

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TITEFLEX CORPORATION,
Petitioner,

v.

GOODSON HOLDINGS, LLC,
Patent Owner.

Case IPR2016-00730
Patent 7,562,448 B2

Before KALYAN K. DESHPANDE, JUSTIN T. ARBES, and
KIMBERLY McGRAW, *Administrative Patent Judges*.

McGRAW, *Administrative Patent Judge*.

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

I. INTRODUCTION

In this *inter partes* review, instituted pursuant to 35 U.S.C. § 314, Titeflex Corporation (“Petitioner”) challenges the patentability of claims 1–7 of U.S. Patent No. 7,562,448 B2 (Ex. 1001, “the ’448 patent”), owned by Goodson Holdings, LLC. (“Patent Owner”). We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed below, we determine that Petitioner has shown by a preponderance of the evidence that claims 1–7 of the ’448 patent are unpatentable.

A. *Procedural History*

Petitioner filed a Petition requesting an *inter partes* review of claims 1–7 of the ’448 patent. Patent Owner filed a Preliminary Response. Paper 7 (“Prelim. Resp.”). On September 9, 2016, we instituted an *inter partes* review of claims 1–7 of the ’448 patent on certain asserted grounds of unpatentability. Paper 8 (“Dec. on Inst.”).

After institution of trial, Patent Owner filed a Patent Owner Response (Paper 11, “PO Resp.”) and Petitioner filed a Reply (Paper 14, “Reply”). A consolidated oral hearing for this proceeding and Case IPR2016-00731, involving the same parties and similar issues, was held on May 10, 2017. A transcript of the consolidated hearing has been entered into the record. Paper 19 (“Tr.”).

B. *Related Proceedings*

The parties state the ’448 patent is asserted in a patent infringement lawsuit filed by Patent Owner against Petitioner in the U.S. District Court

for the Northern District of Texas, Dallas Division, captioned *Goodson Holdings, LLC v. Titeflex Corporation*, Civil Action No. 3:15-cv-2153. Pet. 3; Paper 4, 2. The parties also identify Case IPR2016-00731, an *inter partes* review of U.S. Patent No. 7,821,763 B2 (“the ’763 patent”), which is a divisional of the ’448 patent, as a related matter. Pet. 3; Paper 4, 2.

C. The ’448 Patent

The ’448 patent generally relates to “method[s] of preventing electrically induced fires in household gas tubing,” such as corrugated stainless steel tubing (“CSST”), through the use of a “conductive wire [that] provides direct electrical contact between . . . appliance connectors [that are] affixed to the ends of the tubing.” Ex. 1001, Abstract. The conductive ground wire can either be a single wire or multiple strands, such as a wire mesh. *Id.* at 3:29–30.

An embodiment having single conductive grounding wire 601 is shown in Figure 6A, reproduced below.

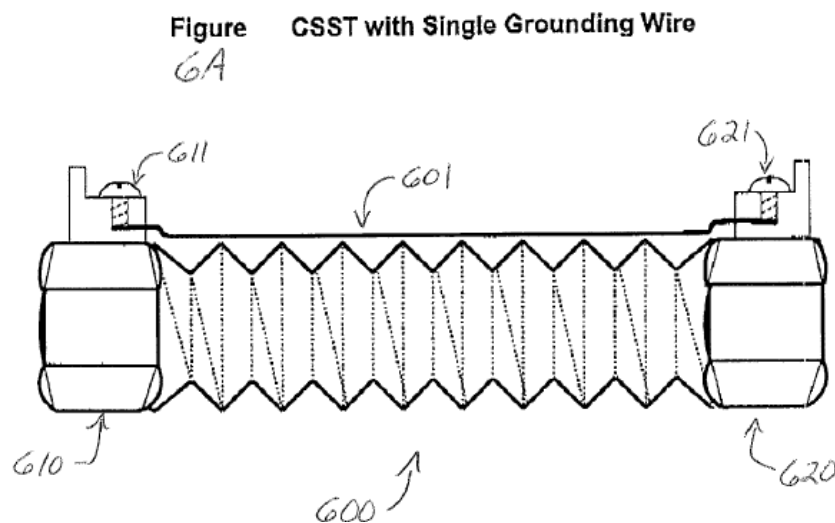
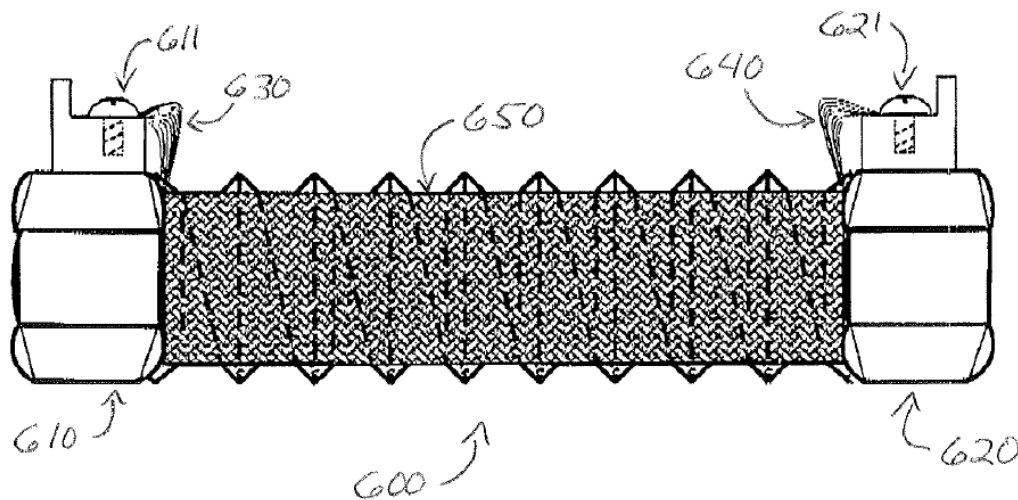


Figure 6A illustrates a CSST having a single “copper ground wire 601 of ~#8 American Wire Gauge (AWG) or larger electrically in parallel with the length of CSST or the appliance connectors 610, 620.” *Id.* at 5:4–9.

“[G]round wire 601 attaches to . . . end connectors 610, 620 at . . . set screws 611, 621 one on each end.” *Id.* at 5:9–11.

An alternative embodiment having “multiple strands of grounding wire” (e.g., a mesh) is shown below in Figure 6B. *Id.* at 5:21–22

Figure 6B CSST with Multiple Strands of Grounding Wire



As shown in Figure 6B above, “CSST flex line 600 is shrouded by . . . wire mesh 650, which is attached to . . . collars 630, 640 on each end.” *Id.* at 5:24–26. Also shown are “brass nuts 610, 620,” which “have collars 630, 640 that protrude from the top.” *Id.* at 5:22–24.

Both embodiments keep “electrical current from damaging the flared ends of the CSST by providing an electrical shunt in the form of copper ground wire between the brass connectors on the ends.” *Id.*, Certificate of Correction dated Mar. 9, 2010. Because “copper is a superior conductor to

CSST, it can safely carry currents that the CSST was never designed to handle.” *Id.* “If an electrical charge goes to ground via the CSST or the appliance connector, such as from a lightning strike or an appliance short, the majority of the current is carried by the conductive wire rather than the CSST or appliance connector itself, thus preventing damage to the CSST from the current.” *Id.* at 3:31–37; *see also id.* at Abstract (stating that “damage to the gas tubing is prevented by the conductive wire and end connectors providing a low resistance electrical path that allows the current to pass over the gas tubing assembly without the gas tubing itself actually having to carry[] the load”). The ’448 patent further explains that for embodiments using a “mesh type shield,” “if the CSST or appliance connector receives an electrical charge from arcing to the side walls, the mesh serves as a current shunt and thus both shunts the current and causes the charge on the actual CSST (or appliance connector) wall to be dissipated over a larger area.” *Id.* at 3:37–42.

D. Illustrative Claim

Petitioner challenges independent claim 1 and dependent claims 2–7.

Claim 1 is reproduced below.

1. A method of preventing electrically induced fires in gas tubing, the method comprising:
 - (a) affixing connectors to each end of the gas tubing, wherein the connectors allow the tubing to be securely coupled to gas lines and appliances, allowing the gas tubing to carry gas between a gas line and an appliance, and wherein the connectors are made of a conductive material; and

- (b) coupling conductive wire to said connectors, wherein the conductive wire provides direct electrical contact between the connectors;
- (c) wherein if an electrical charge goes to ground via the gas tubing, the conductive wire carries the electrical current rather than the gas tubing itself, preventing damage to the tubing from the electrical current.

E. Instituted Grounds of Unpatentability

We instituted *inter partes* review based upon the following asserted grounds of unpatentability:

References	Basis	Challenged Claim(s)
Yamane ¹ and Design Guide ²	§ 103	1–6
Yamane, Design Guide, and Ohki ³	§ 103	7
Ohki and Design Guide	§ 103	1–4, 7
Rivest ⁴ and Yamane	§ 103	1–6
Rivest and Ohki	§ 103	1–4, 7

Dec. on Inst. 29.

¹ Japanese Unexamined Patent Application No. 2003-83482, published March 19, 2003 (Ex. 1019) (“Yamane”).

² Excerpts from Titeflex Corp., Gastite Division, GASTITE SYSTEM DESIGN AND INSTALLATION GUIDE (Jan. 2004) (Ex. 1021) (“Design Guide”). We cite to Exhibit 1021 throughout this Decision. Per our instruction, Dec. on Inst. 13 n.7, 29, Petitioner filed a complete copy of the Design Guide as Exhibit 1028.

³ Japanese Unexamined Patent Application No. 2002-174374, published June 21, 2002 (Ex. 1020) (“Ohki”).

⁴ U.S. Patent No. 7,044,167 B2, filed April 7, 2004, issued May 16, 2006 (Ex. 1006) (“Rivest”).

II. DISCUSSION

A. *Principles of Law*

To prevail in challenging Patent Owner's claims, Petitioner must demonstrate by a preponderance of the evidence that the claims are unpatentable. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time of the invention to a person having ordinary skill in the art. *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). The level of ordinary skill in the art may be reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995).

B. *Claim Construction*

In an *inter partes* review, claim terms in an unexpired patent are given their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142 (2016). There is a “heavy presumption” that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002). However, a

“claim term will not receive its ordinary meaning if the patentee acted as his own lexicographer and clearly set forth a definition of the disputed claim term in either the specification or prosecution history.” *Id.* “Although an inventor is indeed free to define the specific terms used to describe his or her invention, this must be done with reasonable clarity, deliberateness, and precision.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Also, we must be careful not to read a particular embodiment appearing in the written description into the claim if the claim language is broader than the embodiment. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993) (“[L]imitations are not to be read into the claims from the specification.”).

We construe the claim language below in accordance with these principles and to the extent necessary to resolve the controversy. No other terms require express construction. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (stating “only those terms need be construed that in controversy and only to the extent necessary to resolve the controversy”).

1. “(b) coupling conductive wire to said connectors, wherein the conductive wire provides direct electrical contact between the connectors”

Claim 1, step (b) recites “coupling conductive wire to said connectors, wherein the conductive wire provides direct electrical contact between the connectors” (hereinafter “the coupling step”). In our Decision on Institution, we determined, based on the record presented at the time, that the broadest reasonable interpretation of the coupling step, consistent with the specification, was “coupling (i.e., connection) of a conductive wire (i.e., a

wire that conducts electricity) to connectors located at each end of the gas tubing so that the connection allows electricity to flow directly from one connector through the conductive wire to the other connector.” Dec. on Inst. 8–9. In our Decision on Institution, we disagreed with Patent Owner’s argument that the coupling step cannot encompass “a configuration where the ground wire is touching and in electrical contact with the CSST tubing surface, or potentially [where] such contact results from lightning piercing a laminated resin layer, as disclosed by *Yamane* and/or *Ohki*.” *Id.* at 7 (quoting Prelim. Resp. 7).

In its Response, Patent Owner argues that the broadest reasonable construction of the coupling step does “not include coupling the conductive wire such that it is electrically contacting the surface of the CSST even as a result of damage due to a lightning strike, because such would not represent a ‘direct’ electrical connection ‘in parallel’ with the length of the CSST.”

PO Resp. 12–13. Patent Owner frames the claim construction issue as

whether the coupling step of establishing a configuration where the ground wire is touching and in electrical contact with the CSST tubing surface, or potentially such contact results from lightning piercing a laminated resin layer, as disclosed by *Yamane* and/or *Ohki*, is such a “parallel” configuration, or is instead effectively an electrical “short”. The proper construction is that the coupling step requires a parallel configuration and does *not* include such an electrical short.

PO Resp. 13.

Patent Owner also argues that under the broadest reasonable interpretation of the coupling step, the conductive wire cannot be in “close electrical contact” to the gas tubing and the conductive wire cannot be

separated from the inner gas tubing by a resin layer. *See, e.g.*, PO Resp. 1 (stating the '448 patent discloses use of a “‘shunt’ that would not be in close electrical contact with the surface of the tubing (i.e., ‘touching’), even in a failure mode”), 26–27 (describing the resin layer in *Yamane* and *Ohki* as a “design flaw” and stating that the structures shown in the '448 patent “do not employ a resin”); *see also id.* at 5, 10.

To support its proposed construction, Patent Owner states the only structures disclosed in the '448 patent having “direct electrical contact between the connectors” are (1) ground wire 601 shown in Figure 6A, and (2) mesh 650 shown in Figure 6B, and neither of these structures are in contact with the surface of the CSST tube. *Id.* at 12 (stating the mesh of Figure 6B “is not in contact with the surface of the CSST tubing since a space is shown at the top of the diagram between ground wires 650 and the surface of the CSST”). Patent Owner also contends the nature of the electrical contact between the ends of the ground wire and the end connectors is described in the specification as “direct” and electrically “in parallel” and these “are the only disclosed structures for such single ground wires acting as a ‘shunt.’” *Id.* (citing Ex. 1001, 3:27–28, 5:7–8, 5:18–20).

Petitioner responds, *inter alia*, that the coupling step does not include “no touching,” “no close contact,” or “no resin” limitations, and Patent Owner is attempting to import inappropriately a limitation from the specification. Reply 5–12. Petitioner also argues that “[t]he Board’s construction is correct because the specification expressly states that a ‘majority’ of the current goes through the conductive wire” and “even Patent Owner’s expert witness concedes that at least some electrical current will be

carried by the gas tubing.” *Id.* at 13 (citing Ex. 1001, 3:32–41; Ex. 2001 ¶ 2).

We do not agree that the broadest reasonable interpretation of the coupling step (b) of claim 1 does not encompass the conductive wire touching or being in electrical contact with the CSST tubing surface following a lightning strike; being in “close electrical contact” to the gas tubing; or being separated from the inner gas tubing by a resin layer. The claims do not recite any such limitations that would exclude these configurations, and Patent Owner does not identify any statements in the ’448 patent specification that indicate the scope of the claims is limited in the manner proposed by the Patent Owner. Patent Owner does not explain what “close electrical contact” means or provide any definition by which it could be determined whether the distance between components is or is not “close.” Indeed, the conductive wires shown in Figures 6A and 6B of the ’448 patent appear to be in “close electrical contact” with the CSST tube, and Patent Owner does not provide any explanation otherwise. *See, e.g.*, Ex. 1001, Fig. 6A, 6B.

With respect to the “no resin” limitation, even if the structures of the ’448 patent do not employ a resin, it is improper to read limitations from preferred embodiments described in the specification into the claims absent a clear indication in the intrinsic record that the patentee intended the claims to be so limited. *Van Geuns*, 988 F.2d at 1184. Step (b) merely recites “coupling conductive wire to said connectors, wherein the conductive wire provides direct electrical contact between the connectors,” and does not limit what happens to the conductive wire after it is coupled to the connectors

such that it provides direct electrical contact between the connectors, nor what other structures may be present (so long as direct electrical contact is provided).⁵

We are not persuaded by Patent Owner's arguments. Based on the full trial record, we interpret the coupling step to mean "coupling (i.e., connection) of a conductive wire (i.e., a wire that conducts electricity) to connectors located at each end of the gas tubing so that the connection allows electricity to flow directly from one connector through the conductive wire to the other connector."

2. "(c) wherein if an electrical charge goes to ground via the gas tubing, the conductive wire carries the electrical current rather than the gas tubing itself, preventing damage to the tubing from the electrical current"

In our Decision on Institution, we construed claim 1, step (c) to mean that "if the electrical charge goes to ground via the gas tubing, the conductive wire carries a sufficient amount of the electrical current to ground so as to prevent damage to the tubing from the electrical current. The conductive wire need not carry all of the electrical current." Dec. on Inst. 10. Our construction that the conductive wire need not carry all of the electrical current is consistent with the specification of the '448 patent which states that when the CSST tube receives an electrical charge from arcing to

⁵ Patent Owner acknowledged at the hearing that claim 1 permits an insulation layer between the gas tubing and conductive wire, but argued that such a layer cannot be a "resin." See Tr. 48:23–50:12. We see no basis for reading such a distinction into the claim.

the side walls, the mesh will both shunt current as well as cause the actual charge on the CSST to be dissipated over a larger area. *Id.* at 9–10 (citing Ex. 1001, 3:32–41).

Patent Owner contends that this construction is incorrect because “it is not true to the meaning of the claim terms ‘in parallel’ and ‘direct’ with respect to: a ground wire (Fig. 6A) or mesh (Fig. 6B) ‘in parallel’ with the CSST tubing that provides a ‘direct’ connection between the length of the CSST tubing.” PO Resp. 13. Patent Owner contends that these structures of the ’448 patent “are a far superior solution than that proposed in *Yamane* and *Ohki* and *Rivest* which are not ‘parallel’ configurations.” *Id.* at 13–14.

Patent Owner also argues that in a parallel circuit (such as that disclosed in the ’448 patent), some residual current will still exist on the CSST even in the presence of a shunt. *Id.* at 14 (citing Ex. 2001 ¶ 97). Therefore, Patent Owner asserts that

when the specification references the same thing by saying that current will be shunted over the mesh “as well as . . . on the CSST wall”, this does not mean that the wire or mesh should touch or be in close electrical contact with the surface of the CSST which would not be a shunt structure. These statements in the specification are to recognize the residual current on the CSST even with a shunt structure, and does not imply an electrical “short” is also includ[ed] in the coupling step. (See Dr. Icové Decl. at ¶ 97, Ex. 2001.)

PO Resp. 14.

Patent Owner’s arguments are not persuasive. Patent Owner’s reference to the specification of the ’448 patent fails to acknowledge the language stating that charge on the CSST is dissipated over a larger area. Specifically, the ’448 patent expressly states that in the event of arcing from

the side wall, the mesh will serve “as a current shunt [that] *both* shunts the current” as well as “causes the charge on the actual CSST . . . wall to be dissipated over a larger area.” Ex. 1001, 3:36–41 (emphasis added).

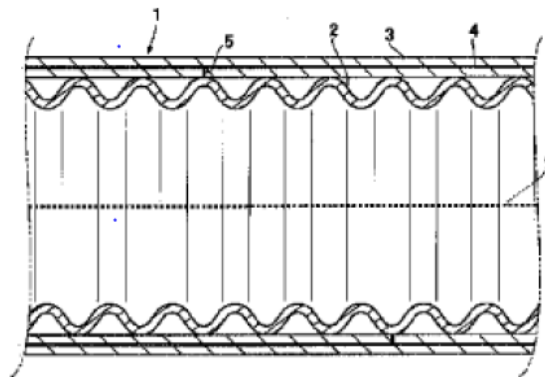
Based on the full trial record, we interpret claim 1 step (c) to mean that “if the electrical charge goes to ground via the gas tubing, the conductive wire carries a sufficient amount of the electrical current to ground so as to prevent damage to the tubing from the electrical current. The conductive wire need not carry all of the electrical current.”

*C. Obviousness of Claims 1–6 over
Yamane and the Design Guide*

Petitioner asserts claims 1 through 6 of the ’448 patent are unpatentable under 35 U.S.C. § 103 as obvious over Yamane in combination with the Design Guide, relying on declaration testimony of Vladimir A. Rakov, Ph.D. Pet. 4, 26–39 (citing Ex. 1026). Patent Owner opposes, relying on declaration testimony of David J. Icove, Ph.D. PO Resp. 25–29, 31–33 (citing Ex. 2001). Having considered the parties’ contentions and supporting evidence, we determine that Petitioner has shown by a preponderance of the evidence that claims 1 through 6 are unpatentable under 35 U.S.C. § 103 over Yamane and the Design Guide.

1. Yamane

Yamane, entitled “Lightning-Proof Tubing,” describes various embodiments of covered corrugated stainless steel tubing “capable of withstanding a discharge during a lightning strike without damage to the tube body.” Ex. 1019, Abstract, ¶¶ 2, 7, 21. To prevent damage to the tube body from lightning strikes, Yamane teaches covering tube body 2 with insulating cover layer 3 that has a wire or band shaped conductive member 4 integrated in the cover layer. *Id.* ¶¶ 5, 20. Figure 1 of Yamane is reproduced below.



[FIG. 1]

Figure 1 of Yamane depicts a lightning-proof tubing comprising tube body 2, insulating cover layer 3 that covers the outer peripheral region of tube body 2, and wire- or band-shaped conductive members 4. *Id.* ¶ 20. In one embodiment, conductive members 4 are located in the interior of, or the outer face of, the insulating cover layer, but are connected directly to the connecting joint. *Id.* ¶¶ 10, 22. Yamane explains that even if the insulating cover layer is damaged by a lightning strike, most of the lightning current “is guided from the conductive member, through the connecting joint, and then through the electroconductive equipment to the ground, and energy does not

concentrate at one point in the tube body, so there is virtually no effect on the tube body.” *Id.* ¶¶ 24, 36. In another embodiment, conductors 5 electrically connect the conductive members to the tube. *Id.* ¶¶ 11, 22. Yamane also states that insulating cover layer 3 may be a resin. *Id.* ¶ 28 (stating that “[i]f the insulating cover layer 3 is constituted by a resin material, this reinforces . . . tube body 2 and makes it more bendable”); *see also* claim 4 (dependent claim limiting the insulating cover layer to be “constituted by a resin material”).

2. Design Guide

The Design Guide is a document that provides a “user with general guidance when designing and installing fuel gas piping using Gastite® Flexible Gas Piping.” Ex. 1021, 1. Relying upon the declaration testimony of Mark Harris (Ex. 1024), Petitioner contends that the Design Guide was published in January 2004 and qualifies as prior art under § 102(b). Pet. 25.

In our Decision on Institution, we found that Petitioner made a threshold showing that the Design Guide is a prior art printed publication under § 102(b). Patent Owner does not argue in its Response that the Design Guide is not a printed publication. *See* PO Resp. After considering the evidence and argument on the full record, we find the Design Guide qualifies a prior art printed publication under § 102(b).

Petitioner has shown that the Design Guide was sufficiently accessible to the public interested in the art more than one year before July 18, 2005, the filing date of the application that gave rise to the ’448 patent. *See In re Cronyn*, 890 F.2d 1158, 1160 (Fed. Cir. 1989) (stating that to qualify as a printed publication, a document must have been sufficiently accessible to the

public interested in the art before the critical date); Ex. 1001, [22]. “A reference is publicly accessible ‘upon a satisfactory showing that such document has been disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art exercising reasonable diligence, can locate it.’” *Kyocera Wireless Corp. v. ITC*, 545 F.3d 1340, 1350–51 (Fed. Cir. 2008). Mr. Harris, business development manager for the Gastite Division of Petitioner, testifies that Exhibit 1021 is a “true and correct copy of excerpts from the January 2004 Gastite Design and Installation Guide,” that the complete Design Guide “was published and made available to the public during or before January 2004 through Gastite’s website, www.gastite.com, through Gastite’s distributors, through Gastite’s certification and training programs, and directly from Gastite upon request.” Ex. 1024 ¶ 2. For these reasons, we determine that the Design Guide qualifies as a printed publication.

The Design Guide provides instructions for the installation and grounding of corrugated stainless steel tubing using the Gastite Flexible Gas Piping system, which uses CSST flexible gas piping to supply gas or liquefied petroleum to appliances. Ex. 1021, 2–4. The Design Guide explains that the CSST gas supply system should be bonded to ground, stating “each above ground portion of a gas piping system which is likely to become energized shall be electrically continuous and bonded to a designed, permanent, low impedance effective ground fault current path.” *Id.* at 63. The “tubing is connected using special mechanical brass fittings.” *Id.* at 3, 5 (“Straight Fittings connect the flexible gas piping to gas supply, distribution manifolds or gas appliances.”), 46, 91 (stating the “Fitting adapter, bushings

and nut” and “Mechanical Joint Fitting” are made of “CA360 Brass”), Fig. 4–31 (illustration of corrugated tubing with connectors on both ends).

3. Level of Ordinary Skill in the Art

Section 103(a) forbids issuance of a patent when “the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.”

KSR, 550 U.S. at 406 (quoting 35 U.S.C. § 103(a)). Petitioner argues that a person of ordinary skill in the art “would have been familiar with basic concepts of lightning-protection,” and such familiarity would have come from “an undergraduate degree in electrical engineering or [a] comparable subject,” or “one to three years of practical work experience designing and installing lightning-protection systems.” Pet. 12 (citing Ex. 1026 ¶¶ 66–67). Patent Owner does not propose a different level of ordinary skill in its Response. Based on our review of the ’448 patent, the types of problems and solutions described in the ’448 patent and cited prior art, and the testimony of the parties’ declarants, we agree with Petitioner’s assessment of the level of ordinary skill in the art.

4. Claim 1

Claim 1 is directed to a “method of preventing electrically induced fires in gas tubing.” In general, the claim recites (a) affixing conductive connectors to each end of the gas tubing to allow the tubing to be securely coupled to, and carry gas between, gas lines and appliances, (b) coupling the conductive wire to the connectors wherein “the conductive wire provides direct electrical contact between the connectors,” and (c) “if an electrical

charge goes to ground via gas tubing, the conductive wire carries the electrical current rather than the gas tubing itself, preventing damage to the tubing from the electrical current.”

Petitioner explains how the combination of Yamane and the Design Guide teaches each of the limitations of claim 1. Petitioner argues that Yamane teaches a “lightning-proof tubing” for use in “an internal gas pipe system used for supplying gas” that would prevent electrically induced fires. Pet. 27–28 (citing Ex. 1019 ¶¶ 3, 18; Ex. 1026 ¶ 115) (emphasis omitted). The tubing has connectors affixed to each end that secure the tubing to gas lines and appliances and allow the tubing to carry gas between the gas line and the appliances. *Id.* at 28 (citing Ex. 1019 ¶ 18; Ex. 1026 ¶¶ 108, 117–121). Petitioner also asserts one of ordinary skill in the art would have known, based on the disclosures of Yamane and the Design Guide, that the connecting joint of Yamane is made of a conductive material. *Id.* at 29–30 (citing Ex. 1019 ¶ 36; Ex. 1026 ¶¶ 122–126; Ex. 1021, 3, 5, 91).

Petitioner also asserts that Yamane’s disclosure of “conductive members 4 [that] may be connected directly to the connecting joint” teaches coupling conductive wire to connectors to provide a direct electrical contact between the connectors as recited in claim 1, step (b). *Id.* at 32 (emphasis omitted); Ex. 1019 ¶¶ 22, 24; Fig. 1; *see also* Ex. 1019 ¶ 36 (stating that lightning current “is guided from the conductive member, through the connecting joint, and then through the electroconductive equipment to the ground”); Ex. 1026 ¶ 249 (stating the Yamane device “would work only if the external conductive members are electrically coupled to the end connectors of the gas tubing”).

Regarding step 1(c), Petitioner again cites Yamane's teaching that "[m]ost of the lightning current produced by a discharge during a lightning strike is guided from the conductive member, through the connecting joint, and then through the electroconductive equipment to the ground, and energy does not concentrate at one point in the tube body, so there is virtually no effect on the tube body." Ex. 1019 ¶¶ 24, 36, 37; *see* Pet. 34–35.

Petitioner further asserts it would have been obvious to one ordinarily skilled in the art, based on the disclosure of Yamane, to configure the Yamane device to guide all current through the conductive wire because Yamane teaches that the conductive member can be either in the interior of the insulating cover layer or on the outer face of the insulating cover layer, thereby being electrically isolated from the inner metal tubing. Pet. 36; Ex. 1019 ¶ 20; Ex. 1026 ¶ 144. Petitioner, relying upon the testimony of Dr. Rakov, explains "[o]ne of ordinary skill in the art would have known that the connecting joints could be electrically isolated from the gas tubing," which "would electrically isolate the gas tube and, in some circumstances, force all objectionable electrical current through the Yamane conductive members." Pet. 36; Ex. 1026 ¶ 144.

Petitioner has shown that the combination of Yamane and the Design Guide teaches all of the claim limitations and has articulated sufficient reasoning for why a person of ordinary skill in the art would have combined the teachings of the references. For the reasons explained below, we are not persuaded by Patent Owner's arguments to the contrary. *See, e.g.*, PO Resp. 25–29. Patent Owner's arguments are mainly premised on its proposed interpretations of the coupling step and step (c) of claim 1, with which we

disagree for the reasons explained above. *See supra* Section II.B. Further, even if claim 1 had “no touching,” “no close contact,” and “no resin” limitations, as Patent Owner contends, we are persuaded that Yamane teaches the limitations, for the reasons explained below.

Patent Owner first argues that Yamane does not teach coupling step of claim 1(b) because Yamane does not teach “a ground wire not touching the surface of the CSST tubing, thereby creating an electrical path ‘in parallel’ with the surface of the CSST tubing which ‘directly’ connects the end connectors on either side of the CSST tubing run to create the electrical shunt.” *Id.* at 28. Patent Owner also contends that Yamane is designed to “short” the conducting layer by physically connecting the conductive layer with the surface of the CSST and that Yamane’s design is the “exact opposite of a ‘direct electrical contact’ . . . as claimed in the ’448 Patent.” *Id.* at 5–6.

These arguments are not persuasive. Yamane’s conductive member 4, which is connected to end connectors, may be on the outer face of the insulating cover layer, in which case the conductive wire would not touch the surface of the CSST tubing and would create an electrical path in parallel with the surface of the CSST tubing. *See, e.g.*, Ex. 1019 ¶ 5; Ex. 1026 ¶ 144; Reply 13–15. Yamane teaches a “lightning-proof tubing that can be electrically connected to a piece of electroconductive equipment, wherein the outer peripheral region of a tube body . . . is covered with an insulating cover layer.” Ex. 1019 ¶ 5. A “wire- or band- shaped conductive member that is integrally provided in said insulating cover layer over the longitudinal

region of the tubing can be electrically connected to the electroconductive equipment.” *Id.*

Patent Owner also contends that even if the disclosed conductive wire of Yamane “is a better conductor than the metal surface of the CSST, some current will necessarily flow through the available path from the wire” as a result of the “physical connection such as shunt 5 in Fig. 1, 2 or 3 in *Yamane*.” PO Resp. 24. Patent Owner asserts that “[s]uch path has a significant resistance, and as such, resistive heating can be sufficient in many circumstances to cause a puncture failing in CSST tubing.” *Id.* at 25; Ex. 2001 ¶ 120. This argument is not persuasive, as Yamane also discloses embodiments lacking conductor 5 in which the conductive wire is connected directly to the connecting joint. *See, e.g.*, Ex. 1019 ¶ 29 (stating that if “conductive members 4 integrally provided in . . . insulating cover layer 3 are electrically connected to . . . tube body 2 by a connecting joint, this allows lightning current to be conducted and dispersed to . . . tube body 2 without the need for a separate conduction means”); *see also id.*, claim 7, ¶¶ 22, 36; Ex. 1026 ¶¶ 128–130; Reply 13–15. The conductive wire does not touch the tubing because the wire is in or on an insulating layer that surrounds the tubing. Ex. 1019 ¶ 5 (“the outer peripheral region of a tube body constituted by a conductive material is covered with an insulating cover layer, and a wire- or band-shaped conductive member that is integrally provided in said insulating cover layer over the longitudinal region of the tubing can be electrically connected to the electroconductive equipment”).

Patent Owner also attempts to distinguish claim 1 from Yamane by stating Yamane’s resin layer is a “design flaw” that could lead to fire as a

result of lightning piercing the resin layer and allowing the creation of an electrical connection between the conducting layer and the surface of the CSST, and “[s]uch flaws are not present in the coupling step of claim 1(b).” PO Resp. 1–2, 5–6, 10, 26–27 (citing Ex. 2001 ¶¶ 116–120, 127, 155).

These arguments are not persuasive for a number of reasons. First, Yamane does not require that the insulating cover layer be a resin layer. *See, e.g.*, Ex. 1019, claim 4 (dependent claim limiting the insulating cover layer to be “constituted by a resin material”); *see also id.* ¶ 28 (“If the insulating cover layer 3 is constituted by a resin material, this reinforces . . . tube body 2 and makes it more bendable.” (emphasis added)). Second, claim 1 does not exclude the use of a resin layer. *See supra* Section II.B; Reply 16 n.6. Third, Patent Owner has not provided persuasive evidence that a lightning strike to a CSST tube as disclosed in Yamane would result in “catastrophic failure,” as none of the cited evidence relates to a CSST tube having a conductive wire as disclosed by Yamane. *See, e.g.*, Ex. 2001 ¶ 127 (citing to a video as evidence that a “configuration similar to that disclosed by Yamane and Ohki burst into flames when tested in laboratory conditions”); Tr. 27:14–28:6 (admitting that the video is not an embodiment of Yamane).

Accordingly, we are persuaded that Yamane and the Design Guide teach all of the limitations of claim 1, and that a person of ordinary skill in the art would have had reason to combine their teachings to achieve the recited method.

As part of our obviousness analysis, we consider the evidence and arguments submitted by Patent Owner regarding secondary considerations of nonobviousness. *See Graham*, 383 U.S. at 17–18.

Secondary Considerations

Factual inquiries for an obviousness determination include secondary considerations based on evaluation and crediting of objective evidence of nonobviousness. *Graham*, 383 U.S. at 17–18. Notwithstanding what the teachings of the prior art would have suggested to one with ordinary skill in the art at the time of the invention, the totality of the evidence submitted, including objective evidence of nonobviousness, may lead to a conclusion that the challenged claims would not have been obvious to one with ordinary skill in the art. *In re Piasecki*, 745 F.2d 1468, 1471–72 (Fed. Cir. 1984). Secondary considerations may include any of the following: long-felt but unsolved needs, failure of others, unexpected results, commercial success, copying, licensing, and industry praise. *See Graham*, 383 U.S. at 17; *Leapfrog Enters., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1162 (Fed. Cir. 2007).

To be relevant, evidence of nonobviousness must be commensurate in scope with the claimed invention. *In re Kao*, 639 F.3d 1057, 1068 (Fed. Cir. 2011). The proponent of secondary considerations evidence “must establish a nexus between the evidence and the merits of the claimed invention.” *Rambus Inc. v. Rea*, 731 F.3d 1248, 1256 (Fed. Cir. 2013). “Nexus” is “a legally and factually sufficient connection between the [objective evidence] and the patented invention, such that the objective evidence should be considered in the determination of nonobviousness.” *Demaco Corp. v.*

F. Von Langsdorff Licensing Ltd., 851 F.2d 1387, 1392 (Fed. Cir. 1988).

The burden of showing that there is a nexus lies with Patent Owner. *In re Paulsen*, 30 F.3d 1475, 1482 (Fed. Cir.1994).

In its Response, Patent Owner argues the secondary considerations of long-felt need, failure of others, and industry recognition⁶ demonstrate non-obviousness.⁷ PO Resp. 31–33. Patent Owner relies on the declaration of Dr. Icove in support of its contentions. *See* Ex. 2001 ¶¶ 35–37, 48, 50, 51, 161.

We have considered the evidence of obviousness of claim 1 set forth above in conjunction with the arguments and evidence of secondary considerations, and conclude that on balance, the secondary considerations evidence does not outweigh the strong evidence of obviousness.

First, Patent Owner has failed to provide persuasive evidence of a nexus between the asserted considerations and the claimed invention of the ’448 patent. Indeed, Patent Owner does not address specifically the issue of nexus in its Response. *See* PO Resp. 31–33. At the oral hearing, however, Patent Owner asserted that nexus is provided “by the general counsel of Omega Flex,” a “competitor of [Petitioner],” who “put[] up [a] slide” at a City Council hearing of Lubbock, Texas identifying the ’448 and ’763 patents and stating that “[Patent Owner] has a monopoly on a solution that

⁶ Patent Owner also lists “copying” as a secondary consideration of obviousness (PO Resp. 31) but does not provide any evidence or argument directed to copying.

⁷ The parties’ arguments with respect to secondary considerations are directed to claims 1–7 collectively. *See* PO Resp. 31–33; Reply 19–24.

could meet the higher standard,” which would require an “increased threshold of 85 Coulombs [that] would be required to eliminate CSST perforation at the 95 percentile.” Tr. 29:11–30:21; Ex. 2001 ¶ 50. However, a slide and testimony identifying a lawsuit involving the ’448 patent and the ’763 patent, without providing any link between any alleged novel aspects of the patented invention and asserted secondary considerations, does not establish the requisite nexus.

Similarly, we are not persuaded that the paragraphs of Dr. Icove’s declaration cited in Patent Owner’s Response demonstrate the requisite nexus. PO Resp. 31–33 (citing Ex. 2001 ¶¶ 35–37, 48, 50, 51, 161). None of the paragraphs, other than paragraph 161, even mention the claimed invention. See Ex. 2001 ¶¶ 35–37, 48, 50, 51. Dr. Icove states in paragraph 161 that “[m]anufacture[r]s of CSST have recognized Goodson’s advancement over prior art and have begun commercial realizations of his embodiment” and that the “CSST industry has ab[a]ndoned its prior products based on *Yaman[e]*, *Ohki*, and *Rivest* and replaced them with products embodying Goodson’s design.” Ex. 2001 ¶ 161. Dr. Icove does not cite any supporting evidence for these statements. Therefore, his testimony has little probative value. See *Am. Acad. of Sci.*, 367 F.3d at 1368. As such, Dr. Icove’s conclusory assertions do not provide a sufficient connection between the submitted objective evidence and the claimed invention, and so do not establish the nexus required for evidence of secondary considerations.

Second, even if Patent Owner had shown a nexus, Patent Owner’s substantive arguments regarding secondary considerations are not

persuasive. With respect to long-felt need and failure of others, Patent Owner contends that a prior art “CSST ‘yellow’ jacket product with only an insulation layer as the cover” had “a protective rating of less than 1 Coulomb,” and “failed numerous times and caused personal injury and property damage.” PO Resp. 31 (citing Ex. 2001 ¶¶ 35–37; Ex. 2028). According to Patent Owner, “studies as early as 1972 have advocated for CSST protection at the 95% level of expected charge related to a lightning strike and such protection would be in the 85 Coulomb range.” *Id.* at 31–32 (citing Ex. 2001 ¶¶ 35–37, 48; Ex. 2028; Ex. 2021). Patent Owner further argues that there has “been a long-felt need in the industry for much better protection for CSST than the prior art,” including “the ‘original yellow’ jacket product.” *Id.* at 32 (citing Ex. 2006). Patent Owner states “Dr. Icove opines unequivocally that the solution is the Goodson ’448 Patent, and that the industry has abandoned prior art products.” *Id.* (citing Ex. 2001 ¶ 161).

Patent Owner’s arguments are not persuasive of long-felt need and failure of others. The 1972 study (Ex. 2021) that Patent Owner contends “advocated for CSST protection at the 95% level of expected charge related to a lightning strike” relates to the impact of lightning strikes on “engineering systems” and does not mention CSST or gas tubing. A study discussing the impact of lightning on engineering systems does not show a long-felt need related to the invention disclosed and claimed in the ’448 patent, which relates to a method of preventing electrically induced fires in gas tubing. Nor are Patent Owner’s arguments relating to the failure of the “original ‘yellow’ jacket product” persuasive. *See* PO Resp. 31–33. Patent Owner does not explain the circumstances under which anyone tried but

failed to solve the alleged problems with CSST, and does not provide argument or evidence that makes a connection between any failure of others and any alleged novel aspect of the '448 patent. Moreover, Patent Owner has not provided explanation or evidence that the claimed invention “satisfied a long-felt and unmet need.” *Perfect Web Techs., Inc. v. InfoUSA, Inc.*, 587 F.3d 1324, 1332 (Fed. Cir. 2009) (emphasis added). For example, Patent Owner has not provided any evidence (e.g., experimental evidence) that the claimed invention provides CSST protection at the 95% level of expected charge related to a lightning strike. *See, e.g.*, PO Resp. 31–33. To the contrary, Patent Owner asserts that the alleged problems with CSST had not been solved even years after the '448 patent issued. *Id.* at 32 (citing Ex. 2006, published in 2011).

Patent Owner also contends the “CSST industry is moving to adopt stricter CSST standards . . . and has recognized the contribution of [Mark E. Goodson, the inventor of the '448 patent] and he has provided information to the building code hearings recently held in Lubbock, Texas and the '448 Patent was referenced during the hearings.” *Id.* at 32–33. Dr. Icove states that testimony at the city council meeting “referenced that Goodson has advised the model code committee.” Ex. 2001 ¶ 50. However, Patent Owner does not explain in any detail how Mr. Goodson’s advice to a model code committee, or other comments made at the meeting, constitute evidence of industry praise. *See In re Cree, Inc.*, 818 F.3d 694, 702 (Fed. Cir. 2016) (discounting self-recognition of inventor’s own work as “self-serving statements”). Similarly, Patent Owner does not persuasively explain how identification of the '448 patent constitutes industry praise of the patent,

let alone industry praise for any novel or nonobvious aspects of the patent. Finally, Patent Owner does not explain how comments made at a city council meeting can be considered recognition in the CSST “industry.” *See* Reply 23.

We have considered all of Patent Owner’s evidence of non-obviousness and find it unpersuasive. Accordingly, when we balance Petitioner’s strong evidence of obviousness against Patent Owner’s alleged objective evidence of nonobviousness, we determine that a preponderance of the evidence supports Petitioner’s position that claim 1 is unpatentable under 35 U.S.C. § 103 over Yamane and the Design Guide.

5. Claims 2–6

Relying on the testimony of Dr. Rakov, Petitioner argues that claims 2 through 6, which depend directly or indirectly from claim 1, are unpatentable over Yamane and the Design Guide. We have reviewed the evidence and Petitioner’s arguments, and determine that Petitioner has shown where each of the limitations of claims 2 through 6 is taught by Yamane or the Design Guide, and has articulated a sufficient rationale for combining the teachings of the prior art.

Both Yamane and the Design Guide disclose “gas tubing [that] comprises Corrugated Stainless Steel Tubing (CSST)” as required by claim 2. *See, e.g.*, Ex. 1019 ¶ 16 (stating “tube body 2 is composed of a flexible metal conductive member . . . consisting of stainless steel,” and the “tube walls consist of a bendable corrugated tubing [having a] corrugated shape”);

Ex. 1021, 3 (stating the system “uses corrugated stainless steel tubing (CSST)”); *see also* Ex. 1021, 2, 4.

The Design Guide teaches connectors (connective fittings) made of brass as required by claim 3. *See, e.g.*, Ex. 1021, 3, 5, 91. We are persuaded by Petitioner’s arguments and evidence, including Dr. Rakov’s unrebutted testimony, that one of ordinary skill in the art would have known that brass fittings were “commonly used in lightning protection systems because brass is a copper alloy” that is “highly conductive, relatively inexpensive, and as resistive to corrosion as copper,” and that it would have been an obvious design choice to use brass connective fittings for the connective joints in the Yamane lightning-proof tubing. Ex. 1026 ¶¶ 152–155; *see also* Ex. 1001, 4:46–51 (stating prior art corrugated gas tubing “often” used brass fittings); Ex. 1002, 55.

With respect to claims 4–6, claim 4 requires that the “conductive wire is made of copper” and claim 5 requires that the “copper wire is approximately number 8 America Wire Gauge (AWG) or larger.” We are persuaded by Dr. Rakov’s unrebutted testimony that it would have been an obvious design choice to use copper wire of approximately 8 AWG as the conductive members in Yamane’s lightning-proof tubing. Dr. Rakov testifies that copper wire was commonly used in lightning protection systems because copper wire is “highly conductive, resistant to corrosion, and relatively inexpensive,” that “heavy gauge copper wires are commonly used for current diversion and bonding in lightning protection systems,” and that “smaller gauge wire likely would not be able to carry lightning current.” Ex. 1026 ¶¶ 157–162; Ex. 1002, 55, 191–192. Further, Yamane’s disclosure that

“there may be only one conductive member” teaches the limitation of claim 6 requiring that the “conductive wire comprise a single wire.” Ex. 1019 ¶ 20.

Patent Owner does not argue separately the patentability of dependent claims 2 through 6. *See* PO Resp. 27–28. Having considered the parties’ contentions and supporting evidence, including evidence of secondary considerations of nonobviousness submitted by Patent Owner, we determine that Petitioner has shown by a preponderance of the evidence that claims 2 through 6 are unpatentable under 35 U.S.C. § 103 over Yamane and the Design Guide.

*D. Obviousness of Claims 1–4 and 7 over
Ohki and the Design Guide*

Petitioner contends claims 1 through 4 and 7 are unpatentable under 35 U.S.C. § 103 as obvious over Ohki in combination with the Design Guide. Pet. 42–50. Relying on the testimony of Dr. Rakov, Petitioner explains how Ohki and the Design Guide teach the limitations of the challenged claims. *Id.* (citing Ex. 1026). Having considered the parties’ contentions and supporting evidence, including evidence of secondary considerations of nonobviousness submitted by Patent Owner, we determine that Petitioner has shown by a preponderance of the evidence that claims 1 through 4 and 7 are unpatentable under 35 U.S.C. § 103 over Ohki and the Design Guide.

1. Ohki

Ohki, like Yamane, is entitled “Lightning-Proof Tubing,” and describes various embodiments of covered corrugated stainless steel tubing

“capable of withstanding a discharge during a lightning strike without damage to the tube body.” Ex. 1020, Abstract, ¶¶ 2, 7, 16. The corrugated steel tubing is used to carry gas and is connected to electroconductive equipment by “an ordinary connecting joint.” *Id.* ¶¶ 2, 16. To prevent damage to the tubing from lightning strikes, Ohki teaches covering the tube with conductive cover layer 3 that can be a metal mesh. *Id.* ¶ 26. Figure 2 of Ohki discloses an “insulation layer” between the conductive layer and the inner tube body that prevents electrical conduction between the two. *Id.* Figure 2 of Ohki is reproduced below.

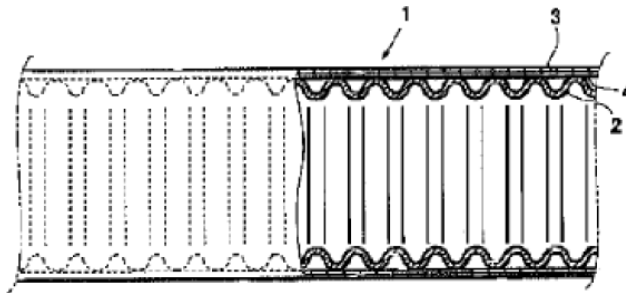


Figure 2 depicts lightning-proof tubing 1, having tube body 2, conductive layer 3, and insulation layer 4 that is laminated over the inner peripheral face of conductive layer 3. Ex. 1020 ¶¶ 25–26. “[T]he insulation layer 4 prevents electrical conduction between the tube body 2 and the conductive cover layer 3, and conduction between the tube body 2 and the conductive layer 3 may be accomplished by [] a connecting joint between the lightning-proof tubing 1 and the electroconductive equipment.” *Id.* ¶ 26. Conductive cover layer 3 may be “constituted by a conductive polymer,” “may be a conductive resin,” “or it can be constituted by a metal film or a metal mesh.” *Id.* ¶¶ 17, 26.

2. Claim 1

Petitioner explains how the combination of Ohki and the Design Guide teaches each of the limitations of independent claim 1. Pet. 42–48. Petitioner argues that Ohki is “directed to preventing electrically induced fires in gas tubing,” as it teaches that “current from a lightning strike goes to ground via a conductive cover layer,” thereby keeping the current off the gas tube and protecting the tube from damage. *Id.* at 42 (citing Ex. 1020 ¶¶ 3–4, 17, 19, 26; Ex. 1026 ¶ 173). Ohki teaches connecting gas tubing to electroconductive equipment via a conductive “ordinary connecting joint.” *Id.* at 43–44 (citing Ex. 1020 ¶¶ 16, 31, 19, claim 8; Ex. 1026 ¶¶ 175, 177).

Petitioner further asserts that one ordinarily skilled in the art would have known, based on the disclosure of the Design Guide, that the connectors of Ohki are made of a conductive material and are typically affixed to both ends of corrugated gas pipe (Pet. 43; Ex. 1021 ¶ 46, 63, Figs. 4–31; Ex. 1026 ¶ 177), that the purpose of gas tubing was to carry gas between a gas line and an appliance, and that connectors (e.g., end fittings) are used to securely couple the tubing to gas lines and appliances (Pet. 43; Ex. 1021 ¶¶ 65, 67).

Petitioner asserts that Ohki teaches the coupling step of claim 1(b), as Ohki teaches a metal mesh conductive cover layer, which is a type of conductive wire, that is coupled to connective fittings on the end of the corrugated gas tubing. Pet. 44–45; Ex. 1020 ¶ 17 (stating the conductive cover layer can be “connected directly to the connecting joint”). Petitioner also states the conductive cover layer/metal mesh of Ohki provides “direct electrical contact between the connectors” on the ends of the tubing, as the

mesh is connected directly to the connecting joint and lightning current is guided “from the conductive cover layer 3, through the connecting joint, then through the electroconductive equipment, and to ground.” Pet. 45–46 (emphasis omitted) (quoting Ex. 1020 ¶ 19); *see also* Ex. 1026 ¶¶ 187–92 (stating the conductive wire of Ohki must provide direct electrical contact between the connectors, otherwise all of the current would travel to ground through the gas tubing as opposed to going through the conductive layer/metal mesh).

Petitioner also explains that Ohki teaches step (c) of claim 1, as Ohki teaches that “[m]ost of [the lightning current] is guided from the conductive cover layer, through the connecting joint, then through the electroconductive equipment, and to the ground,” and that the “tube body will be able to withstand a discharge during a lightning strike without being damaged.” Pet. 46–47 (quoting Ex. 1020 ¶ 31–32) (emphasis omitted); Ex. 1026 ¶¶ 196–99.

We have reviewed the evidence and argument and find that Petitioner has shown where each of the limitations of claim 1 is taught by Ohki or the Design Guide and has articulated a sufficient rationale for combining the teachings of the prior art. Again, Patent Owner’s arguments are premised mainly on its proposed claim interpretations, with which we disagree, *see supra* Section II.B, and even if Patent Owner’s proposed interpretations were adopted, we are persuaded that Ohki teaches the disputed limitations.

Patent Owner first argues that Ohki does not teach the coupling step (b) of claim 1 because Ohki does not teach a ground wire or mesh not touching the surface of the CSST tube. PO Resp. 28–29 (citing Ex. 2001

¶¶ 145–156). Patent Owner also contends that Ohki, like Yamane, is designed to “short” the conducting layer by physically connecting the conductive layer with the surface of the CSST and that Ohki’s design is the “exact opposite of a ‘direct electrical contact’ . . . as claimed in the ’448 patent. *Id.* at 5–6.

These arguments are not persuasive because Ohki does teach a ground wire not touching the surface of the CSST tube. Ohki teaches an “insulation layer” between the conductive layer (mesh) and the inner tube body that “prevents electrical conduction” between the two. Pet. 48; Ex. 1020 ¶ 26. Petitioner has provided persuasive argument and evidence that in such an embodiment, the tube and the conductive wire are isolated from each other. Pet. 48; Ex. 1026 ¶ 202.

Patent Owner also attempts to distinguish claim 1 from Ohki by arguing that Ohki’s resin layer is a “design flaw” that could lead to fire as a result of lightning piercing the resin layer and allowing the creation of an electrical connection between the conducting layer and the surface of the CSST, and “[s]uch flaws are not present in the coupling step of claim 1(b).” PO Resp. 1–2, 5–6, 10, 26–27 (citing Ex. 2001 ¶¶ 116–120, 127, 155).

These arguments are not persuasive for a number of reasons. First, Ohki does not require that the conductive cover layer be a resin layer. *See, e.g.*, Ex. 1020 ¶ 17 (stating that the conductive cover layer “may” be a resin). Additionally, Ohki discloses use of an insulation layer between the conductive layer and the CSST tube that would prevent a direct electrical connection between the conducting layer and the surface of the CSST. *See* Ex. 1020, Fig. 2, claim 4. Second, claim 1 does not exclude the use of a

resin layer. *See supra* Section II.A. Third, Patent Owner has not provided persuasive evidence that a lightning strike to a CSST tube as disclosed in Ohki would result in “catastrophic failure,” as none of the cited evidence relates to a CSST tube having a conductive wire as disclosed by Ohki. *See, e.g.*, Ex. 2001 ¶ 127 (citing to a video as evidence that a “configuration similar to that disclosed by *Yamane* and *Ohki* burst into flames when tested in laboratory conditions”); Tr. 27:14–28:6 (admitting that the video is not an embodiment of Ohki).

Petitioner has shown that Ohki and the Design Guide teach all of the limitations of claim 1 and that a person of ordinary skill in the art would have had reason to combine their teachings in the manner asserted. Patent Owner’s arguments regarding secondary considerations of nonobviousness are not persuasive. *See supra* Section II.C.4. For the reasons discussed above, Petitioner has demonstrated by a preponderance of the evidence that claim 1 is unpatentable under 35 U.S.C. § 103 over Ohki and the Design Guide.

3. Claims 2–4 and 7

Relying on the testimony of Dr. Rakov, Petitioner contends the combination of Ohki and the Design Guide teaches each of the limitations of dependent claims 2–4 and 7. Pet. 48–50. Patent Owner does not dispute Petitioner’s contentions as to these claims.

We agree with Petitioner that Ohki teaches “Corrugated Stainless Steel Tubing (CSST)” as required by claim 2 and further teaches “conductive wire compris[ing] a mesh surrounding the gas tubing” as required by claim 7. *See, e.g.*, Ex. 1020 ¶¶ 13–16 (stating Ohki is directed to

“gas tubing” made of “stainless steel” with a “corrugated shape”), 11 (stating “the conductive cover layer is constituted by a metal mesh”). Claim 3 requires that the connectors are made of brass. We agree with Petitioner’s un rebutted evidence that the Design Guide teaches brass fittings and that it would have been obvious to one of ordinary skill in the art to use brass material for the connective fittings (connectors) of Ohki. Pet. 49 (citing Ex. 1026 ¶¶ 208–210; Ex. 1002, 55; Ex. 1001, 4:46–51). Claim 4 requires that the “conductive wire is made of copper.” Ohki teaches that its conductive cover layer can be made using copper. Ex. 1020 ¶ 17. Petitioner has provided evidence, including Dr. Rakov’s un rebutted testimony, that an ordinarily skilled artisan would have known that copper wire is the most commonly used wire in lightning protection systems and that it would have been obvious to form the metal mesh of Ohki using copper wires. Pet. 49–50; Ex. 1026 ¶¶ 213–214.

Petitioner has shown that Ohki and the Design Guide teach all of the limitations of claims 2–4 and 7, and that a person of ordinary skill in the art would have had reason to combine their teachings in the manner asserted. Patent Owner’s arguments regarding secondary considerations of nonobviousness are not persuasive. *See supra* Section II.C.4. For the foregoing reasons, we determine Petitioner has demonstrated, by a preponderance of the evidence, that claims 2 through 4 and 7 are unpatentable over Ohki and the Design Guide.

*E. Obviousness of Claim 7
over Yamane, the Design Guide, and Ohki*

Claim 7 depends from claim 1 and further requires that the “conductive wire comprises a mesh surrounding the gas tubing.” Petitioner asserts that it would have been obvious to substitute the “metal mesh” taught in Ohki for the conductive member of Yamane because (1) one of ordinary skill in the art would have understood a metal mesh provides additional protection from arcing caused by lightning, (2) a mesh would have reinforced the Yamane tubing and made it more bendable, and (3) the substitution would have been “nothing ‘more than the predictable use of prior art elements according to their established functions.’” Pet. 39–41 (citing Ex. 1020, claim 7, ¶¶ 1–3, 16, 18–37; Ex. 1026 ¶¶ 166, 168, 169). Petitioner further asserts the particular method for connecting the mesh to the connectors would have been a simple matter of design choice for a person of ordinary skill in the art. *Id.* at 41; Ex. 1026 ¶ 170. Petitioner has shown that the combination of Yamane, the Design Guide, and Ohki teach the limitations of dependent claim 7 and has articulated sufficient reasoning for combining the teachings of the references. We are not persuaded by Patent Owner’s argument that Ohki does not teach the coupling step (b) of claim 1 (Prelim. Resp. 21) for the same reasons discussed above in Section II.D.3. Patent Owner does not make any additional arguments with respect to this asserted ground.

Petitioner has shown that Yamane, the Design Guide, and Ohki teach all of the limitations of claim 7 and that a person of ordinary skill in the art would have had reason to combine their teachings in the manner asserted.

Patent Owner's arguments regarding secondary considerations of nonobviousness are not persuasive. *See supra* Section II.C.4. Therefore, we determine that Petitioner has shown by a preponderance of the evidence that claim 7 is unpatentable under 35 U.S.C. § 103 over Yamane, the Design Guide, and Ohki.

*F. Obviousness of Claims 1–4 over Rivest and Yamane
or over Rivest and Ohki*

Petitioner contends claims 1 through 4 are unpatentable under 35 U.S.C. § 103 as obvious over Rivest in view of either Yamane or Ohki. Pet. 50–58. Relying on the testimony of Dr. Rakov, Petitioner explains how the combination of either Rivest and Yamane or the combination of Rivest and Ohki teaches the limitations of the challenged claims. *Id.* (citing Ex. 1026 ¶¶ 222–228, 233, 245, 246, 248, 250–258, 260, 262, 264). Having considered the parties' contentions and supporting evidence, including evidence of secondary considerations of nonobviousness submitted by Patent Owner, for the reasons set forth below we determine that Petitioner has shown by a preponderance of the evidence that claims 1 through 4 are unpatentable under 35 U.S.C. § 103 over Rivest and Yamane and over Rivest and Ohki.

1. Rivest

Rivest describes corrugated stainless steel tubing, used for transporting gas, covered with a conductive thermoplastic polymer jacket and having brass end fittings 16. Ex. 1006, 1:13–15, 1:60–2:1, 2:17–20, 3:53–58. Rivest explains that because “the jacket 14 is made from a conductive thermoplastic, charge accumulated on jacket 14 (e.g., due to

direct or indirect lightning strike) is conducted through the jacket 14 to the tubing 12 and then to the end fittings 16 and through components connected to fittings 16. Thus, the tubing 12 is not damaged by a buildup of charge on a non-conductive jacket.” *Id.* at 3:59–65.

2. Claim 1

Relying on the testimony of Dr. Rakov, Petitioner explains how the combination of Rivest and Yamane, and the combination of Rivest and Ohki, teach the limitations of claim 1. Pet. 50–57. Rivest teaches a conductive polymer jacket disposed along a length of CSST. Ex. 1006, 1:60–2:1. Petitioner states that because Rivest’s conductive polymer jacket is less conductive than the metal tubing, the jacket dissipates charge accumulated on the jacket due to lightning strikes. Pet. 50 (citing Ex. 1006, 3:59–65). Rivest also discloses “fittings” that are affixed to each end of the gas tubing to allow the tubing to be securely coupled to gas lines and appliances and allow the gas tubing to carry gas between a gas line and an appliance. *Id.* at 54–55 (citing Ex. 1006, 3:54–58, Fig. 1; Ex. 1026 ¶¶ 234–239).

Petitioner acknowledges that Rivest does not teach coupling a “conductive wire” to the connectors to establish a direct electrical connection between them, but asserts it would have been obvious to substitute the metal mesh of Ohki for the conductive jacket of Rivest, as a simple substitution of one known element (the mesh of Ohki) for another known element (polymer jacket of Rivest) using a known technique to improve a similar device. *Id.* at 51–53 (quoting Ex. 1020 ¶ 26 (“the

conductive cover layer 3 can be constituted by a conductive polymer . . . or it can be constituted by a metal film or a metal mesh”)); Ex. 1026 ¶ 225.

Similarly, Petitioner asserts it would have been obvious to either substitute the polymer jacket of Rivest with the more conductive members of Yamane as a simple substitution with predictable results, or to add the conductive wires of Yamane to the conductive tubing of Rivest as a known technique to improve a similar device. Pet. 53; Ex. 1026 ¶ 226. Petitioner further argues that the conductive wire of Yamane and Ohki both carry “a sufficient amount of the electrical current to ground so as to prevent damage to the inner tubing from the electrical current.” Pet. 57 (citing Ex. 1019 ¶ 36; Ex. 1020 ¶ 31).

Petitioner has shown that the combination of Rivest and Yamane, as well as the combination of Rivest and Ohki, teaches all of the limitations of claim 1 and has articulated sufficient reasoning for combining the teachings of the references. For the reasons explained below, we are not persuaded by Patent Owner’s arguments to the contrary. PO Resp. 30.

Patent Owner argues Rivest does not teach step (b) of claim 1, because Rivest does not teach a ground wire or mesh shroud that does not touch the surface of CSST. *Id.* This argument is not persuasive, as Petitioner is relying upon the teachings of either Yamane or Ohki, not Rivest, to teach the conductive wire or mesh. As explained above, Petitioner has shown sufficiently that Yamane and Ohki teach the conductive wire limitations of claim 1 and that one of ordinary skill in the art would have had reason to combine the teachings of Rivest and Yamane and the teachings of Rivest and Ohki. See Pet. 51–53; Ex. 1026 ¶¶ 226–228. Patent Owner’s

arguments regarding secondary considerations of nonobviousness are not persuasive. *See supra* Section II.C.4. Accordingly, Petitioner has shown by a preponderance of the evidence that claim 1 is unpatentable under 35 U.S.C. § 103 over Rivest and Yamane, and over Rivest and Ohki.

3. Claims 2–4

Petitioner contends Rivest, Yamane, and Ohki each disclose corrugated stainless steel tubing, thereby satisfying the limitation of claim 2 requiring “the gas tubing [to] comprise[] Corrugated Stainless Steel Tubing (CSST)”. Pet. 57–58 (citing Ex. 1006, 2:18–20 (“tubing 12 may be annular, corrugated stainless steel tubing (CSST) for transporting fluids such as natural gas” (emphasis omitted))); Ex. 1019 ¶ 21; Ex. 1020 ¶ 16. Petitioner also contends that Rivest’s disclosure that “[p]referably the end fittings [at one or both ends of the tubing assembly] are from metals (e.g., brass),” teaches the limitation of claim 3 requiring that the “connectors are made of brass.” Pet. 58 (emphasis omitted).

Claim 4 requires the “conductive wire [be] made of copper.” Relying on Dr. Rakov’s un rebutted testimony, Petitioner asserts that it would have been an obvious design choice to have the conductive wire of Yamane be made of copper because copper is commonly used in lightning protection systems, as it is highly conductive and relatively inexpensive. *Id.* at 58–59 (citing Ex. 1026 ¶ 264).

Patent Owner does not separately argue the patentability of claims 2 through 4. *See* PO Resp. We have reviewed the evidence and arguments and find that Petitioner has shown where each of the limitations of claims 2 through 4 are taught by Rivest and Yamane, and by Rivest and Ohki, and

has articulated a sufficient rationale for combining the teachings of the prior art. Patent Owner's arguments regarding secondary considerations of nonobviousness are not persuasive. *See supra* Section II.C.4. As such, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 2 through 4 are unpatentable over the combination of Rivest and Yamane as well as over the combination of Rivest and Ohki.

G. Obviousness of Claims 5 and 6 over Rivest and Yamane

Petitioner contends claims 5 and 6 are unpatentable under 35 U.S.C. § 103 as obvious over Rivest and Yamane. Pet. 58–59. Relying on the unrebutted testimony of Dr. Rakov, Petitioner explains how selecting a single wire (as required by claim 6) or selecting a copper wire of approximately number 8 American wire gauge or larger (as required by claim 5) would have been obvious to one ordinarily skilled in the art who was implementing Rivest with an external conductive member as disclosed by Yamane. *Id.*; Ex. 1026 ¶¶ 266, 269. Patent Owner's argument that claims 5 and 6 are patentable because the cited art does not teach the “‘coupling’ step of claim 1(b)” (*see* PO Resp. 30) is not persuasive for the reasons stated above, and Patent Owner's arguments regarding secondary considerations of nonobviousness are not persuasive (*see supra* Section II.C.4). Having considered the parties' contentions and supporting evidence, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 5 and 6 are unpatentable over the combination of Rivest and Yamane.

H. Obviousness of Claim 7 over Rivest and Ohki

Petitioner contends claim 7, which requires the conductive wire to comprise a mesh, is unpatentable under 35 U.S.C. § 103 as obvious over Rivest and Ohki. Pet. 60. Relying on the testimony of Dr. Rakov, Petitioner contends that it would have been obvious to use the mesh of Ohki instead of, or in addition to, the conductive polymer jacket of Rivest, in view of Ohki's teaching that "conductive layer 3 can be constituted by a conductive polymer . . . or it can be constituted by a metal film or metal mesh." Pet. 60 (quoting Ex. 1020 ¶ 26) (emphases omitted); Ex. 1026 ¶ 271. Patent Owner's argument that claim 7 is patentable because the cited art does not teach the "'coupling' step of claim 1(b)" (see PO Resp. 30–31) is not persuasive for the reasons stated above, and Patent Owner's arguments regarding secondary considerations of nonobviousness are not persuasive (see *supra* Section II.C.4). Having considered the parties' contentions and supporting evidence, including evidence of secondary considerations of nonobviousness submitted by Patent Owner, we determine that Petitioner has demonstrated by a preponderance of the evidence that claim 7 is unpatentable over the combination of Rivest and Ohki.

III. CONCLUSION

Based on the evidence and arguments, Petitioner has demonstrated by a preponderance of the evidence that:

- (1) claims 1–6 are unpatentable under 35 U.S.C. § 103 over Yamane and the Design Guide;
- (2) claim 7 is unpatentable under 35 U.S.C. § 103 over Yamane, the Design Guide, and Ohki;

(3) claims 1–4 and 7 are unpatentable under 35 U.S.C. § 103 over Ohki and the Design Guide;

(4) claims 1–6 are unpatentable under 35 U.S.C. § 103 over Rivest and Yamane; and

(5) claims 1–4 and 7 are unpatentable under 35 U.S.C. § 103 over Rivest and Ohki.

IV. ORDER

Accordingly, it is

ORDERED that claims 1–7 of U.S. Patent No. 7,562,448 B2 are held to be unpatentable; and

FURTHER ORDERED that, because this Decision is final, a party to the proceeding seeking judicial review of the Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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Patent 7,562,448 B2

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