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Paper 34
Date: November 29, 2017

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

PACKERS PLUS ENERGY SERVICES INC.,
Petitioner,

v.

BAKER HUGHES OILFIELD OPERATIONS, INC.,
Patent Owner.

Case IPR2016-01100
Patent No. 6,848,505 B2

Before MITCHELL G. WEATHERLY, BEVERLY M. BUNTING, and ROBERT L. KINDER, *Administrative Patent Judges*.

KINDER, *Administrative Patent Judge.*

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

Packers Plus Energy Services Inc. ("Petitioner") filed a Petition pursuant to 35 U.S.C. §§ 311–319 to institute an *inter partes* review of claims 1–20 of U.S. Patent No. 6,848,505 B2 ("the '505 patent"). Paper 2 ("Pet."). Baker Hughes Oilfield Operations, Inc. ("Patent Owner") filed a Preliminary Response. Paper 10 ("Prelim. Resp."). Applying the standard set forth in 35 U.S.C. § 314(a), we instituted an *inter partes* review of all challenged claims. Paper 12 ("Dec.").

After institution of trial, Patent Owner filed a Patent Owner Response (Paper 16, "PO Resp.") and Petitioner filed a Reply (Paper 19, "Pet. Reply"). Patent Owner also filed a Patent Owner Sur-reply (Paper 26, "PO Sur-reply") pursuant to our authorization (Paper 23). An oral hearing was held on September 20, 2017. Paper 31 ("Tr.").

The Board has jurisdiction under 35 U.S.C. § 6. In this Final Written Decision, issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1–20 of the '505 patent are unpatentable.

I. BACKGROUND

A. Real Parties in Interest

Petitioner names Packers Plus Energy Services Inc. and ReTek Energy Products LLC as the real parties in interest. Pet. 3. Patent Owner asserts that "[t]he real parties-in-interest in this proceeding are Baker Hughes Oilfield Operations, LLC; Baker Hughes, a GE Company, LLC; and Baker Hughes, a GE Company." Paper 32, 1.

B. The '505 patent (Ex. 1001)

The '505 patent is titled "Alternative Method to Cementing Casing and Liners." Ex. 1001, (54). The '505 patent issued on February 1, 2005, from U.S. Patent Application No. 10/354,242 filed on January 29, 2003. *Id.* at (45), (21), (22).

The '505 patent relates to "[a] method of sealing casing or liners in a wellbore." *Id.* at Abst. (57). "Traditionally[,] casing and liners have been sealed in the wellbore with cement that is pumped down" that eventually flows "into the annular space between the casing or liner and the wellbore." *Id.* at 1:12–16. According to the '505 patent, "[t]he present invention eliminates the cementing process" and "provides for the stands of casing or liner to be wrapped between the end connections with a rubber sleeve preferably bonded to the tubular." *Id.* at 1:44–49. As the casing or liner is run, the rubber swells to create a seal. *Id.* The formulation may swell at a predetermined rate in response to exposure to well fluids. *Id.* at 2:1–2.

The '505 patent describes an embodiment where "the casing or liner can be expanded with a swage to reduce the volume of the annular space around the casing or liner that the rubber sleeve would have to bridge." *Id.* at 1:49–52. In such an embodiment, "[t]he casing or liner can also be expanded with a swage preferably prior to the onset of significant jacket swelling." *Id.* at 2:2–4, 2:34–37. In another embodiment of the '505 patent, the annular space between the string and wellbore could be sealed by swelling of the covering, or rubber, without physical expansion of the string, depending on the dimensions of the wellbore and the covering. *Id.* at 2:30–33.

The method of sealing liners in a wellbore is depicted below in Figures 2–5.

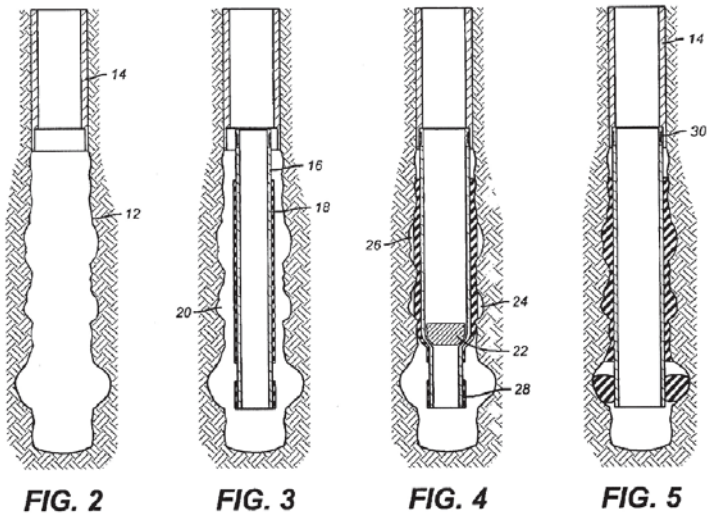

FIG. 2 FIG. 3 FIG. 4 FIG. 5

Figures 2–5 are elevation views of the wellbore, depicting: before liner insertion (Fig. 2), the liner run in (Fig. 3), liner partially expanded (Fig. 4), and liner expanded and the rubber swollen (Fig. 5). Ex. 1001, 2:12–18.

Figures 2 and 3 depict wellbore 12 and casing 14 with liner 16 inserted into the wellbore and overlapping with casing 14. *Id.* at 2:27–30. Covering 18 expands to fill annular space 20 between string 16 and wellbore 12 creating a seal. *Id.* at 2:30–33. Covering 18 "for hydrocarbon induced swelling is preferably made of a Nitrile Rubber compound," and "[p]referably, when bonded it is a single annular shape with no seams that can allow channeling." *Id.* at 2:58–59, 2:66–67. Figure 4 depicts an embodiment where swage 22 can expand string 16 before the covering has finished swelling but while voids 24 and 26 still exist. *Id.* at 2:34–37. When the expansion is complete and the swelling stops, Figure 5 depicts the assembly with string 16 supported from casing 14 and fully expanded to approximately the same diameter. *Id.* at 2:37–40. As depicted in Figures 4

and 5, packer 28 can be placed at the lower end to keep covering 18 from extruding. *Id.* at 2:41–43.

C. Illustrative Claim

Claim 1 is independent and illustrative of the claims at issue:

1. A method of sealing a tubular string in a wellbore, comprising:

providing a seamless covering on a plurality of stands that make up the tubular string;

running the tubular string to a desired position in the wellbore;

using well fluids to promote swelling of said covering at a rate slow enough to allow placement of said string at the depth desired; and

sealing the wellbore from said swelling.

Id. at 3:13–23.

D. Related Proceedings

The parties state that the '505 patent is asserted in *Baker Hughes Oilfield Operations, Inc. v. Packers Plus Energy Services Inc.*, Case No. 4:16-cv-00019 (S.D. Tex.). Pet. 3; Paper 5, 1.

E. Evidence Relied Upon

Petitioner relies on the following references:

U.S. Patent No. 7,578,354 B2, filed June 11, 2007, issued August 25, 2009 (Ex. 1005, "Thomson");

U.S. Patent No. 6,702,029 B2, filed December 22, 1999, issued March 9, 2004 (Ex. 1006, "Metcalfe"); and,

U.S. Patent No. 3,776,561, filed October 16, 1970, issued December 4, 1973 (Ex. 1007, "Haney").

Petitioner also relies on the Declaration of Richard C. Haut, Ph.D. (Ex. 1003). Patent Owner relies on the Declaration of Blake R. Cox (Ex.

2005). The parties rely on other evidence and exhibits as in the analysis below.

F. Instituted Grounds

We instituted trial based on the following grounds (Dec. 26):

Reference(s)	Basis	Claims Challenged
Thomson	§ 102(e)	1–5, 9–18
Thomson and Haney	§ 103(a)	1–5, 9–18
Thomson and Metcalfe	§ 103(a)	6–8, 19–20
Thomson, Metcalfe, and Haney	§ 103(a)	6–8, 19–20

II. ANALYSIS

Petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail, Petitioner must establish the facts supporting its challenge by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d).

A. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art, various factors may be considered, including the "type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field." *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). In that regard, Petitioner's expert, Dr. Haut, testifies that:

> Based on the background knowledge required to appreciate the technology of the '505 patent and my experience in this area, a person of ordinary skill in the art in this field ("POSITA") at the relevant time frame would have had a combination of experience and education in the oil and gas industry, consisting of a minimum of a bachelor of science in civil, chemical, mechanical, electrical, or petroleum engineering and three to five years of professional experience in drilling and casing wells with expandable pipe, as well as a functional knowledge of swellable elastomers. More education might substitute for less professional experience, and vice versa.

Ex. 1003 ¶ 20. Petitioner also contends the cited prior art itself is representative of the level of ordinary skill, and "the prior art included disclosures of swellable-polymer sealing devices decades prior to the '505 patent." Pet. Reply. 11.

Patent Owner argues for a similar level of skill in the art contending that a person of ordinary skill "would have a combination of technical education and experience that would have given that person a first-hand understanding of the types of tools, particularly packers and sealing devices, used in the drilling, completion, stimulation, and remediation of wellbores to extract oil and gas." PO Resp. 10 (citing Ex. 2005 ¶¶ 32–34). Patent Owner contends that this person would have "a bachelor of science degree in mechanical engineering or petroleum engineering," with "5–6 years of technical experience in the drilling, completion, stimulation, and remediation of well bores to extract oil and gas," or alternatively, "8–10 years of technical experience" if the person did not have a technical degree. *Id.* Despite recognizing that a person of ordinary skill in the art may have a bachelor of science degree, Patent Owner contends that a degree is not

necessary. *Id.* at 13. Patent Owner also contends that "identification of the pertinent art as 'the oil and gas industry' is too broad." *Id.*

Where the parties diverge is in the amount of experience and understanding the person of ordinary skill in the art would have in the design of swellable polymer sealing devices. As noted above, Dr. Haut contends the person of ordinary skill would have "a functional knowledge of swellable elastomers." Ex. 1003 ¶ 20. Patent Owner, relying on Mr. Cox, contends that "swellable polymer sealing elements, were instead typically designed by polymer chemists with detailed knowledge of and experience with these types of swellable polymers." PO Resp. 11. Thus, according to Patent Owner, "a person of ordinary skill in the art may have been more likely to recognize a potential new use for a tool, but would have been less able to design or modify the details of such a swellable-polymer sealing device." *Id.*

Based on the evidence before us, we do not observe meaningful differences between the parties' assessments of a person with ordinary skill in the art in terms of education and experience. Indeed, the parties' disagreement centers on whether the POSITA would additionally have had a functional knowledge of swellable elastomers such that the person of ordinary skill could design and build a swellable covering as claimed. PO Resp. 11–13; Pet. Reply 12–13. Patent Owner attempts to define POSITA's knowledge and skills to carve out any practical knowledge of swellable polymer sealing devices so that it would be very difficult for this person to arrive at the claims of the '505 patent. The prior art of record contradicts Patent Owner's carve out. For example, Thomson describes "providing an elastomeric material in the borehole and exposing the material to an

actuating agent that causes the elastomeric material to expand," as well as making a selection from numerous elastomeric materials that would be acceptable to achieve this intended purpose. Ex. 1005, 1:56–2:5 ("The choice of elastomeric material will largely depend upon the particular application and the actuating agent."). Thus, we disagree with Patent Owner and find that the person of ordinary skill in the art would have a functional knowledge of swellable elastomers as advocated by Dr. Haut. As such, we determine that the POSITA would have had a combination of experience and education in the oil and gas industry, consisting of a minimum of a bachelor of science in civil, chemical, mechanical, electrical, or petroleum engineering and three to five years of professional experience in drilling and casing wells with expandable pipe, as well as a functional knowledge of swellable elastomers. We note that our analysis would be the same under either proposed definition.

B. Claim Construction

The Board interprets claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard). Under the broadest reasonable interpretation standard, and absent any special definitions, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definitions for claim terms or phrases must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480

(Fed. Cir. 1994). In the absence of such a definition, limitations are not to be read from the specification into the claims. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

Petitioner proposes constructions for two claim terms — "seamless covering" (Pet. 6) and "extrusion barrier" (Pet. 7). In turn, Patent Owner proposes constructions for the claim limitation "sealing the wellbore from said swelling," and "seamless covering." PO Resp. 20, 24. As to the first proposed construction, Patent Owner contends that statements made during prosecution are clear disavowals that compel a disclosed embodiment to be excluded from the interpretation of "sealing the wellbore from said swelling." For purposes of this Decision, having considered the evidence presented, we determine that the claim term "sealing the wellbore from said swelling" needs to be construed in order to determine whether a disclosed embodiment has been disavowed as alleged by Patent Owner. We also construe the term "seamless covering" as addressed below. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) ("only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy").

1. "Sealing the Wellbore from Said Swelling"

Claim 1 requires the method of sealing a tubular string in a wellbore, to comprise, in pertinent part, the step of "sealing the wellbore from said swelling." Ex. 1001, 3:22. The claimed "swelling" is achieved by "using well fluids to promote swelling of said covering at a rate slow enough to allow placement of said string at the depth desired." *Id.* at 3:19–21.

Patent Owner alleges that statements made during prosecution require "'sealing the wellbore from said swelling' to exclude expansion of the inner

stand before swelling of the seamless covering seals the wellbore." PO Resp. 24. According to Patent Owner, the amendment and accompanying arguments unequivocally disavow expansion of the stand before swelling of the covering seals the wellbore. *Id.* at 24–25.

Both parties recognize that the embodiment that Patent Owner seeks to exclude is an embodiment described in the Specification of the '505 patent and depicted in Figure 4. *See* Ex. 1001, 2:34–37 ("Optionally, as shown in FIG. 4, a swage, schematically illustrated as 22 can expand the string 16 before the covering has finished swelling and while voids such as 24 and 26 still exist."); PO Resp. 26 ("Claim 1 . . . was initially broad enough to cover sealing a wellbore solely with swelling of the covering, or by expanding the stand and subsequently swelling the covering."). According to Patent Owner, however, "claim 1 was narrowed during prosecution to require that the wellbore is sealed solely by swelling of the covering." PO Resp. 26.

Petitioner argues that "[b]ecause Patent Owner did not expressly disclaim the '505 patent's expansion embodiment, or otherwise clearly and unmistakably limit its invention to the swelling embodiment, Patent Owner's claim construction arguments must fail." Pet. Reply 5.

Below, we consider the parties' arguments in relation to the intrinsic evidence to determine whether an embodiment was clearly and unequivocally disavowed during prosecution. For the reasons set forth below, we disagree with Patent Owner that an embodiment of the Specification was clearly and unequivocally disavowed during prosecution.

a. Specification and Claims

The Specification sets forth two embodiments. The first embodiment, as depicted in Figure 4, has a swage that expands the string before the covering has finished swelling. *See* Ex. 1001, 2:34–38. As depicted in Figures 4 and 5, even after expansion of the string, the covering continues to swell to fill voids to achieve a seal. *Id.* Under Patent Owner's theory, this embodiment was disclaimed during prosecution. PO Resp. 26. In the second described embodiment, the annular space between the string and wellbore could be sealed by swelling of the covering without physical expansion of the string, depending upon the dimensions of the wellbore and covering. Ex. 1001, 2:30–33.

The Specification does not describe an embodiment in which the annular space between the string and wellbore could be sealed by swelling of the covering, followed by the swage expanding the string. *See* Pet. Reply 8 ("the specification does not describe an embodiment where expansion occurs after sealing"); Tr. 23:20–24:21.

The claim language itself is broad enough to capture both embodiments described in the Specification whereas "sealing the wellbore from said swelling" may occur with or without expansion of the string as described in the Specification. Further, as pointed out by Petitioner, "not a single claim in the '505 patent precludes expansion of the pipe." Pet. 15. In fact, the dependent claims discussed below expressly require the type of expansion that Patent Owner contends to have been disavowed.

For example, claim 3, dependent from claim 1, requires "expanding the stands"; and claim 4, dependent from claim 3, further requires "performing said expanding before said covering swells completely."

Ex. 1001, 3:26–30; *see also id.* at 4:20–25 (claims 14 and 15). The plain language of these claims suggests that expanding may occur before the covering finishes swelling. We find persuasive Petitioner's argument that "[s]ome dependent claims, in fact, ***require*** expansion (claims 3 and 14), which creates a presumption that the scope of the broader independent claim must also encompass expansion." Pet. 15. The plain language of claims 3 and 4 also suggests expansion may occur in claim 1 either before or concurrently with "sealing the wellbore from said swelling." *Id.* at 3:22.

Patent Owner contends that the Petitioner's claim differentiation arguments are contrary to the law and the intrinsic evidence. PO Resp. 33. Patent Owner argues that any inference from claim differentiation cannot overcome the clear prosecution history disclaimer discussed below. *Id.* at 33–34. Patent Owner further contends that the language of claims 3 and 4 — that the stands are expanded before the covering swells completely — "indicates that the expansion in claims 3 and 14 could occur after the covering has swelled completely (and sealed the wellbore per claim 1)." *Id.* at 35.

The plain language of claim 4 requires "performing said expanding before said covering swells completely." Based on this language, the swelling and sealing required by claims 1 and 3 may occur during or after expansion of the stands. Patent Owner contends that claims 3 and 4, when read in light of the disclaimer, require swelling of the rubber covering to first achieve a seal, and then expansion of the stands must occur—an embodiment not described in the Specification.[1] PO Resp. 35 ("Two other

[1] One embodiment described in the Specification states that expansion is not necessary to achieve the seal, but only swelling of the covering. Ex. 1001,

dependent claims also confirm that the stands can be expanded ***after*** the covering has swelled to seal the wellbore."). Patent Owner contends that expanding an already sealed covering is possible, and Mr. Cox testifies that such an expansion could be desirable because swellable polymers become more compliant as they swell. *Id.* at 36 (citing Ex. 2005 ¶¶ 68–70). Although possible, such an embodiment is not expressly described in the Specification or file history of the '505 patent. Further, as Petitioner argues, dependent claims 3 and 4 fail to inform a person of ordinary skill in the art that the scope of claim 1 is limited to an undisclosed embodiment where swelling occurs before expansion, and "whether POSA may want to expand the casing after swelling in certain situations does nothing to inform the public of whether Patent Owner unequivocally disavowed the expansion embodiment." Pet. Reply 8. Based on the language of the dependent claims, we determine that "sealing the wellbore from said swelling" may occur before, during, or after expansion of the string.

b. Prosecution History

The crux of Patent Owner's contention is that the amendment adding "sealing the wellbore from said swelling," and arguments made to differentiate the prior art, constitute a clear and unequivocal disavowal of a disclosed embodiment in favor an embodiment that is not disclosed in the Specification of the '505 patent. PO Resp. 24–33; Pet. Reply 8 ("the specification does not describe an embodiment where expansion occurs after

2:30–33 ("Depending on the dimensions of the wellbore and the covering 18, the annular space 20 between string 16 and wellbore 12 could be sealed by swelling of covering 18 without physical expansion of the string 16.").

sealing"); Tr. 23:20–24:21. Below, we consider the office actions and amendments giving rise to Patent Owner's contention.

In a non-final office action dated March 2, 2004, the Office rejected application claims 1–20 as unpatentable under § 103(a) based on various combinations of Duggan (U.S. Patent Pub. No. 2003/0146003), Harrall (U.S. Patent Pub. No. 2003/0127225), and Hewitt (U.S. Patent No. 5,964,292). Ex. 1002, 37–44.[2] In an office action response dated June 1, 2004, applicant responded by making three distinct arguments to differentiate the prior art. *Id.* at 33–36. First, applicant contended that neither Harrall nor Duggan show seamless coverings as required by claim 1. *Id.* at 33. Next, applicants argued that Hewitt is non-analogous art. *Id.* Third, applicants argued Hewitt teaches away from a combination with either Harrall or Duggan because both Harrall and Duggan "rely on expansion to get a seal while saying nothing about the exterior layer's structure." *Id.* Applicants further argued in response to the office action that claim 1 requires a seamless covering and the claim "was [also] amended to clarify the sealing that was previously mentioned in the preamble, as [sic] the result of the method." *Id.* at 34. Applicants argued "[a]s to Harral[l] or Duggan individually, neither gets the job done without expansion. Neither recognizes the advantage of a seamless covering to stop leakage in a longitudinal direction." *Id.* Similarly, applicants contended in the response, "[i]n short neither of the two main references have developed a system that can seal the wellbore without being

[2] For the prosecution history and articles cited by Petitioner, we rely on Petitioner's inserted page numbering set forth at the bottom of each page. *See* 37 C.F.R. § 42.63(d)(2).

triggered first by expansion" and "[n]either reference recognizes the benefit of a seamless covering." *Id.*

According to Patent Owner, "[b]ecause the limitation 'sealing the wellbore from said swelling' was added by amendment and accompanied by statements expressly distinguishing the prior art that relied on both expansion and swelling, Patent Owner unequivocally disclaimed expansion of the stand causing the seal." PO Resp. 37. Based on this alleged disavowal, Patent Owner contends "[t]he BRI of 'sealing the wellbore from said swelling' is therefore 'sealing the wellbore solely by swelling of the covering, without first expanding the stand.'" *Id.*

Patent Owner argues that a claim amendment, standing alone, "amounts to a clear disavowal of claim coverage." PO Resp. 25 (citing *Amgen Inc. v. Hoechst Marion Roussel*, 314 F.3d 1313, 1327 (Fed. Cir. 2003)). Patent Owner alleges that "claim 1 was narrowed during prosecution to require that the wellbore is sealed solely by swelling of the covering." *Id.* at 26–27. Patent Owner contends that the Examiner cited Duggan and Harrall as each disclosing the recited "seamless covering" for sealing a wellbore and that each of these references requires expanding the tubing to achieve a seal. *Id.* at 27. According to Patent Owner, "the Examiner determined that claim 1 was unpatentable over the Duggan and Harrall references that taught expanding the tubular stand as a necessary step to achieve a seal in the wellbore." *Id.* at 30. Thus, Patent Owner contends that "[t]his amendment, distinguishing Applicants' claimed invention from the Duggan and Harrall references that accomplished sealing by first expanding the tubing string, unmistakably relinquished such devices and methods from the scope of the claimed invention." *Id.*

Patent Owner also relies on the arguments quoted above that purportedly distinguished the cited references for the reason that they first required expansion of the inner tubing. *Id.* at 31. Patent Owner argues that the "arguments further demonstrate Applicants' intent to exclude sealing that requires expanding the tubular to obtain a seal." *Id.* "For example, the clear meaning of Applicants' argument that the prior art does not 'get[] the job done without expansion' is that the Applicants' claimed invention does 'get the job done'—i.e., seal the wellbore—'without expansion.' Ex. 1002. at 34/72." *Id.* at 32–33.

Petitioner contends "that even if Patent Owner argued against the Duggan and Harrell references during prosecution for reasons related to expansion, that does not mean that Patent Owner unequivocally surrendered the expansion embodiment." Pet. Reply 6. Petitioner points out that the arguments made during prosecution "were not made to distinguish Duggan or Harrall because they first required expansion, but that the references did not 'get the job done' without expansion because in both references 'expansion caus[ed] the elastomer to actually seal.'" *Id.* (quoting Ex. 1002, 34). As explained by Petitioner,

> That is, Patent Owner distinguished its application over Duggan and Harrell, in part, because liner expansion was required in both to set the elastomer against the wellbore and create a seal, whereas in the '505 patent and Thomson, the liner may expand first, but the elastomer swells and seals the wellbore without requiring the liner to press the elastomer against the wellbore.

Id.

Petitioner also argues that "Patent Owner consistently asserted during prosecution that 'neither reference recognizes the benefit of a seamless covering' to prevent channeling, so it is equally plausible that Patent

Owner's amendments were directed to the nature of the 'seamless covering' that seals the wellbore from said swelling." *Id.* at 7.

c. Analysis

"[The Federal Circuit has] recognized that a 'clear and unmistakable' disavowal during prosecution overcomes the 'heavy presumption' that claim terms carry their full ordinary and customary meaning." *Biogen Idec, Inc. v. GlaxoSmithKline LLC*, 713 F.3d 1090, 1095 (Fed. Cir. 2013) (quoting *Omega Eng'g, Inc. v. Raytek Corp.*, 334 F.3d 1314, 1323, 1326 (Fed. Cir. 2003)). Specifically, "when the patentee unequivocally and unambiguously disavows a certain meaning to obtain a patent, the doctrine of prosecution history disclaimer narrows the meaning of the claim consistent with the scope of the claim surrendered." *Id.*

The amendment made during prosecution, and the corresponding remarks, indicate that language from the preamble was included in the body of the claim to emphasize the result of the method. *See id.* ("Claim 1 was amended to clarify the sealing that was previously mentioned in the preamble, as the result of the method."). The language of the amendment for claim 1 ("sealing the wellbore from said swelling") does not address expansion of the stand and at most differentiates the prior art by requiring a seal based on swelling of the covering with or without expansion. The language added by amendment does not address expansion of the stand and it is does not preclude embodiments in which expansion occurs before sealing, as evidenced by dependent claims 3 and 4, which require expansion before the covering swells completely.

We conclude that Patent Owner has not unequivocally disavowed claim scope as alleged. Patent Owner contends that it amended claim 1 and

made arguments that distinguished Harrall and Duggan as relying on expansion of the inner tubing. The statements discuss features of the prior art, but the statements do not state the claimed invention is being limited or that the expansion embodiment set forth in the Specification (Fig. 4) is being disavowed. Stating that neither prior art reference gets the job done without expansion (Ex. 1002, 34) at most emphasizes the prior art seals were achieved by expansion, but it does not necessarily preclude expansion of the stands as part of the claimed process. To the contrary, some dependent claims require expansion before swelling of the covering is complete, which demonstrates ambiguity in the statements made during prosecution. "Where the alleged disavowal is ambiguous, or even 'amenable to multiple reasonable interpretations,' we have declined to find prosecution disclaimer." *Avid Tech., Inc. v. Harmonic, Inc.*, 812 F.3d 1040, 1045 (Fed. Cir. 2016) (quoting *Cordis Corp. v. Medtronic AVE, Inc.*, 339 F.3d 1352, 1359 (Fed. Cir. 2003)).

Claiming that the sealing must occur based on swelling of the covering may differentiate prior art where sealing occurred by expansion, but it does not unambiguously preclude expansion as a step before, or after, sealing. For an amendment to disclaim a disclosed embodiment, the disclaimer or disavowal of claim scope must be clear and unmistakable, requiring "words or expressions of manifest exclusion or restriction" in the intrinsic record. *Teleflex, Inc. v. Ficosa N. Am. Corp.*, 299 F.3d 1313, 1327 (Fed. Cir. 2002). Further, Patent Owner is in the best position to clarify claim scope during prosecution, or even in this proceeding through a motion to amend, and we will not find disclaimer under the broadest reasonable interpretation standard unless the amendments and arguments unequivocally

and unambiguously disavow a certain meaning or embodiment. *See Tempo Lighting, Inc. v. Tivoli, LLC*, 742 F.3d 973, 978 (Fed. Cir. 2014) ("the PTO is under no obligation to accept a claim construction proffered as a prosecution history disclaimer, which generally only binds the patent owner").

We also determine that the amendment and statements made during prosecution equally stress the importance of the "seamless covering" in achieving the intended result of sealing the wellbore from the swelling of the covering. *See* Ex. 1002, 33 ("neither of these references . . . suggests that a problem exists that is addressable by making coverings seamless"), *id.* at 34 ("Neither recognizes the advantage of a seamless covering to stop leakage in a longitudinal direction."). It is equally likely that the claims were allowed because of these limitations and arguments, and because Patent Owner bears the burden of establishing prosecution history disclaimer, these additional arguments and limitations create further ambiguity as to the alleged disclaimer. *See Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1063–64 (Fed. Cir. 2016) ("The party seeking to invoke prosecution history disclaimer bears the burden of proving the existence of a 'clear and unmistakable' disclaimer that would have been evident to one skilled in the art.").

d. Summary

Based on the final trial record before us, we determine that the amendment and statements made by Patent Owner during prosecution are not clear and unequivocal evidence that the claimed invention does not include the expansion embodiment set forth in the Specification (Fig. 4). Further, the scope of the dependent claims suggests that the step of "sealing the wellbore from said swelling" of claim 1 may occur before or during

expansion of the string, thus encompassing the expansion embodiment set forth in the Specification. For these reasons, we therefore reject Patent Owner's proposed construction that the "sealing the wellbore from said swelling" should mean "sealing the wellbore solely by swelling of the covering, without first expanding the stand." *See* PO Resp. 24–25. Instead, we determine that the broadest reasonable interpretation of "sealing the wellbore from said swelling" means *sealing the wellbore based on swelling of the covering*.

2. "a seamless covering"

Claim 1 of the '505 patent requires "providing a seamless covering on a plurality of stands that make up the tubular string." Ex. 1001, 3:15–16. The parties dispute the meaning of the term "seamless covering," and more particularly, the parties disagree as to what constitutes a seam. We first consider the parties arguments and then provide our determination as to the proper meaning of "seamless covering."

Petitioner first contends that '505 patent defines "seamless covering" to mean "a covering having 'no seams that can allow channeling.'" Pet. 6 (citing Ex. 1001, 2:66–67, Ex. 1003 ¶¶ 23–24). Petitioner notes that the term "seamless" does not appear in the '505 patent, except in claim 1. *Id.* Petitioner argues that the only mention of the word "seams" in the patent supports its proposed definition because this sentence states: "'[p]referably, when bonded [the covering] is a single annular shape with no seams that can allow channeling.' (*Id.* at 2:66-67.)." *Id.* at 6–7. Petitioner contends that based on this sole reference to seams, "a POSITA would have understood 'seamless covering' as recited in claim 1 to mean a covering having 'no seams that can allow channeling.'" *Id.* at 7. Petitioner, relying on the

testimony of Dr. Haut, contends that the term "[c]hanneling is a term of art that refers to fluid flow from one zone to another along the lengthwise direction of the wellbore." *Id.*

Dr. Haut explains that:

> "Channeling" is a term of art referring to the flow of fluid in the lengthwise direction of the wellbore such that it flows from one zone to another. This flow generally occurs through a gap in the wellbore sealing such as a gap in the wellbore sealing material, a gap between the wellbore sealing material and the formation, a gap between the tubular member and the wellbore sealing material, or a combination of these. In the Background of the Invention section, the '505 patent criticizes the prior art cementing techniques for potentially causing "channeling of fluids from one zone penetrated by the casing or liner to an adjacent zone." (Ex. 1001 at 1:21-24.) A POSITA reading the criticism of the prior art would have understood this "channeling" issue deals with the flow of fluids along the lengthwise direction of the wellbore through gaps in the wellbore sealing (here, cement is the sealing material).

Ex. 1003 ¶ 24. Based on this background understanding of channeling, and considering the only sentence in the '505 patent that discusses the covering having no seams that can allow channeling, Dr. Haut testifies that "'seamless covering' in the '505 patent is a covering having no seams that would permit channeling — i.e., fluid flow in the lengthwise direction of the wellbore." *Id.* Dr. Haut provides a definition of channeling as "fluid flow in the lengthwise direction of the wellbore." *Id.*

Patent Owner contends that a "'seamless covering' is a 'covering having no seams,' and that the "term does not require construction beyond its plain meaning." PO Resp. 20 (emphasis omitted). Patent Owner relies on various general purpose dictionary definitions to argue that the term "seam" should include lines, grooves, and furrows formed by joints or

abutting edges, and indentations resembling such a join. *Id.* at 21–22. Patent Owner, relying on the testimony of Mr. Cox, contends "that a person of ordinary skill in the art would have understood 'seam' in this context as including indentations such as grooves that resembled such a joining or abutting of edges." *Id.* at 22 (citing Ex. 2005 ¶ 48). Patent Owner contends that "[i]f further construction beyond 'having no seams' is required, then the broadest reasonable interpretation of a 'seamless covering' would thus be 'a covering having no crevices or interstices where edges join or abut, and having no line, groove, or ridge formed by the joining or abutment of edges or resembling such a join.'" *Id.* at 23.

In reply, Petitioner contends that Patent Owner's proposed construction is improper because the "term[s] 'groove,' 'furrow,' and 'indentation or marks resembling such a join' are terms of degree without any corresponding description in the specification to illuminate when a surface feature becomes a groove, furrow, or something resembling one of these elements.'" Pet. Reply 3. Petitioner argues that "[b]ecause the specification fails to provide any objective boundaries for Patent Owner's construction of the term 'seamless covering,' it should be rejected." *Id.* Petitioner also contends that Patent Owner's proposed interpretation rests on a visual inspection test that would depend on inconsistent, subjective, opinion. *Id.* at 4.

Patent Owner responds in its sur-reply that it is not arguing that "seamless covering" requires a perfectly smooth covering, and its proposed definitions would be understandable to a person of ordinary skill in the art. PO Sur-reply 1–2.

Based on the Specification of the '505 patent, and statements made during prosecution of the patent, the term "seamless covering" invokes a meaning to those of ordinary skill in the art that diverges from Patent Owner's general purpose dictionary based definitions. "Where, as here, the disputed claim term is technical or a term of art, '[t]he best source for understanding [it] is the specification from which it arose, informed, as needed, by the prosecution history.'" *AquaTex Indus., Inc. v. Techniche Sols.*, 419 F.3d 1374, 1380 (Fed. Cir. 2005) (quoting *Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005) (en banc)) (additional internal citations omitted). Below we consider how the terms "seam" and "channel" are used in the Specification and file history such that these terms invoke a meaning in the art that is distinct from broader meanings of those terms found in general dictionaries. Simply put, a "seam" as understood in the lay sense, such as seam in clothing or abutting edges of planks on a ship (Ex. 1010, "seam"), is not the same as a seam that allows "channeling between adjacent formations" as understood in the art of sealing casings in wellbores. Ex. 1001, Abst. (57). The fact that a term "has multiple dictionary meanings does not mean that all of these meanings are reasonable interpretations in light of [the] specification." *PPC Broadband, Inc. v. Corning Optical Commc'ns RF, LLC*, 815 F.3d 747, 752 (Fed. Circ. 2016).

We first consider how to apply the broadest reasonable construction in light of the Specification to the claim term "seamless." We note that Patent Owner proposes broad meanings of the word "seam" itself based on general dictionaries. PO Resp. 21–22. Because Patent Owner proposes broad meanings for the term "seam," Patent Owner's proposed interpretation of "seamless" is narrow in scope. *See* PO Resp. 23 ("a covering having no

crevices or interstices where edges join or abut, and having no line, groove, or ridge formed by the joining or abutment of edges or resembling such a join"). When interpreting a negative limitation, such as seamless, under the broadest reasonable interpretation standard, the interpretation is narrowed by giving the underlying root word ("seam") a broad interpretation. Thus, interpreting "seamless" according to its broadest reasonable interpretation, we should interpret "seam" as narrowly as reasonable in view of the Specification.

The Specification of the '505 patent describes swelling of the jacket, or covering, in order to prevent channeling between adjacent formations. Ex. 1001, Abst., 2:1–7 (describing swelling of the formulation and "packers and sealing hangers" as meant to "further secure against channeling between adjacent formations"). "[T]he rubber slowly swells to seal around the casing or liner," and this swelling is meant to seal the wellbore and thus prevent channeling. *Id.* at 1:48–49, 2:30–40. The Specification states that the covering, "when bonded it is a single annular shape with no seams that can allow channeling." *Id.* at 2:66–67. The Specification thus establishes that seams may allow channeling and the covering is bonded as a single annular shape without seams to prevent channeling. Based on these descriptions in the Specification, we find persuasive Dr. Haut's testimony that channeling is "fluid flow in the lengthwise direction of the wellbore." Ex. 1003 ¶ 24. There is no persuasive evidence demonstrating that "channeling" as used in the Specification refers to fluids moving circumferentially rather than longitudinally past a seal within the wellbore.

The file history of the application leading to the '505 patent is discussed in detail above. To overcome the rejection based on Harrall and

Duggan, Patent Owner argued that the seamless covering of claim 1 was not obvious. Ex. 1002, 33. To differentiate Harrall and Duggan, Patent Owner argued that "[n]either recognizes the advantage of a seamless covering to stop leakage in a longitudinal direction." *Id.* at 139. Thus, during prosecution, Patent Owner stated that the claimed seamless covering was designed to prevent leakage (channeling) in a longitudinal (axial) direction. The Examiner allowed the application because, in part, "[t]he prior art fails to disclose a method of sealing a tubular string in a well bore comprising placing a swellable seamless covering around multiple strings of tubular . . . ." *Id.* at 19.

Patent Owner's proposed construction for "seam" looks at the ordinary meaning of the term, but it ignores how that term is used in the context of the Specification and file history. *See Medrad, Inc. v. MRI Devices Corp.*, 401 F.3d 1313, 1319 (Fed. Cir. 2005) ("We cannot look at the ordinary meaning of the term . . . in a vacuum. Rather, we must look at the ordinary meaning in the context of the written description and the prosecution history."). Patent Owner alleges that a seam is a groove, furrow, indentation or marks resembling such a join, or even abutting edges. PO Resp. 22. Mr. Cox's similar contentions, including that "'[s]eamless' would not have had a special, technical meaning to someone of ordinary skill in the art," is at odds with both the Specification and file history. Ex. 2005 ¶¶ 47–53, Ex. 1015, 54:20–55:19; *see Phillips*, 415 F.3d at 1318 ("[A] court should discount any expert testimony 'that is clearly at odds with the claim construction mandated by the claims themselves, the written description, and the prosecution history, in other words, with the written record of the patent.'"). The Specification and file history use the terms "seam" and

"seamless" in the context of preventing channeled fluid flow, and not in terms of surface indentations, or whether edges abut as proposed by Patent Owner and Mr. Cox. As such, the terms "seam" and "seamless" are best understood by referring to the intrinsic evidence of record as understood by one of ordinary skill in the art.

The descriptions found in the Specification and statements made during prosecution weigh heavier in our analysis for "seamless covering" than the general dictionary definitions relied on by Patent Owner. Patent Owner is correct that longitudinal channeling is not explicitly mentioned in the Specification. *See* Tr. 26:17–27:16. The Specification is clear, however, that the purpose of the swellable covering is to secure against channeling "between adjacent formations," which by nature would involve longitudinal channeling. *See* Ex. 1001, Abst., 2:4–7, Ex. 1003 ¶ 24 ("'Channeling' is a term of art referring to the flow of fluid in the lengthwise direction of the wellbore such that it flows from one zone to another."); *see also* Tr. 10:4–16 ("What they're worried about is a longitudinal direction because you want to try to keep a discreet -- or if you have a vertical wellbore you're going to be worried about the up-down and keeping a discreet section of the wellbore separate from the rest of the wellbore."). Based on the statements made during prosecution, and the Specification's description of preventing channeling "between adjacent formations," and the statement that the covering is bonded as a singular annual shape with no seams to allow channeling, we find persuasive Dr. Haut's interpretation that "seamless covering" means "a covering having no seams that would permit channeling – i.e., fluid flow in the lengthwise direction of the wellbore." Ex. 1003 ¶ 24; *see also Phillips*, 415 F.3d at 1318 ("We have also held that extrinsic

evidence in the form of expert testimony can be useful to a court for a variety of purposes, such as to . . . to establish that a particular term in the patent or the prior art has a particular meaning in the pertinent field."). Based on the final trial record before us, we determine that "a seamless covering" means *a covering formed without channels that would allow fluid flow longitudinally*.

C. Anticipation Ground Based on Thomson

Petitioner contends that claims 1–5 and 9–18 are anticipated by Thomson under 35 U.S.C. § 102(e). Pet. 5, 22–26. We instituted trial based on Petitioner's contentions. Dec. 13–17. Based on the final trial record before us, Petitioner has proven by a preponderance of the evidence that the challenged claims would be anticipated by Thomson.

1. Thomson (Ex. 1005)

Thomson has a prior art date of January 28, 2002, the PCT filing date. Pet. 5–6 (citing 35 U.S.C. § 102(e)(2) (pre-AIA); MPEP § 2136). Thomson relates to a "seal for use in a borehole" comprising "an elastomeric material that is capable of expanding upon contact with an actuating agent." Ex. 1005, 1:52–55. Thomson describes an outer surface of an expandable conduit with a formation that includes an elastomeric material, such as rubber, that can expand or swell when the material comes into contact with an actuating agent, such as water, brine, or drilling fluid. *Id.* at Abst. (57). Thomson recognizes that a seal is generally required in between expandable sections of tubing after being lowered into the well because the expanded tubing does not necessarily contact the conduit (e.g., liner, casing or formation) along the entire length of the tubing due to irregularities in the surface of the liner, casing, or formation. *Id.* at 1:28–39. The purpose of the

seal is "to prevent fluid flow in an annulus created between the expandable member and the liner, casing or formation, and also to hold differential pressure" and "to prevent movement of the expandable member." *Id.* at 1:36–42.

Thomson describes that the tubing is preferably expandable and thus is typically made of a ductile material. *Id.* at 2:24–26. The conduit can be a single piece or a number of pieces joined together by welding, screw threads, etc. *Id.* at 2:27–29. Thomson further explains that the elastomeric material may be in the form of a formation, which may comprise one or more annular bands of the elastomeric material. *Id.* at 2:50–52. Figure 1 of Thomson depicts an exemplary coated conduit.

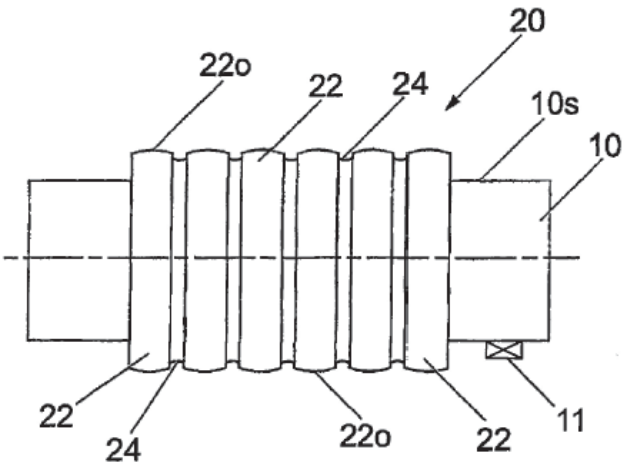

Fig. 1

Figure 1 is a first embodiment of a formation applied to an outer surface of a conduit.

As explained above, conduit 10 may be a single piece or a number of joined pieces. *Id.* at 5:47–53; 7:34–38. Formation 20, which "expand[s] or swell[s] due to contact with an actuating agent," may be formed in a single continuous piece over the length of conduit 10, over a portion of its length,

or at multiple axially spaced-apart locations along its length. *Id.* at 4:31–36; 5:54–57; 7:32–38. The outer surface of the formation may be contoured (e.g., ribs 22 and valleys 24, or serrations) to expose a greater surface area of the material to the actuating agent. *Id.* at 5:36–40; 7:41–45. The formation can be attached or bonded to the conduit. *Id.* at 5:60–64.

2. Anticipation of Claim 1

To establish anticipation, each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference. *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). "To anticipate a claim, a prior art reference must disclose every limitation of the claimed invention, either explicitly or inherently." *In re Schreiber*, 128 F.3d 1473, 1477 (Fed. Cir. 1997). Below, we consider each limitation of claim 1 and the parties' corresponding arguments.

Claim 1 first recites the step of "providing a seamless covering on a plurality of stands that make up the tubular string." Ex. 1001, 3:15–16. Petitioner identifies the claimed plurality of stands as disclosed by Thomson's plurality of conduits. Pet. 23. Petitioner identifies the claimed seamless covering with Thomson's formation 20, which can comprise one or more bands of elastomeric material, the bands typically being annular. *Id.* (citing Ex. 1005l, 2:51–52); *see also* Ex. 1005, Fig. 1 (formation 20). Petitioner contends that within Thomson, "the curing process would result in a solid mass of elastomer that a POSITA would have understood to be seamless." Pet. 21. According to Petitioner, "Thomson teaches that the ribs/valleys and/or serrations are optional: '. . . the outer surfaces of the formation 20 may be profiled to enable maximum material exposure to the swelling or expanding medium.'" *Id.* at 21–22 (citing Ex. 1005, 5:38–40).

Petitioner also contends that Thomson's bands of elastomeric material are perpendicular to the lengthwise direction of the wellbore and they are also designed to prevent channeling of fluids in the axial (longitudinal) direction. *Id.* at 22. Patent Owner contends that Thomson does not disclose this limitation.

Patent Owner contends that "[e]ach of the coverings disclosed in Thomson [has] seams, and Thomson does not indicate that . . . the coverings are seamless." PO Resp. 42. Patent Owner's contentions are predicated on the overly narrow definition of "seamless covering" that we considered and rejected because the Specification and file history of the '505 patent dictate that "a seamless covering" means a covering formed without channels that would allow fluid flow longitudinally. Patent Owner contends that "[e]ach valley 24 of the formation 20 shown in Fig. 1 is a 'seam,' in that it is a 'groove' or 'furrow' that 'joins' two edges of the adjacent bands." *Id.* at 43. Patent Owner also contends that Thomson's circumferential grooves can permit channeling around the covering. PO Resp. 47.

We are persuaded by Petitioner's arguments and evidence that Thomson's circumferential grooves do not permit fluid flow longitudinally. As such, we find that Thomson's circumferential grooves are therefore not seams as that term is used in the '505 patent. We also find persuasive Dr. Haut's explanation that channeling is "fluid flow in the lengthwise direction of the wellbore" and that the seamless covering prevents longitudinal channeling. Ex. 1003 ¶ 24; *see also* Ex. 1015, 62:12–63:5 (Mr. Cox testifying that channeling means "you displace the cement around a casing or a pipe, as the cement came up the annulus, it would divert in one area and channel around some thick mud.").

Further, Patent Owner's contention that circumferential fluid flow "can find a weak spot between each seam and the geological formation, and can channel through the formation to the next seam" (PO Resp. 48) is speculative. First, according to claim 1, a "seamless covering" is provided on a plurality of stands, and we consider whether or not the covering is seamless at that time and not upon the later step of "using well fluids to promote swelling." Ex. 1001, 3:15–20. Second, Patent Owner's contention that channeling may result after the covering is swollen is unpersuasive because the argument contradicts Thomson's disclosure that once the elastomeric material is swollen it achieves "a tight seal in the annulus." Ex. 1005, 6:60–7:6.

Alternatively, even if we adopted Patent Owner's proposed claim construction for "seamless covering," Thomson discloses an embodiment with a single annular band of swelling elastomeric material that would have a seamless covering as interpreted by Patent Owner. Petitioner also relies on this embodiment in its analysis. *See* Pet. 23 ("The formation can comprise *one* or more bands of the elastomeric material, the bands typically being annular.") (emphasis added) (quoting Ex. 1005, 2:51–52). For example, Figure 1 of Thomson depicts a plurality of bands 22 that are joined by a plurality of valleys 24:

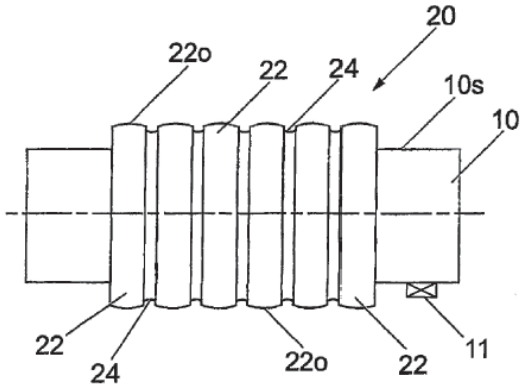

Fig. 1

Figure 1 is a first embodiment of a formation applied to an outer surface of a conduit.

Patent Owner contends that the valleys 24 combined with the bands 22 create seams, and therefore Thomson is not seamless. *See* PO Resp. 43 ("Each valley 24 of the formation 20 shown in Fig. 1 is a 'seam,' in that it is a 'groove' or 'furrow' that 'joins' two edges of the adjacent bands."). In the embodiment with a single band 22, there would not exist any valley or abutting edges that Patent Owner contends are seams. Petitioner's expert, Dr. Haut, also provides sufficient analysis of this single band embodiment, including reliance on claim 26 of Thomson, which claims "the swelling elastomer is *a band* having an outer surface, an inner surface, a first end surface and a second end surface and wherein the inner surface of the band is in contact with the tubular body." Ex. 1003 ¶ 44 (emphasis added) (also quoted at Pet. 21, but inaccurately identified as claim 21). Thomson discloses how a single band of swelling elastomer may be employed (Ex. 1005, 2:51–64) and the use of only a single band would create a "seamless covering" even under Patent Owner's proposed interpretation. *See* Pet. 20–21.

Based on the final trial record before us, Petitioner presents sufficient arguments and credible evidence to support a finding that Thomson's continuous band or bands of elastomeric material would be "a seamless covering."

Petitioner presents persuasive arguments and credible evidence to support a finding that Thomson discloses "running the tubular string to a desired position in the wellbore," and "using well fluids to promote swelling of said covering at a rate slow enough to allow placement of said string at the depth desired" as required by claim 1. Ex. 1001, 3:17–21; Pet. 24–25. Specifically, Thomson discloses that the elastomeric material in the formation may begin to swell as soon as the conduit is located in the borehole and contacts naturally occurring fluid that actuates the swelling in the borehole. Pet. 24 (citing Ex. 1005 at 6:16–22). Thomson further discloses that the covering may swell at a controlled rate slow enough to allow the conduit to be positioned in the well. *Id.* at 24–25 (quoting 9:14–16, 6:36–45 ("Certain embodiments of the present invention can also prevent swelling of the material until the conduit to which it is applied has been radially expanded in situ," and "it is possible to delay the swelling of the elastomeric material.")).

The final limitation of claim 1 requires "sealing the wellbore from said swelling." As previously discussed, we construe this claim limitation as "sealing the wellbore based on swelling of the covering." Petitioner presents persuasive evidence and credible evidence to support a finding that Thomson discloses sealing the wellbore from the swelling of the covering as required by claim 1. *See* Pet. 25–26. For example, Thomson explains that "[a]s the elastomeric material swells, it expands and thus creates a seal in the

annulus. The seal is independent of the diameter of the borehole, casing, liner or the like as the material will swell and continue to swell upon absorption of the fluid to substantially fill the annulus." Ex. 1005, 6:60–7:5. Thomson further discloses that "the elastomeric material act[s] as a seal." Ex. 1005, 7:2–5; *see also id.* at 9:48–58, 65–67 (claims 8 and 11).

Patent Owner's contentions for this limitation hinge on its claim interpretation that requires no expansion of the conduit before the wellbore is sealed by swelling of the covering. PO Resp. 49–51. For the reasons set forth above, we determined Patent Owner's proposed claim interpretation is not persuasive. Patent Owner argues, for example, "that the 'conduit 10 is located in the wellbore, casing, line or the like and ***radially expanded***' before the wellbore is sealed." *Id.* at 50. As discussed in Section II.B.1 above, we found that the embodiment within the '505 patent that permits radial expansion of the conduit before swelling was not disclaimed.

Petitioner alternatively contends that "[e]ven if Patent Owner's construction were adopted, Thomson teaches that expanding the stand is merely preferable, and in fact discloses that the stand could be drill pipe, which is not typically expandable." Pet. Reply 20. According to Petitioner, "POSA would have read Thomson's disclosure as explicitly teaching that its swellable-polymer sealing device would have been used with either expanded or unexpanded conduit as desired and/or needed." *Id.* at 21 (citing (Ex. 1003 ¶ 54 ("This language concerns expandable conduit, but Thomson also says that expanding the conduit is simply preferable.")).

We also find Petitioner's alternative theory persuasive—even if Patent Owner's claim construction is adopted, which precludes expansion of the conduit before swelling and sealing, Thomson discloses such an

embodiment. Thomson describes expansion of the conduit as a preferred embodiment, but Thomson is clear that the seal in the borehole may be created by the swelling of the elastomeric material alone. For example, method claim 8 of Thomson recites a "method of creating a seal in a borehole." Ex. 1005, 9:48–58; *see also* Dec. 17 (citing to claims 8 and 11). This seal is created by "providing an elastomeric material in the borehole," and then "exposing the material to an actuating agent that causes the elastomeric material to expand." Ex. 1005, 9:48–58. Patent Owner does not direct us to, nor can we find, any requirement in claim 8 that the conduit of Thomson is expanded to achieve the seal. In fact, claim 11, indirectly dependent from claim 8, goes on to require "the additional step of applying a radial expansion force to the conduit." *Id.* at 9:65–67. Claims 8 and 9 (*id.* at 9:48–61) inform us that the seal was already created by the swelling of the elastomeric material on an outer surface of a conduit, and thereafter the conduit is expanded according to claim 11 of Thomson (*id.* at 9:65–67). Thus, even if we were to adopt Patent Owner's proposed claim construction, we agree with Petitioner that Thomson discloses an embodiment wherein the "sealing of the wellbore from said swelling" is achieved regardless of radial expansion of the conduit. *See* Pet. Reply 20–21.

Based on the final trial record before us, Petitioner has established by a preponderance of the evidence that Thomson discloses all the limitations of independent claim 1.

3. Anticipation of Claims 2–5 and 9–18

We have reviewed Petitioner's explanations and evidence regarding each of the challenged dependent claims, and determine that Petitioner has established by a preponderance of the evidence that Thomson discloses all

the limitations of dependent claims 2–5 and 9–18. *See* Pet. 26–34 (citing Ex. 1005 2:21–22, 3:24–26, 4:55–65, 5:11–15, 5:54–57, 5:60–6:4, 6:60–7:2, 7:6–12, 7:49–52, 9:14–16; Ex. 1003 ¶¶ 57–76). We address each claim in turn, but also note that Patent Owner has not challenged the sufficiency of Petitioner's evidence for these claims.

Claim 2

Dependent claim 2 depends from claim 1 and adds the step of "bonding the covering to the stands." Ex. 1001, 3:24–25. Petitioner's arguments and evidence persuasively establish that Thomson discloses this limitation because "[t]he elastomeric material of the or each formation 20 is typically in a solid or relatively solid form so that it can be attached or bonded to the outer surface 10s and remain there as the conduit 10 is run into the borehole, casing, liner or the like." Pet. 26 (quoting Ex. 1005, 5:60–64) (citing Ex. 1003 ¶ 57).

Claim 3

Dependent claim 3 depends from claim 1 and adds the step of "expanding the stands." Ex. 1001, 3:26–27. As explained above in regard to claim 1, and based on the final trial record before us, Petitioner presents sufficient arguments and credible evidence to support a finding that Thomson discloses this limitation. Pet. 27. Thomson discloses radially expanding the conduit (stands) by any conventional means. Ex. 1005, 5:65–6:4. As also discussed above, Thomson describes expanding the conduit before swelling of the elastomeric material (*id.*) or swelling the elastomeric material and then expanding the conduit (*id.* at 9:48–58, 9:65–67).

Claim 4

Dependent claim 4 depends from claim 3 and adds the limitation of "performing said expanding before said covering swells completely." Ex. 1001, 3:28–30. Based on the final trial record before us, Petitioner presents sufficient arguments and credible evidence to support a finding that Thomson discloses this limitation whereas Thomson describes "[c]ertain embodiments of the present invention can also prevent swelling of the material until the conduit to which it is applied has been radially expanded in situ." Pet. 27–28 (quoting Ex. 1005, 9:14–16).

Alternatively, under Patent Owner's proposed claim construction, Thomson also describes delaying the swelling of the elastomeric material for a period of time and expanding the conduit after a seal is achieved through swelling of the elastomeric material. *See* Pet. Reply 20–21. Such a configuration would allow continued swelling after a seal is achieved and the stands are expanded. *See* Ex. 1005, 3:17–29 (explaining that swelling can occur over days), 9:48–58, 9:65–67.

Claim 5

Dependent claim 5 depends from claim 1 and adds the limitation of "providing extrusion barriers for said covering near at least one extremity of said string." Ex. 1001, 3:31–33. Petitioner relies on Thomson's disclosure of non-swellable bands 32/34 that flank elastomeric formation 36 and act as a barrier to axial swelling, or extrusion, as depicted in Figure 2. Pet. 28. Petitioner contends that "[a] POSITA would understand that the outer bands act as extrusion barriers and could be placed as near to or as far from the ends of the conduit as desired." *Id.* at 29 (citing Ex. 1003 ¶¶ 60–61). Based on the final trial record before us, Petitioner presents sufficient arguments

and credible evidence to support a finding that Thomson discloses these limitations.

Claim 9

Dependent claim 9 depends from claim 1 and adds the limitation of "making said covering from a material that swells in the presence of one of oil based mud and oil based hydrocarbon production." Ex. 1001, 4:6–9. Based on the final trial record before us, Petitioner presents sufficient arguments and credible evidence to support a finding that Thomson discloses this limitation: "[t]he actuating agent is typically a fluid, such as hydraulic oil or water, and is generally an oil- or water-based fluid." Pet. 29–30 (quoting Ex. 1005, 4:57–65).

Claim 10

Dependent claim 10 depends from claim 1 and adds the limitation of "making said covering from a material that swells in the presence of one of water based systems and water based production well fluids." Ex. 1001, 4:10–13. Based on the final trial record before us, Petitioner presents sufficient arguments and credible evidence to support a finding that Thomson discloses this limitation because, as noted above, the actuating agent is typically a fluid, such as hydraulic oil or water. *See* Ex. 1003 ¶¶ 64–65.

Claim 11

Dependent claim 11 depends from claim 1 and adds the limitation of "allowing said covering to fill wellbore irregularities due to said swelling." Ex. 1001, 4:14–16. Based on the final trial record before us, Petitioner presents sufficient arguments and credible evidence to support a finding that Thomson discloses this limitation. Pet. 31–32. Thomson recognizes that

wellbores often have irregular surfaces and thus irregular gaps between the casing and the wellbore. Ex. 1005, 6:6–15. Thomson discloses filling those irregularities whereas "the elastomeric material swells, it expands and thus creates a seal in the annulus," and "[t]he seal is independent of the diameter of the borehole, casing, liner or the like as the material will swell and continue to swell upon absorption of the fluid to substantially fill the annulus between the conduit 10 and the borehole, casing, liner or the like in the proximity of the formation 20." *Id.* at 6:60–7:2.

Claim 12

Dependent claim 12 depends from claim 1 and adds the limitation of "making said covering from a polymer." Ex. 1001, 4:17–18. As cited by Petitioner, Thomson discloses using any suitable polymer material for the application. Pet. 32–33; Ex. 1005, 2:1–3. Thus, based on the final trial record before us, Petitioner presents sufficient arguments and credible evidence to support a finding that Thomson discloses this limitation.

Claim 13

Dependent claim 13 depends from claim 12 and adds the limitation of "making said covering from rubber." Ex. 1001, 4:19–20. Based on the final trial record before us, Petitioner presents sufficient arguments and credible evidence to support a finding that Thomson discloses this limitation because Thomson discloses the elastomeric material of the surface covering is typically a rubber. Pet. 33 (citing Ex. 1005, 1:64, 2:21–22, 4:55–57).

Claim 14

Dependent claim 14 depends from claim 2 and adds the limitation of "expanding the stands." Ex. 1001, 4:21–22. This limitation is identical to that of dependent claim 3, and Petitioner presents sufficient arguments and

credible evidence to support a finding that Thomson discloses this limitation for the reasons set forth above for claim 3. *See* Pet. 33.

Claim 15

Dependent claim 15 depends from claim 14 and adds the limitation of "performing said expanding before said covering swells completely." Ex. 1001, 4:23–25. This limitation is identical to that of dependent claim 4, and Petitioner presents sufficient arguments and credible evidence to support a finding that Thomson discloses this limitation for the reasons set forth above for claims 3 and 4. *See* Pet. 33.

Claim 16

Claim 16 depends from claim 15 and adds the limitation "allowing the covering to fill wellbore irregularities due to said swelling." Ex. 1001, 4:26–28. This limitation is identical to that of dependent claim 11, and Petitioner presents sufficient arguments and credible evidence to support a finding that Thomson discloses this limitation for the reasons set forth above for claim 11. *See* Pet. 34.

Claim 17

Claim 17 depends from claim 16 and adds the limitation "making said covering from a polymer." Ex. 1001, 4:29–30. This limitation is identical to that of dependent claim 12, and based on the final trial record before us, Petitioner presents sufficient arguments and credible evidence to support a finding that Thomson discloses this limitation for the reasons set forth above for claim 12. *See* Pet. 34.

Claim 18

Claim 18 depends from claim 17 and adds the limitation "providing extrusion barriers for said covering near at least one extremity of said

string." Ex. 1001, 4:31–33. This limitation is identical to that of dependent claim 5, and Based on the final trial record before us, Petitioner presents sufficient arguments and credible evidence to support a finding that Thomson discloses this limitation for the reasons set forth above for claim 5. *See* Pet. 34.

C. Obviousness of Claims 1–5 and 9–18 Based on Thomson and Haney

We instituted trial on the ground that the subject matter of claims 1–5 and 9–18 would have been obvious over Thomson and Haney. Dec. 17–21; Pet. 34–38. Having now considered the arguments and evidence in the complete record established during trial, we are persuaded that, based on this record, Petitioner has demonstrated by a preponderance of the evidence that the claims would have been obvious over those references in combination.

Petitioner alternatively relies on the combination of Thomson and Haney in the event that we determine that Thomson does not disclose the claimed "seamless covering." Pet. 34–35. Petitioner reasons that "it would have been obvious to a POSITA to form the elastomeric band disclosed in Thomson without seams – i.e., seamless" as taught by Haney. *Id.* at 35 (citing Ex. 1003 ¶ 77).

A patent claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc*., 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art;

(2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

We first provide a brief overview of Haney below, and then address the evidence and contentions of each party in turn.

1. Haney (Ex. 1007)

Haney relates to the formation of well packers, "including a sleeve disposed about a pipe or other carrier structure and adapted to be compressed axially in a manner expanding the sleeve radially outwardly to form a seal in a well." Ex. 1007, Abst. (57). As depicted below in Figure 3, Haney discloses a method for forming an elastomeric well packer, which integrates three separate strips of elastomeric material, each strip itself having multiple layers rolled around a mandrel.

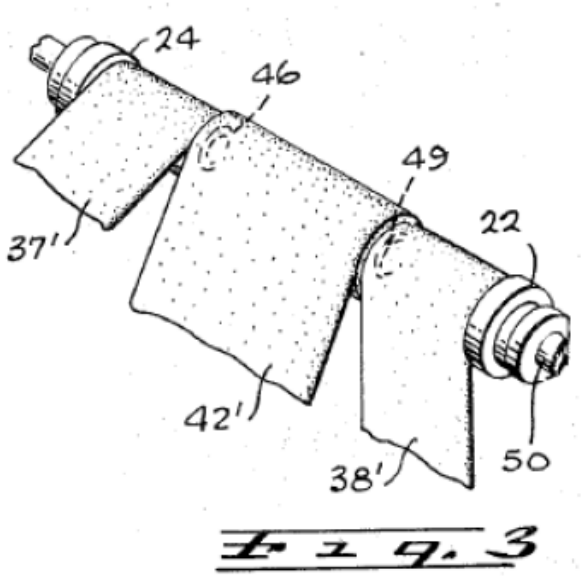

Figure 3 of Haney illustrates the manner in which the rubber of the packer body is built up on a mandrel.

"The three main bodies of rubber 37, 38, and 42 of the packer sleeve 23 may be formed on mandrel 50 by winding three elongated strips of thin uncured rubber 37′, 38′ and 42′ helically on to mandrel 50 . . . to attain the desired thickness of each section." *Id.* at 4:53–58. Haney teaches a curing process to integrate the uncured sections of rubber:

> With the rubber of all of the sections in uncured state, the mandrel and its carried parts are inserted into an oven at vulcanizing temperature, and the rubber is cured, to vulcanize and integrate the various bodies of rubber into a single unitary elastomeric sleeve tightly vulcanized to the four metal elements 22, 24, 46, and 49.

Id. at 5:11–17.

2. Claims 1–5 and 9–18

Petitioner's analysis demonstrates where each limitation of claims 1–5 and 9–18 is found in the Thomson and Haney combination. Pet. 34–38. For example, Petitioner contends that Haney discloses a curing process to integrate the uncured sections of rubber on a mandrel (*see* Fig. 3) and that the disclosure of integrating the various bodies of rubber into a single unitary elastomeric sleeve teaches forming a seamless covering as required by claim 1. Pet. 34–38. Petitioner asserts that "if Thomson is judged not to inherently disclose a seamless covering, it would been readily apparent to a POSITA to create such a seamless covering, as taught by Haney, through a formation and curing process such as that laid out above." *Id.* at 37. We find this argument persuasive on the final trial record before us.

As depicted in Figure 3 of Haney (above), Petitioner contends that Haney discloses a method for forming an elastomeric well packer that integrates three separate strips of elastomeric material, each strip itself having multiple layers from being rolled around a mandrel, into a seamless

whole. *Id.* at 35 (citing Ex. 1007, 4:53–58). According to Petitioner, Haney "teaches that any seams between the uncured sections of rubber (e.g., between strips 37′, 38′, and 42′), as well as what might be considered helical seams formed by the winding of any individual strip, are eliminated by the curing process." *Id.* at 36. Petitioner relies on Haney's disclosure that "the rubber is cured, to vulcanize and integrate the various bodies of rubber into a single unitary elastomeric sleeve tightly vulcanized to the four metal elements 22, 24, 46, and 49." *Id.* (emphasis omitted) (quoting Ex. 1007, 5:11–1).

Petitioner establishes persuasively that a person of ordinary skill in the art would have been motivated to combine the teachings of Thomson and Haney. *Id.* at 36–37 (citing Ex. 1003 ¶¶ 78–81). Petitioner contends that "[i]t would have been obvious for a POSITA to choose to form Thomson's elastomeric material as seamless as taught in Haney," because channeling was a known problem existing in the art and curing Thomson's covering as taught by Haney would have been a simple substitution of known elements to achieve predictable results. *Id.* at 37; Ex. 1003 ¶ 81 ("Using Haney's seamless material for Thomson's elastomeric formation would have been the simple substitution of known elements, or similarly combining familiar elements according to known methods to achieve predictable results, and thus would have been obvious to a POSITA.").

Patent Owner repeats its unpersuasive contentions addressed above, further arguing that because the cited secondary references (Haney and Metcalfe) fail to teach sealing a wellbore via swelling of a covering, neither reference could cure the Thomson deficiency. PO Resp. 56. Patent Owner also makes distinct arguments, which we address in turn below.

Patent Owner contends that Petitioner fails to establish "that it would have been obvious to change the shape of Thomson's formations, or that it would have been obvious to physically replace Thomson's formation with that of Haney." PO Resp. 56. Patent Owner also contends that "physically substituting Haney's element for Thomson's formation would render Thomson wholly unsuitable for sealing because Haney's element is not swellable." *Id.* Patent Owner also alleges that Petitioner did not properly address the first *Graham* factor as to the level of ordinary skill in the art. *Id.* at 58.

Patent Owner's contentions selectively pick and choose features of each individual reference while ignoring the combination proposed as a whole. Thomson teaches that any suitable elastomeric material would work in the invention. Ex. 1005, 2:1 ("Any elastomeric material may be used."). The fact that Haney's material is not described as swellable does not impact the proposed combination, whereas Petitioner relies on the curing process of Haney to form Thomson's swellable polymers as a single integrated whole without seams. *See* Pet. 35–38. Petitioner's expert establishes persuasively how to integrate Haney's wrapping and curing process into Thomson and also that Thomson's elastomers ("such as the Nitrile disclosed in both the '505 patent and Thomson") can be cured according to the process of Haney to result in a seamless covering. Ex. 1003 ¶ 79. Further, Thomson teaches that its formation is capable of employing both swellable and non-swelling elastomers, which would provide further motivation to adopt the curing process described in Haney. Ex. 1005, 5:36–38.

Patent Owner contends that the obviousness theory would not remove Thomson's circumferential grooves (PO Resp. 63), but this contention again

ignores the proposed combination. Thomson explains that the ribbed profile depicted in Figures 1 and 2 is merely an option: "the outer surfaces of the formation 20 may be profiled to enable maximum material exposure to the swelling or expanding medium." *Id.* at 5:38–40. Thomson also describes embodiments with a single band of swelling elastomeric material that would not be contoured as depicted in the figures of Thomson. *Id.* at 5:51–64; *see also id.* at 11:11–15 (a single elastomer band would not contain seams). We agree with Petitioner that Thomson's teaching that the outer surface "may be" profiled conveys to person of ordinary skill in the art that other formations (not depicted in Thomson) may be used without a profiled outer area. *See* Pet. Reply 18–20. Such a teaching provides further motivation for "[u]sing Haney's seamless material for Thomson's elastomeric formation." Ex. 1003 ¶ 81. The combined covering based on Thomson and Haney would not have circumferential grooves as argued by Patent Owner.

As to Patent Owner's contentions that Petitioner did not properly address the first *Graham* factor as to the level of ordinary skill in the art, we find this contention unpersuasive. *See* PO Resp. 58–61, 64, 65. Petitioner's expert, Dr. Haut, considered the relevant skill level in the art in performing his analysis, which Petitioner relies upon. *See* Ex. 1003 ¶¶ 20–21. We agree with Petitioner that Patent Owner has not established how Patent Owner's proposed level of skill in the art would "result in any sort of patentable distinction." Pet. Reply 12–13.

For the foregoing reasons and based on the final trial record, we determine that Petitioner has articulated an adequate reason supported by rational underpinnings to combine Thomson and Haney, namely, that using Haney's seamless material for Thomson's elastomeric formation would have

been the simple substitution of known elements according to known methods to achieve predictable results. *See* Pet. 37–38. Petitioner presents sufficient arguments and credible evidence to support a finding that the combination of Thomson and Haney would have taught "providing a seamless covering on a plurality of stands that make up the tubular string" as required by claim 1 Based on the final record, we determine that Petitioner has established by a preponderance of the evidence that Thomson and Haney teach all the limitations of independent claim 1.

We have reviewed Petitioner's contentions regarding each of the dependent claims, and determine that Petitioner has established by a preponderance of the evidence that Thomson and Haney teach all the limitations of dependent claims 2–5 and 9–18. *See* Pet. 34–38; Ex. 1003 ¶¶ 77–81. Patent Owner has not argued that these dependent claims are patentable over the combination of Thomson and Haney except by their dependency from claim 1. For the same reasons set forth above in the ground based on Thomson alone, we agree with Petitioner that the combination of Thomson and Haney teaches each limitation of claims 2–5 and 9–18.

D. Obviousness of Claims 6–8, 19, and 20 Based on Thomson and Metcalfe

We instituted trial on the ground that the subject matter of claims 6–8, 19, and 20 would have been obvious over Thomson and Metcalfe. Dec. 21–25; Pet. 38–48. Having now considered the evidence in the complete record established during trial, we are persuaded that, based on this record, Petitioner has demonstrated by a preponderance of the evidence that the claims would have been obvious over those references in combination.

We first provide a brief overview of Metcalfe below, and then address the evidence and contentions of each party in turn.

1. Metcalfe (Ex. 1006)

Metcalfe discloses "[a] method of installing a liner in a drilled bore below a section of bore previously lined with casing." Ex. 1006, Abst. (57). According to Metcalfe, the "invention relates to a tubing anchor, such as a liner hanger, that is a[n] arrangement for locating and sealing a section of liner downhole relative to an existing casing." *Id.* at 1:3–5, 13–15 ("The liner is secured and sealed to the casing using a liner hanger . . . ."). Metcalfe recognizes that conventional liner hangers are complex, expensive, and take up significant space in a wellbore annular, which results in a significant loss in wellbore diameter between the casing and the liner. *See id.* at 1:17–26. As a solution, Metcalfe proposes a liner made from relatively soft metal. *Id.* at 2:31–37. As depicted below in Figure 7, liner 48 is lowered through casing 50 into the wellbore, leaving an overlap between the bottom of the casing 50 and the top of the liner 48:

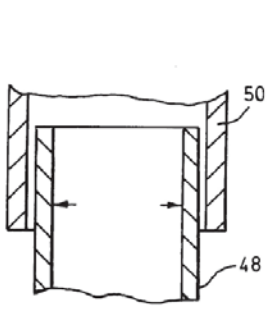

Fig.7

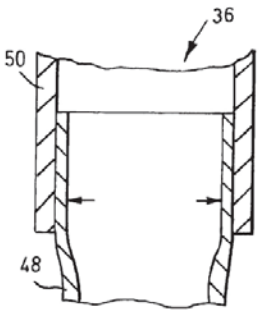

Fig.8

Figures 7 and 8 of Metcalfe illustrate a liner hanger 36.

As depicted in Figures 7 and 8, internal rolling compression and subsequent expansion of the upper section of liner 48 creates high radial interference between the outside diameter of the upper section of liner 48 and the inside

diameter of the lower sections of casing 50. *Id.* at 7:16–23. As depicted in Figure 8, liner 48 is plastically deformed with an expander member, causing an interference fit between the outer edge of liner 48 and the inner edge of casing 50. *Id.*; *see also id.* at Abst. (57). The interference fit provides both hanging support for liner 48, and provides a fluid-tight seal between liner 48 and casing 50. *Id.*

2. Claims 6–8, 19, and 20

Petitioner's element-by-element analysis demonstrates where each limitation of claims 6–8, 19, and 20 is found in the Thomson and Metcalfe combination. Pet. 38–48. For example, Petitioner persuasively establishes on the final trial record that the claim 6 requirement of "providing a combination hanger and extrusion barrier" is taught by the combination of Thomson and Metcalfe. *See* Pet. 41–43. Specifically, as depicted in Metcalfe Figures 7 and 8, a liner hanger is formed by expanding the upper end of the liner into contact with the casing to create a metal-to-metal seal. Ex. 1006, 1:54–56. After the expansion of the upper end of liner 48 in the lower end of casing 50, the two form a metal-to-metal, fluid-tight seal, which would have been understood to also limit the axial swelling of elastomeric material formed on the portion of the liner below the seal. Pet. 43 (citing Ex. 1003 ¶¶ 87–90).

Dependent claim 7 adds the limitations of "overlapping said string with existing well casing" and "expanding an end of said string to support it from said existing well casing." Petitioner persuasively establishes that these limitations are taught by Metcalfe Figures 1 and 2, which depict overlapping a portion of the liner, which is one segment of the claimed string, with the existing well casing. Pet. 43–45. Further, Metcalfe provides

a circumferential interference fit with the casing and hanging support for the liner, which obviates the requirement to provide slips or the like on the liner. *Id.* at 45 (citing Ex. 1006, 2:10–15). Claims 8 and 19 require "providing substantially circumferential sealing contact between said string and said existing well casing due to said expansion," and "using said sealing contact as an extrusion barrier." Ex. 1001, 4:1–5, 4:34–38. Petitioner persuasively establishes that Metcalfe teaches circumferential contact and sealing between the liner and existing well casing. Pet. 45 (citing Ex. 1006, 5:20–27, 3:30–39). We find persuasive Petitioner's contention that "[a] POSITA would have understood that the seal between liner 48 and well casing 50 would necessarily limit the axial swelling of elastomeric material attached to the liner below the seal." Pet. 47 (citing Ex. 1003 ¶¶ 94–97).

Petitioner also provides sufficient rationales, based on the final trial record, for combining the teachings of Thomson and Metcalfe. *Id.* at 41; Ex. 1003 ¶ 86. For example, Petitioner contends a person of ordinary skill in the art would have recognized the references disclose similar "techniques for sealing the wellbore annulus after installing the casing or liner: Metcalfe with cement, and Thomson with swellable elastomer." Ex. 1003 ¶ 86. According to Petitioner, "using Metcalfe's liner hanger with Thomson's swellable coating would have been simply combining familiar elements according to known methods to achieve predictable results, and thus would have been obvious." *Id.* Further, Petitioner contends a person of ordinary skill in the art "would have been motivated to use Metcalfe's interlocking expandable liner hanger in conjunction with Thomson's swellable coating to gain the benefits of Metcalfe's thinner, less-expensive hanger system as well as the benefits of Thomson's more reliable wellbore seal." *Id.* For the

foregoing reasons and based on the final record, we determine that Petitioner has articulated an adequate reason with rational underpinnings to support the proposed combination of Thomson and Metcalfe.

Patent Owner repeats its contentions against the challenge based on Thomson addressed above and adds that "[a] person of ordinary skill would not combine the teachings of Metcalfe with those of Thomson." PO Resp. 64 (emphasis omitted). Patent Owner fails to provide any supporting evidence or argument for this contention, and as explained above, we determine Petitioner's rationale is sufficient.

Based on the final trial record, we determine that the Petitioner has established by a preponderance of the evidence that the combination of Thomson and Metcalfe teach all the limitations of dependent claims 6–8, 19, and 20, and a person of ordinary skill in the art would have combined the references as proposed by Petitioner. *See* Pet. 41–48; Ex. 1003 ¶¶ 86–99.

E. Obviousness of Claims 6–8, 19, and 20 Based on Thomson, Metcalfe, and Haney

We instituted trial on the ground that the subject matter of claims 6–8, 19, and 20 would have been obvious over Thomson, Metcalfe, and Haney. Dec. 25; Pet. 48–49. Having now considered the evidence in the complete record established during trial, we are persuaded that, based on this record, Petitioner has demonstrated by a preponderance of the evidence that the claims would have been obvious over those references in combination.

Petitioner again relies on Haney in the event we find "Thomson in combination with Metcalfe does not teach a 'seamless covering,' it would have been obvious to a POSITA, in view of Haney's teachings, to use such a covering in conjunction with the combination of Thomson and Metcalfe."

Id. at 48–49. For the reasons set forth above with respect to the proposed combination of Thomson and Metcalfe, and Thomson and Haney, we are persuaded that Petitioner has established by a preponderance of the evidence that claims 6–8, 19, and 20 would have been obvious over Thomson, Metcalfe, and Haney. Petitioner's rationales for the combination of each of Metcalfe and Haney with Thomson also support the combination of all three references.

Patent Owner contends that "[a]s dependent on claim 1, claims 6–8 and 19–20 are patentable for the same reasons independent claim 1 is patentable over Thomson and Haney." PO Resp. 64–65. For the reasons set forth above, we find these contentions unpersuasive.

F. Patent Owner's Challenge to Dr. Haut's Qualifications as an Expert

Patent Owner contends that Petitioner's expert, Dr. Haut, lacks education or experience to provide a basis for his opinions and therefore his testimony should be disregarded. PO Resp. 14–18. We have considered Patent Owner's contentions, including Petitioner's response (Pet. Reply 22–25), and we find Patent Owner's contentions unpersuasive.

Here, Patent Owner has not moved to exclude Dr. Haut's testimony, but instead claims that he lacks education or experience to provide an opinion. PO Resp. 14. Federal Rule of Evidence ("Rule") 702 provides that:

> A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:
>
> (a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;

> (b) the testimony is based upon sufficient facts or data;
>
> (c) the testimony is the product of reliable principles and methods; and
>
> (d) the expert has reliably applied the principles and methods to the facts of the case.

Fed. R. Evid. 702. Under this standard, testimony on the issue of unpatentability proffered by a witness who is not "qualified in the pertinent art" generally is not admissible. *Sundance Inc. v. DeMonte Fabricating Ltd.*, 550 F.3d 1356, 1363–64 (Fed. Cir. 2008). Rule 702, however, does not "require[] a witness to possess something more than ordinary skill in the art to testify as an expert" and a "witness possessing merely ordinary skill will often be qualified to present expert testimony." *Id.* at 1363. Nor does the Rule require a perfect match or complete overlap between the witness's technical qualifications and the field of the invention. *See SEB S.A. v. Montgomery Ward & Co.*, 594 F.3d 1360, 1372–73 (Fed. Cir. 2010).

In his declaration and curriculum vitae, Dr. Haut details his relevant work experience dating from 1977 as well as his research experience and numerous technical publications and presentations. *See* Ex. 1003 ¶¶ 1–15; *see also* Ex. 1004. Dr. Haut has a Bachelor of Science in Mechanical Engineering as well as Masters and a Ph.D in Engineering. *Id.* ¶¶ 2–4. His relevant work experience includes 25 years in the oil and gas industry. *Id.* ¶ 5.

Patent Owner contends that because Dr. Haut does not have sufficient experience with swellable polymers, he is not qualified to testify. PO Resp. 14. Patent Owner also contends that Dr. Haut "has no experience designing inflatable packers" as well as such devices "for use in open hole." *Id.* at 15.

Petitioner responds by pointing to Dr. Haut's extensive experience in "working with casing, liners, packers, and other sealing devices, specifically including the use of swellable polymers on expandable casing, which are all relevant to the subject matter of the '505 patent." Pet. Reply 23–24. Petitioner notes that "Dr. Haut is also listed on forty two U.S. Patents in this technology space," and upon review of these cited patents, we agree many of these are relevant to the technology at hand. *Id.* at 24 (citing Ex. 1004, 7–8 (patents titled: "Radial Expansion of Tubular Members" and "Apparatus for Expanding a Tubular Member")). The record also shows that Dr. Haut had some experience "researching the use of swellable polymers for sealing the expandable casing system that they had developed" at Eventure. *Id.* (citing Ex. 2007, 37:7–43:7).

Dr. Haut does not have to be expert in polymer chemistry to qualify as an expert for a patent related to "sealing casing or liners in a wellbore." Ex. 1001, Abst. (57). Having reviewed the entirety of Dr. Haut's experience and education, we find his knowledge, skill, and experience in the relevant field of sealing casing or liners in a wellbore through use of a swellable polymer, sufficient to render him qualified to offer testimony in this proceeding under Rule 702.

III. SUMMARY AND ORDER

Petitioner has demonstrated, by a preponderance of the evidence that:

Claims 1–5 and 9–18 are unpatentable under 35 U.S.C. § 102(e) based on Thomson;

Claims 1–5 and 9–18 are unpatentable under 35 U.S.C. § 103(a) over Thomson and Haney;

Claims 6–8 and 19–20 are unpatentable under 35 U.S.C. § 103(a) over Thomson and Metcalfe; and

Claims 6–8 and 19–20 are unpatentable under 35 U.S.C. § 103(a) over Thomson, Metcalfe, and Haney.

It is, therefore

ORDERED that claims 1–20 of the ’505 patent are unpatentable;

FURTHER ORDERED that, because this is a final written decision, parties 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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