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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 10,553,739

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EXHIBIT LIST

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1001	U.S. Patent No. 10,553,739 to Solon ("'739 patent").
1002	Prosecution History of '739 patent.
1003	Expert Declaration of Dr. Thomas Kenny.
1004	U.S. Patent Publication No. 2013/0257580 to Gilman *et al*. ("Gilman")
1005	Chinese Patent No. CN201994507U to Ye et al. ("Ye") – *Translation Certified.*
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 *et al.* ("Darr")
1008	U.S. Published Patent Application No. 2011/0209741 to Solon. ("Solon")
1009	Chinese Patent No. CN2562350Y to Fan, Banghong ("Fan") – *Translation Certified*
1010	Amphenol Declaration of Gary Joseph ("Joseph Decl.")
1011	Chinese Patent No. 102568970 to Ba *et al*. ("Ba") – *Translation Certified*
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

Exhibit No.	Description
1014	Merriam-Webster dictionary, "in-line"; "seal"
1015	Overmolding Guide, © 2002 GLS Corporation
1016	U.S. Patent No. 6,523,380 to McGuire *et al*. ("McGuire").
1017	"Solar Line – Photovoltaic Interconnections System -- Helios", Amphenol Industrial Solar Technologies, (Nov. 2012).
1018	*Shoals Technologies Group, LLC v. Voltage, LLC et al.*, 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" Current Opinion in Colloid & Interface Science 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)

Claim Listing

Claim Number / Element	Claim Limitation
1 (Preamble)	An in-line assembly for a solar installation including:
1(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;
1(b)(1)	an undermold surrounding and sealing said fuse,
1(b)(2)	said undermold defining an outer surface outline,
1(b)(3)	wherein the outer surface outline of said undermold is substantially parallel relative to the outline of said solid outer surface;
1(c)(1)	an overmold defining an outline and surrounding said undermold,
1(c)(2)	said undermold and said overmold each constructed of a single unit and each constructed of dissimilar materials,
1(c)(3)	wherein the outline of said overmold is substantially parallel relative to the outline of said undermold; and
1(d)	a first photovoltaic connector engaged with said first end, wherein said assembly provides electrical insulation.
2	The assembly of claim 1 further including a second photovoltaic connector engaged with said second end.
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.
4	The assembly of claim 1 wherein said first and second connectors are locking type connectors.
5	The assembly of claim 4 further comprising a tool for unlocking said connectors.
7	The assembly of claim 1 wherein said overmold is a thermoplastic elastomer.
10 (Preamble)	A photovoltaic wire harness including:
10(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

10(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:
10(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;
10(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;
10(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
10(b)(iv)	a first photovoltaic connector engaged with said first end, wherein said assembly provides electrical insulation.
11	The photovoltaic wire harness of claim 10 wherein said fuse assemblies each further include a second photovoltaic connector.
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.
13	The photovoltaic wire assembly of claim 10 wherein said angles are surrounded by an encasement.
15 (Preamble)	A method of configuring a solar installation including the steps of:
15(a)	engaging the trunk of a wire harness with a combiner box wherein said combiner box lacks fuses and circuit breakers; and
15(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:

15(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;
15(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;
15(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
15(b)(iv)	a first photovoltaic connector engaged with said first end, wherein said assembly provides electrical insulation.
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.
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.
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.

INTRODUCTION

Voltage LLC ("Petitioner") petitions for *inter partes* review of claims 1-5, 7, 10-13, and 15-18 of U.S. Patent No. 10,553,739 to Solon, entitled "Photovoltaic in line fuse connector assembly having an integral fuse" ("the '739 patent," EX1001), which according to PTO records, is assigned to Shoals Technologies Group, LLC (Patent Owner or PO).

As will be shown in this Petition and the exhibits, claims 1-5, 7, 10-13, and 15-18 of the '739 patent are merely assemblages of well-known parts and materials put together in the well-known fashion for use in solar power installations according to well-known practices. Accordingly, claims 1-5, 7, 10-13, and 15-18 of the '739 patent are unpatentable as obvious in view of prior art not available to the Examiner, and cancellation of the claims in an IPR is appropriate as will be shown.

I. Mandatory Notices (37 C.F.R. § 42.8(a)(1))

REAL PARTY IN INTEREST:

The real parties-in-interest are Voltage, LLC, a North Carolina corporation, and Ningbo Voltage Smart Production Co., a limited liability company formed under the laws of the People's Republic of China.

RELATED MATTERS:

Pursuant to 37 C.F.R. § 42.8(b)(2), Petitioner identifies the following related matters.

- In the Matter of CERTAIN PHOTOVOLTAIC CONNECTORS AND COMPONENTS THEREOF, Inv. No. 337-TA-1365, (Int'l Trade Comm. ("ITC")).
- *Shoals Technologies Group, LLC v. Voltage, LLC et al,* Docket No. 1:23-cv-00365 (M.D.N.C. May 04, 2023), which is currently stayed.

LEAD AND BACKUP COUNSEL:

Pursuant to 37 C.F.R. § 42.8(b)(3) and 37 C.F.R. § 42.10(a), Petitioner appoints:

Robert M. Hansen (Reg. No. 43,656) as lead counsel,

Tony A. Gayoso (Reg. No. 37,331) as back-up counsel,

Scott B. Amankwatia (Reg. No. 78,226) as back-up counsel,

Matthew J. Anderson (Reg. No. 78,257) as back-up counsel, and

David Okano (Reg. No. 66,657) as back-up counsel.

Pursuant to 37 C.F.R. § 42.10(b), a power of attorney is being filed with this designation of counsel.

SERVICE INFORMATION:

Petitioner provides the following service information for designated counsel:

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PAYMENT OF FEES

The PTO is authorized to charge any fees due during this proceeding to Deposit Account No. 18-1579.

II. Grounds for Standing (37 C.F.R. § 42.104(a))

Petitioner certifies that the '739 patent is available for *inter partes* review and that Petitioner is not barred or estopped from requesting an *inter partes* review challenging the patent claims on the grounds identified in this Petition.

III. Identification of Challenge (37 C.F.R. § 42.104(b)

A. Priority Date and Applicable Statutes

The '739 patent claims priority to U.S. Provisional Patent Application No. 61/830,284 that was filed 6/3/2013. EX1001, Cover. While Petitioner reserves the right to challenge the priority date of the '739 patent in the District Court litigation, the earliest priority date is assumed to be 6/3/2013 (the "'739 patent priority date") for purposes of this IPR. Accordingly, the claims should be evaluated under the current (i.e., post-AIA) version of 35 U.S.C. §§102, 103.

B. Citation of Prior Art

Chinese Patent No. 2562350Y to Fan, Banghong

("Fan," EX1009) is prior art under 35 U.S.C. §§ 102(a)(1) because it was published on July 23, 2003, before the '739 patent priority date. Fan was not identified to or considered by the Examiner who allowed the '739 patent.

Chinese Patent Publication No. 102568970 to Ba *et al.*

("Ba," EX1011) is prior art under 35 U.S.C. §§ 102(a)(1) because it was published on 7/11/2012, before the '739 patent priority date. Ba was not identified to or considered by the Examiner who allowed the '739 patent.

U.S. Published Patent Application No. 2010/0207716 to Yen, Chun-Chang

("Yen," EX1006) is prior art under 35 U.S.C. §§ 102(a)(1) because it was published on August 19, 2010, before the '739 patent priority date. Yen was applied by the Examiner during prosecution of the application that issued as the '739 patent. PO overcame rejections citing Yen with amendments that did not address or distinguish the Yen disclosures relied on in the rejections. Yen is used in Grounds 1-3 and 7-9 for its teaching of insulating and protective materials, which was not disputed during prosecution.

U.S. Published Patent Application No. 2013/0257580 to Gilman *et al.*

("Gilman," EX1004) is prior art under 35 U.S.C. §§ 102(a)(2) because it was filed on 3/27/2012, before the '739 patent priority date. Gilman was not identified to or considered by the Examiner who allowed the '739 patent.

Chinese Patent No. CN201994507U to Ye *et al.*

("Ye," EX1005) is prior art under 35 U.S.C. §§ 102(a)(1) because it was published on 9/28/2011, before the '739 patent priority date. Ye was not identified to or considered by the Examiner who allowed the '739 patent.

U.S. Published Patent Application No. 2012/0309232A1 to Darr *et al.*

("Darr," EX1007) is prior art under 35 U.S.C. §§ 102(a)(1) because it was published on 12/6/2012, before the '739 patent priority date. Darr was addressed in prosecution. The Examiner asserted Darr against claims that issued as dependent claim 7. PO overcame rejections citing Darr with amendments that did not address or distinguish the Darr disclosures relied on in the Office Actions. Darr is used in Grounds 2, 5, and 8 for its teaching of outer layer materials for waterproofing, which was not disputed by PO during prosecution.

U.S. Published Patent Application No. 2011/0209741 to Solon

("Solon," EX1008) is prior art under 35 U.S.C. §§ 102(a)(1) because it was published on 9/1/2011, before the '739 patent priority date. Solon was not submitted to or considered by the Examiner who allowed the '739 patent.

C. Statutory Grounds for Challenge

Petitioner requests review of '739 patent claims 1-5, 7, 10-13, and 15-18 (the "Challenged Claims") on the following grounds:

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. The ’739 Patent

A. Summary of the Claims

The ’739 patent describes methods and an apparatus for a solar installation and photovoltaic wire harness**.**

Claims 1-9 recite an in-line fuse assembly for a solar installation including a photovoltaic fuse, undermold, overmold, and photovoltaic connector. EX1001, 4:28-45. Dependent claims 2-8 recite further limitations regarding first and second photovoltaic connectors, first and second connectors, an unlocking tool, undermold, overmold, and the fuse. EX1001, 4:46-67.

Claims 10-14 recite a photovoltaic wire harness that has a trunk wire, fuse assemblies, a photovoltaic fuse, undermold, overmold, and a photovoltaic connector. EX1001, 4:63-5:21. Dependent claims 11-14 recite further limitations regarding the wire harness and wire assembly. EX1001, 5:22-37.

Claims 15-18 recite a solar installation method. EX1001, 6:1-27. Dependent claims 16-18 recite further limitations regarding engaging terminal branches and connecting the connectors. EX1001, 6:28-36.

B. Summary of the Prosecution History

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

Initially, the Examiner issued a restriction requirement, and Patent Owner (PO) elected for examination claims 1-9 (FIGS. 5-12), which were directed to an in-line fuse and its structure. EX1002, pp.408-415. While examining these claims the Examiner searched for prior art in the solar field as well as in international

classification H01H which is related to "ELECTRIC SWITCHES; RELAYS; SELECTORS; EMERGENCY PROTECTIVE DEVICES" such as generic fuses. EX1001, Cover.

The elected claims were rejected multiple times under 35 U.S.C. § 103 based on various combinations of prior art including: Darr (EX1007), U.S. Pub. 2013/0037294 to Blaha, U.S. 5,903,209 to Stepniak, to Jonczyk, U.S. Pub. 2011/0104925 to Quiter, U.S. 5,316,502 to Loet, U.S. Pub. 2011/0232963 to Kono, and Yen (EX1006). *Id*. at 385-90. There were a total of seven Office Actions rejecting the claims and six amendments. *Id*.

On 8/8/2017, PO responded to an Office Action rejecting claims based on Darr and Blaha by removing the limitation of "double molded," and adding limitations reciting an undermold "sealing" said fuse, and providing that the undermold and overmold are each formed as a "single unit" and 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 by assembling two separate pieces. *Id*. PO asserted that a "single unit" undermold is a unit formed as a single piece during production, and made a similar argument regarding the overmold. *Id*. PO did not address or distinguish Darr.

PO responded on 5/10/19 to an Office Action rejecting claims based on Yen and Jonczyk 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...relative to the outline of said solid outer surface". *Id*., pp.130. PO argued the claim language is limited to photovoltaic fuses and excludes generic fuses, and therefore Yen is not analogous art. *Id*., pp.134. PO further argued that Yen teaches neither a fuse having an outline nor a fuse having a solid outer surface. *Id*., pp.135-37. The examiner was not persuaded as in a 5/21/19 non-final Office Action, claims 1-9 were again rejected based on Yen, Stepniak and Jonczyk. *Id*., pp.87-94.

On 8/21/19, after an Examiner Interview, PO amended claim 1 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 to address the Examiner's position that "similar contour and orientation" was indefinite. *Id*., p.80-82. PO admitted the specification did not recite the "substantially parallel" limitations, but pointed to FIGs. 7 and 8 for support. *Id*. citing FIGS. 7-9. PO argued the amendments 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*. PO did not address or distinguish Yen.

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 adding limitations from final amended claim 1. *Id*., pp.25-26.

C. Level of Ordinary Skill in the Art

As established by the Expert Declaration of Dr. Thomas Kenny dated May 8, 2024, a person having ordinary skill in the art (POSITA) would have a B.S. degree in electrical engineering, mechanical engineering, or an equivalent, and two years of professional experience related to the design and/or manufacturing of electrical wiring and connectors. Lack of professional experience can be remedied by additional education, and vice versa. EX1003, ¶57.

D. Claim Construction

In this IPR proceeding, claims are interpreted under the same standard applied by Article III courts (i.e., the *Phillips* standard). 37 C.F.R. §42.100(b); *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc).

In parallel litigation, some claim terms in the '739 patent have been construed by the ITC. EX1023. For the purposes of this IPR, Petitioner proposes that the Board adopt the ITC's constructions listed below. Notwithstanding, 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. Petitioner proposes that all other terms be afforded their plain and ordinary meanings.

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, pp.17,20. This construction is consistent with the plain and ordinary meaning of this term in the context of the claim as would have been understood by a POSITA. *Decl.*, ¶53.

"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, p.34. This construction is consistent 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. *Decl.*, ¶54.

"**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.

EX1023, pp.22-23. This construction is consistent 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. *Decl.*, ¶55.

V. Grounds of Rejection

The following discussion and the accompanying evidence demonstrate that there is a reasonable likelihood that Petitioner will prevail with respect to the Challenged Claims.

In all grounds, Petitioner evaluates the scope and content of the prior art, any differences between the art and the claim, and the knowledge of person of ordinary skill in the art in accordance with *Graham v. John Deere Co.,* 383 U.S. 1 (1966) and *KSR Int'l Co. v. Teleflex, Inc.,* 550 U.S. 398 (2007). Further, a more than adequate written rationale is provided in each ground to support the combination of the asserted prior art under *KSR.* 550 U.S. at 418.

A. Ground 1: Claims 1-5 are unpatentable under 35 U.S.C. § 103(a) as obvious based on Fan, Ba and Yen.

- **Motivation to Combine Fan, Ba and Yen**

Fan, Ba and Yen are analogous prior art to the '739 patent. *Decl.*, ¶¶77-79. Fan describes an "overcurrent protection device disposed on power supply line" directly applicable to power supply lines from solar panel arrays. EX1009, p.3, ll. 5-10; *Decl.*, ¶¶73-75. Ba discloses "a fuse holder for a solar photovoltaic power

generation system." EX1011, Abstract; *Decl.*, ¶¶60-61. Yen discloses overcurrent protection devices including insulating and protective materials. EX1006, ¶¶[0007]-[0008]; *Decl.*, ¶¶68-70. While Yen was cited in claim rejections during prosecution, PO never addressed or distinguished the disclosures in Yen. Fan, Ba, and Yen are complimentary because they disclose different elements and materials for in-line fuses that have different advantages.

A POSITA would have looked to Fan when designing a solar power system because Fan discloses simple, low-cost in-line fuses with "two or more injection-molding operations [for] good water protection" to protect against environmental conditions faced by the power lines of such systems. EX1009, p.2, ll. 11-16; *Decl.*, ¶80. Fan teaches that "a plug and connector are separately molded onto two ends of the power supply line." EX1009, p.3, ll. 3-5.

A POSITA designing a solar power system would also have looked to Ba because it discloses in-line fuses adapted for solar array use. EX1011, Abstract; *Decl.*, ¶81. A POSITA would have been motivated to improve upon the in-line fuse of Fan by using the plug and connector of Ba to provide a plug and connector (mentioned but not shown in Fan) that physically integrated with the fuse protector of Fan, eliminating the extra wire pieces. *Decl.*, ¶¶80-83. While Fan provides easy-to-follow instructions for making an in-line fuse protected by two layers of injection molding layers (see, e.g., EX1009, p.2), Ba discloses solar power plugs

and connectors that are easy to connect and provide reliability in connections with wire harnesses. EX1011, ¶¶[0015]-[0016],[0040]; *Decl.*, ¶¶82-83. A POSITA would have been motivated to combine the teachings of Fan and Ba to provide an in-line fuse that simplifies installation in solar system power lines at convenient locations. *Decl.*, ¶83.

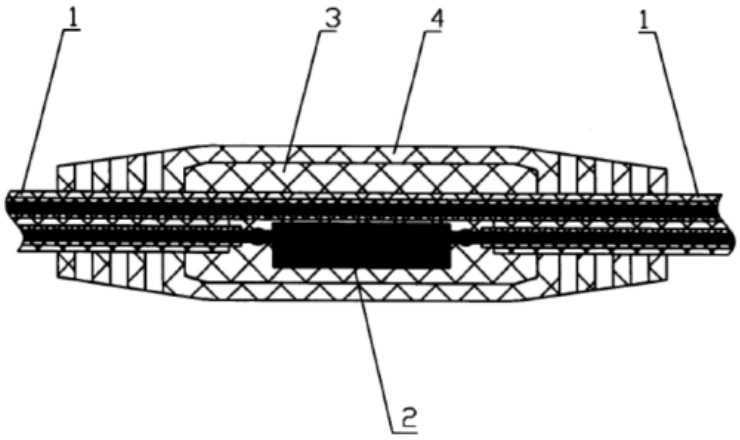
A POSITA designing a solar power system would also have looked to Yen as it discloses in-line fuse configurations with protections against deterioration in many environments plus added protection against arcing, which is of particular concern in high-power electrical cable installations. *Decl.*, ¶84. A POSITA would have been motivated to modify the in-line fuse configurations of Fan in view of Ba to improve the electrical insulation of the protective shell by using an arc-resistant material (e.g., crystalline or amorphous thermoplastics) as an inner layer (undermold) that is encapsulated in an outer layer (overmold) as taught in Yen. *Decl.*, ¶¶85-86 (citing EX1006, ¶[0020]).

Because Fan, Ba and Yen involve well-known in-line fuse configurations, use well-understood molded insulation materials, and provide easy-to-follow instructions for assembly, a POSITA would have had a high expectation of success in modifying the in-line fuse of Fan with the plug and connector of Ba and the arc-resistant materials of Yen. *Decl.*, ¶84.

1. Claim 1

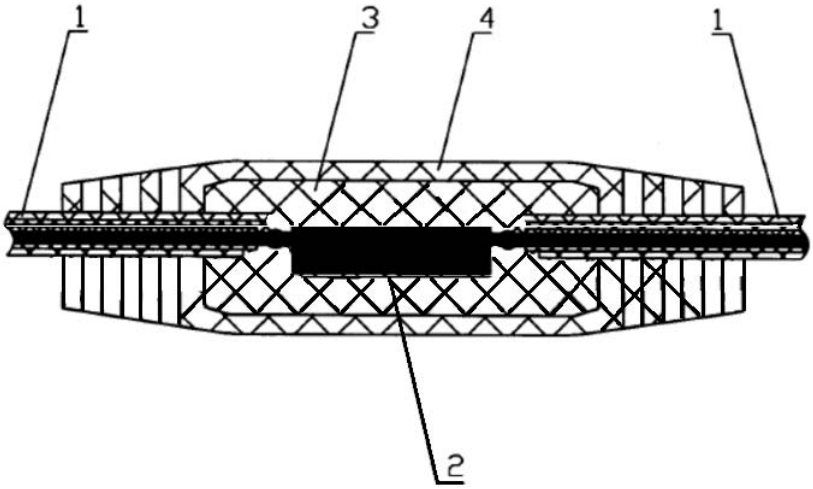
Preamble.

Fan discloses an in-line assembly stating "[o]ne wire is cut through; ends thereof …are connected to the pins 2.1 at two ends of the fuse 2." EX1009, p.4-l.34-37. The connection of the fuse **between** the two ends of the cut wire discloses an in-line connection as shown in Figure 1 below. *Decl.*, ¶¶89-91.



EX1009, Fig. 1

A POSITA would have understood that for high-voltage applications, the return line could be removed from the central section to improve arc prevention and replaceability. *Decl.*, ¶92.



EX1009, Fig. 1(modified)

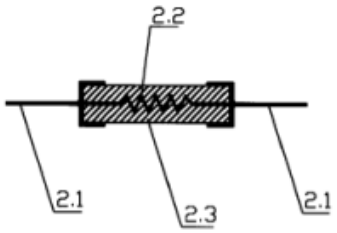
Fan's in-line fuse assembly is designed for power supply lines, which a POSITA would understand is applicable to solar power installations that supply power to the electric grid. EX1009, p. 3; *Decl.*, ¶92.

To the extent that Fan does not explicitly teach applying its in-line fuse to solar power supply lines, Ba teaches this intended use. *Decl.*, ¶¶93-95.

Thus, claim 1(Preamble) is disclosed by Fan or Fan in view of Ba. *Decl.*, ¶96.

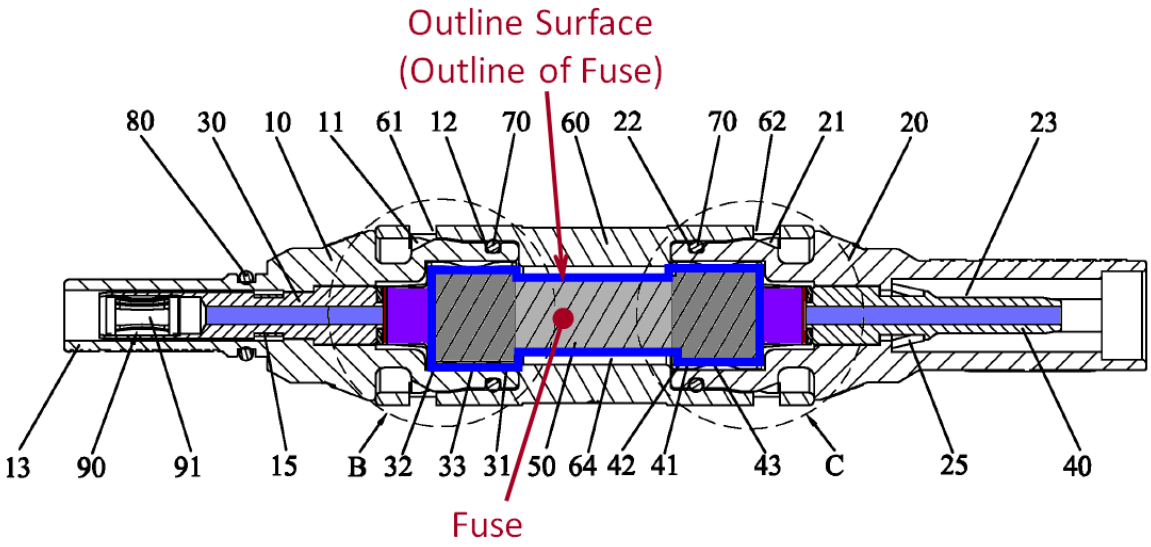
1(a)

Fan's Fig. 2 discloses a cartridge fuse 2.2 including a fuse element, 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, *Decl.*, ¶97.



EX1009, Fig. 2

While Fan is agnostic regarding uses for its in-line fuse, Ba discloses a cartridge fuse 50 in the fuse holder 100 for a solar photovoltaic generation system (thus a "photovoltaic fuse"). EX1011, ¶[0007],[0030]; *Decl.*, ¶98.



EX1011, Fig. 4 (annotated)

Ba's cartridge fuse 50 includes a first end, a second end, and a middle section therebetween. EX1011, ¶[0029],FIG. 4(annotated); *Decl.*, ¶99-100.

The solid outline in Ba is the outer perimeter of the cartridge fuse illustrated by the blue line in the annotated Figure 4 above. A ferrule-capped cartridge fuse has a solid outer surface, as clearly shown in Figure 4 above where the cartridge

fuse is emphasized in grey. A defined outline is a feature of any solid object. A POSITA would have been motivated to use the cartridge fuse of Ba in the assembly of Fan to make installation easier, which Fan discloses as a problem and for which Ba proposes a solution. EX1009, p.3; EX1011, ¶[0009]; *Decl.*, ¶¶101-102. As noted above in the motivation to combine, Ba is compatible with Fan as both are directed to power electronics and a POSITA would have looked to Ba to provide integrated connectors into the assembly of Fan. *Decl.*, ¶95.

Thus, claim element 1(a) is disclosed by Fan and Ba.

1(b)

The specification of the '739 patent does not define the term "undermold". *Decl.*, ¶105. As noted above, Petitioner proposes that "undermold" be construed based on the ITC construction 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, pp.17,20; *Decl.*, ¶106-108. The elements of claim 1(b) are broken out below as 1(b)(1)-(3).

1(b)(1)

The inner insulating layer 3 of Fan clearly surrounds the fuse 2. EX1009, Fig. 1. Thus, the inner insulating layer 3 formed by injection molding disclosed in Fan discloses an undermold. *Decl.*, ¶109-111.

Further, 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, which a POSITA would have understood as disclosing an undermold that seals the fuse. EX1009, p. 4; *Decl.*, ¶112-113.

Thus, claim element 1(b)(1) is disclosed by Fan.

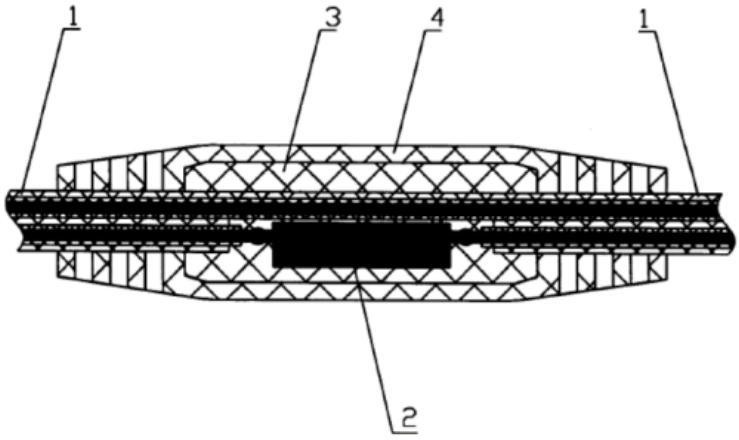
1(b)(2)

As shown in Fig. 1 of Fan, the inner insulating layer 3 ("undermold") includes an outer surface outline. The solid outer surface is formed in a first injection molding operation that results in a solid undermold, which a POSITA would have understood as disclosing this limitation. EX1009, p. 4, Fig. 1; *Decl.*, ¶114.

Thus, claim element 1(b)(2) is disclosed by Fan.

1(b)(3)

Fan discloses an inner insulating layer 3, which is an "undermold" as described above, that discloses an outer surface outline [that] is substantially parallel relative to the outline of said solid outer surface [of the fuse]. As can be seen in Fig. 1 from Fan, the inner insulating layer 3 includes an outer surface outline that is substantially parallel to the outer surface outline of the fuse 2. EX1009, p. 4-5, Fig. 1; *Decl.*, ¶115.



Id., Fig. 1.

Thus, claim element 1(b)(3) is disclosed by Fan.

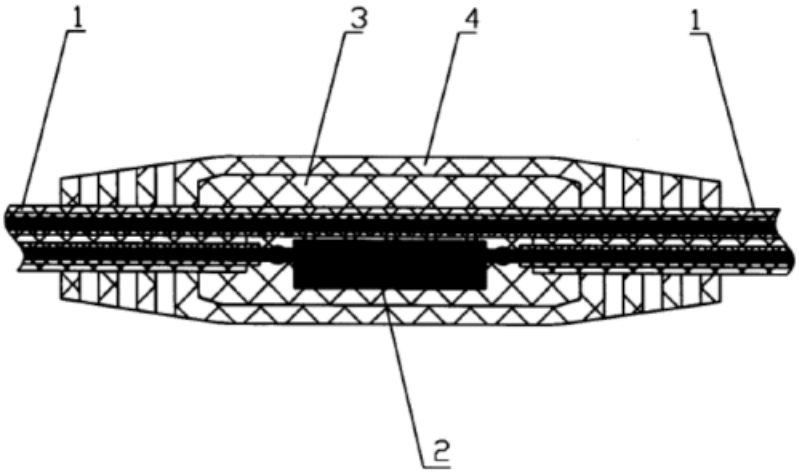
1(c)

As explained above, Fan discloses an inner insulating layer 3 corresponding to the "undermold". Fan further discloses that additional moldings of protective insulating layers should be formed over this inner insulating layer 3 (thus an overmold), shown as outer insulating layer 4 in Fig. 1. EX1009, Fig. 1, p. 5; *Decl.* ¶117. The elements of claim 1(c) are broken out below into 1(c)(1)-(3).

1(c)(1)

Fan discloses an outer insulating layer 4 which defines an outer surface outline due to its nature as an object made from solid material (e.g., plastic). *Decl.*, ¶119. This outline is illustrated in Figure 1 below. EX1009, Fig. 1, pp. 4-5.

Fan shows that the entire outer surface of the inner insulating layer 3 in Fig. 3 is surrounded and covered by the outer insulating layer 4 which is over molded on the inner insulating layer 3. *Id*.



EX1009, Fig. 1

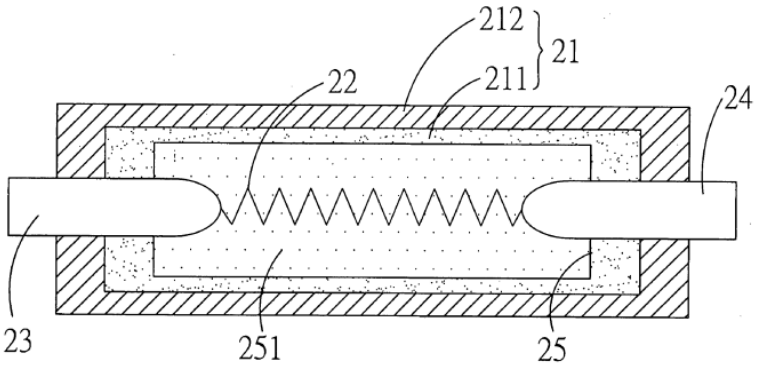
Thus, claim element 1(c)(1) is disclosed by Fan.

1(c)(2)

Fan discloses that the inner insulating layer 3 and the outer insulating layer 4 are each formed in separate injection molding operations. EX1009, pp. 4-5. A POSITA would have understood that the injection molding of these layers form single units. *Decl.*, ¶121. Therefore, Fan teaches forming the undermold and overmold each as single units.

Fan does not mention use of dissimilar materials for these separate injection molded layers. Similar to Fan, Yen uses a gas-assisted injection molding process to encapsulate a fuse. Yen teaches covering the fuse in an arc-resistant material

(inner layer 211) to protect against arcing, which is of particular concern in any high-power electrical system, and covering the arc-resistant material with an ordinary coating (outer layer 212), thus teaching using dissimilar materials. EX1006, ¶¶[0008],[0020],[0021]; *Decl.*, ¶¶122-123.



EX1006, Fig. 3.

A POSITA would have been motivated, based on the teachings of Fan and Ba to provide various forms of protection (e.g., waterproofing and shock resistant), to modify Fan by forming the insulating layers out of different, complementary materials that improve the integrity and arc resistance of the fuse assembly as taught in Yen. EX1011, ¶¶[0009],[0032]; *Decl.*, ¶¶123-124.

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. EX1011, Fig. 4, ¶[0014]; EX1006, ¶[0028]; EX1009, pp. 4-5; *Decl.*, ¶¶125-126.

Thus, claim element 1(c)(2) is disclosed by Fan and Yen.

1(c)(3)

As discussed regarding claim 1(b), Fan discloses an undermold covered by an overmold. *Decl.*, ¶XXX. Further, the outer profile contours of the inner and outer insulating layers 3/4 of Fan would be understood by a POSITA wo be substantially parallel to each other. EX1009, Fig. 1; *Decl.*, ¶128. Thus, claim element 1(c)(3) is disclosed by Fan.

Therefore, claim element 1(c) is disclosed by Fan and Yen. *Decl.*, ¶130.

1(d)

Fan discloses that the inner insulating layer 3 and the outer insulating layer 4 are insulating layers. EX1009, p. 4. A POSITA would have recognized that these insulating layers ("assembly") electrically insulate the fuse from the environment and inadvertent grounding. *Decl.*, ¶131. As noted above, the inner insulating layer of Fan as modified by Yen, which as a combination teaches an undermold, would have arc protection, which a POSITA would understand to mean the material is highly insulative including over a range of conditions. EX1006, ¶[0026]; *Decl.*, ¶131.

Fan does not mention a "photovoltaic connector." Fan does disclose connectors for inserting the in-line fuse assembly into power supply lines stating "[a] required plug and connector are separately injection molded on two ends of

the power supply line." EX1009, p. 5. Thus, Fan an in-line fuse having a plug and connector for connecting into power supply lines. *Decl.*, ¶132.

Ba teaches fuse assemblies for photovoltaic systems and teaches specialized connectors at each end of the central housing designed to protect the fuse. *Decl.*, ¶134. In Ba, the sub-assembly of the "first housing 10" and the "first electric terminal 30" form a "first photovoltaic connector." EX1011, Fig. 4, ¶¶[0036],[0050]. A POSITA would have been motivated to modify the in-line fuse assembly of Fan to include the power line connectors and plugs of Ba to shorten the assembly and simplify installation in power lines as suggested in Ba. *Decl.*, ¶133,135. In this combination, the connector ends of Ba would be applied to the fuse assembly of Fan-Yen so that the connector would physically and electrically engage the end of fuse. *Decl.*, ¶135.

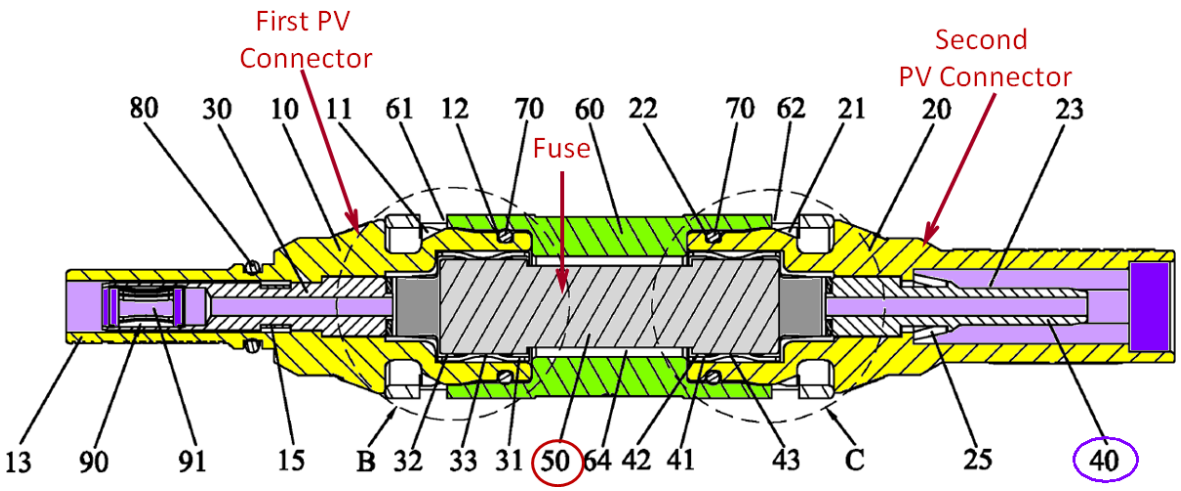
Therefore, claim element 1(d) is disclosed by Fan and Ba. *Id*.

Therefore, a POSITA would have found claim 1 to be obvious based on the Fan-Ba-Yen combination. Accordingly, claim 1 is invalid under 35 U.S.C. § 103 based on Fan, Ba, and Yen.

2. Claim 2

As noted above, Fan discloses that the fuse assembly includes a plug and connector for connecting with other wires. As discussed regarding claim 1(d), Ba discloses that the assembly of the "second housing 20" and the "second electric

terminal 40" includes a "second photovoltaic connector" that is disposed on an opposite side of the fuse 50 from the "first housing 10" and the "first electric terminal 30." EX1011, ¶[0039],Figs. 2,4; *Decl.*, ¶¶134,137.



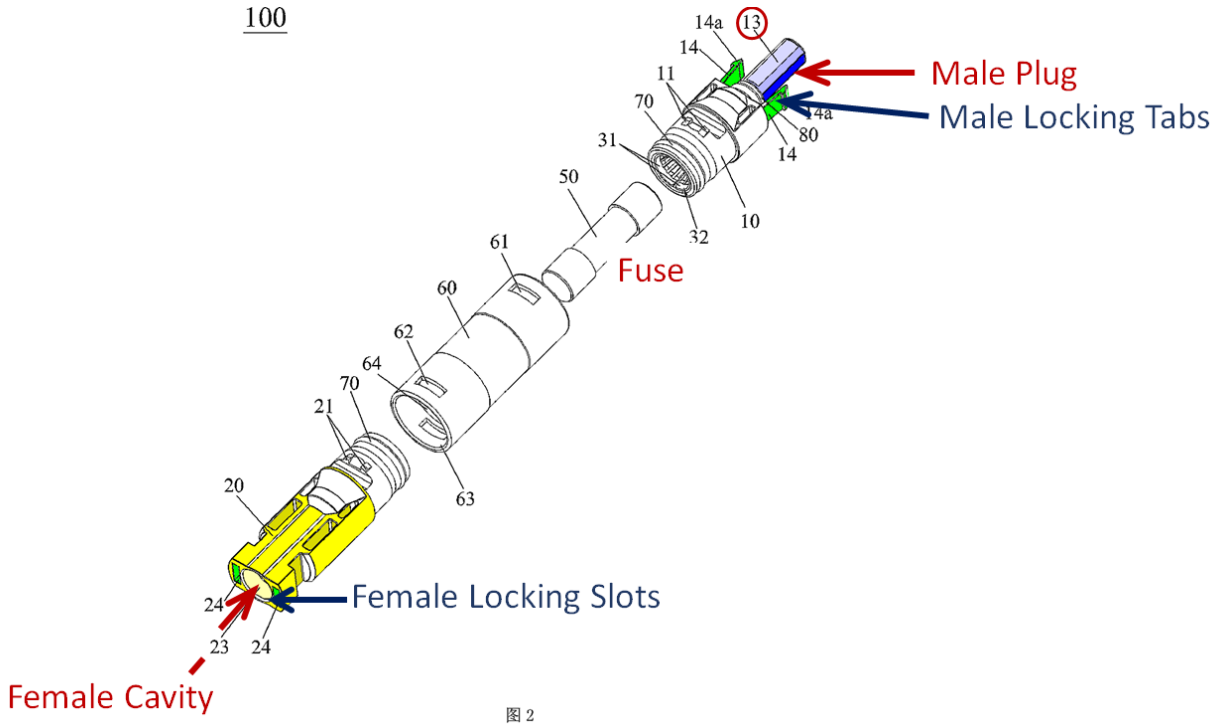
EX1011, FIG. 4 (annotated).

A POSITA would be motivated to add the second connector of Ba to Fan for the same reasons as described regarding claim 1(d) above. *Decl.*, ¶138.

Thus, claim 2 is obvious based on the Fan-Ba-Yen combination.

3. Claim 3

In Ba, both female and male type connectors are disclosed. EX1011, ¶[0039]-[0040],Fig. 2; *Decl.*, ¶139. A POSITA would have understood that either end of Ba's fuse assembly may be considered the first or second ends, as well as that using female or male type connectors are interchangeable on the two ends. *Decl.*, ¶140.



EX1011, Fig. 2 (annotated)

Therefore, claim 3 is obvious based on the Fan-Ba-Yen combination. *Decl.*, ¶141.

4. Claim 4

As noted above re claim element 1(d), Fan discloses a fuse assembly having a plug and connector for connecting with other wires. 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. EX1011, ¶[0039]-[0040]; *Decl.*, ¶142. A POSITA would recognize that the locking tabs and

locking slots on the first housing 10 and second housing 20 disclosed in Ba form portions of locking type connectors. EX1011, Fig. 2; *Decl.*, ¶143.

Therefore, claim 4 is obvious based on the Fan-Ba-Yen combination. *Id*.

5. Claim 5

A POSITA would have understood from Ba's Figure 2 that a tool could be used to squeeze the engagement bumps 14a (annotated as locking tabs above) inwardly to unlock the connectors 10, 20 from the input and output cables. EX1011, Fig. 2; *Decl.*, ¶¶144-145 (citing an Amphenol product catalog EX1017, pp. 3-4 for showing similar locking elements and tools for unlocking were well known; and EX1010).

Accordingly, a POSITA would have understood the need for and the existence of a tool to unlock the engagement bumps 14a of Ba based on their structure and operation. *Decl.*, ¶¶145-147. Therefore, claim 5 is obvious based on the Fan-Ba-Yen combination. *Decl.*, ¶148.

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

- **Motivation to Combine the Ba, Gilman, Ye, and Darr**

As shown in Ground 1 (p. 23, *supra*), Fan, Ba, and Yen are analogous prior art to the '739 patent. *Decl.*, ¶¶77-79,149. Darr is also analogous to the '739 patent because it discloses in-line fuse assemblies that are substantially waterproof,

non-releaseable when assembled, and suitable for use in solar photovoltaic systems. EX1007, ¶¶[0021],[0024],[0030]; *Decl*., ¶¶149-150. While Darr was cited in claim rejections during prosecution, PO never addressed or distinguished the disclosures in Darr. Fan, Ba, Yen, and Darr are complimentary but not cumulative because they each disclose different elements and materials of in-line fuses. *Decl*., ¶151.

As shown in Ground 1 (pp. 23-25, *supra*), a POSITA would have looked to Fan, Ba, and Yen when designing a solar power system because these references disclose in-line fuse assemblies suitable for providing the overcurrent protections required for power lines in such systems. *Decl*., ¶150.

A POSITA designing a solar power system would also have looked to Darr because it discloses in-line fuse assemblies suitable for solar array use. EX1007, ¶¶[0003],[0013],[0015]. In particular, a POSITA would have looked to Darr for its teachings of suitable outer layer materials for waterproofing and insulating in-line fuses as disclosed in Fan, Ba, and Yen. *Decl*., ¶151. A POSITA would have been motivated to improve upon the in-line fuse of Fan, Ba, and Yen by using a thermoplastic rubber (i.e., elastomer) with a Shore A scale between 50 and 75, such as the particular products identified by Darr. EX 1007, ¶[0024]; *Decl*., ¶151.

Because Fan, Ba, Yen, and Darr all involve well-known in-line fuse configurations made using commercially available insulation materials such as

specified by Darr, a POSITA would have had a high expectation of success in modifying the in-line fuse of Fan with the plug and connector of Ba and the arc-resistant materials of Yen and the thermoplastic elastomer material of Darr. *Decl*., ¶152.

1. Claim 7

As explained above regarding claim 1, from which claim 7 depends, Fan teaches an overmold and an undermold that a POSITA would be motivated to modified according to Yen to be of dissimilar materials. *See supra*, pp. 32-33. Further, Darr discloses forming fuse holder components from thermoplastics which are hard and flexible, which a POSITA would have understood renders obvious an overmold made of a thermoplastic elastomer. EX1007, ¶[0024]; *Decl.*, ¶153 (citing EX1022).

As shown in Ground 1, the Fan-Ba-Yen combination discloses all limitations recited in claim 1 from which claim 7 depends. Therefore, claim 7 is obvious based on Fan, Ba, Yen, and Darr.

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

- **Motivation to Combine the Solon, Fan, Ba, and Yen**

Solon is analogous prior art to claims 10-13 and 15-18 of the ’739 patent because Solon discloses a “Solar Energy Wire Harness with In-Line Fuses.” EX1008, Title; *Decl.*, ¶156. As shown in Ground 1 (pp. 23, *supra*), Fan, Ba, and

Yen are analogous prior art to in-line fuse within the wire harness recited in 10-13 and 15-18 of the '739 patent. *Decl.*, ¶¶77-79. Solon, Fan, Ba, and Yen are complimentary because each disclose different elements and aspects of solar power wiring assemblies. *Decl.*, ¶¶155-158.

A POSITA designing a solar power system would have looked to Solon because it discloses wire harness designs for solar array use, including in-line fuses and power line configurations. EX1008, Abstract; *Decl.*, ¶158. In particular, a POSITA would have looked to Solon for its teachings of wiring harness configurations for efficiently connecting multiple solar panels to power conversion components. *See e.g.*, EX1008, figures 2, 3.

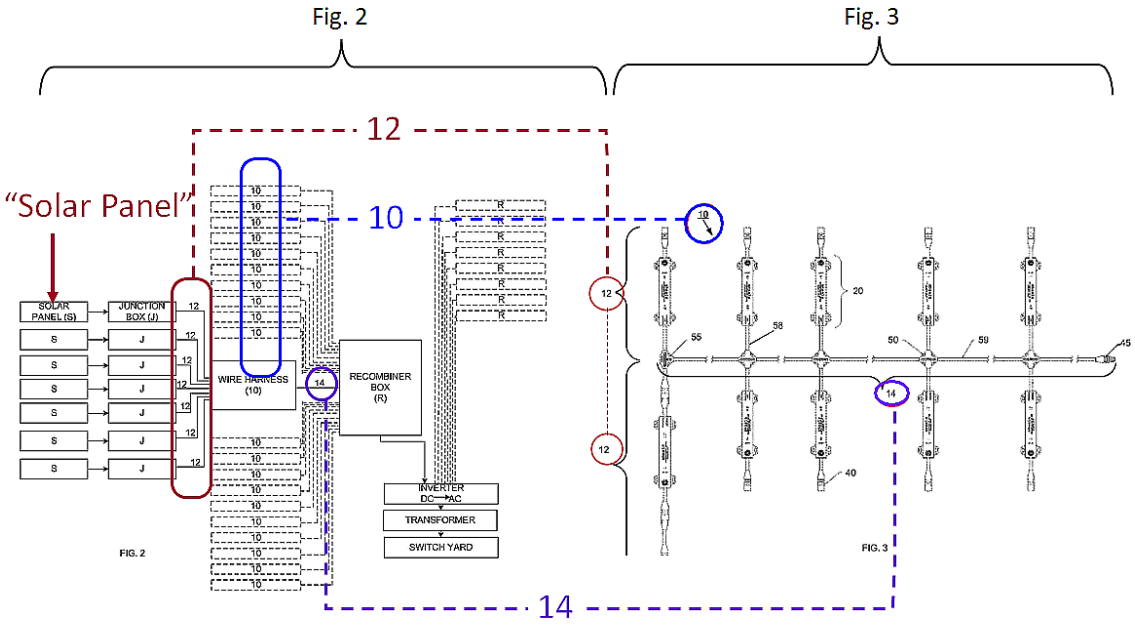
Solon discloses solar array wiring harnesses that include in-line fuses and anticipates the need to protect each fuse from ambient conditions, such as moisture. As shown in Ground 1 (pp. 23-25, *supra*), a POSITA would have looked to Fan, Ba, and Yen for in-line fuse assemblies suitable for providing overcurrent protections required for power lines of solar power system. *Decl.*, ¶¶157-158. Therefore, 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. *Id*.

Because Solon, Fan, Ba, and Yen all involve well-known technologies of wire harnesses and in-line fuse configurations, a POSITA would have had a high expectation of success in modifying the wire harnesses of Solon with in-line fuses of Fan with the plug and connector of Ba, and the arc-resistant materials of Yen. *Decl.*, ¶¶157-159.

1. Claim 10

Preamble

Solon discloses a "wire harness 10 [including] a plurality of branches 12 feeding into one trunk 14." EX1008, ¶[0029].

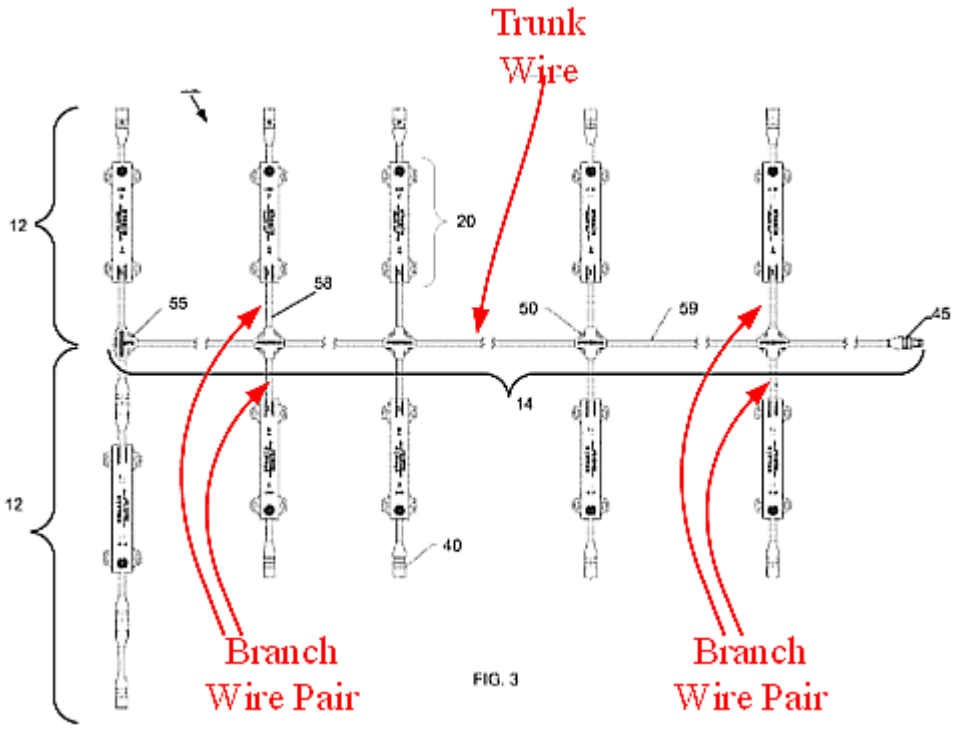


EX1008, FIGS. 2 and 3 (combined with annotation)

Therefore, claim 10(Preamble) is disclosed by Solon. *Decl.*, ¶160.

10(a)

Solon 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." EX1008, ¶[0030].



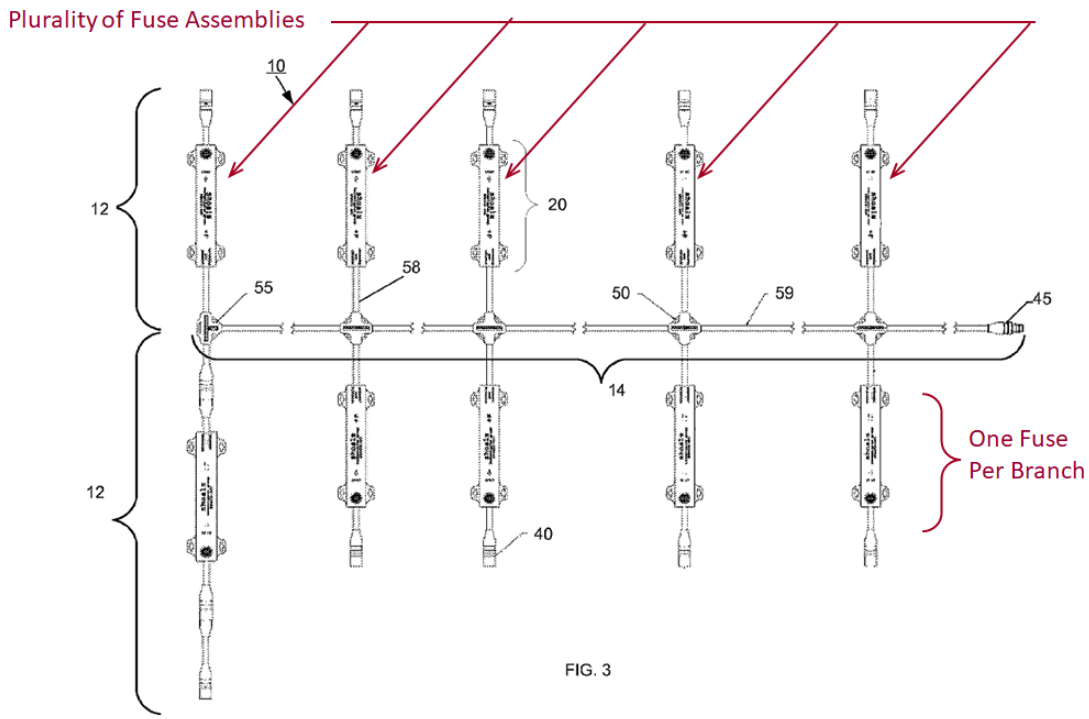
EX1008, Fig. 3(annotated)

Since the limitation "forming angles having vertices of approximately degrees" appears indefinite an at best only relates to some approximate angle, Solon further discloses that an angle is formed at the intersection of the branch wires with the trunk. EX1008, Fig. 3; *Decl.*, ¶¶161-162.

Therefore, claim element 10(a) is disclosed by Solon. *Id*.

10(b)

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." EX1008, ¶[0030].



EX1008, Fig. 3(annotated)

Therefore, claim element 10(b) is disclosed by Solon. *Decl.*, ¶164.

10(b)(i)

See Ground 1, claim element 1(a). *Decl.*, ¶97-103,167. 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. EX1009, p. 4. Therefore, a POSITA would have been motivated to

include the in-line fuse assembly taught by the Fan-Ba-Yen combination in the photovoltaic wire harness disclosed by Solon. *Decl.*, ¶¶165-166.

10(b)(ii)

See Ground 1, claim elements 1(b) for how limitations 10(b)(ii) are disclosed in the Fan-Ba-Yen combination. *Decl.*, ¶¶111-116,168.

10(b)(iii)

See Ground 1, claim elements 1(c) for how limitations 10(b)(iii) are disclosed in the Fan-Ba-Yen combination. *Decl.*, ¶¶117-129,169.

10(b)(iv)

See Ground 1, claim elements 1(d) for how limitations 10(b)(iv) are disclosed in the Fan-Ba-Yen combination. *Decl.*, ¶¶131-135,170.

Therefore, claim 10 is obvious based on the Solon-Fan-Ba-Yen combination.

2. Claim 11

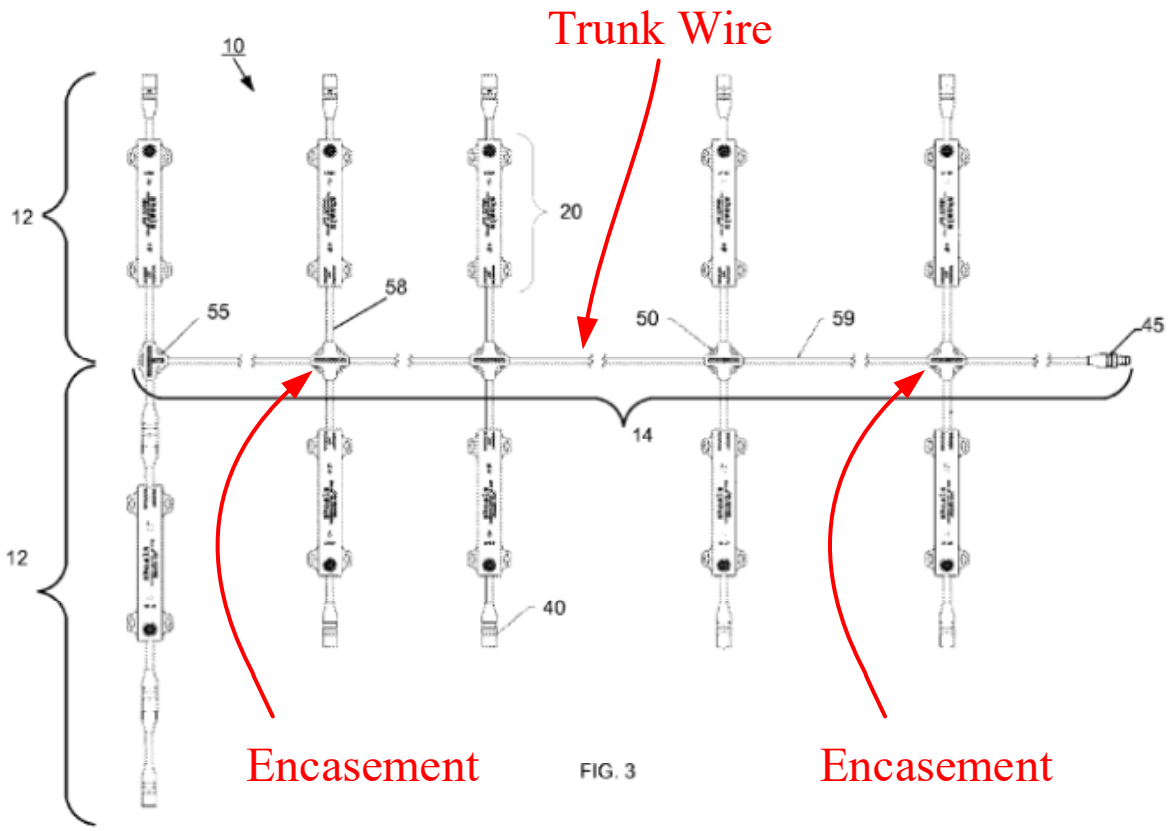
See Ground 1, claim 2 for how claim 11 limitations are disclosed in the Fan-Ba-Yen combination. Therefore, claim 11 is obvious based on the Solon-Fan-Ba-Yen combination. *Decl.*, ¶172.

3. Claim 12

See Ground 1, claim 3. for how claim 12 limitations are disclosed in the Fan-Ba-Yen combination. Therefore, claim 12 is obvious based on the Solon-Fan-Ba-Yen combination. *Decl.*, ¶173.

4. Claim 13

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." EX1008, ¶[0029].



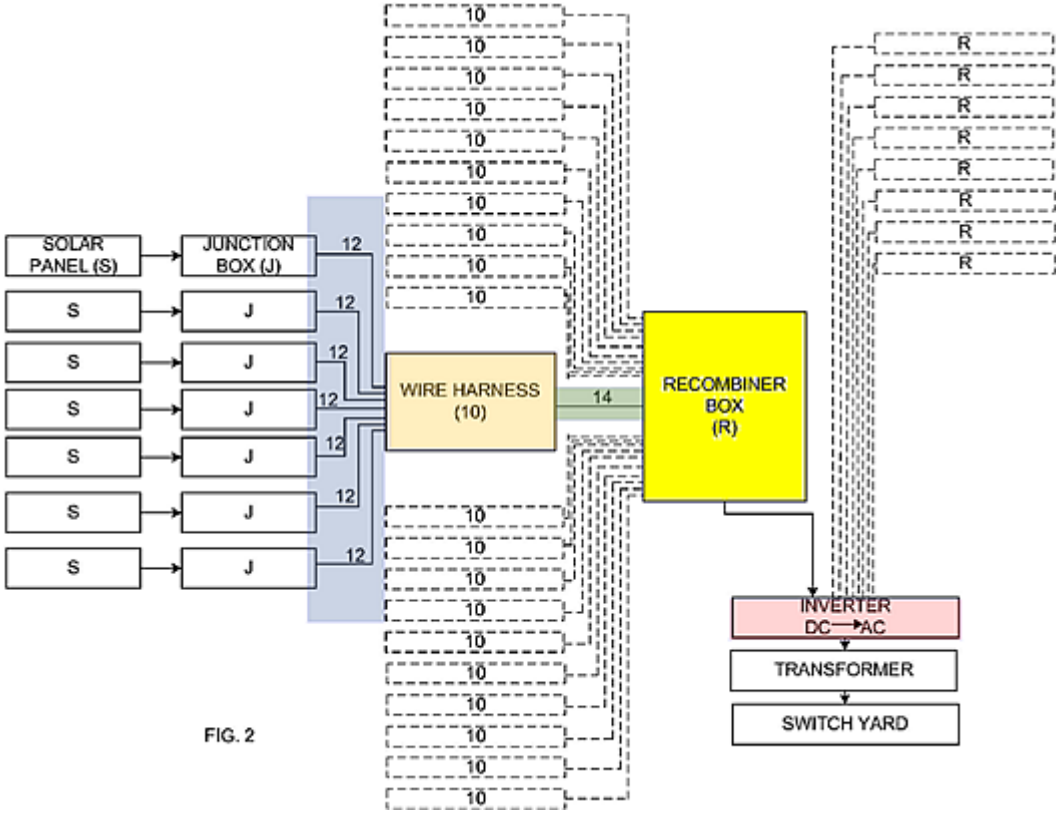
EX1008, Fig. 3.

Therefore, claim 13 is obvious based on the Solon-Fan-Ba-Yen combination. *Decl.*, ¶¶174-175.

5. Claim 15

Preamble

Solon discloses that a "'big picture' presentation of a solar energy plant…is depicted in FIG. 2." EX1008, ¶[0026].



EX1008, Fig. 2(annotated)

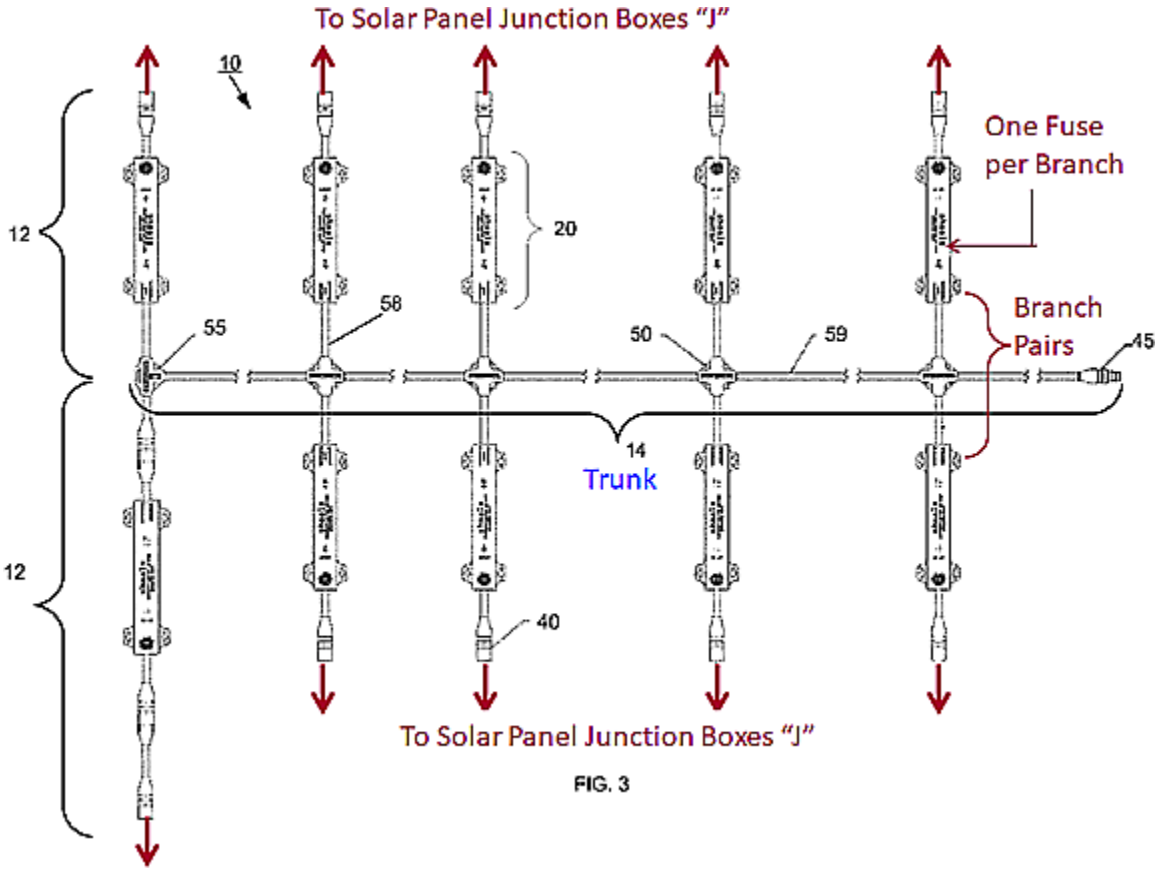
Given this disclosure, a POSITA would have understood this to be a disclosure of a method of configuring a solar installation. *Decl*. ¶177.

Therefore, claim element 15(Preamble) is disclosed by Solon. *Id*.

15(a)

Solon renders claim element 15(a) obvious by disclosing that "[e]ach wire harness has one trunk 14, which is in communication with a recombiner box R"

and "recombiner box R of the present invention is preferably devoid of fuses." EX1008, ¶¶[0026],[0028]; *Decl*. ¶178.



EX1008, Fig. 3(annotated)

15(b)

Solon renders claim element 15(b) obvious by disclosing 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." EX1008, ¶¶[0026],[0028]; *Decl*., ¶179.

15(b)(i)

See Ground 1, claim element 1(a). *Decl.*, ¶¶97-103,181. 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. EX1009, p. 4. Thus, the POSITA would have been motivated to add the in-line fuse assembly taught by the Fan-Ba-Yen combination to the photovoltaic wire harness disclosed by Solon. *Decl.*, ¶180.

15(b)(ii)

See Ground 1, claim element 1(b) for how the 15(b)(ii) limitations are disclosed in the Fan-Ba-Yen combination. *Decl.*, ¶¶111-116,182.

15(b)(iii)

See Ground 1, claim element 1(c) for how the 15(b)(iii) limitations are disclosed in the Fan-Ba-Yen combination. *Decl.*, ¶¶117-129,183.

15(b)(iv)

See Ground 1, claim element 1(d) for how the 15(b)(iv) limitations are disclosed in the Fan-Ba-Yen combination. *Decl.*, ¶¶131-135,184.

Therefore, claim 15 is obvious based on the Solon-Fan-Ba-Yen combination.

6. Claim 16

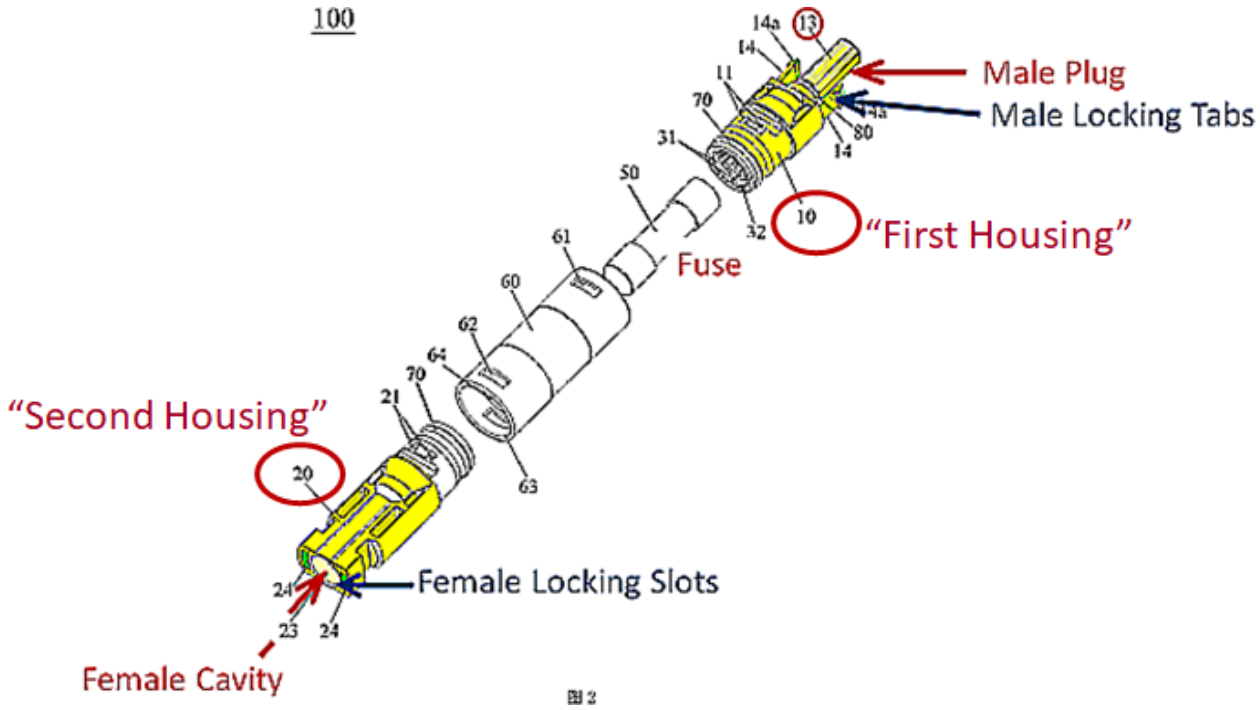
Solon discloses "[e]ach solar panel S is connected to a junction box J. which may be integrated or separate. Each junction box J is in communication with one

branch 12 of wire harness 10", which is illustrated in Figure 2 reproduced above. EX 1008, ¶[0026]; *Decl.*, ¶186.

Therefore, claim 16 is obvious based on the Solon-Fan-Ba-Yen combination. *Decl.*, ¶187.

7. Claim 17

Ba discloses that the second housing 20 (a "first photovoltaic connector") is a female type connector, and the first housing 10 (a "second photovoltaic connector") is a male type connector. EX1011, Fig. 1. A POSITA would have understood these connector types are configured to connect as recited in claim 17. *Decl.*, ¶188.



EX1003, Fig. 1(annotated).

Therefore, claim 17 is obvious based on the Solon-Fan-Ba-Yen combination. *Decl.*, ¶189.

8. Claim 18

Ba discloses that the second housing 20 (a "first photovoltaic connector") is a female type connector, and the first housing 10 (a "second photovoltaic connector") is a male type connector as shown above. EX1011, Fig. 1. A POSITA would have understood these connector types are configured to connect as recited in claim 18. *Decl.*, ¶¶190-191.

Therefore, claim 18 is obvious based on the Solon-Fan-Ba-Yen combination. *Id.*

D. Ground 4: Claims 1-5 are unpatentable under 35 U.S.C. § 103 as obvious based on Ye and Gilman.

- **Motivation to Combine the Ye and Gilman**

Ye and Gilman are analogous prior art to the '739 patent. *Decl.*, ¶¶193-195. Ye, entitled "Solar cell connecting line," describes an in-line fuse assembly, including plug terminals for use in solar cells. EX1005, Abstract. Gilman discloses in-line fuses including protective wrappings for protecting the fuse and wires from abrasion, environmental elements (e.g., water), and ultraviolet light. EX1004, Abstract, ¶[0035]. Ye and Gilman are complimentary because they disclose different elements and materials of in-line fuses. *Id*.

As Ye explains, solar power systems "are generally set up in outdoor

environments where the climate is harsh and variable … [with] exposure to the sun and rain." EX1005, ¶[0002]. A POSITA would have looked to Ye when designing a solar power system because Ye discloses solar cell connecting lines with in-line fuses that are "waterproof, corrosion-resistant and well-sealed [that] meets the requirements for use in harsh outdoor environmental conditions, ensuring stable and reliable operation of the solar cell." EX1005, Abstract; *Decl.*, ¶196.

A POSITA using Ye would also have looked to Gilman because it discloses an undermold design for in-line fuses to protect against outdoor elements, such as sun and rain, as addressed in Ye. EX1004, ¶[0035]; *Decl.*, ¶197. A POSITA would have been motivated to improve the in-line fuse assembly of Ye by replacing the holder body with the protective wrapping materials of Gilman to provide better waterproofing and by modifying the fuse connection to include fuse end cap connections as described in Gilman. Decl., ¶¶197-200,204. The materials disclosed in Gilman, including "polyolefin, fluoropolymer, PVC, neoprene, silicone elastomer, VITON, etc." and heat-shrinkable materials for waterproofing in-line fuses provide advantages a POSITA would understand complement protections of the insulating case of Ye. *Decl.*, ¶¶198,201; EX1004, ¶[0034]. Also, a POSITA would have understood that Gilman's protective wrapping is configured to be overmolded based on the explicit disclosure in Gilman, and would

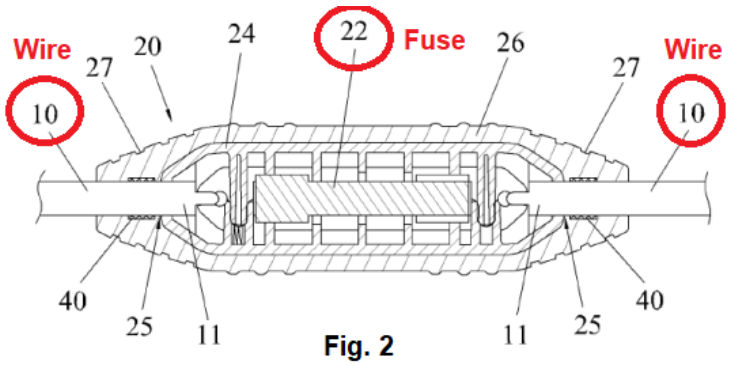
have applied the insulating case of Ye for that overmold. EX1004, ¶[0036]; *Decl.*, ¶¶198,203-204.

Because Ye and Gilman involve well-known in-line fuse configurations, use well-understood materials, and provide detailed descriptions of the components, a POSITA would have had a high expectation of success in modifying the in-line fuse of Ye with the fuse end caps, protective layer materials, and undermolding of Gilman. *Decl.*, ¶¶199-205.

1. Claim 1

Preamble

Ye discloses "a fuse component being installed in the holder body and electrically connected at two ends to the wiring ends of 30 the electric cables." EX1005, ¶[0004], Abstract. This arrangement is shown in Figure 2 of Ye.

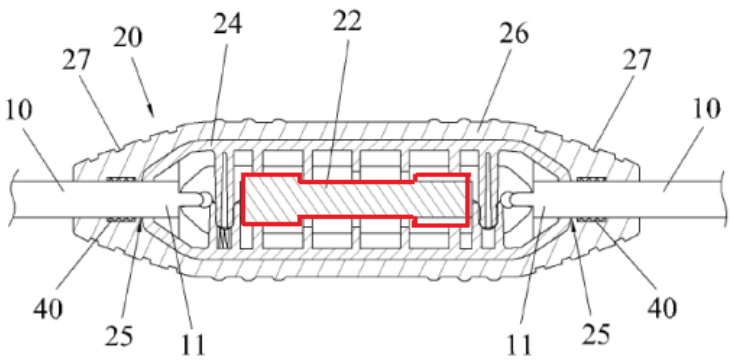


EX1005, Fig. 2(annotated)

Therefore, claim 1(Preamble) is disclosed by Ye. *Decl.*, ¶¶207-210.

1(a)

Ye's abstract discloses "a solar cell connecting line, comprising a fuse holder, two electric cables and two plug terminals, …the fuse holder comprising a fuse component," which a POSITA would have understood relates to a photovoltaic fuse. EX1005, Abstract; *Decl.*, ¶211. 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. *Decl.*, ¶212.



EX1005, Fig. 2(annotated)

A POSITA would have recognized that the fuse component 22 includes a solid outer surface defining an outline. *Decl.*, ¶¶213-214.

Therefore, claim element 1(a) is disclosed by Ye. *Decl.*, ¶215.

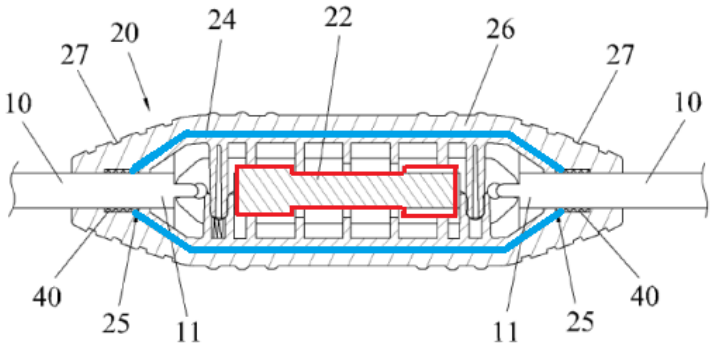
1(b)

As noted above, Petitioner proposes that "undermold" be construed based on the ITC construction 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, pp.17,20; *Decl.*, ¶¶216-219. The elements of claim 1(b) are broken out as 1(b)(1)-(3) below:

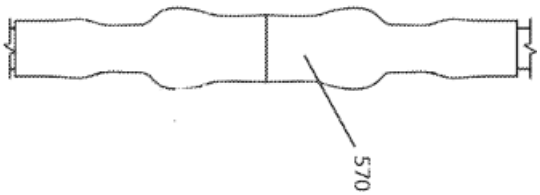
1(b)(1)

The holder body 24 (blue) in Ye surrounds the fuse component 22 (red), which a POSITA would have understood protects the fuse. EX1005, ¶[0012]; *Decl.*, ¶¶221-224.



EX1005, Fig. 2(annotated)

Gilman teaches a protective wrapping 570 ("undermold") that a POSITA would have been motivated to apply to the fuse of Ye to replace the holder body 24. *Decl.*, ¶¶225-227 (citing EX1004, Fig. 5, ¶¶[0034]-[0035]). Gilman discloses that the protective wrapping is melted and molds to the contour of the fuse as shown in the cropped Figure 5 of Gilman below:



EX1004, Fig. 5

Therefore, claim element 1(b)(1) is obvious based on Ye-Gilman. *Decl.*, ¶229.

1(b)(2)

Modifying the holder body 24 in Ye by the protective wrapping covering the fuse of Gilman, which is an undermold as described above, also provides an outer surface outline. EX1005, Fig. 2; EX1004, ¶¶[0034]-[0035], Fig. 5; *Decl.*, ¶¶230-231.

Therefore, claim element 1(b)(2) is obvious based on Ye-Gilman. *Decl.*, ¶232.

1(b)(3)

The holder body 24 in Ye as modified by the protective wrapping (undermold) of Gilman also provides an outer surface outline that is substantially parallel relative to the outline of said solid outer surface of the fuse. *Decl.*, ¶233. A POSITA would have understood the shrinkwrapped sleeve of Gilman includes an outer surface outline that is substantially parallel to the outer surface outline of the fuse component 22 underneath since shrinkwrapping is contour fitting. EX1004,

¶¶[0034]-[0035], Fig. 5; *Decl.*, ¶233.

Therefore, claim element 1(b)(3) is obvious based on Ye-Gilman. *Decl.*, ¶234.

1(c)

As explained regarding claim element 1(b), Ye discloses a holder body 24 that a POSITA would have been motivated to modify with the protective wrapping of Gilman corresponding to the "undermold". Gilman discloses that the protective wrapping 570 is heated and melted to seal the fuse (i.e., fuse 22 of Ye). EX1004, ¶¶[0034]-[0035]. Both Ye and Gilman also teach that the first layer of protection for the fuse (i.e., holder body 24 and protective wrapping 570) is overmolded for further protection. *Decl.*, ¶¶235-236. This combination would render obvious the limitations of 1(c) as identified below:

1(c)(1)

The insulating case 26 in Ye is molded around the holder body 24 (as modified to be the protective wrapping of Gilman) and defines an outline (i.e., an outer surface outline) due to its nature as an object made from solid material (e.g., plastic). Ye states "[t]he profile of the holder body 24 is matched to the insulating case 26, [and] the insulating case 26 covers the holder body 24." EX1005, ¶[0013]; *Decl.*, ¶¶238-239.

Therefore, claim element 1(c)(1) is disclosed by Ye. *Id*.

1(c)(2)

As noted above, Gilman teaches a protective wrapping that is heated and melted onto the fuse 22 of Ye to form the undermold of the assembly. EX1004, ¶[0034],Fig. 5; *Decl.*, ¶240. A POSITA would have understood that the protective wrapping of Gilman after heating and shrinking would form an integrated single unit wrapping of the in-line fuse assembly. Therefore, Ye as modified by Gilman discloses an undermold constructed as a single unit. *Decl.*, ¶240.

Ye states that "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." EX1005, ¶[0013]; *Decl.*, ¶XXX. A POSITA would have understood that casting the insulating case 26 would result in a single piece protective shell over the wrapping of Gilman. *Decl.*, ¶241.

Gilman discloses that the protective wrapping 570 (i.e., the undermold), which may be made of thermoplastic material, provides "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." EX1004, ¶¶[0034],[0036]; *Decl.*, ¶243. Therefore, based on the disclosure of Gilman, a POSITA would have selected 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, wear, liquid) as taught by Gilman and by Ye. *Decl.*, ¶242-244. A POSITA would have been motivated to make this combination and incorporate dissimilar materials based on the separate advantages of each material. *Decl.*, ¶243.

Therefore, claim element 1(c)(2) is obvious based on Ye-Gilman. *Decl.*, ¶244.

1(c)(3)

As shown in the combined Ye-Gilman figure above, the surface of the protective wrapping is substantially parallel to the surface of the insulating case 26 of Ye. *Decl.*, ¶245. As described regarding claim element 1(b)(3), the wrapping of Gilman follows the contour of the fuse. EX1004, Figs. 1A, 5. Since the undermold of Ye is also configured to follow the shape of the fuse for compactness, a POSITA would have understood that the insulating case of Ye could be applied over the wrapping of Gilman in the same way. *Decl.*, ¶¶245-246. For these reasons, a POSITA would have found it obvious to apply the insulating case of Ye ("the profile of the holder body 24 is matched to the insulating case 26; the insulating case 26 covers the holder body 24") to the wrapping for Gilman to achieve the same result (i.e., a matching profile). EX1005, ¶[0013]; *Decl.*, ¶¶246-248.

Therefore, claim element 1(c)(3) is obvious based on Ye-Gilman. *Decl.*, ¶249.

(1)(d)

Ye discloses connector ends that connect to a fuse component 22 via wires, where the connector ends are configured to connect into a solar power generating system. EX1005, ¶¶[0002],[0012],Fig. 1; *Decl.*, ¶¶251,254. Gilman discloses "terminals 132a and 132b of the end caps 130a and 130b [of the fuse] may be substantially tubular members having respective cavities 138a and 138b formed therein," which are configured to receive conductors and be "held in firm engagement" with the fuse. EX1004, ¶¶[0023]-[0025]. A POSITA would have been motivated to modify the connectors of Ye according to the teachings of Gilman to achieve the firm engagement and ease of installation described by Gilman with a connector physically or mechanically connected to the ends of the fuse. EX1004, ¶¶[0023]-[0024]; *Decl.*, ¶¶252-253,255.

Therefore, claim element 1(d) is obvious based on Ye-Gilman. *Decl.*, ¶256.

Therefore, claim 1 is obvious based on the Ye-Gilman combination. *Decl.*, ¶257.

2. Claim 2

As noted above, Ye discloses terminal connections for its fuse. Gilman discloses "terminals 132a and 132b of the end caps 130a and 130b [of the fuse]

may be substantially tubular members having respective cavities 138a and 138b formed therein," which are configured to receive wires and be "held in firm engagement" with the fuse. EX1004, ¶¶[0023]-[0025]. A POSITA would have been motivated to modify the connectors of Ye using teachings of Gilman to achieve the firm engagement and ease of installation described by Gilman. EX1004, ¶¶[0023]-[0024]; *Decl.*, ¶258.

Therefore, claim 2 is obvious based on the Ye-Gilman combination. *Decl.*, ¶259.

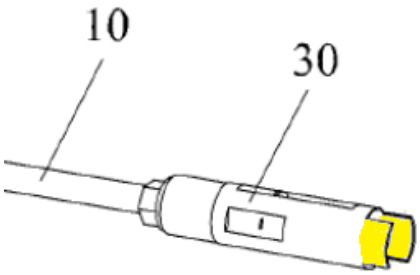
3. Claim 3

Ye discloses that "[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." EX1005, ¶[0012]. Gilman discloses end caps on the fuse ("male type") to be inserted into a sleeve and discloses mounting cuffs ("female type") to receive wire ends. EX1004, ¶[0023]-[0025]. A POSITA would have been motivated to modify Ye as suggested in Ye based on actual needs, which Gilman teaches includes more secure engagement between the wire and fuse. *Decl.*, ¶¶260-262.

Therefore, claim 3 is obvious based on the Ye-Gilman combination. *Decl.*, ¶263.

4. Claim 4

Ye's Figure 1 discloses an assembly with locking connectors:



EX1005, Fig. 1(annotated)

A POSITA would have understood these tabs of Ye to form the outer portions of locking type connectors. *Decl.*, ¶¶264-265. Further, regarding the connectors of Ye as modified by Gilman as described above, Gilman teaches crimping, pinching, and securely trapping the wire in the mounting cuff of the connector of Gilman. EX1004, ¶[0024]; *Decl.*, ¶266.

Therefore, claim 3 is obvious based on the Ye-Gilman combination. *Decl.*, ¶267.

5. Claim 5

The specification of the '739 patent does not include a description or a drawing disclosing a "tool" that could be used for unlocking connectors. A POSITA would have understood that a tool, such as plyers, 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. *Decl.*, ¶268. Specialty tools for such locking/unlocking of electrical connectors were known and required for use in applications like those of Ye. *Decl.*, ¶¶269-272 (citing EX1017 showing such a tool; and citing EX1012 showing electrical regulations discussing locking and unlocking via a tool). Further, Gilman discloses using tools such as pliers to crimp, pinch, and securely trap the wire in the connector (mounting cuff) of Gilman, which a POSITA would have understood may be applied to the connectors of Ye-Gilman. EX1004, ¶[0024]; *Decl.*, ¶272.

Therefore, a POSITA would have found claim 5 to be obvious based on the Ye-Gilman combination. *Decl.*, ¶273.

E. Ground 5: Claim 7 is unpatentable under 35 U.S.C. § 103 as obvious based on Ye, Gilman, and Darr.

- **Motivation to Combine Ye, Gilman and Darr**

As shown in Ground 4 (p. 52, *supra*), Ye and Gilman are analogous prior art to the ’739 patent. *Decl.*, ¶¶193-195,275. Darr is also analogous to the ’739 patent because it discloses in-line fuse holder assemblies that are substantially waterproof, non-releaseable when assembled, and suitable for use in solar photovoltaic systems. EX1007, ¶¶[0003],[0021]-[0024]; *Decl.*, ¶276. Ye, Gilman, and Darr are complimentary because they disclose different elements and materials of in-line fuses. *Decl.*, ¶277.

As shown in Ground 4 (pp. 53-54, *supra*), a POSITA would have looked to Ye and Gilman when designing a solar power system because these references disclose in-line fuse assemblies protected from harsh outdoor environmental conditions of solar power applications. *Decl.*, ¶205,276.

A POSITA designing a solar power system would also have looked to Darr because it discloses in-line fuse assemblies suitable for solar array use. EX1007, ¶¶[0003],[0013],[0015]. In particular, a POSITA would have looked to Darr for its teachings of suitable materials for waterproofing and insulating in-line fuses as disclosed in Ye and Gilman. *Decl.*, ¶278. A POSITA would have been motivated to improve upon the in-line fuse of Ye and Gilman by using a thermoplastic rubber (i.e., elastomer) with a Shore A scale between 50 and 75, such as the particular products identified by Darr. EX1007, ¶[0024], *Decl.*, ¶278.

Because Ye, Gilman, and Darr involve well-known in-line fuse configurations, made using well-understood materials, and provide detailed descriptions of the components, a POSITA would have had a high expectation of success in modifying the in-line fuse of Ye with the protective layer materials and over-molding of Gilman. *Decl.*, ¶278.

1. Claim 7

See Ground 2, claim 7 for how Darr discloses the limitations in claim 7. As shown in Ground 4, the Ye-Gilman combination discloses all limitations recited in

claim 1 from which claim 7 depends. Therefore, claim 7 is obvious based on the Ye-Gilman-Darr combination. *Decl.*, ¶¶279-280.

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

- **Motivation to Combine Solon, Ye, and Gilman**

As shown in Ground 3 (p. 41, *supra*), Solon is analogous prior art to claims 10-13 and 15-18 of the '739 patent because Solon discloses a "Solar Energy Wire Harness with In-Line Fuses." EX 1008, Title; *Decl.*, ¶282. As shown in Ground 4 (p. 52, *supra*), Ye and Gilman are analogous prior art to the '739 patent. *Decl.*, ¶¶194-195. Solon, Ye, and Gilman are complimentary because they disclose different elements and materials of in-line fuses. *Decl.*, ¶¶196,198,284.

As shown in Ground 3 (pp. 41-42, *supra*), a POSITA designing a solar power system would have looked to Solon because it discloses wire harness designs, including in-line fuses and power line configurations, efficiently connecting a plurality of solar panels to power conversion components. EX1008, Abstract, FIGs. 2,3; *Decl.*, ¶283.

In view of Solon anticipating the need to protect each power line fuses from ambient conditions, a POSITA would have looked to Ye and Gilman when designing a solar power system because these references disclose in-line fuse assemblies protected from harsh outdoor environmental conditions of solar power applications. *Decl.*, ¶283. A POSITA would have been motivated to use the in-

line fuse assembly according to the Ye and Gilman combination for the in-line fuses identified but not described in Solon in order to provide added water proofing and shock proofing that their combination provides. *Decl.*, ¶¶284-285.

Because Solon, Ye, Gilman involve well-known technologies of wire harnesses and in-line fuse configurations, a POSITA would have had a high expectation of success in modifying the wire harnesses of Solon with in-line fuse assemblies of Ye and Gilman. *Decl.*, ¶283.

1. Claim 10

Preamble

See Ground 3, claim 10(Preamble) for how Solon discloses the claim 1(Preamble). *Decl.*, ¶286.

10(a)

See Ground 3, claim 10(a) for how Solon discloses the limitations of claim element 10(a). *Decl.*, ¶¶287-289.

10(b)

See Ground 3, claim 10(b) for how Solon discloses the limitations of claim element 10(b). *Decl.*, ¶290.

10(b)(i)

See Ground 4, claim element 1(a). *Decl.*, ¶¶211-214,293. 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. EX1008, ¶[0031]; *Decl.*, ¶292. Thus, the POSITA would have been motivated to include the in-line fuse assembly taught by the Ye-Gilman combination in the photovoltaic wire harness disclosed by Solon. *Decl.*, ¶290,292.

10(b)(ii)

See Ground 4, claim element 1(b) for how limitations 10(b)(ii) are disclosed in the Ye-Gilman combination. *Decl.*, ¶216-234,294.

10(b)(iii)

See Ground 4, claim element 1(c) for how limitations 10(b)(iii) are disclosed in the Ye-Gilman combination. *Decl.*, ¶235-248,295.

10(b)(iv)

See Ground 4, claim element 1(d) for how limitations 10(b)(iv) are disclosed in the Ye-Gilman combination. *Decl.*, ¶251-256,296.

Therefore, claim 10 is obvious based on the Solon-Ye-Gilman combination. *Decl.*, ¶297.

2. Claim 11

See Ground 4, claim 2 for how claim 11 limitations are disclosed in the Ye-Gilman combination. Therefore, claim 11 is obvious based on the Solon-Ye-Gilman combination. *Decl.*, ¶298.

3. Claim 12

See Ground 4, claim 3 for how claim 12 limitations are disclosed in the Ye-Gilman combination. Therefore, claim 12 is obvious based on the Solon-Ye-Gilman combination. *Decl.*, ¶299.

4. Claim 13

See Ground 3, claim 13 for how the claim 13 limitations are disclosed in Solon. Therefore, claim 13 is obvious based on the Solon-Ye-Gilman combination. *Decl*., ¶¶300-301.

5. Claim 15

Preamble

See Ground 3, claim 15(Preamble) for how Solon discloses this Preamble. *Decl.*, ¶¶302-303.

15(a)

See Ground 3, claim element 15(a) for how Solon discloses the 15(a) limitations. *Decl.*, ¶304.

15(b)

See Ground 3, claim element 15(b) for how Solon discloses the 15(b) limitations. *Decl.*, ¶305.

15(b)(i)

See Ground 4, claim element 1(a). *Decl.*, ¶¶211-214,308. 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. EX1008, ¶[0031]; *Decl.*, ¶307. Thus, the POSITA would have been motivated to add the in-line fuse assembly taught by the Ye-Gilman combination to the photovoltaic wire harness disclosed by Solon. *Decl.*, ¶307.

15(b)(ii)

See Ground 4, claim element 1(b) for how the 15(b)(ii) limitations are disclosed in the Ye-Gilman combination. *Decl.*, ¶¶216-234,309.

15(b)(iii)

See Ground 4, claim element 1(c) for how the 15(b)(iii) limitations are disclosed in the Ye-Gilman combination. *Decl.*, ¶¶235-248,310.

15(b)(iv)

See Ground 4, claim element 1(d) for how the 15(b)(iv) limitations are disclosed in the Ye-Gilman combination. *Decl.*, ¶¶251-256,311.

Therefore, claim 15 is obvious based on the Solon-Ye-Gilman combination. *Decl.*, ¶312.

6. Claim 16

See Ground 3, claim 16 for how Solon discloses the limitations of claim 16. Therefore, claim 16 is obvious based on the Solon-Ye-Gilman combination. *Decl.*, ¶¶313-314.

7. Claim 17

See Ground 4, claim 3 for how Ye discloses the structural limitations of claim 17, which a POSITA would understand is used as recited in the method limitations of this claim. Therefore, claim 17 is obvious based on the Solon-Ye-Gilman combination. *Decl*., ¶¶315-316.

8. Claim 18

See Ground 4, claim 3 for how Ye teaches the structural limitations of this claim, which a POSITA would understand is used as recited in the method limitations of this claim. Therefore, claim 18 is obvious based on the Solon-Ye-Gilman combination. *Decl*., ¶¶317-318.

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

- **Motivation to Combine Ba, Ye, and Yen**

Ba, Ye and Yen are analogous prior art to the ’739 patent. *Decl*., ¶320. Ba discloses “a fuse holder for a solar photovoltaic power generation system.” EX1011, Abstract. Entitled “Solar cell connecting line,” Ye describes an in-line fuse assembly and includes plug terminals for use in solar installs. EX1005, Abstract. Yen discloses overcurrent protection devices including insulating and protective materials. EX1006, ¶¶[0007]-[0008]. Accordingly, Ba, Ye, and Yen are in the same field of endeavor as the ’739 patent and solve similar problems. *Decl*.,

¶320. Ba, Ye and Yen are complimentary because they disclose different elements and materials for protection of in-line fuses. *Decl*., ¶¶323-324.

A POSITA designing solar power systems would have looked to Ba because it discloses robust in-line fuse assemblies for solar array use with solar power plugs and connectors that are easy to connect and provides easy-to-follow instructions for connecting in-line fuses in wiring harnesses. EX1011, ¶¶[0015]-[0016],[0040]; *Decl*., ¶¶325-326. Also, a POSITA would have looked to Ye when designing solar power systems because Ye discloses a solar cell connecting line with in-line fuses that are "waterproof, corrosion-resistant and well-sealed [that] meets the requirements for use in harsh outdoor environmental conditions, ensuring stable and reliable operation of the solar cell." EX1005, Abstract; *Decl*., ¶327. A POSITA would have been motivated to improve the in-line fuse assembly of Ba by encasing it in the insulating case of Ye to provide further waterproofing, corrosion-resistance, and sealing of the in-line fuse. While casting an insulating case over the in-line fuse per Ye means the fuse assembly cannot be disassembled after installation, the resulting in-line fuse retains the primary benefits identified by Ba of reduced cost, providing environmental protections, achieving firmer contact, and providing better shock resistance. See EX1011, Abstract,[0007],[0041]; *Decl*., ¶¶328-329. Thus, modifying Ba's in-line fuse with the overmolding of Ye is a combination a POSITA would be motivated to make because the primary benefits

of Ba would be retained. *See Raytheon Co. v. Sony Corp.*, 727 F. App'x 662, 667 (Fed. Cir. 2018); *Allied Erecting & Dismantling Co. v. Genesis Attachments, LLC*, 825 F.3d 1373, 1381 (Fed. Cir. 2016) .

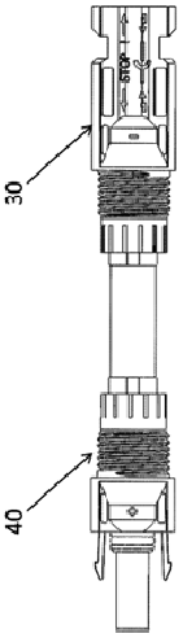
A POSITA designing a solar power system would also have looked to Yen as it discloses an in-line fuse configuration with protections against deterioration in many environments plus added protection against arcing, which is of particular concern in high-power electrical cable installations like solar. EX1006, ¶¶[0020],[0026]; *Decl*., ¶¶330-331. A POSITA would have been motivated to modify the in-line fuse configuration of Ba in view of Yen to improve the electrical insulation of the protective shell by using different materials in the overmold and undermold, such as arc-resistant materials in the inner layer of Ba that is encapsulated in an outer layer (overmold) as taught in Ye. *Decl*., ¶¶330-332.

Because Ba, Ye and Yen involve well-known in-line fuse configurations, made using well-understood materials, and provide detailed descriptions of the components, a POSITA would have had a high expectation of success in modifying the in-line fuse of Ba with the overmolding of Ye and protective layer materials of Yen. *Decl*., ¶331.

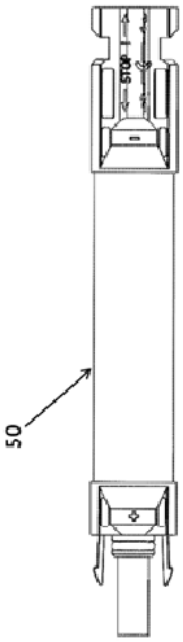
1. Claim 1

Preamble

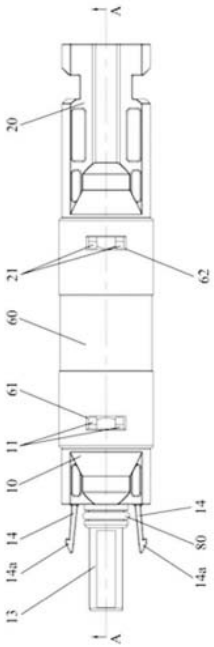
Ba teaches "…the fuse holder being configured to be electrically connected between an input cable and an output cable in the solar photovoltaic power generation system." EX1011, ¶[0008]. This arrangement is also shown in FIGS. 1, 2, 3, and 4 of Ba. For comparison, figures 3 and 4 of Ba are reproduced below alongside Figures 7 and 8 of the '739 patent:



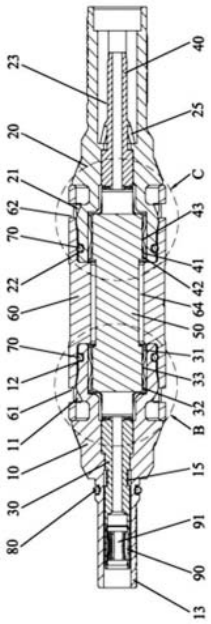
'739 - Fig. 7



'739 - Fig. 8



Ba - Fig. 3



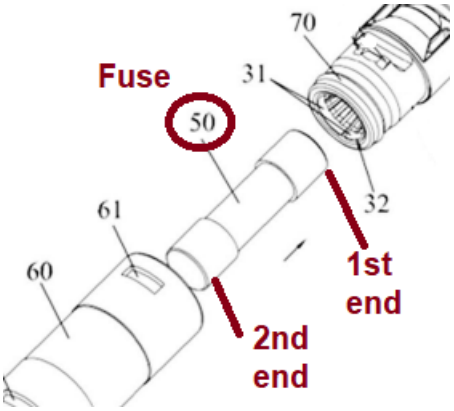
Ba - Fig. 4

Therefore, claim 1(Preamble) is disclosed by Ba. *Decl.*, ¶¶334-339.

1(a)

Ba discloses a fuse 50 in the fuse holder 100 of the solar photovoltaic generation system. EX1011, ¶¶[0008],[0029],Fig. 2. 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. EX1011, ¶¶[0008],[0029],Fig. 2; *Decl.*, ¶341-

344.



EX1011, Fig. 2(annotated)

Therefore, claim element 1(a) is disclosed by Ba. *Decl.*, ¶342,345.

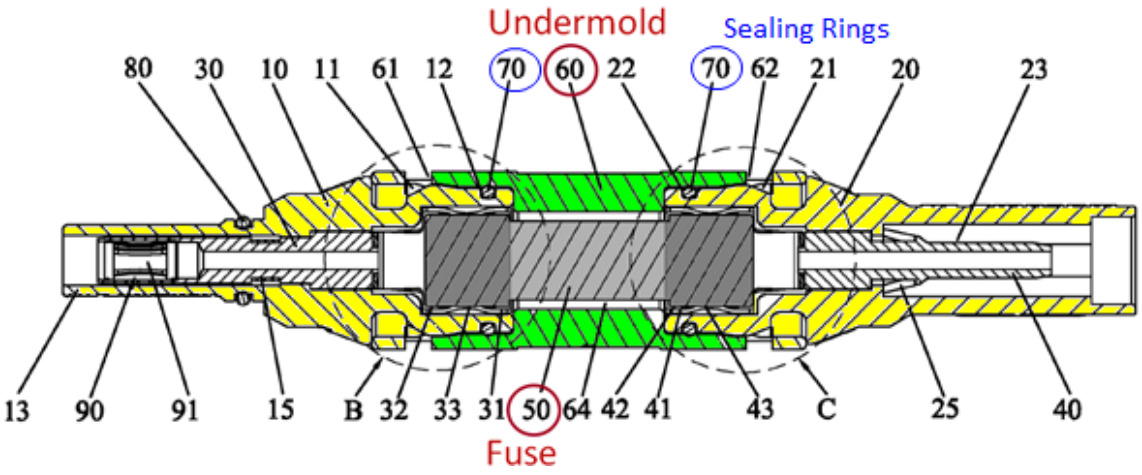
1(b)

As noted above, Petitioner proposes that "undermold" be construed based on the ITC construction 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, pp.17,20. Generally, a POSITA would have known of injection molding and understood how to make the protective elements of the assemblies of Ba and Ye with this common manufacturing method. *See generally*, EX1015 (describing molding techniques for molding on existing components); EX1006, ¶[0026]; *Decl.*, ¶¶346-350. In particular, a POSITA would have understood that a protective sleeve (e.g., sleeving member 60 of Ba) could be injection molded on the fuse and housings of Ba and that the casting of the insulating case of Ye could be accomplished by these

techniques. *Decl.*, ¶350. The elements of claim 1(b) are broken out as 1(b)(1)-(3) below:

1(b)(1)

The sleeving member 60 in Ba surrounds the fuse 50. The '739 patent only discloses that the undermold surrounds the fuse and seals the assembly. Likewise, the sleeving member 60 of Ba surrounds the fuse and seals the assembly as shown below. *Decl.*, ¶346,351-354.



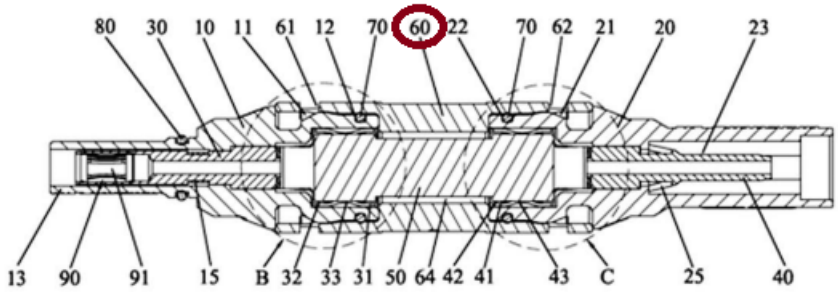
EX 1011, Fig. 4(annotated)

The sleeving member 60 would have been understood by a POSITA as rendering obvious an undermold formed by injection molding in that position and configuration. *Decl.*, ¶354 (citing EX1015 and EX1006).

Therefore, claim element 1(b)(1) is rendered obvious by the Ba-Ye-Yen combination.

1(b)(2)

The sleeving member 60 of Ba has an outer surface outline since it is illustrated as a solid object. EX1011, [0030]; *Decl.*, ¶355.



EX1011, Fig. 4

Therefore, claim element 1(b)(2) is disclosed by Ba. *Id*.

1(b)(3)

As shown in Ba's FIG. 4, the sleeving member 60 includes an outer surface outline that is substantially parallel to the outer surface outline of the fuse 50. As noted above regarding claim element 1(b)(1), a POSITA would have found it obvious to mold the sleeve member 60 in place as pictured above around the fuse 50 using injection molding. *Decl.*, ¶356 (citing EX1015).

A POSITA would have been motivated to modify Ba to mold the sleeve 60 so as to achieve the advantages of better sealing and arc protection disclosed in Ye and Yen for such moldings. *Decl.*, ¶357. The advantages of Ba including reliable contact, shock resistance, easy assembly of the housing, waterproofing, and convenient assembly (i.e., insertion) into the solar installation would remain after

this modification. EX1011, ¶¶[0005],[0010],[0015]-[0016],[0030],[0040]. A POSITA would understand the benefits of adding arc protection and better sealing as advantages that would offset any disadvantage of the inability to disassemble the assembly of Ba after molding of the sleeve 60. *Decl.*, ¶357.

Therefore, claim element 1(b)(3) is rendered obvious by Ba as modified by Ye and Yen. *Decl.*, ¶358.

1(c)

A POSITA designing a solar installation would have been aware that elements in harsh outdoor conditions can be heated and degraded by the sun. EX1005, ¶[0013]; *Decl.*, ¶360. A POSITA would have been motivated to improve the environmental protections of Ba by adding another layer like that in Ye with different properties as suggested by Yen. EX1006, ¶¶[0020],[0021]; EX1005, ¶[0019]; *Decl.*, ¶360. As noted above regarding claim element 1(b), while molding layers onto Ba prevents disassembly, the primary benefits of Ba remain; and, a POSITA would have recognized the need for added protection as described by Ye and Yen. *Decl.*, ¶361. The elements of claim 1(c) are broken out as 1(c)(1)-(3) below:

1(c)(1)

Figure 2 of Ye shows that the insulating case (overmolding) provides an outline (i.e., an outer surface outline) and a POSITA would understand that the due

to its nature as an object made from solid material (e.g., plastic) it would have such an outline. *Decl.*, ¶363.

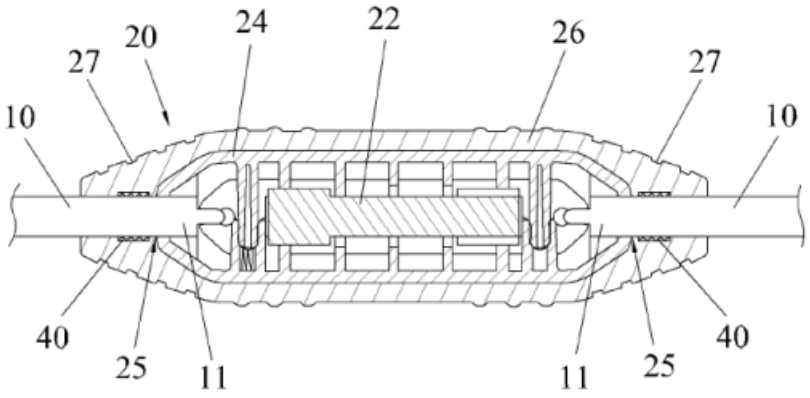


Fig. 2

EX1005, Fig. 2

Further, Ye discloses that the insulating case 26 is cast over the holder body (undermold) and the wire ends, and thus, it naturally surrounds the holder body. EX 1005, ¶[0013]; *Decl.*, ¶363. 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 cover the sleeving member 60 ("undermold") of Ba as well. *Decl.*, ¶363.

Therefore, claim element 1(c)(1) is rendered obvious by Ba and Ye. *Id*.

1(c)(2)

As noted above, a POSITA would have been motivated to apply the insulating case of Ye to the assembly of Ba. *Decl.*, ¶365. Ye discloses an in-line fuse assembly having a holder body 24 ("undermold") that covers a fuse 22, where

the holder body is itself covered by an insulating case ("overmold"). EX1005, ¶[0013]. Ye discloses that this insulating case is "casted" over the underlying protective element as illustrated in Figure 2 of Ye. *Id*. A POSITA would have understood "casting" to be molding of the insulating case over the underlying element and that the casted insulating case would be one piece as a result. *Decl.*, ¶364.

Likewise, the sleeving member 60 of Ba is illustrated as a single piece. EX 1011, Fig. 2. A POSITA would have understood that the sleeving member 60 as modified by Ye and Yen to be molded over the fuse and ends of the housings 10/20 would also be a single unit. *Decl.*, ¶366.

Further, a POSITA would have understood based on the disclosure of Yen that different layers of protection can be provided by the overmold and undermold. EX 1006, ¶[0020]; *Decl.*, ¶367. Yen discloses that the inner layer 211(i.e., the undermold), which may be made of an injection moldable thermoplastic material or thermoset material, provides arc resistance, while the overmold of ordinary material represents cost savings. EX1006, ¶¶[0020],[0031]; *Decl.*, ¶368. Ye describes further advantages of using different materials for the overmold, including resistance to radiation, high temperatures, and water penetration. EX1005, ¶¶[0008],[0013],[0020]. The continuous outer case of Ye protects against solar radiation decay of the underlying material. EX1005, ¶[0013]; *Decl.*,

¶370. A POSITA would have been motivated to modify the sleeving member of Ba to apply the arc-resistant material of Yen, while using the materials of Ye for the overmold to attain the advantages disclosed in both Ye and Yen. *Decl.*, ¶¶365,367-369.

Therefore, claim element 1(c)(2) is rendered obvious by Ba, Ye and Yen. *Decl.*, ¶371.

1(c)(3)

Ye 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. EX1005, ¶¶[0013],[0020]; *Decl.*, ¶372. A POSITA would have understood that the insulating case 26 of Ye when applied to the sleeving member 60 of Ba could attain a similar matching for the same reasons noted in Ye (i.e., low profile). *Decl.*, ¶¶373-374.

Therefore, claim element 1(c)(3) is rendered obvious by Ba, Ye and Yen. *Decl.*, ¶375.

1(d)

A POSITA would have recognized that fuse holder 100 in Ba (i.e., the "assembly") provides electrical insulation for its internal components. *Decl.*, ¶377. Likewise, the insulating case of Ye formed as the overmold in this combination provides electrical insulation. EX1005, ¶[0013]; *Decl.*, ¶378.

Further, Ba teaches a sub-assembly of the "first housing 10" and the "first electric terminal 30" that form a "first photovoltaic connector." EX1011, Fig. 4. Ba discloses that the first electric terminal 30 receives an output cable at one end and the fuse 50 at the other end, which renders engagement with the fuse end obvious. EX1011, ¶¶[0036],[0050]; *Decl.*, ¶379.

Therefore, claim element 1(d) is rendered obvious by Ba, Ye and Yen. *Decl.*, ¶379.

Therefore, a POSITA would have found claim 1 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

In Ba, the assembly of the "second housing 20" and the "second electric terminal 40" disclose a "second photovoltaic connector," which is disposed on an opposite side of the fuse 50 from the "first housing 10" and the "first electric terminal 30," as discussed above regarding claim element 1(d). EX1011, ¶[0039],Figs.-2,4; *Decl.*, ¶381.

Therefore, claim 2 is obvious based on the Ba-Ye-Yen combination. *Decl.*, ¶382.

3. Claim 3

See Ground 1, claim 3 above for how Ba discloses the claim 3 limitations. Therefore, claim 3 is obvious based on the Ba-Ye-Yen combination. *Decl.*, ¶¶383-384.

4. Claim 4

See Ground 1, claim 4 above for how Ba discloses the claim 4 limitations. Therefore, claim 4 is obvious based on the Ba-Ye-Yen combination. *Decl.*, ¶¶385-386.

5. Claim 5

See Ground 1, claim 5 above for how Ba renders the claim 5 limitations obvious in view of knowledge of a POSITA. *Decl.*, ¶¶387-390 (citing EX1017 and citing EX1012). Therefore, claim 5 is obvious based on the Ba-Ye-Yen combination. *Decl.*, ¶391.

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

- **Motivation to Combine the Ba, Ye, Yen and Darr**

As shown in Ground 7 (p. 71, *supra*), Ba, Ye, and Yen are analogous prior art to the ’739 patent. *Decl.*, ¶392. Darr is also analogous to the ’739 patent because it discloses in-line fuse holder assemblies that are substantially waterproof

and suitable for use in solar photovoltaic systems. EX1007, ¶¶[0003],[0014],[0024]; *Decl.*, ¶XXX. Ba, Ye, Yen, and Darr are complimentary because they disclose different elements and materials of in-line fuses.

As shown in Ground 7 (pp. 72-73, *supra*), a POSITA would have looked to Ba, Ye, and Yen when designing a solar power system because these references disclose in-line fuse assemblies suitable for providing the overcurrent protections required for power lines in such systems. *Decl.*, ¶393.

A POSITA would have looked to Darr for its teachings of suitable materials for waterproofing and insulating in-line fuses as disclosed in Ba, Ye, and Yen. EX1007, ¶¶[0003],[0013],[0015]; *Decl.*, ¶¶393-394. A POSITA would have been motivated to improve upon the in-line fuse of Ba, Ye and Yen by using a thermoplastic rubber (i.e., elastomer) with a Shore A scale between 50 and 75, such as the particular products identified by Darr. EX 1007, ¶[0024], *Decl.*, ¶¶394.

Because Ba, Ye, Yen, and Darr all involve well-known in-line fuse configurations, use commercially available insulation materials, a POSITA would have had a high expectation of success in modifying the in-line fuse of Ba with the protective layers and materials of Ye, Yen, and Darr. *Decl.*, ¶394.

1. Claim 7

See Ground 2, claim 7 for how Darr discloses the limitations in claim 7. As shown in Ground 7, the Ba-Ye-Yen combination discloses all limitations recited in

claim 1 from which claim 7 depends. Therefore, claim 7 is obvious based on the Ba-Ye-Yen-Darr combination. *Decl.*, ¶¶395-396.

I. Ground 9: Claims 10-13 and 15-18 is unpatentable under 35 U.S.C. § 103 as obvious based on Solon, Ba, Ye, and Yen.

- **Motivation to Combine the Solon, Ba, Ye, and Yen**

Solon is analogous prior art to claims 10-13 and 15-18 of the '739 patent because Solon discloses a "Solar Energy Wire Harness with In-Line Fuses." EX1008,Title; *Decl.*, ¶398. As shown in Ground 7 (p. 71, supra), Ba, Ye, and Yen are analogous prior art to the '739 patent. *Decl.*, ¶397. Solon, Ba, Ye, and Yen are complimentary because they disclose different elements and materials of in-line fuses.

A POSITA designing a solar power system would also have looked to Solon because it discloses wire harness designs, including in-line fuses and power line configurations, for solar array use. EX1008, Abstract; *Decl.*, ¶399. In particular, a POSITA would have looked to Solon for its teachings of wiring harness configurations for efficiently connecting a plurality of solar panels to power conversion components. See e.g., Solon figures 2 and 3; *Decl.*, ¶400.

Solon discloses solar array wiring harnesses that include in-line fuses and anticipates the need to protect each fuse from ambient conditions, such as moisture. EX1008, ¶¶[0031],[0033]; *Decl.*, ¶XXX. As shown in Ground 7 (pp.72-73, *supra*), a POSITA would have looked to Ba, Ye, and Yen for in-line fuse

assemblies suitable for providing the overcurrent protections required for power lines in the wiring harnesses of Solon. *Decl.*, ¶XXX.

In view of Solon anticipating the need to protect each power line fuses from ambient conditions, a POSITA would have looked to Ba, Ye, and Yen when designing a solar power system because these references disclose in-line fuse assemblies protected from harsh outdoor environmental conditions of solar power applications. *Decl.*, ¶XXX. A POSITA would have been motivated to use the in-line fuse assembly according to the Ba, Ye, and Yen combination for the in-line fuses identified but not described in Solon in order to provide added water proofing and shock proofing that their combination provides. *Decl.*, ¶398.

Because Solon, Ba, Ye, and Yen all involve well-known technologies of wire harnesses and in-line fuse configurations, a POSITA would have had a high expectation of success in modifying the wire harnesses of Solon with in-line fuses of the Ba, Ye, and Yen combination. *Decl.*, ¶400.

1. Claim 10

Preamble

See Ground 3, claim 10(Preamble) for how Solon discloses the claim 1(Preamble). *Decl.*, ¶402.

10(a)

See Ground 3, claim 10(a) for how Solon discloses the limitations of claim element 10(a). *Decl.*, ¶¶403-405.

10(b)

See Ground 3, claim 10(b) for how Solon discloses the limitations of claim element 10(b). *Decl.*, ¶406-408.

10(b)(i)

See Ground 7, claim element 1(a). *Decl.*, ¶¶341-345,409. 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. EX1005, ¶[0013]. Thus, the POSITA would have been motivated to include the in-line fuse assembly taught by the Ba-Ye-Yen combination to the photovoltaic wire harness disclosed by Solon. *Decl.*, ¶408.

10(b)(ii)

See Ground 7, claim elements of 1(b) for how limitations 10(b)(ii) are disclosed in the Ba-Ye-Yen combination. *Decl.*, ¶¶346-357,410.

10(b)(iii)

See Ground 7, claim elements of 1(c) for how limitations 10(b)(iii) are disclosed in the Ba-Ye-Yen combination. *Decl.*, ¶¶359-375,411.

10(b)(iv)

See Ground 7, claim elements of 1(d) for how limitations 10(b)(iv) are disclosed in the Ba-Ye-Yen combination. *Decl.*, ¶¶377-379,412.

Therefore, claim 10 is obvious based on the Solon-Ba-Ye-Yen combination.

2. Claim 11

See Ground 7, claim 2 for how claim 11 limitations are disclosed in the Ba-Ye-Yen combination. Therefore, claim 11 is obvious based on the Solon-Ba-Ye-Yen combination. *Decl.*, ¶414.

3. Claim 12

See Ground 7, claim 3 for how claim 12 limitations are disclosed in the Ba-Ye-Yen combination. Therefore, claim 12 is obvious based on the Solon-Ba-Ye-Yen combination. *Decl.*, ¶415.

4. Claim 13

See Ground 3, claim 13 for how the claim 13 limitations are disclosed in Solon. Therefore, claim 13 is obvious based on the Solon-Ba-Ye-Yen combination. *Decl*., ¶416.

5. Claim 15

Preamble

See Ground 3, claim 15(Preamble) for how Solon discloses this Preamble. *Decl*., ¶¶417-418.

15(a)

See Ground 3, claim element 15(a) for how Solon discloses the 15(a) limitations. *Decl.*, ¶419.

15(b)

See Ground 3, claim element 15(b) for how Solon discloses the 15(b) limitations. *Decl.*, ¶420.

15(b)(i)

See Ground 7, claim element 1(a). *Decl.*, ¶¶341-345,422. 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. EX1005, ¶[0013]. Thus, the POSITA would have been motivated to add the in-line fuse assembly taught by the Ba-Ye-Yen combination to the photovoltaic wire harness disclosed by Solon. *Decl.*, ¶421.

15(b)(ii)

See Ground 7, claim element 1(b) for how the 15(b)(ii) limitations are disclosed in the Ba-Ye-Yen combination. *Decl.*, ¶¶346-357,423.

15(b)(iii)

See Ground 7, claim element 1(c) for how the 15(b)(iii) limitations are disclosed in the Ba-Ye-Yen combination. *Decl.*, ¶¶359-375,424.

15(b)(iv)

See Ground 7, claim element 1(d) for how the 15(b)(iv) limitations are disclosed in the Ba-Ye-Yen combination. *Decl.*, ¶¶377-379,425.

Therefore, claim 15 is obvious based on the Solon-Ba-Ye-Yen combination.

6. Claim 16

See Ground 3, claim 16 for how Solon discloses the limitations of claim 16. Therefore, claim 16 is obvious based on the Solon-Ba-Ye-Yen combination. *Decl.*, ¶¶427-428.

7. Claim 17

See Ground 3, claim 17 for how Ba renders obvious the limitations of claim 17. Therefore, claim 17 is obvious based on the Solon-Ba-Ye-Yen combination. *Decl.*, ¶¶429-430.

8. Claim 18

See Ground 3, claim 18 for how Ba renders obvious the limitations of claim 18. Therefore, claim 18 is obvious based on the Solon-Ba-Ye-Yen combination. *Decl.*, ¶¶431-432.

VI. NO BASIS FOR DISCRETIONARY DENIAL

There is no basis to deny institution under 35 U.S.C. §§ 314(a), 325(d) .

There is parallel court litigation, so Fintiv factors are addressed preliminarily. *Apple v. Fintiv*, IPR2020-00019, Paper 11 (PTAB Mar. 20, 2020))

(precedential). First, if IPR is instituted, Petitioner stipulates to not raise in the parallel District Court proceedings any ground raised or that could have been reasonably raised in the IPR. *Sotera Wireless, Inc., v. Masimo Corp*., No. IPR2020-01019, Paper 12 at 19 (P.T.A.B. Dec. 1, 2020)) (precedential, designated Dec. 17, 2020). Second, a stay was instituted June 5, 2023 in the parallel district court litigation "until the determination of the Commission in the ITC Investigation, including any appeals, becomes final." EX1013, p. 2. Further, Director Vidal has established that the "PTAB will not discretionarily deny petitions based on applying *Fintiv* to a parallel ITC proceeding." Katherine Vidal, *Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation*, USPTO, at 7 (Jun. 21, 2022). Third, there is no trial date set in the parallel litigation as that case is stayed. Fourth, no actions or discovery have happened in the district court litigation. Finally, Petitioner and Shoals are parties in the parallel litigation as identified in the Mandatory Notices.

Discretionary denial is strongly disfavored here because the "same or substantially the same art or arguments" were not presented to the Office, and the Office "erred in a manner material" to patentability by not asserting the Ba, Gilman, Ye, Solon, and Fan prior art. *See Advanced Bionics, LLC v. MED-EL Elektromedizinische Gerate GmbH*, IPR2019-01469, Paper 6, 8-9 (Feb. 13, 2020).

Analysis of this issue is guided by the "*Becton*" factors. *Advanced Bionics* at 9-11.

Ba, Gilman, Ye, Solon, and Fan were not cited in any of the office communications. *See* EX1006. Regarding *Becton* factor (a) (material differences between asserted art and prior art) and (b) (cumulative nature of the asserted art and prior art), Ba, Gilman, Ye, Solon, and Fan are materially different from the combination of references asserted in Office communications. During prosecution, Darr and Yen were asserted in claim rejections for disclosures PO did not to dispute or distinguish, effectively conceding Darr and Yen disclose the limitations for which each was cited by the Examiner and as asserted in this IPR petition. Further, during prosecution, Darr and Yen were not used in any combination with Ba, Gilman, Ye, Solon, or Fan.

Thus, the individual references of Ba, Gilman, Ye, Solon, and Fanare not merely cumulative of references on which the Office relied. Regarding *Becton* factor (d) (extent of overlap), the arguments made in the Grounds do not overlap with rejections made during prosecution.

Even if the Board finds the "same or substantially the same" art or arguments were presented to the Office, discretionary denial under § 325(d) is still not proper because the Office has made a "material error" by not finding and asserting the Ba, Gilman, Ye, Solon, and Fan prior art.

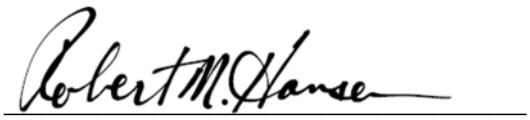
Regarding *Becton* factors (c) (evaluation of art during examination), none of Ba, Gilman, Ye, Solon, and Fan were used in any claim rejections, weighing strongly against exercising discretion. *See Cellco Partnership v. Huawei Device Co.,* IPR2020-01117, Paper 10, 13 (Feb. 3, 2021) . Regarding *Becton* factor (e) (examiner error) and (f) (other facts), this petition specifically points out and explains how Ba, Gilman, Ye, Solon, and Fan disclose the claims limitations.

VII. CONCLUSION

Inter partes review of claims 1-5, 7, 10-13 and 15-18 of U.S. Patent No. 10,553,739 is requested based on the grounds described above.

Respectfully submitted,

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CERTIFICATION OF SERVICE (37 C.F.R. §§ 42.6(e), 42.105(a))

The undersigned hereby certifies that the above-captioned **PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 10,553,739**, Petitioner's power of attorney, and all associated exhibits were served in their entireties on May 8, 2024, on the following party via FedEx:

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CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMITATION

Pursuant to 37 C.F.R. § 42.24 et seq., the undersigned certifies that this Petition complies with the 14,000-word type-volume limitation. The Petition contains 13,671 words according to the word-processing program used to prepare this document (Microsoft Word), excluding figures copied from the prior art, tables of contents and authorities, the listing of the claims, mandatory notices under 37 C.F.R. §42.8, the certificate of service, this certificate of word count, and the exhibits.

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