

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

VOLTAGE LLC

Petitioner,

v.

SHOALS TECHNOLOGIES GROUP, LLC

Patent Owner

Inter Partes Review IPR202300877,

Declaration of Dr. Thomas Kenny in Support of the

Petition for *Inter Partes* Review of U.S. Patent No. 10,553,739

DECLARATION OF DR. THOMAS W. KENNY

I currently hold the opinions expressed in this declaration. But my analysis may continue, and I may acquire additional information and/or attain supplemental insights that may result in added observations.

I hereby declare that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I further declare 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 of the Title 18 of the United States Code.

Dated: May 8, 2024

By: 
Thomas W. Kenny, Ph.D.

QUALIFICATIONS AND BACKGROUND INFORMATION

1. My education and experience are described more fully in my curriculum vitae provided as Exhibit 1024. For ease of reference, I have highlighted certain information below.
2. My academic and professional background is in Applied Physics, Mechanical Engineering, Sensing, and Robotics, with a research specialization focused on microelectronic physical sensors, and I have been working in those fields since the completion of my Ph.D. more than 30 years ago. The details of my background and education and a listing of all publications I have authored in the past 35 years are provided in my curriculum vitae, attached as Appendix A. Below I provide a short summary of my education and experience which I believe to be most pertinent to the opinions that I express here.
3. I received a B.S. in Physics from University of Minnesota, Minneapolis in 1983, and a Ph.D. in Physics from University of California at Berkeley in 1989. I was educated as a physicist specializing in the design and fabrication of sensors to be used for measurements of many kinds. My physics Ph.D. thesis involved measurements of the heat capacity of monolayers of atoms on surfaces. This thesis research relied on precision measurements of temperature and power using time-varying electrical signals and also on the design and construction of miniature

sensor components and associated electrical circuits for conditioning and conversion to digital format.

4. My training in Physics at the University of Minnesota and at UC Berkeley relied on understanding of fundamental principles of electromagnetism, which include detailed study of the basic principles of electrical conduction, and the properties of resistors, capacitors, inductors, diodes, fuses and many other semiconductor devices, including the basic properties of thermovoltaic devices and photovoltaic devices, and the ongoing research to optimize the band structures and other materials properties for more efficient conversion of thermal and optical energy to electrical energy. The basic electrical properties of cables, connectors and diodes are part of this training, including an understanding of the special requirements for systems that produce and carry large currents.

5. After completion of my Ph.D. in Physics at U.C. Berkeley in 1989, I joined the Jet Propulsion Laboratory (JPL) in Pasadena, CA, as a staff scientist, and began working on miniature sensors and instruments for small spacecraft. This work involved the use of silicon microfabrication technologies for miniaturization of the sensors and developed my experience in the field of micro-electromechanical systems (MEMS), which is the study of very small mechanical sensors powered by electricity and used for detection of physical and chemical signals.

6. While at JPL, we developed accelerometers, uncooled infrared sensors, magnetometers, seismometers, force and displacement sensors, soil chemistry sensors, miniature structures for trapping interstellar dust, and many other miniature devices. Some of these projects led to devices that were launched with spacecraft headed for Mars and for other interplanetary missions. Much of this work involved the use of physical sensors for detection of small forces and displacements using micromechanical sensors. In many cases, the design of the sensors included considerations for packaging of the sensor to protect from external environments, and for management of electrical connections to the sensor.

7. I am presently the Richard Weiland Professor at the Department of Mechanical Engineering at Stanford University, where I have taught for the past 30 years. I am also currently the Senior Associate Dean of Engineering for Education and Student Affairs at Stanford.

8. For almost all of these 30 years, I have taught courses in the Mechanical Engineering department on Sensors and Mechatronics at Stanford University. The annual enrollment in these collections of courses has exceeded 100 students for most of this time, and so I have had the privilege of teaching thousands of Stanford undergraduate students and graduate students in these topics. Of course, teaching is a great way to learn, so my education in these topics includes approximately 40

years of learning, first as a student and then as an educator.

9. The ME210 course titled “Introduction to Mechatronics” is a review of the mechanical, electrical, and computing technologies necessary to build electromechanical systems. The applications of this course include everything from cars and robots to cellphones and other consumer electronics devices. Alumni of this course are currently working at Apple, Tesla, Google, Meta, SpaceX, Intel, Bosch, Waymo, and many other large and small enterprises. A significant part of this course focuses on the design and implementation of power systems for mobile robots which includes batteries, regulators, protection diodes, fuses and wiring harnesses. I was one of the instructors for the first offering of this course in 1995, and this course has been offered at least once each year ever since, except for the pandemic year of 2021. Students from this class include undergraduates with majors in Mechanical Engineering, Electrical Engineering, Computer Science and other disciplines, and we also have representation of B.S., M.S., and Ph.D. students from all these departments as well. Over the history of this course, as many as 2,000 students in this course have subsequently earned a B.S., M.S., or Ph.D. degree in electrical engineering, mechanical engineering, or an equivalent such as applied physics or general engineering, and many of the students in this course enter with two or more years of professional experience

relating to the design and/or manufacturing of electromechanical systems that include electrical wiring and connectors.

10. I am co-author of a textbook titled “Introduction to Mechatronic Design,” which is used for the ME210 course described above. This textbook broadly covers the topic of integration of mechanical, electronic and computer systems design into “smart products.” This textbook includes chapters on Voltage Regulators, Power Supplies and on Batteries, Noise, Isolation and Grounding, which includes discussion of design and construction of wiring harnesses that connect power sources to electronic systems, including microprocessors, diodes, fuses, and other elements.

11. The ME220 course titled “Introduction to Sensors” is a broad overview of all sensing technologies, from thermometers to inertial sensors, ultrasound devices, flow sensors, optical and IR sensors, chemical sensors, pressure sensors, and many others. This course is focused on sensors that operate based on determination of changes in capacitance, resistance, and piezoelectricity that arise from external signals. This course specifically includes discussion of the relation between sensor performance and environmental stresses, such as temperature, moisture, chemical corrosives, and mechanical strain. I first taught this course at Stanford in the Spring of 1994, and I offered this course at least annually until 2016, when my

duties as Senior Associate Dean made this impractical, yet have continued to offer this course periodically since, including these last two years.

12. My research group at Stanford has focused on the area of microsensors and microfabrication—a domain in which we design and build micromechanical sensors using silicon microfabrication technologies. The various applications for these technologies are numerous. In addition to microelectronic devices, my research has encompassed various electrical interconnects and contacts between electrical components.

13. I have advised 75 Ph.D. students that have completed Ph.D. degrees and many more M.S. and B.S. students in Engineering during my time at Stanford.

14. I have published over 250 technical papers in refereed journals and conferences in the field of sensors, MEMS, and measurements. I have further presented numerous conference abstracts, posters, and talks in my field. I am a named inventor on 50 patents in my area of work.

15. From 2006 to 2010, I served as a program manager at DARPA in the Microelectronics Technology Office. I launched and managed programs in Thermal Management of High-Power Systems, Nanofabrication, and other areas. The Thermal Management Programs were focused on systems, such as the THAAD radar systems currently deployed around the world for missile defense,

which required design and development of complex, systems that relied on delivery of huge amounts of electrical power to a compact radar module, followed by extraction of huge amounts of thermal power in order to keep the radar systems operating within allowed temperatures. At a basic level, these systems required cables, connectors, and other structures for delivery of significant current, extraction of significant return current, and the simultaneous removal of heat. The underlying systems included cables, connectors, junctions, and protective insulation layers – with similarities to the structures discussed in the '739 Patent.

16. I received the Office of the Secretary of Defense Award for Exceptional Public Service in 2010, the IEEE Sensors Council Technical Achievement Award in 2011, and was named Fellow of the ASME in 2014. I was awarded the 2018 IEEE Daniel Noble Award for Emerging Technologies. In 2022, I was elected to the National Academy of Engineering.

17. I have previously served as an expert on patent infringement cases related to the design and use of inertial sensors, sensors of physiological parameters, optical proximity sensors, and other sensor-based technologies and applications, as well as other topics. My CV (EX 1024) includes a full listing of all cases in which I have testified at deposition or trial in the preceding several years.

18. I have been retained on behalf of Voltage, LLC, to offer technical opinions

relating to U.S. Patent No. 10,553,739 (“the ’739 Patent”) and prior art references relating to its subject matter. I have reviewed the ’739 Patent, and relevant excerpts of the prosecution history of the ’739 Patent.

19. Based on my experience, education, and research, including extensive experience with research, DOD program management, and teaching courses that include emphasis on the design and fabrication of power systems and wiring harnesses for integrated systems, I believe that I am qualified to offer opinions as to the knowledge and level of skill of one of ordinary skill in the art at the time of the invention of the ’739 Patent (which I further describe below). Based on my experiences, I have a good understanding of the capabilities of a person of ordinary skill. Indeed, I have taught, participated in organizations, and worked closely with many such people over the course of my career, including the thousands of students who were enrolled in courses that I have taught on these topics. Based on my knowledge, skill, and experience, I understand the capabilities of a person of ordinary skill.

20. In addition to any materials cited in the present declaration, I have also reviewed the following Exhibits:

➤ **EXHIBITS CONSIDERED**

Exhibit No.	Description
-------------	-------------

1001	U.S. Patent No. 10,553,739 to Solon (“’739 patent”).
1002	Prosecution History of ’739 patent.
1003	Reserved for this declaration.
1004	U.S. Patent Publication No. 2013/0257580 to Gilman <i>et al.</i> (“Gilman”)
1005	Chinese Patent No. CN201994507U to Ye <i>et al.</i> (“Ye”) – <i>Translation Certified.</i>
1006	U.S. Published Patent Application No. 2010/0207716 to Yen, Chun-Chang (“Yen”)
1007	U.S. Published Patent Application No. 2012/0309232A1 to Darr <i>et al.</i> (“Darr”)
1008	U.S. Published Patent Application No. 2011/0209741 to Solon. (“Solon”)
1009	Chinese Patent No. CN2562350Y to Fan, Banghong (“Fan”) – <i>Translation Certified</i>
1010	Amphenol Declaration of Gary Joseph (“Joseph Decl.”)
1011	Chinese Patent No. 102568970 to Ba <i>et al.</i> (“Ba”) – <i>Translation Certified.</i>
1012	“National Electrical Code 2002,” by National Fire Protection Association (“NEC2002”), copyright 2001. National Fire Protection Association®, Quincy, MA 02169. ISBN 978-087765914-3
1013	Cooper-Bussman SB989107 Rev. A, December 21, 1998
1014	Merriam -Webster dictionary, “inline”; “seal”
1015	Overmolding Guide, © 2002 GLS Corporation
1016	U.S. Patent No. 6,523,380 to McGuire <i>et al.</i> (“McGuire”).

1017	“Solar Line – Photovoltaic Interconnections System -- Helios”, Amphenol Industrial Solar Technologies, (Nov. 2012).
1018	<i>Shoals Technologies Group, LLC v. Voltage, LLC et al.</i> , Docket No. 1:23-cv-00365, Order on Motion to Stay, Dkt. 20 (M.D.N.C. June 28, 2023)
1019	Chinese Patent No. 102568970 to Ba (Original).
1020	Chinese Patent No. CN201994507U to Ye (Original).
1021	U.S. Provisional Application No. 61/830,284 to Solon. (Provisional of ’739)
1022	Spontak, et al., “Thermoplastic elastomers: fundamentals and applications” <i>Current Opinion in Colloid & Interface Science</i> 5 (2000) 334-341
1023	Order No. 16: In the Matter of CERTAIN PHOTOVOLTAIC CONNECTORS AND COMPONENTS THEREOF, Inv. No. 337-TA-1365, (Int’l Trade Comm., February 20, 2024).
1024	Curriculum Vitae of Dr. Thomas Kenny.
1025	Chinese Patent No. CN2562350Y to Fan (Original)

I. **BASES FOR OPINIONS EXPRESSED**

21. The opinions set forth in this declaration are my own. My opinions are based on my review of the materials cited throughout this Declaration as itemized in the “Exhibits Considered” list provided above; my educational background and experiences throughout my career, including my experience as a technical consultant providing expert testimony in numerous cases involving the validity and

infringement of patents.

22. My analysis of the materials relating to this matter is ongoing, and I will continue to review any new material that are provided to me. This Declaration represents certain opinions that I have formed to date and the bases for those opinions. I reserve the right to revise, supplement, and/or amend my opinions based on new information presented to me and on my continuing analysis of the materials cited throughout this Declaration and those identified in the “Exhibits Considered” list.

II. **UNDERSTANDING OF LEGAL STANDARDS**

23. I am not an attorney. For purposes of this declaration, I have been informed about certain aspects of the law that are relevant to my analysis and opinions, as set forth below.

A. **PATENTABILITY**

24. I understand that for an invention claimed in a patent to be valid and patentable, it must, among other things, be new and not obvious in light of what was known and came before it. That which was known or came before subject matter is generally referred to as “prior art.”

25. I understand that there are two ways in which prior art may render a patent

claim unpatentable. First, the prior art can be shown to “anticipate” the claim. Second, the prior art can show that the claim would have been “obvious” to a POSITA at the time of filing of the patent.

1. ANTICIPATION

26. It is my understanding that anticipation is a question of fact that is determined from the perspective of a POSITA as of the filing date of the patent. I also understand that the standard for anticipation in an *inter partes* review proceeding is by “a preponderance of the evidence” (which I understand means “more likely than not”).

27. It is my further understanding that a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior-art reference.

28. I understand that if the prior-art reference does not expressly set forth a particular claim element, the prior art may still anticipate if that element is “inherent” in its disclosure. It is my understanding that to establish inherency, the evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference.

29. I understand that if a claim recites alternatives, for example, in the format “selected from the group consisting of A, B, and C,” anticipation of the entire claim limitation can be achieved through prior art that discloses one alternative, for example, a prior art reference that simply discloses B.

30. I understand that when a patent claims a range, that range is anticipated by a prior-art reference if the reference discloses a point within the range. I also understand that if the prior art discloses its own range, the prior art is still anticipatory if the ranges overlap.

2. OBVIOUSNESS

31. It is my understanding that obviousness is a question of law with underlying factual inquiries that are determined from the perspective of a POSITA at the time of filing. I also understand that the standard for obviousness in an *inter partes* review proceeding is by a preponderance of the evidence.

32. It is my understanding is that an obviousness analysis requires consideration of the following underlying factual inquiries:

- determining the scope and content of the prior art;
- ascertaining the differences between the claims at issue and the prior art;
- resolving the level of ordinary skill in the art; and

- evaluating “objective evidence” or “secondary considerations” of non-obviousness, such as commercial success, long-felt but unresolved needs, failure of others, copying of the invention, praise and recognition of the invention by others, licensing of the rights to the invention, and unexpected results.

33. It is my understanding that a prior art reference must be analogous art to the challenged claims in order to be properly considered for use in an obviousness inquiry. It is my understanding that a reference is analogous art to the challenged claims if:

- the reference is from the same field of endeavor as the challenged claims (even if it addresses a different problem); or
- the reference is reasonably pertinent to the problem faced by the inventor (even if it is not in the same field of endeavor as the challenged claims).

34. It is my understanding that whether a reference is reasonably pertinent depends on how the problem faced by the inventor is reflected, either explicitly or implicitly, in the specification.

35. It is my understanding that the following are exemplary rationales that may

support a conclusion of obviousness:

- 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 method or product in the same way;
- d) Applying a known technique to a known method or product ready for improvement to yield predictable results;
- e) “Obvious to try”, i.e.— choosing from a finite number of identified, predictable solutions with a reasonable expectation of success;
- f) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations would have been predictable to a POSITA; and
- g) Some teaching, suggestion, or motivation in the prior art that would have led a POSITA to modify the prior-art reference or to combine prior-art

reference teachings to arrive at the challenged.

36. It is my understanding that the analysis of obviousness may include recourse to logic, judgment, and common sense available to the person of ordinary skill in the art that does not necessarily require explicit explanation in any reference.

3. PRIOR ART

37. I understand that, for the purposes of this proceeding, prior art includes patents filed and printed publications appearing in or outside the United States before the Effective Filing Date of the patent. I understand that prior art includes U.S. patents, published U.S. patent applications, and published international applications (pursuant to the Patent Cooperation Treaty) that themselves have a filing date before the Effective Filing Date, as long as they name another inventor.

38. I have been instructed to assume in my analysis, that, for the purpose of determining what is “prior art, the date of June 3, 2013¹ is the effective filing date of the ’739 patent (“Effective Filing Date”). In other words, I should consider as “prior art” any patents or publications that were publicly available prior to the Effective Filing Date, as well as any patent or patent application publication, to someone other than the named inventors of the ’739 patent, having a filing date

¹ Filing date of Provisional application No. 61/1830,284

before the Effective Filing Date of the '739 patent. I further understand that for purposes of this proceeding before the United States Patent Trial and Appeal Board, only documents that have the legal status of a "printed publication" may be relied upon as prior art.

4. SUMMARY OF '739 PATENT

39. The '739 Patent is entitled "Photovoltaic In Line Fuse Connector Assembly Having An Integral Fuse" and issued on June 3, 2014 with Dean Solon listed as the sole inventor. The abstract of the '739 Patent states:

A photovoltaic in line connector assembly has an integral fuse, and is double molded to provide electrical insulation, protection and strain relief. The assembly can be integrated with, or added to, a wiring harness for a photovoltaic installation, thereby providing one fuse per solar panel. The assembly may include zero, one, or two connectors that are male, female, or one of each.

40. Solar energy may be converted into usable electrical energy by photovoltaic solar panels, which may be connected to the grid or a power load. Conventional solar installations that can collect solar energy include solar panels that are interconnected by a "wire harness," i.e., wires that carry electricity. '739 patent at 1:25-32. Numerous solar panels connected together are called an "array." *Id.* The wire harness carries the electricity gathered by the solar array to a "combiner box," which includes a plurality of fuses. *Id.* Multiple combiner boxes are electrically

coupled to a central “recombiner box.” Fig. 1 of the ’739 patent provides an overview of this example of a basic prior art configuration for a solar power installation.

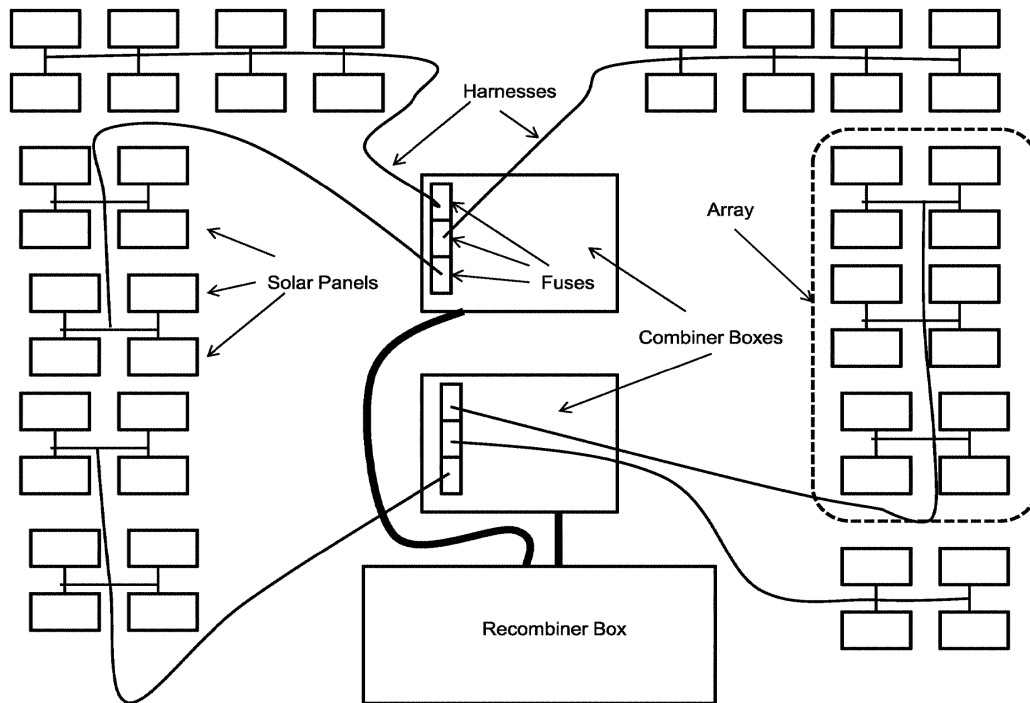


FIG. 1 – PRIOR ART

EX 1001, Figure 1.

41. In the above configuration, when a single solar panel within a solar array malfunctions, the shared fuse operates as a protection device and causes that entire solar array to shut down. *Id.* at 1:33-36. Instead of using one fuse for an entire solar array, Shoals alleges the “invention” disclosed in the ’739 patent is to use one fuse per solar panel. *Id.* at 1:49-62. In addition, by moving the fuses from the combiner boxes to the wire harness, the ’739 patent alleges that circuit protection can be

moved from the combiner boxes to the wire harness, which reduces the number of combiner boxes required. *Id.* at 1:55-62. And when there is a malfunction, a fuse within the wire harness would trip and allow the other solar panels in the array to continue to function normally and continue to provide power. *Id.* at 2:57-63. Fig. 4 of the '739 patent illustrates the fuses moved to the wire harnesses.

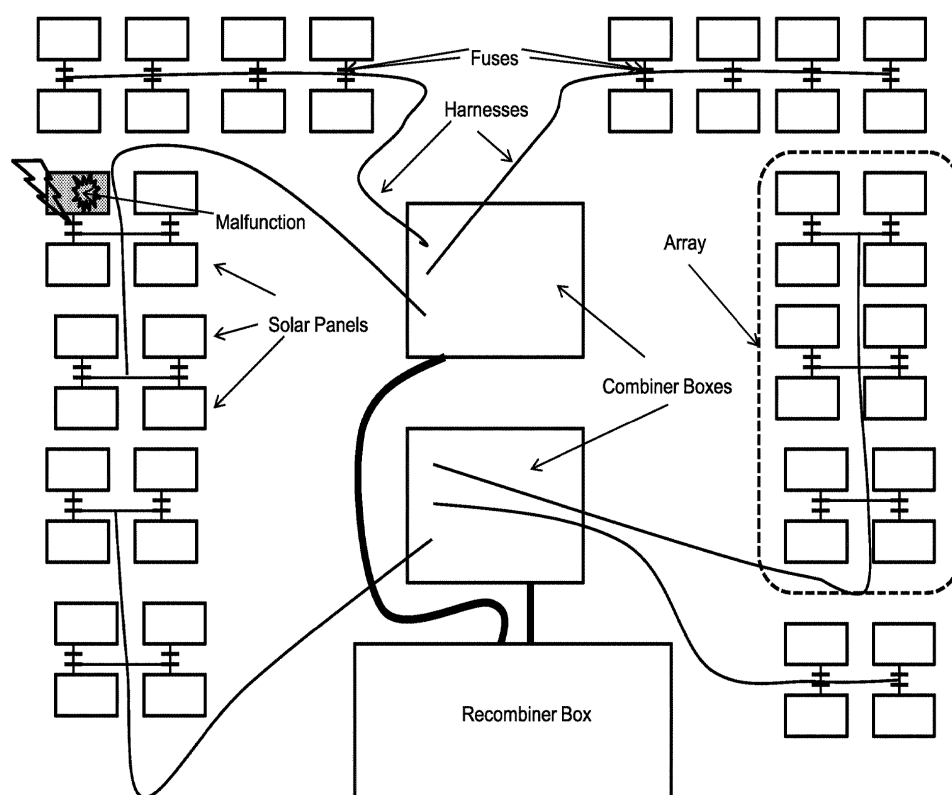


FIG. 4

EX 1001, Figure 4.

42. In 2010, four years before the '739 patent application was filed, Patent Owner (PO) filed the U.S. Patent Application Publication No. 2011/0209741

entitled “Solar Energy Wire Harness with In-Line Fuses.” In this patent application, PO has disclosed the use of in-line fuses to reduce the number of combiner boxes by moving the fuses onto the wire harness. PO did not disclose this related patent application to the examiner. EX 1008, cover page; EX 1001, cover page.

43. To position the fuses within the wire harness, the ’739 provides a description of a double mold process for in-line packaging of the fuse. This process surrounds the fuse with two layers of different materials, to provide electrical insulation, protection, and strain relief. (EX 1001, Abstract). The design of these double molded fuses as disclosed are the focus of the claims, with the four claimed elements: (i) a photovoltaic fuse; (ii) an undermold that surrounds and seals the fuse; (iii) an overmold that surrounds the undermold; and (iv) a connector engaged with the photovoltaic fuse. (EX 1001, Figs. 5-8, and 4:28-42)

5. PROSECUTION HISTORY

44. The application that issued as the ’739 patent, U.S. Patent Application No. 14/295,132, was filed on 6/3/2014, claiming priority to a provisional application that was filed 6/3/2013. EX1001, Cover page.

45. During the initial stages of prosecution, the Examiner issued a restriction requirement, and Patent Owner (PO) elected to have claims 1-9 (FIGS. 5-12) examined, which were directed to an in-line fuse and its structure. EX1002, pp.408-

415. These claims were rejected multiple times under 35 U.S.C. § 103 based on various combinations of prior art references, such as: Darr, Blaha (U.S. Pub. 2013/0037294), Stepniak (U.S. 5,903,209), Jonczyk, Quiter (U.S. Pub. 2011/0104925), Loet (U.S. 5,316,502), Kono, and Yen (U.S. Pub. 2010/0207716). *Id.* at 385-90. There were a total of seven (7) Office Actions rejecting the claims and six (6) amendments. *Id.* During prosecution the Examiner searched not only in the solar field for prior art, but also in international classification H01H which is related to “ELECTRIC SWITCHES; RELAYS; SELECTORS; EMERGENCY PROTECTIVE DEVICES” such as generic fuses. EX1001, Cover.

46. On 8/8/2017, PO responded, in part, to an Office Action by removing the limitation of “double molded,” and adding limitations reciting that the undermold acts for “sealing” said fuse, and providing that the undermold and overmold each are formed as a “single unit” and are each constructed of dissimilar materials. *Id.*, pp.324,328. PO argued that the new language would overcome Blaha’s multiple-piece design because Blaha’s multiple-piece design would not seal the fuse. *Id.* PO also argued that a “single unit” undermold could not be formed from two separate pieces which are assembled in any manner. *Id.* Instead, a “single unit” undermold is asserted to be a unit formed as a single piece during production, and Shoals made a similar argument regarding the overmold. *Id.*

47. PO then later responded on 5/10/19 to an Office Action by amending claim 1 to recite in part “A photovoltaic fuse having a solid outer surface including...a second end and a middle section there between...said solid outer surface defining an outline...the outline of said fuse solid outer surface”. *Id.*, pp.130. PO argued that the claim language is limited to only photovoltaic fuses and not fuses in general, and thus Yen is not analogous art. *Id.*, pp.134. PO further argued that Yen does not teach a fuse having an outline nor a fuse having a solid outer surface. *Id.*, pp.135-37. In a 5/21/19 non-final Office Action, claims 1-9 were again rejected and the rejection under Yen was maintained. *Id.*, pp.87-94.

48. On 8/21/19, PO initiated an Examiner Interview and then amended claim 1, in part as follows: “defining an outer surface outline, wherein the outer surface outline of said undermold ~~has a similar contour and orientation~~ is substantially parallel...wherein the outline of said overmold ~~has a similar contour and orientation~~ is substantially parallel”. *Id.*, pp.75-76. The claims were also amended to recite that the overmold is “substantially parallel” to the outline of the undermold. *Id.* The language “substantially parallel” was used to address the Examiner’s concerns about “similar contour and orientation” being indefinite. *Id.*, p.80-82. PO admits that the specification did not recite, verbatim, the newly added “substantially parallel” limitations. *Id.* Rather, PO claimed that these limitations would be

understood to a person of ordinary skill in the art based on the originally cited specification, citing FIGS. 7-9. *Id.* PO also argued that the amended claims overcame Stepniak because the outer surface of Stepniak's undermold was not substantially parallel to the outline of the outer surface of the fuse. *Id.*

49. A Notice of Allowability issued on 9/30/19 in which the restriction requirement was withdrawn pursuant to an Examiner's Amendment. *Id.*, pp.21-24. The Examiner Amendment included amendments to independent claims 10 and 15 effectively including limitations from final amended claim 1. *Id.*, pp.25-26.

6. CLAIM CONSTRUCTION

50. I have been informed and understand that patent claims are construed from the perspective of one of ordinary skill in the art at the time the claimed invention was made and that, during this proceeding, claims are construed using the same claim construction standard that would be used to construe the claim in a civil action. Under that standard, claim terms are to be given their plain and ordinary meaning, which is the meaning understood by a POSITA in light of the claim language, patent specification, and prosecution history.

51. I also understand that some claims are independent and are thus complete by themselves. Other claims that refer to such independent claims are deemed "dependent" on those independent claims. A dependent claim is

sometimes said to “depend from” its independent claim. A dependent claim includes all the limitations of the independent claim and any intervening claim(s) on which it depends.

52. I understand that, in parallel litigation, some claim terms in the ’739 patent have been construed by the ITC. I describe these claim constructions briefly below and have adopted them for the purposes of my opinion in this declaration. I note, however, that due to the structural nature of the claims and prior art, the Grounds presented below are consistent with these constructions but do not rely on them for a finding of obviousness unless otherwise noted.

53. “Undermold”: The ITC construed “the term ‘undermold’ to mean ‘material molded over a piece or part that seals against environmental factors and is surrounded by the overmold.’ The undermold may be—but need not be—the ‘innermost mold.’” EX1023, pg. 17,20. This construction is consistent, in my opinion, with the plain and ordinary meaning of this term in the context of the claim as would have been understood by a POSITA.

54. “Engaged with”: The ITC construed “‘photovoltaic connector engaged with said [first/second] end’... to mean ‘photovoltaic connector physically or mechanically connected to the corresponding said [first/second] end.’ The

limitation is not met by simply an electrical connection via wire.” EX1023, pg. 34.

This construction is consistent, in my opinion, with the plain and ordinary meaning of this term in the context of the claim and patent drawings as would have been understood by a POSITA.

55. “Outline of said overmold”: The ITC construed the relevant comparison required by “wherein the outline of said overmold is substantially parallel relative to the outline of said undermold” is to the outer surface of the undermold. EX 1023, pg. 22-23. This construction is consistent, in my opinion, with the plain and ordinary meaning of this term in the context of the claim as would have been understood by a POSITA.

III. **SUMMARY OF OPINIONS**

56. For reasons described in more detail in this Declaration, my overall opinion is that claims 1-5, 7, 10-13, and 15-18 of the '739 patent are obvious in light of the following grounds put forth by Petitioner below:

- **GROUND 1:** Claims 1-5 are unpatentable under 35 U.S.C. § 103(a) as obvious based on Fan (EX 1009), Ba (EX 1011) and Yen (EX 1006).

- **GROUND 2:** Claim 7 is unpatentable under 35 U.S.C. § 103(a) as obvious based on Fan (EX 1009), Ba (EX 1011), Yen (EX 1006), and Darr (EX 1007).
- **GROUND 3:** Claims 10-13 and 15-18 are unpatentable under 35 U.S.C. § 103(a) as obvious based on Solon (EX 1008), Fan (EX 1009), Ba (EX 1011) and Yen (EX 1006).
- **GROUND 4:** Claims 1-5 are unpatentable under 35 U.S.C. § 103(a) as obvious based on Ye (EX 1005) and Gilman (EX 1004).
- **GROUND 5:** Claim 7 is unpatentable under 35 U.S.C. § 103(a) as obvious based on Ye (EX 1005) and Gilman (EX 1004) and Darr (EX 1007).
- **GROUND 6:** Claims 10-13 and 15-18 are unpatentable under 35 U.S.C. § 103(a) as obvious based on Solon (EX 1008), Ye (EX 1005) and Gilman (EX 1004).
- **GROUND 7:** Claims 1-5 are unpatentable under 35 U.S.C. § 103(a) as obvious based on Ba (EX 1011), Ye (EX 1005), and Yen (EX 1006).
- **GROUND 8:** Claim 7 is unpatentable under 35 U.S.C. § 103 as obvious based on Ba (EX 1011) Ye (EX 1005), Yen (EX 1006), and Darr (EX 1007).

- **GROUND 9:** Claims 10-13 and 15-18 are unpatentable under 35 U.S.C. § 103 as obvious based on Solon (EX 1008), Ba (EX 1011), Ye (EX 1005), and Yen (EX 1006).

IV. LEVEL OF ORDINARY SKILL IN THE ART

57. Based on my knowledge and experience, it is my opinion that a person having ordinary skill in the art (POSITA) would have had a Bachelor of Science degree in electrical engineering, mechanical engineering, materials science, or an equivalent field, and two years of professional experience relating to electrical wiring and connectors. Lack of professional experience could be remedied by additional education, and vice versa.

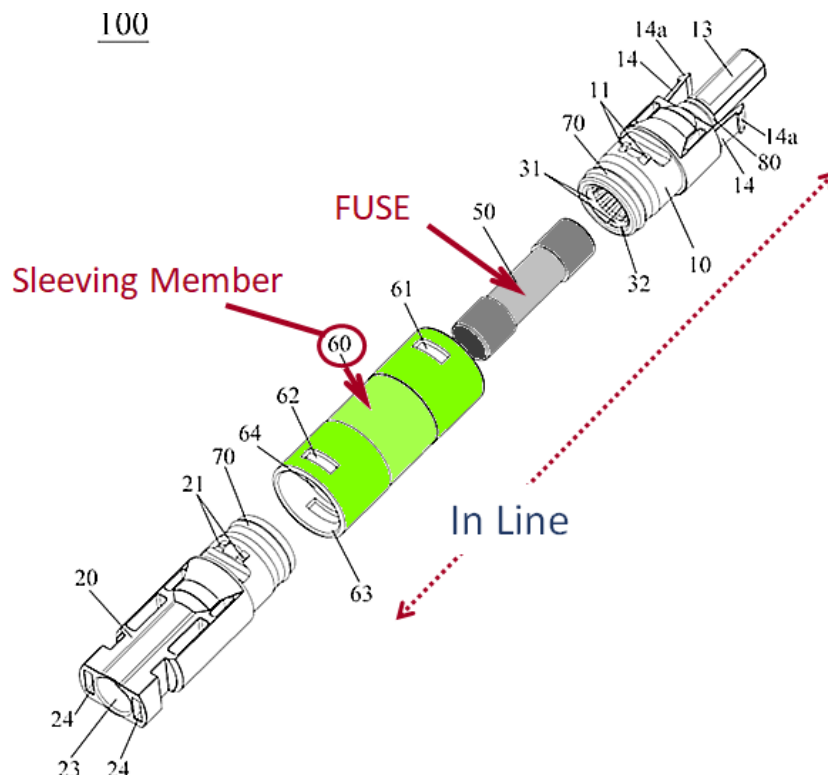
58. I understand that the patent owner has challenged my qualifications as an expert for consideration of the '739 Patent. In the parallel ITC proceedings, the patent owner has asserted that two years of experience with an understanding of Balance of Systems Components for utility-scale photovoltaic power installations is required. This is a substantial overstatement of the requirements for understanding of the '739 Patent, especially since the claims of the '739 Patent are not limited to utility-scale photovoltaic power installations, and their focus is instead more generally directed to electrical wiring and connectors.

V. **SUMMARY OF THE PRIOR ART**

59. In the analysis to follow, I cite several prior art references which are summarized below.

Chinese Patent Application No. CN 102568970 (Ba) – EX 1011

60. Chinese Patent No. CN 102568970 to Ba was published on July 11, 2012. This date precedes the June 3, 2013 Effective Filing Date of the '739 patent, hence Ba is prior art to the '739 patent. Ba is entitled “Fuse Holder for Solar Photovoltaic Power Generation System”. Ba discloses “a fuse holder for a solar photovoltaic power generation system” (Ba, Abstract). The principal embodiment of Ba is disclosed in Fig. 2, shown below, which is an exploded view of a fuse holder 100. A key feature of Ba is the cylindrical structure 60, which Ba terms the “sleeving member” (*Id.*, ¶[0030]) that when assembled, “is located outside the fuse” (*Id.*, ¶[0011]).



EX 1011, Fig. 2 (annotated)

61. Ba explains that one purpose of its invention is to improve “the contact reliability and shock resistance reliability of the fuse” when used in a “solar photovoltaic power generation system.” (*Id.*, ¶[0007]). Ba discloses the ability of the invention to seal the fuse via “a sealing engagement and sleeving manner”. (*See, e.g., Id.*, claim 5). A stated objective of Ba is thus to disclose a fuse holder that has better protection for the fuse than existing fuse holders, particularly “to work in an outdoor environment.” (*Id.*, ¶¶[0030], [0041]).

US Patent Application No. 2013/0257580 (Gilman) – EX 1004

62. US Patent Application No. 2013/0257580 to Gilman, entitled “Fuse End Cap with Crimpable Terminal”, was filed on March 27, 2013. This date precedes the June 3, 2013 Effective Filing Date of the ’739 patent, hence Gilman is prior art to the ’739 patent. The Gilman application eventually issued as US Patent 9,564,281 to Gilman.

63. The focus of Gilman is a “fuse end cap for providing an electrical connection between a fuse and an electrical connector.” (EX 1004, Abstract.) Inasmuch as the focus of the ’739 patent is providing for such a fuse connection in solar applications, Gilman is analogous art to the ’739 patent. Gilman doesn’t explicitly disclose a photovoltaic fuse, but a POSITA would understand that the disclosure of Gilman could be applied to a photovoltaic fuse as all of the characteristics of the fuse in Gilman (e.g., shape, connectors, need for molding to protect from environmental factors) are similar to the requirements for a photovoltaic fuse to be used in an outdoor solar installation.

64. Gilman discloses a fuse having two ends and a central portion (see EX 1004, Fig. 1B below) covered by a “protective wrapping or coating” [see Fig. 5 below, green] ...that may be made of thermoplastic material, including but not limited to polyolefin, fluoropolymer, PVC, neoprene, silicone elastomer, VITON, etc.”, where

the protective wrapping can also be of the heat-shrinkable type. (EX 1004, ¶[0034]).

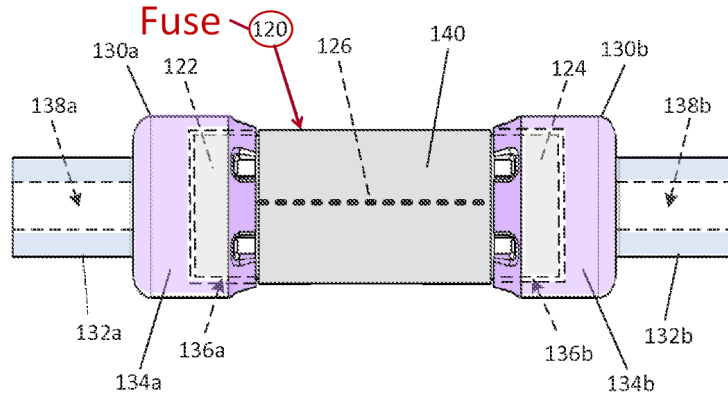
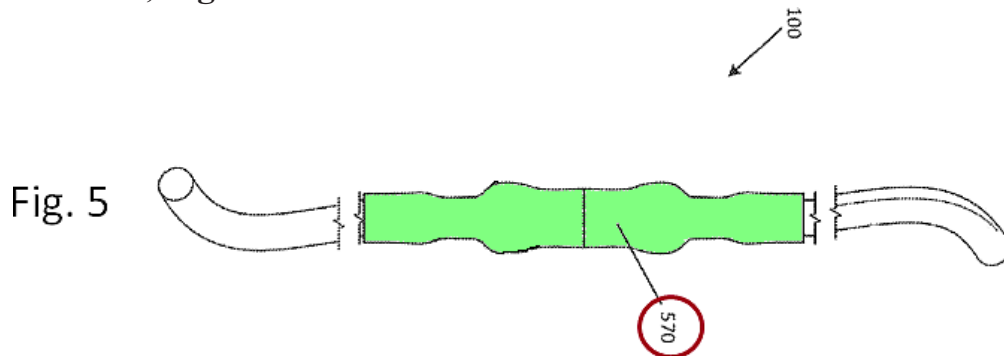


FIG. 1B

EX 1004, Fig. 1B.



Id., Fig. 5 (annotated)

Gilman also discloses an “over-molding or molded housing...over the protective wrapping 570...for providing further protection against damage and environmental elements.” (*Id.*, ¶[0036]). Gilman thus discloses the use of an overmold put over an undermold to further weatherize and protect the fuse.

Chinese Patent CN 201994507 (Ye) – EX 1005

65. Chinese Patent CN 201994507 to Ye, entitled “Solar Cell Connecting Line”, was published on September 28, 2011. This date precedes the June 3, 2013

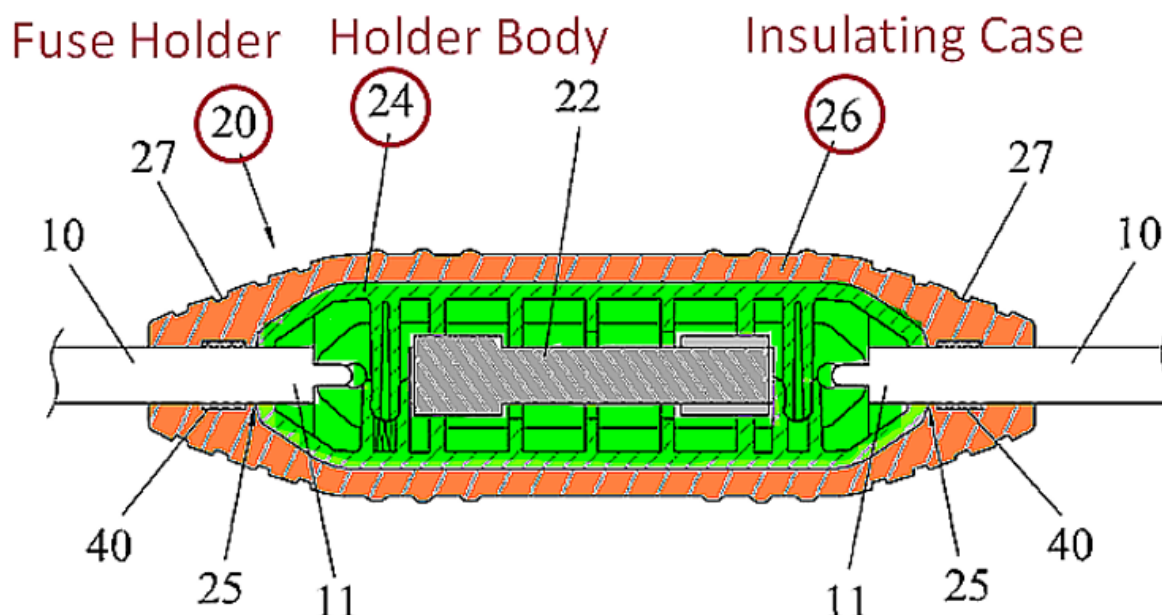
Effective Filing Date of the ’739 patent, hence Ye is prior art to the ’739 patent.

The focus of Ye is on a “solar cell connecting line comprising a fuse holder” (EX 1005, Abstract). The fuse holder disclosed in Ye is “waterproof, corrosion-resistant and well-sealed, and meets the requirements for use in harsh outdoor environmental conditions, [thus] ensuring stable and reliable operation of the solar cell.” *Id.*

66. The principal embodiment of Ye is disclosed in Fig. 2, shown below. A key feature of the structure is the fuse holder 20 having an “insulating case 26” and a “holder body 24”. Ye describes the case 26 as an “overmold” (*Id.*, ¶[0012]). Ye explains that the outer case is “...waterproof, corrosion-resistant, UV-resistant and well-sealed, and meets the requirements for use in harsh outdoor environmental conditions.” The structure of Ye, thus, serves the purpose of better enabling outdoor wiring installations in a solar-power generating system. As such, a POSITA would understand that the fuse in a solar cell connecting line is a photovoltaic fuse.

67. As Ye explains, “...solar cells are generally used and set up in outdoor

environments where the climate is harsh and variable” with “...exposure to the sun and rain.” (*Id.*, ¶[0002]). Ye thus underscores the “need for a waterproof, corrosion-resistant and well-sealed connecting line which has an overload protection function.” *Id.*



EX 1005, Fig. 2 (annotated)

US Patent Application 2010/0207716 (Yen) – EX 1006

68. US Patent Application 2010/0207716 to Yen was filed on April 17, 2008 and published on August 19, 2010, both of which precede the June 3, 2013 Effective Filing Date of the '739 patent by more than a year. The title for Yen is “overcurrent protection structure and method and apparatus for making the same” and its focus is on a fuse that does not deteriorate under high temperature and operates in many

environments.

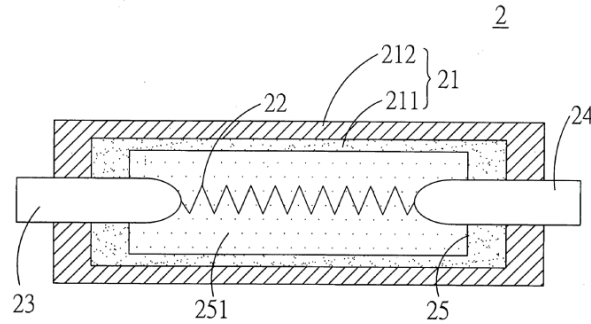
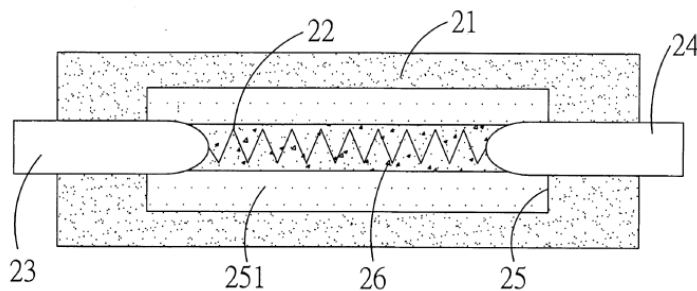


FIG. 3

EX1006, Fig. 3

69. The overcurrent protection structure disclosed in Yen mainly comprises a fusible fuse structure unit disposed in a coating, and both ends of the fusible fuse structure unit extend outwardly beyond the coating and form a first electrode 23 and a second electrode 24. Figure 4 of Yen below shows more fuse detail, while Figure 3 above shows that the coating 21 may be formed of two separate layers.

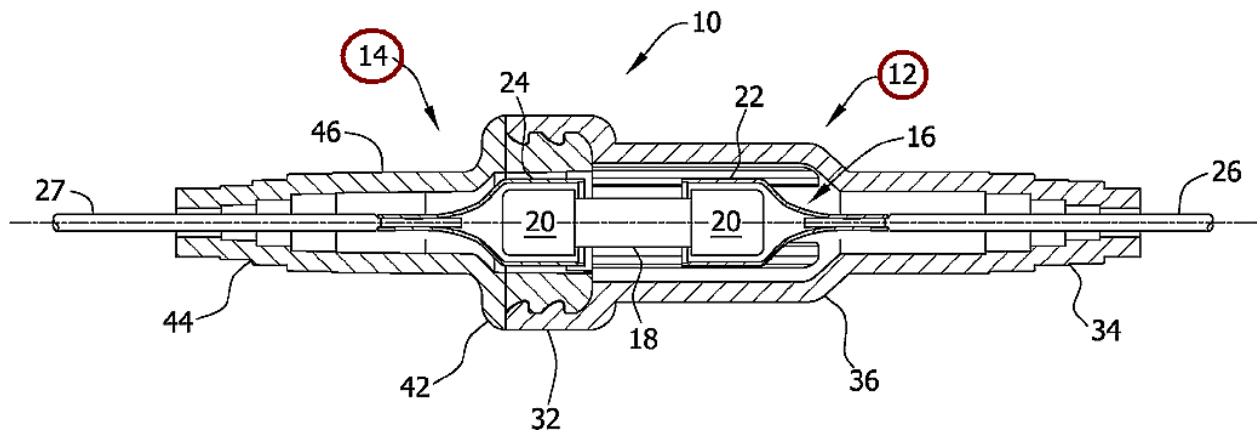


EX1006, Fig. 4.

70. The coating 21, which encapsulates the fusible fuse structure unit 22, is formed by means of an arc-resistant material and a gas-assisted injection molding process, and the space 25 between the fusible fuse structure unit 22 and the coating 21 is simultaneously formed. (EX 1006, ¶¶[0008], [0021]).

US Patent Application 2012/0309232 (Darr) – EX 1007

71. US Patent Application 2012/0309232 to Darr was filed on June 2, 2011. This date precedes the June 3, 2013 Effective Filing Date of the '739 patent, hence Darr is prior art to the '739 patent. The title of Darr is “Inline Fuse Holder Assembly”, and its focus is an inline fuse holder that is “substantially waterproof [and] non-releasable upon connection”. An exemplary embodiment of Darr’s invention is disclosed in Fig. 3, shown below:



EX 1007, Fig. 3 (annotated)

Darr discloses that two key components, the “first and second fuse holder

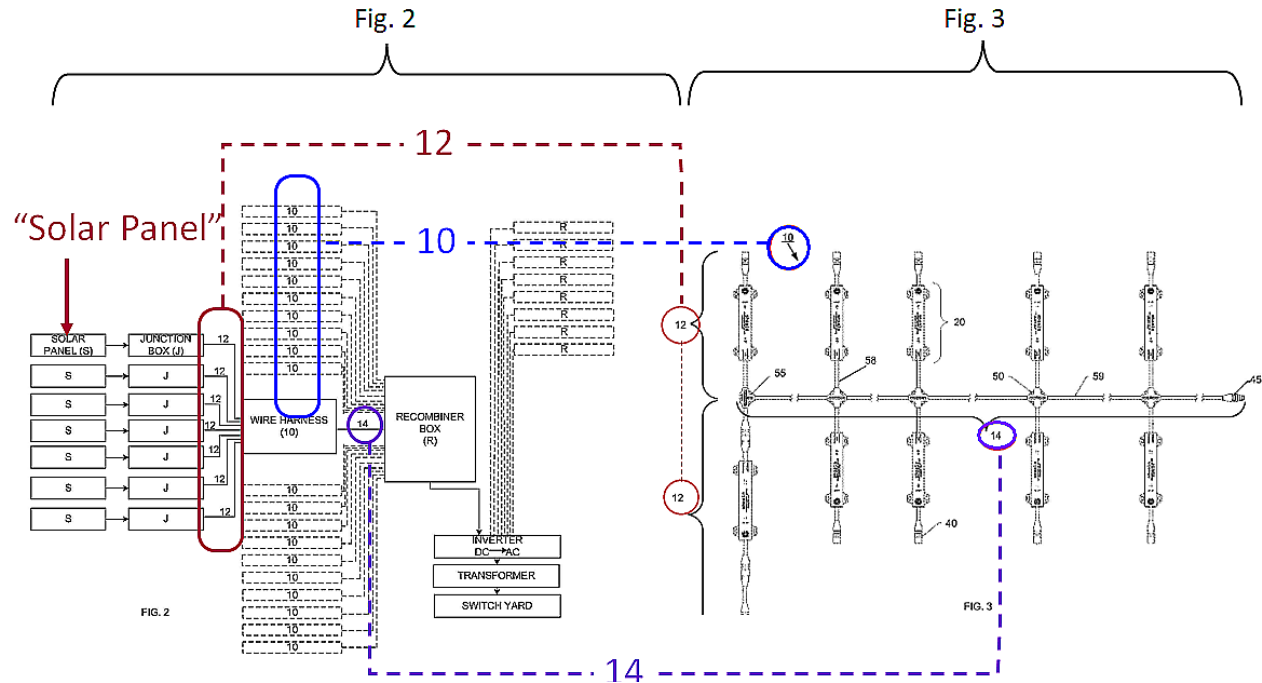
components 12, 14 (see Fig. 3 above) can also be formed as a one-piece component by molding using a “substantially waterproof, electrically insulating material.” (EX 1007, ¶[0024]). Darr specifies one type of such a suitable material in the form of a “thermoplastic rubber (also called ‘thermoplastic elastomer’)” having a hardness rating on the “Shore A” scale between 50 and 75.² As to applications for the disclosed invention, Darr states that, “Among several applications, the inline fuse holder may be used in solar photovoltaic systems” and “solar panels”. (*Id.*, ¶¶[0003], [0013], [0015]). Thus, Darr links the use of thermoplastic elastomers with designs for in-line fuse holders for solar power applications. As such, a POSITA would understand that the in-line fuse assembly for a “solar photovoltaic system” would include a photovoltaic fuse.

US Application 2011/0209741 (Solon) – EX 1008

72. US Application 2011/0209741 to Solon (“Solon”) was published on September 1, 2011. This date precedes the June 3, 2013 Effective Filing Date of the ’739 patent, hence Solon is prior art to the ’739 patent. The title of the Application is “Solar Energy Wire Harness with In-Line Fuses”. Solon “relates generally to components used in the solar energy industry” and focuses on wire harnesses for

² The Shore A scale is one measure of the hardness of a thermoplastic elastomer as measured by a device called a “durometer”

solar applications. (EX 1008, ¶[0002]). The combined figure below shows a typical solar power system array:

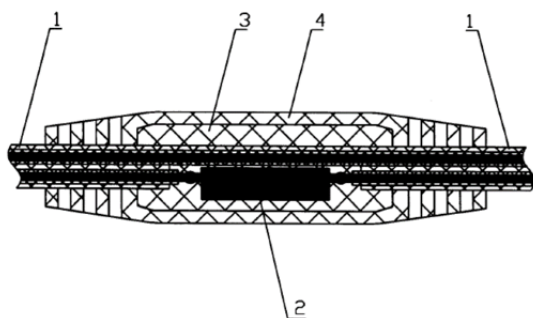


EX 1008, FIGS. 2 and 3 (combined with annotation)

Solon also adds the element of inline fuse holders. In particular, Solon discloses that, “[t]he in-line fuse assembly may include a variety of fuse types, such as midget fuses and/or 1000-V fuses. Of particular note is the current range disclosed in Solon, namely “an ampacity of 2 to 30 amps” (*Id.*, ¶[0033].) Similarly, Solon discloses fuse voltage ranges of 500 – 1500 V and 600 – 1000V. (*Id.*, [0030]). Further, a POSITA would understand that the in-line fuse to be used in a "solar energy wire harness line” is a photovoltaic fuse.

CN Patent 2562350 Y (Fan) – EX 1009

73. CN Patent 2562350 Y to Fan was published on January 20, 2011. This date precedes the June 3, 2013 Effective Filing Date of the '739 patent, hence Fan is prior art to the '739 patent. The title of the Fan patent is “overcurrent protection device disposed on power supply line.” Fan discloses an interest in solving the “problem of waterproofing” in prior art devices, which would be of interest to a POSITA interested in systems for use in outdoor applications. The device disclosed in Fan is an overcurrent protection device disposed on a power supply line, including a power supply line, a fuse and an insulating layer, the fuse being series-connected in the power supply line, and a junction between the fuse and the power supply line being encased by the insulating layer; two ends of the fuse are each provided with a pin; a fusible body of the fuse is encapsulated in a ceramic tube; and the insulating layer is two or more layers. (EX 1009, Abstract) The cross-sectional structure of this device is shown in Fig. 3 of Fan below.



EX 1009, Fig. 1

74. The device disclosed in Fan consists of a power supply line 1, a fuse 2, an inner insulating layer 3 and an outer insulating layer 4, wherein the fuse 2 consists of pins 2.1, a fusible body 2.2 and a ceramic tube 2.3. This assembly has good water resistance and low cost. (EX 1009, pg. 2) As described by Fan, “after two or more injection molding operations, the device is waterproof, as well as being structurally simple, convenient to operate, and low-cost”, indicating that the disclosure of two or more injection molding operations is intended to provide an assembly for an in-line fuse that provides waterproofing and low cost.

75. Notably, throughout all of these prior art references, those that explicitly disclose photovoltaic fuses or fuses to be used in a solar photovoltaic system, a “solar energy wire harness”, or other solar energy applications, there is no mention in any disclosure of any unique characteristics of a photovoltaic fuse that would impose special constraints or requirements on the design of the assembly. In all cases, as described with respect to the embodiments discussed in these disclosures, a photovoltaic fuse is the same as an ordinary fuse. A POSITA would appreciate that the characteristics of fuses that might distinguish a photovoltaic fuse from a more generic fuse are generally associated with the current and voltage requirements of solar array applications. Besides these requirements, the common features of electrical connections to the ends of a cylindrical fuse and the need for

molded layers to protect the fuse from environmental factors are common to photovoltaic and ordinary outdoor electrical installations. A POSITA would have considered the features disclosed by any of these references as providing benefits that would apply to any combination of these references, because the fundamental issues and challenges of the applications of photovoltaic fuses and ordinary fuses are the same.

VI. **GROUND FOR INVALIDITY**

76. In the following sections, I present my opinions as to why the '739 patent claims 1-5, 7, 10-13, and 15-18 are obvious in light of the prior art. There are nine grounds for invalidity of these claims.

❖ **GROUND 1 – Claims 1-5 are unpatentable under 35 U.S.C. § 103 as obvious based on Fan in view of Ba and Yen**

77. As noted above (see list under Summary of Opinions), Ground 1 is based on Fan together with Ba and Yen. Fan provides solutions in the same field of endeavor as the '739 patent at least because Fan describes “overcurrent protection device disposed on power supply line” which is directly applicable to power supply lines from solar panel arrays. (EX 1009, Title, pg. 3, lines 5-10). Likewise, Fan is directed at solving the same problems as the systems described in the claims of the '739 patent including easy and efficient overcurrent protection for power lines, as well as waterproofing and low cost. (EX 1009, pg.

3; EX 1001, col. 1, lines 50-63, col. 4, lines 25-45) Therefore, Fan is analogous prior art to the '739 patent.

78. Ba provides solutions in the same field of endeavor as the '739 patent at least because Ba relates to “a fuse holder for a solar photovoltaic power generation system”. (EX 1011, Abstract). Therefore, Ba is analogous prior art to the '739 patent.

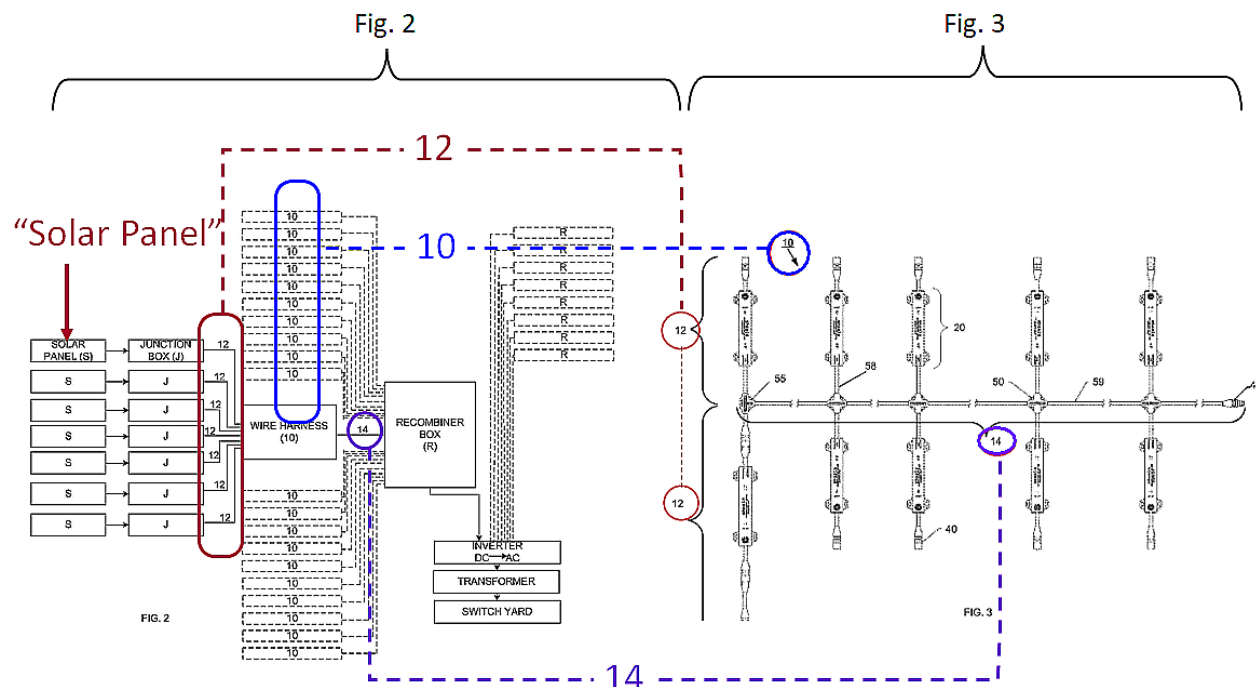
79. Yen provides solutions in the same problems addressed in the '739 patent at least because Yen relates overcurrent protection devices and structures for protecting those devices. (EX 1006, ¶¶[0007]-[0008]). Therefore, Yen is analogous prior art to the '739 patent.

80. A POSITA would have been motivated to combine Fan and Ba. Fan relates to in-line fuses with plug connectors for power supply lines. Fan discloses that its in-line fuse is designed to use two or more molded protection layers to provide waterproofing to protect the fuse from the environment and also to be simple, convenient and low-cost. (EX 1009, pg. 3, lines 25-35) Fan teaches inserting the in-line fuse directly into the power supply line in order to avoid the inconvenience and cost of developing the in-line fuse assembly with different connectors for different applications. (EX 1009, pg. 3, lines 14-25) For systems that use plug ends and connectors throughout the system, a POSITA would be

motivated to add plug-type connectors to the waterproof, in-line fuse of Fan.

81. Because solar power systems involve arrays of solar panels in a hierarchical connection configuration, connectors are essential to the construction and wiring of the system. Therefore, a POSITA applying the simple construction methods of the in-line fuse of Fan to solar array power lines would be motivated to splice in the inline fuse into a power line that included connecting plugs as described in Ba.

82. Ba discloses “the fuse holder being configured to be electrically connected between an input cable and an output cable in the solar photovoltaic power generation system.” As noted previously, solar power installations typically involve large arrays with many connectors at each level. (See EX 1008, combined figures 2, and 3)



EX 1008, FIGS. 2 and 3 (combined with annotation)

In the solar industry, such connection arrangements make scaling easier and more efficient. Accordingly, a POSITA applying the power line fuses of Fan to the power lines of a large-scale solar power system would look to devices like that of Ba with plug connectors that are adapted for solar array use. A POSITA would have expected success because the in-line fuses with connectors disclosed by Ba include detailed descriptions of the structure and connectors and simple instructions for assembly and disassembly from the main power lines of the solar assembly. For example, Ba states: “to achieve more convenient and easier assembly and disassembly between the fuse holder 100 for a solar photovoltaic power generation

system according to the present invention and the input cable and the output cable, the input cable and the output cable are each provided with a plug-in connection component.” (EX 1011, ¶[0039]. A POSITA would understand that the connectors and fuse of Ba together with the undermold/overmold of Fan and Yen are complementary. Further, a POSITA would have been motivated to insert the protected, plug-in, overvoltage fuse of combined Fan, Ba, and Yen in order to protect the system from overvoltage events such as arcs. (EX 1006, ¶[0026]). Formed together, a POSITA would have anticipated the combined benefits of the molded layers of Yen to provide protection for the fuse while also providing the connector assemblies of Ba to enable easy assembly and maintenance.

83. Because Ba provides these details of the in-line fuse and connector structure, along with these instructions, a POSITA would appreciate that installation and maintenance would be simple. Further, as the connectors in Ba are designed “the plug-in connection component on the input cable is a plug, the plug-in connection component on the output cable is a socket”, it is easy to insert an inline fuse at any location where there is a plug-to-socket connection already present in the array, and such connections can be incorporated into the overall system design, enabling insertion of the in-line fuses assemblies of Ba at convenient locations. (EX 1011, ¶[0016]).

84. Further, to achieve better protection from environmental damage including UV damage, and other aspects of ambient exposure, a POSITA would have been motivated to add to the waterproof protection of Fan and Ba. (EX 1011, ¶[0017]; EX 1009, pg. 3, lines 30-35) A POSITA, desiring to add more environmental protection as suggested in Ba, would look to similar devices that add protection and also use different materials that confer different, complementary protections. (*Id.*) Specifically, a POSITA would look to a disclosure like that of Yen which describes various materials for protecting fuses and the different advantages of these materials. (EX 1006, ¶[0020]). One of the disclosed advantages of the fuse arrangement of Yen is to prevent arcing, which is a catastrophic failure condition of insulation that allows high voltage to jump to another conductor. Therefore, Yen operates to improve the electrical insulative capacities of the protective shell of the in-line fuse with durable thermoplastics. A POSITA would have expected success in using the materials of Yen in the double-layered fuse protectors of Fan and Ba, because Yen also teaches using multiple layers of materials and describes multiple available materials which each have different properties.

85. As disclosed in Yen, the coating layer that serves as an overmold that provides arc protection can be made using crystalline or amorphous thermoplastics of many kinds (there is a long list in Yen), or from thermosetting resins of many

kinds, and even filled with hydrating inorganic materials. (EX 1006, ¶[0020]).

Further, “[t]he inner layer 211 can be made of an arc resistant material and the outer layer 212 can be made of an ordinary coating material so as to decrease the use of the arc resistant material, thereby further reducing the cost.” (*Id.*) A POSITA would understand that the ordinary coating material can provide protection from environmental factors, and would choose a material such as those in Fan to provide benefits that are complimentary to the arc resistant material that is of primary interest to Yen.

86. A POSITA would have modified the double layered injection molded protector of Fan by using dissimilar materials for added protection and modifying the external molding or overmold of Fan with a thermoplastic described by Yen. (EX 1006, ¶[0026]). A POSITA would consider dissimilar materials for these two layers so as to obtain the complimentary benefits of two different materials to extend the life and improve the reliability of the assembly. Also, as mentioned in Yen, it is possible to utilize a less expensive material for one of the layers so as to further reduce the cost of an assembly with a single layer made of more expensive material. (EX 1006, ¶[0020]).

Claim by Claim Analysis of Ground 1

87. I shall now examine each of the claim elements of claim 1 of the '739 patent, in light of Fan combined with Ba and Yen. The claim 1 preamble recites:

1. Claim 1

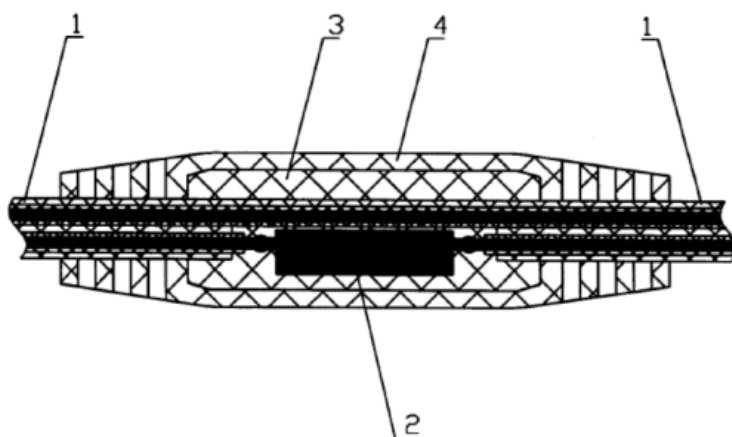
88. **Claim 1 (Preamble) - An in-line assembly for a solar installation including:**

89. To the extent that the preamble is limiting, the preamble to claim 1 requires an “in-line” assembly for a solar installation. The title of the '739 patent contains the term “in-line”, as does the first line of the Abstract. However, this term is not further defined anywhere in the '739 patent specification. As such, a POSITA would have understood this term by its plain and ordinary meaning, which is connectors for fuses that are in series with a connecting cable. The '739 patent does describe “in-line” as “the fuse [being] connected wire-to-wire” (EX 1001 at 1:52-53.)

90. As described above with regard to claim 1, preamble, the field of electrical engineering, the term “in line” [*sic*: inline] has a well-known meaning that would have been familiar to a POSITA. For example, the Merriam -Webster dictionary defines the word “inline” as “having the parts or units arranged in a straight line”. (EX 1014, pg. 4) A POSITA would have understood an “in-line assembly”

involving a photovoltaic fuse inserted end-to-end into the wire essentially co-axially.

91. An inline fuse holder is explicitly disclosed in Fan which describes “One wire is cut through; ends thereof ...are connected to the pins 2.1 at two ends of the fuse 2.” (EX 1009, pg. 4, lines 34-37). The connection of the fuse **between** the two ends of the cut wire defines the essence of an inline connection. Figures 1 from Fan, reproduced below, clearly show the fuse 2 being connected inline between the power supply line, along with a separate return line 1.



EX 1009, Figure 1

92. The in-line fuse of Fan is designed for power supply lines, which a POSITA would understand is directly applicable to solar power installations which supply power to the electric grid. (EX 1009, pg. 3) Further, a POSITA would have understood that a circuit is protected from overvoltage events by a fuse on either side of the current loop as illustrated in Fan in FIG. 1. Likewise, a

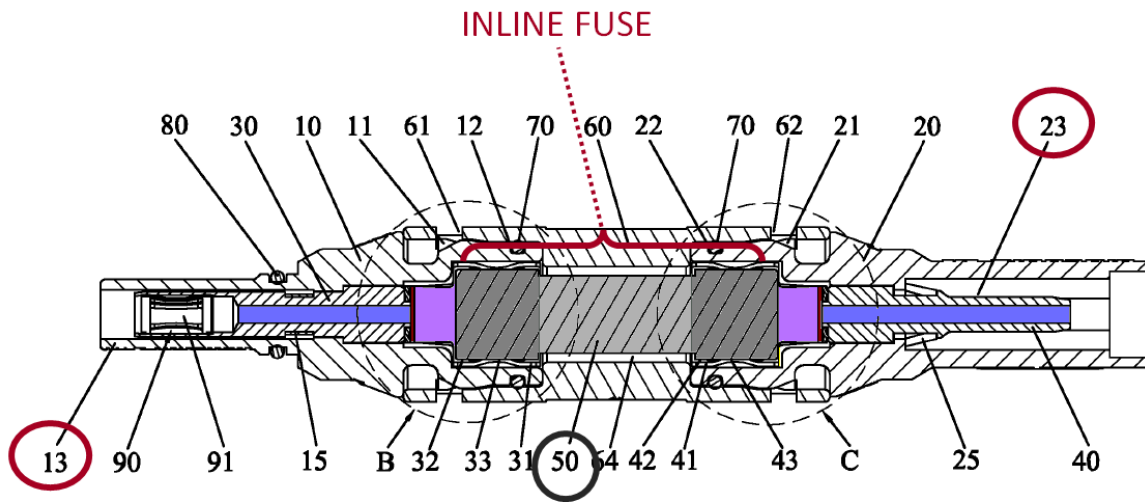
POSITA would have understood that the wires of a high voltage application such as a photovoltaic system should be separated to prevent arcs and protect each wire separately as described in Ba and Yen. (EX 1006, ¶¶[0026]-[0030]). For easy application and replacement of a fuse, a POSITA would have separated the wires of Fan such that only the fuse protected line is molded under layers $\frac{3}{4}$ and would have added connectors to the end of the separated wire and fuse.

93. To the extent that Fan does not explicitly teach the application of its in-line fuse to solar-based power supply lines in particular, Ba teaches this aspect of the intended use (to the extent that it is considered to be limiting).

94. Ba, as shown in figure 4 reproduced below, similarly shows fuse 50 (gray) connected in-line between connectors 13 and 23 (red circles) via wires and contacts (purple):³

³ For the purpose of clarity, the color-coding for the figures in this declaration will be as follows:

gray = fuse	green = undermold	orange = overmold
yellow = connector	blue = surface outline	purple = wires and contacts



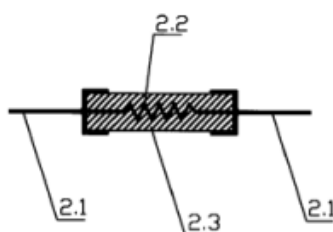
Id., Fig. 4 (annotated)

95. I note that the (Certified English Translation) title for the Ba application is: “Fuse Holder for Solar Photovoltaic Power Generation System” which confirms that the fuse-holder disclosed in Ba is for solar power photovoltaic (PV) systems. The addition of connectors of Ba to the separated wire and fuse of Fan would have been understood to improve convenience and ease of installation. (EX 1011, ¶¶[0015]-[0016]). A POSITA would understand that the advantageous features of Fan and Ba as described above could be combined with reasonably predictable success.

96. Given the above disclosure of an inline fuse assembly for a solar installation, it is my opinion that the claim 1(preamble) is obvious in view of Yen and Ba.

a. A photovoltaic fuse having a solid outer surface including a first end, a second end and a middle section there between, said solid outer surface defining an outline;

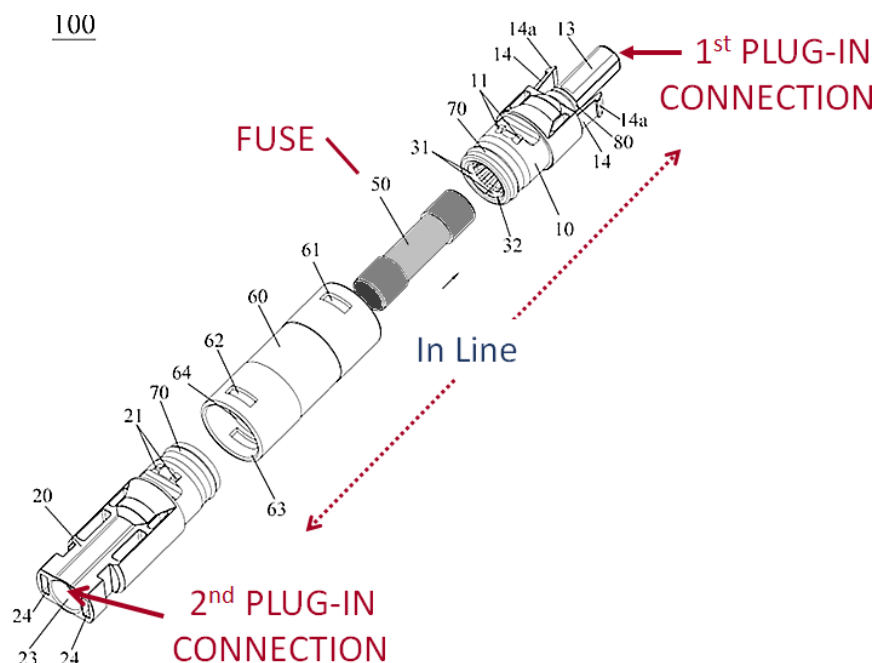
97. Fan's Fig. 2 discloses a cartridge fuse 2.2 including a fuse element and a solid outer surface including a first end, a second end and a middle section therebetween, the solid outer surface defining an outline. EX1009, p. 7.



EX1009, Fig. 2.

98. As noted above, Fan described its assembly and fuse as applicable to power lines which a POSITA would have understood to include solar power lines. Nevertheless, to the extent an explicit photovoltaic fuse is required, a POSITA would have appreciated that the fuse holder and fuse disclosed in Ba is a “photovoltaic fuse”, because the title of the application is “Fuse Holder for Solar **Photovoltaic** Power Generation System” (EX 1011, cover page; emphasis added).

99. Ba discloses a cartridge fuse 50 in the fuse holder 100 of the solar photovoltaic generation system.



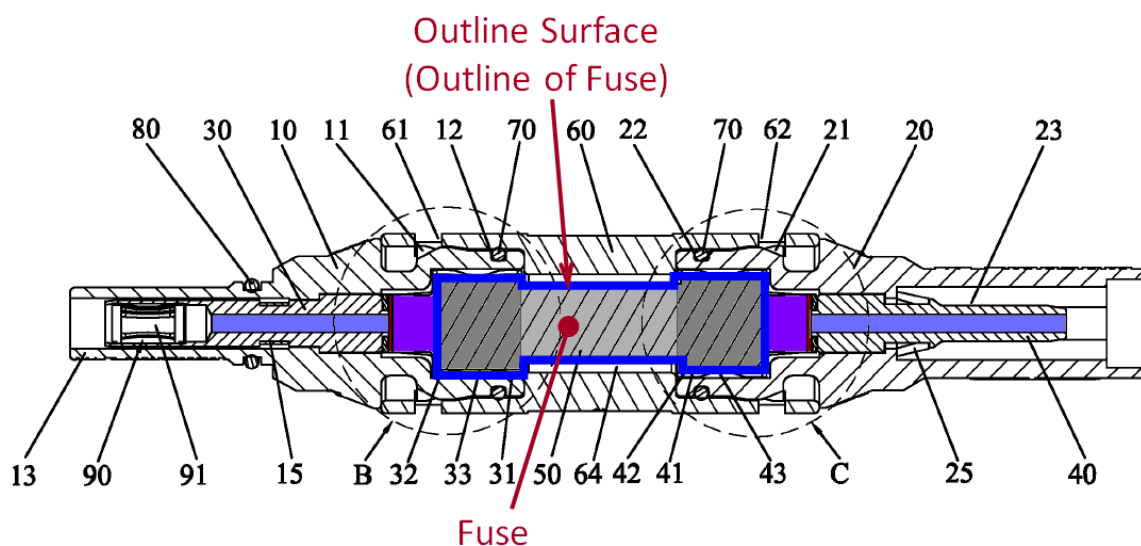
EX 1011, Fig. 2 (annotated)

100. As shown in the annotated version of FIG. 2 above, the cartridge fuse 50 includes a first end, a second end, and a middle section therebetween. EX 1011, ¶[0029]; FIG. 2 (annotated), above.

101. A POSITA would have recognized that the cartridge fuse 50 includes a solid outer surface defining an outline. A ferrule-capped cartridge fuse has a *solid outer surface*, a fact shown clearly in Figure 2 of Ba (see above), where the cartridge fuse is emphasized in grey. Ba’s Fig. 4, shown previously above, depicts the fuse as having first and second ends (left and right in the figure). A POSITA would have known that, logically, something having a longitudinal extension will have a first end and a second end, and the “middle section there

between” would be located between these ends.

102. A POSITA would also have recognized that a body having a solid outer surface defines an outline with that surface as illustrated below in the annotated figures from Ba. A defined outline is, again, a feature of any solid object. The solid outline in Ba Fig. 4, for example, is the outer perimeter of the cartridge fuse illustrated by the blue line in the annotated Fig. 4 shown below:



EX 1011, Fig. 4 (annotated)

103. For all the reasons explained above, it is my opinion that a POSITA would have found the limitations of **claim 1(a)** to be disclosed and/or obvious in view of Fan and Ba.

104. In summary, Fan-Ba renders this limitation obvious.

b. An undermold surrounding and sealing said fuse, said undermold defining an outer surface outline, wherein the outer surface outline of said undermold is substantially parallel relative to the outline of said solid outer surface;

105. The specification of the '739 patent does not define the term “undermold”.

A POSITA would thus have interpreted this term by its plain and ordinary meaning in the context of its defined function in the claim. The term “undermold”, as would have been understood by a POSITA, refers to any molded or moldable element serving as a substrate to a second layer of plastic called the “overmold”. This concept is explained in detail, for example, in numerous places in GLS Overmolding Guide (*See*, e.g., Ex. 1015 at pgs. 1-4). In context of Fan, Ba, and Yen, both the undermolding and overmolding materials are insulating polymers such as plastic that can be molded into desired shapes. (*See*, e.g., EX 1009, pg. 4, lines 5-15; EX 1011, ¶[0030]; EX 1006, ¶[0020]).

106. The terms “undermold” and “overmold” were known in the time frame of the '739 patent. For example, “overmold” appears in the publicly-available publication *Overmolding Guide* by the GLS Corporation (EX 1015)⁴. This

⁴ Ex. 1015 - Overmolding Guide, © 2002 GLS Corporation

publication defines “overmold” as follows:

“**Overmolding** utilizes the injection molding process to apply one material [Overmold] onto another material [Substrate]. The over molded material should form a bond with the substrate that endures the end-use environment.... Overmolding eliminates the need for adhesives and primers to bond TPEs to rigid substrates”

(EX 1015 at 1.1; emphasis added).

107. The terms undermold and overmold also appear in several patents related to manufacturing. One example is US Patent 6,523,380 to McGuire et al, entitled “Overmolded Key Including an Ornamental Element and Methods of Making Same” (EX 1016, cover page). McGuire issued on February 25, 2003, more than a decade before the Effective Filing Date of the ’739 patent. McGuire does not address any solar or fuse holder technology. Its subject matter is related to, “[a] vehicle ignition key having an ornamental element molded onto the key.” (*See Id.*) Such a key is depicted in McGuire at Figs. 2 and 3, shown below. Both an undermold layer 26 and an overmold layer 24 are used to make the finished product:

“The **overmold material 24** encapsulates the transponder 30 and secures the peripheral edge 22 of the element 16 to the key, trapping the peripheral edge between the overmold material 24 and the **undermold material 26** as shown in FIG. 3, for example”. (EX 1016, 5:2-5; emphasis added).

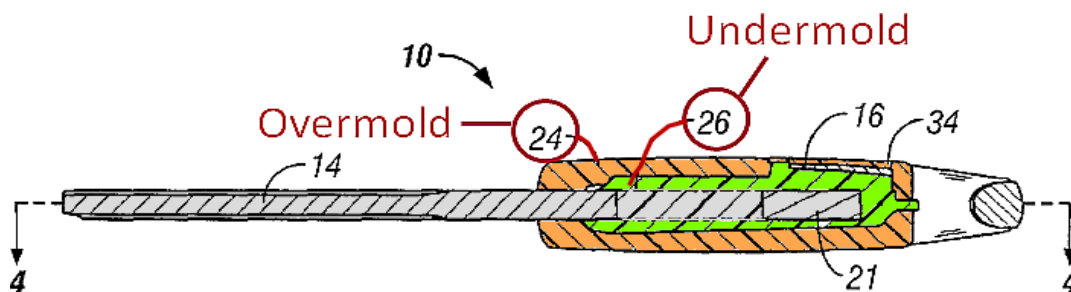


FIG. 2

EX 1016, Fig. 2 (annotated)

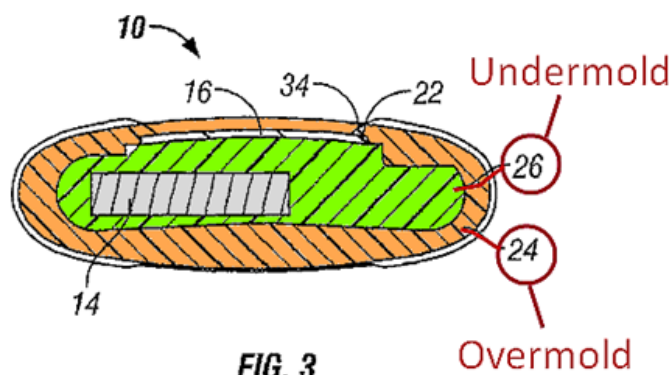


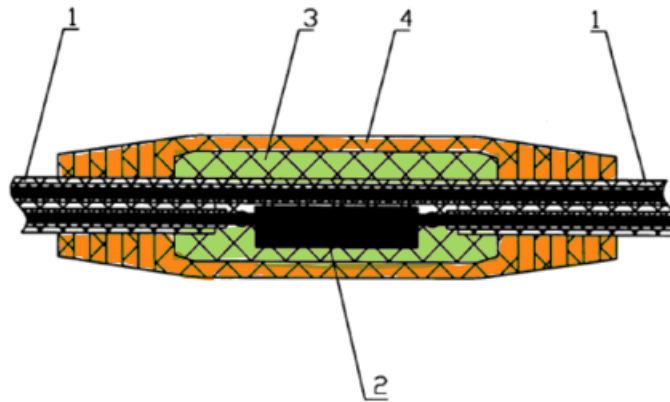
FIG. 3

Id., Fig. 3 (annotated)

108. McGuire demonstrates that the terms “undermold” and “overmold” were standard fare in manufacturing, and in injection molding in particular, long before the ’739 patent was filed and would have been well known to a POSITA. Furthermore, as I noted above, the ITC has construed the term undermold as “material molded over a piece or part that seals against environmental factors and is surrounded by the overmold,” which is consistent with these uses in the art by

McGuire and the Overmolding Guide. EX1023, pp. 17, 20.

109. As shown in Figure 1 of Fan below, Fan discloses multiple layers of insulators. As noted above, these layers of insulators include materials that can be injection molded. (EX 1009, pg. 3, lines 30-35).



EX 1009, Figure 1 (annotated)

Fan discloses an inner insulating layer 3 and an outer insulating layer 4, each of which may be injection molded in sequence such that inner insulating layer 3 is molded first. Then when inner insulating layer 3 has been molded and is stable, outer insulating layer 4 is molded over the inner insulating layer 3. (EX 1009, pg. 4, line 35 to pg. 5, line 5). A POSITA would recognize this sequential molding of insulating layers as an undermold and an overmold as claimed in claim 1(b).

110. As shown in Figure 1, the insulating layers of Fan serve the purpose of sealing in the fuse, which is the role of the undermold in the '739 patent. (EX

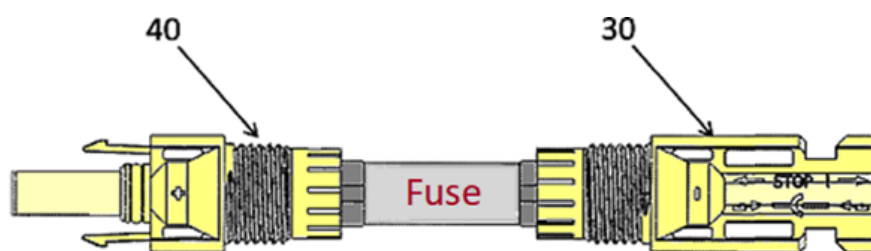
1009, pg. 3, lines 30-35) Thus, it is my opinion that the inner insulating layer 3 of Fan discloses an undermold as would have been understood by a POSITA upon reading the '739 patent. The additional limitations associated with the undermold that are claimed in this portion of the claim are addressed below in more detail.

1) “an undermold surrounding and sealing said fuse”

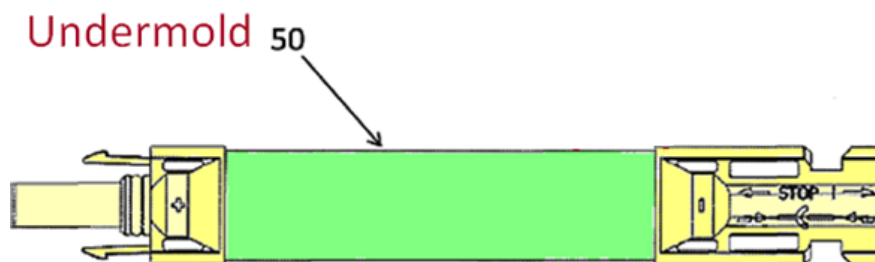
111. The inner insulating layer 3 of Fan clearly surrounds the fuse 2 as modified by the fuse of Ba. (EX 1009, Fig. 1) Further, Fan explicitly discloses that these insulating layers operate to seal the fuse from the outside environment including waterproofing the structure. (EX 1009, pg. 3, lines 30-35) Thus, in my opinion, the inner insulating layer 3 formed by injection molding disclosed in Fan would have been understood by a POSITA as being an undermold.

112. The specification of the '739 patent provides no detail or limitation about how the undermold 50 “seals” the fuse. The specification of the '739 patent merely states that “undermold 50, seals the *assembly*” (emphasis added), rather than specifying that the “fuse” is sealed by the undermold. (EX 1001, 3:13-15). The originally-filed claims of the '739 patent recited only “an undermold surrounding said fuse.” (EX 1002, pg. 448). Thus, the undermold 50, as

originally disclosed in the '739 patent, only seals the fuse to the extent that it surrounds it (e.g., the portion between the male connector 30 and the female connector 40, as illustrated in Figs. 7 and 8 from the '739 patent -- reproduced below). As shown by the annotations below, the undermold is highlighted in green and the connectors in yellow.



Ex. 1001, Fig. 7 (annotated)



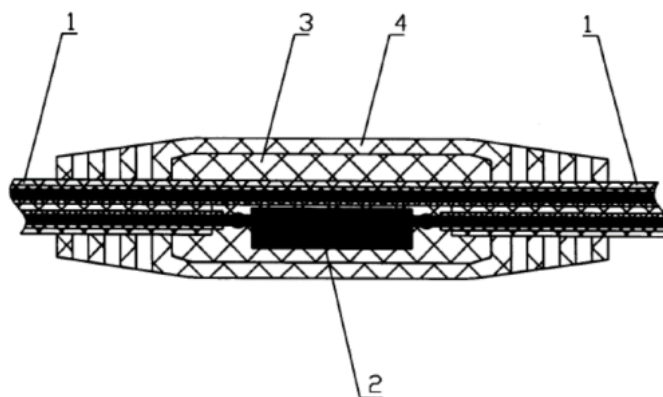
Ex. 1001, Fig. 8 (annotated)

113. Since the specification of the '739 patent does not define the term “sealing,” a POSITA would thus have understood that an ordinary and customary meaning of the term “sealing” is “to close or make secure against access, leakage, or passage by a fastening or coating.” (EX 1014, pg. 4) In accordance with this meaning, the inner insulating layer 3 of Fan, which waterproofs the fuse 2,

clearly operates to close and make the fuse 2 secure against access, leakage, or passage. (see *Id.*) Accordingly, it is my opinion that Fan discloses or renders obvious this limitation.

2) said undermold defining an outer surface outline,

114. The inner insulating layer 3 of Fan, which is an “undermold” as described above, also teaches the feature of an outer surface outline. As shown in Fig. 1 from Fan, the inner insulating layer 3 includes an outer surface outline. The solid outer surface is formed in a first injection molding operation that results in a solid undermold.



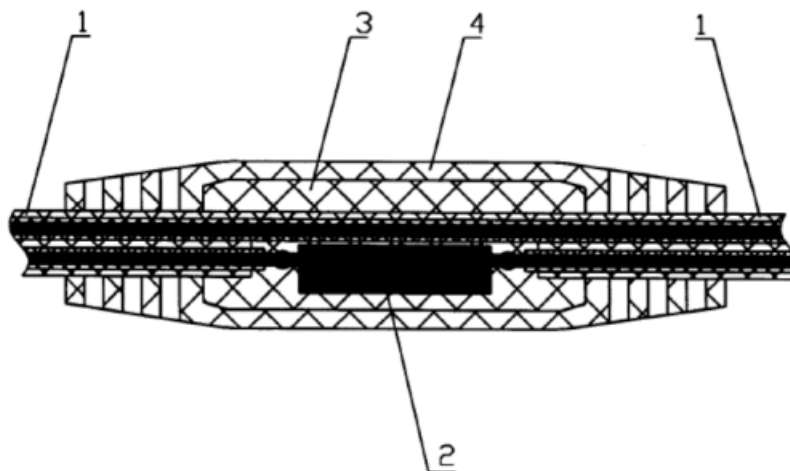
Id., Fig. 1

Accordingly, it is my opinion that Fan discloses or renders obvious this limitation.

3) “wherein the outer surface outline of said undermold is substantially

parallel relative to the outline of said solid outer surface”

115. The inner insulating layer 3, which is an “undermold” as described above, also teaches the feature of an outer surface outline [that] is substantially parallel relative to the outline of said solid outer surface [of the fuse]⁵. As shown in Fig. 1 from Fan, the inner insulating layer 3 includes an outer surface outline that a POSITA would have identified as substantially parallel to the outer surface outline of the fuse 2. The solid outer surface is formed in a first injection molding operation. (EX 1009, pg. 4, lines 5-15)



Id., Fig. 1

116. For all the reasons explained above, a POSITA would have found the claim 1(b) limitations to be obvious in view of Fan.

⁵ Based on antecedent bases, the expression “said solid outer surface” refers to the “solid outer surface” of the photovoltaic fuse addressed in 1(a), above.

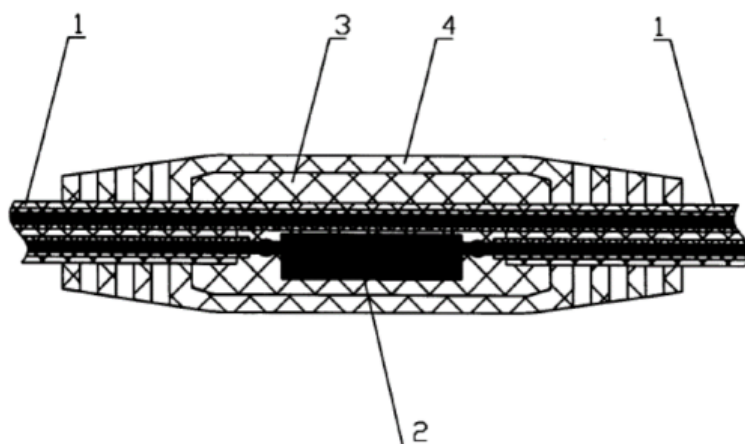
c. An overmold defining an outline and surrounding said undermold, said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials, wherein the outline of said overmold is substantially parallel relative to the outline of said undermold; and

117. As explained above, Fan discloses an inner insulating layer 3 corresponding to the “undermold”. Further, Fan discloses that additional moldings of protective insulating layers should be formed over this inner insulating layer 3. (EX 1009, Fig. 1, and pg. 5, lines 1-5) Indeed, Fan explicitly shows an outer insulating layer 4, which is formed in this manner. (*Id.*)

118. The mapping of aspects of Fan and Yen to the limitations of claim 1(c) are addressed in more detail below:

(1) “an overmold defining an outline and surrounding said undermold”

119. The outer insulating layer 4 defines an outline (i.e., an outer surface outline) due to its nature as an object made from solid material (e.g., plastic). This outline is illustrated in Figure 1 of Fan below. Further, as shown in Figure 1 of Fan below, the entire outer surface of the inner insulating layer 3 of Fan is surrounded and covered by the outer insulating layer 4 which is over molded on the inner insulating layer 3. (EX 1009, Fig. 1, and pg. 5, lines 1-5)



EX 1009, Fig. 1

120. Thus, Fan discloses an “overmold defining an outline and surrounding said undermold”, as recited in the claim 1(c)(1) limitation.

(2) “said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials”

121. Fan discloses that the inner insulating layer 3 and the outer insulating layer 4 are each formed in separate injection molding operations. (EX 1009, pg. 4-5)

A POSITA would have understood that the injection molding of these layers form single units. Indeed, Fan discloses that they are each a layer, which is understood to be a single unit. (*Id.*) Therefore, Fan explicitly teaches forming the undermold and overmold each as single units as claimed.

122. Fan does not explicitly disclose that the injected molded layers corresponding to the undermold and overmold may be formed of dissimilar materials. A POSITA would have understood that various materials impart

different protections to the fuse assembly. For example, Ba teaches that in an outdoor environment shock protection is also needed to keep the fuse engaged with the wire at all times. (EX 1011, ¶¶[0009], [0032]) A POSITA would have been motivated, based on the multiple layered protection of Fan and the various forms of protection disclosed as being advisable in Fan and Ba (e.g., waterproofing and shock resistant), to modify Fan by forming the insulating layers of Fan out of different, complementary materials.

123. Yen discloses a variety of materials that can be injection molded and which, individually, provide different protections. (EX 1006, ¶¶[0020], [0026], [0030], [0031]) Yen, like Fan and Ba, also teaches the use of multiple layers. Therefore, the teachings of Yen are compatible with the teachings of Ba and Fan since all three references teach the use of multiple layers of materials for added protection. (EX 1011, Fig. 4, ¶[0014]; EX 1006, ¶[0028]; EX 1009, pg. 4-5) For example, the material disclosed in Fan is focused on providing electrical insulation, which a POSITA would have understood to involve various moldable rubbers or other moldable sealing compounds. A POSITA would appreciate that the use of two or more layers provides an opportunity to provide a sealed inline fuse with complimentary protective properties. For example, the undermold material could be chosen for its electrical resistance properties, and the overmold

material could be chosen for its resistance to environmental effects and moisture.

A POSITA would consider dissimilar materials for these two layers so as to obtain the complimentary benefits of two different materials to extend the life and improve the reliability of the assembly. Also, as mentioned in Yen, it is possible to utilize a less expensive material for one of the layers so as to further reduce the cost of an assembly with a single layer made of more expensive material.

124. Yen discloses that a fuse should also have protection from the environment without dissipating too much heat through this outer protection and without allowing electricity to arc past the fuse when in operation. (EX 1009, ¶[0021])

Likewise, several of the thermoplastics listed in Yen form hard protective pieces that provide the type of shock resistance suggested by Ba. (EX 1011, [0014]; EX 1006, [0020]) A POSITA would have understood that rigid outer protective materials, such as the crystalline or amorphous thermoplastics of many kinds (there is a long list in Yen), or from thermosetting resins of many kinds, and even filled with hydrating inorganic materials can add shock absorption and mechanical protection to the interior components of the assembly. Accordingly, a POSITA would have been motivated to modify the outer insulating layer 4 of Fan to obtain the protection suggested by Ba while still keeping the assembly

simple as advised by Fan. (EX 1011, ¶[0014]; EX 1009, pg. 3, line 34) Further, Yen itself motivates a POSITA to modify the outer insulating layer of Fan in order to avoid the problem of the insulative protecting layer counteracting the heat-based trigger of the fuse. Finally, Yen discloses another advantage of these materials, which a POSITA would have used as the outer insulating layer of Fan, which is arc prevention – property that requires high resistance even at high temperatures.

125. Based on the above, it would have been obvious to a POSITA to add an overmold formed of one of the materials of Yen, and formed as a single unit as taught by Fan and Yen, in order to better protect the fuse component from the harsh outdoor environments typical in photovoltaic installations, where the components of the solar assemblies are located outdoors. (EX 1009, ¶¶[0020], [0026]). In addition, a POSITA would have had a high likelihood of success in modifying the assembly of Fan with an outer insulating layer of one of the materials disclosed in Yen since both Fan and Yen deposit their outer protective layers via injection molding. (EX 1006, ¶¶[0026], [0028]; EX 1009, pg. 3)

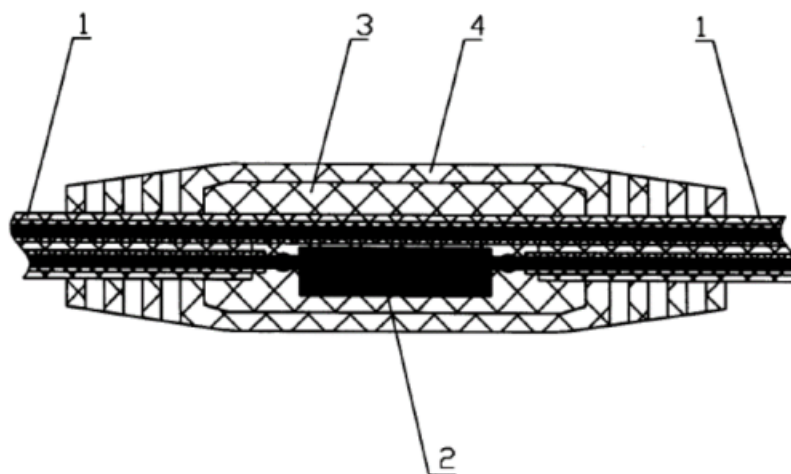
126. Thus, to further summarize the combination of Fan, Ba and Yen, it would have been obvious to a POSITA to utilize an undermold and an overmold as taught by Fan, each being single units as disclosed in Fan, and to further modify

that undermold of Fan to be of a different material than the overmold of Fan in order to add complementary protections to the fuse as disclosed in Yen.

127. Accordingly, the combination of Fan and Yen (as additionally motivated by Ba) as discussed above discloses “said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials”, as recited in the claim 1(c)(2) limitation.

(3) “wherein the outline of said overmold is substantially parallel relative to the outline of said undermold”

128. As discussed above regarding claim 1(b), Fan discloses an undermold covered by an overmold. Further, the outer profile contours of the inner and outer insulating layers of Fan are parallel to each other. This aspect is illustrated below in Figure 1 of Fan.



EX 1009, Figure 1

Accordingly, Fan teaches this feature of the different outlines being parallel. (*Id.*)

A POSITA would have understood that Figure 1 of Fan shows the outer outlines of the under molded insulating layer 3 and the over molded insulating layer 4 as being substantially parallel.

129. Given all of the above, it is my opinion that Fan discloses “the outline of said overmold is substantially parallel relative to the outline of said undermold”, as recited in the claim 1(c)(3) limitations.

130. For all the reasons explained above, I believe that a POSITA would have found the claim 1(c)(1-3) limitations to be obvious in view of Fan and Yen as additionally motivated by Ba.

d. A first photovoltaic connector engaged with said first end, wherein said assembly provides electrical insulation.

131. Fan explicitly discloses that the inner insulating layer 3 and the outer insulating layer 4 are insulating layers. (EX 1009, pg. 4) A POSITA would have recognized that that these insulating layers (“assembly”) are intended to electrically insulate the fuse from the environment and inadvertent grounding. Furthermore, as noted above, the inner insulating layer of Fan as modified by Yen, which as a combination teaches the undermold of this claim, would have arc protection, which a POSITA would understand to mean the material is highly insulative including over a range of conditions. (EX 1006, [0026]) Therefore, a

POSITA would have understood the assembly of Fan as modified by Yen to teach the limitation of “wherein said assembly provides electrical insulation.”

132. Fan does not explicitly teach a “photovoltaic connector” as claimed. Fan does disclose connectors for insertion into the power supply line stating “[a] required plug and connector are separately injection molded on two ends of the power supply line.” (EX 1009, pg. 4). In other words, the power line of Fan is disclosed as having a plug and connector for connecting with other wires. While Fan is directed to protecting a fuse connection in a power supply line, Fan is not explicitly directed to a photovoltaic implementation. As noted above, a POSITA would have understood that the fuse assembly of Fan could be inserted into a solar panel power supply line without modification.

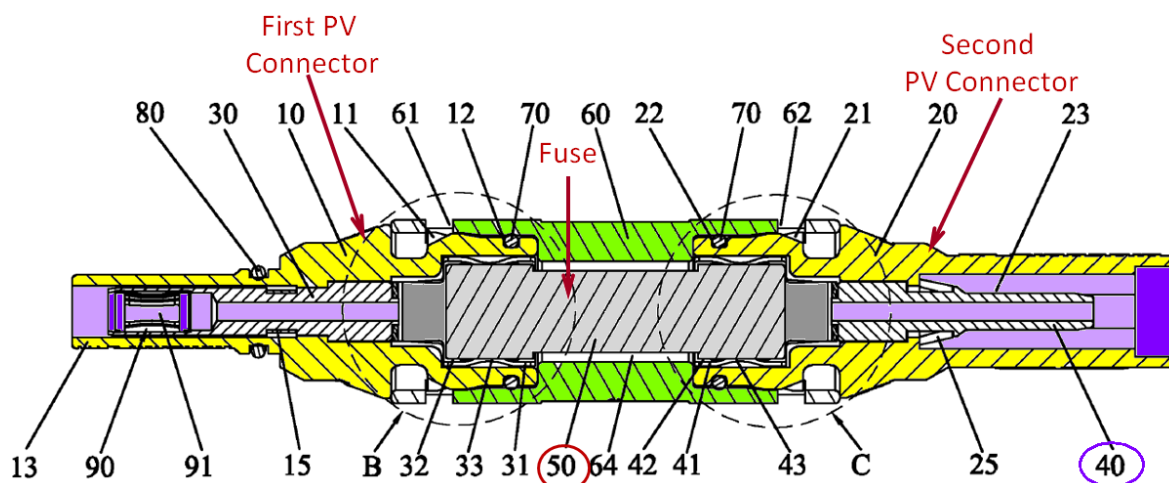
133. Nevertheless, to the extent that the use-modifier “photovoltaic” is limiting, Ba teaches applying its fuse assemblies in solar or photovoltaic systems. Further, Ba teaches specialized connectors at each end of the sleeving member 60 that surrounds and protects the fuse. In the combination provided in this Ground, the sleeving member are instead taught by Fan and Yen as explained above. Further, in this combination, Ba modifies the power line connectors and plugs disclosed in Fan. This modification is contemplated by Fan which discloses that required plugs and connectors can be injection molded onto two ends of the assembly for

connecting with other wires. (EX 1009, pg. 4) A POSITA based on Fan would have understood that the required power connector for a particular power installation such as the connector of Ba for solar applications can be injection molded onto the assembly of Fan.

134. Ba discloses a first photovoltaic connector engaged with said first end [of the fuse]⁶. In Ba, the sub-assembly of the “first housing 10” and the “first electric terminal 30” form a “first photovoltaic connector.” (EX 1011, FIG. 4)

Figure 4 of Ba as annotated below shows the connectors highlighted in yellow.

Ba discloses that the first electric terminal 30 receives an output cable at one end and the fuse 50 at the other end of the first PV connector. (EX 1011, ¶¶[0036], [0050]).



⁶ Based on antecedent bases, the expression “said first end” refers to one end of the photovoltaic fuse addressed in 1(a), above.

EX 1011, Fig. 4 (annotated)⁷

As noted above, the connector ends of Ba would be applied to the assembly of Fan-Yen at each end as contemplated by Fan. The portion of the structure of Ba that would be applied to the assembly of Fan extends from the area of the B indicated on the figure above to the left-most end of the connector for the first connector.

135. A POSITA as instructed by Fan could have easily arrived at this combination by inserting an end of the fuse 2 into a Ba's connector so that the connector would physically and electrically engage the end of fuse 2. Further, two insulating layers 3 and 4 would then be formed by injection molding process to insulate the fuse from the environment and inadvertent grounding. A POSITA would have been motivated to modify the structure of Fan at least because as contemplated in Fan, such modification is necessary to fit different systems and to remove the unneeded wire to the plug described in Fan for cost savings and

⁷ For the purpose of clarity, the color-coding for the figures in this declaration will be as follows:

gray = fuse	green = undermold	orange = overmold
yellow = connector	blue = surface outline	purple = wires and contacts

simplicity. A POSITA would have had a reasonable likelihood of success in making this making this modification, as the addition of a connector to each end of an inline fuse is necessary to install the fuse into the cable, and a POSITA would consider use of connector assemblies such as those shown in great detail in Ba because of the features of these connector assemblies that are disclosed by Ba – simplicity, reliability, and ease of installation and maintenance. For the reasons above, I believe that a POSITA would have found the claim 1(d) limitations to be obvious in view of Ba.

136. Given all that is discussed above, it is my opinion that a POSITA would have found claim 1 in its entirety to be obvious based on the Fan-Ba-Yen combination. Accordingly, claim 1 should be found invalid under 35 U.S.C. § 103 based on Fan, Ba, and Yen.

2. Claim 2

The assembly of claim 1 further including a second photovoltaic connector engaged with said second end.

137. In Ba, the assembly of the “second housing 20” and the “second electric terminal 40” form a “second photovoltaic connector”. This assembly is disposed on an opposite side of the fuse 50 from the “first photovoltaic connector” formed by the assembly of the “first housing 10” and the “first electric terminal 30,” as discussed above regarding claim 1(d). *See* EX 1011, FIG. 4 (annotated), above.

138. Therefore, a POSITA would have found the limitation recited in claim 2 to be obvious based on Ba. The Fan-Ba-Yen combination discloses all limitations recited in claim 1, from which claim 2 depends. Accordingly, in my opinion, claim 2 should be found invalid under 35 U.S.C. § 103 based on the Fan-Ba-Yen combination.

3. Claim 3

The assembly of claim 2 wherein said first photovoltaic connector is a female type connector, and said second photovoltaic connector is a male type connector.

139. In Ba, both female and male type connectors are disclosed as can be seen in Figure 2 of Ba shown below. A POSITA would have understood that either end of the assembly of Ba could be considered the first or second end.

Additionally, which of the designated “first” and “second” ends (arbitrary in itself) would be chosen to be the male end or the female end is arbitrary, and thus interchangeable. The male/female of the photovoltaic connector in Ba is shown below in FIG. 2 (annotated), where the male end is configured to be inserted into the female end.

140. Further, a POSITA would understand that the design of the in-line fuse assembly would be enhanced by the ability to position this assembly at any cable-to-cable connection, which would necessarily be a male-to-female or female-to-

male connection. Inserting an inline fuse at such a junction would be easiest if the connectors of the fuse assembly can be connected to the male and female connectors that made up the original connection between lengths of cable. Therefore, a POSITA would naturally select a design of an inline fuse assembly with a female connector on one end and a male connector on the other end. Any other choice would be more inefficient requiring the addition of adapters or converters in order to position the in-line fuse within the existing cable assembly.

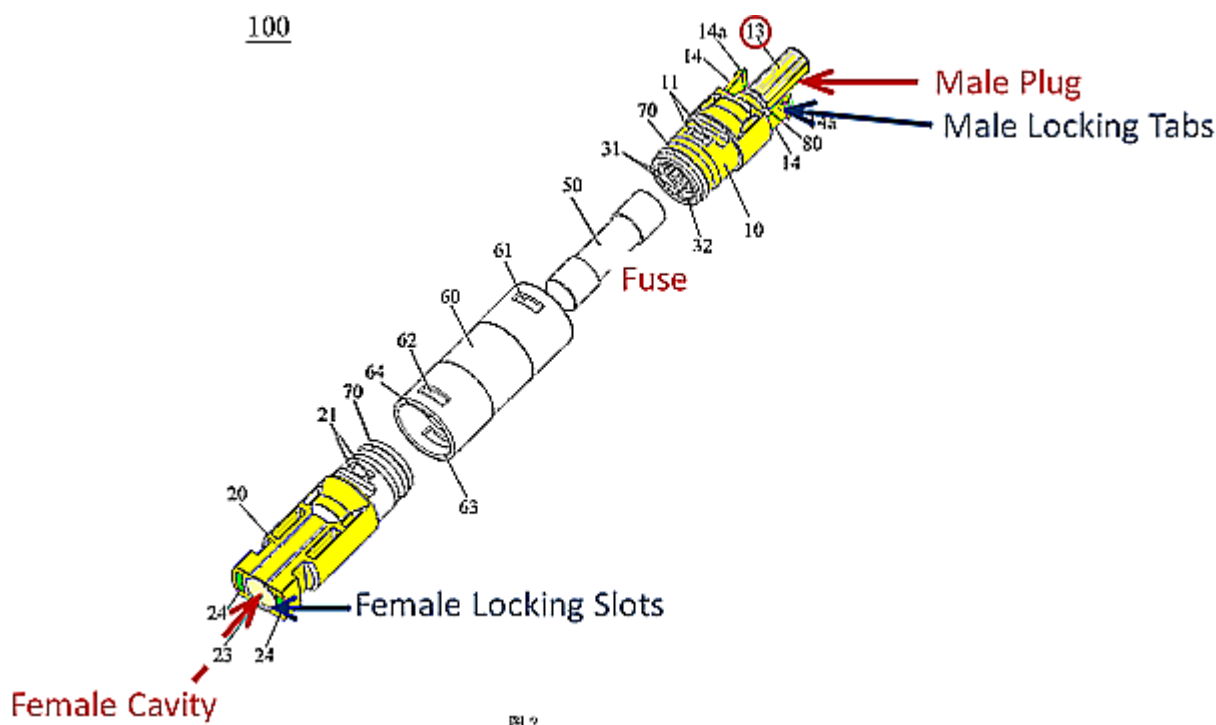


FIG. 2

EX 1011, Fig. 2 (annotated)

141. A POSITA would have been motivated to modify the ends of the assembly of Fan as shown with respect to claim 1(d) in order to add the “required” plug

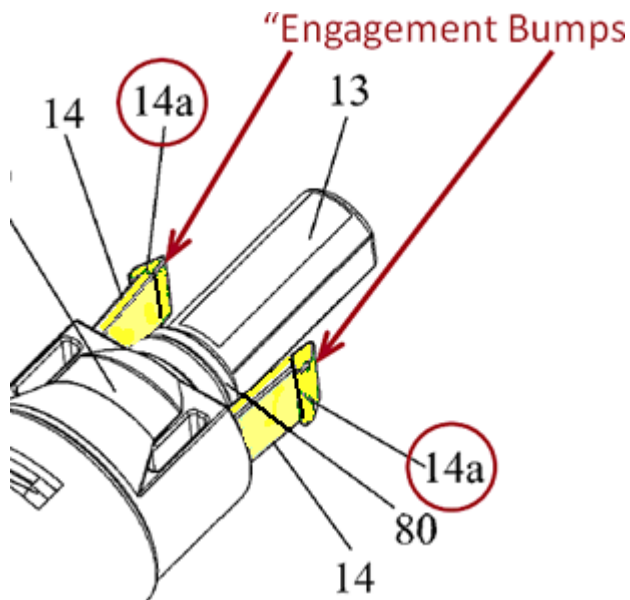
ends for the particular power system. (EX 1009, pg. 5) A POSITA would have found the limitations recited in claim 3 to be obvious based on the Fan-Ba-Yen combination. The Fan-Ba-Yen combination discloses all limitations recited in claim 2, from which claim 3 depends. Accordingly, in my opinion, claim 3 should be found invalid under 35 U.S.C. § 103 based on the Fan-Ba-Yen combination.

4. Claim 4

The assembly of claim 1 wherein said first and second connectors are locking type connectors.

142. It should be noted that the expression “said first and second connectors,” in claim 4 is indefinite since it lacks antecedent basis. In any case, Ba discloses that “[t]he first housing 10 is provided with a first plug-in connection portion 13 connected to the socket in a plug-in manner and... the second housing 20 is provided with a second plug-in connection cavity 23 connected to the plug in a plug-in manner. (EX 1011, ¶[0039]). This structure is evident in Ba Fig. 2, shown above, where the male locking tabs and their corresponding female locking slots are evident. A POSITA would thus have recognized that the first housing 10 and the second housing 20 disclosed in Ba form the outer portions of locking type connectors. In Ba’s Fig. 2 annotated above regarding claim 3, the male locking tabs and their corresponding female locking slots can be seen. The figure shown below,

which is a “zoomed in” closeup view of the male end connectors, shows the mail locking tabs (referred to in Ba as “engagement bumps” 14a).



EX 1011, Fig. 2 (portion, annotated)

143. Based on all of the above, it is my opinion that a POSITA would have found the limitation recited in claim 4 to be obvious based on Ba. The motivation to combine these features with the assembly of Fan is described regarding claim 1(d). Thus, the Fan-Ba-Yen combination discloses all limitations recited in claim 1, from which claim 4 depends. Accordingly, claim 4 should be found invalid under 35 U.S.C. § 103 based on the Fan-Ba-Yen combination.

5. Claim 5

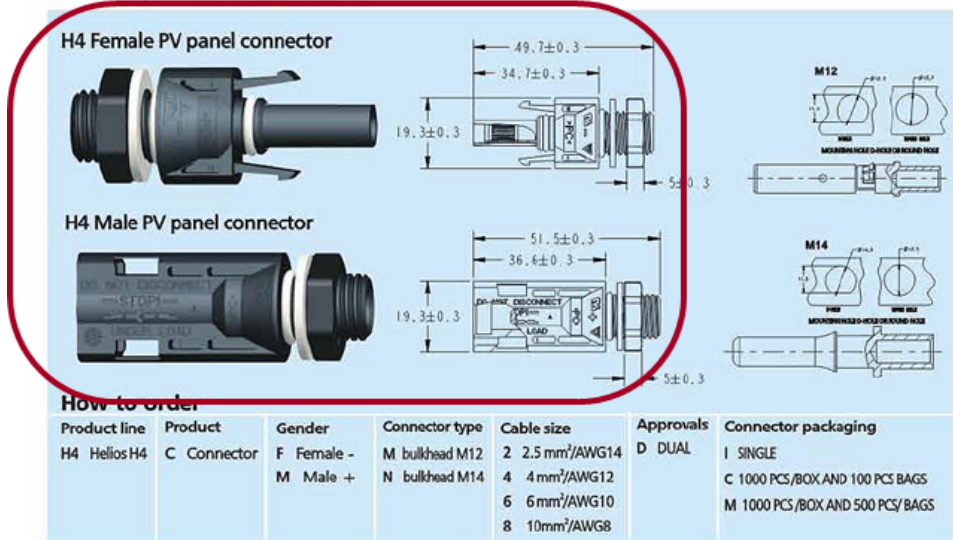
The assembly of claim 4 further comprising a tool for unlocking said connectors.

144. The specification of the '739 patent does not disclose either a description or a drawing containing a “tool” that would be used for unlocking connectors.

Regardless, the concept of using a tool to unlock connectors was well known, long before the Effective Filing Date of the '739 patent. A POSITA would have understood that a tool, such as pliers, could be used to squeeze the Ba engagement bumps 14a inwardly to unlock the connectors 10, 20 from the input and output cables in Ba. (EX 1011, ¶[0040]). Also, more specialty tools were not only known, but often required in the time frame of the '739 patent. For example, the publication “Solar Line Photovoltaic Interconnection System,” by Amphenol Industrial Solar Technologies (November 2012) (EX 1010), shows that Helio H4 photovoltaic connectors were offered for sale with a tool for unlocking those connectors before the Effective Filing Date of the '739 patent. (EX 1017). The connectors in the figure below from Amphenol bear a remarkable resemblance to the lockable connectors disclosed in the '739 patent and in the Ba application.



H4 PV panel connector Helios H4 Female and Male Connectors



Amphenol, pg. 3 (annotated)

145. Amphenol indicates that a “special unlocking tool” is needed to un-mate the connectors. Of note is the fact that these sort of unlocking tools for connectors would have been known to a POSITA. For example, one detailed compendium of rules and regulations relating to wiring connections, the “NEC” (National Electric Code), which may be adopted for enactment by, for example, different counties or states, specifies such an “unlocking tool required to un-mate” a snap-lock (See red circled text below). The NEC has the following specific requirement with respect to connectors used in photovoltaic installations:

“690.33 Connectors, (C) Type. The connectors shall be of the latching

or locking type. Connectors that are readily accessible and that are used in circuits operating at over 30 volts, nominal, maximum system voltage for dc circuits, or 30 volts for ac circuits, *shall require a tool for opening.*”

EX 1012 (emphasis added).⁸

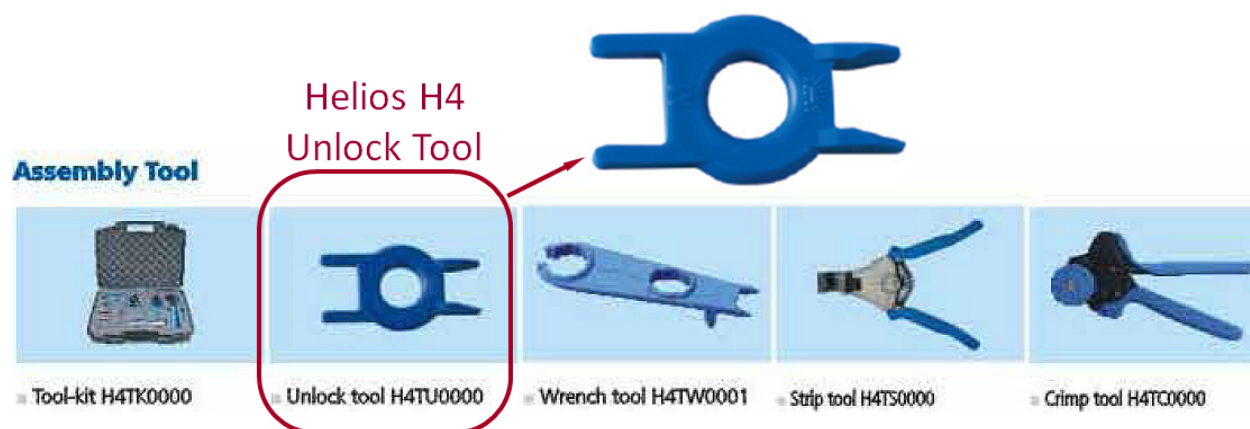
146. As the above shows, the use of a tool to facilitate unlocking of photovoltaic connectors, as demonstrated by Amphenol, was well known in the time frame of the ’739 patent.

Contact system	Machined/cold formed or S&F contact with RADSOK® insert
Insulation material	PC
Locking mechanism	Snap-lock, special unlocking tool required to un-mate as required by NEC2008
Cable strain relief	Compression gland with ratcheting gland nut
Degree of protection	IP68 (1 meter, 1 hour) mated

Id., pg. 3.

A photo of the unlocking tool referenced in Amphenol is shown in the catalog on pg. 4 (below):

⁸ The Amphenol table cites to NEC2008, but the same cited requirement is found in NEC2002 (EX 1012).



Id., pg. 4 (annotated).

147. The Amphenol catalog shows that a tool for taking apart male and female photovoltaic connectors was known before the Effective Filing Date of the '739 patent. Accordingly, it is my opinion that the use of a tool to unlock photovoltaic connectors was obvious, and also necessary in some cases. A POSITA would have found the limitation recited in claim 5 to be obvious based on the structure of Ba. As shown, the Fan-Ba-Yen combination discloses all limitations recited in claims 1 and 4 from which claim 5 depends. Accordingly, claim 5 should be found invalid under 35 U.S.C. § 103 based on the Fan-Ba-Yen combination.

148. For these reasons, in accordance with Ground 1, claims 1-5 should be found invalid under 35 U.S.C. § 103 based on Fan-Ba-Yen.

❖ **Ground 2: Claim 7 is unpatentable under 35 U.S.C. § 103 as obvious based on Fan in view of Ba and Yen, and further in view of Darr.**

149. A POSITA would have been motivated to combine the teachings of Fan, Ba, and Yen with those of Darr, because each of the Fan, Ba, Yen, and Darr references discloses an in-line fuse assembly providing electrical connections and do so in the same field of endeavor (power lines) and in a compatible manner. (EX 1011, Abstract; EX 1006, Abstract; EX 1009, Abstract; and EX 1007, Abstract).

150. As noted above in my discussion of Ground 1, the Fan-Ba-Yen combination discloses an enhanced in-line fuse assembly with added protection for maintaining an electrical connection via connection plugs until the fuse is needed for overcurrent protection. (*Id.*) Specifically, Yen would have been recognized by a POSITA to provide needed arc-resistance to the fuse holder of Fan by utilizing an arc-resistant material in the inner layer (undermold) of Fan.

151. Darr also discloses an inline fuse holder for use in photovoltaic systems. (EX 1007, ¶[0003]). Darr adds that a thermoplastic elastomer may be used to form an overmold to form an additional safeguard. (EX 1007, ¶[0023]). Darr recognized that selecting a suitable material for the overmold of a fuse holder can make the fuse holder waterproof as well as electrically insulating. (EX 1007, ¶[0024]).

While the insulating layers of Fan provide waterproofing, Fan does not disclose the materials to be used and Yen merely suggests an “ordinary” outer layer. EX1006,

¶[0020]. Thus, a POSITA would have looked to Darr to determine which materials to use for an outer layer of protection. Darr complements the Fan-Ba-Yen combination by adding details regarding materials to be used in the injection molding of Fan. (*Id.*)

152. A POSITA would have had an expectation of success in combining the teachings of Fan, Ba, and Yen with that of Darr, because a POSITA would have understood the modification to be the selection of a known material based on its suitability for its intended use (i.e., strengthening connectors as disclosed in Fan-Ba-Yen), which is a rationale that supports a prima facie case of obviousness. It is thus my opinion that claim 7 should be found invalid under 35 U.S.C. § 103 based on Fan, Ba, Yen in view of Darr.

1. Claim 7

The assembly of claim 1 wherein said overmold is a thermoplastic elastomer.

153. Darr discloses that the “overmold is a thermoplastic elastomer.” In particular, Darr discloses:

first and second fuse holder components 12, 14 may be a suitable thermoplastic rubber (also called “**thermoplastic elastomer**”). Such as a suitable thermoplastic rubber having a hardness of about 50 Shore A to about 75 Shore A. For example, a suitable thermoplastic rubber is sold by Exxon Mobil Corporation, New Jersey, USA, and sold under the mark Santoprene(R). In one non-limiting example, the first and second fuse holder components 12, 14 may be made from Santoprene(R) 101-64 having a hardness of about 69 Shore A.

EX 1007, ¶[0024].

A POSITA would have understood, as is known in the trade, that a thermoplastic rubber (TPR) is a type of thermoplastic elastomer (TPE), and that thermoplastic elastomers are a class of polymers that combine the properties of elastomers (rubbery materials) with the processability of thermoplastics. As described by Spontak and Patel, “Thermoplastic elastomers (TPEs) constitute a commercially relevant and fundamentally interesting class of polymeric materials. Generally speaking, they are biphasic materials that (i) possess the combined properties of glassy or semi-crystalline thermoplastics and soft elastomers, and (ii) enable rubbery materials to be processed as thermoplastics” (EX 1022, pg. 334). This means they can be melted and reshaped multiple times, like thermoplastics, but they also have elastic properties when they are at room temperature and can thus be readily stretched and deformed under stress, and will return to their initial form once the stress is removed. (EX 1007, ¶[0024]). Thus, Darr teaches the use of a thermoplastic elastomer for an overmold. *Id.*

154. Given the preceding, I believe that a POSITA would have found the limitation of claim 7 to be obvious based on the addition of Darr to the combination of Fan-Ba-Yen. As is shown in Ground 1, the Fan-Ba-Yen combination discloses all limitations recited in claim 1 from which claim 7 depends. Thus, it is my

opinion that claim 7 should be found invalid under 35 U.S.C. § 103 based on Fan, Ba, Yen, and Darr.

❖ Ground 3: Claims 10-13 and 15-18 are unpatentable under 35 U.S.C. § 103 as obvious based on Solon in view of Fan, Ba, and Yen.

155. As discussed above regarding Ground 1, a POSITA would have been motivated to combine features and arrive at the modified in-line fuse assembly disclosed by the Fan-Ba-Yen combination. Further, a POSITA would have been motivated to combine Solon with the Fan-Ba-Yen combination at least because all these references relate to power connectors applicable to solar power installations, and are, therefore, in the same field of endeavor.

156. Solon discloses a “Solar Energy Wire Harness with In-Line Fuses.” (EX 1008, Abstract). Solon is analogous prior art to the ’739 patent because it is directed to in-line fuses and power line configurations for solar power systems. Further, Solon anticipates the need to protect each fuse from ambient conditions (i.e., the outdoor environment). (EX 1008, ¶[0033]). Likewise, the ’739 patent claims relate not only to in-line fuses but also their placement in wire harnesses in a larger solar energy system. (EX 1001, 4:60-5:10) Therefore, Solon is analogous prior art to the ’739 patent. Solon was not disclosed to the examiner during filing

of the '739 patent, even though both Solon and the '739 application share the same single inventor and both are directed towards in-line fuses and configurations for solar power systems. Solon was not considered by the examiner during prosecution of the '739 patent.

157. A POSITA tasked with building a large-scale solar installation would have understood the need to make use of the utility and neatness of wiring harnesses as well as the circuit protection of fuses. In particular, a POSITA would have been motivated by the advantageous installation efficiency of inline fuses and the increased reliability due to durability which are disclosed by Fan, Ba, and Yen as being an advantage of inline fuse assemblies. A POSITA would have been motivated to combine the wire harness teachings of Solon with the enhanced in-line fuse assembly of the Fan-Ba-Yen combination in order to reduce costs and failure rates as taught by Solon. Further, the enhanced in-line fuse assembly of the Fan-Ba-Yen combination protects the inline fuses in the harnesses from the elements as described above in Ground 1 with regard to the motivation to combine Fan-Ba-Yen. The POSITA would also have known that the combination of Fan-Ba-Yen to yield a fuse protector could easily replace the fuse protector of Solon. For both Solon and Fan-Ba-Yen, the input/output wires would be the same, hence the Fan-Ba-Yen combination would operate in the same manner in place of the fuse protector of

Solon.

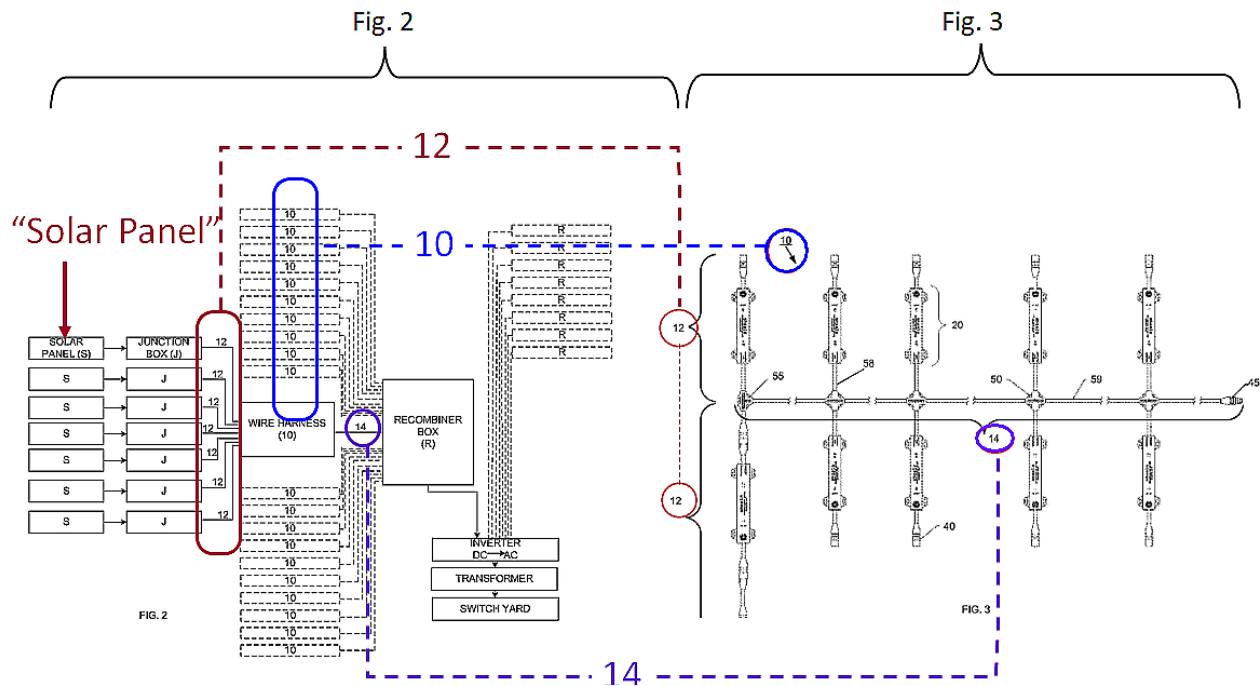
158. As demonstrated with respect to Ground 1, the Fan-Ba-Yen combination discloses an enhanced in-line fuse assembly intended for use in solar-power applications that is configured to better protect a photovoltaic system. EX 1009, p. 3; EX 1006, ¶[0020]; EX 1011, ¶[0005]. A POSITA working on solar-power installations and informed about the solar energy wire harness disclosed in Solon would have been motivated to better protect the in-line fuses in such wire harnesses by using an enhanced in-line fuse assembly, as is taught by the Fan-Ba-Yen combination. EX 1008, ¶[0033]. A POSITA would have been motivated to use the in-line fuse assembly according to the Fan, Ba, and Yen combination for the in-line fuses identified but not described in Solon in order to provide overcurrent protections with fuses that are easy and affordable to install in solar wiring system and protected against environmental conditions, abrasion and impact damage. EX 1009, p. 3; EX 1006, ¶[0020]; EX 1011, ¶¶[0038]-[0039].

159. For all of these reasons, it is my opinion that a POSITA would have been motivated to combine the teachings of Solon with the Fan-Ba-Yen combination to better facilitate the installation process and to protect the solar-energy wire harness from harsh outdoor environments.

1. Claim 10

Preamble. A photovoltaic wire harness including:

160. Solon discloses that a “wire harness 10 includes a plurality of branches 12 feeding into one trunk 14.” (EX 1008, ¶[0029] and FIGS. 2 and 3, combined with annotation).

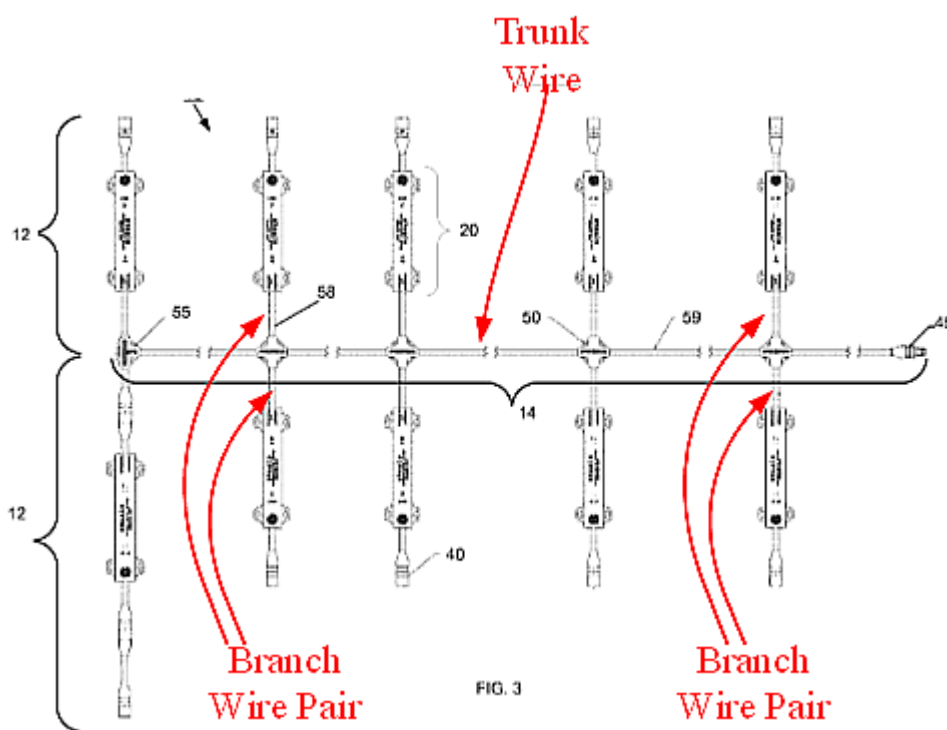


EX 1008, FIGS. 2 and 3 (combined with annotation)

Given the above, it is my opinion that a POSITA would have found the limitations in claim 10(Preamble) to be obvious in view of Solon.

a. A trunk wire having a plurality of branch wires extending there from in pairs, said branch wires and said trunk wire forming angles having vertices of approximately degrees [sic]; and.

161. Solon further discloses “[b]ranches 12 of wire harness 10 each include one in-line fuse assembly 20, so wire harness 10 includes a plurality of in-line fuse assemblies 20 connected to branch wire 58, which is preferably photovoltaic wire.” (EX 1008, ¶[0030] and FIG. 3 as annotated).



Ex. 1008, FIG. 3 (1st-annotation)

162. The '739 patent provides no details about what is meant by the expression “said branch wires and said trunk wire forming angles having vertices of approximately degrees” as recited in claim 10(a). An ordinary and customary

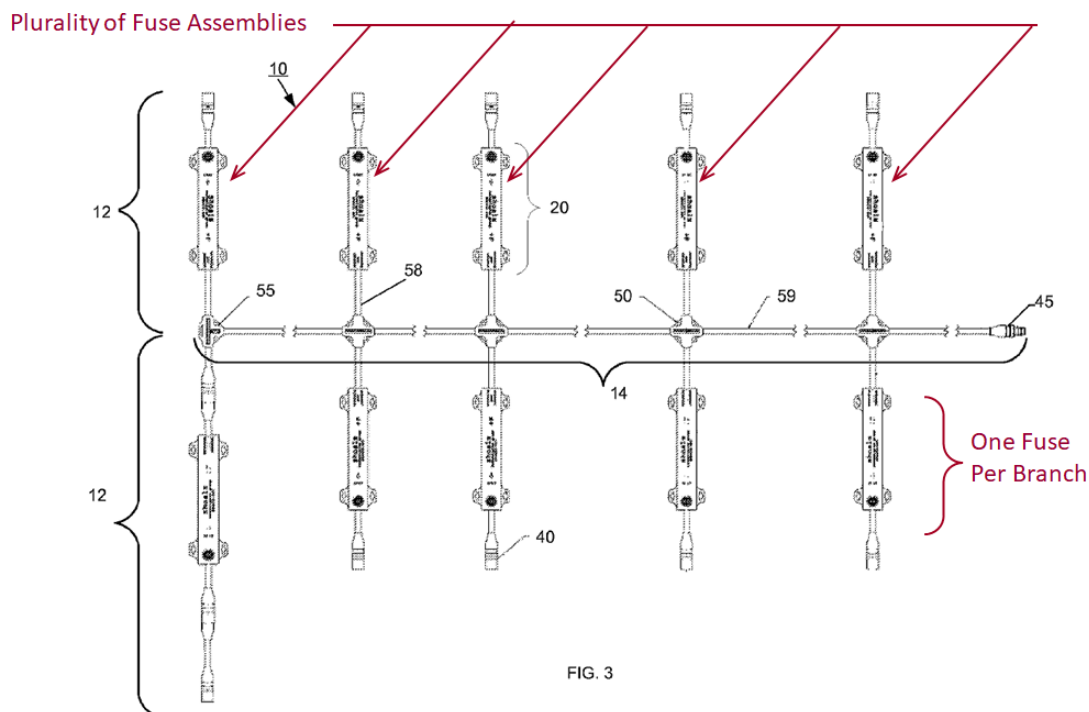
meaning, as understood by a POSITA, of the expression "said branch wires and said trunk wire forming angles having vertices of approximately degrees" would be that *some* angle is formed at the intersection of the branch wires with the trunk.

163. Solon further discloses that some angle is formed at the intersection of the branch wires with the trunk. (EX 1008, FIG. 3, annotated above).

Given the above, I believe that a POSITA would have found the limitations of claim 10(a) to be obvious in view of Solon.

b. A plurality of fuse assemblies engaged only with said branch wires in a ratio of one fuse assembly per branch wire, said fuse assemblies each including:

164. Solon discloses that “[b]ranches 12 of wire harness 10 each include one in-line fuse assembly 20, so wire harness 10 includes a plurality of in-line fuse assemblies 20 connected to branch wire 58, which is preferably photovoltaic wire.” (EX 1008, ¶[0030] and Fig. 3 annotated).



Ex. 1008, FIG. 3 (annotated)

For the above reasons, it is my opinion that a POSITA would have found the limitations in claim 10(b) to be obvious in view of Solon.

165. With regard to the fuse assemblies, Solon acknowledges the need to “protect housing-22 and lid-23 encased assembly 20 from ambient.” (EX 1008, ¶[0033]).

A POSITA would have understood from Solon the need to protect the in-line fuses in wire harnesses from ambient conditions by using enhanced in-line fuse assemblies and would have looked to the Fan-Ba-Yen combination for such protection. EX 1009, p. 3; EX 1006, ¶[0020]; EX 1011, ¶[0005]. Specifically, the overmold of Yen provides protection from impacts in the ambient environment and

Fan-Ba provides protection from water and other corrosive intrusions. EX 1009, p. 3; EX 1006, ¶[0020]; EX 1011, ¶[0005].

166. The following subsections of claim 10(b), namely i-iv, recite the same limitations as the in-line assembly recited in Claim 1, addressed above. A POSITA would have understood that fuse assemblies in a solar installation are exposed to harsh outdoor environments and can benefit from additional protection from the elements. Thus, the POSITA would have been motivated to add the modified in-line fuse assembly taught by the Fan-Ba-Yen combination, discussed above, to the photovoltaic wire harness disclosed by Solon.

i. A photovoltaic fuse having a solid outer surface including a first end, a second end and a middle section there between, said solid outer surface defining an outline;

167. The claim 10(b)i limitations are the same as, or at least substantially correspond to, the claim 1(a) limitations addressed in Ground 1. For the same reasons that I presented in Ground 1 for the claim 1(a) limitations, I believe that a POSITA would have found the claim 10(b)i limitations also to be obvious in view of Solon, Fan, Ba, and Yen.

ii. An undermold surrounding and sealing said fuse, said undermold defining an outer surface outline, wherein the outer surface outline of said undermold is substantially parallel relative to the outline of said solid outer surface;

168. The claim 10(b)ii limitations are the same as, or at least substantially correspond to, the claim 1(b) limitations addressed in Ground 1. For the reasons presented in Ground 1 for the claim 1(b) limitations, I believe that a POSITA would have found the claim 10(b)ii limitations to be obvious in view of Solon, Fan, Ba, Yen.

iii. An overmold defining an outline and surrounding said undermold, said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials, wherein the outline of said overmold is substantially parallel relative to the outline of said undermold; and

169. The claim 10(b)iii limitations are the same as, or at least substantially correspond to, the limitations recited in claim 1(c) addressed in Ground 1. For the reasons presented in Ground 1 for the claim 1(c) limitations, I believe that a POSITA would have found the claim 10(b)iii limitations to be obvious in view of Solon, Fan, Ba, and Yen.

iv. A first photovoltaic connector engaged with said first end, wherein said assembly provides electrical insulation.

170. The claim 10(b)iv limitations are the same as, or at least substantially correspond to, the claim 1(d) limitations addressed in Ground 1. For the reasons presented in Ground 1 for the claim 1(d) limitations, it is my opinion that a

POSITA would have found the claim 10(b)iv limitations to be obvious in view of Solon, Fan, Ba, and Yen.

171. For all the reasons cited above, I believe that a POSITA would have found claim 10 in its entirety to be obvious based on the combination of Solon, Fan, Ba, and Yen. Accordingly, claim 10 should be found invalid under 35 U.S.C. § 103 based on Solon, Fan, Ba, and Yen (i.e., the “Solon-Fan-Ba-Yen combination”).

2. Claim 11

The photovoltaic wire harness of claim 10 wherein said fuse assemblies each further include a second photovoltaic connector.

172. The limitations recited in claim 11 are the same as, or at least substantially correspond to, the limitations recited in claim 2 addressed in Ground 1. Therefore, in my opinion, a POSITA would have found the limitation recited in claim 11 to be obvious based on Ba. As demonstrated above, the Solon-Fan-Ba-Yen combination discloses all the limitations recited in claim 10 from which claim 11 depends.

Accordingly, in my opinion, claim 11 should be found invalid under 35 U.S.C. § 103 based on Solon, Fan, Ba, and Yen.

3. Claim 12

The photovoltaic wire assembly of claim 10 wherein said fuse assemblies each include a pair selected from the group consisting of one male type said first photovoltaic connector and one female type connector; one female type said first photovoltaic connector and one male type connector; one male type said first photovoltaic connector and one wire; and one female type said first photovoltaic connector and one wire.

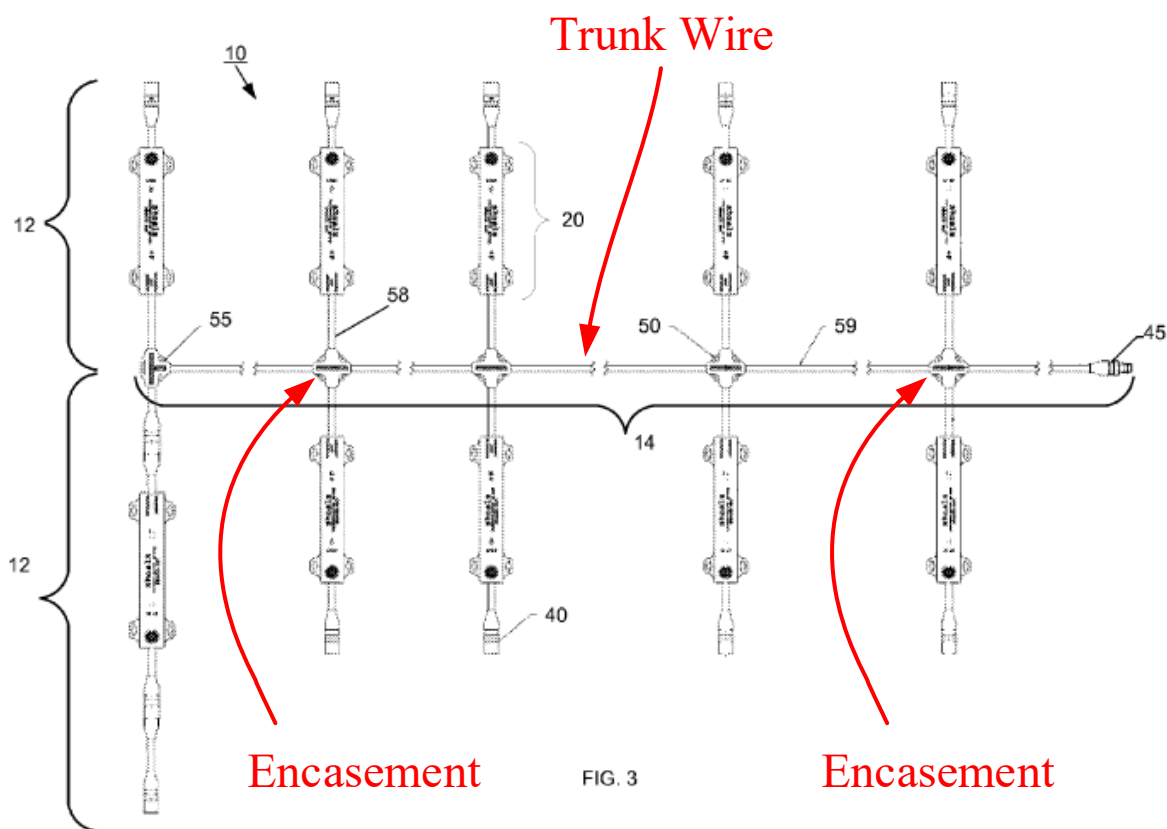
173. The limitations recited in claim 12 are the same as, or at least substantially correspond to, the limitations recited in claim 3 of Ground 1, discussed above.

Therefore, in my opinion, a POSITA would have found the limitation recited in claim 12 to be obvious based on Ba. As demonstrated above, the Solon-Fan-Ba-Yen combination discloses all the limitations recited in claim 10 from which claim 12 depends. Accordingly, claim 12 should be found invalid under 35 U.S.C. § 103 based on Solon, Fan, Ba and Yen.

4. Claim 13

The photovoltaic wire assembly of claim 10 wherein said angles are surrounded by an encasement.

174. Solon discloses that “[b]ranches 12 connect to trunk 14 with cross joints 50, or tee joints 55, with the former uniting four wires and the latter uniting three.” (EX 1008, ¶[0029] and FIG. 3, annotated).



EX 1008, FIG. 3 (annotated)

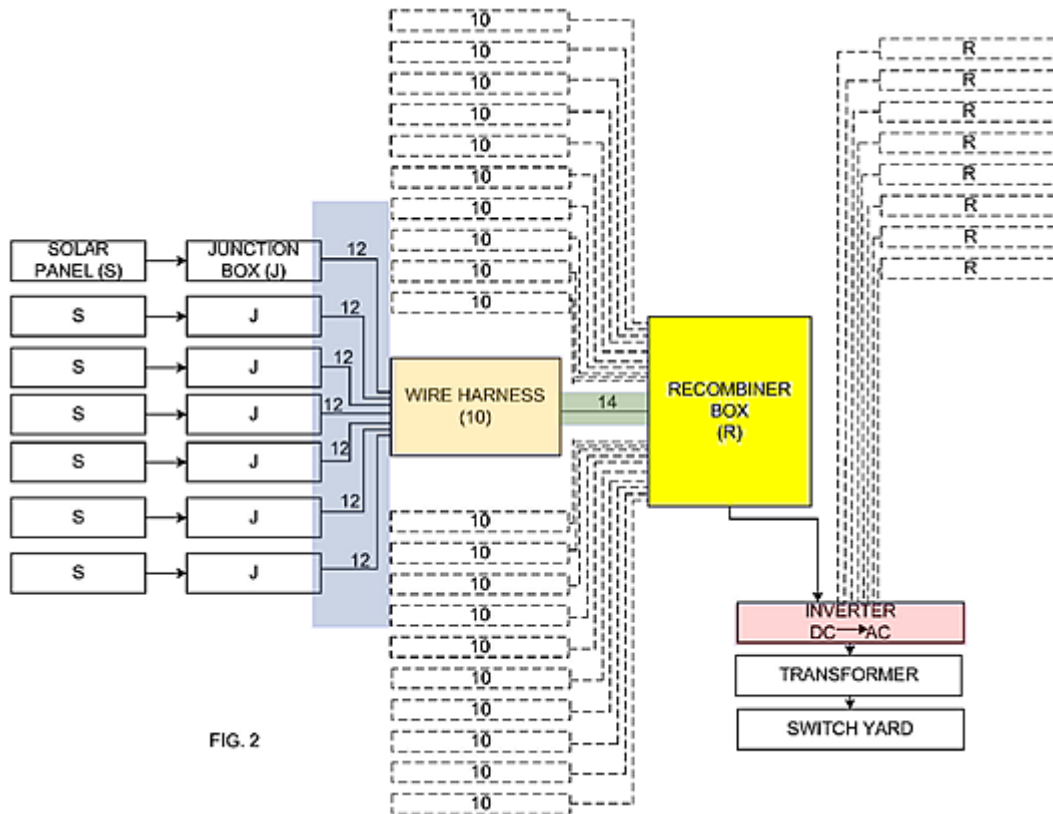
175. In my opinion, a POSITA would have found the limitation recited in claim 13 of Ground 1 to be obvious based on Solon. As I have shown, the Solon, Fan, Ba, and Yen combination discloses all limitations recited in claim 10 from which claim 13 depends. Accordingly, claim 13 should be found invalid under 35 U.S.C. § 103 based on Solon, Fan, Ba, and Yen.

5. Claim 15

176. Claim 15 recites a method for assembling the parts recited in claim 10. As the parts recited in claim 10 are not novel and are not assembled or combined in a novel manner, I believe that a POSITA would have found the assembly process recited in claim 15 and its dependent claims to be obvious.

Preamble. A method of configuring a solar installation including the steps of:

177. Solon discloses that a “‘big picture’ presentation of a solar energy plant according to the present invention is depicted in FIG. 2.” (EX 1008, [0026] and FIG. 2).



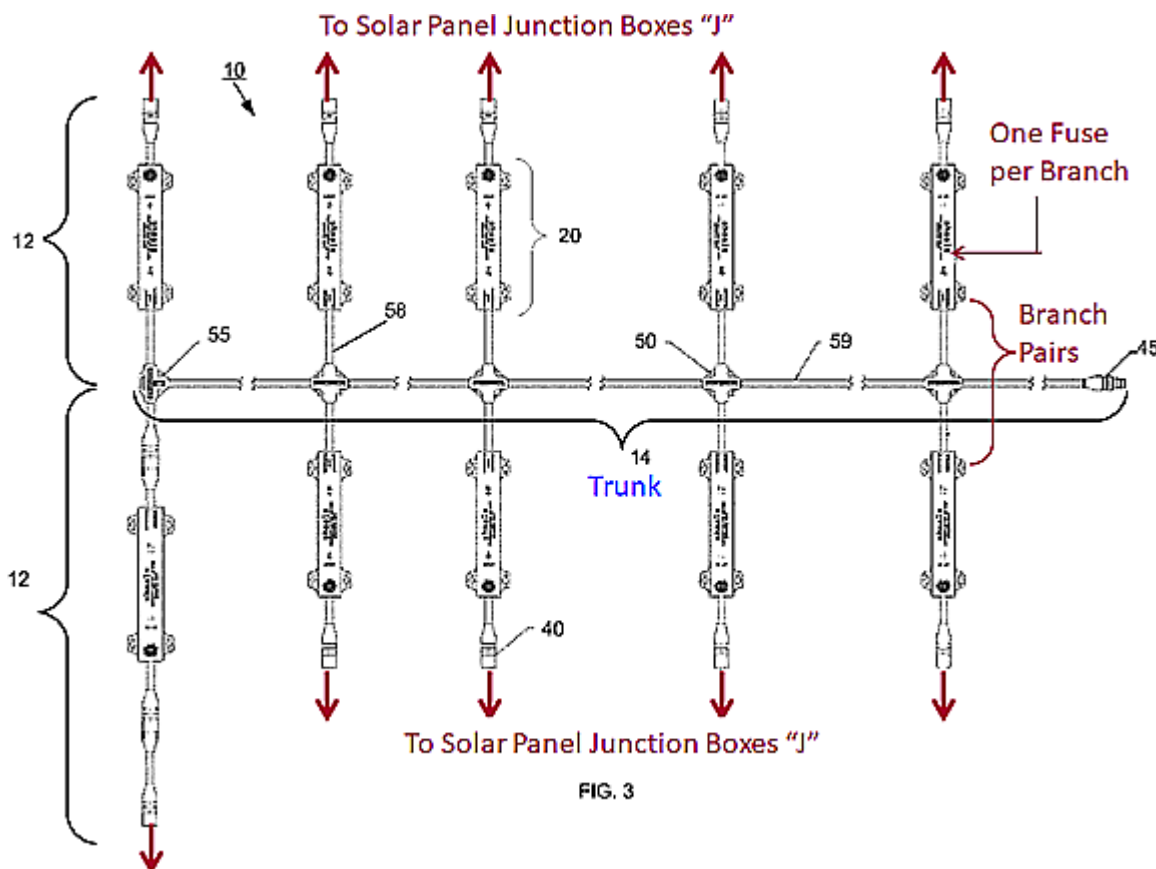
Ex. 1008, FIG. 2 (annotated)

Given this disclosure, I believe that a POSITA would have found the elements of claim 15(Preamble) to be obvious in view of Solon to the extent that the preamble is found to be limiting.

a. Engaging the trunk of a wire harness with a combiner box wherein said combiner box lacks fuses and circuit breakers; and

178. Solon discloses “[e]ngaging the trunk of a wire harness with a combiner box.” In particular, Solon discloses that “[e]ach wire harness has one trunk 14, which is in communication with a recombining box R” and “recombining box R of

the present invention is preferably devoid of fuses.” (EX 1008, ¶¶[0026], [0028] and FIG. 3 annotated).



EX 1008, FIG. 3 (annotated)

For the above reasons, I believe that a POSITA would have found the limitations in claim 15(a) to be obvious in view of Solon.

b. Engaging each terminal branch of said wire harness with one solar panel wherein each terminal branch includes exactly one in line fuse assembly each of said in line fuse assemblies including:

179. Solon discloses “[e]ngaging each terminal branch of said wire harness with one solar panel wherein each terminal branch includes exactly one in line fuse assembly.” In particular, Solon discloses that “[e]ach solar panel S is connected to a junction box J, which may be integrated or separate. Each junction box J is in communication with one branch 12 of wire harness 10.” (EX 1008, ¶¶0026] and FIG. 2 above). Given the above, I believe that a POSITA would have found the limitations in claim 15(b) to be obvious in view of Solon.

180. The following subsections of claim 15(b), namely i-iv, recite the same limitations as the in-line assembly recited in claim 1 and claim 10, addressed above. Again, a POSITA would have understood that fuse assemblies in a solar installation are exposed to harsh outdoor environments and can benefit from additional protection from the elements. Thus, the POSITA would have been motivated to add the modified in-line fuse assembly taught by the Fan-Ba-Yen combination, discussed above, to the photovoltaic wire harness disclosed by Solon.

i. A photovoltaic fuse having a solid outer surface including a first end, a second end and a middle section there between, said solid outer surface defining an outline;

181. The claim 15(b)i limitations are the same as, or at least substantially corresponds to, the recited claim 1(a) limitations addressed in Ground 1. For the reasons presented in Ground 1 for the claim 1(a) limitations, I believe that a POSITA would have found the claim 15(b)i limitations to be obvious in view of Fan, Ba and Yen.

(b) ii. An undermold surrounding and sealing said fuse, said undermold defining an outer surface outline, wherein the outer surface outline of said undermold is substantially parallel relative to the outline of said solid outer surface;

182. The claim 15(b)ii limitations are the same as, or at least substantially corresponds to, the claim 1(b) limitations addressed in Ground 1. For the reasons presented in Ground 1 for the claim 1(b) limitations, I believe that a POSITA would have found the claim 15(b)ii limitations to be obvious in view of Fan, Ba, and Yen.

iii. An overmold defining an outline and surrounding said undermold, said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials, wherein the outline of said overmold is substantially parallel relative to the outline of said undermold; and

183. The claim 15(b)iii limitations are the same as, or at least substantially corresponds to, the claim 1(c) limitations addressed in Ground 1. For the reasons

presented in Ground 1 for the claim 1(c) limitations, a POSITA would have found the claim 15(b)iii limitations to be obvious in view of Fan, Ba, and Yen.

iv. A first photovoltaic connector engaged with said first end, wherein said assembly provides electrical insulation.

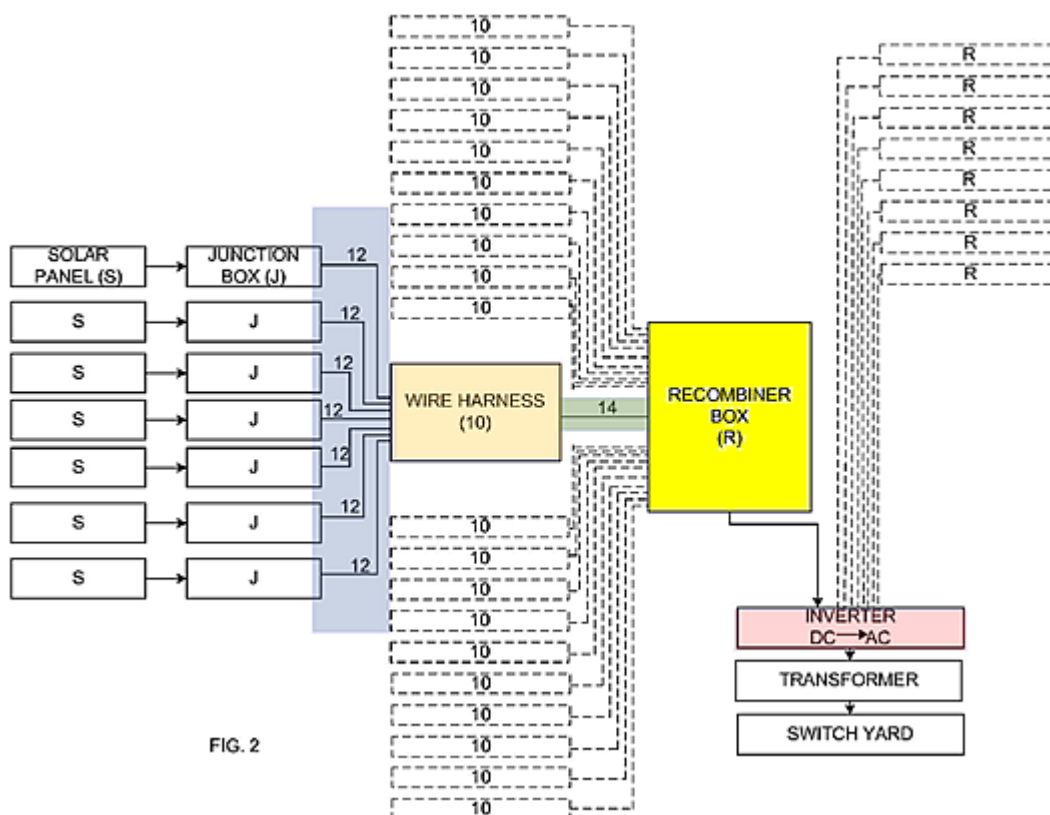
184. The claim 15(b)iv limitations are the same as, or at least substantially corresponds to, the claim 1(d) limitations addressed in Ground 1. For the reasons presented in Ground 1 for the claim 1(d) limitations, I believe that a POSITA would have found the claim 15(b)iv limitations to be obvious in view of Fan, Ba, and Yen.

185. For all the reasons cited above, I believe that a POSITA would have found claim 15 in its entirety to be obvious based on the combination of Solon, Fan, Ba, and Yen. Accordingly, in my opinion, claim 15 should be found invalid under 35 U.S.C. § 103 based on Solon, Fan, Ba, and Yen.

6. Claim 16

The method of claim 15 wherein said step of engaging each terminal branch with one solar panel includes the step of connecting to said first photovoltaic connector.

186. Solon discloses “[e]ach solar panel S is connected to a junction box J. which may be integrated or separate. Each junction box J is in communication with one branch 12 of wire harness 10.” EX 1008, ¶[0026] and FIG. 2 annotated)

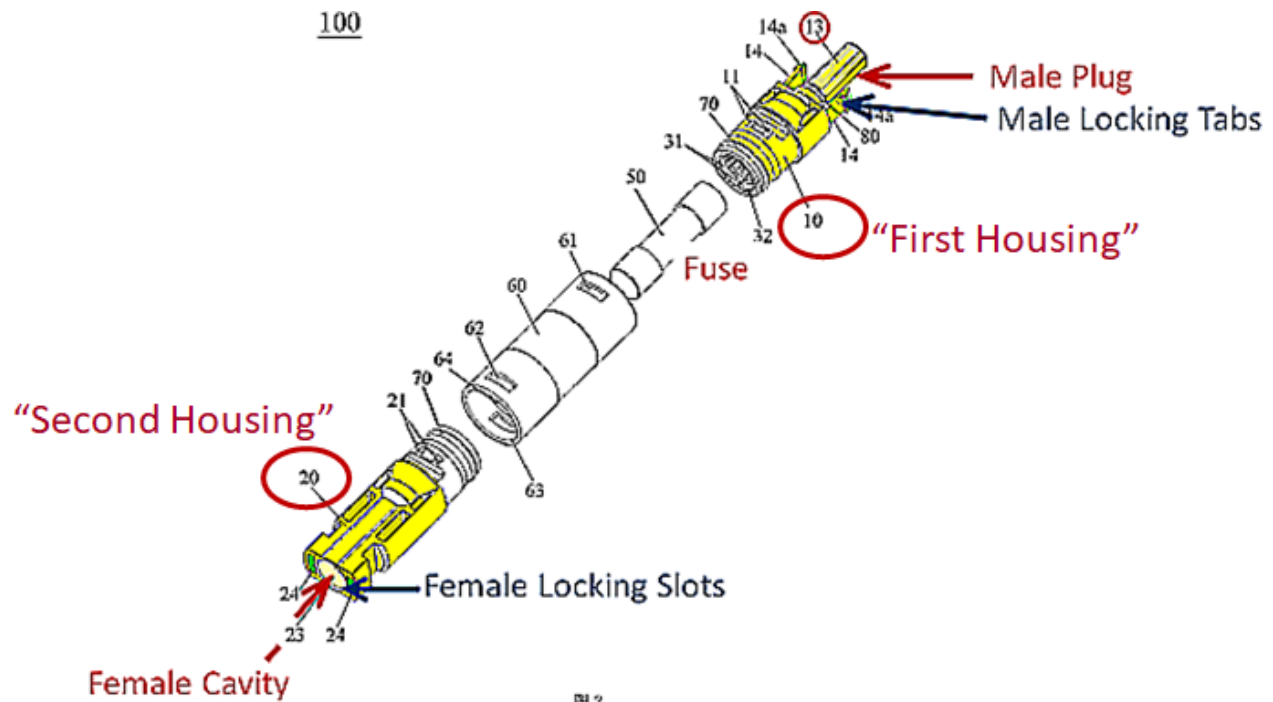
**EX 1008, FIG. 2 (annotated)**

187. Given the above, it is my opinion that a POSITA would have found the limitation recited in claim 16 to be obvious based on Solon. As I have shown previously, the Solon-Fan-Ba-Yen combination discloses all the limitations recited in claim 15 from which claim 16 depends. Accordingly, claim 16 should also be found invalid under 35 U.S.C. § 103 based on Solon, Fan, Ba, and Yen.

7. Claim 17

The method of claim 16 wherein said step of connecting to said first photovoltaic connector includes the step of connecting to a male said first photovoltaic connector.

188. Solon, Fan, Ba, and Yen disclose “connecting to said first photovoltaic connector includes the step of connecting to a male said first photovoltaic connector.” In particular, Ba discloses that the second housing 20 (corresponding to a “first photovoltaic connector”) is a female type connector, and the first housing 10 (corresponding to a “second photovoltaic connector”) is a male type connector. (EX 1011, FIG. 1 annotated).



EX 1003, FIG. 1 (annotated)

189. For the above reasons, I believe that a POSITA would have found the limitation recited in claim 17 to be obvious based on Solon, Fan, Ba, and Yen. As I have shown, the Solon, Fan, Ba, and Yen combination discloses all limitations recited in claims 15 and 16, from which claim 17 depends. Accordingly, in my opinion, claim 17 should be found invalid under 35 U.S.C. § 103 based on Solon, Fan, Ba, and Yen.

8. Claim 18

The method of claim 16 wherein said step of connecting to said first photovoltaic connector includes the step of connecting to a female said first photovoltaic connector.

190. A POSITA would have found the limitation recited in claim 18 to be obvious in view of the disclosure in Ba. In particular, Ba illustrates that the second housing 20 (corresponding to a “first photovoltaic connector”) is a female type connector, and the first housing 10 (corresponding to a “second photovoltaic connector”) is a male type connector. (EX 1011, FIG. 1). A POSITA would have found it obvious to use this structure in the manner recited in claim 18.

191. For these reasons, I believe that a POSITA would have found the limitation recited in claim 18 to be obvious based on Solon, Fan, Ba, and Yen. As I have also shown, the Solon, Fan, Ba, and Yen combination discloses all limitations recited in claims 15 and 16, from which claim 18 depends. Accordingly, in my opinion,

claim 18 should be found invalid under 35 U.S.C. § 103 based on Solon, Fan, Ba, and Yen.

192. For these reasons, in accordance with Ground 3, claims 10-13 and 15-18 should be found invalid under 35 U.S.C. § 103 based on Solon, Fan, Ba, and Yen.

❖ **GROUND 4 – Claims 1-5 are unpatentable under 35 U.S.C. § 103 as obvious based on Ye and Gilman**

193. As noted above (see list under Summary of Opinions), Ground 4 is based on Ye combined with Gilman. As I discussed above, I have been informed that for a prior art reference to be proper for use in an obviousness analysis, the reference must be “analogous art” to the claimed invention. I have been informed that a prior art reference is analogous to the claimed invention if, for example, the reference is from the same field of endeavor as the claimed invention or the reference is reasonably pertinent to the particular problem of the claimed invention.

194. Ye provides solutions in the same field of endeavor as the '739 patent at least because Ye relates to “a solar cell connecting line comprising a fuse holder.” (EX 1005, Abstract). Correspondingly, the '739 patent is directed to an “assembly [that] allows for circuit protection to be installed into the wiring harness for a photovoltaic installation.” (EX 1001, 1:55-56). Additionally, claim 1 of the '739 patent is

directed to “[a]n in line assembly for a solar installation including: [a] photovoltaic fuse...” (EX 1001, 4:27-29) Therefore, Ye is pertinent to the problem addressed by the ’739 patent and is analogous prior art to the ’739 patent.

195. Likewise, Gilman is directed to improving inline fuse connections and the durability of those electrical connections and is, therefore, pertinent to the problem addressed by the ’739 patent. Correspondingly, the ’739 patent, which is entitled “photovoltaic in line fuse connector assembly having an integral fuse,” and which claims elements and methods related to “[a]n in line assembly for a solar installation including: [a] photovoltaic fuse...” (EX 1001, Abstract, 4:27-29).

During examination, the examiner also looked for art in the area of fuses and power connectors generally, rather than focus on areas that are limited to solar applications. (EX 1001, Front Page) In this regard, the examiner believed that prior art outside of the field of solar power installations would be relevant for consideration, and I believe a POSITA would have the same view. Therefore, Gilman is analogous prior art to the ’739 patent.

196. A POSITA would have been motivated to combine Ye and Gilman to merge their separately disclosed strengths in order to provide greater environmental durability and also provide lower cost. Specifically, Ye describes a “solar cell connecting line [that] is waterproof, corrosion-resistant and well-sealed, and meets

the requirements for use in harsh outdoor environmental conditions, ensuring stable and reliable operation of the solar cell.” (EX 1005, Abstract) Accordingly, Ye recognizes the need for protection of the in-line fuse and connectors. Structurally, Ye teaches a “fuse holder comprising a fuse component, a holder body and an integrally formed insulating case, the wiring ends of the two electric cables being fixedly connected to the holder body separately, the fuse component being installed in the holder body and electrically connected at two ends to the wiring ends of the electric cables separately, and the insulating case covering the holder body and being in sealed connection with the electric cables.” (*Id.*)

197. Structurally, Gilman discloses:

[a] fuse assembly 100 may include a fuse 120, a pair of wires or cables 111 and 114 (hereinafter referred to as “the wires 111 and 114), and a pair of electrically conductive end caps 130a and 130b that electrically couple the wires 111 and 114 to the fuse 120 as further described below. The wires 111 and 114 may provide an electrical connection between the fuse 120 and various other circuit elements (not shown) for which the fuse 120 may provide protection against certain overcurrent conditions.

EX 1004, ¶[0020].

198. Specifically, Gilman focuses on improving the durability and stability of the connection between the wire and the in-line fuse. (EX 1004, ¶[0006]). Since the fuse assemblies of Ye are contemplated as being installed outdoors, a POSITA

would recognize that these fuse assemblies need protection from torsional, lateral, and longitudinal forces from abrasions. (EX 1004, ¶[0035]). Likewise, the in-line fuse must remain firmly in contact with the wire at both of its ends or the circuit fails. (EX 1004, ¶[0024]). Ye describes relying primarily on the casting of the holding body 24 to secure the wiring ends 11 to the fuse 22, which a POSITA would recognize is susceptible to being disconnected by forces pulling, twisting, or bending the wire to which the fuse is held. (EX 1005, ¶¶[0004], [0012]-[0013], [0018]). Additionally, Ye discloses the step of separately fixing each of the wiring ends to each end of the fuse as an installation step but provides no further details on this important connection. (EX 1005, ¶[0017]). Therefore, a POSITA would have recognized that the wire-fuse connection details disclosed in Gilman and the improvements thereto would be advantageous to combine with the in-line fuse holder of Ye.

199. Gilman discloses “an improved fuse end cap that provides a more robust electrical connection mechanism between a fuse and wire connections without the need to additional components that avoids soldered, welded.” (EX 1004, ¶[0004]). To accomplish this improved connection, Gilman discloses an in-line fuse with integrated mounting cuffs so that the outer metal conductive ends of the fuse overlap and circumferentially surround the wiring ends along a portion of the wire

end. (EX 1004, ¶¶[0024]-[0025], Figs. 1C, 2B, 3B). In particular, Gilman discloses:

Once the conductor 116 has been inserted thusly, the terminal 132a, which may be formed of a malleable material as further described below, may be crimped, crushed, bent, flattened, or otherwise deformed (hereinafter collectively referred to as “crimped”) so as to pinch and securely trap the end of the conductor 116 therein... The conductor 116 may thereby be held in firm engagement with the terminal 132a, and a secure electrical connection may be established therebetween without requiring additional fasters, adhesives, or the application of solder.

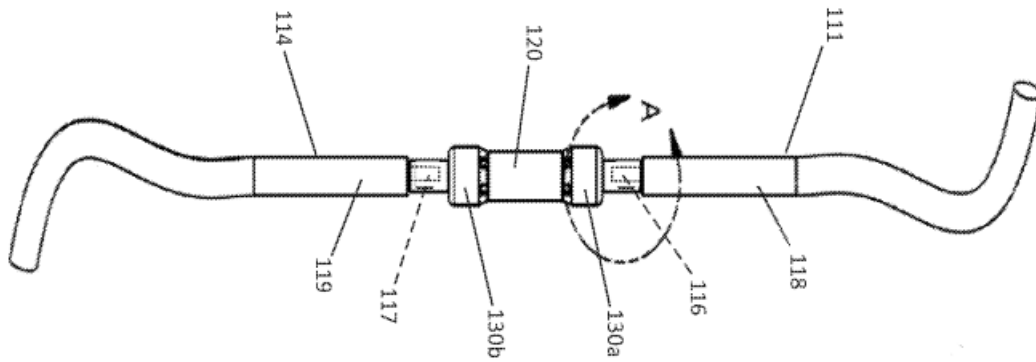
EX 1004, ¶[0024].

200. A POSITA would understand that this connection mechanism disclosed in Gilman provides “a more robust electrical connection mechanism between a fuse and wire connections.” (EX 1004, ¶[0003]), and that the disclosure of Gilman could be applied to a photovoltaic fuse assembly because of the similarity in size and shape between photovoltaic fuses and generic fuses, and the common need to protect fuses from mechanical forces and environmental factors. (EX 1004, ¶[0036]). A POSITA looking for opportunities to improve on the details disclosed in Ye would be motivated to look at examples for packaging and protecting ordinary in-line fuses, as such designs could be readily applied to photovoltaic fuses.

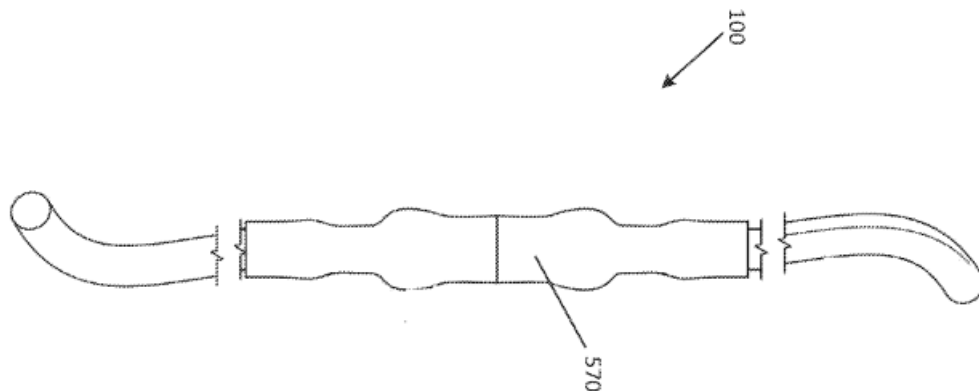
201. Further, Gilman discloses various materials that can be used for shielding and

protecting the wire-fuse connections after fastening them. (EX 1004, ¶[0035]).

Gilman also discloses various advantages of each of the materials that can be used for the shielding layers. For example, Gilman describes a shielding arrangement that provides “protection against abrasion and other potentially damaging contact” and “a liquid-tight and/or airtight seal around the fuse assembly ... thereby protecting the fuse assembly from environmental elements.” (*Id.*).



EX 1004, Figure 1A.



EX 1004, Figure 5.

Further, paragraphs [0034]-[0035] state:

[0034] Referring to FIG. 5, it is contemplated that the inline fuse assembly 100 of FIG. 1A may include a protective wrap ping or coating 570 (hereinafter referred to as “the protective wrapping 570”) surrounding the fuse 120, end caps 130a and 130, and end portions of the wires 111 and 114 (not within view). The protective wrapping 570 may be made of a thermoplastic material, including, but not limited to, polyolefin, fluoropolymer, PVC, neoprene, silicone elastomer, VITON, etc. In addition, the protective wrapping 570 may be heat shrinkable, such that when heat is applied to the protective wrapping 570 (e.g. after it has been wrapped around the fuse assembly 100) it will decrease in size and will fit tightly over the fuse 120, end caps 130a and 130, and wires 111 and 114.

[0035] The protective wrapping 570 may provide the fuse 120, end caps 130a and 130b, and wires 111 and 114 with protection against abrasion and other potentially damaging contact. In addition, the protective wrapping 570 may provide a liquid-tight and/or airtight seal around the fuse assembly 100, thereby protecting the fuse assembly 100 from environmental elements such as water, grease, oil, dirt, dust, etc., which might otherwise enter the fuse assembly 100 and cause corrosion and/or degradation of performance.

202. A POSITA would have been motivated by the disclosed performance and protection in Gilman to apply similar weatherproofing materials for Ye’s inline fuse holder. A POSITA would have recognized that different materials confer different

and complimentary protection benefits and that layering these protection benefits may be required to meet exterior, exposed solar wiring code. A POSITA would have understood that such layering of an overmold disposed on an undermold is often a cheaper way of applying protection from different environmental degradation factors than attempting to do so using a single high-end material. (*Id.*, ¶¶[0035]-[0036]).

203. A POSITA would be well-aware of the need to protect electrical wiring from environmental degradation factors. Safety issues that may stem from degradation of electrical wiring have led to many rules and regulations governing the safe operation of electrical elements. For example, provisions in the National Electric Code (NEC), such as Article 110.27(B)-Guarding of Live Parts/ Prevent Physical Damage, which states the following general requirement for wiring installations:

B) Prevent Physical Damage. In locations where electrical equipment is likely to be exposed to physical damage, enclosures or guards shall be so arranged and of such strength as to prevent such damage.

EX 1012, pg. 50.

204. The POSITA would have looked to the crimpable connections, protective wrapping, and different materials for overmold/undermold that are disclosed in Gilman as modifications to be made to the system disclosed in Ye in order to comply with this requirement at the locations of fuses in the solar installation.

Therefore, a POSITA would have been motivated to modify the fuse of Ye with the crimpable connections, the holder body of Ye to be a protective wrapping as disclosed in Gilman. Further description of the structural details of the combination are explained below where substitutions or modifications are made for elements of the claims.

205. Since the installation steps and the ordering of protective layers in Ye and Gilman correspond to each other, a POSITA would have had a high likelihood of success in modifying the in-line fuse protection design of Ye with that of Gilman. (EX 1004, ¶¶[0030]-[0035])(EX 1005, ¶¶[0015]-[0019]).

Claim by Claim Analysis of Ground 4

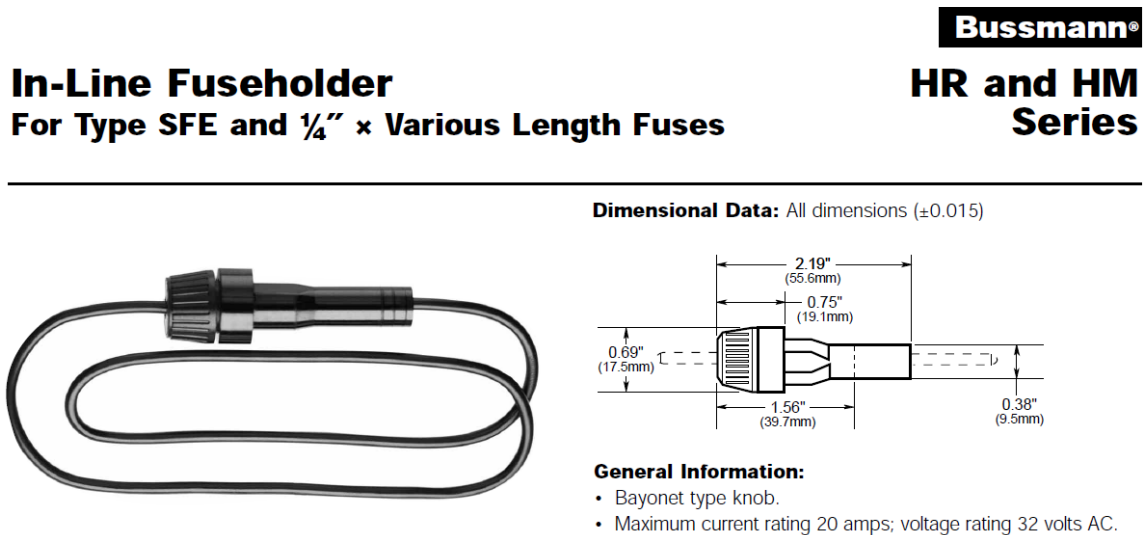
206. I shall now examine each of the claim elements of claim 1 of the '739 patent, in light of Ye and Gilman. The claim 1 preamble recites:

1. Claim 1

(Preamble) - An in-line assembly for a solar installation including:

207. To the extent that the preamble is limiting, the preamble to claim 1 requires an “in-line” assembly for a solar installation. The title of the '739 patent contains the term “in-line”, as does the first line of the Abstract. The '739 patent describes “in-line” as “the fuse [being] connected wire-to-wire” (EX 1001, 1:52-53). In the field of electrical engineering, the term “in line” [*sic*: inline] has a well-known

meaning that would have been familiar to a POSITA. For example, the reference “In-Line Fuse holder - HR and HM Series” shows an example of a well-known inline fuse configuration. See EX 1013, reproduced below. The fuse cartridge in this figure is connected in series with two sections of wire. In operation, the part is sold with the wire uncut; the user cuts the wire between the two ends of the fuse to produce one wire connected to each end of the fuse.



COOPER Bussmann
12-21-98
SB98107 Rev. A

Form No. HR and HM Series
Page 1 of 1
BIF Doc #2122

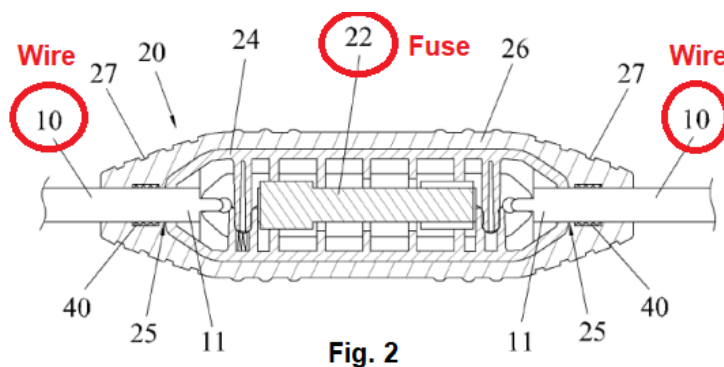
The Merriam -Webster dictionary defines the word “inline” as “having the parts or units arranged in a straight line” (EX 1014, p. 1). A POSITA would have understood an “in-line assembly” involving a photovoltaic fuse to have the configuration shown in the In-Line Fuseholder from Bussmann above.

208. An inline fuse holder is explicitly disclosed in Ye stating:

a solar cell connecting line, comprising a fuse holder, two electric cables and two plug terminals, one end of the electric cable being connected to the plug terminal and another end forming a wiring end, the fuse holder comprising a fuse component... the fuse component being installed in the holder body and electrically connected at two ends to the wiring ends of 30 the electric cables separately...

EX 1005, ¶[0004].

This arrangement is shown in Figure 2 of Ye below:



EX 1005, Figure 2 (annotated - 1).

209. I note that the (Certified English Translation) title for the Ye patent is: “Solar cell connecting line” which confirms that the fuse-holding connecting line disclosed in Ye is for solar power photovoltaic (PV) systems. Further, Ye discloses “when manufacturing the solar cell connecting line of the present utility model, the fuse

component 22 is first installed in the holder body 24, the respective wiring ends 11 of the two electric cables 10 are passed through the insertion holes 25 of the holder body 24 and electrically connected to the fuse component 22 by soldering or another method.” (EX 1005, ¶[0019]).

210. Given the above disclosure of an inline fuse assembly for a solar installation, it is my opinion that the preamble of claim 1 is obvious based on Ye.

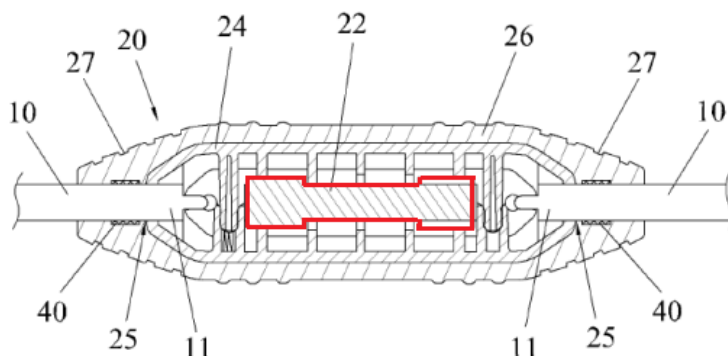
a. A photovoltaic fuse having a solid outer surface including a first end, a second end and a middle section there between, said solid outer surface defining an outline;

211. Ye discloses as part of its abstract that “[t]he present utility model discloses a solar cell connecting line, comprising a fuse holder, two electric cables and two plug terminals, ...the fuse holder comprising a fuse component.” (*Id.*, Abstract).

Thus, Ye explicitly relates the fuse holder and connecting wires to applications in solar cell connections. Further, Ye discloses that such fuses and connecting lines are used in various arrangements and current carrying configurations within rows of solar panels. (*Id.*, ¶[0002]). Accordingly, a POSITA would have understood that the fuses and connecting lines disclosed in Ye relate to photovoltaic or solar cell applications.

212. Ye discloses a cartridge-type fuse 22 in the fuse holder 24 of the solar cell connecting line. As shown in the annotated version of FIG. 2 below, the fuse

component 22 includes a first end, a second end, and a middle section therebetween. *See* EX 1005, ¶[0012]; FIG. 2 (annotated), below.



EX 1005, Fig. 2 (annotated - 2)

213. A POSITA would have recognized that the fuse component 22 includes a solid outer surface defining an outline. The fuse component 22 has a *solid outer surface*, a fact shown clearly in Figure 2 of Ye above, where the cartridge fuse is outlined in red. Also visible from this outline is that the ends of the fuse component 22 are wider and a middle section is narrower. This configuration is common in cartridge-type fuses where the ends are capped by a metal (usually copper). Thus, a POSITA would have recognized that the fuse component 22 of Ye is explicitly shown with the outline limitations of this element of claim 1.

214. A POSITA would also have recognized that a body having a solid outer surface defines an outline with that surface as illustrated below in the annotated

figure from Ye. A defined outline is, again, a feature of any solid object. The claimed “solid outline” is illustrated in Figure 2 of Ye, for example, as the outer perimeter of the cartridge fuse emphasized by the red line above. Further, Ye discloses explicitly that the fuse component 22 has “two ends” that contact the wiring ends 11. (Id., ¶[0012]).

215. For all the reasons explained above, it is my opinion that a POSITA would have found the limitations of claim 1(a) to be disclosed and/or obvious based on Ye (EX 1005).

b. An undermold surrounding and sealing said fuse, said undermold defining an outer surface outline, wherein the outer surface outline of said undermold is substantially parallel relative to the outline of said solid outer surface;

216. The specification of the '739 patent does not define the term “undermold”. A POSITA would thus have interpreted this term by its plain and ordinary meaning in the context of its function in the claim and description in the specification. A POSITA would have understood an “undermold” refers to any molded or moldable element serving as a substrate to a second layer, which claim 1 recites as an “overmold”. This concept is explained in detail, for example, in numerous places in GLS Overmolding Guide (*See*, e.g., EX 1015, pgs. 1-4). In context of Gilman and Ye, both the undermolding and overmolding materials are insulating polymers such

as plastic that can be molded into desired shapes. (See, e.g., EX 1004, ¶¶[0034], [0036]; EX 1005, ¶¶[0005], [0013]).

217. The terms “undermold” and “overmold” were known in the time frame of the ’739 patent. For example, “overmold” appears in the publicly-available publication *Overmolding Guide*⁹ (EX 1015). This publication defines “overmold” as follows:

“**Overmolding** utilizes the injection molding process to apply one material [Overmold] onto another material [Substrate]. The over molded material should form a bond with the substrate that endures the end-use environment.... Overmolding eliminates the need for adhesives and primers to bond TPEs to rigid substrates”

(EX 1015, section 1.1; emphasis added).

218. The terms undermold and overmold also appear in several patents related to manufacturing. One example is US Patent 6,523,380 to McGuire et al, entitled “Overmolded Key Including an Ornamental Element and Methods of Making Same” (EX 1016). McGuire issued on February 25, 2003, more than a decade before the Effective Filing Date of the ’739 patent. *See id.* McGuire does not address any solar or fuse holder technology and instead relates to “[a] vehicle ignition key having an ornamental element molded onto the key.” *See id.* Such a

⁹ Overmolding Guide, © 2002 GLS Corporation

key is depicted in Figs. 2 and 3 of McGuire, shown below. McGuire discloses that an undermold layer 26 and an overmold layer 24 are used to make the finished product:

“The **overmold material 24** encapsulates the transponder 30 and secures the peripheral edge 22 of the element 16 to the key, trapping the peripheral edge between the overmold material 24 and the **undermold material 26** as shown in FIG. 3, for example”.

(EX 1016, 5:2-5; emphasis added).

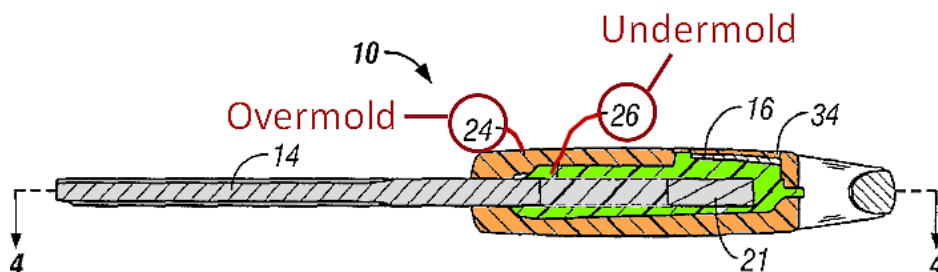


FIG. 2

EX 1016, Fig. 2 (annotated)

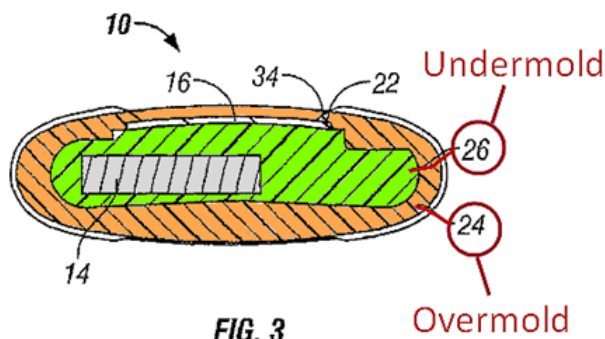


FIG. 3

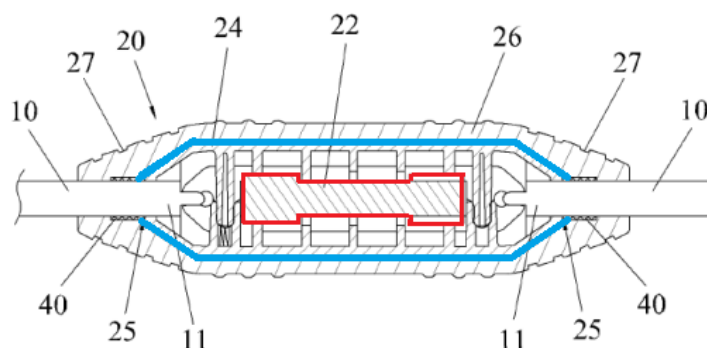
Id., Fig. 3 (annotated)

219. McGuire demonstrates that the terms “undermold” and “overmold” were standard fare in manufacturing, and in injection molding in particular, long before the ’739 patent and as such the terms would have been well known to a POSITA. Furthermore, as I noted above, the ITC has construed the term undermold as “material molded over a piece or part that seals against environmental factors and is surrounded by the overmold,” which is consistent with these uses in the art by McGuire and the Overmolding Guide. (EX1023, pp. 17, 20.)

220. As shown in Figure 2 from Ye, reproduced again below, Ye discloses a holder body 24 (“undermold”) that serves the purpose of holding the fuse and wire ends, which is the role of the undermold in the ’739 patent. (EX 1001, 3:10-20; EX 1005, ¶[0012]). The holding body 24 in Ye clearly surrounds and seals the fuse component 22. *See*, EX 1005, FIG. 2 (annotated) below. The corresponding structure between Ye as modified by Gilman and claim 1(b) of the ’739 patent are explained further below.

1) “undermold surrounding and sealing said fuse,”

221. The holder body 24 (blue) in Ye surrounds the fuse component 22 (red).

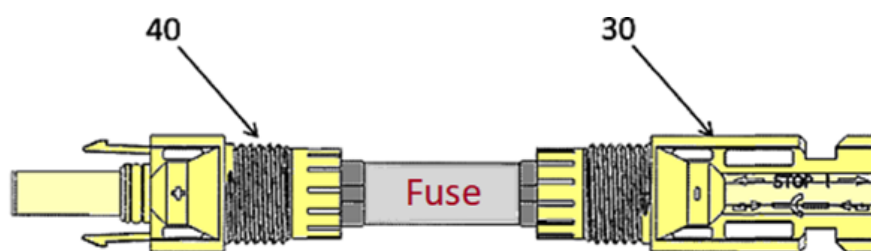


EX 1005, Figure 2 (annotated - 3)

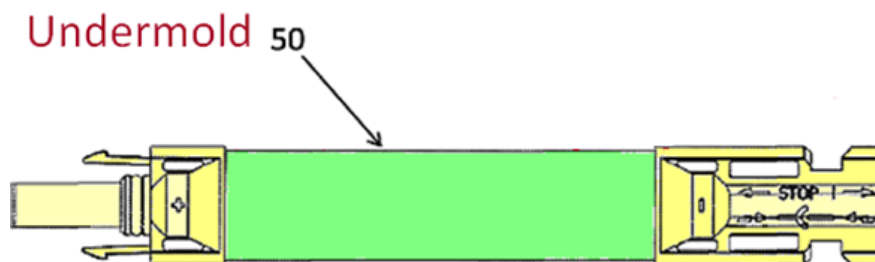
222. Although molding is not explicitly disclosed for the inner holder body 24, Ye teaches molding for the insulating case 26, which a POSITA would have understood can be applied to the inner fuse protector. (See EX 1004, ¶[0036] and EX 1005, ¶[0019]). Thus, in my opinion, the holder body 24 would have been understood by a POSITA as disclosing or suggesting a molded body corresponding to “an undermold” as claimed.

223. The specification of the ’739 patent provides no detail about how the undermold 50 “seals” the fuse. In fact, the specification of the ’739 patent only recites that “undermold 50, seals the *assembly*” (emphasis added), as opposed to specifying that the “fuse” is sealed by the undermold. (EX 1001, 3:13-15). Similarly, the originally-filed claims of the ’739 patent recited only “an undermold surrounding said fuse.” (EX 1002, pgs. 448-450). Thus, the undermold 50, as

originally disclosed in the '739 patent, only seals the fuse to the extent that it surrounds it (e.g., the portion between the male connector 30 and the female connector 40, as illustrated in Figs. 7 and 8 from the '739 patent -- reproduced below). As shown by the annotations below, the undermold is highlighted in green and the connectors in yellow.



Ex. 1001, Fig. 7 (annotated)



Ex. 1001, Fig. 8 (annotated)

224. The specification of the '739 patent does not define the term “sealing.” A POSITA would thus have understood that an ordinary and customary meaning of the term “sealing” is “to close or make secure against access, leakage, or passage by a fastening or coating.” (EX 1014, pg. 2) As such, the sealing provided by the undermold would be important to provide protection from the materials used during

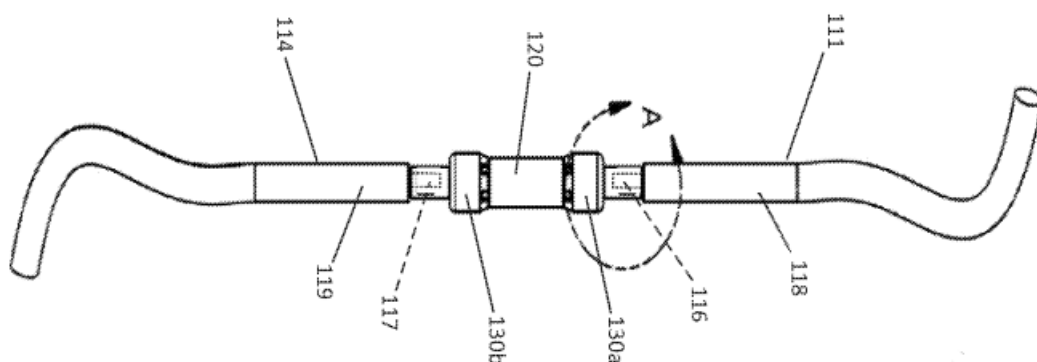
the overmolding process, including the process used to form the insulating case disclosed in Ye. Accordingly, the holder body 24 in Ye clearly closes and makes the fuse secure against access, leakage, or passage to the fuse component 22 which is held therein.

225. Furthermore, Gilman teaches the sealing aspects of an undermold.

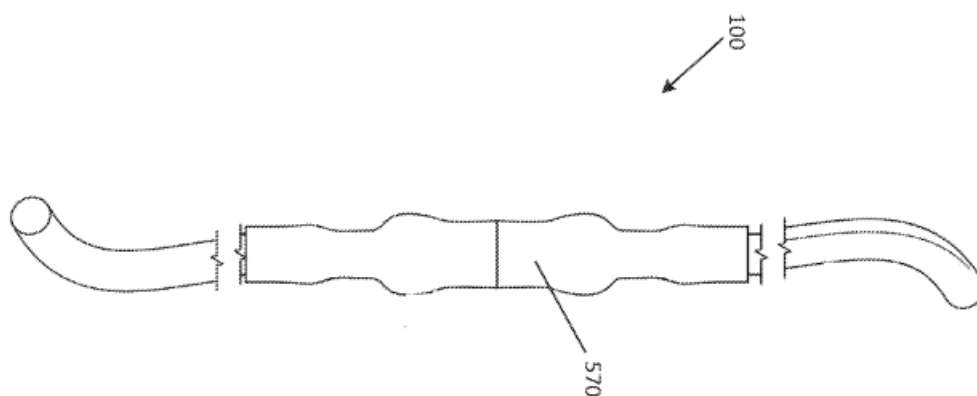
Specifically, Gilman discloses:

[T]he inline fuse assembly 100 of FIG. 1A may include a protective wrapping or coating 570 (hereinafter referred to as “the protective wrapping 570”) surrounding the fuse 120, end caps 130a and 130, and end portions of the wires 111 and 114 (not within view). The protective wrapping 570 may be made of a thermoplastic material, including, but not limited to, polyolefin, fluoropolymer, PVC, neoprene, silicone elastomer, VITON, etc. In addition, the protective wrapping 570 may be heat shrinkable, such that when heat is applied to the protective wrapping 570 (e.g. after it has been wrapped around the fuse assembly 100) it will decrease in size and will fit tightly over the fuse 120, end caps 130a and 130, and wires 111 and 114. ...the protective wrapping 570 may provide a liquid-tight and/or airtight seal around the fuse assembly 100...

EX 1004, ¶¶[0034]-[0035].



EX 1004, Figure 1A.



EX 1004, Figure 5.

226. Gilman also discloses that the protective wrapping 570 that is fitted to the in-line fuse assembly via heat and that the protective wrapping 570 may then be overmolded by further protective materials such as the insulating case 26 of Ye. (*Id.*) Accordingly, a POSITA would have understood the protective wrapping 570

disclosed in Gilman and molded to the fuse as part of the installation process in Gilman to correspond to an undermold by the plain and ordinary meaning of this term explained above.

227. A POSITA would have been motivated to modify the holder body 24 of Ye to be a heatshrink thermoplastic in order to form a liquid-tight / air-tight seal between the wire and the fuse. As described by Gilman, this heatshrink sleeve decreases in size during heating, and subsequently "...fits tightly over the fuse", and "...provides a liquid-tight and/or airtight seal...". The tight fit, which can protect the fuse from liquid or vapor, would surround and seal the fuse. Therefore, a POSITA would understand that the use of the heatshrink from Gilman in place of the holder body of Ye would provide the claimed benefits of the holder body while providing improved protection from liquid and vapor. As noted above, the installation steps of Ye and Gilman to insert the fuse into the wire in an inline arrangement are ordered the same way, and so a POSITA would have expected success in implementing this modification.

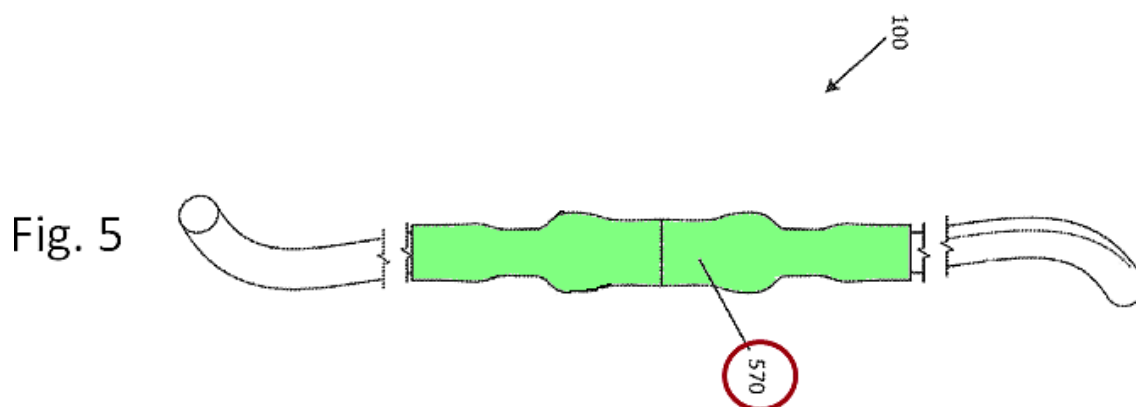
228. Heatshrink sleeves are widely used in many electronics applications because of the low cost, reliable performance, and easy utilization for protecting structures like wire junctions, connectors, and fuses. A POSITA would understand that the

use of the heatshrink sleeve from Gilman in place of the holder body of Ye would be straightforward and could be implemented without undue experimentation, and that the subsequent steps of forming an overmold could be easily carried out as well using straightforward injection molding processes as described in Ye.

229. Accordingly, it is my opinion that Ye in view of Gilman discloses or renders obvious this limitation.

2) said undermold defining an outer surface outline,

230. The holder body 24 in Ye as modified by Gilman, which is an undermold as described above, also teaches the feature of an outer surface outline. The modified assembly of Ye, where the protective wrapping 570 of Gilman replaces the holder body 24, would include an outer surface outline on the protective wrapping.



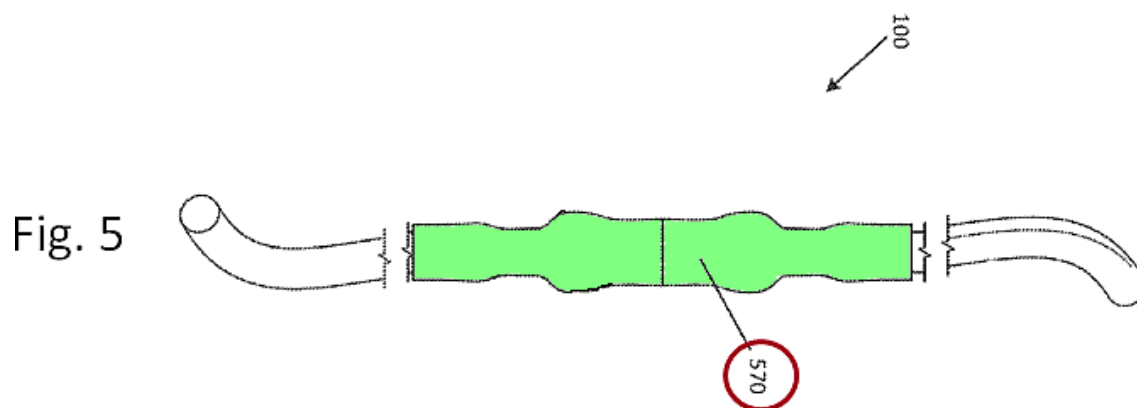
EX 1004, Fig. 5 (annotated)

231. As noted above, a POSITA would also have recognized that a solid body would have a solid outer surface that defines an outline with that surface. A defined outline is, again, a feature of any solid object.

232. Accordingly, it is my opinion that Ye in view of Gilman discloses or renders obvious this limitation.

3) “wherein the outer surface outline of said undermold is substantially parallel relative to the outline of said solid outer surface”

233. The holder body 24 in Ye as modified by Gilman, which is an undermold as described above, also teaches the feature of an outer surface outline [that] is substantially parallel relative to the outline of said solid outer surface [of the fuse]. As shown in Figure 5 of Gilman below, the inner sleeve includes an outer surface outline that a POSITA would have identified as substantially parallel to the outer surface outline of the fuse component underneath by virtue of its shrink wrapping. (EX 1004, ¶¶[0034]-[0035]).

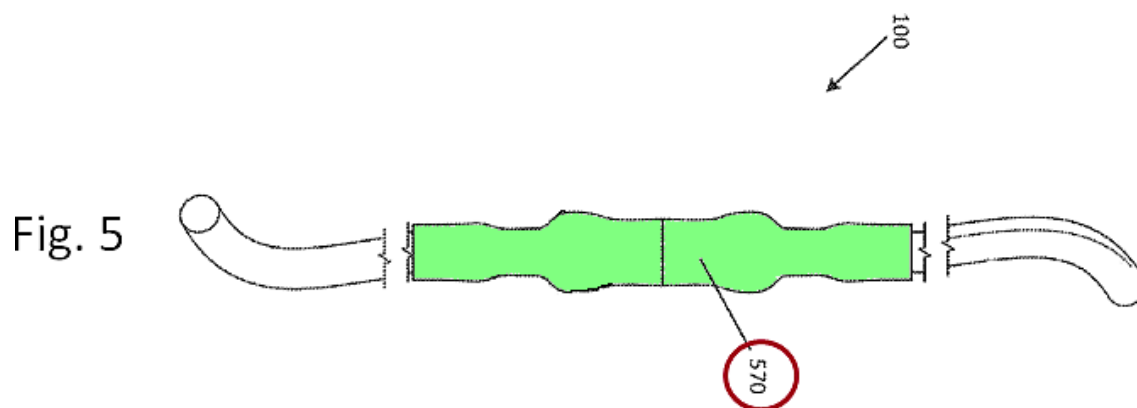


EX 1004, Fig. 5 (annotated)

234. For all the reasons explained above, a POSITA would have found the claim 1(b) limitations to be obvious in view of Ye and Gilman.

c. An overmold defining an outline and surrounding said undermold, said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials, wherein the outline of said overmold is substantially parallel relative to the outline of said undermold; and

235. As explained above, Ye discloses a holder body 24 corresponding to the “undermold” which would be replaced by the sealing protective wrapping of Gilman. Gilman discloses a protective wrapping 570, which also corresponds to an “undermold”, surrounding a fuse 120. (EX 1004, ¶¶[0034]-[0035]) This use of an undermold in Gilman serves the function as described in the ’739 patent, namely to “seal the *assembly*”. (EX 1001, 3:13-15; EX 1004, ¶¶[0034]-[0035] and FIG 5 (annotated) below).



EX 1004, Fig. 5 (annotated)

236. Accordingly, a POSITA would have looked to Gilman as described above to provide sealing aspects including an integrated single piece undermold and various materials for improving the environmental stability and resilience of the shielding provided by the undermold/overmold arrangement. Further, a POSITA would look to Ye and to Gilman for description of methods for forming an integrated single-piece overmold where the undermold and the overmold are constructed of dissimilar materials, and such that feature outlines are substantially parallel to each other.

237. The mapping of aspects of Ye and Gilman to the limitations of claim 1(c) are addressed in more detail below:

1) “an overmold defining an outline and surrounding said undermold”

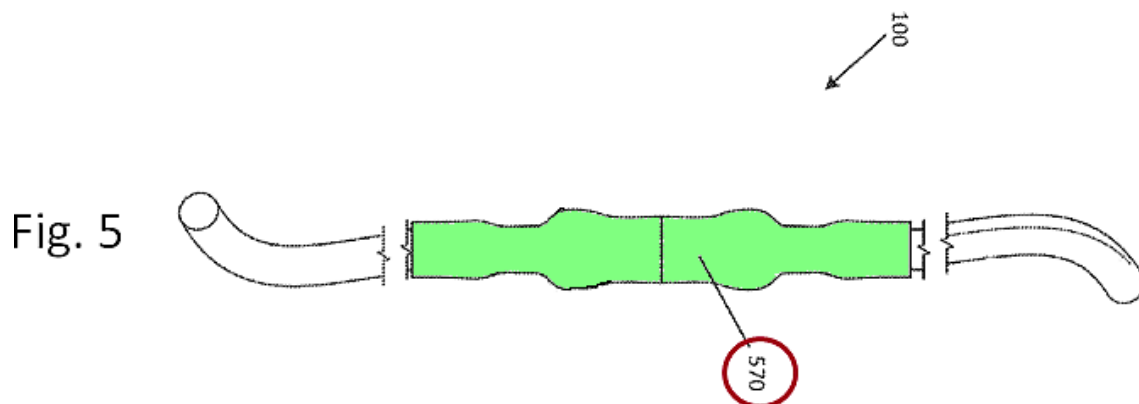
238. The insulating case 26 in Ye is disclosed as being molded around the holder

body 24 and defines an outline (i.e., an outer surface outline) due to its nature as an object made from solid material (e.g., plastic) and as illustrated in Figure 2 of Ye. (EX 1005, ¶[0013]). Also, as stated explicitly in Ye, “the insulating case 26 covers the holder body 24, and is joined to the wiring ends 11 of the electric cables 10 by casting, having excellent sealing, [and] a compact structure.” (*Id.*) Thus, Ye discloses an “overmold defining an outline and surrounding said undermold”, as recited in the claim 1(c)(1) limitation.

239. Further, Gilman describes an overmold: “an over-molding or molded housing (not shown) may be disposed over the protective wrapping 570, proximate the fuse 120 and/or over the entire fuse assembly 100, for providing further protection against damage and environmental elements. Such an over-molding may be injection molded and may be made from plastic, rubber, or other durable, wear-resistant materials.” (EX 1004, ¶[0036]). Therefore, a POSITA would have understood that the protective wrapping 570 was intended to be overmolded as provided by this combination where the insulating case 26 is cast over the protective wrapping. Accordingly, the combination of Gilman and Ye discussed above (the “Ye-Gilman combination”) discloses “an overmold defining an outline and surrounding said undermold”, as recited in the claim 1(c)(1) limitation

2) “said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials”

240. Gilman discloses that the protective wrapping 570 (corresponding to the undermold) is liquid-tight and air-tight after the thermoplastic wrapper has been heated. Gilman in Figure 5, however, illustrates a radial line in the protective wrapping 570.



EX 1004, Fig. 5 (annotated)

It is not clear from the illustration or the description that this line is intended to indicate that the protective wrapping initially consists of two pieces. A POSITA would consider that it is possible to prepare and position two pieces of protective wrapping, or that a single piece of protective wrapping would be easier to utilize in this assembly process. A POSITA would find it obvious to use a single piece of protective wrapping in this situation. However, to the extent this figure indicates that the protective wrapping initially consists of two pieces, a POSITA would have understood that the appropriate installation of this protective wrapping for sealing purposes would include overlapping the protective wrapping in the area where the

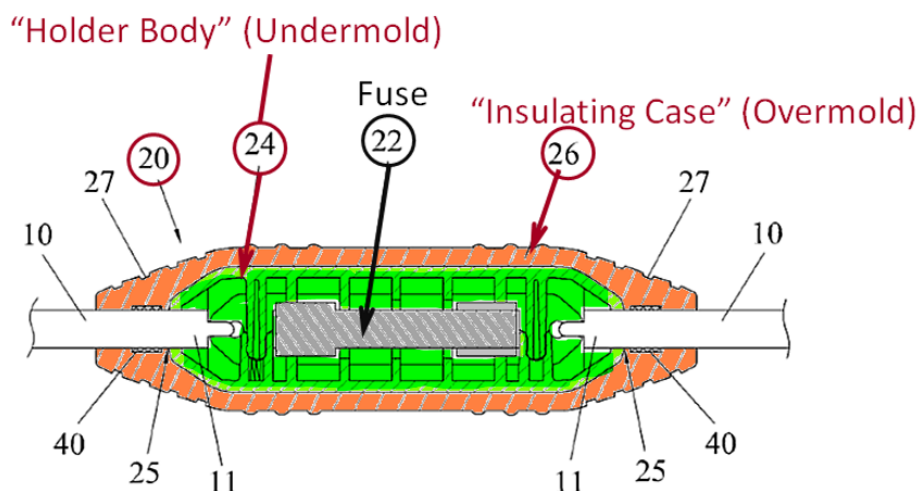
radial line is illustrated. A POSITA would have understood that the protective wrapping of Gilman after heating and shrinking would form an integrated single unit wrapping of the inline fuse assembly in order to have the functionality asserted in Gilman for this wrapping. Therefore, Ye as modified by Gilman teaches the claimed undermold constructed of a single unit.

241. As shown in Ye's Fig. 2 below, a POSITA would see that Ye discloses an inline fuse assembly having a holder body 24 (corresponding to the "undermold" as modified by Gilman) that covers a fuse 22, where the holder body is itself covered by an overmold. Ye refers to the latter as an "insulating case 26" (EX 1005, ¶¶[0012],[0013]). Ye describes the insulating case ("overmold") as follows:

...is integrally formed outside the holder body, sealing and covering the fuse component, the holder body and the wiring ends of the electric cables; the structure is compact with stable mechanical performance, waterproof, corrosion-resistant, UV-resistant and well-sealed, and meets the requirements for use in harsh outdoor environmental conditions, so that the operating performance of the solar cell is more stable and reliable.

EX 1005, ¶[0020].

Ye also illustrates that the insulating case 26 (i.e., the overmold) is formed as a single unit and correspondingly describes it as "integrally formed". (EX 1005, FIG. 2 and ¶[0012]).



EX 1005, Fig. 2 (annotated)

Both Ye and Gilman teach forming an overmolding or outer molded case to provide further environmental protection. (EX 1004, ¶[0036]; EX 1005, ¶[0020]). It would have been obvious to a POSITA to add the overmold of Ye as described by Ye to the Ye-Gilman undermold as described above in order to better protect the fuse component from the harsh outdoor environments typical in photovoltaic installations, where the components of the solar assemblies are located outdoors. (EX 1005, ¶¶[0013], [0019] (noting “the insulating case 26 of the polyethylene material undergoes electron accelerator irradiation treatment and thus becomes a radiation-crosslinked polyethylene case”). As disclosed in Ye, this continuous outer shell protects against solar radiation decay of the underlying material. (EX 1005, ¶[0013]). A POSITA would understand that the benefits of the overmold described by Ye would provide additional protection for the fuse with the heatshrink

undermold of Gilman. On its own, the heatshrink of Gilman provides protection against fluids and vapor, but a POSITA would understand that any such layer does not provide absolute, permanent protection from environmental factors, and that the addition of the overmold described by Ye would enhance the protection from environmental factors like crushing and ultraviolet light. Gilman also provides an explicit description of an overmold. (EX 1004, ¶[0036]).

242. By adding an overmold as disclosed in Ye and Gilman to the Ye-Gilman undermold (protective wrapping) as shown above, a POSITA would have a reasonable expectation of success. Both Gilman and Ye describe forming an injection molded overmold structure to the fuse and undermold structures disclosed in Gilman and Ye. A POSITA would understand that addition of an overmold to the Ye + Gilman fuse assembly and undermold would be straightforward. Gilman explicitly discusses the application of an overmold to a fuse assembly with a heatshrink protective layer. A POSITA would understand that the molding process and materials disclosed by Ye could be applied to the Ye+Gilman assembly using straightforward injection molding techniques and common molding materials that are dissimilar to the heatshrink material of Gilman.

243. A POSITA would also look to the disclosures of Ye and Gilman for materials that could be used to form an undermold and overmold with properties that afford

different, complimentary types of protection. As disclosed in Gilman, forming the undermold and overmold of dissimilar materials would enhance the types of protection provided. (EX 1004, ¶¶[0034], [0036]). For example, Gilman discloses that the protective wrapping 570 (i.e., the undermold), which may be made of thermoplastic material, may provide “protection against abrasion and other potentially damaging contact,” in addition to providing a “liquid-tight and/or airtight seal,” while the over-molding (i.e., the overmold) may be “made from plastic, rubber, or other durable, wear-resistant materials,” that provide “further protection against damage and environmental elements.” (*See id.*; ¶¶[0034], [0036]). It would thus have been obvious to a POSITA to use different materials for the protective wrapping 570 (i.e., the undermold) and the insulating case 26 (i.e., the overmold) to achieve protection from various elements (e.g., radiation) as taught by Gilman and by Ye.

244. Accordingly, the combination of Gilman and Ye discussed above (the “Ye-Gilman combination”) discloses “said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials”, as recited in the claim 1(c)(2) limitation.

3) “wherein the outline of said overmold is substantially parallel relative to the outline of said undermold”

245. As discussed above, the Ye-Gilman combination discloses an undermold

covered by an overmold. Ye explicitly discloses that the “profile of the holder body 24 [i.e., the undermold] is matched to the insulating case 26 [i.e., the overmold]”. In other words, these profile contours are substantially parallel to each other. (EX 1005, ¶[0013]). Further, Ye illustrates that the outline of the insulating case 26 (i.e., the overmold) is substantially parallel to the outline of the holder body 24 (i.e., the undermold). (EX 1005, FIG. 2)

246. In combined Ye-Gilman, consistent with the teachings of Ye, the surface of the protective wrapping is substantially parallel to the surface of the insulating case 26 of Ye. (EX1004, Figs. 1A, 5; EX1005, Fig. 2). A POSITA would have understood this feature to be present in the combined assembly, because the wrapping of Gilman is designed to match the contour of the underlying fuse, just as Ye teaches for its undermold and overmold as I noted above.

247. Further, it would have been obvious to a POSITA to form an overmold that followed the natural contours of the undermold, thus having substantially parallel outlines, to provide a compact structure, as taught by Ye. As disclosed by Ye, “...The profile of the holder body 24 is matched to the insulating case 26; the insulating case 26 covers the holder body 24 and is joined to the wiring ends 11 of the electric cables 10 by casting, having excellent sealing, a compact structure and a

high level of practicality.” (EX 1005, ¶[0013]).

248. For the proposed combination of Ye and Gilman the overmold and undermold provide outlines that are substantially parallel and provide a compact structure.

249. Given all of the above, it is my opinion that the Ye-Gilman combination renders obvious “the outline of said overmold is substantially parallel relative to the outline of said undermold”, as recited in the claim 1(c)(3) limitation.

250. For all the reasons explained above, a POSITA would have found the claim 1(c)(1-3) limitations to be obvious based on Ye and Gilman.

d. A first photovoltaic connector engaged with said first end, wherein said assembly provides electrical insulation.

251. Ye discloses two connector ends at each end of the wire that attaches to the fuse component 22 that are configured to connect into a solar power generating system. (EX 1005, ¶¶[0002],[0012]). “One end of the electric cable 10 is connected to the plug terminal 30, while another end forms a wiring end 11... The fuse holder 20 comprises a fuse component 22, a holder body 24 and an integrally formed insulating case 26. The wiring ends 11 of the two electric cables 10 are fixedly connected to the holder body 24 separately; the fuse component 22 is installed in the holder body 24 and electrically connected at two ends to the wiring ends 11 of the

electric cables 10.” *Id.*

252. Further, to achieve a firm engagement between the fuse and the solar power system, a POSITA would have looked to Gilman, which describes clampable fuse ends used to ensure a secure connection with the conductor. Specifically, Gilman discloses:

As described above, the stripped end of the conductor 116 may be longitudinally inserted into the cavity 138a of the terminal 132a. Once the conductor 116 has been inserted thusly, the terminal 132a, which may be formed of a malleable material as further described below, may be crimped, crushed, bent, flattened, or otherwise deformed (hereinafter collectively referred to as “crimped”) so as to pinch and securely trap the end of the conductor 116 therein. Depending on the rigidity of the terminal 132a, the terminal 132a may be crimped using a manual tool (e.g. pliers), by hand (e.g. manually pinched between fingers), or by various automated means. The conductor 116 may thereby be held in firm engagement with the terminal 132a, and a secure electrical connection may be established therebetween without requiring additional fasteners, adhesives, or the application of solder.

EX 1004, ¶[0024].

253. Accordingly, a POSITA would have been motivated to modify the fuse and engagement connection with the connectors of Ye by modifying them according to the configuration described in Gilman to achieve these advantages with a connector

physically or mechanically connected to the ends of the fuse. Therefore, Ye as modified by Gilman renders obvious the limitation of “first photovoltaic connector engaged with said first end.”

254. Ye explicitly discloses that the outer housing is an insulating case 26 and provides electrical insulation from the environment. Ye discloses the “integrally formed insulating case” for insulating current-carrying components from the elements and inadvertent electrical contact, stating:

... the **integrally formed insulating case seals and covers** the fuse component, **the holder body and the wiring ends of the electric cables**. As a result, the solar cell connecting line of the present utility model is **waterproof, corrosion-resistant and well-sealed**, and meets the requirements for use in harsh outdoor environmental conditions, ensuring stable and reliable operation of the solar cell.

(EX 1005, Abstract).

255. Likewise, Gilman explains the importance of using electrical insulation to protect current-carrying conductors from abrasion, weather elements, and inadvertent electrical contact. (EX 1004, ¶[0035]). As described in Gilman, “[t]he protective wrapping 570 may provide the fuse 120, endcaps 130a and 130b, and wires 111 and 114 with protection against abrasion and other potentially damaging contact. In addition, the protective wrapping 570 may provide a liquid-tight and/or airtight seal around the fuse assembly 100, thereby protecting the fuse assembly 100 from

environmental elements such as water, grease, oil, dirt, dust, etc., which might otherwise enter the fuse assembly 100 and cause corrosion and/or degradation of performance.” The protective wrapping of Gilman protects the fuse, endcaps and wires with protection against environmental elements by electrically isolating the wires and fuse from the environment. A POSITA would appreciate that these benefits provided by Gilman would be complimentary to and enhanced by the addition of the overmold of Ye which is also insulating.

256. For the reasons above, a POSITA would have found the claim 1(d) limitations to be obvious in view of either Ye or Gilman.

257. Given all that is discussed above, it is my opinion that a POSITA would have found claim 1 in its entirety to be obvious based on the Ye-Gilman combination. Accordingly, claim 1 should be found invalid under 35 U.S.C. § 103 based on Ye-Gilman.

2. Claim 2

The assembly of claim 1 further including a second photovoltaic connector engaged with said second end.

258. With respect to Figure 1 of Ye, Ye discloses a fuse assembly “comprising a fuse holder, two electric cables and two plug terminals, one end of the electric cable being connected to the plug terminal and another end forming a wiring end” for use in solar installations (i.e., photovoltaic connector). (EX 1005, Fig. 1, ¶[0008]). A

POSITA would have modified the fuse and connector connection of Ye as described by Gilman to ensure firm engagement between the fuse end and the connectors. (EX 1004, ¶[0024]).

259. Therefore, a POSITA would have found the limitation recited in claim 2 to be obvious based on Ye and Gilman. The Ye-Gilman combination discloses all limitations recited in claim 1, from which claim 2 depends. Accordingly, in my opinion, claim 2 should be found invalid under 35 U.S.C. § 103 based on the Ye-Gilman combination.

3. Claim 3

The assembly of claim 2 wherein said first photovoltaic connector is a female type connector, and said second photovoltaic connector is a male type connector.

260. In Ye, “[t]he plug terminals 30 are matched for butt-connection to a wiring end of a solar panel and other components such as a wiring box or inverter; suitable plug terminals 30 may be selected according to actual needs.” (EX 1005, ¶[0012]). Likewise, the Gilman discloses various female connections for receiving the wire in a firm engagement with the fuse (see Fig. 2A-4A) and discloses a connector (mounting cuff 460) with a male end for insertion into a sleeve (terminal 432) that is crimped to the wire (see Fig. 4B). (EX 1004, ¶¶[0029], [0032], Fig. 2A-4B). Accordingly, Ye as modified by Gilman teaches this claim’s limitations.

261. A POSITA would have understood that either end of the assembly of Ye could be considered the first or second end. Additionally, which of the designated “first” and “second” ends (arbitrary in itself) would be chosen to be the male end or the female end is arbitrary, and thus interchangeable. As Ye discloses, “suitable plug terminals 30 may be selected according to actual needs.”. Ye also states that the plug terminals 30 are matched for butt-connection which a POSITA would understand to be a male-female electrical/physical connection. (EX 1005, ¶[0012]).

262. A POSITA would understand that the “actual needs” would include selecting terminals that are plug-compatible with the other elements of the overall assembly, which would include selecting characteristics, including the male or female nature of connectors to match needs of the solar cable into which the in-line fuse is inserted. (EX 1004, ¶[0033] (discussing that a POSITA would modify as needed)). A POSITA would have found the limitation recited in claim 3 to be obvious based on the Ye-Gilman combination.

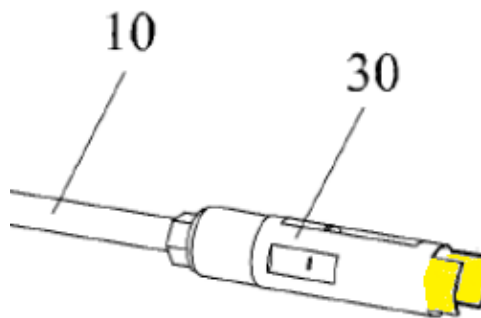
263. The Ye-Gilman combination discloses all limitations recited in claim 2, from which claim 3 depends. Accordingly, in my opinion, claim 3 should be found invalid under 35 U.S.C. § 103 based on the Ye-Gilman combination.

4. Claim 4

The assembly of claim 1 wherein said first and second connectors are locking type connectors.

264. It should be noted that the expression “said first and second connectors,” in claim 4 is indefinite since it lacks antecedent basis. In any case as shown in Figure 1, Ye discloses an assembly with locking connectors. A POSITA designing a solar assembly with in-line fuses would obviously be concerned that the connectors could be disconnected during positioning and fixturing of the entire assembly, and would rely on locking connectors.

265. A POSITA would thus have recognized that the two plug terminals 30 in Ye form the outer portions of locking type connectors. In Ye’s annotated Figure 1 below, the locking tabs can be seen. The figure shown below, which is a “zoomed in” closeup view of one of the plug terminals of Ye.



EX 1005, Fig. 1 (portion, annotated)

266. Likewise, Gilman teaches crimping, pinching, and securely trapping the wire

in the mounting cuff of the connector of Gilman. (EX 1004, ¶[0024]).

267. Based on all of the above, it is my opinion that a POSITA would have found the limitation recited in claim 4 to be obvious based on Ye and Gilman. Thus, the Ye-Gilman combination discloses all limitations recited in claim 1, from which claim 4 depends. Accordingly, claim 4 should be found invalid under 35 U.S.C. § 103 based on the Ye-Gilman combination.

5. Claim 5

The assembly of claim 4 further comprising a tool for unlocking said connectors.

268. The specification of the '739 patent does not disclose either a description or a drawing containing a “tool” that would be used for unlocking connectors.

Regardless, the concept of using a tool to unlock connectors was well known, long before the Effective Filing Date of the '739 patent. A POSITA would have understood that a tool, such as pliers, could be used to squeeze the tabs of the plug terminals 30 of Ye inwardly to unlock them from the input and output cables of the solar power system. (EX 1005, ¶[0012]).

269. Also, more specialty tools were not only known, but often required in the time frame of the '739 patent. For example, the publication “Solar Line Photovoltaic Interconnection System,” by Amphenol Industrial Solar Technologies (November 2012), shows that these photovoltaic connectors were offered for sale

with a tool for unlocking those connectors before the Effective Filing Date of the '739 patent. *See* EX 1017 and EX 1010. Amphenol indicates that a “special unlocking tool” is needed to un-mate the connectors.

270. Furthermore, these sort of unlocking tools for connectors would have been known to a POSITA. For example, one detailed compendium of rules and regulations relating to wiring connections, the NEC, which may be adopted for enactment by, for example, different counties or states, specifies such an “unlocking tool required to un-mate” a snap-lock. (*See* red circled text below). The NEC has the following specific requirement with respect to connectors used in photovoltaic installations:

“690.33 Connectors, (C) Type. The connectors shall be of the latching or locking type. Connectors that are readily accessible and that are used in circuits operating at over 30 volts, nominal, maximum system voltage for dc circuits, or 30 volts for ac circuits, *shall require a tool for opening.*”

EX 1012 (emphasis added).¹⁰

271. As the above shows, the use of a tool to facilitate unlocking of photovoltaic connectors, as demonstrated by Amphenol, was well known in the time frame of the

¹⁰ The Amphenol table cites to NEC2008, but the same cited requirement is found in NEC2002 (EX 1012).

'739 patent.

Contact system	Machined/cold formed or S&F contact with RADSOK® insert
Insulation material	PC
Locking mechanism	Snap-lock, special unlocking tool required to un-mate as required by NEC2008
Cable strain relief	Compression gland with ratcheting gland nut
Degree of protection	IP68 (1 meter, 1 hour) mated

Id., pg. 3. A photo of the unlocking tool referenced in Amphenol is shown in the catalog on pg. 4 (below):



Id., pg. 4 (annotated).

272. The Amphenol catalog shows that a tool for taking apart male and female photovoltaic connectors was known before the Effective Filing Date of the '739 patent. Accordingly, it is my opinion that the use of a tool to unlock photovoltaic connectors was obvious, and also necessary in some cases. Further, Gilman discloses using tools such as pliers to crimp, pinch, and securely trap the wire in the connector (mounting cuff) of Gilman. (EX 1004, ¶[0024]).

273. A POSITA would have found the limitation recited in claim 5 to be obvious based on the structure disclosed in Ye and Gilman. As shown, the Ye-Gilman combination discloses all limitations recited in claims 1 and 4 from which claim 5 depends. Accordingly, claim 5 should be found invalid under 35 U.S.C. § 103 based on the Ye-Gilman combination.

274. For these reasons, in accordance with Ground 4, claims 1-5 should be found invalid under 35 U.S.C. § 103 based on Ye and Gilman.

❖ **GROUND 5 – Claim 7 is unpatentable under 35 U.S.C. § 103 as obvious based on Ye, Gilman, and Darr.**

275. As noted above (see list under Summary of Opinions), Ground 5 is based on Ye combined with Gilman and Darr. Ye and Gilman provide solutions to similar problems and/or are in the same field of endeavor as the '739 patent as described in Ground 4. Ye and Gilman are analogous prior art for the reasons noted in Ground 4 above.

276. As noted above in my discussion of Ground 4, the Ye-Gilman combination discloses an enhanced in-line fuse assembly with added protection for maintaining an electrical connection until the fuse is needed for overcurrent protection. (EX 1004, ¶[0001]; EX 1005, Abstract). Similarly, Darr discloses an inline fuse holder for use in photovoltaic systems. (EX 1007, ¶[0003]). Therefore, Darr is also in the

same field of endeavor and analogous prior art to the '739 patent.

277. Darr adds that a thermoplastic elastomer may be used to form an overmold as an additional safeguard. (EX 1007, ¶[0023]). Darr recognized that selecting a suitable material for the overmold of a fuse holder can make the fuse holder waterproof as well as electrically insulating. (EX 1007, ¶[0024]). Thus, Darr complements the Ye-Gilman combination by teaching how to further protect in-line fuses. *See id.*

278. A POSITA would have had an expectation of success in combining the teachings of Ye and Gilman with those of Darr, because a POSITA would have understood the modification to be the selection of a known material based on its suitability for its intended use (i.e., strengthening connectors as disclosed in Ye-Gilman), which is a rationale that supports a prima facie case of obviousness.

1. Claim 7

The assembly of claim 1 wherein said overmold is a thermoplastic elastomer.

279. Darr discloses that the “overmold is a thermoplastic elastomer.” In particular, Darr discloses:

first and second fuse holder components 12, 14 may be a suitable thermoplastic rubber (also called “**thermoplastic elastomer**”). Such as a suitable thermoplastic rubber having a hardness of about 50 Shore A to about 75 Shore A. For example, a suitable thermoplastic rubber is sold by Exxon Mobil Corporation, New Jersey, USA, and sold under the mark Santoprene(R). In one non-limiting example, the first and second fuse holder

components 12, 14 may be made from Santoprene(R) 101-64 having a hardness of about 69 Shore A.

(EX 1007, ¶[0024]).

A POSITA would have understood, as is known in the trade, that a thermoplastic rubber (TPR) was known to be a type of thermoplastic elastomer (TPE), and that thermoplastic elastomers are a class of polymers that combine the properties of elastomers (rubbery materials) with the processability of thermoplastics. This means they can be melted and reshaped multiple times, like thermoplastics, but they also have elastic properties when they are at room temperature and can thus be readily stretched and deformed under stress and will return to their initial form once the stress is removed. *Id.* Thus, Darr teaches the use of a thermoplastic elastomer for an overmold. *Id.*

280. Given the preceding, I believe that a POSITA would have found the limitation of claim 7 to be obvious based on the addition of Darr to the combination of Ye-Gilman. As is shown in Ground 4, the Ye-Gilman combination discloses all limitations recited in claim 1 from which claim 7 depends. Thus, it is my opinion that in accordance with Ground 5, claim 7 should be found invalid under 35 U.S.C. § 103 based on Ye, Gilman, and Darr.

❖ **GROUND 6: Claims 10-13 and 15-18 are unpatentable under 35 U.S.C. § 103 as obvious based on Solon in view of Ye and Gilman.**

281. As discussed above regarding Ground 4, a POSITA would have been motivated to combine features and arrive at the modified in-line fuse assembly disclosed by the Ye-Gilman combination. Further, a POSITA would have been motivated to combine Solon with the Ye-Gilman combination at least because Solon and Ye explicitly relate to power connectors applicable to solar power installations, and the details in Gilman would be understood by a POSITA to apply to solar power installations and provide important benefits when used in combination with Solon and Ye, for improved in-line fuse assemblies for solar power installations.

282. Solon discloses a “Solar Energy Wire Harness with In-Line Fuses.” (EX 1008, Abstract). Solon is analogous prior-art to the ’739 patent because it is directed to in-line fuses, each encased in a housing 22. Further, Solon anticipates the need to protect each fuse from ambient conditions (i.e., the outdoor environment). (EX 1008, ¶[0033]). Likewise, the ’739 patent claims relate not only to inline fuses but also their placement in wire harnesses in a larger solar energy system. (EX 1001, 4:60-5:10) Therefore, Solon is analogous prior-art to the ’739 patent. Importantly, the sole author of the ’739 patent is also the sole author of Solon: Dean Solon. The two patents use similar language to describe their fields of

use, and a POSITA would appreciate that a patent by the same author disclosing improvements in the same field of use would be analogous prior art. The Solon reference was not disclosed to the examiner. (EX 1001, Front page)

283. A POSITA tasked with building a solar installation would have understood the need to make use of the utility and neatness of wiring harnesses as well as the circuit protection of fuses. In particular, the POSITA would have been motivated by the advantageous installation efficiency of inline fuses and the increased reliability that is disclosed by Ye and Gilman as being an advantage of their inline fuse assemblies. A POSITA would have been motivated to combine the wire harness teachings of Solon with the enhanced in-line fuse assembly of the Ye-Gilman combination in order to reduce costs and failure rates as taught by Solon while protecting the inline fuses in the harnesses from the elements as described above in Ground 1 with regard to the motivation to combine Ye and Gilman. The POSITA would also have known that the combination of Ye-Gilman to yield a fuse protector could easily replace the fuse protector of Solon. For example, Solon Figures 8a and 8b show a fuse assembly that includes a first section of wire and a first connector associated with the first end of the fuse, and a second section of wire and a second connector associated with the second end of the fuse. Therefore, Solon and Ye-Gilman, each disclose similar arrangements for the short wires and the connectors

at both ends of the fuse, and so the arrangement of the assembly inserted in the overall installation would be the same, hence the Ye-Gilman combination would operate in the same manner in place of the fuse protector of Solon.

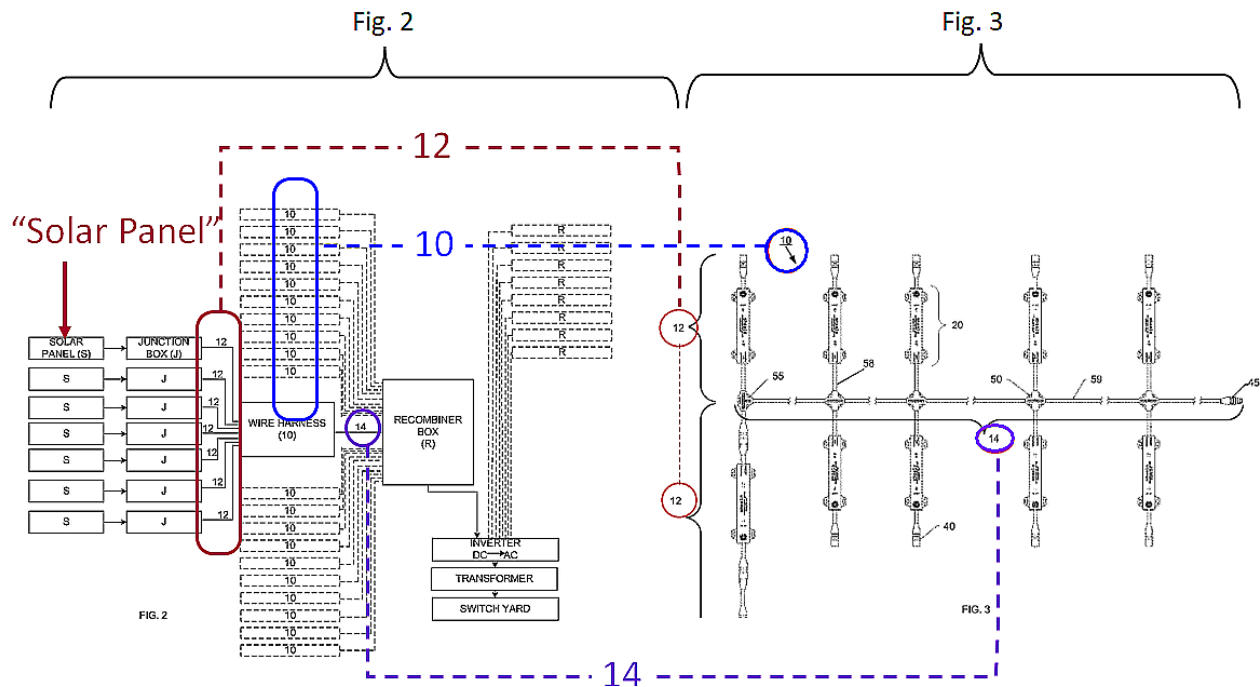
284. As demonstrated with respect to Ground 4, the Ye-Gilman combination discloses an enhanced in-line fuse assembly intended for use in solar-power applications that is configured to better protect a photovoltaic system. A POSITA working on solar-power installations and informed about the solar energy wire harness disclosed in Solon would have been motivated to better protect the in-line fuses in such wire harnesses by using an enhanced in-line fuse assembly, as is taught by the Ye-Gilman combination.

285. For all of these reasons, it is my opinion that a POSITA would have been motivated to combine the teachings of Solon with the Ye-Gilman combination to better facilitate the installation process and to protect the solar-energy wire harness from harsh outdoor environments.

1. Claim 10

Preamble. A photovoltaic wire harness including:

286. Solon discloses that a “wire harness 10 includes a plurality of branches 12 feeding into one trunk 14.” (EX 1008, ¶[0029] and FIGS. 2 and 3 (combined with annotation)).

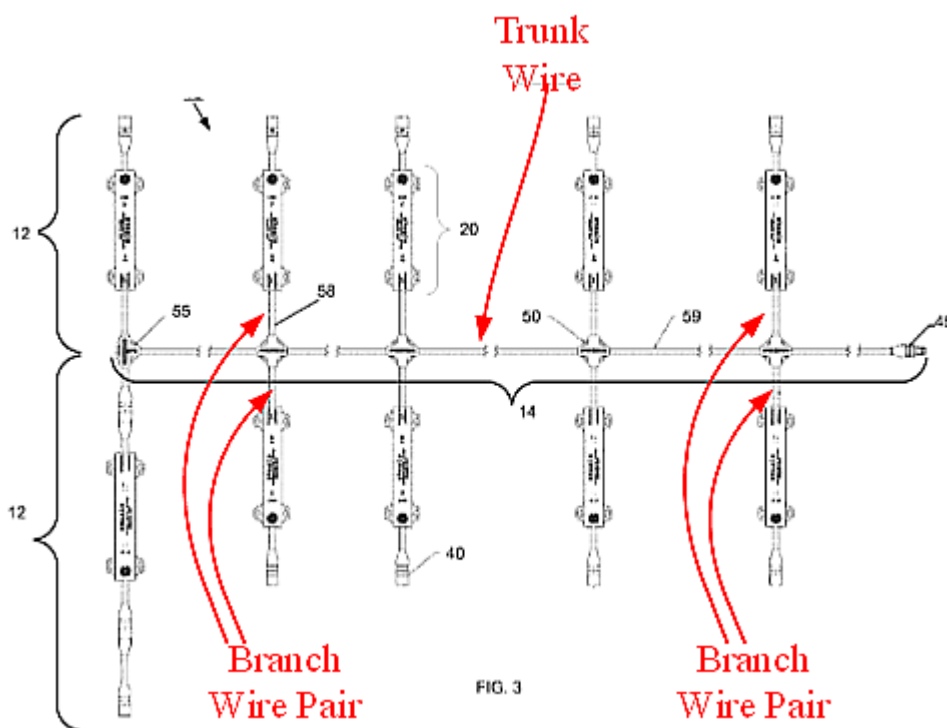


EX 1008, FIGS. 2 and 3 (combined with annotation)

Given the above, it is my opinion that a POSITA would have found the limitations in claim 10 (Preamble) to be obvious in view of Solon.

a. A trunk wire having a plurality of branch wires extending there from in pairs, said branch wires and said trunk wire forming angles having vertices of approximately degrees [sic]; and.

287. Solon further discloses “[b]ranches 12 of wire harness 10 each include one in-line fuse assembly 20, so wire harness 10 includes a plurality of in-line fuse assemblies 20 connected to branch wire 58, which is preferably photovoltaic wire.” (EX 1008, ¶[0030] and FIG. 3 (annotated)).



Ex. 1008, FIG. 3 (1st-annotation)

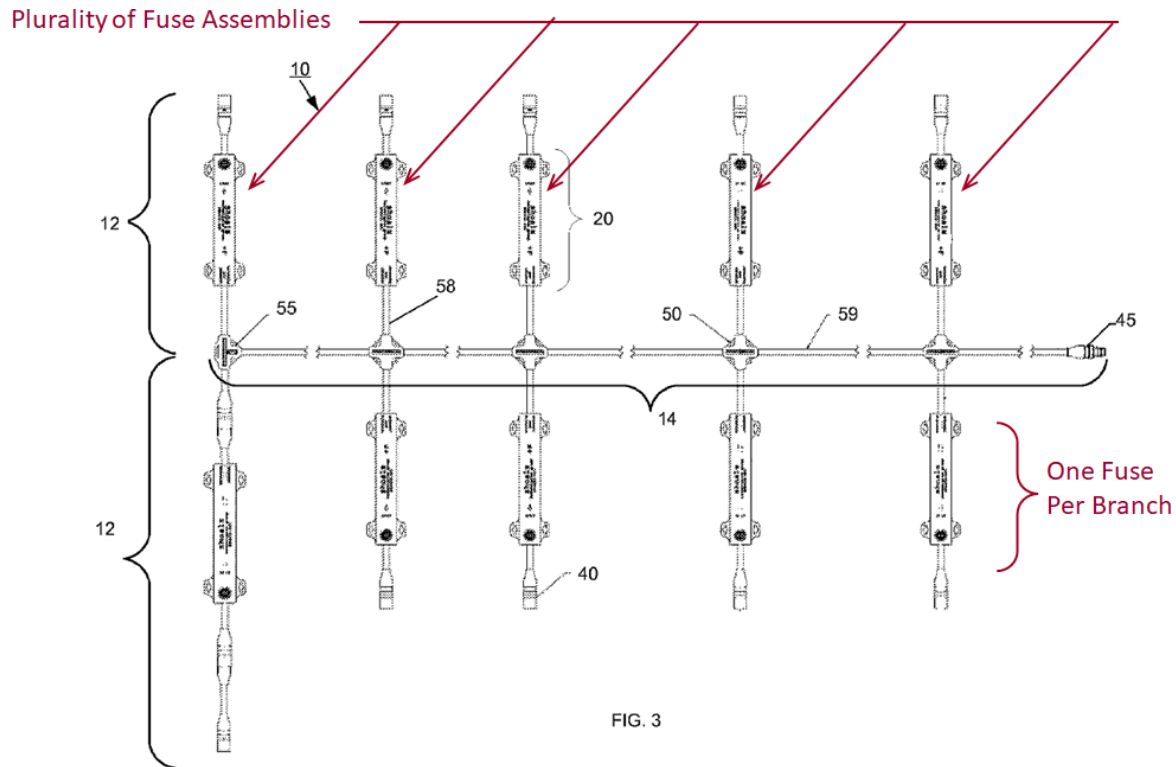
288. The '739 patent provides no details about what is meant by the expression "said branch wires and said trunk wire forming angles having vertices of approximately degrees" as recited in claim 10(a). An ordinary and customary meaning, as understood by a POSITA, of the expression "said branch wires and said trunk wire forming angles having vertices of approximately degrees" would be that *some* angle is formed at the intersection of the branch wires with the trunk.

289. Solon discloses that some angle (e.g., 90 degrees) is formed at the intersection of the branch wires with the trunk as shown above. (EX 1008, FIG. 3 (1st - annotation)).

Given the above, I believe that a POSITA would have found the limitations of claim 10(a) to be obvious in view of Solon.

b. A plurality of fuse assemblies engaged only with said branch wires in a ratio of one fuse assembly per branch wire, said fuse assemblies each including:

290. Solon discloses that “[b]ranches 12 of wire harness 10 each include one in-line fuse assembly 20, so wire harness 10 includes a plurality of in-line fuse assemblies 20 connected to branch wire 58, which is preferably photovoltaic wire.” (EX 1008, ¶[0030] and Fig. 3 (annotated)).



EX 1008, FIG. 3 (2nd – Annotation).

With regard to the fuse assemblies, Solon acknowledges the need to “protect housing-22 and lid-23 encased assembly 20 from ambient.” (EX 1008, ¶[0033]). A POSITA would have understood from Solon the need to protect the in-line fuses in wire harnesses from ambient conditions by using enhanced in-line fuse assemblies and would have looked to the Ye-Gilman combination for such protection. Specifically, the overmold of Ye provides protection from impacts and UV light in the ambient environment and Ye-Gilman provides protection from water and other corrosive intrusions.

291. For the above reasons, it is my opinion that a POSITA would have found the limitations in claim 10(b) to be obvious in view of Solon.

292. The following subsections of claim 10(b), namely i-iv, recite the same limitations as the in-line assembly recited in Claim 1, addressed above. A POSITA would have understood that fuse assemblies in a solar installation are exposed to harsh outdoor environments and can benefit from additional protection from the elements. See, e.g., EX 1008, ¶¶[0031]-[0033] (regarding housing to protect fuse). Thus, the POSITA would have been motivated to add the modified in-line fuse assembly taught by the Ye-Gilman combination, discussed above, to the photovoltaic wire harness disclosed by Solon.

i. A photovoltaic fuse having a solid outer surface including a first end, a second end and a middle section there between, said solid outer surface defining an outline;

293. The claim 10(b)i limitations are the same as, or at least substantially correspond to, the claim 1(a) limitations addressed in Ground 4. For the same reasons that I presented in Ground 4 for the claim 1(a) limitations, I believe that a POSITA would have found the claim 10(b)i limitations to be obvious in view of Ye and Gilman.

ii. An undermold surrounding and sealing said fuse, said undermold defining an outer surface outline, wherein the outer surface outline of said undermold is substantially parallel relative to the outline of said solid outer surface;

294. The claim 10(b)ii limitations are the same as, or at least substantially correspond to, the claim 1(b) limitations addressed in Ground 4. For the reasons presented in Ground 4 for the claim 1(b) limitations, I believe that a POSITA would have found the claim 10(b)ii limitations to be obvious in view of Ye, and Gilman.

iii. An overmold defining an outline and surrounding said undermold, said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials, wherein the outline of said overmold is substantially parallel relative to the outline of said undermold; and

295. The claim 10(b)iii limitations are the same as, or at least substantially correspond to, the limitations recited in claim 1(c) addressed in Ground 4. For the reasons presented in Ground 4 for the claim 1(c) limitations, I believe that a POSITA would have found the claim 10(b)iii limitations to be obvious in view of Ye, and Gilman.

iv. A first photovoltaic connector engaged with said first end, wherein said assembly provides electrical insulation.

296. The claim 10(b)iv limitations are the same as, or at least substantially correspond to, the claim 1(d) limitations addressed in Ground 4. For the reasons presented in Ground 4 for the claim 1(d) limitations, it is my opinion that a

POSITA would have found the claim 10(b)iv limitations to be obvious in view of Ye and Gilman.

297. For all the reasons cited above, I believe that a POSITA would have found claim 10 in its entirety to be obvious based on the combination of Solon, Ye, and Gilman. Accordingly, claim 10 should be found invalid under 35 U.S.C. § 103 based on Solon, Ye, and Gilman (i.e., the “Solon-Ye-Gilman combination”).

2. Claim 11

The photovoltaic wire harness of claim 10 wherein said fuse assemblies each further include a second photovoltaic connector.

298. The limitations recited in claim 11 are the same as, or at least substantially correspond to, the limitations recited in claim 2 addressed in Ground 4. Therefore, in my opinion, a POSITA would have found the limitation recited in claim 11 to be obvious based on Ye. As demonstrated above, the Solon-Ye-Gilman combination discloses all the limitations recited in claim 10 from which claim 11 depends. Accordingly, in my opinion, claim 11 should be found invalid under 35 U.S.C. § 103 based on Solon, Ye, and Gilman.

3. Claim 12

The photovoltaic wire assembly of claim 10 wherein said fuse assemblies each include a pair selected from the group consisting of one male type said first photovoltaic connector and one female type connector; one female type said first photovoltaic connector and one male type connector; one male type said first photovoltaic connector and one wire; and one female type said first photovoltaic connector and one wire.

299. The limitations recited in claim 12 are the same as, or at least substantially correspond to, the limitations recited in claim 3, discussed above in Ground 4.

Therefore, in my opinion, a POSITA would have found the limitation recited in claim 12 to be obvious based on Ye. As demonstrated above, the Solon-Ye-Gilman combination discloses all the limitations recited in claim 10 from which claim 12 depends. Accordingly, claim 12 should be found invalid under 35 U.S.C. § 103 based on Solon, Ye, and Gilman.

4. Claim 13

The photovoltaic wire assembly of claim 10 wherein said angles are surrounded by an encasement.

300. Solon discloses that “[b]ranches 12 connect to trunk 14 with cross joints 50, or tee joints 55, with the former uniting four wires and the latter uniting three” as shown in the annotated figure below. (EX 1008, ¶[0029] and FIG. 3 (annotated))

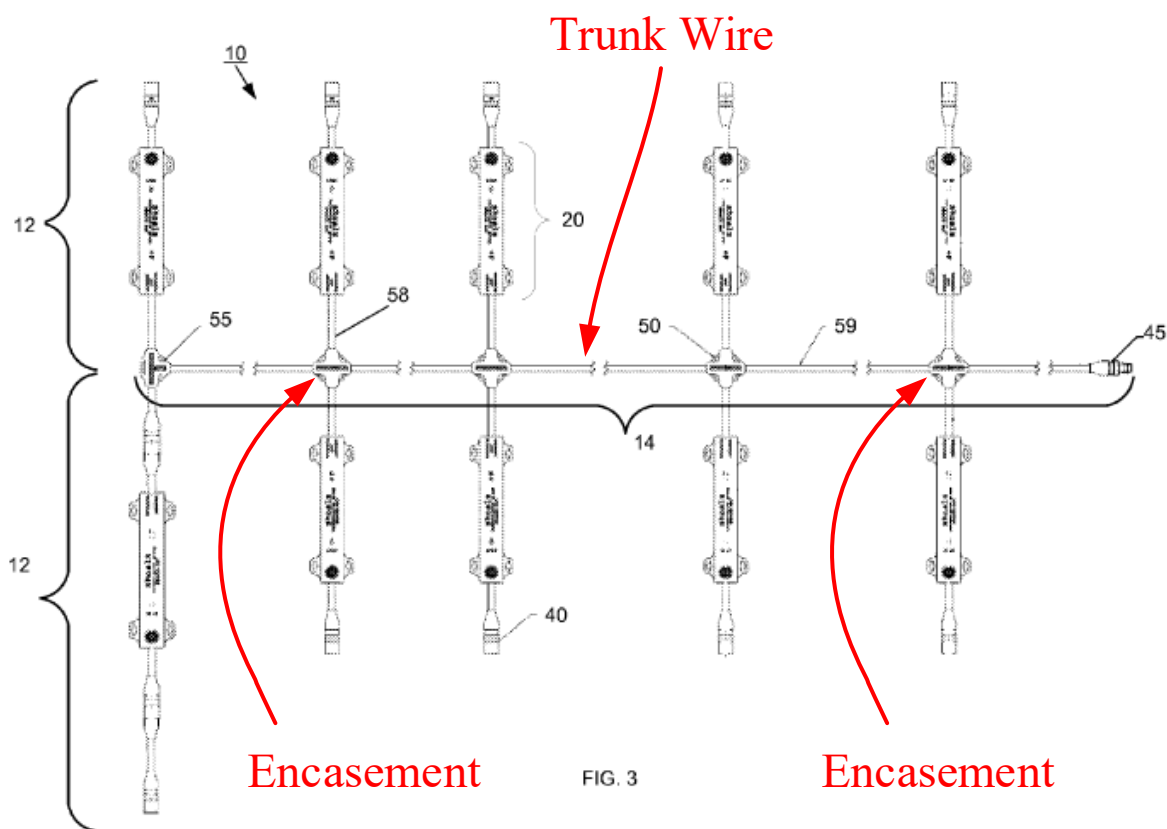


FIG. 3

Ex. 1008, FIG. 3 (1st - annotation)

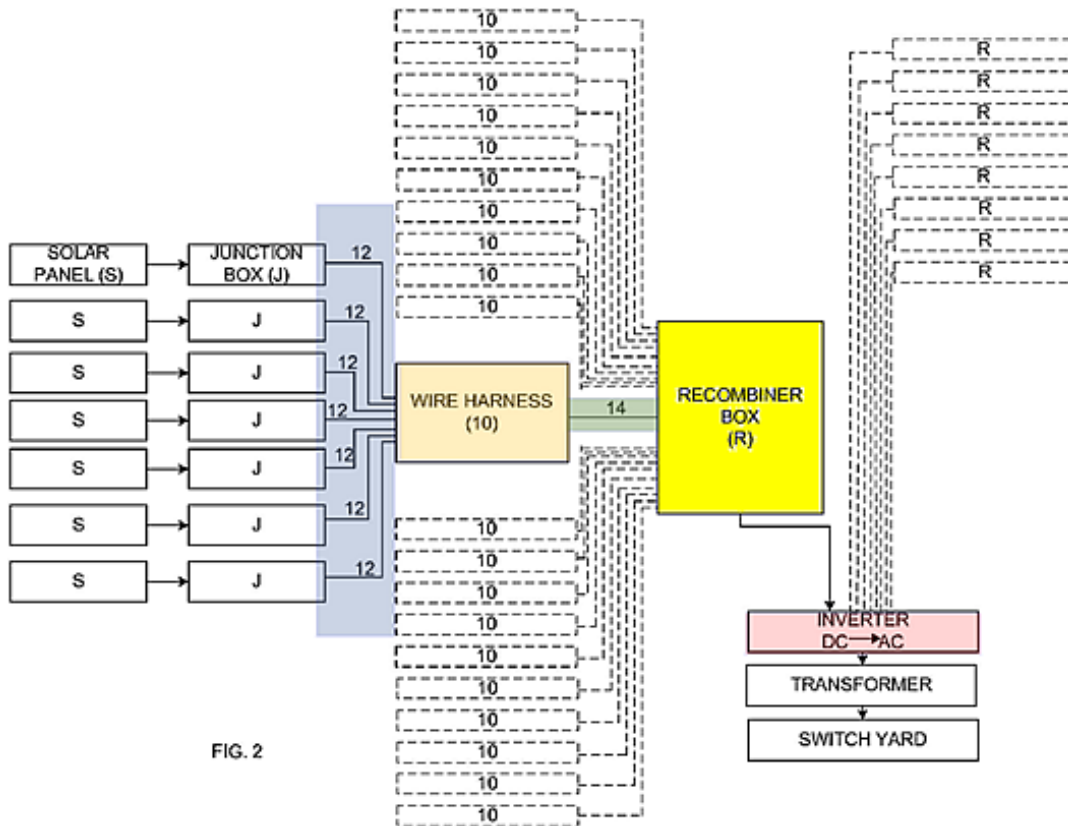
301. In my opinion, a POSITA would have found the limitation recited in claim 13 to be obvious based on Solon. As I have shown, the Solon, Ye, Gilman combination discloses all limitations recited in claim 10 from which claim 13 depends. Accordingly, claim 13 should be found invalid under 35 U.S.C. § 103 based on Solon, Ye, and Gilman.

5. Claim 15

302. Claim 15 recites a method for assembling the parts recited in claim 10. As the parts recited in claim 10 are not novel and are not assembled or combined in a novel manner, I believe that a POSITA would have found the assembly process recited in claim 15 and its dependent claims to be obvious for much the same reasons as claim 10.

Preamble. A method of configuring a solar installation including the steps of:

303. Solon discloses that a “‘big picture’ presentation of a solar energy plant according to the present invention is depicted in FIG. 2.” (EX 1008, ¶[0026] and FIG. 2).



EX 1008, Fig. 2 (Annotated)

Given this disclosure, I believe that a POSITA would have found the elements of claim 15(Preamble) to be obvious in view of Solon to the extent that the preamble is found to be limiting.

a. Engaging the trunk of a wire harness with a combiner box wherein said combiner box lacks fuses and circuit breakers; and

304. Solon discloses the limitation of “[e]ngaging the trunk of a wire harness with a combiner box.” In particular, Solon discloses that “[e]ach wire harness has one trunk 14, which is in communication with a recombining box R” and “recombining

box R of the present invention is preferably devoid of fuses” as shown below in Figure 2 of Solon. (EX 1008, ¶[0026], [0028] and FIG. 3).

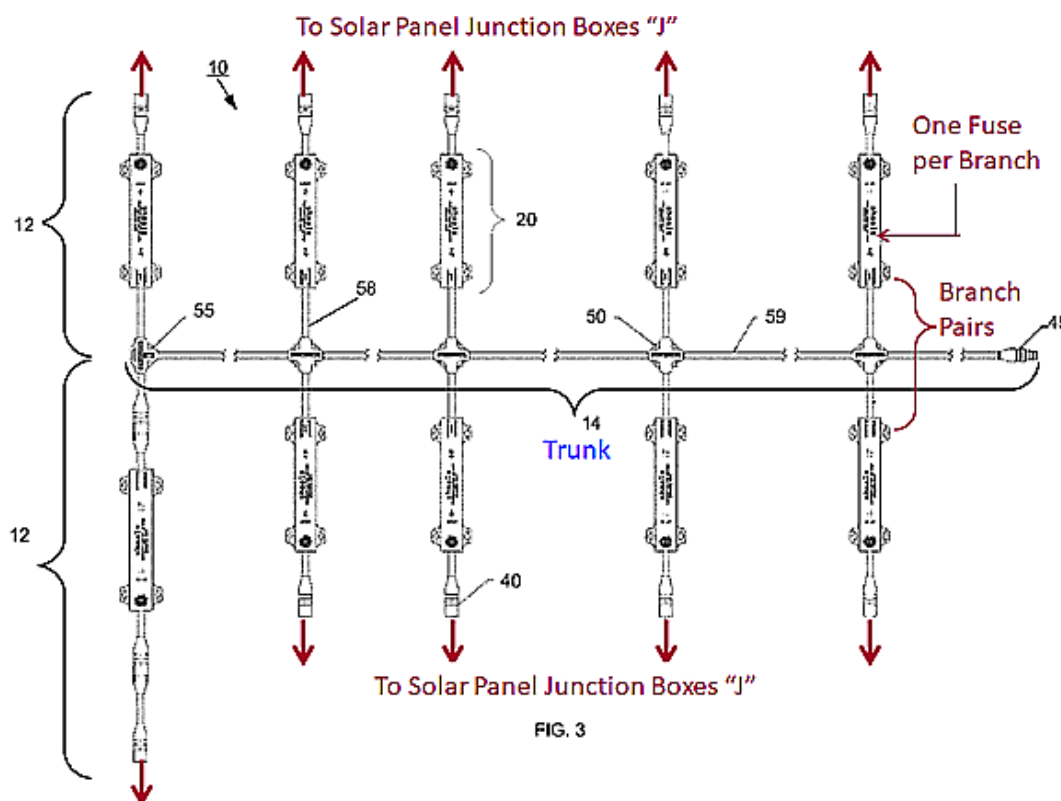


FIG. 3

EX 1008, Fig. 3 (Annotated)

For the above reasons, I believe that a POSITA would have found the limitations in claim 15(a) to be obvious in view of Solon.

b. Engaging each terminal branch of said wire harness with one solar panel wherein each terminal branch includes exactly one in line fuse assembly each of said in line fuse assemblies including:

305. Solon discloses the limitation of “[e]ngaging each terminal branch of said wire harness with one solar panel wherein each terminal branch includes exactly one in line fuse assembly”. Specifically, Solon teaches “[e]ach branch of a wire

harnesses connects to the junction box of a solar panel, with each of the branches including an in-line fuse assembly.” (EX 1008, ¶[0013]). Further, Solon discloses that “[e]ach solar panel S is connected to a junction box J, which may be integrated or separate. Each junction box J is in communication with one branch 12 of wire harness 10.” (EX 1008, ¶[0026] and FIG. 2).

306. Given the above, I believe that a POSITA would have found the limitations in claim 15(b) to be obvious in view of Solon.

307. The following subsections of claim 15(b), namely i-iv, recite the same limitations as the in-line assembly recited in claim 1 and claim 10, addressed above. Again, a POSITA would have understood that fuse assemblies in a solar installation are exposed to harsh outdoor environments and can benefit from additional protection from the elements. Thus, the POSITA would have been motivated to add the modified in-line fuse assembly taught by the Ye-Gilman combination, discussed above, to the photovoltaic wire harness disclosed by Solon.

i. A photovoltaic fuse having a solid outer surface including a first end, a second end and a middle section there between, said solid outer surface defining an outline;

308. The claim 15(b)i limitations are the same as, or at least substantially corresponds to, the recited claim 1(a) limitations addressed in Ground 4. For the reasons presented in Ground 4 for the claim 1(a) limitations, I believe that a

POSITA would have found the claim 15(b)i limitations to be obvious based on Ye and Gilman.

ii. An undermold surrounding and sealing said fuse, said undermold defining an outer surface outline, wherein the outer surface outline of said undermold is substantially parallel relative to the outline of said solid outer surface;

309. The claim 15(b)ii limitations are the same as, or at least substantially corresponds to, the claim 1(b) limitations addressed in Ground 4. For the reasons presented in Ground 4 for the claim 1(b) limitations, I believe that a POSITA would have found the claim 15(b)ii limitations to be obvious based on Ye and Gilman.

iii. An overmold defining an outline and surrounding said undermold, said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials, wherein the outline of said overmold is substantially parallel relative to the outline of said undermold; and

310. The claim 15(b)iii limitations are the same as, or at least substantially corresponds to, the claim 1(c) limitations addressed in Ground 4. For the reasons presented in Ground 4 for the claim 1(c) limitations, a POSITA would have found the claim 15(b)iii limitations to be obvious based on Ye and Gilman.

iv. A first photovoltaic connector engaged with said first end, wherein said assembly provides electrical insulation.

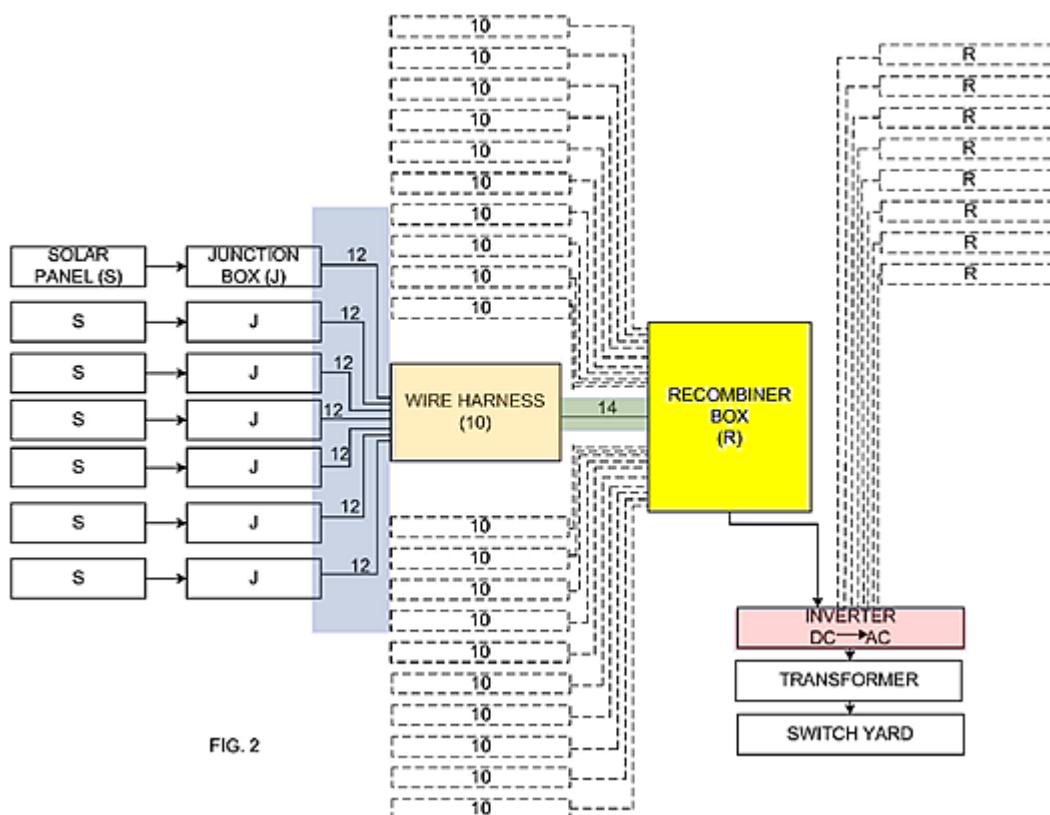
311. The claim 15(b)iv limitations are the same as, or at least substantially corresponds to, the claim 1(d) limitations addressed in Ground 4. For the reasons presented in Ground 4 for the claim 1(d) limitations, I believe that a POSITA would have found the claim 15(b)iv limitations to be obvious based on Ye and Gilman.

312. For all the reasons cited above, I believe that a POSITA would have found claim 15 in its entirety to be obvious based on the combination of Solon, Ye and Gilman. Accordingly, in my opinion, claim 15 should be found invalid under 35 U.S.C. § 103 based on Solon, Ye and Gilman.

6. Claim 16

The method of claim 15 wherein said step of engaging each terminal branch with one solar panel includes the step of connecting to said first photovoltaic connector.

313. Solon discloses “[e]ach Solar panel S is connected to a junction box J. which may be integrated or separate. Each junction box J is in communication with one branch 12 of wire harness 10” as shown below in annotated Figure 2 of Solon. (EX 1008, ¶[0026] and FIG. 2).

**Ex. 1008, FIG. 2 (annotated)**

314. Given the above, it is my opinion that a POSITA would have found the limitation recited in claim 16 to be obvious based on Solon. As I have shown previously, the Solon-Ye-Gilman combination discloses all the limitations recited in claim 15 from which claim 16 depends. Accordingly, claim 16 should also be found invalid under 35 U.S.C. § 103 based on Solon-Ye-Gilman.

7. Claim 17

The method of claim 16 wherein said step of connecting to said first photovoltaic connector includes the step of connecting to a male said first photovoltaic connector.

315. Solon, Ye and Gilman disclose “connecting to said first photovoltaic connector includes the step of connecting to a male said first photovoltaic connector.” As noted with regard to Ground 4, Claim 3, the disclosure of Ye renders these limitations obvious.

316. For these reasons, I believe that a POSITA would have found the limitation recited in claim 17 to be obvious based on Solon, Ye, and Gilman. As I have shown, the Solon-Ye-Gilman combination discloses all limitations recited in claims 15 and 16, from which claim 17 depends. Accordingly, in my opinion, claim 17 should be found invalid under 35 U.S.C. § 103 based on Solon, Ye, and Gilman.

8. Claim 18

The method of claim 16 wherein said step of connecting to said first photovoltaic connector includes the step of connecting to a female said first photovoltaic connector.

317. A POSITA would have found the limitation recited in claim 18 to be obvious in view of the disclosure in Ye. As noted with regard to Ground 4, Claim 3, the disclosure of Ye renders these limitations obvious and a POSITA would

have found it obvious to use the structure mapped in Ground 4, claim 3 in the manner recited in claim 18.

318. For these reasons, I believe that a POSITA would have found the limitation recited in claim 18 to be obvious based on Solon, Ye, and Gilman. As I have also shown, the Solon-Ye-Gilman combination discloses all limitations recited in claims 15 and 16, from which claim 18 depends. Accordingly, in my opinion, claim 18 should be found invalid under 35 U.S.C. § 103 based on Solon-Ye-Gilman.

319. For these reasons, in accordance with Ground 6, claims 10-13 and 15-18 should be found invalid under 35 U.S.C. § 103 based on Solon, Ye, and Gilman.

❖ GROUND 7 – Claims 1-5 are unpatentable under 35 U.S.C. § 103 as obvious based on Ba in view of Ye and Yen

320. As noted above (see list under Summary of Opinions), Ground 7 is based on Ba combined with Ye and Yen. Ba provides solutions in the same field of endeavor as the '739 patent at least because Ba relates to “a fuse holder for a solar photovoltaic power generation system”. (EX 1011, Abstract). Therefore, Ba is analogous prior art to the challenged claims of the '739 patent. Likewise, as I described regarding Grounds 1 and 4 above, Ye and Yen are analogous prior art to

the challenged claims of the '739 patent.

321. A POSITA would be well-aware of the need to protect electrical wiring from environmental degradation factors. Safety issues that may stem from degradation of electrical wiring have led to many rules and regulations governing the safe operation of electrical elements. For example, provisions in the National Electric Code (NEC), such as Article 110.27(B)-Guarding of Live Parts/ Prevent Physical Damage, states the following general requirement for wiring installations:

B) Prevent Physical Damage. In locations where electrical equipment is likely to be exposed to physical damage, enclosures or guards shall be so arranged and of such strength as to prevent such damage.

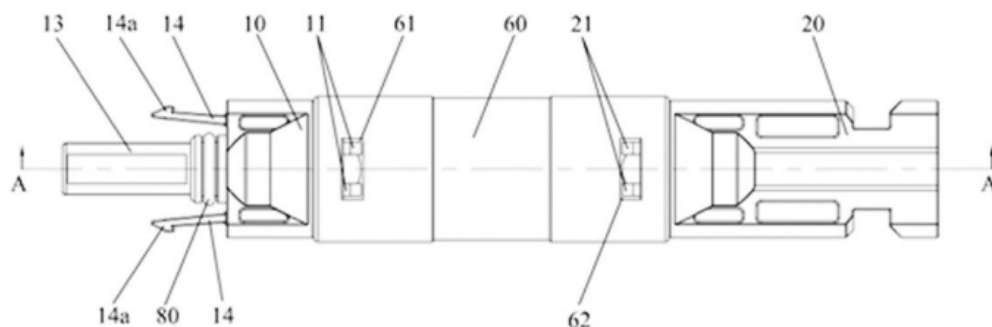
322. A POSITA would have understood that an electrical circuit with an in-line fuse consists of two electrical junctions between the wire and the fuse and that such a circuit needs protection from water and other contacts that might carry current around the fuse or short-circuit the current to ground. (EX 1011, ¶[0030]).

Therefore, a POSITA would have understood that several levels or types of protection were required for active electrical junctions in an outdoor solar installation.

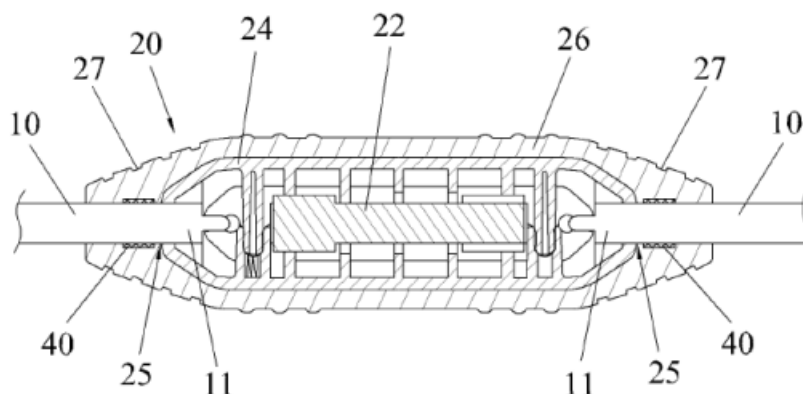
323. The POSITA would have looked to the overmold structure of Ye, as a

solution to this requirement at the locations of fuses in the solar installation. The POSITA also would have been well-aware of the safety issues associated with electrical wiring and connectors. Such issues have been long-recognized and embodied in safety regulations, such as NEC 690.33(B) from the NEC section on Solar Photovoltaic (PV) Systems, which states that, “[t]he connectors shall be constructed and installed so as to guard against inadvertent contact with live parts by persons.” (EX 1012) Accordingly, a POSITA would have looked to the insulating undermolding materials of Yen together with overmoldings of Ye as ways to provide this type of protection at fuse-connection points in a solar installation.

324. The POSITA would have had a high likelihood of success in using the overmolding technique of Ye, as well as the materials disclosed in Ye and Yen, with the inline fuse structure of Ba to protect the fuse assembly by adding an overmold over the molded sleeving member 60 (i.e., the undermold). Specifically, the shapes of the fuses in Ba and Ye are similar to each other as are the first protective layers disposed on these fuses and their connectors in Ba and Ye. (EX 1011, Fig. 4 and EX 1004, Fig. 2)



EX 1011, Figure 3.



EX 1005 , Figure 2.

Therefore, a POSITA would have understood that the overmold of Ye is easily added over the fuse and over the first layer of protection (undermold) of Ba since the mechanical features of each of the structures were similar.

325. A POSITA would have been motivated to also combine Ba with Ye for

several reasons. The focus of Ba is on inline fuse assemblies. (EX 1011, Abstract, ¶[0001]). Likewise, Ye is directed to an inline fuse with a focus on applying these inline fuses to solar-cell connecting lines. (EX 1005, ¶¶[0009], [0012]). A POSITA would appreciate that the characteristics of fuses that might distinguish a photovoltaic fuse from a more generic fuse are generally associated with the current and voltage requirements of solar array applications. Besides these requirements, the features of electrical connections to the ends of a cylindrical fuse and the need for molded layers to protect the fuse from environmental factors are common to all outdoor electrical installations, including solar installations and other more ordinary outdoor electrical installations.

326. A POSITA would have considered the features disclosed by Ba as providing benefits that would apply to the assembly of Ye as well, because the fundamental issues and challenges of the applications and the different kinds of fuses are the same. For example, Ba discloses that the housing assembly provided in its design provides reliable contact even in vibrational external environments (e.g., wind, rain, other vibrations), provides better shock resistance, provides easy assembly of the housing, and provides waterproofing. (EX 1011, ¶¶[0005], [0010], [0015]-[0016], [0030]). Additionally, the connectors of Ba provide convenient and easy assembly and disassembly (i.e., insertion) of the inline fuse into the wires of the solar

installation. (EX 1011, ¶[0040]).

327. One of the disclosed advantages of the fuse and solar connector arrangement of Ye is to “reduce the investment cost of the solar photovoltaic power generation system” and “to work in an outdoor environment”. (*Id.*, ¶[0007]). As I note above, Ba is also directed towards other aspects of this improvement to reduce installment costs by providing inline fuse connections that operate without adhesives, fasteners or welding. (EX 1011, ¶¶[0016]-[0017]) Accordingly, a POSITA would have been aware of Ba and Ye and the advantages they provide in enhancing durability of inline fuse connections.

328. Ye discloses “a solar cell connecting line, comprising a fuse holder, two electric cables and two plug terminals. (EX 1005, Abstract). Ye discloses that the fuse-holding connecting line is for use in solar power systems to provide a connection that is “waterproof, corrosion-resistant and well-sealed” (*Id.*, ¶[0003].) Thus, Ye and the ’739 patent are both in the same field of endeavor and are directed towards solving similar problems and achieving similar results.

329. Ba discloses an in-line fuse having one layer of protection. Ba does not disclose specifics of injection molding or how to make the parts described in the assembly, and moreover also fails to discuss specific material types such as

thermoplastic elastomers. However, Ye discloses casting protective elements such as the sleeve of Ba and teaches providing a covering for the entire fuse holder with an elastomeric overmold as a way to keep out moisture and dust. (EX 1005, ¶¶[0013], [0014], [0018]) A POSITA, looking for ways to make the device of Ba with better sealing and improved durability would have looked to the molding of Ye and Yen, which each teach two layers of protection for improved reliability. Inasmuch as overmolding was a well-known technique in the field of injection molding in the time frame of Ba¹¹, a POSITA would have had a high likelihood of success in using the overmolding technique and shape of Ye to add to the undermold of the inline fuse structure of Ba. Likewise, a POSITA would have understood that the sleeve or undermold of Ba could be formed by these same injection molding techniques. (See generally, EX 1015).

330. Yen is directed to protecting high-voltage inline fuses (e.g., 2250V) in power lines. (EX 1006, ¶¶[0004], [0006]) Accordingly, Yen is analogous prior art at least because it discloses a device in the same field of endeavor as the '739 patent and solves similar problems related to inline fuses that the '739 patent is also related to.

¹¹ (See, e.g., EX 1015 at Introduction, pgs. 1-3; EX 1016 at Abstract)

331. Yen teaches injection molding as a method of forming parts in a manufacturing process. (EX 1006, ¶[0008]). A POSITA would have understood that the plastic parts of Ba could be made by injection molding at least because the process was well known at the time. (*See*, e.g., EX 1015 at Introduction, pgs. 1-3; EX 1016 at Abstract) Further, Yen teaches using an arc resistant material for an undermold to ensure good electrical insulation at high voltage for the fuse and a coating molded over the undermold, where both layers are injection molded. (EX 1006, ¶¶[0020]-[0021], [0026]). Yen teaches using a different material for the coating of the outer layer to provide other protections and reduce costs. *Id.* A POSITA would have expected success in using the materials of Yen in the double-layered fuse protector of Ba-Ye, because Yen also teaches using multiple layers of materials and describes the materials that each have different properties for these layers. (EX 1006, ¶[0020]).

332. Accordingly, a POSITA would have been motivated to modify the materials used in the combination of Ba-Ye or would be motivated to choose materials in the combination of Ba-Ye in accordance with Yen based on the added protection against arc resistance provided by the materials and design of Yen as well as the cost savings described in Yen. (EX 1006, ¶[0020]). Therefore, a POSITA would have looked to the disclosure of Yen, which describes injection molding for useful

details on how to make the pieces and moldings of Ba and Ye (e.g., to implement the polyethylene “casting” of Ye). (EX 1005, ¶[0019]).

Claim by Claim Analysis of Ground 7

333. I shall now examine each of the claim elements of claim 1 of the ’739 patent, in light of Ba combined with Ye and Yen. The claim 1 preamble recites:

1. Claim 1

(Preamble) An in-line assembly for a solar installation including:

334. To the extent that the preamble is limiting, the preamble to claim 1 requires an “in-line” assembly for a solar installation. The title of the ’739 patent contains the term “in-line”, as does the first line of the Abstract. However, this term is not further defined anywhere in the ’739 patent specification. As such, a POSITA would have understood this term by its plain and ordinary meaning, which is connectors for fuses that are in series with a connecting cable. The ’739 patent does describe “in-line” as “the fuse [being] connected wire-to-wire” (EX 1001, 1:52-53.)

335. In the field of electrical engineering, the term “in line” [*sic*: inline] has a well-known meaning that would have been familiar to a POSITA. For example, the reference “In-Line Fuse holder - HR and HM Series” shows an example of a well-known inline fuse configuration. *See*, EX 1013, reproduced below. The fuse

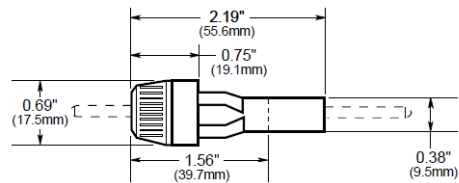
cartridge in the figure is connected in series with two sections of wire. In operation, the part is sold with the wire uncut; the user cuts the wire between the two ends of the fuse to produce one wire connected to each end of the fuse.

In-Line Fuseholder
For Type SFE and ¼" × Various Length Fuses

Bussmann®
HR and HM
Series



Dimensional Data: All dimensions (±0.015)



General Information:

- Bayonet type knob.
- Maximum current rating 20 amps; voltage rating 32 volts AC.

COOPER Bussmann
12-21-98
SB98107 Rev. A

Form No. HR and HM Series
Page 1 of 1
BIF Doc #2122

Source: Cooper-Bussman SB989107, December 21, 1998

The Merriam -Webster dictionary defines the word “inline” as “having the parts or units arranged in a straight line” (EX 1014, pg. 2). A POSITA would have understood an “in-line assembly” involving a photovoltaic fuse to have the configuration shown in the In-Line Fuseholder from Bussmann.

336. An inline fuse holder is explicitly disclosed in Ba which describes “...the fuse holder being configured to be electrically connected between an input cable

and an output cable in the solar photovoltaic power generation system.” (EX 1011, claim 1). The connection of the fuse **between** “input cable” and “output cable” defines the essence of an inline connection. Figures 1 and 2 from Ba, reproduced below, clearly show the fuse 50 being connected inline between the first plug-in connection 13 and the second plug-in connection 23.

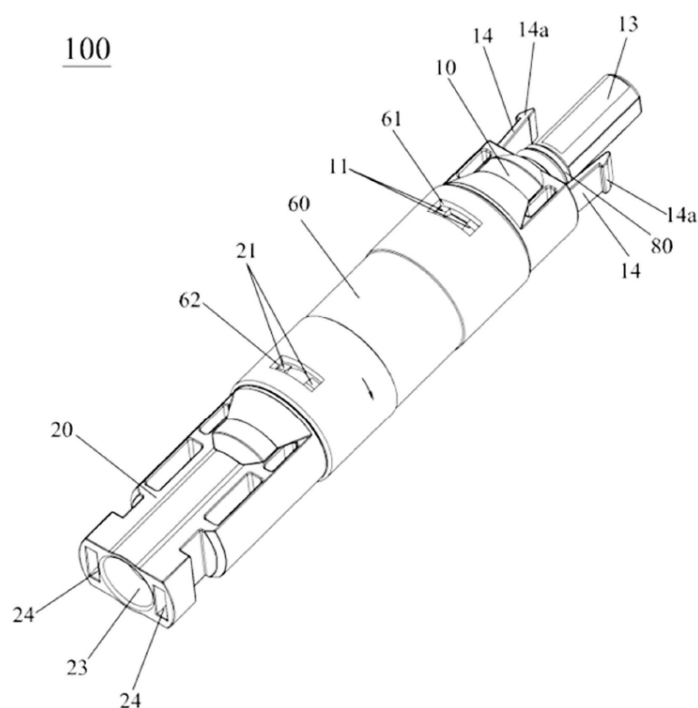
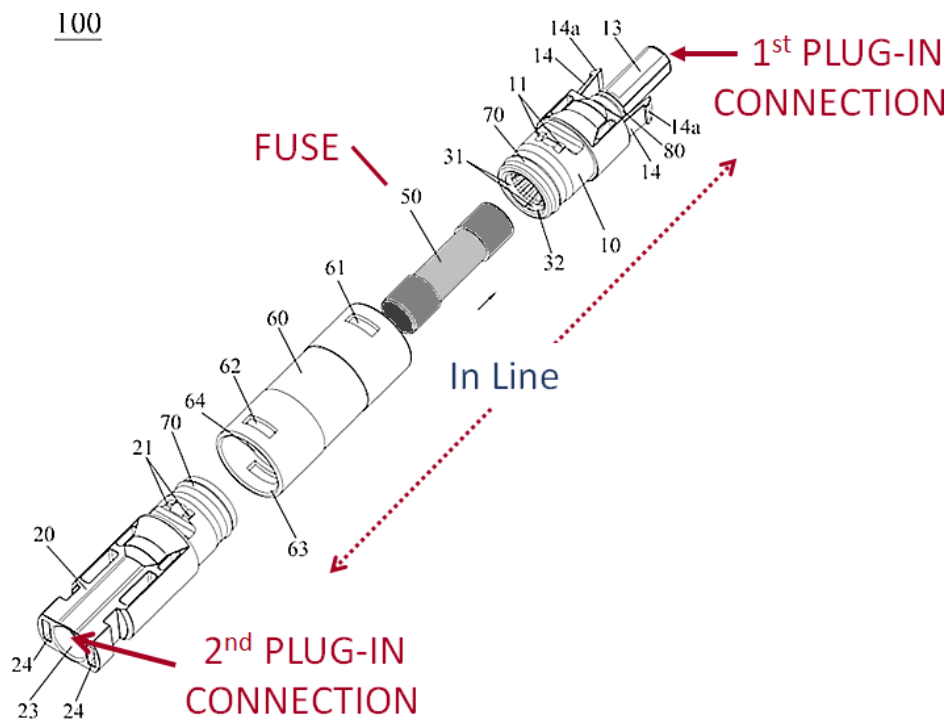


FIG. 1

EX 1011, Fig. 1 (annotated)

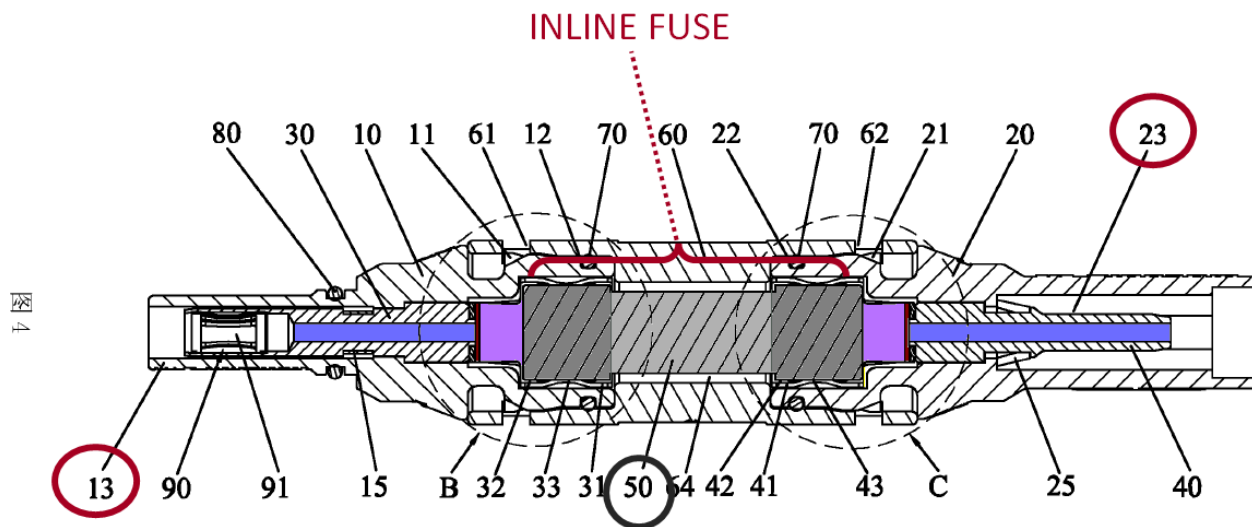


Id., Fig. 2 (annotated)

337. Figure 4 from Ba, reproduced below, similarly shows fuse 50 (gray) connected in-line between connectors 13 and 23 (red circles) via wires and contacts (purple):¹²

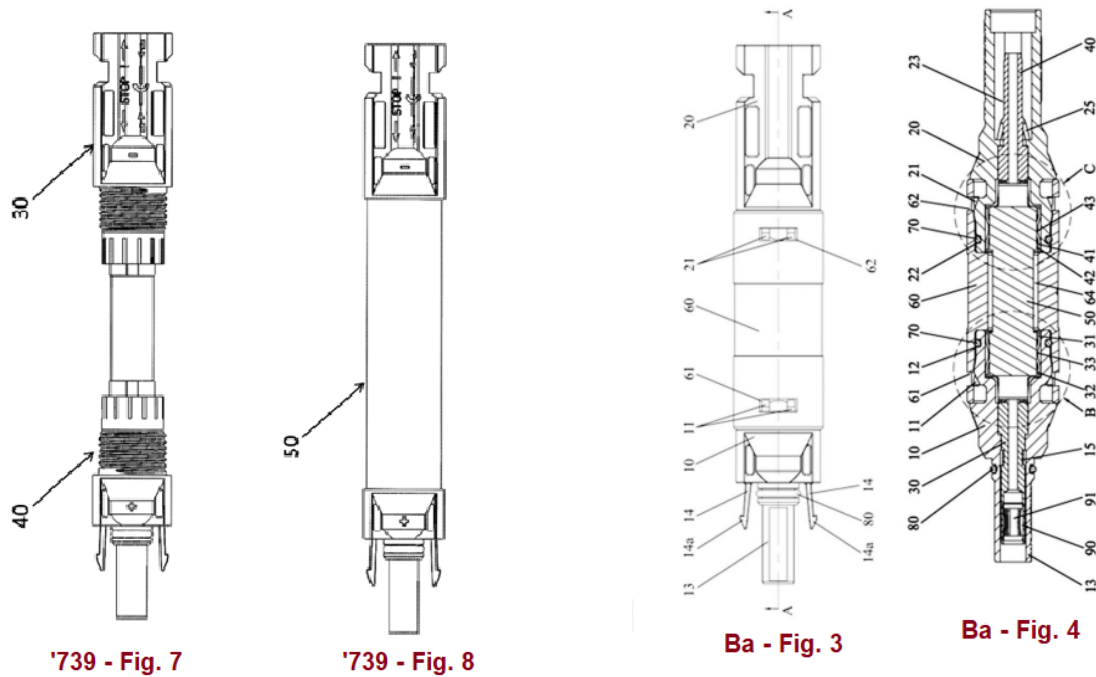
¹² For the purpose of clarity, the color-coding for the figures in this declaration will be as follows:

gray = fuse	green = undermold	orange = overmold
yellow = connector	blue = surface outline	purple = wires and contacts



Id., Fig. 4 (annotated)

338. As a side-by-side comparison of Ba and the '739 patent's fuse protectors, I provide the following, which shows that Ba and the '739 patent are describing similar features:



339. I note that the (Certified English Translation) title for the Ba application is: “Fuse Holder for Solar Photovoltaic Power Generation System” which confirms that the fuse-holder disclosed in Ba is for solar power photovoltaic (PV) systems.

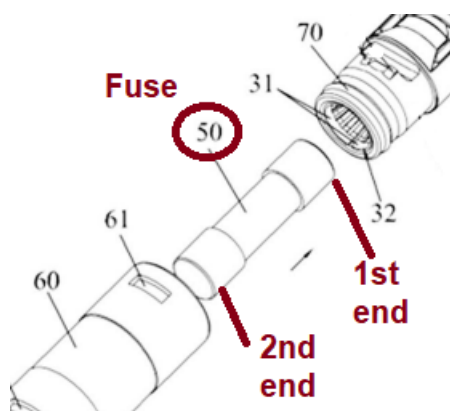
340. Given the above disclosure of an inline fuse assembly for a solar installation, it is my opinion that the claim 1(preamble) is obvious in view of Ba.

a. A photovoltaic fuse having a solid outer surface including a first end, a second end and a middle section there between, said solid outer surface defining an outline;

341. A POSITA would have known immediately that the fuse holder and fuse disclosed in Ba is a “photovoltaic fuse”, because the title of the application is “Fuse Holder for Solar **Photovoltaic** Power Generation System” [EX 1011, cover page;

emphasis added].

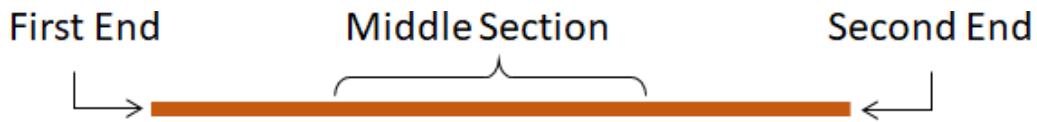
342. Ba discloses a cartridge fuse 50 in the fuse holder 100 of the solar photovoltaic generation system. As shown in the annotated portion of FIG. 2 below, the cartridge fuse 50 includes a first end, a second end, and a middle section therebetween. EX 1011, ¶[0029]; FIG. 2 (annotated), below.



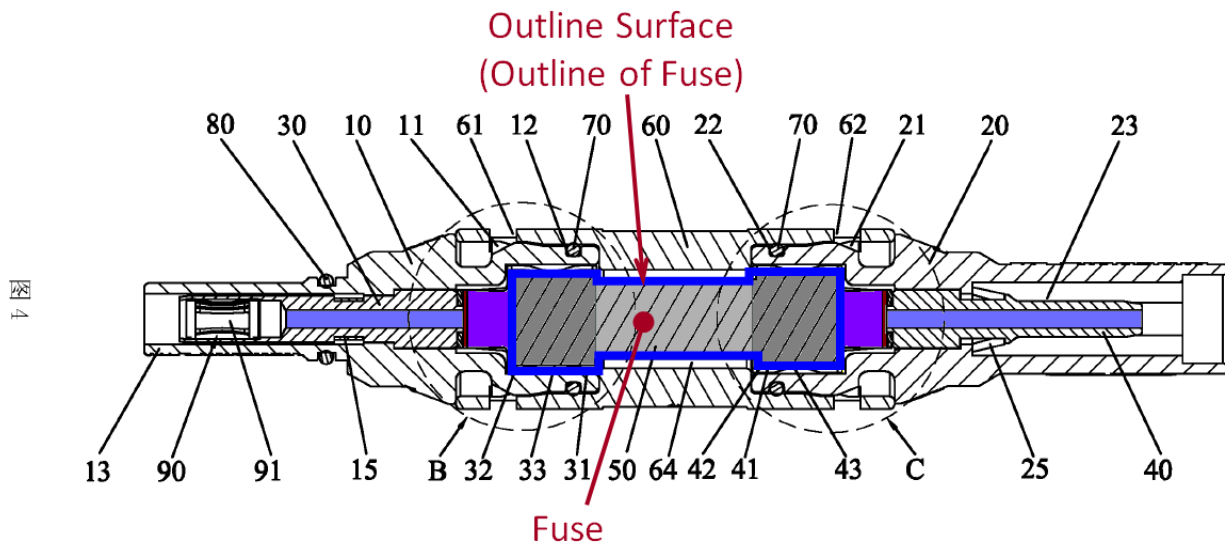
EX 1011, Fig. 2 (annotated)

343. A POSITA would have recognized that the cartridge fuse 50 includes a solid outer surface defining an outline. A ferrule-capped cartridge fuse has a *solid outer surface*, a fact shown clearly in Ba Fig. 2 (see above) with the first and second ends annotated. Ba's Fig. 4, shown previously above, also depicts the fuse as having first and second ends (left and right in the figure). A POSITA would have known that, logically, something having a longitudinal extension will necessarily have a first

end and a second end, and the “middle section there between” would be located between these ends. The diagram below illustrates the concept in the abstract as it would have been understood by a POSITA. The middle section is, thus, located between the two ends:



344. A POSITA would also have recognized that a body having a solid outer surface defines an outline with that surface as illustrated below in the annotated figure from Ba. A defined outline is, again, a feature of any solid object. The solid outline in Ba Fig. 4, for example, is the outer perimeter of the cartridge fuse illustrated by the blue line in the annotated Fig. 4 shown below:



EX 1011, Fig. 4 (annotated)

345. For all the reasons explained above, it is my opinion that a POSITA would have found the limitations of claim 1(a) to be disclosed and/or obvious in view of Ba.

b. An undermold surrounding and sealing said fuse, said undermold defining an outer surface outline, wherein the outer surface outline of said undermold is substantially parallel relative to the outline of said solid outer surface;

346. The specification of the '739 patent does not define the term “undermold”. A POSITA would thus have interpreted this term by its plain and ordinary meaning in the context of its defined function. The term “undermold”, as would have been understood by a POSITA, refers to any molded or moldable element serving as a substrate to a second layer of plastic called the “overmold”. This concept is explained in detail, for example, in numerous places in GLS Overmolding Guide (*See*, e.g., EX 1015, pgs. 1-4). In context of Ye and Yen, both the undermolding and overmolding materials are insulating polymers such as plastic that can be molded into desired shapes. (*See*, e.g., EX 1005, ¶¶[0005], [0013]; EX 1006, ¶[0020]).

347. The terms “undermold” and “overmold” were known in the time frame of the '739 patent. For example, “overmold” appears in the publicly-available publication

Overmolding Guide by the GLS Corporation (GLS)¹³. This publication defines “overmold” as follows:

“**Overmolding** utilizes the injection molding process to apply one material [Overmold] onto another material [Substrate]. The over molded material should form a bond with the substrate that endures the end-use environment.... Overmolding eliminates the need for adhesives and primers to bond TPEs to rigid substrates” (EX 1015, 1.1; emphasis added).

348. The terms undermold and overmold also appear in several patents related to manufacturing. One example is US Patent 6,523,380 to McGuire et al, entitled “Overmolded Key Including an Ornamental Element and Methods of Making Same” (EX 1016). McGuire issued on February 25, 2003, more than a decade before the Effective Filing Date of the ’739 patent. *See id.* McGuire does not address any solar or fuse holder technology. *See id.* Its subject matter is, “A vehicle ignition key having an ornamental element molded onto the key.” *See id.* Such a key is depicted in McGuire at Figs. 2 and 3, shown below. Both an undermold layer 26 and an overmold layer 24 are used to make the finished product:

“The **overmold material 24** encapsulates the transponder 30 and secures the peripheral edge 22 of the element 16 to the key, trapping the

¹³ Ex. 1015 - Overmolding Guide, © 2002 GLS Corporation

peripheral edge between the overmold material 24 and the **undermold material 26** as shown in FIG. 3, for example”. (EX 1016, 5:2-5; emphasis added).

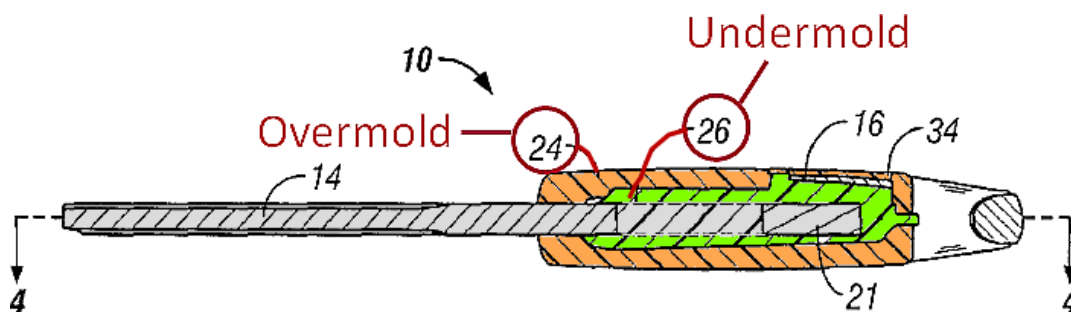


FIG. 2

EX 1016, Fig. 2 (annotated)

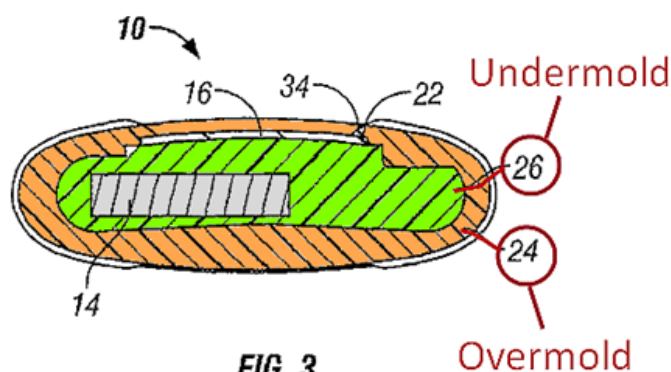


FIG. 3

Id., Fig. 3 (annotated)

349. McGuire demonstrates that the terms “undermold” and “overmold” were standard fare in manufacturing, and in injection molding in particular, long before the ’739 patent and would have been well known to a POSITA. Furthermore, as I

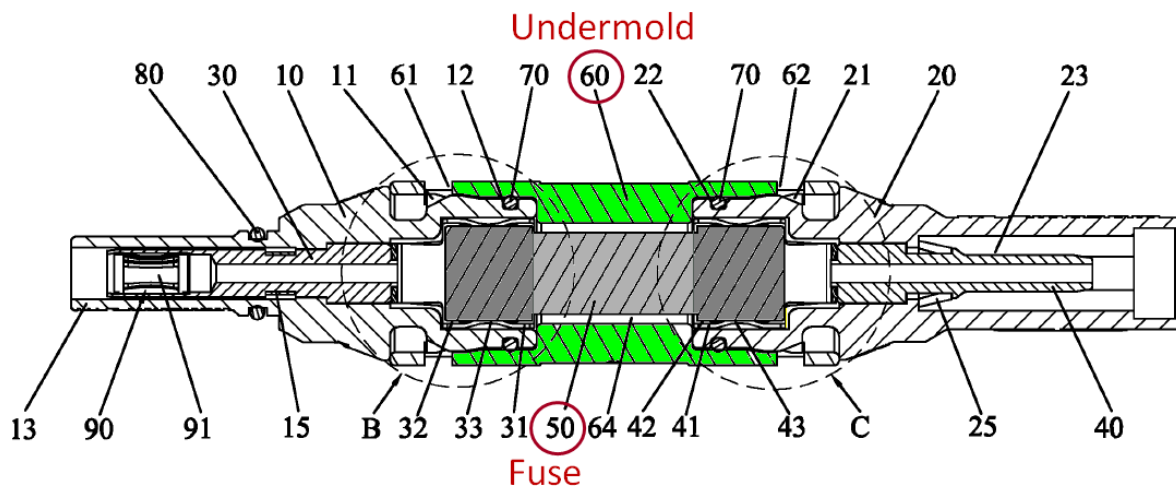
noted above, the ITC has construed the term undermold as “material molded over a piece or part that seals against environmental factors and is surrounded by the overmold,” which is consistent with these uses in the art by McGuire and the Overmolding Guide. (EX1023, pp. 17, 20.)

350. As shown in Fig. 4 from Ba, reproduced again below, Ba discloses an undermold 60 (“sleeving member”) that serves the purpose of sealing in the fuse, which is the role of the undermold in the ’739 patent. The sleeving member 60 in Ba clearly surrounds the fuse 50. *See*, EX 1011, FIG. 4 (annotated) below. Given the knowledge of a POSITA of undermolding and overmolding as described in the Overmolding Guide and in Yen, a POSITA would have understood the sleeving member 60 in Ba could be formed from molded plastic or another molded insulator by molding the material on the fuse and housings 10 and 20. (*See generally* EX 1015; EX 1006, ¶¶[0008], [0026], 0028]). A POSITA would have been motivated to mold the sleeving member 60 of Ba in place as pictured since doing so would improve the sealing of the sleeving member with the housings, such as described in Ye and Yen. (EX 1005, ¶[0013] (stating that casting of an insulator over the fuse and wire ends has “excellent sealing”)). Thus, it is my opinion that the sleeving member 60 in Ba would have rendered obvious an undermold as would have been understood by a POSITA upon reading the ’739 patent and consistent with the

claim construction above. The elements of claim 1(b) are analyzed further below:

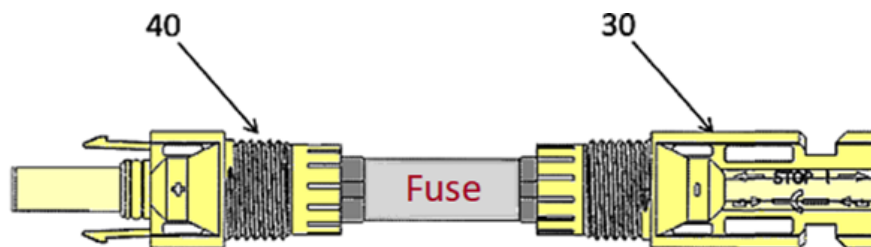
1) “an undermold surrounding and sealing said fuse”

351. The sleeving member 60 in Ba clearly surrounds the fuse 50. *See*, EX 1011, FIG. 4 (annotated) below. Although not explicitly disclosed, a POSITA would have understood that the sleeving member 60 in Ba could be formed from injection molding, because that technology was in widespread use for molding a material over a piece or part. (See generally, EX 1015, for many examples and methods; see also EX 1006, ¶[0008]). Thus, in my opinion, the sleeving member 60 would have been understood by a POSITA as rendering obvious an undermold that is molded in that position and configuration to better seal the fuse. (EX 1005, ¶[0013]). The sleeving member 60 (below, green) in Ba’s Fig. 4 thus performs the function of an undermold:

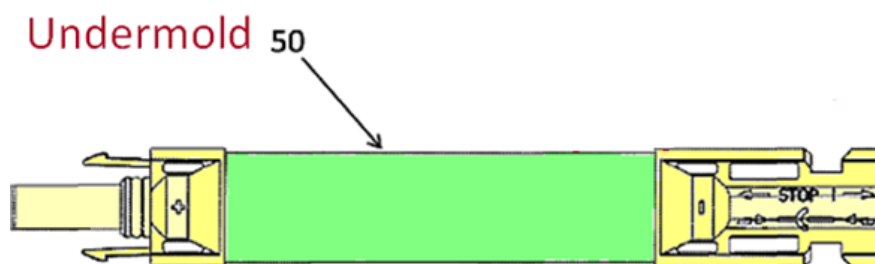


EX 1011, Fig. 4 (annotated)

352. The specification of the '739 patent provides no detail about how the undermold 50 “seals” the fuse. In fact, the specification of the '739 patent only recites that “undermold 50, seals the *assembly*” (emphasis added), as opposed to specifying that the “fuse” is sealed by the undermold. (EX 1001, 3:13-15). Similarly, the originally-filed claims of the '739 patent recited only “an undermold surrounding said fuse.” (EX 1002, 448:4). Thus, the undermold 50, as originally disclosed in the '739 patent, only seals the fuse to the extent that it surrounds it and contains a portion of it (e.g., the portion between the male connector 30 and the female connector 40, as illustrated in Figs. 7 and 8 from the '739 patent -- reproduced below). As shown by the annotations below, the undermold is highlighted in green and the connectors in yellow.



Ex. 1001, Fig. 7 (annotated)

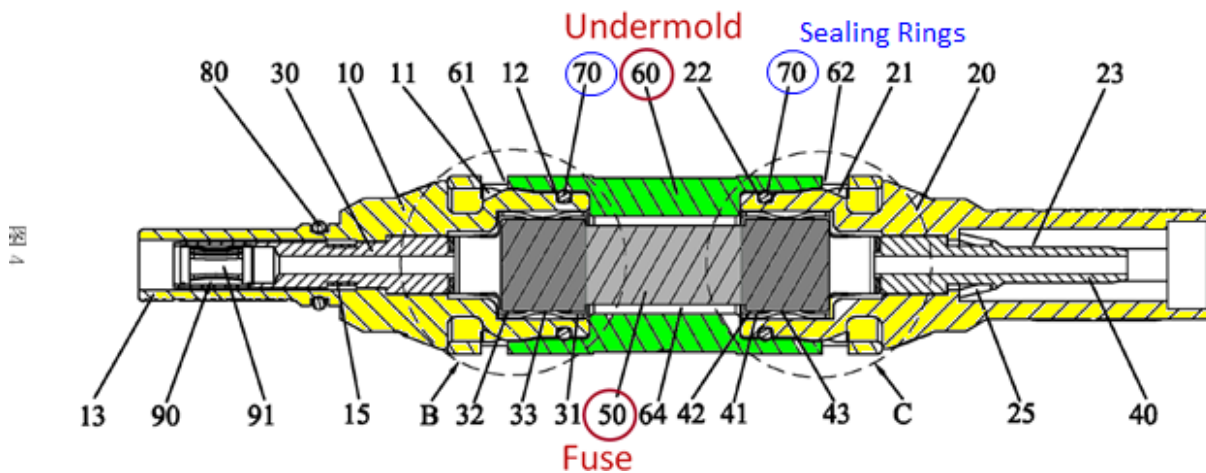


Ex. 1001, Fig. 8 (annotated)

353. The specification of the '739 patent does not define the term “sealing.” A POSITA would thus have understood that an ordinary and customary meaning of the term “sealing” is “to close or make secure against access, leakage, *or* passage by a fastening or coating.” (EX 1014, pg. 4) Similarly, as I noted in the Claim Construction section, “undermold” has been construed by the ITC to mean “material molded over a piece or part that seals against environmental factors and is surrounded by the overmold.” Accordingly, the sleeving member 60 in Ba clearly closes and makes secure against access, leakage, or passage to the fuse 50 which is held between the first and second housings 10, 20. (EX 1011, Fig. 4) A POSITA would have understood that the sleeve 60 could be molded or casted in place as

described in Ye and Yen. (EX 1005, ¶¶[0018]-[0019]; EX 1006, ¶[0026]).

354. Additionally, Ba discloses that one end of the sleeving member 60 seals the fuse 50 by covering it and enclosing it with a tight seal between two connectors. As modified by the molding process of Yen and as motivated by Ye, the sleeving member 60 is molded in place between the housings by injection molding so as to achieve excellent sealing. (EX 1006, ¶¶[0026], [0028]; EX 1005, ¶[0013]). Thus, the sleeving member 60 in Ba, which also corresponds to an undermold, not only surrounds the fuse 50, but also seals the fuse 50.



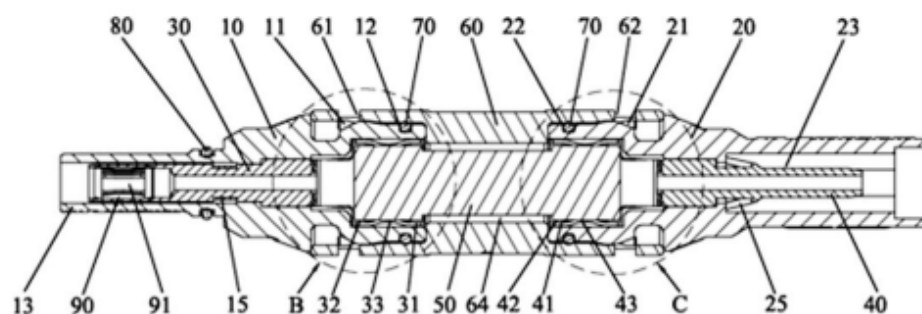
EX 1011, Fig. 4 (annotated)

Accordingly, it is my opinion that the Ba-Ye-Yen combination renders obvious this limitation.

2) said undermold defining an outer surface outline,

355. The sleeving member 60 in Ba, which is an “undermold as described above,”

also teaches the feature of an outer surface outline. As shown in FIG. 4 from Ba, the sleeving member 60 includes an outer surface outline.

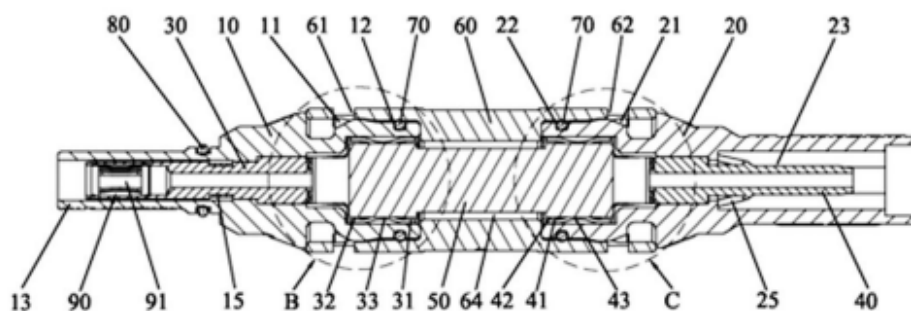


Id., Fig. 4

3) “the outer surface outline of said undermold is substantially parallel relative to the outline of said solid outer surface”

356. The sleeving member 60 in Ba, which is an “undermold as described above,” also teaches the feature of an outer surface outline [that] is substantially parallel relative to the outline of said solid outer surface [of the fuse]¹⁴. As shown in FIG. 4 from Ba, the sleeving member 60 includes an outer surface outline that a POSITA would have identified as substantially parallel to the outer surface outline of the fuse 50. (EX 1011, ¶[0030])

¹⁴ Based on antecedent bases, the expression “said solid outer surface” refers to the “solid outer surface” of the photovoltaic fuse addressed in 1(a), above.



Id., Fig. 4

357. A POSITA would have been motivated to modify Ba to mold the sleeving member 60 so as to achieve the advantages of better sealing and arc protection disclosed in Ye and Yen for such moldings. The advantages of Ba that I referred to throughout the section describing the general motivation to combine for this Ground, including increased reliability of electrical contact, improved shock resistance, more ease of assembly of the housing, better waterproofing, and more convenient assembly and disassembly (i.e., insertion) into the solar installation, would remain after this modification. (EX 1011, ¶¶[0005], [0010], [0015]-[0016], [0030], [0040]). A POSITA would understand the advantages of adding arc protection and better sealing as advantages that would offset the inability to disassemble the assembly of Ba after molding of the sleeving member 60 in place.

358. For all the reasons explained above, a POSITA would have found the claim 1(b) limitations to be obvious in view of Ba as modified by Ye/Yen.

c. An overmold defining an outline and surrounding said undermold, said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials, wherein the outline of said overmold is substantially parallel relative to the outline of said undermold; and

359. As explained above, Ba discloses sleeving member 60 corresponding to the “undermold”. Ye also discloses a holder body 24 that surrounds and protects the fuse, which a POSITA would consider to be an undermold. (EX 1005, ¶[0012]). Likewise, Yen teaches a molded arc-protection layer disposed on the fuse. (EX 1006, ¶[0020]). For the purposes of this Ground, the undermolds of Ye and Yen are cited only to illustrate that the disclosed overmolds of Ye and Yen are consistent with the overmold/undermold arrangement of the claim as a whole and as a motivation to modify the sleeving member 60 of Ba to be molded in place to achieve better sealing.

360. A POSITA contemplating the use of Ba for a solar installation would have been aware that elements in harsh outdoor conditions can be heated and degraded by the sun. (EX 1005, ¶[0013]). A POSITA would have been motivated to add to the protections of Ba I noted above by adding another layer with different properties as suggested by Yen. (EX 1006, ¶¶[0020],[0021]). Structurally, Ye further discloses the addition of “the insulating case 26 [which] covers the holder body 24, and is joined to the wiring ends 11 of the electric cables 10 by casting,

having excellent sealing, a compact structure and a high level of practicality.”. (EX 1005, ¶[0013]). Compositionally, Yen teaches advantages to selecting different materials for these two layers of undermold/overmold which a POSITA would have applied to the composition or selection of materials for the insulating case and sleeving member of Ba/Ye. (EX 1006, ¶[0020])

361. It would have been obvious to a POSITA to add an overmold like the one disclosed in Ye to the structure of Ba for added protection against aging, radiation, and high temperatures while having excellent sealing, as taught by Ye and further discussed above. *Id.*

362. The mapping of aspects of Ba, Ye, and Yen to the limitations of claim 1(c) are addressed in more detail below:

1) “an overmold defining an outline and surrounding said undermold”

363. The overmolding taught by Ye explicitly shows an outline (i.e., an outer surface outline) due to its nature as an object made from solid material (e.g., plastic). EX 1005, Fig. 2, ¶[0019]. Further, Ye discloses that the insulating case (overmolding) would be cast over the holder body (undermold) and the wire ends, and thus, naturally surrounds the undermold. (EX 1005, ¶[0013]). A POSITA would understand that to achieve the sealing properties of the insulating case when applied to the assembly of Ba, the insulating case would surround the sleeving

member 60 (“undermold”) of Ba as well. Thus, the combination of Ba and Ye discloses an “overmold defining an outline and surrounding said undermold”, as recited in the claim 1(c)(1) limitation.

2) “said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials”

364. As shown in Ye’s Fig. 2 below, Ye discloses an in-line fuse assembly having a holder body 24 that covers a fuse 22, where the holder body is itself covered by an overmold. Ye refers to the overmold as an “insulating case 26.” (EX 1005,

¶[0008]). Ye teaches that the insulating case (“overmold”):

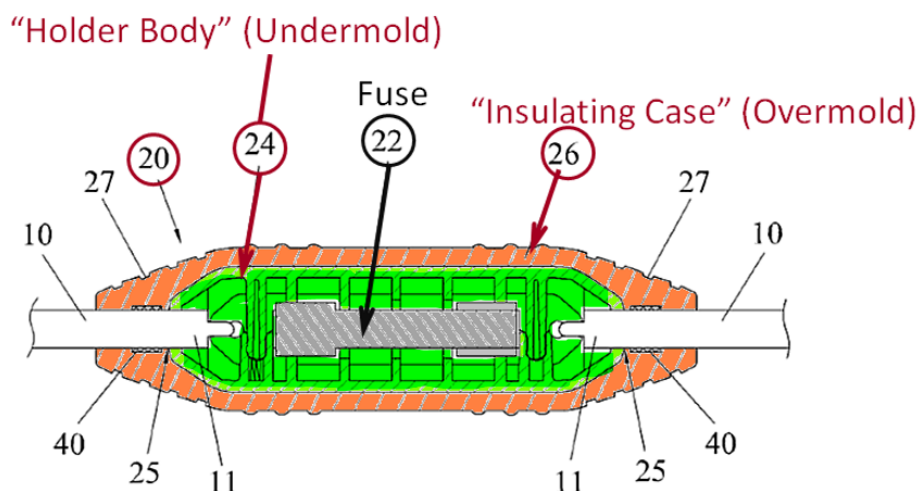
“...is integrally formed outside the holder body, sealing and covering the fuse component, the holder body and the wiring ends of the electric cables; the structure is compact with stable mechanical performance, waterproof, corrosion-resistant, UV-resistant and well-sealed, and meets the requirements for use in harsh outdoor environmental conditions, so that the operating performance of the solar cell is more stable and reliable.”

EX 1005, ¶[0008].

Ye also illustrates that the insulating case 26 (i.e., the overmold) is formed as a single unit. (EX 1005, FIG. 2).¹⁵

¹⁵ Recall that for the purpose of clarity, the shading in the figures follows this color key:

gray = fuse	green = undermold	orange = overmold
yellow = connector	blue = surface outline	purple = wires and contacts



EX 1005, Fig. 2 (annotated)

365. It would have been obvious to a POSITA to add an overmold in the style of Ye, formed as a single unit as taught by Ye, to the structure of Ba to better protect the fuse component from the harsh outdoor environments typical in photovoltaic installations, where the components of the solar assemblies are located outdoors. EX 1005, ¶¶[0008], [0013], [0020] (noting resistance to radiation, high temperatures, and water). As disclosed in Ye, this continuous outer shell protects against solar radiation decay of the underlying material. (EX 1005, ¶[0013]).

366. Ba discloses that the sleeving member 60 is a single piece as illustrated in Figure 2 of Ba. As modified by Yen and motivated by Ye, the molded sleeving member of Ba would be understood by a POSITA to be a single unit at least because of how the injection overmolding process is performed for such a part

configuration. *See generally* EX1015.

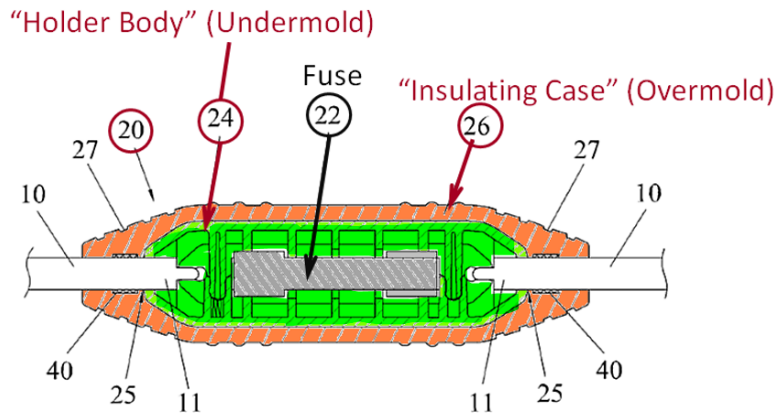
367. Thus, to further summarize the combination of Ba-Yen, Ba teaches and illustrates that the sleeving member 60 (i.e., the undermold) may be constructed as a single unit, and Ye teaches that the over-molding (i.e., the overmold) also may be constructed as a single unit. It would have been obvious to a POSITA to utilize an undermold (in the style of Ba and modified as a molded element as taught by Yen) *and* an overmold in the style of Ye's insulating case. The POSITA would have understood this combination to provide added protection against harsh outdoor environments, as taught by Ye, further discussed above.

368. By adding an overmold (in the style of Ye) to the in-line fuse assembly (in the style of Ba), a POSITA would have a reasonable expectation of success. As noted in Ye, the insulating case matches the profile of the underlying layer (in Ye, the holder body 24) and the holder body of Ye has similar shape and configuration to that of Ba's sleeve so a POSITA could have expected to use the methods of Ye directly on the assembly of Ba.

369. A POSITA could be motivated to add not only the overmold (in the style of Ye) to the in-line fuse assembly of Ba, but also incorporate the disposable nature of the solar cell connecting line disclosed in Ye (EX 1005, Fig. 2, annotated below). Although not explicitly stated in Ye, the insulating case 26 once molded over the

holder body 24, as illustrated in Fig. 2, is not intended to be removed. (*See id.*).

This means that once the fuse 22 in Ye is blown, the entire solar cell connecting line is replaced, which is often easier for a technician than disassembling a body and replacing the fuse. Thus, a POSITA could be motivated to add the overmold (in the style of Ye) to the in-line fuse assembly (as disclosed in Ba), to create a more disposable design that is easier for technicians to use.



EX 1005, Fig. 2 (annotation)

As I noted above regarding claim 1(c) generally, the other four or more advantages of Ba remain after the overmolding of Ye is applied, whereas the ease of disassembly represents a trade off with the disposable and plug-and-play advantages of Ye.

370. Regarding the dissimilar materials, Ba does not specify any particular materials from which the sleeving member 60 (i.e., the undermold) is to be formed.

A POSITA, in an effort to fill this void, would look to Yen's disclosure that an

undermold and overmold could be made of dissimilar materials. So doing would enhance the types of protection provided. (EX 1006; ¶¶[0020], [0021], [0026]). For example, Yen discloses that the inner layer 211 (i.e., the undermold), which may be made of an injection moldable thermoplastic material or thermoset material, may provide arc resistance. (EX 1006, ¶¶[0020], [0031]). Further, Yen explicitly teaches using an “ordinary material” for outer layer of protection for cost savings. (EX 1006, ¶[0020]). Whether for cost savings or for added protection against other environmental conditions (e.g., heat, radiation) as taught in Ye, a POSITA would have been motivated to choose moldable materials with different properties for the undermold of Ba and overmold of Ye so as to enhance the protection of the fuse and electrical connections of the assembly of Ba-Ye. It would thus have been obvious to a POSITA to use different materials, as taught by Yen, for the sleeving member 60 of Ba (i.e., the undermold) and the over-molding of Ye (i.e., the overmold) to achieve protection from various elements (e.g., radiation).

371. Accordingly, the combination of Ba, Ye, and Yen discussed above (the “Ba-Ye-Yen combination”) discloses “said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials”, as recited in the claim 1(c)(2) limitation.

3) “wherein the outline of said overmold is substantially parallel relative to the outline of said undermold”

372. As discussed above, the Ba-Ye-Yen combination discloses an undermold covered by an overmold. Further, Ye explicitly discloses that the “profile of the holder body 24 [i.e., the undermold] is matched to the insulating case 26 [i.e., the overmold]”. In other words, these profile contours are substantially parallel to each other. (EX 1005, ¶[0013]). Further, Ye illustrates that the outline of the insulating case 26 (i.e., the overmold) is substantially parallel to the outline of the holder body 24 (i.e., the undermold). (EX 1005, FIG. 2) See figure 2 of Ye.

373. It would have been obvious to a POSITA to form an overmold that followed the natural contours of the undermold of Ba, thus having substantially parallel outlines, to provide a compact structure, as taught by Ye. (EX 1005, ¶¶[0013], [0020]).

374. Further, a POSITA would understand that it is a benefit to avoid excessive use of materials for formation of the undermold and the overmold as a path to keeping the cost of the assembly low, and that the obvious consequence of avoiding excessive use of materials is an assembly where the outlines of the fuse, the undermold and the overmold are substantially parallel.

375. Given all of the above, it is my opinion that the Ba-Ye-Yen combination discloses “the outline of said overmold is substantially parallel relative to the outline of said undermold”, as recited in the claim 1(c)(3) limitations.

376. For all the reasons explained above, I believe that a POSITA would have found the claim 1(c) (1-3) limitations to be obvious in view of Ba, Gilman, and Ye.

d. A first photovoltaic connector engaged with said first end, wherein said assembly provides electrical insulation.

377. Although not explicitly disclosed in Ba, a POSITA would have recognized that fuse holder 100 in Ba (i.e., the “assembly”) provides electrical insulation for its internal components. As the POSITA would have known, the fuse holder extends over the length of the fuse; if the fuse holder were made from conducting metal, it would short out the fuse. Thus, the material for the holder would have to be some form of plastic or other insulating material.

378. Ye similarly espouses the use of an “integrally formed insulating case” to insulating current-carrying components from the elements and inadvertent electrical contact, wherein:

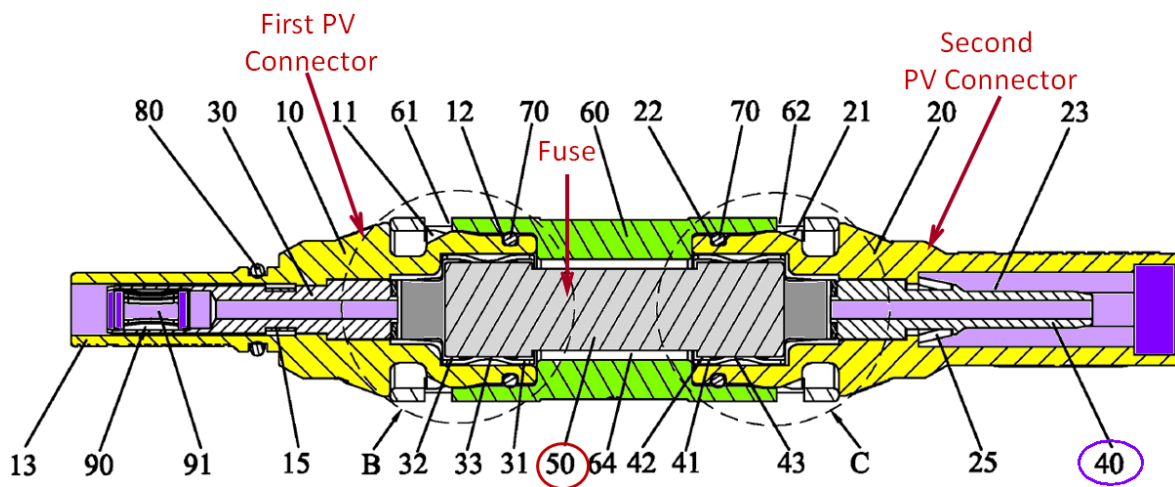
... the **integrally formed insulating case seals and covers** the fuse component, **the holder body and the wiring ends of the electric cables**. As a result, the solar cell connecting line of the present utility model is **waterproof, corrosion-resistant and well-sealed**, and meets the requirements for use in harsh outdoor environmental conditions, ensuring stable and reliable operation of the solar cell.

(EX 1005, Abstract).

Accordingly, a POSITA would have understood that Ba alone or Ba-Ye provide

electrical insulation to the fuse and its inline connections to the wire.

379. Ba discloses a first photovoltaic connector engaged with said first end [of the fuse]¹⁶. In Ba, the sub-assembly of the “first housing 10” and the “first electric terminal 30” form a “first photovoltaic connector.” See FIG. 4 of Ba annotated below, where the connectors have been highlighted in yellow. Ba discloses that the first electric terminal 30 receives an output cable at one end and the fuse 50 at the other end. (EX 1011, ¶¶[0036], [0050]).



EX 1011, Fig. 4 (annotated)

¹⁶ Based on antecedent bases, the expression “said first end” refers to one end of the photovoltaic fuse addressed in 1(a), above.

For the reasons above, I believe that a POSITA would have found the claim 1(d) limitations to be obvious in view of Ba.

380. Given all that is discussed above, it is my opinion that a POSITA would have found claim 1 in its entirety to be obvious based on the Ba-Ye-Yen combination. Accordingly, claim 1 should be found invalid under 35 U.S.C. § 103 based on Ba, Ye, and Yen.

2. Claim 2

The assembly of claim 1 further including a second photovoltaic connector engaged with said second end.

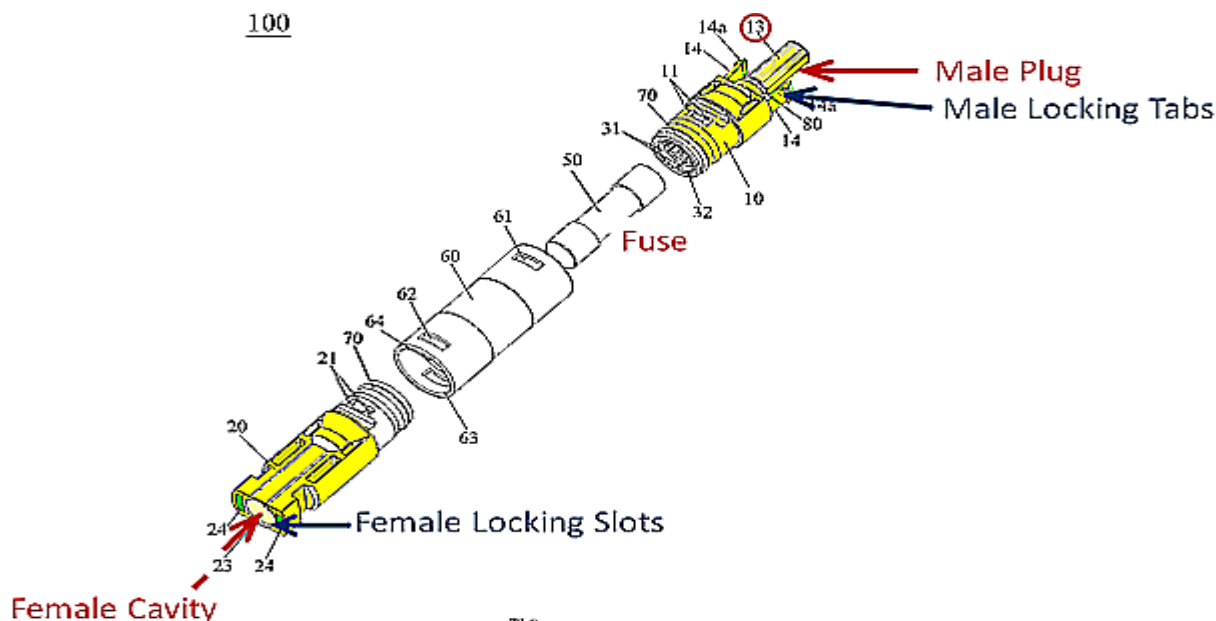
381. In Ba, the assembly of the “second housing 20” and the “second electric terminal 40” form a “second photovoltaic connector”. This assembly is disposed on an opposite side of the fuse 50 from the “first photovoltaic connector” formed by the assembly of the “first housing 10” and the “first electric terminal 30,” as discussed above regarding claim 1(d). (EX 1011, FIG. 4).

382. Therefore, a POSITA would have found the limitation recited in claim 2 to be obvious based on Ba. The Ba-Ye-Yen combination discloses all limitations recited in claim 1, from which claim 2 depends. Accordingly, in my opinion, claim 2 should be found invalid under 35 U.S.C. § 103 based on the Ba-Ye-Yen combination.

3. Claim 3

The assembly of claim 2 wherein said first photovoltaic connector is a female type connector, and said second photovoltaic connector is a male type connector.

383. In Ba, both female and male type connectors are disclosed as is evident, for example, from Ba Fig. 2 below. A POSITA would have understood that either end of the assembly of Ba could be considered the first or second end. Additionally, which of the designated “first” and “second” ends (arbitrary in itself) would be chosen to be the male end or the female end is arbitrary, and thus interchangeable. This aspect of the photovoltaic connector in Ba is shown below in FIG. 2 (annotated). A POSITA would have found the limitation recited in claim 3 to be obvious based on the Ba-Ye-Yen combination.



■ 3

EX 1011, Fig. 2 (annotated)

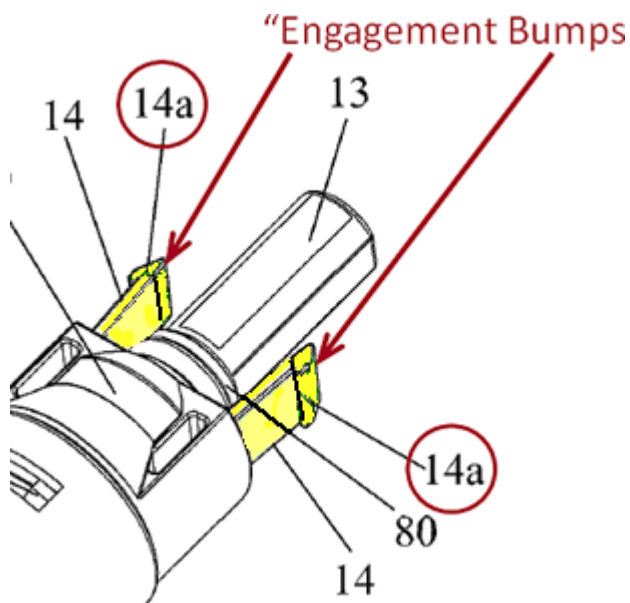
384. The Ba-Ye-Yen combination discloses all limitations recited in claim 2, from which claim 3 depends. Accordingly, in my opinion, claim 3 should be found invalid under 35 U.S.C. § 103 based on the Ba-Ye-Yen combination.

4. Claim 4

The assembly of claim 1 wherein said first and second connectors are locking type connectors.

385. It should be noted that the expression “said first and second connectors,” in claim 4 is indefinite since it lacks antecedent basis. In any case, Ba discloses that “[t]he first housing 10 is provided with a first plug-in connection portion 13 connected to the socket in a plug-in manner and... the second housing 20 is provided with a second plug-in connection cavity 23 connected to the plug in a

plug-in manner. (EX 1011, ¶[0039]). This structure is evident in Ba Fig. 2, shown above, where the male locking tabs and their corresponding female locking slots are evident. A POSITA would thus have recognized that the first housing 10 and the second housing 20 disclosed in Ba form the outer portions of locking type connectors. In Ba's Fig. 2 annotated above regarding claim 3, the male locking tabs and their corresponding female locking slots can be seen. The figure shown below, which is a "zoomed in" closeup view of the male end connectors, shows the male locking tabs (referred to in Ba as "engagement bumps" 14a).



EX 1011, Fig. 2 (portion, annotated)

386. Based on all of the above, it is my opinion that a POSITA would have found the limitation recited in claim 4 to be obvious based on Ba. Thus, the Ba-Gilman-Ye combination discloses all limitations recited in claim 1, from which claim 4

depends. Accordingly, claim 4 should be found invalid under 35 U.S.C. § 103 based on the Ba-Ye-Yen combination.

5. Claim 5

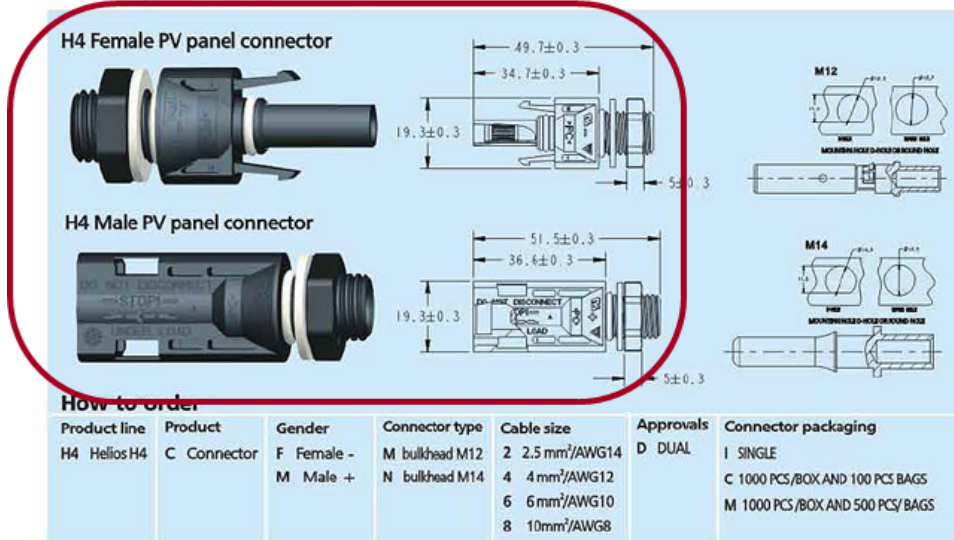
The assembly of claim 4 further comprising a tool for unlocking said connectors.

387. The specification of the '739 patent does not disclose either a description or a drawing containing a “tool” that would be used for unlocking connectors.

Regardless, the concept of using a tool to unlock connectors was well known, long before the Effective Filing Date of the '739 patent. A POSITA would have understood that a tool, such as pliers, could be used to squeeze the Ba engagement bumps 14a inwardly to unlock the connectors 10, 20 from the input and output cables in Ba. (EX 1011, ¶[0040]). Also, more specialty tools were not only known, but often required in the time frame of the '739 patent. For example, the publication “Solar Line Photovoltaic Interconnection System,” by Amphenol Industrial Solar Technologies (November 2012), shows that Helio H4 photovoltaic connectors were offered for sale with a tool for unlocking those connectors before the Effective Filing Date of the '739 patent. (EX 1017). The connectors in the figure below from Amphenol bear a remarkable resemblance to the lockable connectors disclosed in the '739 patent and in the Ba application.



H4 PV panel connector Helios H4 Female and Male Connectors



Amphenol, pg. 3 (annotated)

388. Amphenol indicates that a “special unlocking tool” is needed to un-mate the connectors. Of note is the fact that these sort of unlocking tools for connectors would have been known to a POSITA. For example, one detailed compendium of rules and regulations relating to wiring connections, the “NEC” (National Electric Code), which may be adopted for enactment by, for example, different counties or states, specifies such an “unlocking tool required to un-mate” a snap-lock. (See red circled text below). The NEC has the following specific requirement with respect to connectors used in photovoltaic installations:

“690.33 Connectors, (C) Type. The connectors shall be of the latching

or locking type. Connectors that are readily accessible and that are used in circuits operating at over 30 volts, nominal, maximum system voltage for dc circuits, or 30 volts for ac circuits, *shall require a tool for opening.*”

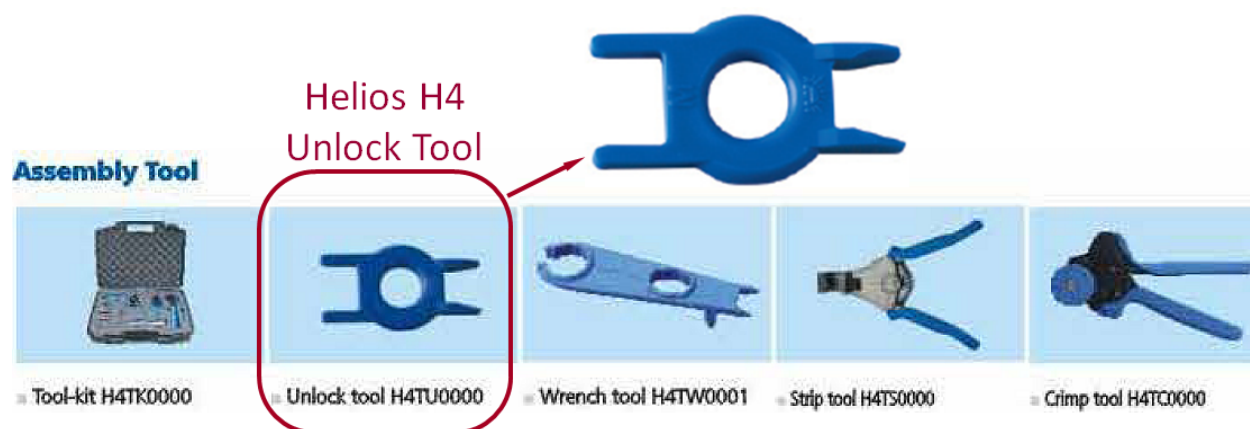
EX 1012 (emphasis added).¹⁷

389. As the above shows, the use of a tool to facilitate unlocking of photovoltaic connectors, as demonstrated by Amphenol, was well known in the time frame of the ’739 patent.

Contact system	Machined/cold formed or S&F contact with RADSOK® insert
Insulation material	PC
Locking mechanism	Snap-lock, special unlocking tool required to un-mate as required by NEC2008
Cable strain relief	Compression gland with ratcheting gland nut
Degree of protection	IP68 (1 meter, 1 hour) mated

Id., pg. 3. A photo of the unlocking tool referenced in Amphenol is shown in the catalog on pg. 4 (below):

¹⁷ The Amphenol table cites to NEC2008, but the same cited requirement is found in NEC2002 (Ex. 1012).



Id., pg. 4 (annotated).

390. The Amphenol catalog shows that a tool for taking apart male and female photovoltaic connectors was known before the Effective Filing Date of the '739 patent. Accordingly, it is my opinion that the use of a tool to unlock photovoltaic connectors was obvious in view of the connector configuration of Ba, and as reflected in various rules and regulations, such as in the NEC. A POSITA would have found the limitation recited in claim 5 to be obvious based on Ba. As shown, the Ba-Ye-Yen combination discloses all limitations recited in claims 1 and 4 from which claim 5 depends. Accordingly, claim 5 should be found invalid under 35 U.S.C. § 103 based on the Ba-Ye-Yen combination.

391. For these reasons, in accordance with Ground 7, claims 1-5 should be found invalid under 35 U.S.C. § 103 based on Ba, Ye, and Yen.

❖ **Ground 8: Claim 7 is unpatentable under 35 U.S.C. § 103 as obvious based on Ba in view of Ye and Yen, and further in view of Darr.**

392. A POSITA would have been motivated to combine the teachings of Ba, Ye, and Yen with those of Darr, because each of the Ba, Ye, Yen and Darr references discloses an in-line fuse assembly providing electrical connections and do so in the same field of endeavor and in a compatible manner. (EX 1011, Abstract; EX 1006, Abstract; EX 1005, Abstract; and EX 1007, Abstract).

393. As noted above in my discussion of Ground 7, the Ba-Ye-Yen combination discloses an enhanced in-line fuse assembly with added protection for maintaining an electrical connection until the fuse is needed for overcurrent protection. (EX 1011, Abstract; EX 1005, Abstract). Similarly, Darr discloses an inline fuse holder for use in photovoltaic systems. (EX 1007, ¶[0003]). Darr adds that a thermoplastic elastomer may be used to form an overmold to form an additional safeguard. (EX 1007, ¶[0023]). Darr recognized that selecting a suitable material for the overmold of a fuse holder can make the fuse holder waterproof as well as electrically insulating. (EX 1007, ¶[0024]). Thus, Darr complements the Ba- Ye-Yen combination by teaching how to further protect in-line fuses. *See id.*

394. A POSITA would have had an expectation of success in combining the teachings of Ba, Ye, and Yen with that of Darr, because a POSITA would have understood the modification to be the selection of a known material based on its

suitability for its intended use (i.e., strengthening connectors as disclosed in Ba-Ye-Yen), which is a rationale that supports a prima facie case of obviousness. It is thus my opinion that claim 7 should be found invalid under 35 U.S.C. § 103 based on Ba, Ye, and Yen in view of Darr.

1. Claim 7

The assembly of claim 1 wherein said overmold is a thermoplastic elastomer.

395. Darr discloses that the “overmold is a thermoplastic elastomer.” In particular, Darr discloses:

first and second fuse holder components 12, 14 may be a suitable thermoplastic rubber (also called “**thermoplastic elastomer**”). Such as a suitable thermoplastic rubber having a hardness of about 50 Shore A to about 75 Shore A. For example, a suitable thermoplastic rubber is sold by Exxon Mobil Corporation, New Jersey, USA, and sold under the mark Santoprene(R). In one non-limiting example, the first and second fuse holder components 12, 14 may be made from Santoprene(R) 101-64 having a hardness of about 69 Shore A.

EX 1007, ¶[0024].

A POSITA would have understood, as is known in the trade, that a thermoplastic rubber (TPR) was known to be a type of thermoplastic elastomer (TPE), and that thermoplastic elastomers are a class of polymers that combine the properties of elastomers (rubbery materials) with the processability of thermoplastics. This means they can be melted and reshaped multiple times, like thermoplastics, but

they also have elastic properties when they are at room temperature and can thus be readily stretched and deformed under stress, and will return to their initial form once the stress is removed. *Id.* Thus, Darr teaches the use of a thermoplastic elastomer for an overmold. *Id.*

396. Given the preceding, I believe that a POSITA would have found the limitation of claim 7 to be obvious based on the addition of Darr to the combination of Ba-Ye-Yen. As is shown in Ground 7, the Ba-Ye-Yen combination discloses all limitations recited in claim 1 from which claim 7 depends. Thus, it is my opinion that in accordance with Ground 8, claim 7 should be found invalid under 35 U.S.C. § 103 based on Ba, Ye, Yen and Darr.

❖ **Ground 9: Claims 10-13 and 15-18 are unpatentable under 35 U.S.C. § 103 as obvious based on Solon in view of Ba, Ye, and Yen.**

397. As discussed above regarding Ground 7, a POSITA would have been motivated to combine features and arrive at the modified in-line fuse assembly disclosed by the Ba-Ye-Yen combination. Further, a POSITA would have been motivated to combine Solon with the Ba-Ye-Yen combination at least because all these references relate to power connectors applicable to solar power installations, and are, therefore, in the same field of endeavor. Importantly, the sole author of the '739 patent is also the sole author of Solon, Dean Solon. The two patents use similar language to describe their fields of use, and a POSITA would appreciate that

a patent by the same author disclosing improvements in the same field of use would be analogous prior art. The Solon reference was not disclosed to the Examiner.

398. Solon discloses a “Solar Energy Wire Harness with In-Line Fuses.” (EX 1008, Abstract). Solon is analogous prior-art to the ’739 patent because it is directed to in-line fuses, each encased in a housing 22. Further, Solon anticipates the need to protect each fuse from ambient conditions (i.e., the outdoor environment). (EX 1008, ¶[0033]). Likewise, the ’739 patent claims relate not only to inline fuses but also their placement in wire harnesses in a larger solar energy system. (EX 1001, 4:60-5:10) Therefore, Solon is analogous prior-art to the ’739 patent.

399. A POSITA tasked with building a large-scale solar installation would have understood the need to make use of the utility and neatness of wiring harnesses as well as the circuit protection of fuses. In particular, the POSITA would have been motivated by the advantageous installation efficiency of inline fuses and the increased reliability due to durability that is disclosed by Ba, Ye, and Yen as being an advantage of inline fuse assemblies. A POSITA would have been motivated to combine the wire harness teachings of Solon with the enhanced in-line fuse assembly of the Ba-Ye-Yen combination in order to reduce costs and failure rates as taught by Solon while protecting the inline fuses in the harnesses from the

elements as described above in Ground 7 with regard to the motivation to combine Ba-Ye-Yen. The POSITA would also have known that the combination of Ba-Ye-Yen to yield a fuse protector could easily replace the fuse protector of Solon. For Solon and Ba-Ye-Yen, the input/output wires would be the same, hence the Ba- Ye-Yen combination would operate in the same manner in place of the fuse protector of Solon.

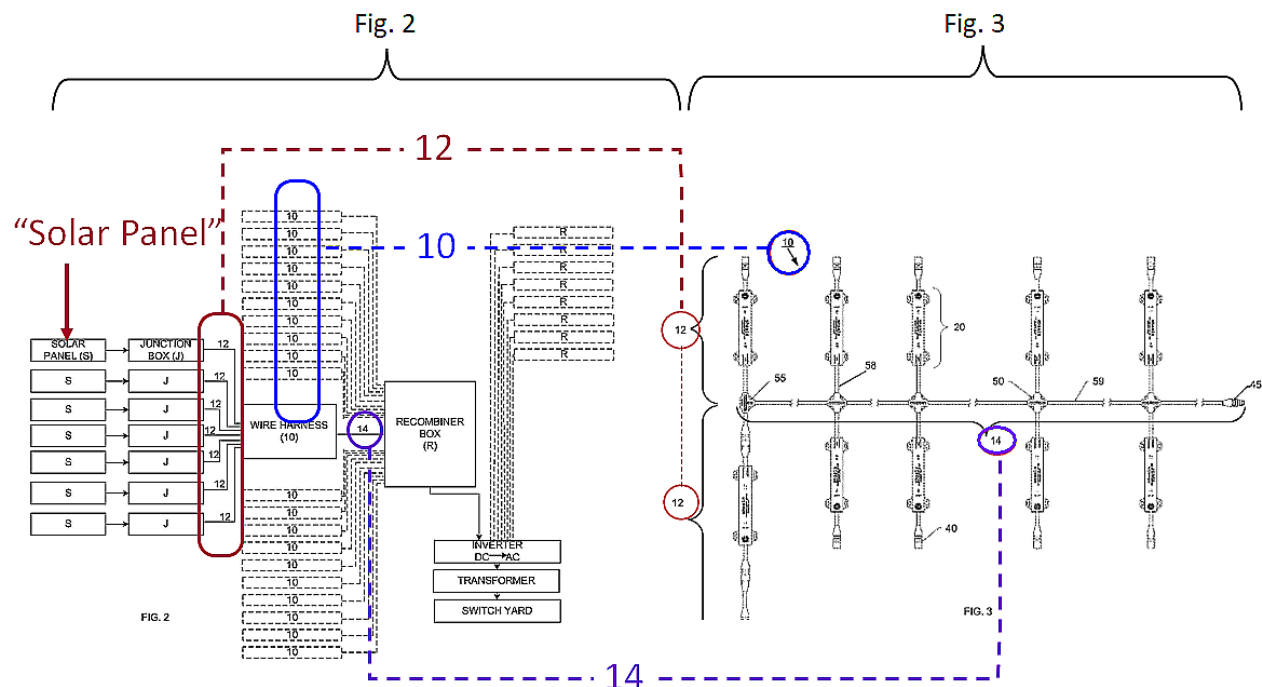
400. A POSITA would have expected success in using the fuse protector taught by the Ba-Ye-Yen combination to replace the fuse protector of Solon because, as demonstrated with respect to Ground 7, the Ba-Ye-Yen combination discloses an enhanced in-line fuse assembly intended for use in solar-power applications that is configured to better protect a photovoltaic system. A POSITA working on solar-power installations and informed about the solar energy wire harness disclosed in Solon would have been motivated to better protect the in-line fuses in such wire harnesses by using an enhanced in-line fuse assembly, as is taught by the Ba-Ye-Yen combination above.

401. For all of these reasons, it is my opinion that a POSITA would have been motivated to combine the teachings of Solon with the Ba-Ye-Yen combination to better facilitate the installation process and to protect the solar-energy wire harness from harsh outdoor environments.

1. Claim 10

Preamble. A photovoltaic wire harness including:

402. Solon discloses that a “wire harness 10 includes a plurality of branches 12 feeding into one trunk 14.” (EX 1008, ¶[0029]). See also FIGS. 2 and 3 combined with each other and with annotation below.

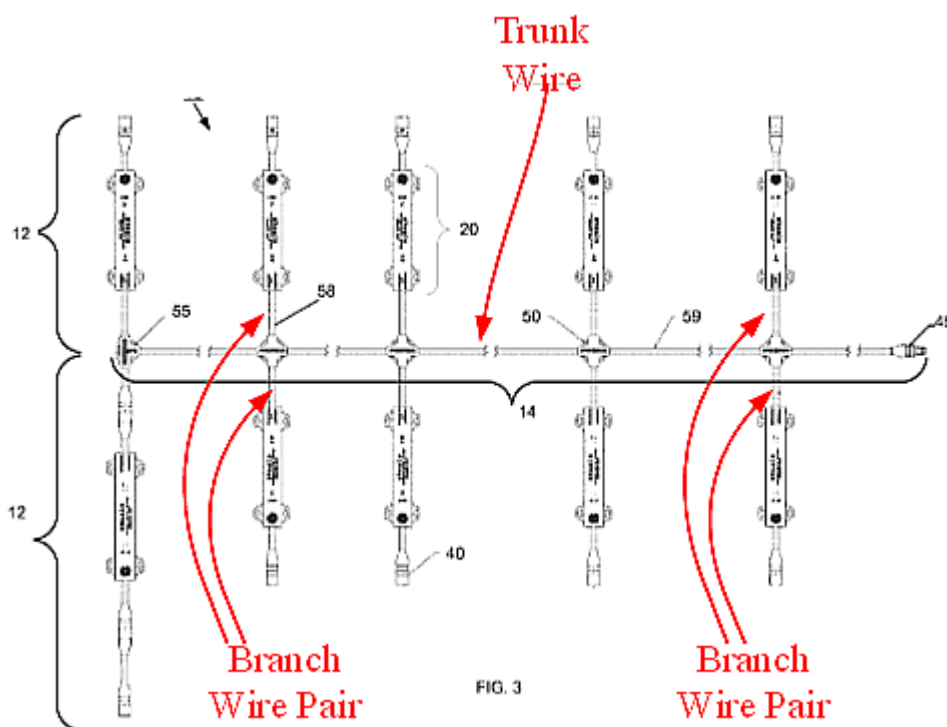


EX 1008, FIGS. 2 and 3 (combined with annotation)

Given the above, it is my opinion that a POSITA would have found the limitations in claim 10(Preamble) to be obvious in view of Solon.

a. A trunk wire having a plurality of branch wires extending there from in pairs, said branch wires and said trunk wire forming angles having vertices of approximately degrees [sic]; and

403. Solon further discloses “[b]ranches 12 of wire harness 10 each include one in-line fuse assembly 20, so wire harness 10 includes a plurality of in-line fuse assemblies 20 connected to branch wire 58, which is preferably photovoltaic wire.” (EX 1008, ¶[0030], FIG. 3).



EX 1008, FIG. 3 (1st-annotation)

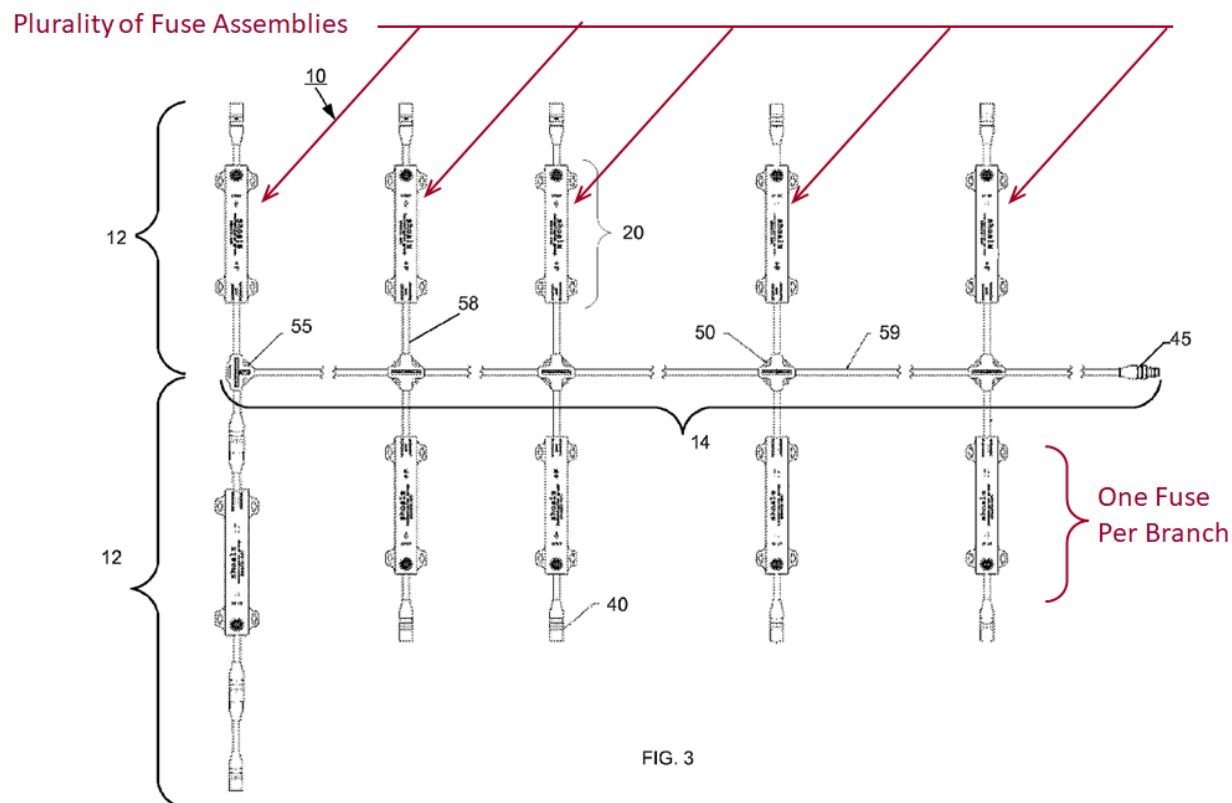
404. The '739 patent provides no details about what is meant by the expression “said branch wires and said trunk wire forming angles having vertices of approximately degrees” as recited in claim 10(a). An ordinary and customary meaning, as understood by a POSITA, of the expression “said branch wires and said trunk wire forming angles having vertices of approximately degrees” would be that

some angle is formed at the intersection of the branch wires with the trunk. Solon further discloses that *some* angle is formed at the intersection of the branch wires with the trunk. (EX 1008, FIG. 3).

405. Given the above, I believe that a POSITA would have found the limitations of claim 10(a) to be obvious in view of Solon.

b. A plurality of fuse assemblies engaged only with said branch wires in a ratio of one fuse assembly per branch wire, said fuse assemblies each including:

406. Solon discloses that “[b]ranches 12 of wire harness 10 each include one in-line fuse assembly 20, so wire harness 10 includes a plurality of in-line fuse assemblies 20 connected to branch wire 58, which is preferably photovoltaic wire.” (EX 1008, ¶[0030], Fig. 3).



EX 1008, FIG. 3 (annotated)

For the above reasons, it is my opinion that a POSITA would have found the limitations in claim 10(b) to be obvious in view of Solon.

407. With regard to the fuse assemblies, Solon acknowledges the need to “protect housing-22 and lid-23 encased assembly 20 from ambient.” (EX 1008, ¶[0033]).

A POSITA would have understood from Solon the need to protect the in-line fuses in wire harnesses from ambient conditions by using enhanced in-line fuse assemblies and would have looked to the Ba-Ye-Yen combination for such protection. Specifically, the overmold of Ye provides protection from impacts and

UV light in the ambient environment, Ba provides protection from water and other corrosive intrusions, and Yen provides a different material for the coating of the outer layer as opposed to the inner layer to provide other protections and reduce costs.

408. The following subsections of claim 10(b), namely i-iv, recite the same limitations as the in-line assembly recited in Claim 1, addressed above. A POSITA would have understood that fuse assemblies in a solar installation are exposed to harsh outdoor environments and can benefit from additional protection from the elements. Thus, the POSITA would have been motivated to add the modified in-line fuse assembly taught by the Ba-Ye-Yen combination, discussed above, to the photovoltaic wire harness disclosed by Solon.

(b)(i). A photovoltaic fuse having a solid outer surface including a first end, a second end and a middle section there between, said solid outer surface defining an outline;

409. The claim 10(b)i limitations are the same as, or at least substantially correspond to, the claim 1(a) limitations addressed in Ground 7. For the same reasons that I presented in Ground 7 for the claim 1(a) limitations, I believe that a POSITA would have found the claim 10(b)i limitations also to be obvious in view of Solon, Ba, Ye, and Yen.

(b)(ii). An undermold surrounding and sealing said fuse, said undermold defining an outer surface outline, wherein the outer surface outline of said undermold is substantially parallel relative to the outline of said solid outer surface;

410. The claim 10(b)ii limitations are the same as, or at least substantially correspond to, the claim 1(b) limitations addressed in Ground 7. For the reasons presented in Ground 7 for the claim 1(b) limitations, I believe that a POSITA would have found the claim 10(b)ii limitations to be obvious in view of Solon, Ba, Ye, and Yen. (EX 1011, ¶[0030], FIG. 4).

(b)(iii). An overmold defining an outline and surrounding said undermold, said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials, wherein the outline of said overmold is substantially parallel relative to the outline of said undermold; and

411. The claim 10(b)iii limitations are the same as, or at least substantially correspond to, the limitations recited in claim 1(c) addressed in Ground 7. For the reasons presented in Ground 7 for the claim 1(c) limitations, I believe that a POSITA would have found the claim 10(b)iii limitations to be obvious in view of Solon, Ba, Ye, and Yen. (EX 1011, FIG. 4; EX 100, ¶¶[0020],[0026], FIG. 1; EX 1005, ¶[0012], FIG. 2).

(b)(iv). A first photovoltaic connector engaged with said first end, wherein said assembly provides electrical insulation.

412. The claim 10(b)iv limitations are the same as, or at least substantially correspond to, the claim 1(d) limitations addressed in Ground 7. For the reasons presented in Ground 7 for the claim 1(d) limitations, it is my opinion that a POSITA would have found the claim 10(b)iv limitations to be obvious in view of Solon, Ba, Ye, and Yen.

413. For all the reasons cited above, I believe that a POSITA would have found claim 10 in its entirety to be obvious based on the combination of Solon, Ba, Ye, and Yen. Accordingly, claim 10 should be found invalid under 35 U.S.C. § 103 based on Solon, Ba, Ye, and Yen (i.e., the “Solon-Ba-Ye-Yen combination”).

2. Claim 11

The photovoltaic wire harness of claim 10 wherein said fuse assemblies each further include a second photovoltaic connector.

414. The limitations recited in claim 11 are the same as, or at least substantially correspond to, the limitations recited in claim 2 addressed in Ground 7. Therefore, in my opinion, a POSITA would have found the limitation recited in claim 11 to be obvious based on Ba. As demonstrated above, the Solon-Ba-Ye-Yen combination discloses all the limitations recited in claim 10 from which claim 11 depends. Accordingly, in my opinion, claim 11 should be found invalid under 35 U.S.C. § 103 based on Solon, Ba, Ye, and Yen.

3. Claim 12

The photovoltaic wire assembly of claim 10 wherein said fuse assemblies each include a pair selected from the group consisting of one male type said first photovoltaic connector and one female type connector; one female type said first photovoltaic connector and one male type connector; one male type said first photovoltaic connector and one wire; and one female type said first photovoltaic connector and one wire.

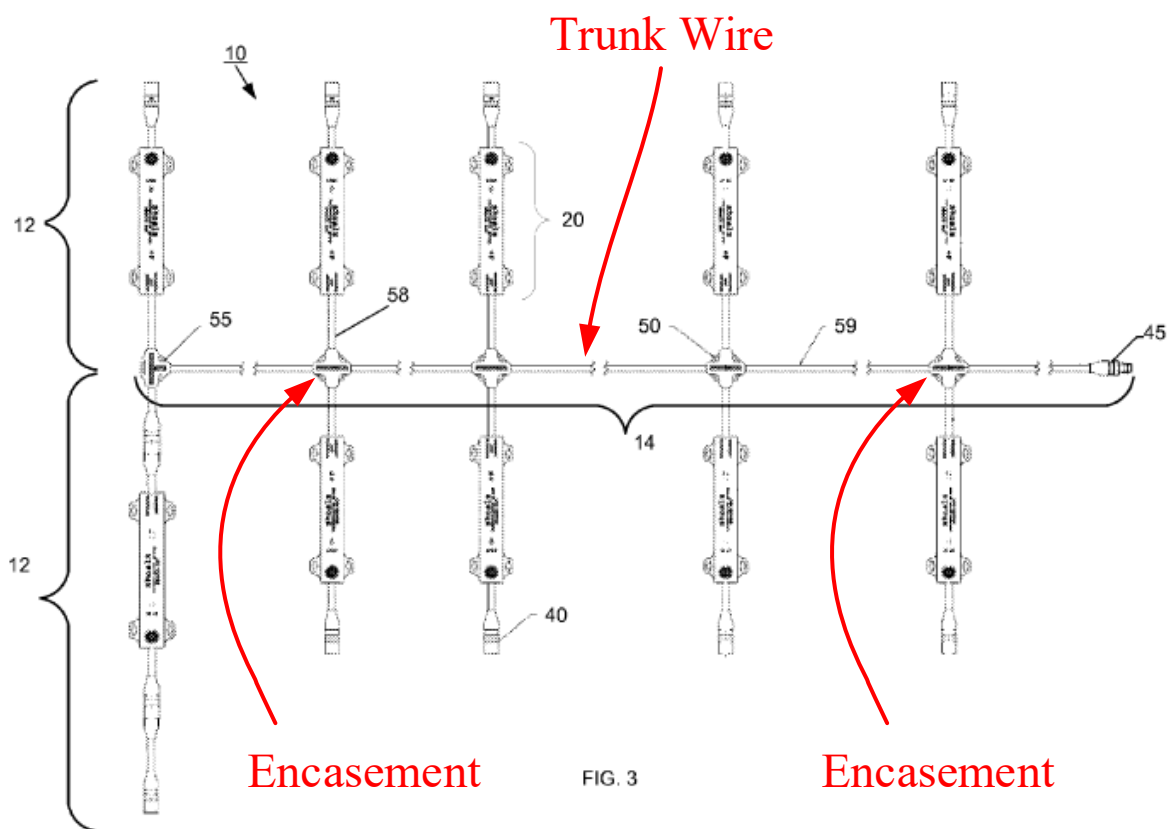
415. The limitations recited in claim 12 are the same as, or at least substantially correspond to, the limitations recited in claim 3 of Ground 7, discussed above.

Therefore, in my opinion, a POSITA would have found the limitation recited in claim 12 to be obvious based on Ba. As demonstrated above, the Solon-Ba-Ye-Yen combination discloses all the limitations recited in claim 10 from which claim 12 depends. Accordingly, claim 12 should be found invalid under 35 U.S.C. § 103 based on Solon, Ba, Ye, and Yen.

4. Claim 13

The photovoltaic wire assembly of claim 10 wherein said angles are surrounded by an encasement.

416. Solon discloses that “[b]ranches 12 connect to trunk 14 with cross joints 50, or tee joints 55, with the former uniting four wires and the latter uniting three.” (EX 1008, ¶[0029], FIG. 3).



EX 1008, FIG. 3 (annotated)

In my opinion, a POSITA would have found the limitation recited in claim 13 to be obvious based on Solon. As I have shown, the Solon, Ba, Ye, and Yen combination discloses all limitations recited in claim 10 from which claim 13 depends. Accordingly, claim 13 should be found invalid under 35 U.S.C. § 103 based on Solon, Ba, Ye, and Yen.

5. Claim 15

417. Claim 15 recites a method for assembling the parts recited in claim 10. As the parts recited in claim 10 are not novel and are not assembled or combined in a novel manner, I believe that a POSITA would have found the assembly process recited in claim 15 and its dependent claims to be obvious.

Preamble. A method of configuring a solar installation including the steps of:

418. Solon discloses that a “‘big picture’ presentation of a solar energy plant according to the present invention is depicted in FIG. 2.” (EX 1008, ¶[0026], FIG. 2).

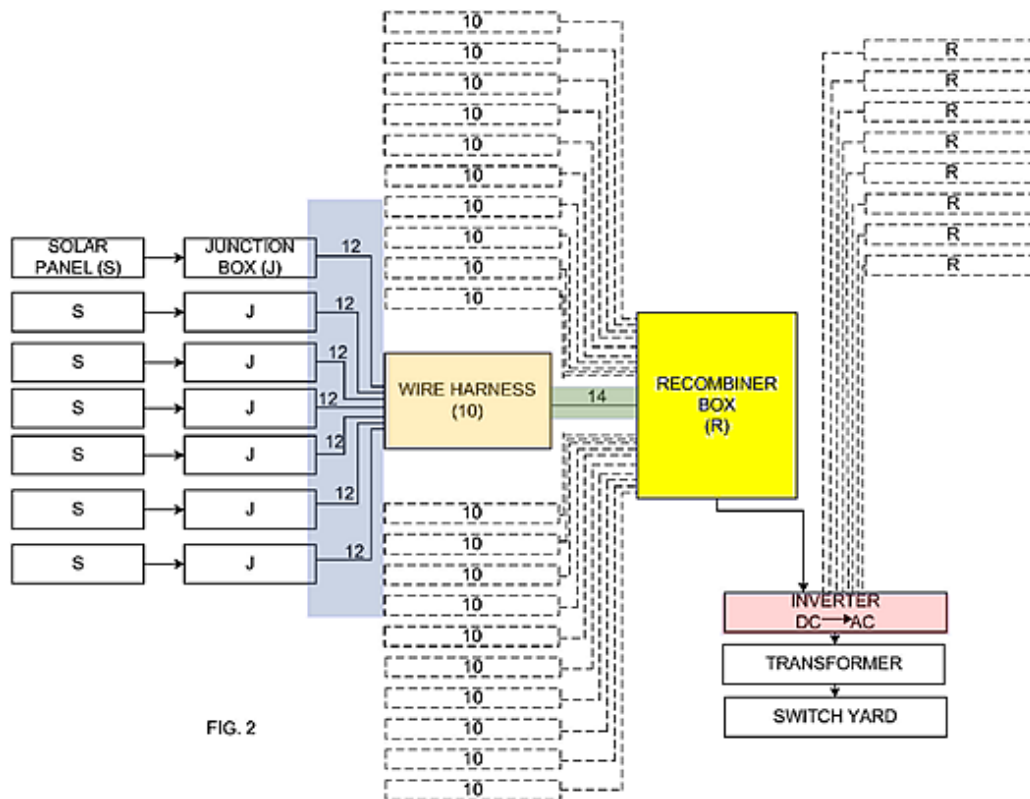


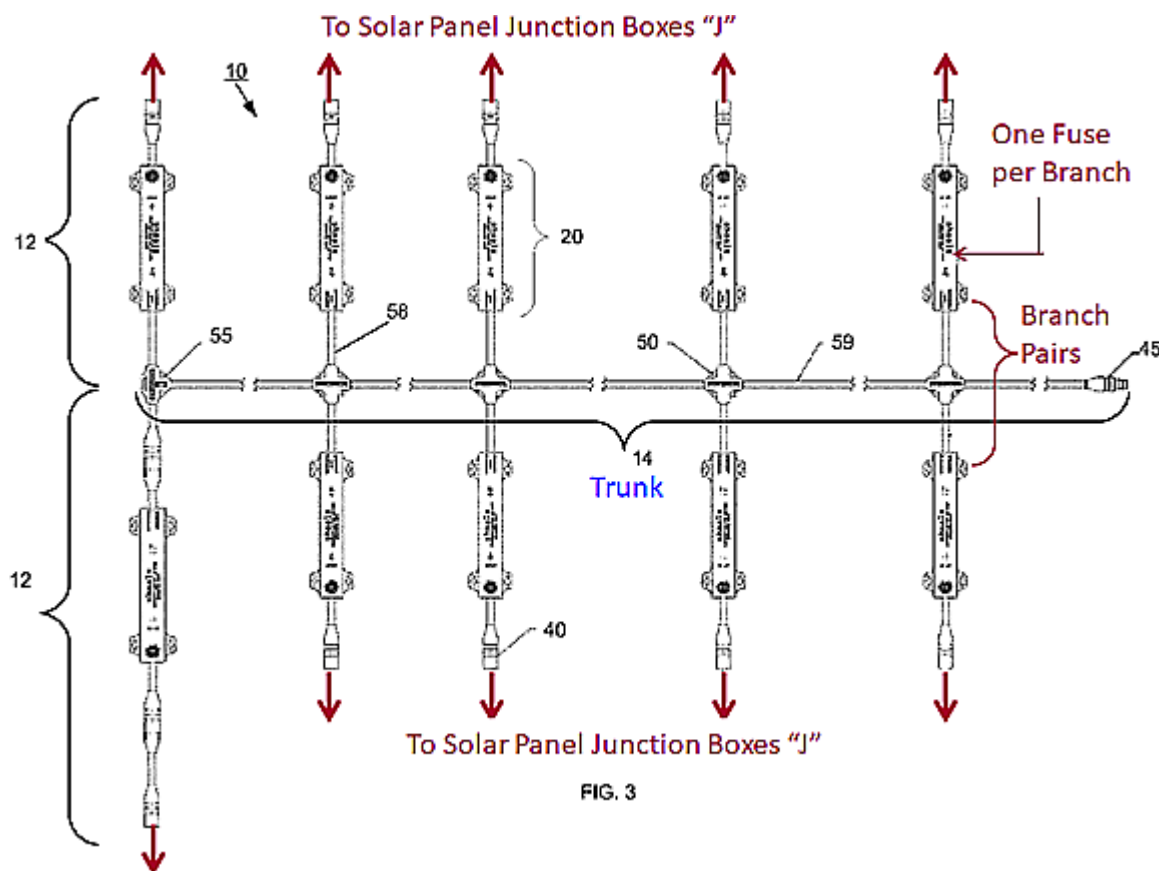
FIG. 2

Ex. 1008, FIG. 2 (annotated)

Given this disclosure, I believe that a POSITA would have found the elements of claim 15(Preamble) to be obvious in view of Solon to the extent that the preamble is found to be limiting.

a. Engaging the trunk of a wire harness with a combiner box wherein said combiner box lacks fuses and circuit breakers; and

419. Solon discloses “[e]ngaging the trunk of a wire harness with a combiner box.” In particular, Solon discloses that “[e]ach wire harness has one trunk 14, which is in communication with a recombining box R” and “recombining box R of the present invention is preferably devoid of fuses.” (EX 1008, ¶[0026], [0028], FIG. 3).



EX 1008, FIG. 3 (annotated)

For the above reasons, I believe that a POSITA would have found the limitations in claim 15(a) to be obvious in view of Solon.

b. Engaging each terminal branch of said wire harness with one solar panel wherein each terminal branch includes exactly one in line fuse assembly each of said in line fuse assemblies including:

420. Solon discloses “[e]ngaging each terminal branch of said wire harness with one solar panel wherein each terminal branch includes exactly one in line fuse assembly.” In particular, Solon discloses that “[e]ach solar panel S is connected to a junction box J, which may be integrated or separate. Each junction box J is in

communication with one branch 12 of wire harness 10.” (EX 1008, ¶[0026], FIG.

2). Given the above, I believe that a POSITA would have found the limitations in claim 15(b) to be obvious in view of Solon.

421. The following subsections of claim 15(b), namely i-iv, recite the same limitations as the in-line assembly recited in claim 1 and claim 10, addressed above. Again, a POSITA would have understood that fuse assemblies in a solar installation are exposed to harsh outdoor environments and can benefit from additional protection from the elements. Thus, the POSITA would have been motivated to add the modified in-line fuse assembly taught by the Ba-Ye-Yen combination, discussed above, to the photovoltaic wire harness disclosed by Solon.

(b) i. A photovoltaic fuse having a solid outer surface including a first end, a second end and a middle section there between, said solid outer surface defining an outline;

422. The claim 15(b)i limitations are the same as, or at least substantially corresponds to, the recited claim 1(a) limitations addressed in Ground 7. For the reasons presented in Ground 7 for the claim 1(a) limitations, I believe that a POSITA would have found the claim 15(b)i limitations to be obvious in view of Ba, Ye, and Yen. (EX 1011, Abstract, FIG. 2).

(b) ii. An undermold surrounding and sealing said fuse, said undermold defining an outer surface outline, wherein the outer surface outline of said undermold is substantially parallel relative to the outline of said solid outer surface;

423. The claim 15(b)ii limitations are the same as, or at least substantially corresponds to, the claim 1(b) limitations addressed in Ground 7. For the reasons presented in Ground 7 for the claim 1(b) limitations, I believe that a POSITA would have found the claim 15(b)ii limitations to be obvious in view of Ba, Ye, and Yen. (EX 1011, ¶[0030], FIG. 4).

(b) iii. An overmold defining an outline and surrounding said undermold, said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials, wherein the outline of said overmold is substantially parallel relative to the outline of said undermold; and

424. The claim 15(b)iii limitations are the same as, or at least substantially corresponds to, the claim 1(c) limitations addressed in Ground 7. For the reasons presented in Ground 7 for the claim 1(c) limitations, a POSITA would have found the claim 15(b)iii limitations to be obvious in view of Ba, Ye, and Yen. (EX 1011, FIG. 4; EX 1006, ¶¶[0020], [0026], FIG. 1; EX 1005, ¶[0012], FIG. 2).

(b) iv. A first photovoltaic connector engaged with said first end, wherein said assembly provides electrical insulation.

425. The claim 15(b)iv limitations are the same as, or at least substantially corresponds to, the claim 1(d) limitations addressed in Ground 7. For the reasons

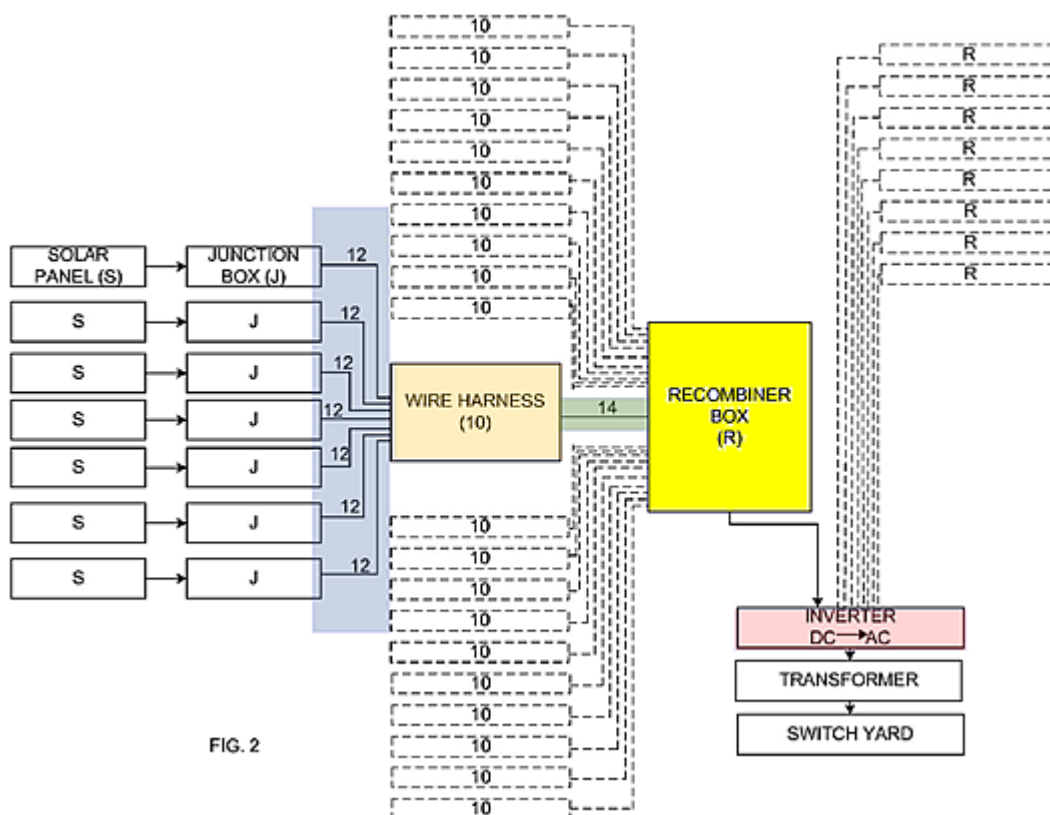
presented in Ground 7 for the claim 1(d) limitations, I believe that a POSITA would have found the claim 15(b)iv limitations to be obvious in view of Ba.

426. For all the reasons cited above, I believe that a POSITA would have found claim 15 in its entirety to be obvious based on the combination of Solon, Ba, Ye, and Yen. Accordingly, in my opinion, claim 15 should be found invalid under 35 U.S.C. § 103 based on Solon, Ba, Ye, and Yen.

6. Claim 16

The method of claim 15 wherein said step of engaging each terminal branch with one solar panel includes the step of connecting to said first photovoltaic connector.

427. Solon discloses “[e]ach solar panel S is connected to a junction box J. which may be integrated or separate. Each junction box J is in communication with one branch 12 of wire harness 10.” (EX 1008, ¶[0026], FIG. 2).

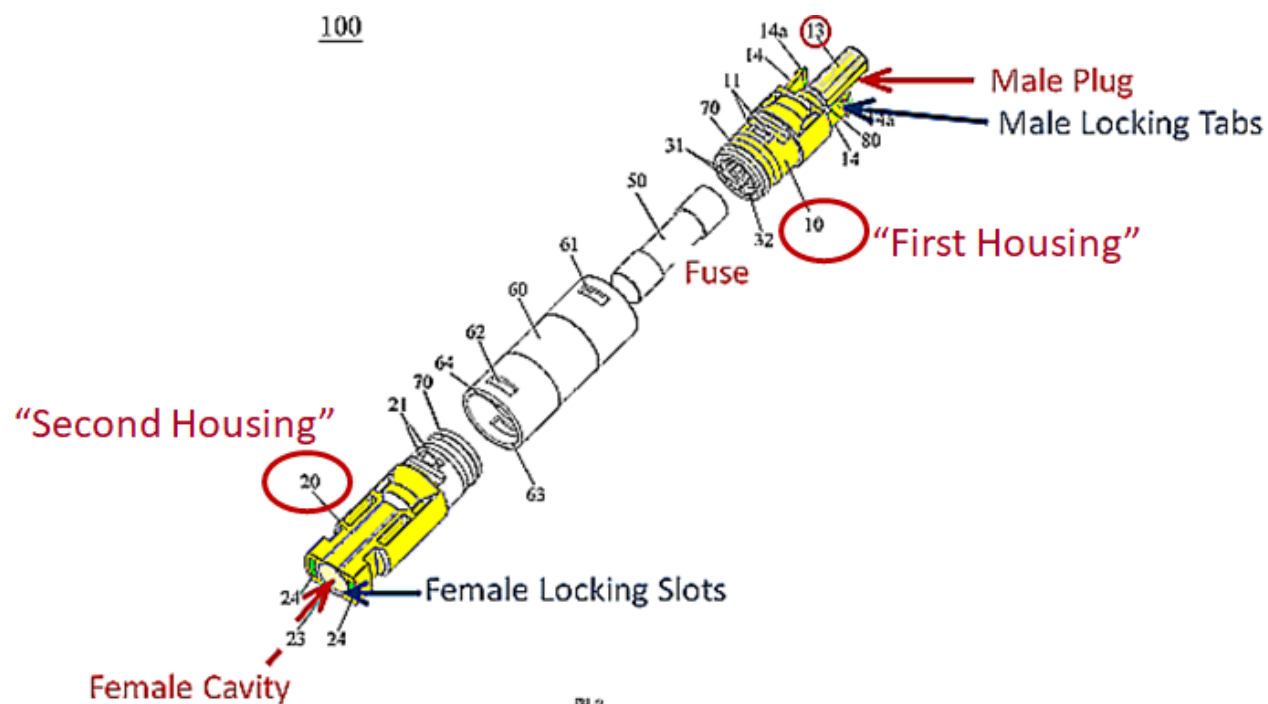
**Ex. 1008, FIG. 2 (annotated)**

428. Given the above, it is my opinion that a POSITA would have found the limitation recited in claim 16 to be obvious based on Solon. As I have shown previously, the Solon-Ba-Ye-Yen combination discloses all the limitations recited in claim 15 from which claim 16 depends. Accordingly, claim 16 should also be found invalid under 35 U.S.C. § 103 based on Solon, Ba, Ye, and Yen.

7. Claim 17

The method of claim 16 wherein said step of connecting to said first photovoltaic connector includes the step of connecting to a male said first photovoltaic connector.

429. Solon, Ba, Ye, and Yen disclose “connecting to said first photovoltaic connector includes the step of connecting to a male said first photovoltaic connector.” In particular, Ba discloses that the second housing 20 (corresponding to a “first photovoltaic connector”) is a female type connector, and the first housing 10 (corresponding to a “second photovoltaic connector”) is a male type connector. EX 1011, FIG. 1 (annotated), below.



EX 1003, FIG. 1 (annotated)

430. For the above reasons, I believe that a POSITA would have found the limitation recited in claim 17 to be obvious based on Solon, Ba, Ye, and Yen. As I have shown, the Solon-Ba-Ye-Yen combination discloses all limitations recited in claims 15 and 16, from which claim 17 depends. Accordingly, in my opinion, claim 17 should be found invalid under 35 U.S.C. § 103 based on Solon, Ba, Ye, and Yen.

8. Claim 18

The method of claim 16 wherein said step of connecting to said first photovoltaic connector includes the step of connecting to a female said first photovoltaic connector.

431. A POSITA would have found the limitation recited in claim 18 to be obvious in view of the disclosure in Ba. In particular, Ba illustrates that the second housing 20 (corresponding to a “first photovoltaic connector”) is a female-type connector, and the first housing 10 (corresponding to a “second photovoltaic connector”) is a male-type connector. EX 1011, FIG. 1 (above).

432. For these reasons, I believe that a POSITA would have found the limitation recited in claim 18 to be obvious based on Solon, Ba, Ye, and Yen. As I have also shown, the Solon-Ba-Ye-Yen combination discloses all limitations recited in claims 15 and 16, from which claim 18 depends. Accordingly, in my opinion,

claim 18 should be found invalid under 35 U.S.C. § 103 based on Solon, Ba, Ye, and Yen.

433. For these reasons, in accordance with Ground 9, claims 10-13 and 15-18 should be found invalid under 35 U.S.C. § 103 based on Solon, Ba, Ye, and Yen.

434. I reserve the right to supplement my opinions to address any information obtained, or positions taken, based on any new information introduced throughout this proceeding.

435. I declare under penalty of perjury that the foregoing is true and accurate to the best of my ability.

Dated: May 8, 2024

By:  _____

Thomas W. Kenny, Ph.D.