposition, however, Dr. Beik offered a different explanation to

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support his opinion. He testified, for the first time, that

> [A POSITA looking at the CAB We
> bsite EX1005] would understand that this is a professional installation at a solar power plant. A POSITA would understand that . . . there are [current-carrying] cables with insulation hanging from a messenger wire with a number of hangers . . . . A POSITA would understand that bare wire off of which the hangers are hanging is a messenger wire. A POSITA would look at – the bottom picture, would see that messenger wire, it's connected to a pile via a mounting structure . . . . A POSITA would know this professional installation would require a grounding system. ***A POSITA would see that there are no other grounding system in this than that messenger wire***, which appears to be galvanized steel or some sort of steel, conductive through conductive brackets or mounting assembly through conductive piles. A POSITA would conclude this is a grounding system ***in the absence of everything else***."

EX2004, 103:9-104:6 (emphasis added)

137. I disagree with Dr. Beik's opinion that the CAB Website and CAB Whitepaper disclose the claimed grounding system merely by what is ***not*** shown in the image he relies upon.

138. First, other portions of Dr. Beik's deposition testimony contradict Dr. Beik's conclusion that a POSITA would understand that this image included in the CAB Website and CAB Whitepaper must disclose a grounding system in which the messenger wire is used as the grounding conductor simply because no other

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grounding system is depicted in this image. Specifically, Dr. Beik testified that he "would not know" whether "metal components that are simply connected together [are] enough by themselves to provide an effective ground fault current path." EX2004, 24:5-9. As Dr. Beik explained, "[t]o provide an effective ground path one must take into account – the POSITA would take into account from the element to the endpoint all the conductive path, the [electrical] resistance, the connection, mechanical strength, and so on." *Id.*, 24:14-18. Dr. Beik acknowledged that this is just some of the information he would need to know to determine whether metallic parts connected together would be sufficient to provide an effective ground fault current path. *Id*., 24:19-24.

139. I agree with Dr. Beik in this respect, that there would be no way a POSITA would be able to determine from a website image that simply depicts metal parts connected together whether there is disclosed a grounding system. I agree that much a POSITA would need to undertake much more investigation in order to be able to make this determination, and would not – could not – simply rely on the fact a grounding system must be disclosed by virtue of what is ***not*** shown in the image.

140. Notably, however, Dr. Beik pointed to no analysis or investigation of his own to reach his conclusion that the CAB Website and CAB Whitepaper disclose the claimed grounding system of the '551 patent, including whether the

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messenger wire as illustrated is serving as a grounding conductor as well as a support structure. Dr. Beik relied solely on his assumption that what was depicted in the CAB Website and CAB Whitepaper was a "professional installation" that a POSITA would know would require a grounding system, and that since there was no other grounding system shown other than a messenger wire, a POSITA would conclude that the messenger wire is the grounding system. *Id*., 103:9-104:6; 110:1-13.

141. Similarly, in another portion of his deposition, discussing the grounding of a metal pile embedded in the earth, Dr. Beik testified that he would "have no way of verifying" whether "a metal pile, without anything else, that's imbedded in the earth would . . . be considered to be grounded." EX2004, 17:13-16. Dr. Beik further stated that he would need to know various details about the pile and earth, such as "the resistance of the earth, the humidity, the resistance of the [pile] the dimension of the [pile] [and] all the details that [would] allow[] [him] to calculate what would be the specification while in the ground." Therefore, he conceded it to be "a fair statement" that "simply looking at a metal pile that's imbedded in the earth, without knowing all of this other information . . . [would not be enough for him know] whether it was sufficient to ground the metal pile just by virtue of it being imbedded in the earth." *Id.*, 17:18-18:4.

142. A POSITA would also know that support equipment such as metal

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piles would not be grounded simply by virtue of being embedded into the earth, but rather by being connected through a grounding conductor to the electrical-system ground at the inverter. In fact, Dr. Beik also agreed that the earth may not be used as the sole EGC or ground fault current path in a grounding system. *Id.*, 26:16-21.

143. Once again, therefore, a POSITA would not understand that what is depicted in the CAB Website and CAB Whitepaper would be sufficient to disclose a grounding system, with a messenger wire serving as the grounding conductor, without additional information that Dr. Beik never undertook to investigate.

144. I also take issue with Dr. Beik's assumption that the depicted CAB Cable Rings and Saddles suspended from the messenger wire, and the messenger wire connected to the pile, is a "professional installation," or that a POSITA would assume that it was any kind of actual installation, professional or otherwise. In fact, other testimony in this case from Mr. Smith and Mr. Brooks confirms that the CAB hangers, messenger wire and connections to the pile were all a mock-up. *See* EX2061, ¶¶14-19; EX2033, ¶¶58-61.[5] Moreover, a POSITA would have had

[5] As Mr. Smith explained, the mock-up did not even utilize an actual messenger wire or actual hardware connections to connect the "messenger wire" to the pile. Instead, CAB had an electrician use what a POSITA would have recognized as a

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ample reason to suspect as much.

145. For example, what is readily apparent from looking at the images in the CAB Website and CAB Whitepaper is that the depicted messenger wire and cable hangers in those images run under and ***parallel*** to the solar panels. To the extent a POSITA would yet have been familiar with above-ground messenger wire supported cable management systems at the time of the CAB Website and CAB Whitepaper, that POSITA would have known that in an actual solar PV array, the messenger wire and cable hangers would have run ***perpendicular*** to the solar panels, at the end of the rows and running between one row and another, what Mr. Brooks refers to as the "home run." EX2033, ¶60; *see also* EX2061, ¶17.

146. The depiction in the CAB Website and CAB Whitepaper of the mounting hardware components that connect the "messenger wire" to the pile would also not assume that these components are properly bonded as shown. EX2033, ¶61. There is no indication that the support for affixing the depicted messenger wire to the pile in the CAB Website and CAB Whitepaper is suitable for bonding. *See id.* It is insufficient to show that mounting hardware is metallic, or that there are metal-to-metal connections between the messenger wire and its

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wire rope and jerry-rigged pipe clamps and studs to attach the wire rope to the piles. EX2061, ¶16; EX2033, ¶59.

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supports. For proper grounding, the metal-to-metal components must not just be connected to each other, they must be properly bonded. *See also* EX2033, ¶61.

147. Nothing in the CAB Website or CAB Whitepaper would suggest to a POSITA that the depicted mounting hardware components are sufficiently bonded so as to provide a grounding path for a grounding conductor, and a POSITA would not assume that the components are properly bonded without actually confirming. In the image shown in the CAB Website and CAB Whitepaper, it is not even clear that these hardware components are metallic. Given all this lack of disclosure in the CAB Website and CAB Whitepaper, it is my opinion that it would be much more likely that a POSITA would suspect that what is shown is merely illustrative, intended solely for marketing purposes.[6]

[6] To support his opinion that the CAB Website and CAB Whitepaper show an actual "professional installation," Dr. Beik relies on such indicia as CAB product award stamps, copyright notice, CAB cable management part numbers, system specifications, product information and reference to NEC code included in the CAB Website and CAB Whitepaper. EX2004, 110:1-116:15. This is simply not the kind of information that a POSITA would rely upon to determine if the CAB Website and CAB Whitepaper show an actual solar installation and a grounding system that uses the messenger wire as a grounding conductor.

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148. The fact remains that at the time of the invention of the '551 patent, a POSITA would not have had any reason to assume that a messenger wire must be functioning as a grounding conductor simply because a separate grounding conductor is not shown in an image purporting to show a solar installation. At the time of the '551 patent's invention, the use of a messenger wire as a grounding conductor as well as a support structure was not a recognized commercial application of messenger wires in the PV industry. Mr. Brooks, who has decades of experience in the solar industry, has confirmed this point. EX2033, ¶62. A POSITA viewing the CAB Website, therefore, would have had no reason to assume that the depicted messenger wire was a grounding conductor as well as a mechanical structure for supporting hangers.

149. For that matter, contrary to Dr. Beik's deposition testimony, a POSITA in any other industry would not be familiar with the use of a messenger wire as both a support structure and a grounding conductor. None of the examples cited by Dr. Beik disclose a messenger wire that serves as both a support structure and a grounding conductor.

150. In ¶50 of his declaration (EX1002), for example, Dr. Beik includes an excerpt of EX1023, the Southwire triplex service drop cable, as an example of what he believes to be a disclosure of a messenger wire that is used as a grounding conductor to provide an effective ground fault current path as well as a support

structure. EX2004, 37:13-38:10. I discuss this reference further below in Section VIII.B.3, in connection with the Petersen reference, EX1004. Dr. Beik is mistaken in his description of the Southwire triplex service drop as a grounding conductor.

151. The Southwire reference throughout expressly identifies the messenger wire as a "neutral messenger." EX1023, 1, 2, 3, 4. This neutral messenger wire is one of three cables in the triplex service drop cable. The other two cables are phase conductors. As Dr. Beik acknowledges, the neutral messenger is bundled together with the phase conductors to form the single triplex service drop cable. EX2004, 39:8-19.

152. As I explain further below with respect to the Petersen ground, a neutral messenger wire that is lashed with phase conductors acts as a neutral conductor, intended to carry current under normal conditions. This neutral conductor supports the phase conductors, but because it is also intended to carry current, it cannot also serve as an equipment grounding conductor, which is only intended to carry current in the event of a fault condition.

153. The same is true of EX1024, the Hendrix reference, cited in ¶51 of Dr. Beik's declaration (EX1002), which discloses a messenger wire that supports three phase conductors and is also used as a "system neutral." *Id*., 13.

154. In ¶47 of his declaration (EX1002), Dr. Beik also cites to the Williams reference, a patent issued in 1930. EX1020. In the same manner that Dr. Beik

argues about the CAB Website and CAB Whitepaper, Dr. Beik testified in his deposition that since Williams does not disclose any other grounding conductor, a POSITA would conclude that the disclosed messenger wire is a grounding conductor. EX2004, 31:2-25. This is simply not correct. Williams merely discloses that previously, it was possible for a lineman to stand on the messenger wire, which itself was grounded, while servicing cables carried by the pole above the messenger cable. This resulted in serious injuries and death if a lineman came in contact with a live cable. Williams is directed to a fixture that would make it impossible for the lineman to stand on the messenger cable. EX1020, 1:1-46; *see also* EX2004, 32:13-33:33. Dr. Beik is simply wrong that Williams discloses a messenger wire that is acting as a grounding conductor, or that a POSITA would assume as much because Williams does not disclose the grounding conductor by which the messenger wire is grounded. Disclosing the grounding conductor is simply not within the scope of Williams' objective.

155. Finally, Dr. Beik cites to the Akasaka reference, EX1025, in ¶52 of his declaration (EX1002). Akasaka is even further removed from the use of a messenger wire as a grounding conductor. Akasaka only discloses a static wire, which acts like a lightning rod, to "provide protection to the conductor from disturbances such as lightning and other atmospheric conditions." *Id*., [0002]. Indeed, Akasaka does not even disclose a messenger wire that provides any

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support function for any other structure – the wire is simply described as "self-supporting." *Id*., [0003].

156. None of these references relied upon by Dr. Beik, therefore, disclose the common use of messenger wires as grounding conductors, as Dr. Beik has testified. *See* EX2004, 64:16-65:18. In fact, the other evidence I have reviewed in this matter regarding the extensive effort and expense that CAB incurred in developing and testing its Integrated Grounding System would refute any such notion. *See* EX2061, ¶¶69-75. The timeline of testing and commercial introduction of CAB's integrated-grounding products support the opposite conclusion from that drawn by Dr. Beik, namely that multi-function lines (i.e., messenger wires that act as equipment grounding conductors as well as support structures) became commercially available and were accepted by the PV industry only ***after*** the time of the '551 invention, and CAB's commercial implementation of its invention.

157. At least because there was no evidence at the time of the invention of the use of a messenger wire that served the dual purpose of a support structure and a grounding conductor, there would have been no basis for a POSITA viewing the CAB Website and CAB Whitepaper at the time of the '551 invention to have assumed the cable depicted as a messenger wire would also have been the EGC, simply because a separate grounding conductor is not disclosed.

158. Given the criticality of proper system grounding and compliance with NEC regulations, a POSITA would not make such unfounded assumptions without more. *See also* EX2033, ¶57 ("No [POSITA] would look at the depiction on the cover page of my Whitepaper, which was taken from CAB's website, and conclude that the purported messenger wire connected to metal hardware and a metal pile is acting as a grounding conductor."); *see also id.*, ¶62 ("a [POSITA] would not assume that the depicted messenger wire is a grounding conductor simply because a separate grounding conductor is not shown").

159. Even if it might be surmised that the messenger wire shown in the CAB Website could also be the grounding conductor, Dr. Beik has acknowledged that a POSITA must know more in order to make such a determination. As Dr. Beik testified, that additional information would include the [electrical] resistance, the connection, mechanical strength, and so on." EX2004, 24:14-18. A POSITA would at the very least inquire regarding the compositional makeup of the messenger wire (*see* EX1007, 2008 NEC, Art. 250.118, 188 listing acceptable materials and structures that may serve as an equipment grounding conductor), and the messenger wire's current-carrying capacity and provisions for mounting and/or bonding. All this must be known to determine if the messenger wire is even capable of providing an effective ground fault current path.

160. Petitioner and Dr. Beik also rely on the CAB Whitepaper's reference

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to a "grounded steel messenger – i.e., 'multi-function line'" keeps the CAB system's cable rings and saddles "at or near ground potential:"

> The CAB Whitepaper discloses that even if the insulation covering the current-carrying cable "were ever to be damaged, the cable rings and saddles [supporting the current-carrying cable] would stay at or near ground potential" due to the use of a ***grounded*** steel messenger wire—i.e., a "multi- function line."

Petition, 20 (citing EX1006, 14) (emphasis added); EX1002, ¶121.

161. As described above in Section VIII.A.1, the CAB Whitepaper was directed to concerns in the industry of whether a cable management system in a PV array utilizing Cable Rings and Saddles suspended from an above-ground messenger wire could comply with applicable NEC requirements. As confirmed by Mr. Brooks, in no way does it purport to, nor would a POSITA understand it to, describe any kind of grounding system. *See* EX1006, 14; EX2033, ¶56.

162. The reference in the CAB Whitepaper to the Cable Rings and Saddles being held at or near ground potential in the event of damage to the insulation covering the current-carrying cables because the messenger wire is "ground***ed***" in no way means that the messenger wire itself is ground***ing*** the system, as Dr. Beik, suggests. A POSITA would understand and expect that exposed metal messenger wires are included among such metallic support structures that themselves must be grounded. NEC Article 396 in fact ***requires*** that messenger wires be grounded as

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required for enclosures:

> **396.60 Grounding** The messenger shall be grounded as required by 250.80 and 250.86 for enclosure grounding.

EX1007, 2008 NEC, Art. 396.60, 241.

163. A POSITA would further understand that a normally non-current carrying metallic support structure such as a messenger wire cannot be left unbonded, with an undefined potential. Rather, the messenger wire must be connected (i.e., bonded) together with other normally non-current carrying materials of the supporting structure and be grounded via an equipment grounding conductor that provides an effective ground fault current path.

164. Statements in the CAB Whitepaper about Cable Rings and Saddles being held near "ground potential" go to questions of safety of the Cable Rings and Saddles, and whether they need to be listed for bonding and grounding in light of the fact that they are in full contact with a ***bonded/grounded*** steel messenger wire. In other words, even if the Cable Rings and Saddles damage the insulation on current-carrying cables and become energized, they remain at or near ground potential because the steel messenger wire to which those hangers are connected is bonded and grounded. EX1006, 14.

165. These are liminal questions related to the adoption of CAB Rings and Saddles in the solar industry at large. In no way does this suggest that a POSITA

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would have understood from this disclosure that the grounded steel messenger wire is serving as an equipment grounding conductor, or that it would replace the separate grounding conductor and grounding splices in the PV array system as was practiced prior to the '551 patent. All of this has been confirmed by Mr. Brooks. EX2033, ¶63.

166. As Mr. Brooks also explains, a POSITA would understand that "it is a separate grounding conductor that grounds all the bonded metallic support components, including the messenger wire. And because the messenger wire is itself grounded, there is no concern about not being in compliance with NEC safety requirements." *Id.*, ¶¶63-64.

167. Notably, in November 2020, Mr. Brooks updated his White Paper and included a discussion about CAB's new grounding messenger wire that was being used in CAB's Integrated Grounding System. *Id.*, ¶65; EX2037. In Mr. Brooks' updated White Paper, he stated that CAB's grounding messenger wire had been "evaluated and certified as 'both an equipment grounding conductor (EGC) and grounding electrode conductor (GEC).'" EX2033, ¶65 (quoting EX2037 at 12). As Mr. Brooks notes, the language in his updated White Paper that "discloses a messenger wire that acts as an equipment grounding conductor as well as a support structure for the cable hangers, is explicitly different that the language in his 2014 Whitepaper [EX1006] that simply refers to a 'grounded messenger wire' . . . ." *Id.*

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168. In my opinion, a POSITA would readily appreciate the difference between the terms "grounded" and "grounding" in connection with Mr. Brooks' description of the grounded steel messenger in EX1006 (CAB Whitepaper) and his description of a messenger wire/equipment grounding conductor in EX2037 (2020 updated Whitepaper).

169. For all of these reasons, it is my opinion that the CAB Website and CAB Whitepaper, either separately or in combination with each other, fail to disclose or render obvious the recited "multi-function line."

ii. CAB Website and CAB Whitepaper fail to disclose the limitation "a number of conductive mounting assemblies" of Claim 1

170. Claim 1 further recites "a number of conductive mounting assemblies, each said conductive mounting assembly ***structured to*** be coupled to said multi-function line. . . ."

171. The specification of the '551 patent specially defines what "structured to" followed by a verb means:

> As used herein, "structured to [verb]" means that the identified element or assembly has a structure that is shaped, sized, disposed, coupled and/or configured to perform the identified verb. . . . Further, as used herein, "structured to [verb]" means that the identified element or assembly ***is intended to, and is designed to, perform the identified verb.*** Thus, an element that is merely capable of performing the identified verb but which is not intended to, and is not designed to,

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perform the identified verb is not "structured to [verb]."

EX1001, 3:36-50 (emphasis added).

172. Given the '551 Patent's definition of "structured to" in the specification (see EX1001, 3:36-50), each of the claimed conductive mounting assemblies is configured, intended, and designed to be coupled to the multi-function line.

173. Dr. Beik, at ¶¶117-118 of his declaration (EX1002), points to "metal mounting assemblies" depicted in the CAB Website and to "a nearly identical photo of a conductive mounting assembly" in the CAB Whitepaper, as disclosing the limitation "a number of conductive mounting assemblies, each said conductive mounting assembly structured to be coupled to said multi-function line . . ." recited in claim 1.

174. Because the conductive mounting assemblies are intended and designed to be coupled to the multi-function line, a POSITA would understand that they, too, must be sufficiently conductive so that, when coupled to the multi-function line, an effective ground fault current path is provided.

175. Because the CAB Website and CAB Whitepaper, either separately or in combination with each other, do not disclose or render obvious a "multi-function line" as recited and claimed in the '551 patent, it follows that the structures that Dr. Beik identifies in the CAB Website and CAB Whitepaper as the "conductive

mounting assemblies" cannot satisfy this claim limitation, since there is no disclosure that those structures are configured, intended or designed to be coupled to a multi-function line so as to provide an effective ground fault current path.

176. Accordingly, it is my opinion that the CAB Website and CAB Whitepaper, either separately or in combination with each other, do not disclose the claim limitation "a number of conductive mounting assemblies, each said conductive mounting assembly structured to be coupled to said multi-function line" recited in claim 1.

177. Further, because the CAB Website and CAB Whitepaper references, either separately or in combination with each other, fail to disclose or render obvious the claim limitation "a multi-function line assembly including a multi-function line," and "a number of conductive mounting assemblies, each said conductive mounting assembly structured to be coupled to said multi-function line," it logically follows that these references further fail to disclose or render obvious the last limitation of claim 1 that recites "said multi-function line assembly is coupled to, and in electrical communication with, said number of conductive mounting assemblies."

178. Because each of dependent claims 2-18 depend from claim 1 (and each recites the limitations: "multi-function line assembly including a multi-function line;" "a number of conductive mounting assemblies, each said

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conductive mounting assembly structured to be coupled to said multi-function line;" and "said multi-function line assembly is coupled to, and in electrical communication with, said number of conductive mounting assemblies"), it is equally my opinion that, for at least these reasons, the CAB Website and CAB Whitepaper, either separately or in combination with each other, do not disclose or render obvious these dependent claims.

179. Separately, with respect to dependent claim 2, the claimed multi-function line couplings are components of the conductive mounting assembly. Since the CAB Website and CAB Whitepaper fail to disclose the claimed conductive mounting assemblies of claim 1, it follows that the CAB Website and CAB Whitepaper cannot satisfy the limitation of claim 2 that requires the multi-function line couplings to define an effective ground fault current path.

b. CAB Website and CAB Whitepaper fail to disclose the limitations of Independent Claim 19

180. Below I provide the language of independent Claim 19 of the '551 Patent:

> **19.** A mounting assembly for a grounding system structured to ground a number of cables supported by a support assembly, said support assembly including a plurality of spaced, conductive piles, said grounding system including a multi-function line assembly with a multi-function line, said mounting assembly comprising:
>
> a mounting body, a support coupling, and a number of multi-

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function line couplings;

each said multi-function line couplings structured to be coupled to said multi-function line;

each said support coupling structured to be coupled to a conductive pile; and

wherein, when said multi-function line assembly is coupled to, and in electrical communication with said multi-function line couplings, each said multi-function line coupling defines a conductive path.

EX1001, 13:16-31.

181. For the reasons stated above, the CAB Website and CAB Whitepaper, separately or in combination with each other, fail to disclose or render obvious a "multi-function line assembly with a multi-function line." Accordingly, the CAB Website and CAB Whitepaper, separately or in combination with each other, fail to disclose or render obvious a mounting assembly for a grounding system that includes a multi-function line assembly with a multi-function line.

182. Dr. Beik, in ¶¶163-164 of his declaration (EX1002), points to a clamp that connects the depicted steel messenger wire to a vertical pile, as shown in the CAB Website and CAB Whitepaper, as satisfying the "a number of multi-function line couplings," and "each said multi-function line couplings structured to be coupled to said multi-function line," claim limitations.

183. For the reasons stated above, however, what is depicted to be a

messenger wire in the CAB Website and CAB Whitepaper is not a "multi-function line assembly including a multi-function line." Moreover, because the claimed multi-function line couplings are structured to, i.e., intended and designed to, be coupled to the multi-function line, a POSITA would understand that they, too, must be sufficiently conductive so that, when coupled to the multi-function line, an effective ground fault current path is provided. Accordingly, it follows that, because the CAB Website and CAB Whitepaper do not disclose the claimed multi-function line, the clamp identified by Dr. Beik as connecting the messenger wire to a pile does not satisfy the multi-function line couplings limitation.

184. In addition, because the CAB Website and CAB Whitepaper, separately or in combination with each other, fail to disclose or render obvious the multi-function line assembly with a multi-function line and the multi-function line couplings, it follows that the CAB Website and CAB Whitepaper, separately or in combination with each other, fail to disclose or render obvious the limitation "wherein, when said multi-function line assembly is coupled to, and in electrical communication with said multi-function line couplings, each said multi-function lie coupling defines a conductive path."

185. Moreover, for the same reasons explained above in connection with dependent claim 2, the CAB Website and CAB Whitepaper do not, separately or in combination with each other, disclose or render obvious a multi-function line

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coupling that defines a conductive path.

186. Accordingly, it is also my opinion that the CAB Website and CAB Whitepaper, separately or in combination with each other, neither disclose nor render obvious claim 19.

2. Alleged Obviousness of Claims 1-12 and 18-19 Over Grushkowitz

187. In my opinion, Grushkowitz in view of the knowledge of a POSITA does not render obvious Claims 1-12, 18-19.

a. Grushkowitz does not render obvious Independent Claim 1 and Dependent Claims 2-12, 18 of the '551 patent

188. Petitioner characterizes Grushkowitz as disclosing "a support and grounding system that comprises a ***cable tray multi-function line***." *See* Petition, 12 (emphasis added). Nowhere does Grushkowitz characterize its cable tray as a "multi-function line." And a POSITA would not recognize the phrase "cable tray multi-function line," much less describe a cable tray as a "tension member."

189. According to Dr. Beik, who cites EX1001, 2:37-40, "[t]he '551 patent defines 'multi-function line' as a 'tension member that supports current wires and/or cable hangers, and, which is conductive.'" *See* EX1002, ¶69. Dr. Beik states that this definition includes cable trays like those used in Grushkowitz's system, since Grushkowitz's trays are (1) metal, hence "conductive;" and (2) are "subjected to tensile forces as a result of gravity and the weight of current wires

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supported thereon." *Id*., ¶69.

190. Dr. Beik also says at ¶70 of his declaration (EX1002) that he understands that wire clip 602 (which is "coupled to the rim 508 on cable tray 502" and which "may be used to support cables 604") "would subject cable tray 502 to tensile forces."

191. As I explain in more detail in Section VII, "Claim Interpretation – Multi-Function Line" above, Dr. Beik's declaration relies on an incomplete definition of "multi-function line" provided in the specification.[7] When taking into account the additional definitional language in the specification that Dr. Beik ignores, namely, that the multi-function line supports cable hangers ***as a messenger*** wire, it is clear the claimed multi-function line must be a tension member that is a robust cable or wire, as "messenger wire" is defined in the specification. *See* EX1001, 1:24-25, 2:35-40.

192. In addition to the fact that Grushkowitz does not disclose a "robust cable," I disagree with Dr. Beik that, under any circumstances, a POSITA would

[7] As set forth above in Section VII, Dr. Beik in his deposition now agrees that the claimed multi-function line must act as a grounding conductor that provides an effective ground fault current path, in addition to supporting cable hangers. EX2004, 67:10-68:12, 148:5-9.

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understand Gushkowitz's rigid cable tray structure to be a "multi-function line" that is a tension member as described in the '551 patent.

193. Throughout the '551 patent specification, the "multi-function line," *i.e.,* the "tension member," is consistently described as a "cable" made from "strands." *See* Section VII, "Claim Interpretation – Multi-Function Line" above. In addition, the Figures show the multi-function line/tension member as a cable.

194. Further, the '551 patent specification describes how the multi-function line is "draw[n]…taut" from its ends:

> [A] "conductive terminal support" 44 is structured to couple a multi-function line 35 to a support, ***draw the multi-function line 35 taut***, and provide a current path between the multi-function line 35 and the support.

EX1001, 7:19-23 (emphasis added). In other words, the multi-function line is intentionally tensioned in order to draw it taut and maximize its length.

195. Grushkowitz discloses a rigid frame structure that consists of interconnected metal components, including cable trays, brackets, and conductive piles, and Grushkowitz's support system is assembled with fasteners. Setting aside my disagreement with Dr. Beik's explanation and depiction of tensile forces on Grushkowitz's cable trays due to gravity, Grushkowitz nowhere describes its cable trays as being intentionally "tensioned," "drawn into tension," "strung," "pulled taut" or the like, in order to maximize its length and support functionality, as the

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‘551 patent describes. *Compare, e.g.,* EX1001, 7:19-22 *with* EX1003, 7:56-59 (“The mounting bracket 522 . . . supports the weight of the cable trays 502 plus additional vertical loads.”).[8]

196. Further, symptomatic of Dr. Beik’s misidentification of a multi-function line, are deficiencies in his analysis of dependent claims of the ’551 patent that include cable fittings and support hardware.

197. Claim 7 of the ’551 patent, for instance, recites:

> **7.** The grounding system of claim 6 wherein each said multi-function line coupling includes one of a clam-shell assembly, a split bolt, a U-bolt, or a lay-in lug assembly.

EX1001, 12:41-43.

198. A “split bolt” is a bolt having a longitudinal channel cut in the shaft. For example, a search of Amazon.com discloses many split bolts including the Morris Products 90324 Split Bolt Connector, shown below, and which is found at https://www.amazon.com/Morris-Products-90324-Connector-Conductors/dp/B005GDFR54/

[8] A POSITA would understand that when sagging under its own weight, the top portion of the cable tray (where Dr. Beik has labeled a “tensile force” in his annotated Figure 8A at ¶69) is compressed, not stretched.

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199. A split bolt is structured to affix one or more cables. The '551 patent specification explains:

> As used herein, a 'split bolt' includes a threaded rod including a passage and a threaded passage, passage, and/or a nut. As is known, and as shown in Figure 6B, a ***cable***, such as multi-function line 35 is passed through the rod passage and the threaded rod is drawn against the passage by tightening the nut.

EX1001, 10:56-61 (emphasis added).

200. In ¶90 of his declaration (EX1002), Dr. Beik maintains that a split bolt, intended to secure cables, is just one of many fasteners capable of coupling Grushkowitz's tray and bracket, even though Grushkowitz has no cables. EX1002, ¶90. In so doing, Dr. Beik would somehow modify the Grushkowitz's cable tray system so as to thread them through the split bolt recited by claim 7.

201. I disagree. In my opinion, a POSITA would ***not*** find it obvious to affix a tray and bracket together with a fastener, ***not*** mentioned in Grushkowitz, adapted to affix cables, also not mentioned in Grushkowitz, rather than with the nuts, bolts, or rivets that ***are*** mentioned in Grushkowitz and suitable for cable

trays. This evidences nothing more than an effort to use hindsight reconstruction to invalidate the claim.

202. I also note that the issue of whether a rigid structure, such as a cable tray, is a "multi-function line" was already considered and ultimately resolved by the Examiner during prosecution.

203. It is my understanding from reviewing the prosecution history that, in the then-pending application, Claims 1-5, 8-11, 13 and 15 had been rejected under 35 U.S.C. § 102(a)(2) as anticipated by Korman. *See* EX1037, 144. Korman discloses a photovoltaic (PV) ac-module grounding system that includes a plurality of PV dc-voltage modules. Each PV dc-voltage module is integrated with a corresponding dc-ac micro-inverter to provide a corresponding PV ac-voltage module. Each PV ac-voltage module includes an ac-voltage plug and play connector that includes a dc ground conductor. *Id.*, 175.

204. Korman discloses rigid metal frames, enclosures, and connector bodies in each module (like the inverter case 36, the plug and play connectors 42, 43, and the metallic grounding rail 48). *Id.*, 179, 180. The solar panels are shown being installed on Korman's rigid frames below, where I have annotated a plug and play connector:

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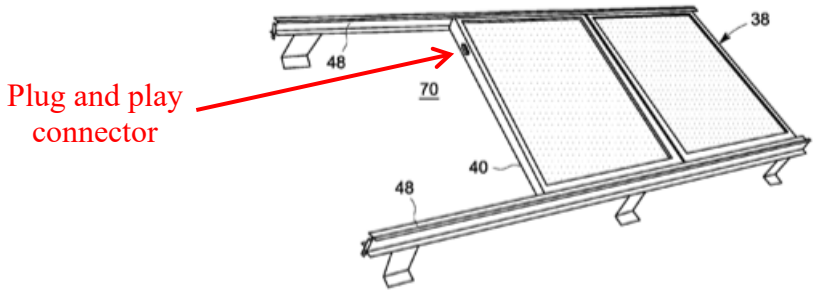

FIG. 5

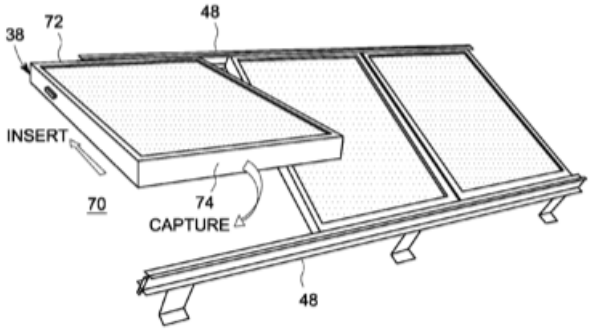

FIG. 6

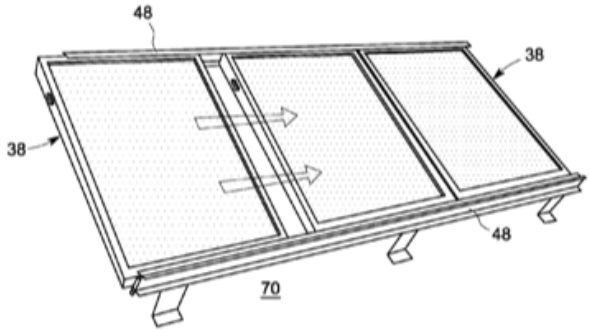

FIG. 7

Figs. 5-7 of Korman

See also EX1037, 175-176 (discussing Korman's disclosures).

205. In a final office action rejection, the Examiner rejected the pending claims as anticipated under §102(a)(2) over Korman, as well as obvious under §103 over Korman in view of other references. *Id*., 125-133.

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206. Patent Owner appealed to the USPTO Patent Trial and Appeal Board. In its Brief on Appeal, Patent Owner argued that:

> As Korman does not disclose a tension member, Korman cannot disclose a "multi-function line" as defined in the present application. Further, for the Examiner to assert that the rigid elements disclosed in Korman anticipate a "multi-function line" means that the Examiner is either ignoring the special definition or is interpreting the term in an overly broad manner.

Id., 181.

207. It is further my understanding that after Patent Owner submitted its appeal brief, the Examiner reversed course, and issued a Notice of Allowance of the claims. Accordingly, Patent Owner overcame the §102(a)(2) rejection over Korman, as well as §103 rejections over Korman in view of other references. *Id.*, 207-211.

208. In my opinion, the fact that Patent Owner prevailed in its Brief on Appeal is directly pertinent to whether claims 1-12, 18, and 19 are rendered obvious based on Grushkowitz. In fact, the Examiner ultimately rejected the very kind of arguments that Dr. Beik and Petitioner assert here – that a rigid structure, such as Grushkowitz's rigid cable tray assembly, can be a tension member that satisfies the "multi-function line" limitation of the claims. Specifically, neither the cable tray, brackets, or any other support structure are a cable or wire construct.

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209. For all of these reasons, it is my opinion that Grushkowitz does not disclose or teach a "multi-function line," and a POSITA would not recognize Grushkowitz's metal cable tray support system as a "multi-function line" as that term is defined in the '551 Patent.

210. Finally, only at the end of his obviousness analysis of the "multi-function line assembly including a multi-function line" limitation does Dr. Beik make a conclusory statement that "[a]ccordingly, Grushkowitz alone, or in view of the knowledge of a POSITA at the time of the alleged invention discloses or renders obvious 'a multi-function line assembly including a multi-function line.'" EX1002, ¶70. Dr. Beik proposes no modification of Grushkowitz, including modifying its support system to replace its cable trays with a tension member that supports cable hangers as a messenger wire, let alone any explanation of any kind of why a POSITA would be motivated to modify Grushkowitz in any manner, or with any reasonable expectation of success in achieving the invention of the '551 patent. It is my understanding that such non-specific, unsupported and conclusory statements are insufficient to demonstrate obviousness.

211. Accordingly, in my opinion, Grushkowitz does not disclose or render obvious the claim limitation "a multi-function line assembly including a multi-function line," as claimed in independent claim 1 and dependent claims 2-12 and 18 of the '551 patent.

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212. Claim 1 further recites "a number of conductive mounting assemblies, each said conductive mounting assembly ***structured to*** be coupled to said multi-function line. . . ." EX1001, 12:17-19 (emphasis added)

213. As explained above, given the '551 patent's definition of "structured to" in the specification (*see* EX1001, 3:36-50), each of the conductive mounting assemblies "structured to be coupled to said multi-function line," i.e., is configured, intended, and designed to be coupled to the multi-function line.

214. Dr. Beik, at ¶71 of his declaration (EX1002)' appears to point to Grushkowitz's disclosure of "fixing a cable tray to a mounting bracket made of conductive materials" as satisfying the claim limitation "a number of conductive mounting assemblies, each said conductive mounting assembly structured to be coupled to said multi-function line."

215. Because Grushkowitz does not disclose or suggest a multi-function line, however, it follows that these structures that Dr. Beik identifies in Grushkowitz cannot satisfy this claim limitation, since those structures are not configured, intended, or designed to be coupled to a multi-function line.

216. Accordingly, it is my opinion that Grushkowitz does not disclose the claim limitation "a number of conductive mounting assemblies, each said conductive mounting assembly structured to be coupled to said multi-function line."

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217. Further, because Grushkowitz fails to disclose or render obvious "a multi-function line assembly including a multi-function line," or "a number of conductive mounting assemblies, each said conductive mounting assembly coupled to be coupled to said multi-function line," it further fails to disclose or render obvious the last limitation of claim 1 that recites "said multi-function line assembly is coupled to, and in electrical communication with, said number of conductive mounting assemblies."

218. Because each of dependent claims 2-12 and 18 depend from claim 1, it is equally my opinion that, for at least these reasons, Grushkowitz does not disclose or render obvious these dependent claims.

b. Grushkowitz Does Not Render Obvious Independent Claim 19

219. Independent Claim 19 recites, in addition to other limitations, "A mounting assembly for a grounding system . . . , said grounding system including a multi-function line assembly with a multi-function line," "a number of multi-function line couplings," and "each said multi-function line couplings structured to be coupled to said multi-function line," and "wherein, when said multi-function line assembly is coupled to, and in electrical communication with said multi-function line couplings, each said multi-function lie coupling defies a conductive path." EX1001, 13:22-25.

220. For the reasons stated above, Grushkowitz fails to disclose or render

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obvious the "multi-function line assembly with a multi-function line" limitation. Accordingly, Petersen fails to disclose or render obvious a mounting assembly for a grounding system that includes a multi-function line assembly with a multi-function line.

221. Dr. Beik, at ¶104 of his declaration (EX1002), identifies Grushkowitz's cable tray fasteners "designed to couple the cable tray to the mounting bracket" as satisfying the "a number of multi-function line couplings," "each said multi-function line couplings structured to be coupled to said multi-function line," claim limitations. For the reasons stated above, however, Grushkowitz's cable trays do not disclose a "multi-function line assembly including a multi-function line." Accordingly, it follows that Grushkowitz's cable tray fasteners fail to disclose or render obvious multi-function line couplings structured to (i.e., configured, designed, or intended to) be coupled to a multi-function line.

222. For the reasons stated above, Grushkowitz fails to disclose or render obvious a multi-function line assembly including a multi-function line or multi-function line couplings. Accordingly, it follows that Grushkowitz fails to disclose or render obvious the limitation "wherein, when said multi-function line assembly is coupled to, and in electrical communication with said multi-function line couplings, each said multi-function lie coupling defines a conductive path."

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223. Further, Dr. Beik once again provides no support for his assertion in ¶¶102, 104 and 106 of his declaration (EX1002) that Grushkowitz alone, or in view of the knowledge of a POSITA, renders these limitations of claim 19 obvious. Dr. Beik again proposes no modification of Grushkowitz or any explanation why a POSITA would be motivated to modify Grushkowitz. Nor does he offer any support that any modification of Grushkowitz could be made with any reasonable expectation of success in achieving the invention of the '551 patent.

224. Accordingly, it is also my opinion that, for at least these reasons, Grushkowitz neither discloses nor renders obvious claim 19.

3. Alleged Obviousness of Claims 1-19 Over Petersen

225. In my opinion, Petersen in view of the knowledge of a POSITA does not render obvious Claims 1-19.

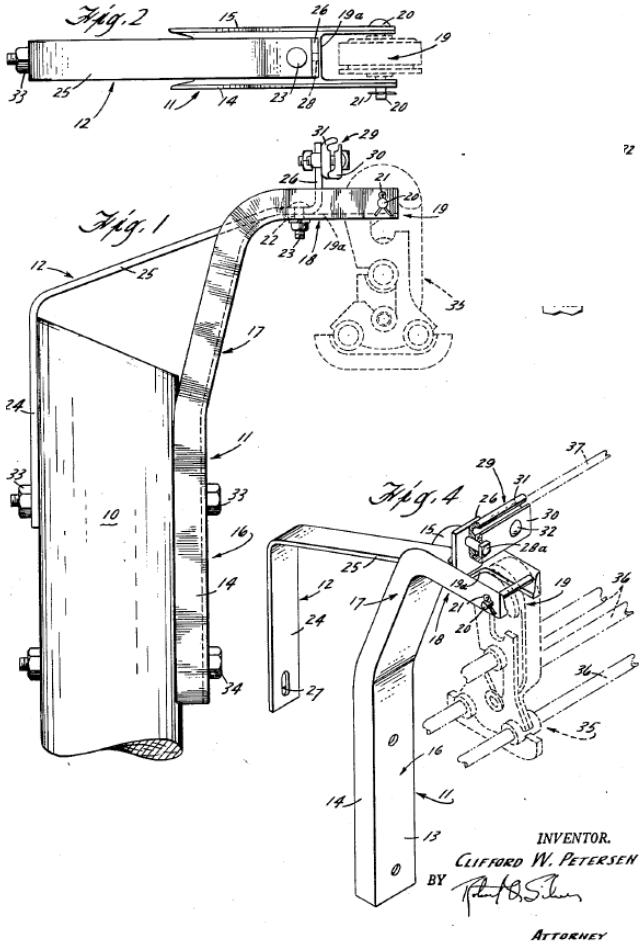
a. Petersen Does Not Render Obvious Independent Claim 1 and Dependent Claims 2-18

226. First, not only does Petersen fail to disclose a multi-function line that serves as a grounding conductor to provide an effective ground fault current path, Petersen also fails to disclose a multi-function line that supports cable hangers and current wires, as required by the definition of a multi-function line.

227. In his declaration, Dr. Beik simply states that "neutral messenger cable 37 is subjected to tensile forces as a result of gravity and the weight [*sic*] current wires and/or cable hangers supported thereon, and accordingly that

Petersen's neutral messenger cable 37 is a tension/support member." EX1002, ¶173. From this, Dr. Beik concludes that "Petersen's neutral messenger cable 37 is a multi-function line." *Id*., ¶174.

228. Petersen makes no disclosure that neutral messenger cable 37 supports anything, let alone current wires and/or cable hangers. Specifically, Petersen's disclosure of aerial cable holder 35 that is adapted to hold the three conductors 36 in spaced relation is not supported on the neutral messenger cable 37, but rather is attached to clevis 19. EX1004, 2:41-47, 56-58.



Id., 1:62-64, 2:56-58; *see also* FIGS. 1, 2 and 4.

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229. Petersen depicts aerial cables held by a spacer, and in turn supported by Petersen's pole-top bracket, but does not show conductors supported by a messenger cable. *Id.*, Fig. 4, 2:41-47, 56-58.

230. Dr. Beik's conclusory assertion that current wires and/or cable hangers are supported on Petersen's neutral messenger cable 37, and his characterization of neutral messenger cable 37 as a "support member," is without any basis in Petersen's disclosure.

231. In his deposition, Dr. Beik for the first time opined that, although Petersen does not disclose that neutral messenger cable 37 supports cable hangers and cables, "a POSITA would know 37 supports the cables as they extend, referring to Figure 4. As they extend along the way, it supports the – those cables with a hanger type." EX2004, 136:22-137:7, 137:21-138:10.

232. Petersen makes no disclosure of such additional support of the current wires between poles, let alone additional support specifically using some type of cable hangers suspended from a messenger wire. And Dr. Beik offered no other evidence to support his new opinion regarding the neutral messenger cable 37 in Petersen other than that "a POSITA would know." *See, e.g.*, *id.*, 138:5-6, 9-10, 139:6, 141:1, 9-10.

233. To the extent that Dr. Beik's opinion suggests that Petersen inherently or necessarily requires that neutral messenger cable 37 supports hangers and cables

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between poles, I disagree. Petersen already discloses aerial cable holder 35 that is adapted to support the three aerial conductors, and that aerial cable holder 35 is supported by the clevis 19 that is part of the pole-top extension. EX1004, 2:41-47, 56-58. In my opinion, there is nothing in Petersen's disclosure from which a POSITA would necessarily conclude that Petersen's aerial cable hanger 35 is only sufficient to support the aerial conductors at the poles, but not between the poles, such that there must be additional hangers suspended from a messenger wire to support the aerial cables between poles.

234. In his deposition, even Dr. Beik conceded that additional information, including specifically the span between poles, would be necessary in order to determine if additional support is necessary. Tellingly, when asked whether there were instances where conductors supported at the pole are not further supported by hangers between poles, he could only answer "I do not know," and could only point to the CAB Website (EX1005) as an example. EX2004, 141:14-20. When asked the same question again, Dr. Beik again conceded "I do not know," but simply offered, without any evidence, that a POSITA "would know current-carrying cables between two poles would need support." *Id*., 141:24-142:7.

235. Further, Petersen does not disclose a multi-function line that ***serves as a grounding conductor***. First, I will provide context for the use of the terms "neutral" and "neutral messenger cable."

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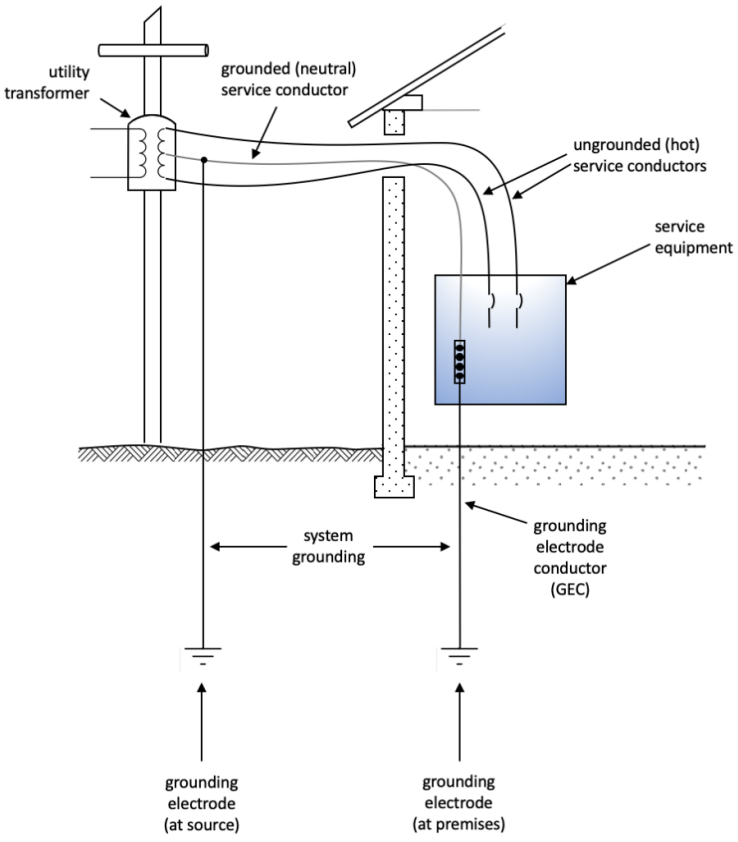
236. As defined in the NEC Article 100, a "grounded conductor" is a system or circuit conductor that is intentionally grounded. EX1007, 2008 NEC, Art. 100, 31. For instance, among the conductors from a supply source (e.g., conductors to the secondary winding of a transformer serving a customer's premises) one of the conductors is often intentionally grounded. As illustrated below in a figure I created, this conductor, called the "neutral conductor," is grounded at the utility transformer and at the service equipment at the customer premises by connecting it to a grounding electrode via a grounding electrode conductor:



237. The "neutral conductor" is defined as a conductor "intended to carry

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current under normal conditions." *See* EX1007, 2008 NEC, Art. 100, 32. It can be thought of as the "return leg" of a circuit, i.e., the conductor that completes the circuit of each phase. In this way, the neutral conductor carries the unbalanced current of the phases.

238. An ungrounded conductor (also referred to as a "hot" or "phase" conductor) is a wire which supplies electrical power or which carries current from a source of power to a device which uses power (a load). For instance, in the figure above, the exemplary split-phase 120/240V circuit includes, in addition to the neutral conductor, two phase conductors, each of which is an ungrounded conductor.

239. A POSITA would understand that a "neutral messenger cable," can provide support function as well as serving as the neutral conductor that provides the return leg of the circuit. For example, a triplex service-drop cable (such as disclosed in the Southwire reference, EX1023) is typically used to supply split-phase power (two hot phase conductors and a neutral) from a pole-mounted transformer to the customer's service head where connection to the service entrance cable is made. *See, e.g.,* EX1007, 2008 NEC, Art. 396.2, 241. When a "neutral messenger cable" is used in this way, the phase conductors are wrapped around or affixed to the messenger wire ("lashed") such that the neutral messenger cable supports the hot phase conductors and acts as a neutral conductor.

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240. Neither the messenger wire itself, however, nor any of the conductors wrapped around or affixed to it, serve as "grounding conductors." In fact, the neutral conductor is part of the circuit – it is intended to carry current to complete the circuit. Because it is intended to carry current under normal conditions, a neutral conductor ***cannot be*** a grounding conductor that provides an effective ground fault current path. Even Dr. Beik agreed in his deposition that "[n]o grounding system is intended to carry current under normal conditions." EX2004, 48:3-4.[9]

241. Nevertheless, in his declaration, Dr. Beik states his understanding that a "neutral messenger," such as that disclosed by the 2003 Southwire triplex service drop cable, refers to a messenger cable that doubles as a grounding conductor." EX1002, ¶50. In his deposition, Dr. Beik again stated that a neutral messenger that is bundled with phase conductors, such as in the Southwire triplex service drop cable, would be a grounding conductor as used in the NEC. EX2004, 38:5-10,

[9] Dr. Beik also refers in ¶50 of declaration to the "well-known benefit of using the messenger cables as a grounding conductor." With all my experience in this industry, I am not aware that anyone involved in electrical power systems was using a messenger wire as a grounding conductor at the time of the invention claimed in the '551 patent.

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39:20-40:5. For the reasons I have explained, Dr. Beik's understanding of the use of the term "neutral messenger" is simply incorrect.

242. Dr. Beik cites to EX1007, 2008 NEC, Art. 396.30, 241, which identifies potential uses of a messenger wire, in addition to a support structure, to include neutral conductor (Article 396.30(B)) or equipment grounding conductor (Article 396.30(C). EX1002, ¶49. But what Dr. Beik fails to appreciate is that NEC Article 396.30(B) (Neutral Conductor) and (C) (Equipment Grounding Conductor) are mutually exclusive. For the reasons stated above, these provisions do not authorize a neutral conductor to double simultaneously as an equipment grounding conductor.

243. In fact, the NEC calls "objectionable" any neutral current that returns on grounding and bonding paths when an improper neutral-to-case bond creates a parallel path for neutral current to return to the power supply. *See* EX1032, at 93; EX1007, 2008 NEC, Art. 250.6(A), 250.6(C), 101.

244. The same is true about the "system neutral" messenger wire disclosed in the Hendrix reference. EX1024. Contrary to Dr. Beik's suggestion that Hendrix's "system neutral" acts as a grounding conductor (EX1002, ¶51), Hendrix only discloses that this "system neutral" serves as lightning shield, which acts like a lightning rod. EX1024, 13. Acting like a lightning shield or lightning rod, however, is far different than acting as a grounding conductor. Again, for the

reasons I have explained, a "system neutral" cannot simultaneously double as a grounding conductor.

245. Given this background regarding "neutral" and "neutral messenger cable," a POSITA would readily understand that Petersen neither discloses nor renders obvious ***any*** type of grounding system, let alone the claimed "grounding system" of the '551 patent that comprises the recited "multi-function line assembly including a multi-function line."

246. Moreover, Petersen is simply directed to a two-piece pole-top mounting bracket, rather than a "grounding system." Many of the features that Dr. Beik relies on to show a purported grounding system are not shown in Petersen. For instance, Petersen never shows a connection to ground of any cable or clamp. Petersen likewise shows no ground wire, or a conductor down the side of the wooden utility pole, to provide a conductive path to earth. There is no disclosure in Petersen, therefore, to enable a POSITA to conclude that it discloses a grounding system.

247. In his declaration, Dr. Beik's entire opinion that Petersen discloses a grounding system in the first instance revolves around Petersen's use of the term "ground clamp means" and what it "implies" to him. *See* EX1002, ¶170 ("Petersen's use of the term 'ground clamp means' ***implies*** to me that the neutral messenger and pole top extension are coupled with the clamp means in order to

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provide a ground-path for any stray electrical current.") (emphasis added). Dr. Beik ignores, however, that Petersen discloses that the "ground clamp means" is used to "confine and keep a ***neutral messenger cable*** 37 in tight supported engagement therewith." EX1004, 2:36-40 (emphasis added). Contrary to Dr. Beik's characterization of Petersen's disclosure (EX1002, ¶57), Petersen says nothing about "keep[ing] the neutral messenger wire in place and ***in a grounded electrical communication,***" and never even uses that term.

248. Now, in his deposition, Dr. Beik again offered a new argument to support his opinion that Petersen's neutral messenger cable 37 satisfies the definition of a multi-function line. Echoing his opinions regarding the CAB Website and CAB Whitepaper references, Dr. Beik testified that "[i]n the absence of any other ground or ground system" shown in Petersen, a POSITA would understand that the neutral messenger 37 "is acting as a grounding conductor." EX2004, 145:21-25. In other words, Dr. Beik once again concludes what Petersen discloses from what is not shown, rather than from what is shown. *See* EX2004, 147:19-148:2.

249. I disagree with Dr. Beik's new opinion. Petersen is directed to a pole top extension. It has nothing to do with any kind of grounding system. A POSITA would not expect that a reference that is directed to a particular feature would necessarily show every other feature. A separate grounding conductor may very

well exist, but Petersen does not show it because it is not relevant to the pole top extension to which Petersen is directed.

250. Just as a POSITA would not understand the absence of a separately depicted grounding conductor in the CAB Website and CAB Whitepaper to mean that the depicted messenger wire must be acting as the grounding conductor, a POSITA would not understand that the absence of a separate grounding conductor in Petersen's depiction of its pole top extension must mean that its neutral messenger cable is acting as a grounding conductor.

251. Petersen thus fails to disclose or render obvious the "multi-function line assembly including a multi-function line" limitation of the '551 patent claims.

252. Claim 1 further recites "a number of conductive mounting assemblies, each said conductive mounting assembly ***structured to*** be coupled to said multi-function line and to a conductive pile."

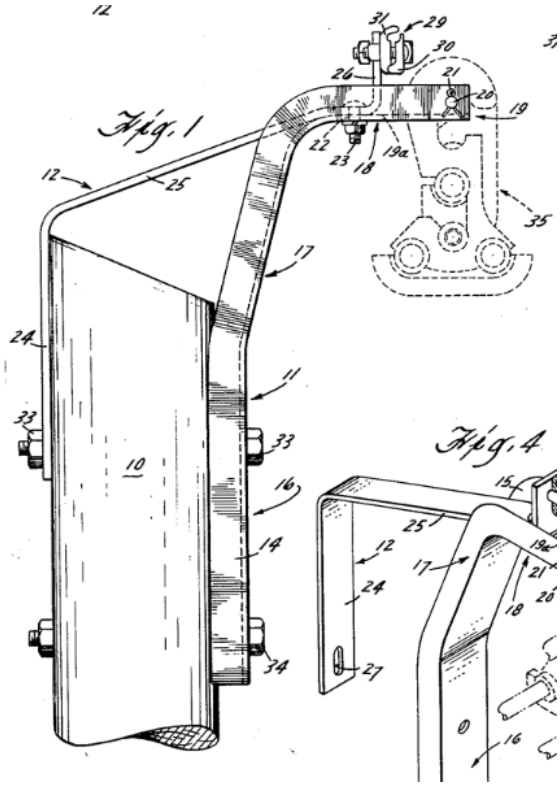
253. Given the '551 Patent's definition of "structured to" in the specification (*see* EX1001, 3:36-50), each of the conductive mounting assemblies must be "structured to be coupled to said multi-function line," i.e., must be configured, intended, and designed to be coupled to the multi-function line.

254. In his declaration, Dr. Beik appears to point to Petersen's pole top extension "comprised of 'metallic parts'" as satisfying the claim limitation "a number of conductive mounting assemblies, each said conductive mounting

assembly structured to be coupled to said multi-function line. . . ." EX1002, ¶175.

255. Because Petersen does not disclose or suggest a multi-function line, however, it follows that Petersen's pole top extension cannot satisfy the conductive mounting assembly limitation, since the pole top extension is not configured, intended or designed to be coupled to a multi-function line.

256. I also disagree with Dr. Beik's suggestion that "Petersen discloses or renders obvious a support system including a plurality of spaced conductive piles. EX1002, ¶172. Petersen consistently refers to the invention as an extension, or bracket, mounted on a "pole top" or "utility pole." EX1004, 1:2-10. Figure 1 of Petersen depicts the pole as wooden:



Id., Fig. 1; *see also id.*, 2:28-33. Wooden poles are not conductive. Petersen,

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therefore, clearly does not disclose a conductive pile.

257. Moreover, to support his suggestion that Petersen renders conductive piles obvious, Dr. Beik simply asserts that metal poles are cheaper and easier to install. EX1002, ¶172. But Dr. Beik ignores that Petersen's pole top extension is specially adapted to be affixed to the top of Petersen's wooden pole. *See* EX1004, 1:50-55; *see also,* 2:28-33 ("Suitable through bolts 33 and 34 extend through the pole and fixedly attach the brace member and the channel support member to the pole . . . ."). Dr. Beik offers no explanation how a metal pole would work with Petersen's pole top extension made specifically for a wooden pole, or what modifications would have been obvious to a POSITA to make Petersen's pole top extension compatible with a metal pole, let alone that a POSITA would have a reasonable expectation of success that any such modifications would achieve the claimed invention.

258. Accordingly, because Petersen does not disclose or suggest a conductive pile, it follows that Petersen's pole top extension cannot satisfy the claim limitation that recites "a number of conductive mounting assemblies, each said conductive mounting assembly ***structured to*** be coupled to . . . a conductive pile," i.e., Petersen's pole top extension is not configured, intended or designed to be coupled to a conductive pile.

259. Further, because Petersen fails to disclose or render obvious "a multi-

function line assembly including a multi-function line," or "a number of conductive mounting assemblies, each said conductive mounting assembly structured to be coupled to said multi-function line," it further fails to disclose or render obvious the last limitation of claim 1 that recites "said multi-function line assembly is coupled to, and in electrical communication with, said number of conductive mounting assemblies."

260. Because each of dependent claims 2-18 depend from Claim 1 (and each requires the limitations: "multi-function line assembly including a multi-function line," "a number of conductive mounting assemblies, each said conductive mounting assembly structured to be coupled to said multi-function line," and "wherein said multi-function line assembly is coupled to, and in electrical communication with, said number of conductive mounting assemblies"), it is equally my opinion that, for at least these reasons, Petersen does not disclose or render obvious these dependent claims.

b. Petersen Does Not Render Obvious Dependent Claim 2

261. In addition to the limitations in independent claim 1 missing from Petersen (i.e., "multi-function line assembly including a multi-function line;" "a number of conductive mounting assemblies, each said conductive mounting assembly structured to be coupled to said multi-function line;" and "said multi-function line assembly is coupled to, and in electrical communication with, said

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number of conductive mounting assemblies"), dependent claim 2 also recites that: "each said conductive mounting assembly includes . . . a number of multi-function line couplings" and "each said multi-function line coupling defines a conductive path."

262. It appears that Dr. Beik relies on Petersen's disclosed "ground clamp means 29" for satisfying the "number of multi-function line couplings" limitation. *See* EX1002, ¶175. I disagree with Dr. Beik's opinion.

263. First, as explained above, Petersen fails to disclose or render obvious the limitation "a number of conductive mounting assemblies," which include a number of multi-function line couplings. It naturally follows, therefore, that Petersen does not disclose the limitation in dependent claim 2: "each said conductive mounting assembly includes a mounting body, a support coupling, and a number of multi-function line couplings," let alone the additional limitation "each said multi-function line coupling defines a conductive path."

264. Thus, for these additional reasons, Petersen does not disclose or suggest claim 2 as well as claims 3, 4, 5, 6, 7, and 8 that depend directly or indirectly on claim 2.

c. Petersen Does Not Render Obvious Independent Claim 19

265. Independent Claim 19 recites, in addition to other limitations, "A mounting assembly for a grounding system . . . , said grounding system including a

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multi-function line assembly with a multi-function line," "a support coupling," "a number of multi-function line couplings," "each said multi-function line couplings structured to be coupled to said multi-function line," "each said support coupling structured to be coupled to a conductive pile," and "wherein, when said multi-function line assembly is coupled to, and in electrical communication with said multi-function line couplings, each said multi-function lie coupling defies a conductive path." EX1001, 13:16-31.

266. For the reasons stated above, Petersen fails to disclose or render obvious the "multi-function line assembly with a multi-function line" limitation. Accordingly, Petersen fails to disclose or render obvious a mounting assembly for a grounding system that includes a multi-function line assembly with a multi-function line.

267. In his declaration, Dr. Beik presumably points to Petersen's ground clamp means 29 as satisfying the "a number of multi-function line couplings," and "each said multi-function line couplings structured to be coupled to said multi-function line," claim limitations. EX1002, ¶211.

268. For the reasons stated above, however, Petersen fails to disclose or render obvious a multi-function line assembly with a multi-function line. Accordingly, it follows that Petersen's ground clamp means 29 fails to disclose or render obvious multi-function line couplings structured to (i.e., configured,

designed or intended to) be coupled to a multi-function line.

269. In addition, Dr. Beik identifies Petersen's "[s]uitable through bolts 33 and 34 [which] extend through the pole and fixedly attach the brace member to the channel support member to the pole" as satisfying the "said support coupling structured to be coupled to a conductive pile" limitation. *Id*., ¶212. For the reasons stated above, however, Petersen fails to disclose or render obvious a conductive pile. Accordingly, it follows that Petersen's through bolts 33 and 34 fail to disclose or render obvious support couplings structured to (i.e., configured, designed or intended to) be coupled to a conductive pile.

270. Further, for the reasons stated above, Petersen fails to disclose or render obvious the multi-function line assembly with a multi-function line and the multi-function line couplings. Accordingly, it follows that Petersen fails to disclose or render obvious the limitation "wherein, when said multi-function line assembly is coupled to, and in electrical communication with said multi-function line couplings, each said multi-function line coupling defines a conductive path."

271. Moreover, for the same reasons explained above in connection with dependent claim 2, Petersen does not disclose or render obvious a multi-function line coupling that defines a conductive path.

272. Further, Dr. Beik once again provides no support for his assertion in ¶¶211, 212 and 213 that Petersen alone, or in view of the knowledge of a POSITA,

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renders the limitations of claim 19 obvious. Dr. Beik again proposes no modification of Petersen or any explanation why a POSITA would be motivated to modify Petersen to achieve the invention of claim 19. Nor does he offer any support that any modification to Petersen could be made with any reasonable expectation of success in achieving the invention of the '551 patent.

273. Accordingly, it is also my opinion that for these reasons Petersen neither discloses nor renders obvious claim 19.

4. Alleged Obviousness of Claims 13-17 Over Petersen and MacLean

274. In my opinion, Petersen and MacLean in view of the knowledge of a POSITA do not render Claims 13-17 obvious. Claim 13 depends from claim 12, which, in turn, depends from independent claim 1, and recites the additional limitation of a "conductive thimble eye" included in the grounding system claimed in claims 1 and 12.

275. Claim 13 depends indirectly from independent claim 1, and thus requires each of the limitations of independent claim 1, specifically, the limitations: a "multi-function line assembly including a multi-function line," "a number of conductive mounting assemblies, each said conductive mounting assembly structured to be coupled to said multi-function line," and "wherein said multi-function line assembly is coupled to, and in electrical communication with, said number of conductive mounting assemblies."

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276. As I have discussed above at Section VIII.B.3.a., Petersen does not render obvious independent claim 1, and for at least these reasons, does not render obvious dependent claim 12. For at least the same reasons, Petersen and MacLean in view of the knowledge of a POSITA do not render obvious claim 13, which depends from claim 12.

277. Claims 14-17, which depend from claim 13, recite additional limitations. Claim 14 recites the additional limitation to the claimed grounding system "wherein said multi-function line is structured to be operational with solar electrical equipment." Claims 15 and 16 add limitations relating to the absence of grounding splices, and claim 17 adds limitations regarding the composition of the multi-function line.

278. Dr. Beik relies on MacLean solely for the disclosure of the "conductive thimble eye" limitation included in claims 14-17 by virtue of their dependency from claim 13. With respect to claim 13, Dr. Beik states that Petersen in view of MacLean discloses the "conductive thimble eye" limitation of claim 13, since "[a]ll messenger supports must be supported where the messenger support terminates in order to maintain the messenger in taught suspension so it can adequately support current carrying cable," and thimble-eye terminal supports were known in the prior art "as a cost effective and simple way to terminate a messenger wire." EX1002, ¶¶214-215.

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279. Dr. Beik further states his opinion at that a POSITA would have been motivated to combine Petersen with MacLean for various reasons, including "because of the inherent need to provide a terminal support for a messenger wire support system." *Id*., ¶216. Dr. Beik further offers his analysis as to why a POSITA would have been motivated to combine Petersen's system with MacLean's thimble-eye terminal support to meet the "conductive thimble-eye" limitation of claims 14-17. *Id*., ¶¶219-221.

280. Dr. Beik offers no such motivation to combine analysis, however, with respect to the other limitations of claims 14-17, including the limitation in claim 14 of the multi-function line being "structured to be operational with solar electrical equipment." He simply states in conclusory fashion, with no analysis whatsoever beyond the "conductive thimble-eye" limitation, that "claims 14-17 are disclosed by Peterson [*sic*], and therefore Peterson [*sic*] in view of MacLean and further in view of a POSITA's knowledge renders them obvious." *Id*., ¶218.

281. For these additional reasons, it is my opinion that Petersen and MacLean in view of a POSITA's knowledge do not render obvious claims 14-17.

5. Alleged Obviousness of Claims 13-17 Based on the CAB Website, CAB Whitepaper, and MacLean

282. In my opinion, CAB Website, CAB Whitepaper, and MacLean in view of the knowledge of a POSITA do not render Claims 13-17 obvious. Claim 13 depends from claim 12, which, in turn, depends from independent claim 1, and

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recites the additional limitation of a "conductive thimble eye" included in the grounding system claimed in claims 1 and 12.

283. Claim 12 depends from independent claim 1, and thus requires each of the limitations of independent claim 1, specifically, the limitations: a "multi-function line assembly including a multi-function line," "a number of conductive mounting assemblies, each said conductive mounting assembly structured to be coupled to said multi-function line," and "wherein said multi-function line assembly is coupled to, and in electrical communication with, said number of conductive mounting assemblies."

284. As I have discussed above at Section VIII.B.1.a, CAB Website and CAB Whitepaper do not render obvious independent claim 1, and for at least these reasons, do not render obvious dependent claim 12. For at least the same reasons, CAB Website, CAB Whitepaper, and MacLean in view of the knowledge of a POSITA do not render obvious claim 13, which depends from claim 12.

285. Claims 14-17, which depend from claim 13, recite additional limitations. Claim 14 recites the additional limitation to the claimed grounding system "wherein said multi-function line is structured to be operational with solar electrical equipment." Claims 15 and 16 add limitations relating to the absence of grounding splices, and claim 17 adds limitations regarding the composition of the multi-function line.

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286. Dr. Beik relies on MacLean solely for the disclosure of the "conductive thimble eye" limitation included in claims 14-17 by virtue of their dependency from claim 13. With respect to claim 13, Dr. Beik states that CAB Website and CAB Whitepaper in view of MacLean disclose the "conductive thimble eye" limitation of claim 13, since "[a]ll messenger supports must be supported where the messenger support terminates in order to maintain the messenger in taught suspension so it can adequately support current carrying cable," and thimble-eye terminal supports were known in the prior art "as a cost effective and simple way to terminate a messenger wire." EX1002, ¶¶222-223. Dr. Beik further states his opinion that a POSITA would have been motivated to combine CAB Website and CAB Whitepaper with MacLean for various reasons, including "because of the inherent need to provide a terminal support for a messenger wire support system." *Id*., ¶224.

287. Dr. Beik further offers his analysis as to why a POSITA would have been motivated to combine CAB Website and CAB Whitepaper with MacLean's thimble-eye terminal support to meet the "conductive thimble-eye" limitation of claims 14-17. *Id*., ¶¶229-231.

288. Dr. Beik offers no such motivation to combine analysis, however, with respect to the other limitations of claims 14-17, including the limitation in claim 14 of the multi-function line being "structured to be operational with solar

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electrical equipment." He simply states in conclusory fashion, with no analysis whatsoever beyond the "conductive thimble-eye" limitation, that "claims 14-17 are disclosed by the CAB Website and CAB Whitepaper, and therefore CAB Website and CAB Whitepaper in view of MacLean and further in view of a POSITA's knowledge renders them obvious." *Id*., ¶228.

289. For these additional reasons, it is my opinion that the CAB Website and CAB Whitepaper in view of MacLean and further in view of a POSITA's knowledge do not render obvious claims 14-17.

IX. SECONDARY CONSIDERATIONS OF NON-OBVIOUSNESS

290. I understand that, in order to further protect against the use of hindsight reconstruction to demonstrate that the claims of the '551 patent would have been obvious to a POSITA at the time of the claimed invention, any objective evidence of secondary considerations of non-obviousness is highly relevant and must be considered.

291. I understand that secondary considerations of non-obviousness include the commercial success of the invention, industry praise for the invention, industry skepticism of the invention, and any long-felt need that the invention solved.

292. Dr. Beik, at ¶¶232-234 of his declaration (EX1002), states that he is not aware of any secondary considerations that would weigh against the alleged

obviousness of the ‘551 patent claims. In his deposition, Dr. Beik testified that he could not remember whether he had made any attempt to determine whether secondary considerations of non-obviousness exist, such as commercial success and industry praise with respect to CAB’s commercial embodiments that implement the invention of the ‘551 patent. EX2004, 154:5-156:17. He further testified that even if he had become aware of the existence of such evidence, there would be no amount of evidence of secondary considerations that would change his opinion that the claims of the ‘551 patent are obvious. *Id*., 156:18-157:16. To whatever extent Dr. Beik may or may not have considered evidence of secondary considerations in this matter, I have reviewed such evidence carefully, and based on my review, it is my opinion that such evidence weighs heavily in favor of the non-obviousness of the ‘551 patent claims.

293. As I explain in further detail below, CAB’s Integrated Grounding System satisfied a long-felt need in the industry, including in solar power plants to avoid the need and expense of separate grounding conductors and grounding splices. Further, based on the evidence I have reviewed, CAB went to great lengths to overcome the industry’s skepticism as to whether its Integrated Grounding could satisfy applicable code requirements. My review of evidence relating to the extent to which CAB’s Integrated Grounding System was met with commercial success, and the industry awards and accolades that CAB received relating to its Integrated

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Grounding System, only solidifies my opinion. It is further my opinion all of these secondary considerations are directly attributable to the features of the invention claimed in the '551 patent

294. Therefore, in my opinion, secondary considerations demonstrate the non-obviousness of the challenged claims of the '551 patent.

A. CAB IS ENTITLED TO A PRESUMPTION OF NEXUS SINCE ITS COMMERCIAL PRODUCT IS COEXTENSIVE WITH THE CLAIMS OF THE '551 PATENT

295. I understand that in order for evidence of secondary considerations to be significant, there must be a nexus between the claimed invention and the evidence of secondary considerations. I also understand that nexus is presumed upon a showing that CAB's commercial product is an embodiment of the invention claimed in the '551 patent and is coextensive with the claimed features.

296. CAB commercializes its Integrated Grounding System, which implements the claimed inventions of the '551 patent, in solar power plant applications. As described more particularly by part numbers below, CAB's Integrated Grounding System includes a custom manufactured copper-clad messenger wire that serves as an equipment grounding conductor (EGC) in addition to supporting cable hangers and electrical cables, mid-pier kits that are rated for grounding and bonding, end-pier kits, and cable hangers of various configurations for supporting and separating various electrical cables within a PV

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array.

297. I have analyzed CAB's Integrated Grounding System and in my opinion, CAB's Integrated Grounding System is coextensive with at least independent claim 1 of the '551 patent, which is the only independent system claim. I have prepared a claim chart (Appendix A to my declaration) mapping the limitations of independent claim 1 of the '551 patent to CAB's Integrated Grounding System.

298. In preparing my claim chart, I personally accessed the CAB Solar website and pulled various photographs of CAB's Integrated Grounding System from the photo gallery. All photos obtained from CAB's website and included in Appendix A are true and accurate copies of the photos as they appear on CAB's website as of the date of last access as indicated in Appendix A.

299. I also obtained directly from CAB a copy of CAB's Installation Guide, revised 01-28-2022. EX2041. The Installation Guide includes instructions for the installation of CAB's Integrated Grounding System as well as various photographs of CAB's installed systems. All content, including photographs, taken from CAB's Installation Guide and included in EX2041 are true and accurate copies as they appear in the Installation Guide.

300. I also have consulted and reviewed a CAB customer bid request for an Integrated Grounding System and CAB's quote in response to that customer

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request. EX2054. I have included component part numbers for CAB's Integrated Grounding System in my claim chart.

301. I have also consulted and reviewed a CAB Products Grounding Messenger Wire Evaluation Electrical Report, dated December 11, 2017, EX2066, and, collectively, a Listing Constructional Data Report (CDR) originally issued on May 22, 2018, and Intertek Authorization to Mark, issued June 12, 2018. EX2043.

302. The underlying test and certification documents show that the CAB connector assemblies (for use with the multi-function line) provide a conductive path (i.e., an effective ground fault current path). Regarding CAB connectors (KC25B1 and GB26T8), Burndy evaluated these assemblies using UL467 test methods to determine if they were "suitable for grounding the copper clad steel conductor." *See* EX2066, 16-17. Standard UL 467, "Grounding and Bonding Equipment," is a standard developed by Underwriters Laboratories (UL) for evaluating the performance of grounding and bonding equipment. This standard outlines various criteria to ensure that the equipment under test (EUT) can safely conduct electrical current in the event of a fault condition. The UL 467 Short Circuit and Mechanical Sequence test is a crucial part of the standard, in which the EUT is subjected to a high current to simulate a fault condition, that evaluates the secureness and electrical resistance of the connection. Burndy reported that "[a]ll samples passed the Short Circuit and Mechanical Sequence tests." *Id*., 18.

303. My claim chart, Appendix A, is all based on information derived directly from the CAB website and from EX2041, EX2043, EX2054, EX2066.

304. Exemplary CAB product part numbers that constitute its Integrated Grounding System include CAB-9605 (copper-clad grounding messenger wire);[10] CAB-9705 (grounding Mid Pier Kit); CAB-9760 (cable hangers); and CAB-9607 (grounding end-pier attachment kit). EX2054.

305. Specifically, regarding claim 1 of the '551 patent, as shown in the claim chart, CAB's Integrated Grounding System comprise a conductive copper-clad messenger support wire/EGC (e.g., CAB-9605) from which is suspended a plurality of messenger supported cable hangers (e.g., CAB-9760) that support a plurality of electrical cables. The conductive messenger support wire/EGC is coupled to, and supported by, a plurality of spaced conductive piles through a conductive mounting assembly that includes a conductive messenger support

[10] While I refer to the CAB-9605 copper-clad grounding messenger wire as an exemplary component of CAB's Integrated Grounding System, I understand that all grounding messenger wires sold by CAB serve both to support cable hangers and cables and to act as an equipment grounding conductor, and therefore meet the definition of the claimed multi-function line as explained in my claim chart, Appendix A.

wire/EGC clamp (components included in the mid pier kit, e.g., CAB-9705). App. A, A1.

306. The annotated photographs and excerpts from CAB's documentation show that CAB's Integrated Grounding System includes a multi-function line assembly including a multi-function line (i.e., exemplary messenger support wire/EGC). *Id.*, A2-A3. CAB's messenger support wire/EGC supports cable hangers and electrical cables and serves as a grounding conductor for the system. *Id.*

307. Further, the annotated photographs and excerpts from CAB's documentation show that CAB's Integrated Grounding System includes a number of conductive mounting assemblies, specifically grounding mid-pier kits listed for grounding and bonding (e.g., CAB-9705). *Id.*, A3-A5. CAB's grounding mid-pier kit is structured to be coupled to CAB's messenger support wire/EGC (e.g., CAB-9605) via a conductive messenger wire/EGC clamp (component included in exemplary CAB-9705) and is also structured to be coupled to a conductive pile. *Id.*

308. Lastly, as shown in the annotated photographs and excerpts from CAB's documentation, the Integrated Grounding System, when installed, comprises a multi-function line assembly including the conductive messenger wire/EGC (e.g., CAB-9605) that is coupled to, and in electrical communication

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with, the grounding mid-pier kit (i.e., conductive mounting assembly, e.g., CAB-9705). *Id.*, A6-A7.

309. Accordingly, in my opinion, CAB's Integrated Grounding System is coextensive with at least system claim 1 of the '551 patent.

B. CAB'S INTEGRATED GROUNDING SYSTEM MET A LONG-FELT INDUSTRY NEED

310. The '551 patent expressly describes the need for its improved grounding system. Specifically, the '551 patent describes the prior art grounding systems in solar plant installations that require separate grounding conductors disposed adjacent to the messenger wire and separate splices from the grounding conductor to each metal pile. EX1001, 1:36-2:17. In other words, it was the separate grounding conductor and splices that provided the required effective ground fault current path. These prior art grounding systems had been used since CAB's above-ground messenger wire supported cable management system was first employed in approximately 2014. *See* EX2061, ¶¶31-32, 65, 67; *see also*, EX2033, ¶¶37-38, 50-53; EX2028, ¶¶50-51; EX2059, ¶58. As the '551 patent explains, these prior art grounding systems that required splicing the copper wires into the grounding conductor and making an electrical connection with each pile were time consuming and expensive. EX1001, 2:12-16.

311. CAB's Integrated Grounding System specifically addressed the need for less labor-intensive and expensive grounding systems. The grounding system

claimed by the '551 patent provides the required effective ground fault current path through the use of its multi-function line and conductive mounting assemblies, replacing the separate grounding conductor and medial grounding splices used in the prior art, and thus providing the needed "grounding system that is less expensive and which can be installed quickly and easily," and that is further "compatible with existing support assemblies." *Id*., 2:17-20; *see also* EX2061, ¶¶66-68; EX2033, ¶¶52-53; EX2028, ¶¶51-55; EX2059, ¶¶59-61.

C. CAB'S INTEGRATED GROUNDING SYSTEM OVERCAME INDUSTRY SKEPTICISM

312. While the idea of CAB's Integrated Grounding System was a welcome improvement over prior art grounding systems, it still required overcoming industry skepticism as to whether it could be implemented in a code-compliant fashion.

313. Specifically, the common variety steel messenger wire was insufficient to serve as the claimed multi-function line. Rather, as one of the '551 patent inventors, Allen Smith, explains, it was necessary to develop the necessary "material composition of the messenger wire itself, so as to allow for sufficient strength and conductivity to serve as both a support structure messenger wire and an equipment grounding conductor." EX2061, ¶¶66, 69-70. It was also necessary to develop a clamp and bracket (components of the claimed conductive mounting assemblies) that were sufficiently conductive, strong enough to support the

messenger wire, and sufficiently bonded. *Id*., ¶¶66, 71-72. All of these system components were required to comply with applicable code, and required substantial development, testing and evaluation in order to do so. *Id*., ¶¶66, 73-75, 79.

314. For additional endorsement, CAB commissioned Bill Brooks to provide a Whitepaper to evaluate its Integrated Grounding System for compliance with the NEC. EX2061, ¶77; EX2033, ¶54. Such a Whitepaper would typically be used to offer assurance to the industry that a new kind of system such as CAB's Integrated Grounding System would be code-compliant. Mr. Brooks provided that Whitepaper in November 2020. EX2061, ¶77; EX2033, ¶¶54, 65. As discussed further below with respect to the commercial success of CAB's Integrated Grounding System, after that time CAB's Integrated Grounding System achieved even greater success overcoming any industry skepticism as to whether it could comply with applicable code.

D. CAB'S INTEGRATED GROUNDING SYSTEM HAS RECEIVED INDUSTRY PRAISE

315. Numerous awards bestowed upon CAB for its Integrated Grounding System provide further substantial evidence of the non-obviousness of the claims of the '551 patent. Mr. Smith has identified these various awards.

316. The earliest of these awards was the prestigious 2018 Showstopper Award given to CAB by the National Electrical Contractors Association (NECA).

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As explained by Mr. Smith, this award is voted on by the largest electrical contractors in the United States, and the award given to CAB recognized CAB's Integrated Grounding System as among the most innovative products introduced into the electrical system that year. EX2031, ¶81; EX2021. In January 2019, Electrical Contractor Magazine featured CAB's receipt of the 2018 Showstopper Award. EX2061, ¶82; EX2022.

317. In both 2019 and 2021, Solar Power World Magazine recognized CAB's Integrated Grounding System as among the top solar component products for those years. EX2061, ¶¶83-84; EX2023, EX2024. Later, in 2022 and 2023, Solar Power World Magazine awarded CAB the Leadership in Solar Energy Award. EX2061, ¶86; EX2026, EX2027.

318. In 2021, an international panel of solar industry experts selected CAB's Integrated Grounding System for the 2021 PV-Balance of System (BOS) Award, an award sponsored by the PV Magazine, an industry-recognized solar energy publication based in Germany. EX2061, ¶85; EX2025, 52, 86-87.

319. CAB's customers and business partners also touted CAB's Integrated Grounding System. EX2061, ¶80; EX2020 (RP Construction Services specifically referencing CAB's Integrated Grounding System and recognizing CAB as a pioneer in above-ground cable management in grid-scale solar plants). *See also*, EX2028, ¶¶20, 54-55 (FTC Solar, focused on the development of trackers for solar

power plants, recognized that CAB's Integrated Grounding System was the "new industry standard" and accordingly, recommended CAB's Integrated Grounding System for any above-ground cable management system moving forward); EX2059, ¶¶1, 60-61 (Bill Novak, owner of Tropenas Company, an engineering firm whose focus includes engineering utility-scale solar projects, stated that CAB's Integrated Grounding System is "particularly impressive" given its safety benefits and cost savings.

320. These awards and accolades are clear evidence of the non-obviousness of the '551 patent claims, the inventions of which are implemented in CAB's Integrated Grounding System.

E. CAB'S INTEGRATED GROUNDING SYSTEM ACHIEVED COMMERCIAL SUCCESS

321. As Mr. Smith has indicated in his declaration, when CAB was able to implement its Integrated Grounding System, it was deemed by solar companies and engineering firms as a "game changer." EX2061, ¶78. On May 22, 2018, as a result of extensive testing and evaluation performed on CAB's Integrated Grounding System, Intertek issued a Constructional Data Report (CDR), approving the Integrated Grounding System, including for compliance with Standard

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UL2703[11] (*see* EX2043, 1), as well as the NEC, Art. 690: Solar Photovoltaic Systems, and Art. 250 *Id*., 2). Three weeks later, on June 12, 2018, Intertek issued its Authorization to Mark (ATM), authorizing the application of Intertek's ETL Listed Certification Mark to CAB's Integrated Grounding System. *Id*., ¶79; *Id*., 50.[12]

322. From that point forward, the Integrated Grounding System exponentially increased CAB's solar sales, nearly doubling the sales in 2018 alone. EX2061, ¶78. As Mr. Smith has further stated, since 2018, [redacted] to [redacted] of CAB's

[11] UL 2703 is a safety standard developed by Underwriters Laboratories (UL) for photovoltaic (PV) module mounting systems and grounding/bonding equipment. UL 2703 covers the grounding and bonding aspects of PV module mounting systems, including mounting devices, clamping devices and ground lugs for use with photovoltaic modules and panels.

[12] The Intertek CDR and ATM covered CAB's mid-pier kit components of the Integrated Grounding System, which included L bracket, Washer, Carriage Bolts, Hex Nut, and Grounding Lug. EX2043, 2. The use of a custom-made Copperweld copper-clad steel composite messenger wire was separately evaluated and approved by HDR for CAB's Integrated Grounding System on December 11, 2017. *See* EX2066, 1-10; *see also* EX2061, ¶¶69-70, 75.

solar sales have been on account of CAB's Integrated Grounding System. *Id*., ¶78.

323. As I noted above in my discussion of the industry praise for CAB's Integrated Grounding System, the industry soon began to recognize CAB's Integrated Grounding System as the "new industry standard," and solar companies who were working with CAB began recommending CAB's Integrated Grounding System for a wide variety of solar projects. *See* EX2028, ¶¶20, 54-55; EX2059, ¶¶60-66.

324. As a result, CAB's sales took off. I have reviewed the expert declaration of Jonathan Putnam, Ph.D., submitted in this IPR, in which he has done an economics-based analysis of CAB's sales growth, including specifically with respect to sales growth attributable to CAB's Integrated Grounding System. EX2044. Specifically, Dr. Putnam has compared the growth rate in solar capacity from 2015 to 2023 to the growth rate in CAB's solar sales during that same period of time, to determine the excess of CAB's sales growth rate over industry growth rate. *See id*., ¶¶46-52.

325. Dr. Putnam has also analyzed CAB's sales growth rate that is attributable to the Integrated Grounding System, specifically detailing, for example, the cost savings of CAB's Integrated Grounding System over CAB's Standard System (above-ground messenger wire-supported system), which does not include integrated grounding. *See id*., ¶¶34-36. Dr. Putnam has concluded that

by 2023, CAB's excess sales were [redacted] or [redacted] over what they would have been had they simply tracked industry growth rates, and that between 2018, when CAB introduced its Integrated Grounding System, and 2023, CAB's "excess sales" were even greater with the Integrated Grounding System than what they had been with CAB's Standard System only. *Id*., ¶51 (emphasis added). As Dr. Putnam further explains, CAB's excess are so large that it is clear that [redacted] can be attributed to the Integrated Grounding System that embodies the invention of the '551 patent, even if the exact amount of sales attributable to the Integrated Grounding System versus CAB's Standard System cannot be determined. *Id*., ¶63.

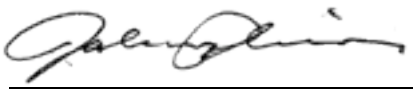
326. Dr. Putnam's analysis only confirms what would logically flow from all the other objective evidence of non-obviousness set forth above, including the fact that the benefits to be realized from CAB's innovative Integrated Grounding System was seen in the solar industry to be a "game changer."

X. CONCLUSION

327. For all the reasons set forth above, it is my opinion that Petitioner has not shown, and Dr. Beik has not supported any showing, that claims 1-19 of the '551 Patent are unpatentable over the references cited by Petitioner.

This declaration and my opinions herein are made to the best of my knowledge and understanding, and based on the material available to me, at the time of signing this declaration. I declare that all statements made herein on my own knowledge are true and that all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 or Title 18 of the United States Code.

Date: August 7, 2024

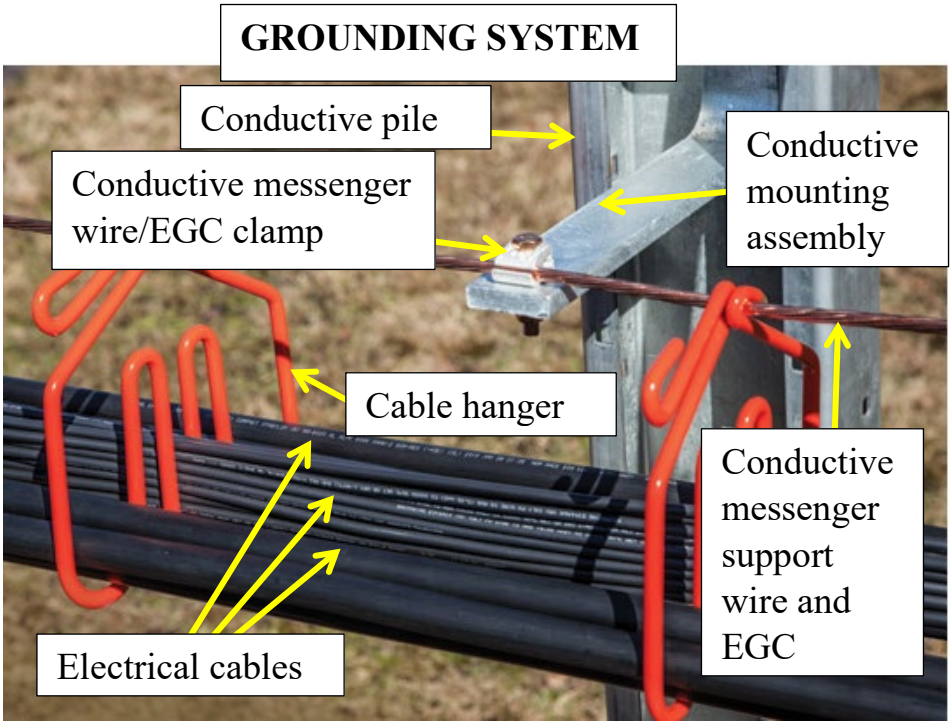


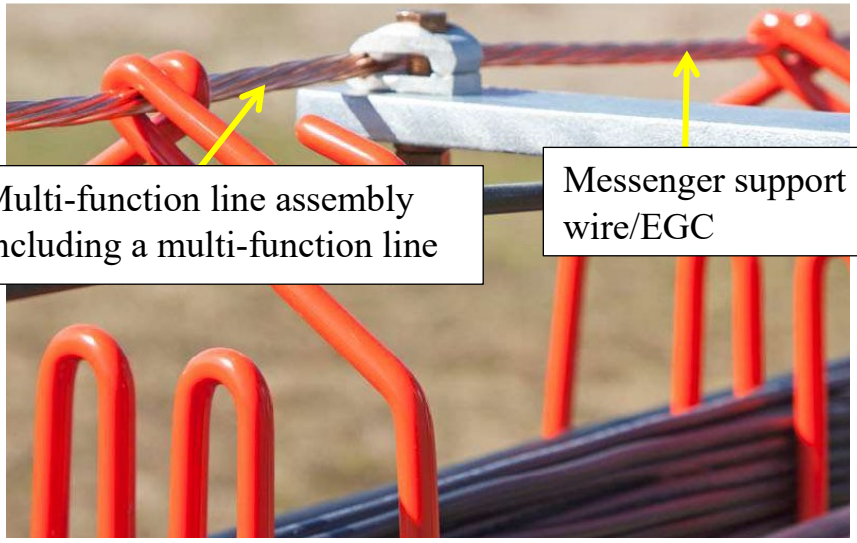
Joshua Phinney, Ph.D.

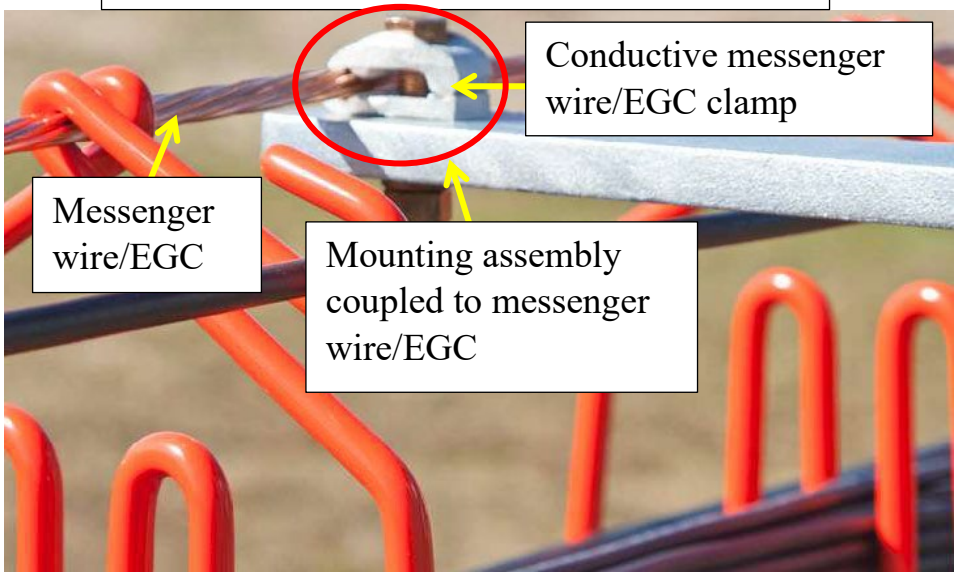
CONFIDENTIAL PROTECTIVE ORDER MATERIAL

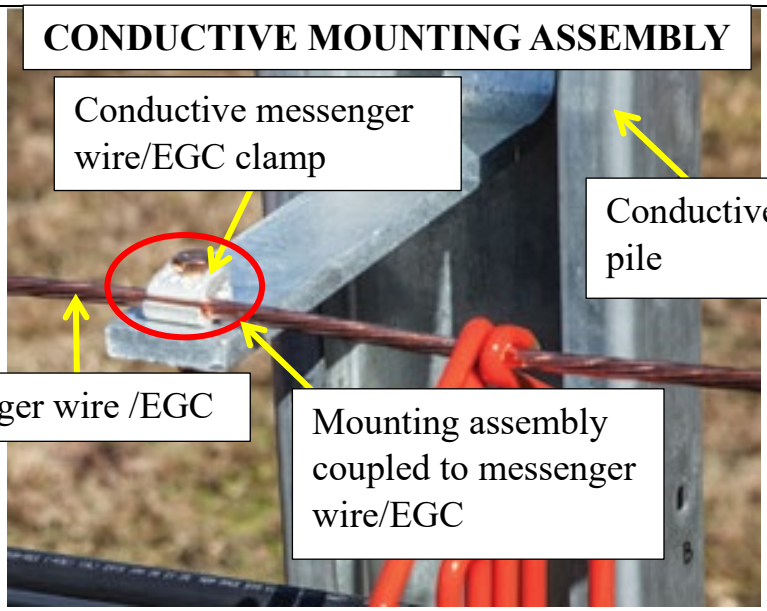
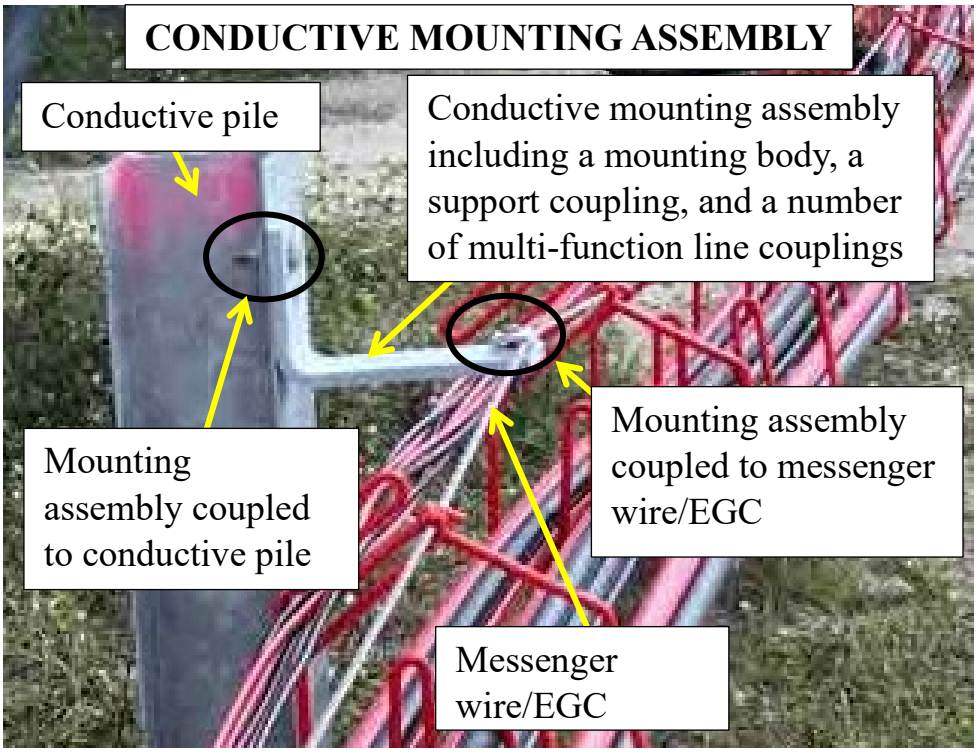
Appendix A

CLAIM CHART FOR CAB'S COMMERCIAL EMBODIMENT OF THE '551 PATENT

Claim Language	CAB's Integrated Grounding System
[1.Preamble] A grounding system structured to ground a number of cables supported by a support assembly, said support assembly including a plurality of spaced, conductive piles, said grounding system comprising:	 *See* https://www.cabproducts.com/solar/ (last visited on July 23, 2024).

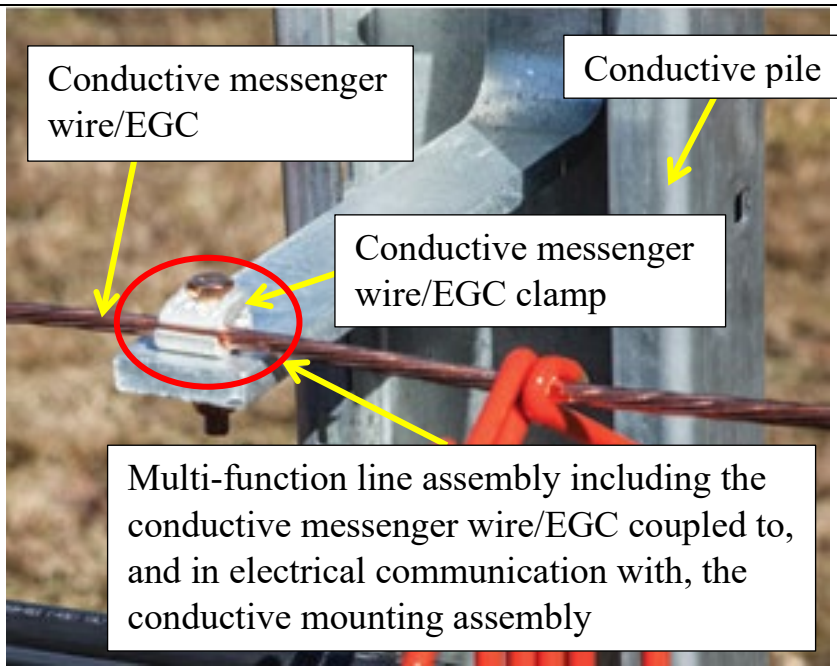
Claim Language	CAB's Integrated Grounding System
[1.a] a multi-function line assembly including a multi-function line;	 EX2041 at 2. "For integrated grounding CAB System: [redacted] Messenger Wire is available from CAB in several options. Only approved [redacted] equivalent grounding messenger wire can be used with CAB System." EX2041 at 4, 3.1.2. [redacted] EX2043 at 25.

Claim Language	CAB's Integrated Grounding System
	Part No. [redacted] is representative of the messenger support wire/EGC in CAB's Integrated Grounding System. EX2054. [redacted] (d=[redacted]) [redacted] was evaluated for its electrical and mechanical properties and was certified as being suitable to be used as a multi-function line (messenger wire/EGC). EX2066, 7, 9, 12.
[1.b] a number of conductive mounting assemblies, each said conductive mounting assembly structured to be coupled to said multi-function line and to a conductive pile; and	**CONDUCTIVE MOUNTING ASSEMBLY**  EX2041 at 2.

Claim Language	CAB's Integrated Grounding System
	 *See* https://www.cabproducts.com/solar/ (last visited on July 23, 2024)  *See* https://www.cabproducts.com/solar-gallery/#iLightbox[gallery_image_1]/9 (last visited on July 23, 2024).

Claim Language	CAB's Integrated Grounding System
	Part No. [redacted] is representative of the "mid-pier kit" [conductive mounting assembly] of CAB's Integrated Grounding System. EX2054. Part No. [redacted] is ETL Listed by Intertek Testing Laboratories as compliant with the UL 2703 Standard for Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels for grounding and bonding.[1] EX2043 at 50.

[1] UL 2703 is a safety standard developed by Underwriters Laboratories (UL) for photovoltaic (PV) module mounting systems and grounding/bonding equipment. UL 2703 covers the grounding and bonding aspects of PV module mounting systems, including mounting devices, clamping devices and ground lugs for use with photovoltaic modules and panels.

Claim Language	CAB's Integrated Grounding System
[1.c] wherein said multi-function line assembly is coupled to, and in electrical communication with, said number of conductive mounting assemblies.	 *See* https://www.cabproducts.com/solar/ (last visited on July 23, 2024). [redacted] EX2043 at 25.

Claim Language	CAB's Integrated Grounding System
	"The Integrated Grounding mid-pier kit will be identified by a label affixed to the L-bracket of the mid-pier kit. This component is part of the UL 2703 Safety Listing for grounding and bonding only." EX2041 at 3, 2.4.1. EX2041 at 3, 2.4.2. "The Integrated Grounding mid-pier kit utilizes a grounding clamp as shown in diagram above. This component is part of the UL 2703 Safety Listing for grounding and bonding only." EX2041 at 3, 2.4.3.