Trials@uspto.gov
571-272-7822

Paper 39
Entered: July 21, 2022

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

WEATHERFORD U.S., L.P.,
Petitioner,

v.

ENVENTURE GLOBAL TECHNOLOGY, INC.,
Patent Owner.

IPR2021-00107
Patent 6,604,763 B1

Before MEREDITH C. PETRAVICK, HYUN J. JUNG, and NEIL T. POWELL, *Administrative Patent Judges.*

JUNG, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

Granting Patent Owner's Motion to Expunge (Paper 25)
37 C.F.R. § 42.24(c)(4)

Denying Petitioner's Motion to Exclude (Paper 29)
37 C.F.R. § 42.64(c)

Granting Motions to Seal (Papers 21, 34)
37 C.F.R. § 42.64(c)

I. INTRODUCTION

We have jurisdiction under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Weatherford U.S., L.P. ("Petitioner") has shown by a preponderance of the evidence that claims 1 and 3 of U.S. Patent No. 6,604,763 B1 (Ex. 1001, "the '763 patent") are unpatentable.

A. Background and Summary

Petitioner filed a Petition (Paper 2, "Pet.") requesting institution of an *inter partes* review of claims 1 and 3 of the '763 patent. Enventure Global Technology, Inc. ("Patent Owner") filed a Preliminary Response (Paper 6). Pursuant to 35 U.S.C. § 314, we instituted an *inter partes* review of the '763 patent. Paper 11 ("Inst. Dec."). In particular, we instituted review of claims 1 and 3 on all presented challenges. Inst. Dec. 2, 40, 49.

After institution, Patent Owner filed a Response (Paper 16, "PO Resp."), to which Petitioner filed a Reply (Paper 20,[1] "Pet. Reply"), and Patent Owner subsequently filed a Sur-reply (Paper 24, "PO Sur-reply").

Patent Owner also filed a Motion to Expunge its originally filed Sur-reply. Paper 25. Petitioner filed a Motion to Exclude Evidence (Paper 29, "Mot. to Excl."), to which Patent Owner filed a Response to Petitioner's

[1] Petitioner filed a confidential Reply to Patent Owner's Response. Paper 19. We cite to the publicly available version. Paper 20.

Motion to Exclude Evidence (Paper 30, "Opp."). Petitioner, thereafter, filed a Reply in Support of Motion to Exclude Evidence. Paper 31 ("Reply for Mot.").

An oral hearing in this proceeding was held on February 24, 2022; a transcript of the hearing is included in the record. Paper 37 ("Tr.").[2]

B. Real Parties in Interest

Petitioner identifies Weatherford U.S., L.P., Weatherford Technology Holdings, LLC, and Weatherford International, plc as real parties in interest. Pet. 6; Paper 15, 2. Patent Owner identifies only Enventure Global Technology, Inc. as a real party in interest. Paper 4, 1.

C. Related Matters

The parties indicate that the '763 patent is involved in *Enventure Global Technology, Inc. v. Weatherford U.S., L.P.*, 4:19-cv-02397 (S.D. Tex.). Pet. 6; Paper 4, 1; Paper 7, 1–2; Paper 15, 2–3. The parties also indicate that other patents asserted by Patent Owner are at issue in IPR2020-01580, IPR2020-01648, IPR2020-01661, IPR2020-01666, IPR2020-01684, and IPR2020-01700.[3] Pet. 6; Paper 4, 1; Paper 15, 3.

D. The '763 patent (Ex. 1001)

The '763 patent relates to "wellbore casings that are formed using expandable tubing." Ex. 1001, 1:40–42. Figure 28 of the '763 patent is reproduced below.

---

[2] A sealed transcript is entered as Paper 36. We cite to the publicly available version. Paper 37.

[3] We instituted trial in all the listed proceedings, except for IPR2020-01661 and IPR2020-01666. Final Written Decisions have been issued for IPR2020-01580, IPR2020-01648, IPR2020-01684, and IPR2020-01700.

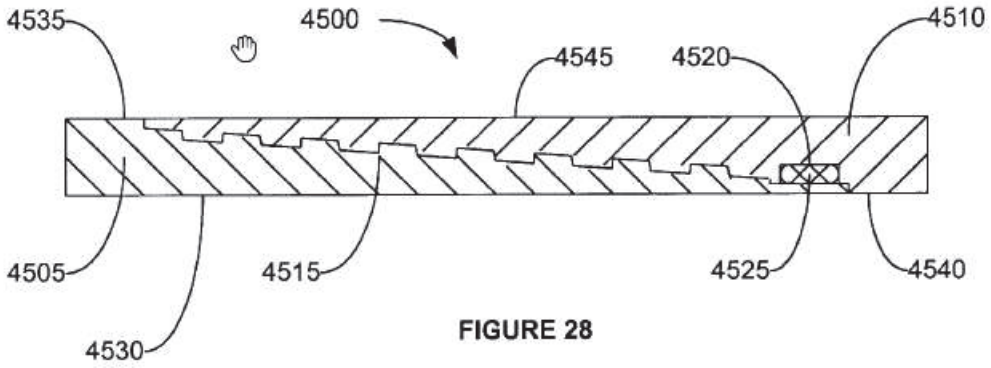


FIGURE 28

Figure 28 shows a cross-section of an expandable threaded connection. Ex. 1001, 10:66–67, 152:28–29. Expandable threaded connection 4500 includes first tubular member 4505, second tubular member 4510, threaded connection 4515, O-ring groove 4520, and O-ring 4525. *Id.* at 152:30–33.

O-ring groove 4520 is preferably on an interior wall of second tubular member 4510 and adjacent to an end of threaded connection 4515. Ex. 1001, 152:58–60. O-ring groove 4520 is sized to allow O-ring 4525 to expand at least 20% in an axial direction during a radial expansion process. *Id.* at 152:63–66.

The ’763 patent also describes other expandable threaded connections 4300, 4700, and 4900. Ex. 1001, 151:51–152:27, 153:8–154:63, Figs. 27, 29, 30. Expandable threaded connections 4300, 4700, and 4900 each include a first tubular member, a second tubular member, a threaded connection for connecting the first and second tubular members, one or more O-ring grooves, and one or more O-rings. *Id.* at 151:51–56, 153:8–13, 153:59–65.

Expandable threaded connection 4300 has O-ring groove 4320 on an interior wall of second tubular member 4310, but groove 4320 is not

adjacent to an end portion of threaded connection 4315. Ex. 1001, 152:12–14, Fig. 27. Expandable threaded connection 4700 has O-ring groove 4720 near an end of threaded connection 4715, but two O-rings 4725, 4730 are placed in O-ring groove 4720. *Id.* at 153:36–41, Fig. 29. Expandable threaded connection 4900 has two O-ring grooves 4920, 4925, one groove 4925 near the end of threaded connection 4915 and the other groove 4920 away from the end of threaded connection 4915. *Id.* at 154:21–24, 154:34–37, Fig. 30.

E. Challenged Claims

The '763 patent includes claims 1–33, of which Petitioner challenges claims 1 and 3, reproduced below.

> 1. An apparatus, comprising:
> a first tubular member;
> a second tubular member;
> a threaded connection for coupling the first tubular member to the second tubular member;
> at least one annular chamber defined between the first and second tubular members; and
> one or more sealing members disposed within the annular chamber for sealing the interface between the first and second tubular members before, during, and after a radial expansion and plastic deformation of the first and second tubular members;
> wherein the size of the annular chamber permits the sealing members to expand in the axial direction during the radial expansion and plastic deformation of the first and second tubular members.
>
> 3. The apparatus of claim 1, wherein the sealing members are positioned adjacent to an end portion of the threaded connection within the annular chamber.

Ex. 1001, 174:16–32, 174:35–37.

F. Asserted Prior Art and Proffered Testimonial Evidence

Petitioner identifies the following references as prior art in the asserted grounds of unpatentability:

Name	Reference	Exhibit
Abdrakhmanov	US 5,083,608, issued Jan. 28, 1992	1004
'799 Publication	WO 93/25799, published Dec. 23, 1993	1012
Meling	SU 1367586 A1, published Nov. 27, 1996	1003
OTC 6131	Moore et al., "O-Ring Seal Failure Mechanisms," Offshore Technology Conference, May 1989	1008

Pet. 8; *see also id.* at 8 (arguing that the effective filing date is no earlier than April 26, 1999 and that all references are prior art under § 102(b)); *see generally* PO Resp. (presenting no arguments regarding the effective filing date). Meling is a patent from the Soviet Union (SU), and Exhibit 1003 includes the original patent and a translation.

Petitioner provides a Declaration of Michael Chambers (Ex. 1002), and Patent Owner provides a Declaration of Gary R. Wooley in Support of Patent Owner's Response (Ex. 2011).

G. Asserted Grounds

Petitioner asserts that claims 1 and 3 would have been unpatentable on the following grounds:

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1, 3	102[4]	Meling
1, 3	103	Meling, OTC 6131

[4] The relevant sections of the Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112–29, 125 Stat. 284 (Sept. 16, 2011), took effect on March 16, 2013. Because the '763 patent claims priority to an application filed before that date, our citations to 35 U.S.C. §§ 102 and 103 are to their pre-AIA versions.

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1, 3	103	Meling, '799 Publication
1, 3	103	Meling, OTC 6131, '799 Publication
1, 3	103	Abdrakhmanov, Meling
1, 3	103	Abdrakhmanov, Meling, '799 Publication

Pet. 8–9. Petitioner also challenges claims 1 and 3 as unpatentable over Meling, Meling and OTC 6131, and Abdrakhmanov and Meling further in view of the knowledge of a person of ordinary skill in the art. *Id.* at 8, 9. Because knowledge of a person of ordinary skill in the art is always a consideration (*KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007)) and not an independent basis for an obviousness challenge, we do not list these additional challenges separately.

II. PATENT OWNER'S MOTION TO EXPUNGE

Patent Owner moves to expunge its originally filed Sur-reply (Paper 22) because it exceeded the permitted word count. Paper 25. Petitioner did not oppose.

We grant Patent Owner's motion and expunge the originally filed Sur-reply (Paper 22).

III. PETITIONER'S MOTION TO EXCLUDE

Petitioner moves to exclude Exhibits 2018–2020 and 2023. Mot. to Excl. 1. Petitioner notes that it timely objected to these exhibits. *Id.* (citing Paper 17).

Petitioner, as the "moving party," "has the burden of proof to establish that it is entitled to the requested relief." 37 C.F.R. § 42.20(c). In an *inter*

partes review, in which we decide admissibility and also serve as the fact-finder, we are well-positioned to determine and assign appropriate weight to evidence presented. Also, a complete record of the evidence is preferable to facilitate public access as well as appellate review.

For the reasons below, we deny Petitioner's motion to exclude. We note that, even if we were to exclude one or more of the exhibits listed above, it would not change the outcome of this Decision.

A. Exhibit 2018

Exhibit 2018 is an article from "Offshore" magazine. Petitioner argues that the exhibit should be excluded under Federal Rule of Evidence ("FRE") 801 and 802 because Patent Owner relies on the exhibit for the truth of statements made therein and no hearsay exception applies. Mot. to Excl. 1–2. Patent Owner responds that Exhibit 2018 is a copy of an exhibit that Petitioner filed in IPR2020-01648 as part of a ground of invalidity and, thus, has manifested that it adopted or believed that the exhibit is true. Opp. 1–2. Patent Owner also argues that Exhibit 2018 is admissible under the periodical exception or the residual exception to hearsay. *Id.* at 3–5.

Petitioner replies it did not rely on Exhibit 2018 for a hearsay purpose in the related Board proceeding. Reply for Mot. 1. Petitioner also argues that the periodical exception cannot be used for Exhibit 2018 and the residual exception should only be applied if the exhibit was more probative than any other evidence reasonably available. *Id.* at 1–2.

We adopt as our own findings and conclusions Patent Owner's analysis of the hearsay issue. *See* Opp. 1–2. Thus, we deny Petitioner's Motion to Exclude as to Exhibit 2018.

B. Exhibit 2019

Exhibit 2019 is a brochure. Petitioner argues that the exhibit should be excluded under FRE 801 and 802 because Patent Owner relies on the exhibit for the truth of statements made therein and no hearsay exception applies. Mot. to Excl. 2–3. Patent Owner argues that the exhibit is admissible under the periodical exception or the residual exception to hearsay. Opp. 5–6. Petitioner replies with arguments similar to the ones summarized above for Exhibit 2018. *See* Reply for Mot. 3.

We adopt as our own findings and conclusions Patent Owner's analysis of the hearsay issue. *See* Opp. 6. Thus, we deny Petitioner's Motion to Exclude as to Exhibit 2019.

C. Exhibit 2020

Exhibit 2020 is the First Amended Complaint filed in related litigation. Petitioner argues that the exhibit should be excluded under FRE 801 and 802 because Patent Owner relies on the exhibit for the truth of statements made therein and no hearsay exception applies. Mot. to Excl. 3–4. Patent Owner argues that the exhibit is admissible under FRE 807 "because it is (1) 'supported by sufficient guarantees of trustworthiness,' including corroborating evidence, and (2) it is more probative on the point for which it is offered than any other evidence." Opp. 7. Petitioner replies that Patent Owner fails to show guarantees of trustworthiness and probative value greater than other evidence. Reply for Mot. 4–5.

We adopt as our own findings and conclusions Patent Owner's analysis of Exhibit 2020 as being admissible under FRE 807. *See* Opp. 7. Therefore, we deny Petitioner's Motion to Exclude as to Exhibit 2020.

D. Exhibit 2023

Exhibit 2023 is a brochure titled "Expandable Completion Systems." According to Petitioner, Exhibit 2023 should be excluded pursuant to FRE 401 and 402 because neither Patent Owner nor its declarant relies on it. Mot. to Excl. 4. Patent Owner responds that the brochure was relied upon, as the brochure is cited in both its Patent Owner's Response and declaration, but that the exhibit number of the brochure was erroneously cited. Opp. 8 (citing PO Resp. 75; Ex. 2011 ¶ 237). Patent Owner also argues that Petitioner should have been aware of the erroneous cite because the brochure was created by Petitioner and was cited in related proceedings. *Id.* Petitioner replies that it was not aware of the erroneous citation and that Patent Owner never notified it or the Board of the error. Reply for Mot. 5.

We agree with Petitioner that Patent Owner never informed us or Petitioner that the source of the quoted material was erroneously cited on page 75 of its Patent Owner's Response. The erroneous cite indicates the source of a quote is Exhibit 2006, which is a paper from related proceeding IPR2020-01580. PO Resp. 75. The quoted material cannot be found in Exhibit 2006, but is instead found in Exhibit 2023.

Also, the brochure of Exhibit 2023 has already been filed as Exhibit 2009. Although Patent Owner's "Table of Exhibits" indicate that they were accessed on different dates, both Exhibits 2009 and 2023 refer to the same brochure. PO Sur-reply v, vii; *compare* Ex. 2009 *with* Ex. 2023. Exhibit 2009 was cited as the source of a quote in Patent Owner's Preliminary Response, which is same quote that appears on page 75 of Patent Owner's Response with the erroneous citation. *Compare* Paper 6, 24

with PO Resp. 75. The brochure was cited in both Patent Owner's Preliminary Response and Patent Owner Response to support the same contention. *See* Paper 6, 24; PO Resp. 75.

Because the source of the quote on page 75 of Patent Owner's Response was erroneously identified as Exhibit 2006, but the source of the same quote was previously properly identified in Paper 6, page 24 as Exhibit 2009, which is the same brochure found in Exhibit 2023, we deny Petitioner's Motion to Exclude as to Exhibit 2023.

Additionally, even if the panel were to grant Petitioner's motion to exclude Exhibit 2023, the same brochure is also found at Exhibit 2009, which is not excluded. Given that the source of the quoted material was previously properly cited as Exhibit 2009 (Paper 6, 24), we could treat the miscite on page 75 of the Patent Owner's Response to Exhibit 2006 instead of Exhibit 2009 as a readily identifiable harmless error.

IV. MOTIONS TO SEAL

The parties filed unopposed Motions to Seal. Papers 21, 34. The parties also submitted a copy of the Board's default protective order. Paper 34, 1.

For the reasons argued, we grant the Motions to Seal, and we enter the accompanying protective order in this proceeding. Accordingly, Petitioner's Reply (Paper 19) and Exhibits 1049 and 1057 are sealed.

V. ANALYSIS

A. Legal Standards

In *inter partes* reviews, the petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to the patent owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail in an *inter partes* review, the petitioner must support its challenges by a preponderance of the evidence. 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d).

Petitioner contends that the challenged claims of the '763 patent are unpatentable under § 102(b) and § 103(a). A claim is anticipated under § 102(b) "only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros., Inc. v. Union Oil Co. of Cal.*, 814 F.2d 628, 631 (Fed. Cir. 1987).

The U.S. Supreme Court set forth the framework for applying the statutory language of 35 U.S.C. § 103 in *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966):

> Under § 103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented.

As explained by the Supreme Court in *KSR International Co. v. Teleflex Inc.*:

> Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. To facilitate review, this analysis should be made explicit.

550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.")).

"Whether an ordinarily skilled artisan would have been motivated to modify the teachings of a reference is a question of fact." *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1327 (Fed. Cir. 2016). "[W]here a party argues a skilled artisan would have been motivated to combine references, it must show the artisan 'would have had a reasonable expectation of success from doing so.'" *Arctic Cat Inc. v. Bombardier Recreational Prods. Inc.*, 876 F.3d 1350, 1360–61 (Fed. Cir. 2017) (quoting *In re Cyclobenzaprine Hydrochloride Extended-Release Capsule Patent Litig.*, 676 F.3d 1063, 1068–69 (Fed. Cir. 2012)).

As described below, the parties' disputes are related to the asserted prior art's disclosures, the scope and content of the asserted prior art, the

differences between claims 1 and 3 and the asserted prior art, and objective indicia of nonobviousness.

After reviewing the complete record, we conclude that Petitioner has shown by a preponderance of the evidence that Meling discloses each and every limitation of claims 1 and 3. We also conclude that Petitioner has shown by a preponderance of the evidence that Abdrakhmanov and Meling teach or suggest the limitations of claims 1 and 3 and that a person of ordinary skill in the art would have had a reason to combine the asserted references with a reasonable expectation of success. We also determine that the asserted objective indicia of nonobviousness lacks nexus to the claims, and, even if nexus were shown, we would determine that Petitioner shows that the challenged claims would have been obvious.

B. Level of Ordinary Skill in the Art

Petitioner asserts that one of ordinary skill in the art "would have been a person with a bachelor of science degree in mechanical or petroleum engineering or a similar technical discipline, with at least five years of experience in oil or gas well drilling, completion, and/or subsurface production operations or in technical support of such operations." Pet. 39 (citing Ex. 1002 ¶ 41). Petitioner also asserts that "[a]dditional education in a relevant technical discipline can compensate for less experience in the relevant field and vice versa." *Id.* (citing Ex. 1002 ¶ 41). In our Decision granting institution, we preliminarily adopted Petitioner's unopposed proposal. Inst. Dec. 20.

Patent Owner states that its "analysis assumes the level of ordinary skill Dr. Wooley articulated, . . . which comports with that asserted by

Petitioner's expert Mr. Chambers." PO Resp. 20 (citing Ex. 1002 ¶ 39; Ex. 2011 ¶¶ 25–27). Patent Owner "agrees with those qualifications and the experience level for oil or gas well drilling." *Id.*; *see also* Ex. 2011 ¶ 26 (stating that "[f]or the purposes of this Response only, however, I understand that the Patent Owner's analysis of the Challenged Claims and the cited art adopts the Petitioner's proposed definition," that "[f]or purposes of this Declaration, I am doing the same," and that "I agree with the degree qualifications and the experience level for oil or gas well drilling").

Patent Owner disputes the "remaining portions" of Petitioner's proposed level of skill because those portions are "far too broad, and show a misunderstanding about the technology at issue." Pet. 20. According to Patent Owner, "[a]t the time of the invention, solid expandables was a drilling technology," and "an engineer having experience in 'completion, and/or subsurface production operations or in technical support of such operations,' especially at the time of the invention in the late 1990s, would lack sufficient relevant knowledge about drilling, the problems associated with 'nested' casing, and how they could be solved." *Id.*

Patent Owner argues that Petitioner's declarant "is an experienced engineer when it comes to conventional operations (*i.e.*, after drilling is done and the well needs to be 'completed' so it can begin producing oil or gas)" but "lacks the appropriate insight of a [person of ordinary skill in the art] about relevant drilling technology at the time of the invention." PO Resp. 21. Patent Owner contends that Petitioner's declarant conflates the term "expandables" as used during the relevant time to include both

conventional operations and drilling and inappropriately mixes the term. *Id.* (citing Ex. 2011 ¶¶ 47–51; Ex. 2013, 128:22–129:1).

Patent Owner replies that its declarant's "experience in oil drilling is vastly more substantial than undergraduate summer internships" and lists other work he has done. PO Sur-reply 6 (citing Ex. 1042, 13:11–15:5, 156:19–157:16). Regarding Patent Owner's declarant's involvement in prior litigation, Patent Owner argues that, "given his experience and knowledge of the technology and the intrinsic record," his "inclusion in this proceeding is common sense." *Id.* (citing Pet. Reply 2). Patent Owner also argues that Petitioner's declarant testimony cannot "mutate the asserted art into the claimed apparatus" and "cannot make up for the substantial missing elements in Petitioner's asserted art that fails to teach or suggest every limitation of the Challenged Claims." *Id.* at 7.

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) (citation and internal quotation marks omitted).

The full record makes clear that the parties do not dispute the portion of Petitioner's proposed level of ordinary skill regarding education and years of experience. Pet. 39; PO Resp. 20; Ex. 1002 ¶ 41; Ex. 2011 ¶¶ 25–27. Regarding the parties' dispute over relevant experience, Patent Owner's declarant quotes an article that indicates expandable technology has revolutionized techniques in completion. Ex. 2011 ¶ 235 (citing Ex. 2012, 1); *see also* Ex. 1039 (paper titled "Towards a Mono-Diameter Well – Advances in Expanding Tubing Technology"), 2 (indicating that "[e]xpanding tubing can be applied in three markets or application segments" that include "Remediation," "Wellbore Construction," and "Completions"), 2–3 (describing "[t]he development of expandable tubing technology towards the mono-diameter well").

In view of the above, we agree with Petitioner that one of ordinary skill in the art would have had "experience in oil or gas well drilling, completion, and/or subsurface production operations or in technical support of such operations." Pet. 39; Ex. 1002 ¶ 41. Weighing the parties' arguments and cited evidence, we determine that one of ordinary skill in the art would have had Petitioner's asserted experience and that experience does not need to be narrowed in the manner argued by Patent Owner. Pet. 39; PO Resp. 20–21; Pet. Reply 2; PO Sur-reply 6–7; Ex. 1002 ¶ 41; Ex. 2007 ¶¶ 25–27, 235; *see also* Tr. 43:3–22 (agreeing that Patent Owner's arguments relate to the weight that should be given to testimonial evidence).

Accordingly, based on the full record before us, we see no reason to disturb our preliminary finding regarding the level of ordinary skill in the art. Thus, we maintain and reaffirm that one of ordinary skill in the art would have had "a bachelor of science degree in mechanical or petroleum engineering or a similar technical discipline, with at least five years of experience in oil or gas well drilling, completion, and/or subsurface production operations or in technical support of such operations" and that "[a]dditional education in a relevant technical discipline can compensate for less experience in the relevant field and vice versa." Pet. 39; Inst. Dec. 20; Ex. 1002 ¶ 41; Ex. 2011 ¶¶ 25–27. This level of skill in the art is consistent with the disclosure of the '763 patent and the prior art of record. *GPAC*, 57 F.3d at 1579.

C. Claim Construction

In an *inter partes* review based on a petition filed on or after November 13, 2018, the claims are construed

> using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. [§] 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent.

37 C.F.R. § 42.100(b) (2021); *see Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc).

1. "radial expansion and plastic deformation"

For "radial expansion and plastic deformation," Petitioner proposes interpreting "radial expansion" to include "the act (performed downhole) of increasing the diameter of the tubular towards the borehole" with support

from the Specification, declarant testimony, a Board decision from IPR2016-00954, Meling, and Abdrakhmanov. Pet. 35–39 (citing Ex. 1001, 20:28–30; Ex. 1002 ¶¶ 124–125, 128–129; Ex. 1003, 4; Ex. 1004, 2:24–36, 4:39–57, 5:10–13, 5:27–34; Ex. 1027, 19–21).

Patent Owner proposes interpreting "radial expansion and plastic deformation" to mean "causing a liner to yield in a radial direction throughout the liner wall" with support from the Specification, declarant testimony, and other record evidence. PO Resp. 22–26. The parties also provide reply arguments for this term. Pet. Reply 3–9; PO Sur-reply 3–9.

In our Institution Decision, we preliminarily adopted Petitioner's proposed interpretation. Inst. Dec. 23. Based on the full record, we maintain and apply Petitioner's proposed interpretation in our analysis. Even under Patent Owner's proposed interpretation for "radial expansion and plastic deformation," our determination would be the same for the reasons stated below.

2. "tubular member"

Petitioner proposes interpreting "tubular member" to encompass longitudinally-shaped hollow conduits. Pet. 35. Petitioner argues that the intrinsic record does not exclude radially expanding corrugated, profiled, or folded tubulars downhole. *Id.* at 37–38 (citing Ex. 1002 ¶¶ 128–129). Petitioner also argues that "it would be improper to import limitations from the '763 Patent's 'particularly preferred embodiment' of a tubular as having a 'substantially circular annular cross-section.'" *Id.* at 39 (citing Ex. 1001, 20:28–30). Petitioner further argues that, during the prosecution of a child application, the applicants "never attempted to distinguish Abdrakhmanov

on the basis that radially expanding profiled pipes does not teach 'radial expansion' of 'tubular members.'" *Id.* at 35, 39.

Patent Owner proposes interpreting "tubular member" to mean "casing strings (or pipes) made of hardened steel." PO Resp. 26–27. According to Patent Owner, "[t]ubulars include Oil Country Tubular Goods ('OCTG'), which is a class of pipe that is much thicker than that used in prior art corrugated expandables," and "[a] corrugated pipe is thin, and can be folded before placing it downhole and later unfolded in the borehole." *Id.* at 27 (citing Ex. 1001, 13:16–33; Ex. 2011 ¶ 114); *see also* PO Sur-reply 12 (arguing similarly) (citing Ex. 2011 ¶ 114). Patent Owner also argues that the '763 patent uses hardened steel pipe to solve a problem in conventional connections and hardened steel has improved reliability over other materials. PO Resp. 27 (citing Ex. 1015, 2:30–44).

Regarding Petitioner's proposed interpretation, Patent Owner responds that it attempts to mirror an unrelated *inter partes* review, "is far too broad, and misconstrues the purpose of the invention." PO Resp. 27–28 (citing Pet. 35; Ex. 1027). Patent Owner additionally argues that Petitioner ignores the context of the Specification and Petitioner's declarant testimony ignores the '763 patent. *Id.* at 28 (citing Pet. 35–39; Ex. 1002 ¶¶ 125–129).

Petitioner replies that Patent Owner's only citation to the Specification refutes Patent Owner's proposed interpretation. Pet. Reply 10 (citing PO Resp. 26, 27; Ex. 1001, 13:16–33). Petitioner also replies that Patent Owner's declarant initially stated that "tubular member" did not need interpretation and "agreed that the '763 Patent describes conventional

materials for tubulars, including plastic." *Id.* (citing PO Resp. 27; Ex. 1053, 35:3–36:13; Ex. 2001 ¶ 75).

Patent Owner replies that Petitioner also argued for a plain and ordinary meaning and that Petitioner's declarant stated that the term is "self-explanatory." PO Sur-reply 12 (citing Pet. 35). Patent Owner also argues that, given Petitioner's attempt to broaden "tubular member," an interpretation is necessary. *Id.* Patent Owner further argues that "[t]he specification may mention other tubular materials, but a [person of ordinary skill in the art] would understand that the **claims** themselves require a tubular member to be casing strings that are or otherwise would encompass the general specifications of OCTG." *Id.* at 13 (emphasis in original).

The language of claim 1, and the other claims of the '763 patent, requires "a threaded connection for coupling the first tubular member to the second tubular member," an "annular chamber defined between the first and second tubular members," and "a radial expansion and plastic deformation of the first and second tubular members." Ex. 1001, 174:16–32. Claims 19, 30, and 31 further recite "a mandrel positioned within the tubular member including an expansion surface." *Id.* at 175:63–64, 177:14–15, 178:8–9. These recitations support Petitioner's proposed interpretation of "tubular member" to mean at least a "longitudinally-shaped hollow conduit." Pet. 35. The claim language does not require expressly any material for a tubular member and, thus, does not support Patent Owner's proposed interpretation of "tubular member" to mean "casing strings (or pipes) made of hardened steel." PO Resp. 26–27; Ex. 1001, 174:16–178:26.

Turning to the Specification, Petitioner argues that "tubular member" must be broader than a preferred embodiment. Pet. 39 (citing Ex. 1001 20:28–30). The cited portion of the Specification states that "[i]n a particularly preferred embodiment, the tubular member 715 has a substantially circular annular cross-section." Ex. 1001, 20:28–30. The claims of the '763 patent do not require any particular cross-sectional shape. *Id.* at 174:16–178:26. The Specification, thus, supports Petitioner's contention that "tubular member" includes but is not limited to a circular annular cross-section. Pet. 39.

Patent Owner points to a portion of the Specification that states "tubular member 210 may be fabricated from any number of conventional commercially available materials such as, for example, Oilfield Country Tubular Goods (OCTG), 13 chromium steel tubing/casing, or plastic tubing/casing" and "[i]n a preferred embodiment, the tubular member 210 is fabricated from OCTG in order to maximize strength after expansion." Ex. 1001, 13:19–26; Ex. 1053, 35:3–36:13. Because the Specification describes other commercially available materials for fabricating a tubular member, the Specification does not support Patent Owner's narrower, proposed interpretation of "tubular member" to mean "casing strings (or pipes) made of hardened steel." PO Resp. 26–27.

As for the prosecution history of the '763 patent, the parties do not point to, nor can we find, any support for limiting the scope of "tubular member," particularly to any specific material. Thus, it tends to support Petitioner's proposed interpretation over Patent Owner's proposed interpretation.

Turning to the parties' declarants, the relied-upon evidence supports Petitioner's cited testimony that "tubular member" is not limited to circular cross-sectional shapes and can include profiled, corrugated, and slotted tubulars. Ex. 1002 ¶¶ 128, 129 (citing Ex. 1013, 13:26–30; Ex. 1030, 2:19–27, 2:30–44, 2:74–104; Ex. 1031 1:33–39, 4:3–11; Ex. 1037, 1:8–27). Patent Owner's cited testimony (Ex. 2011 ¶ 114 (citing Ex. 2011 ¶¶ 46–65, 70–75)) relies on other testimony that address "radial expansion and plastic deformation," problems with corrugated or profiled pipes, the nested arrangement, and problems of expanding conventional connections. Ex. 2011 ¶¶ 46–65, 70–75. Patent Owner's declarant also agreed that the '763 patent describes that tubular member 210 may be fabricated from materials other than steel. Ex. 1053, 35:3–36:17. In view of the above, we credit Petitioner's declarant testimony over Patent Owner's declarant testimony because the full record better supports Petitioner's declarant testimony.

Thus, for the reasons above, we interpret "tubular member" to mean "a longitudinally-shaped hollow conduit" that would not exclude corrugated, profiled, or folded tubular members. Pet. 35; Ex. 1002 ¶¶ 128, 129.

3. Other Terms

The parties provide arguments about "annular chamber" based on its implied meaning in each other's arguments. Pet. Reply 10–11; PO Sur-reply 13–16. The parties also dispute the meaning of "disposed within" and "before, during, and after." Pet. Reply 12–13; PO Sur-reply 13–16. We do not need to interpret expressly these terms to resolve the parties' disputes. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019)

("The Board is required to construe 'only those terms that . . . are in controversy, and only to the extent necessary to resolve the controversy.'") (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Based on the full record, we also determine that other claim terms do not require express interpretation. *See id.*

D. Asserted Anticipation by Meling

With citations to Meling and declarant testimony, Petitioner argues that Meling discloses all the limitations of claims 1 and 3. Pet. 39–49. Patent Owner responds that Petitioner fails to show that Meling discloses the limitations regarding the "one or more sealing members" and "the size of the annular chamber permits the sealing members to expand in the axial direction during the radial expansion and plastic deformation of the first and second tubular members." PO Resp. 31–49.

For the reasons below, based on the full record before us, we determine that Petitioner has shown by a preponderance of the evidence that Meling discloses all the limitations of claims 1 and 3 and, thus, anticipates these claims.

1. Meling (Ex. 1003)

An objective of Meling "is to improve the leak tightness of the connection between the profile packer sections." Ex. 1003, 4. Figures 1, 3, and 5 of Meling are reproduced below.

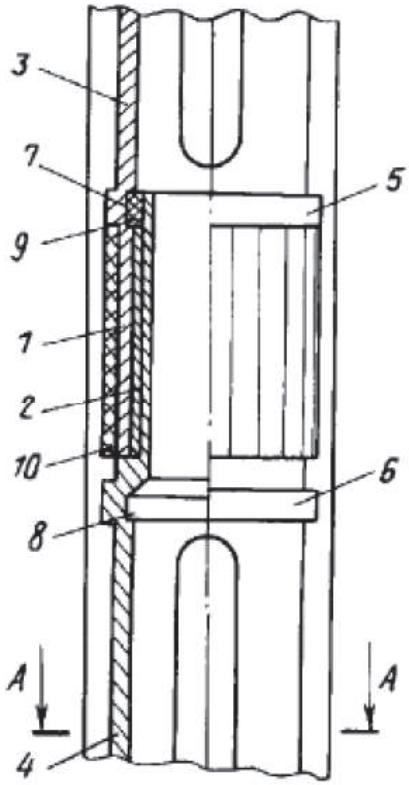


Fig. 1

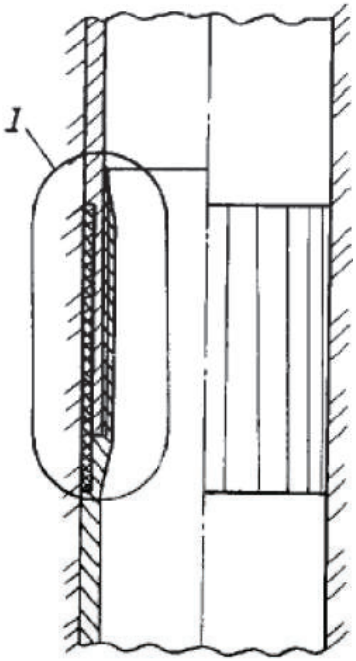


Fig. 3

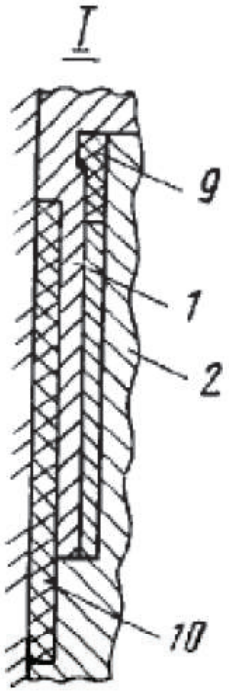


Fig. 5

Figure 1 is a longitudinal cross-section and "partial view of the connection between the profiled pipes of the packer in transport position." Ex. 1003, 4. Figure 3 "shows a partial view of the connection after passing of the tool and increasing its diameter to the well diameter," and Figure 5 "shows an enlarged view of unit (1) shown on Fig. 3." *Id.*

"The connection includes the connectable cylindrical ends of pipes (3) and (4)." Ex. 1003, 4. The end of pipe (3) is formed as sleeve (1), and the end of pipe (4) is formed as nipple (2). *Id.* "Sealing member (9) is located in recess (7) of the sleeve on the side of the internal thread joint, while sealing member (10) is located between circular shoulders (5) and (6) on the external side of the sleeve." *Id.*

During operation, "[p]rofiled pipes (3) and (4) of the packer are screwed together at the wellhead while controlling integrity and correctness of the installation of sealing members (9) and (10)," and "[t]he packer is lowered on a drill string down to the installation range." Ex. 1003, 4. "Pumping fluid increases the pressure inside the packer, which causes the profiled sections thereof to straighten," and "[d]uring this operation, sealing member (9) receives the internal pressure and seals the threaded connection, so as to ensure a more complete straightening of the profiled sections of the packer." *Id.* "Next, an underreamer is used to expand the connection sections to ensure their tight fit against the walls of the well," and "as a result of expansion, the upper part of nipple (2) becomes partially inserted into recess (7), thus, sealing and locking sealing member (9), and forcing it to 'flow' into the gaps of the threaded connection." *Id.* "Under the pressure from the expanded section of the connection between the pipes and walls of the well, external sealing member (10) begins to 'flow' along the outer surface of the pipes that are being connected, thereby sealing the connection under the effect of external pressure."

2. Independent Claim 1

a) "An apparatus, comprising:"

Petitioner argues, and Patent Owner does not dispute, that, if the preamble is limiting, Meling discloses it. Pet. 40 (citing Ex. 1002 ¶¶ 131–132; Ex. 1003, 4); *see also id.* at 23–26 (asserting what Meling discloses); PO Resp. 31–51 (responding that Meling fails to disclose other elements of the claims). The parties do not address if the preamble is limiting. *See generally* PO Resp.; Pet. Reply; PO Sur-reply.

We find that the relied-upon portion of Meling discloses "profile packers" that are "lowered into the well" and that have pipes (3), (4) with a connection that includes sleeve (1) and nipple (2) at the ends of pipes (3), (4), respectively. Ex. 1003, 4. Sleeve (1) is a box, and nipple (4) is a pin that can be threaded with sleeve (1). *Id.* The connection sections are expanded "to ensure their tight fit against the walls of the well." *Id.* We also credit Petitioner's declarant testimony regarding the preamble, because the full record supports it. Ex. 1002 ¶¶ 131–132 (citing Ex. 1003, 4).

Thus, based on the full record, even if the preamble is limiting, because Meling discloses profile packers with connections, Petitioner persuades us that Meling discloses "[a]n apparatus."

b) "a first tubular member; a second tubular member; a threaded connection for coupling the first tubular member to the second tubular member;"

Petitioner argues that Meling's pipe (3), pipe (4), and their connection in between disclose the limitations quoted above. Pet. 40–41 (citing Ex. 1002 ¶¶ 133–134; Ex. 1003, Fig. 1); *see also id.* at 23–26 (asserting what Meling discloses). Reproduced below is Petitioner's annotated Figure 1 from Meling.

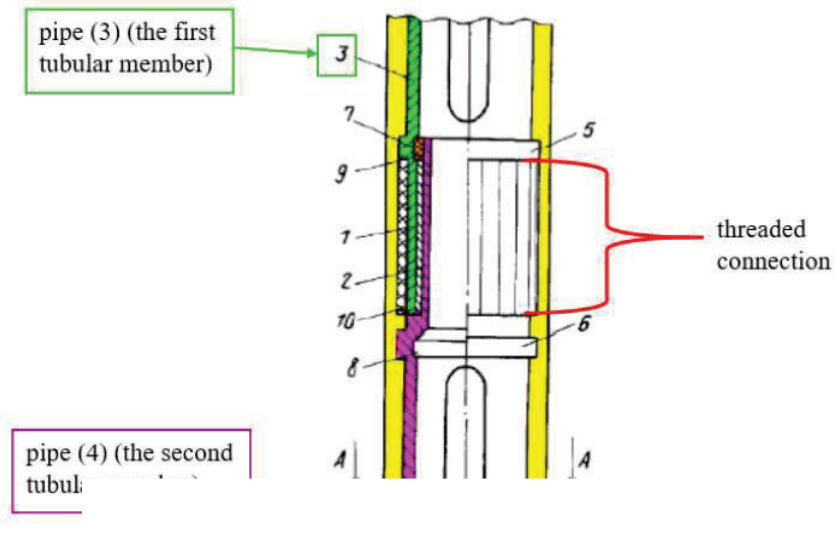


Fig. 1

EX1003, Fig. 1 (annotated)

Figure 1 shows a partial sectional view of a connection between profiled pipes of a packer in a transport position with Petitioner's labels and coloring for "pipe (3) (the first tubular member)," "pipe (4) (the second tubular member)," and "threaded connection." Pet. 41; Ex. 1003, 4.

(1) Patent Owner's Response

In its arguments that Petitioner fails to show that Meling discloses "one or more sealing members disposed within the annular chamber . . . ," Patent Owner responds that Meling's profiled pipe is not a tubular and "is a thinner, folded pipe akin to a corrugate that would not be used in . . . applications in the '763 Patent." PO Resp. 45 (citing Ex. 2011 ¶ 114). Patent Owner argues that "[t]his type of conventional, thin pipe would not solve the problems in the prior art disclosed by the '763 Patent because unfolded, corrugated pipe is simply not as reliable as a steel tubular in generalized well applications." *Id.* (citing Ex. 2011 ¶ 114).

(2) Petitioner's Reply

Regarding tubulars, Petitioner replies that "the '763 Patent teaches its cylindrical tubulars can be thinner than what a [person of ordinary skill in the art] would understand the thickness of profiled tubulars to be" and that "[Patent Owner]'s argument is also irrelevant because neither party proposed a construction of 'tubular' relating to pipe thickness." Pet. Reply 20 (citing PO Resp. 45; Ex. 1001, 20:59–65; Ex. 1013, 15:7–11).

Patent Owner does not provide a reply regarding tubular members. *See generally* PO Sur-reply.

(3) Petitioner Shows that Meling Discloses the Recited Tubular Members and Threaded Connection

We find that a relied-upon portion of Meling discloses pipes (3), (4) and connection between pipes (3), (4) that includes sleeve (1) and nipple (2). Ex. 1003, 4. Meling also discloses that "[p]rofiled pipes (3) and (4) of the packer are screwed together at the wellhead while controlling integrity and correctness of the installation of sealing members (9) and (10)." *Id.* We further credit Petitioner's declarant testimony regarding the tubular members and threaded connection because the full record supports it. Ex. 1002 ¶¶ 133–134 (citing Ex. 1003, 4, Fig. 1).

Based on the full record, because Meling discloses pipes (3), (4) that are screwed together at the wellhead, Petitioner persuades us that Meling discloses "a first tubular member; a second tubular member; a threaded connection for coupling the first tubular member to the second tubular member."

Patent Owner's argument regarding tubular members does not show a deficiency in Petitioner's contention that Meling discloses the recited tubular members. For the reasons explained above in Section V.C.2., we do not accept Patent Owner's proposed interpretation of tubular member to mean "casing strings (or pipes) made of hardened steel."

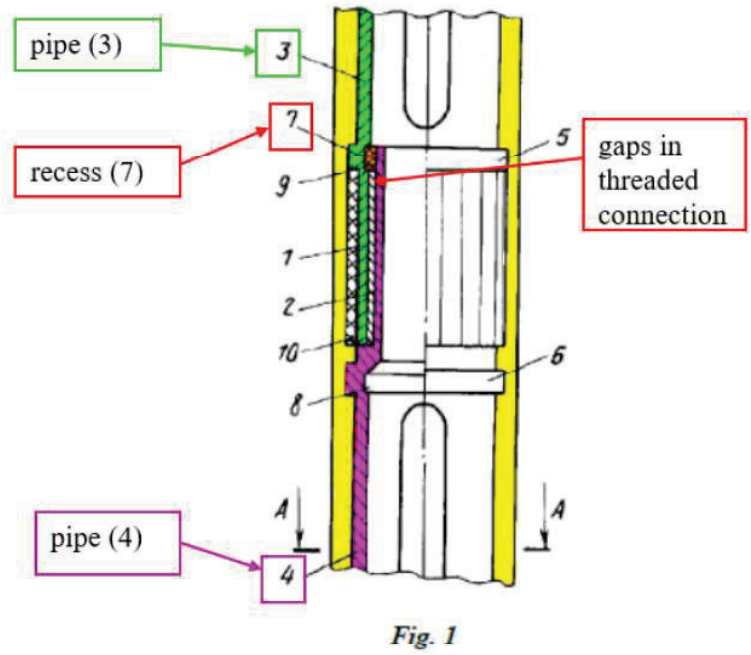
Patent Owner's proposed interpretation also does not require any particular thickness. *See* PO Resp. 26–28. Patent Owner, however, relies on its proposed interpretation to distinguish over Meling based on thickness. *See* PO Resp. 27 (arguing that "[t]ubulars include Oil Country Tubular Goods ('OCTG'), which is a class of pipe that is much thicker than that used in prior art corrugated expandables"), 45 (arguing that Meling's profiled pipe "is a thinner, folded pipe akin to a corrugate that would not be used in . . . applications in the '763 Patent"); PO Sur-reply 12 (arguing that tubular member would be understood "to be a class of pipes that encompass Oil Country Tubular Goods ('OCTG'), like casing strings of hardened steel, that are thicker than corrugated or profiled pipe" and that "[c]orrugated pipes are necessarily thin to allow for the re-forming or unfolding of the pipe").

As pointed out by Petitioner (Pet. Reply 20), according to the '763 patent, in "a particularly preferred embodiment," "[t]he . . . wall thickness of the intermediate section 810 of the tubular member 715 may range, for example, from about . . . 1/16 to 1.5 inches" or "from about . . . 1/8 to 1.25 inches." Ex. 1001, 19:42–43, 20:59–60. The '763 patent does not support Patent Owner's argument that a thin pipe would not be used in an application of the '763 patent or would not solve a problem of the '763 patent. PO Resp. 45.

The full record, therefore, does not indicate that claim 1 would exclude a thin pipe or that Meling's profiled pipes fail to disclose the recited tubular members. Ex. 1001, 19:42–43, 20:59–60.

c) *"at least one annular chamber defined between the first and second tubular members; and"*

Petitioner argues that Meling discloses the recited annular chamber. Pet. 41–43 (citing Ex. 1002 ¶¶ 135–136; Ex. 1003, 4); *see also id.* at 23–26 (asserting what Meling discloses). Reproduced below is Figure 1 of Meling with Petitioner's annotations.



EX1003, Fig. 1 (annotated)

Annotated Figure 1 is a partial view of Meling's connection between the profiled pipes of the packer in transport position with Petitioner's annotations for pipe (3), pipe (4), recess (7), and the "gaps in threaded connection." Pet. 42; Ex. 1003, 4.

(1) Patent Owner's Response

In its arguments that Petitioner fails to show that Meling discloses "one or more sealing members disposed within the annular chamber . . . ," Patent Owner indicates that Meling's gaps of the threaded connection cannot be part of the recited "annular chamber." *See* PO Resp. 33–38. In particular, Patent Owner argues that Meling's "recess is too small . . . and forces the sealing member (9) to flow out of the chamber and into the threaded connection grooves in between the sleeve and nipple components." *Id.* at 34 (citing Pet. 47–48). Patent Owner contends that "the '763 patent describes and claims an annular chamber within which the sealing member is disposed before, during and after expansion." *Id.* at 34–35 (citing Ex. 1001, Figs. 27–30; Ex. 2011 ¶¶ 154–157). Patent Owner also contends that the "dimensions of the annular chamber do not allow, under any circumstances, the sealing member to extend out of the chamber and into the surrounding threaded connection." *Id.* at 35 (citing Ex. 2011 ¶ 158).

According to Patent Owner, Meling does not disclose a sealing member disposed within an annular chamber because sealing member (9) is forced "to 'flow' into the gaps of the threaded connection.'" PO Resp. 36 (citing Pet. 47; Ex. 1003, 4). Patent Owner also argues that "Meling explicitly states that recess (7) is not volumetrically large enough to allow sealing member (9) to expand and remain in the recess," "[r]ecess (7) is not appropriately sized to allow for expansion of the sealing member in the axial direction and remain 'disposed within' the recess," and "recess (7) is too small to accommodate such axial expansion as described and claimed." *Id.* at 36–37 (citing Ex. 2011 ¶¶ 161–163).

Patent Owner also responds that "Petitioner uses a flawed interpretation" and "improperly broadens the 'annular chamber' of claim 1 to include the actual threads of the connection" by referring to unchallenged dependent claims, such as claim 8. PO Resp. 37 (citing Pet. 42–43). Patent Owner argues that the language of claim 1 and the Specification do not support a sealing member that extends out of the annular chamber and into the threads. *Id.* (citing Ex. 1001, 152:14–16, 152:62–63, 153:42–43). Patent Owner also argues that the '763 patent's description and figures support that the annular chamber "is itself located between the threads of the tubular . . . not the threads themselves." *Id.* at 38 (citing Ex. 1001, Figs. 27, 30). Patent Owner further argues that the '763 patent does not describe nor claim "adjacent gaps" in the threaded connection. *Id.* (citing Ex. 1001, Figs. 27–30).

(2) Petitioner Shows that Meling Discloses the Recited Annular Chamber

Based on the full record, we find that the relied-upon portion of Meling discloses "recesses (7) and (8) on the inner surface of the pipes," "[s]ealing member (9) . . . located in recess (7) of the sleeve on the side of the internal thread joint," and that "sealing and locking sealing member (9)" is forced "it to 'flow' into the gaps of the threaded connection." Ex. 1003, 4. We also credit Petitioner's declarant testimony regarding the recited annular chamber because the record supports it. Ex. 1002 ¶¶ 135, 136 (citing Ex. 1003, 4, Fig. 1).

Further, claim 8 depends from claim 1 and recites "wherein the threaded connection further comprises one or more male threads for

engaging one or more female threads; and wherein the annular chamber is disposed between the male threads." Ex. 1001, 174:55–58; *see also id.* at claims 9, 16–18, 22, 25–27 (reciting similar limitations). Thus, as Petitioner points out, "[a]nnular chambers within the threaded connection like the one described in Meling (which comprises recess (7) and the adjacent 'gaps of the threaded connection') must therefore fall within the broader annular chamber in claim 1." Pet. 43.

Therefore, based on the full record, because Meling discloses recess (7), where sealing member (9) is located, and gaps between the threaded connection, into which sealing member (9) flows, Petitioner persuades us that Meling's recess (7) and gaps between the threaded connection together disclose "at least one annular chamber defined between the first and second tubular members."

Turning to Patent Owner's position that the gaps of the threaded connection cannot be part of the recited annular chamber (*see* PO Resp. 33–38), Patent Owner does not propose an interpretation for "annular chamber" that would exclude Meling's gaps or Meling's recess (7) together with the gaps from the scope of "annular chamber." *See* PO Resp. 22–28 (proposing interpretations only for "radial expansion and plastic deformation" and "tubular member").

Moreover, the '763 patent shows O-rings 4325, 4930 partially disposed between threads. *See* Ex. 1001, Figs. 27, 30. In the description related to Figures 27 and 30, the '763 patent states that "O-ring groove 4320 is preferably provided in the threaded portion of the interior wall 4340 of the second tubular member 4310" and that "first O-ring groove 4920 is

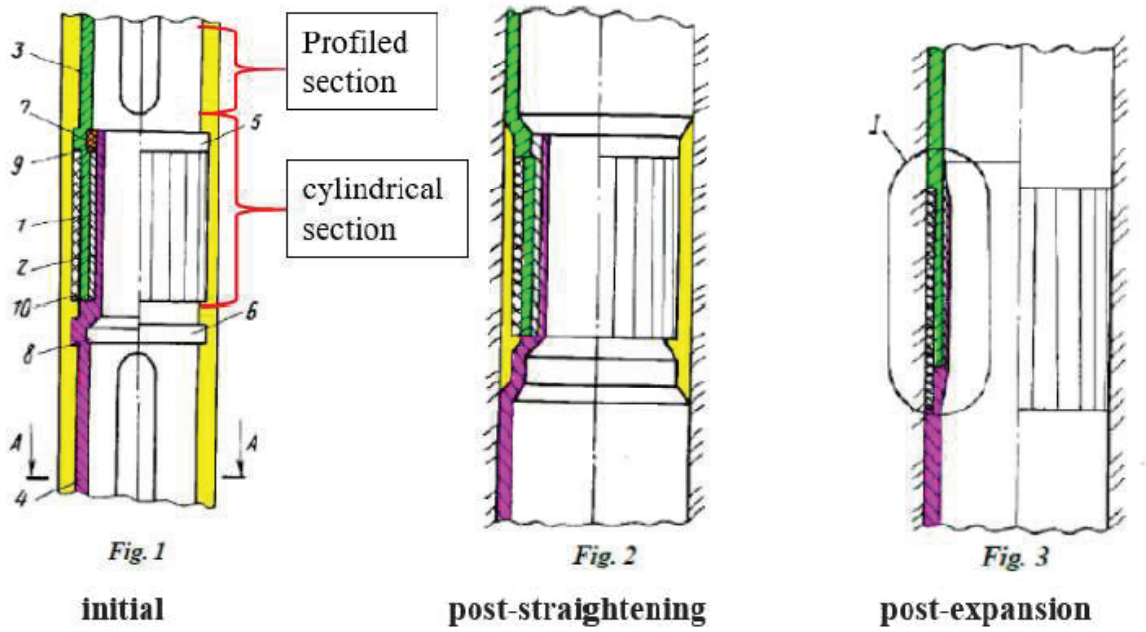
preferably provided in the threaded portion of the interior wall 4950 of the second tubular member 4910." *Id.* at 152:12–14, 154:21–23; *see also id.* at claims 8, 9, 16–18, 22, 25–27. The '763 patent, thus, indicates that the recited "annular chamber," within which sealing members are disposed, can be made up of O-ring grooves 4320, 4920 and part of the threaded portion of interior walls 4340, 4950. *See id.* at 152:12–14, 154:21–23.

> d) *"one or more sealing members disposed within the annular chamber for sealing the interface between the first and second tubular members before, during, and after a radial expansion and plastic deformation of the first and second tubular members;"*

For the limitation quoted above, Petitioner argues that Meling's sealing member (9) teaches the recited "one or more sealing members." Pet. 43–44 (citing Ex. 1002 ¶¶ 137–144; Ex. 1003, 3, Fig. 1). According to Petitioner, because fluid pressure must be increased in a profiled section to straighten pipes (3) and (4) and Meling states "sealing member (9) receives the internal pressure and seals the threaded connection," sealing member (9) must seal the interface between pipes (3) and (4) before radial expansion. *Id.* at 45 (citing Ex. 1002 ¶¶ 138–139; Ex. 1003, 4). Petitioner also argues that sealing member (9) seals during and after radial expansion and plastic deformation. *Id.* at 45–47 (citing Ex. 1002 ¶¶ 142–143; Ex. 1003, 4, Fig. 5).

For "radial expansion and plastic deformation of the first and second tubular members," Petitioner contends that "pipes (3) and (4) are radially expanded and plastically deformed in a two-step process" and "are plastically deformed during this expansion because their diameter is permanently increased." Pet. 44–45 (citing Ex. 1002 ¶ 138 and referencing

Pet. 23–26 (asserted disclosures of Meling)); *see also id.* at 19–23 (asserting what was known in the art about expanding circular tubulars). Reproduced below are Petitioner's annotated Figures 1–3 from Meling.



Figures 1–3 show a partial sectional view of a connection between profiled pipes of a packer, respectively, in a transport position, lowered into a well and straightened by internal pressure, and after passing of a tool to increase the connection diameter to the well diameter with Petitioner's labels for a "profiled section," "cylindrical section," "initial," "post-straightening," and "post-expansion." Pet. 25; Ex. 1003, 4.

(1) Patent Owner's Response

Patent Owner responds that Meling does not disclose "sealing members . . . for sealing the interface between the first and second tubular members before, during, and after a radial expansion and plastic deformation of the first and second tubular members" because "Petitioner expressly shows that Meling's sealing member is **not** disposed in the annular chamber

before, during and after expansion." PO Resp. 33–34 (citing Ex. 2011 ¶ 154).

Patent Owner argues that Meling's "recess is too small to accommodate such expansion and forces the sealing member (9) to flow out of the chamber and into the threaded connection grooves in between the sleeve and nipple components." PO Resp. 34 (citing Pet. 47–48). Patent Owner contends that "the '763 patent describes and claims an annular chamber within which the sealing member is disposed before, during and after expansion," and that the seal is "disposed within" all the disclosed embodiments of the annular groove. *Id.* at 34–35 (citing Ex. 1001, Figs. 27–30; Ex. 2011 ¶¶ 154–157).

According to Patent Owner, the "dimensions of the annular chamber do not allow, under any circumstances, the sealing member to extend out of the chamber and into the surrounding threaded connection" and "the annular chamber, in allowing axial expansion of the O-ring, and retaining the O-ring within the annular chamber, allows radial expansion and plastic deformation with little to no deformation to the outer tubular." PO Resp. 35–36 (citing Ex. 1001, 152:19–22, 152:66–153:2, 153:47–50, 154:45–48; Ex. 2011 ¶¶ 158, 159). Patent Owner argues that, in view of the '763 patent's description and figures, one of ordinary skill in the art "would understand the plain and ordinary language of claim 1 requires the sealing member to be retained/disposed within the annular chamber 'before, during and after' the radial expansion and plastic deformation" and that "that the claimed 'before, during, and after' language modifies 'disposed within', as well as the

functional language 'for sealing the interface between the first and second tubular members.'" *Id.* at 36 (citing Ex. 2011 ¶¶ 157, 158).

Patent Owner, thus, argues that Meling does not disclose a sealing member disposed within an annular chamber before, during, and after an expansion process because the "the upper part of the nipple (2) 'becomes partially inserted into the recess (7), thus, sealing and locking sealing member (9) and forcing it to 'flow' into the gaps of the threaded connection.'" PO Resp. 36 (citing Pet. 47; Ex. 1003, 4). Patent Owner also argues that "Meling explicitly states that recess (7) is not volumetrically large enough to allow sealing member (9) to expand and remain in the recess," "[r]ecess (7) is not appropriately sized to allow for expansion of the sealing member in the axial direction and remain 'disposed within' the recess before, during and after expansion," and "recess (7) is too small to accommodate such axial expansion as described and claimed." *Id.* at 36–37 (citing Ex. 2011 ¶¶ 161–163).

As summarized above for the recited "annular chamber," Patent Owner responds with references to the language of claim 1 and the Specification that "Petitioner uses a flawed interpretation" and "improperly broadens the 'annular chamber' of claim 1 to include the actual threads of the connection" by referring to unchallenged dependent claims, such as claim 8. PO Resp. 37–38 (citing Pet. 42–43; Ex. 1001, 152:14–16, 152:62–63, 153:42–43, Figs. 27, 30). Patent Owner also argues that the '763 patent does not describe nor claim "adjacent gaps" in the threaded connection and that Petitioner's declarant "conceded that Figures 27–30 reflect **post-expansion** connections where the sealing member completely

fills the annular chamber." *Id.* (citing Ex. 1001, Figs. 27–30; Ex. 2014, 150:21–152:18).

Turning to the claim language "radial expansion and plastic deformation of the first and second tubular members," Patent Owner responds that Meling fails to disclose such expansion and deformation because "Meling teaches straightening profiled pipes and expanding connection sections," and "[t]here is no disclosure of 'radial expansion and plastic deformation' as properly construed," i.e., "causing a liner to permanently yield in a radial direction throughout the liner wall." PO Resp. 38–39 (citing Ex. 2011 ¶¶ 92, 121, 123, 137).

Patent Owner argues that Meling "is merely returning the pipe to its original circular shape of the same dimensions prior to profiling," "[r]e-forming profiled pipes," "does not cause the pipe to yield in a radial (and circumferential) direction throughout the liner wall," "bends the pipe at yield points on the innermost areas of the pinched or corrugated pipe," "involves placing high stress only on hinge points (*i.e.*, the valleys) of the pinch and not on the entire profiled pipe wall" and "describes the process as the shutoff being 'straightened' by fluid pressure." PO Resp. 39–40 (citing Ex. 2011 ¶¶ 54, 68, 101, 123), 40 (citing Ex. 1003, 4; Ex. 2011 ¶ 128). According to Patent Owner, "[o]nly the hinge points exceed yield strength, not the entire circumference of the tubular, as in radial expansion." *Id.* at 40 (citing Ex. 2011 ¶ 128); *see also id.* at 41 (arguing similarly) (citing Ex. 2011 ¶¶ 66, 103).

Patent Owner also argues that any increase in the diameter of a corrugated pipe "is not an expansion" because "[t]he folding and unfolding

process may cause the circumference of the unfolded liner to be slightly larger than the circumference of the corrugated liner." PO Resp. 41 (citing Ex. 2011 ¶¶ 63, 104). According to Patent Owner, "this is not a result of the claimed 'apparatus' radially expanding the patch" but "simply a natural stretching that results from folding and unfolding a malleable substance." *Id.* (citing Ex. 2011 ¶¶ 63, 104).

Patent Owner further argues that one of ordinary skill in the art "would understand the difference between re-forming and radial expansion and plastic deformation, described in the '763 Patent, and that Meling fails to disclose the claimed process." PO Resp. 40 (citing Ex. 2011 ¶¶ 66, 127). In Patent Owner's view, "[b]ending or straightening a deformed or profiled pipe to return it to its original dimensions is **not** radial expansion" and "could be considered radial **re-forming (or restoration)**, but it is not radial **expansion and plastic deformation**, as described and claimed in the '763 Patent." *Id.* (alterations in original) (citing Ex. 1003, 4; Ex. 2011 ¶¶ 55, 1269–128). Patent Owner also points to statements by Petitioner's employee and Petitioner's patents that indicate reforming is distinct from expanding. *Id.* at 40–41 (citing Ex. 2012, 1; Ex. 2015, claim 1). Patent Owner quotes from another patent that states "[t]he expression 'expanding' the liner into contact with the casing may be misleading" because "there is **no** expansion taking place," "[t]he liner essentially starts and ends with the same diameter and circumference," and "[t]he liner is profiled (folded) to create a smaller outer diameter while it is being disposed into the casing" and "unfolds the corrugations and returns the liner to the same initial diameter that it started

with." *Id.* at 43 (alternation in original) (citing Ex. 2016, 1:69–72, 2:19–23, 3:58–59, 8:49–71, Fig. 3).

Patent Owner additionally argues that "[f]orces and stresses involved in radially expanding a tubular member, as described in the '763 Patent, . . . are significantly higher than forces and stresses used to re-form a profiled casing" because "Meling is fundamentally different from the '763 Patent," as explained by an employee of a "Petitioner-affiliated company." PO Resp. 43 (citing Ex. 2011 ¶¶ 135–137; Ex. 2012, 2), 44 (citing Ex. 2011 ¶ 135). According to Patent Owner, Meling uses fluid pressure to bend a "profiled pipe back to an original shape by flexing at yield points" and "does not cause the pipe to radially expand." *Id.* at 43–44 (citing Ex. 1003, Fig. 4; Ex. 2011 ¶¶ 130–133). Patent Owner also contends that Meling does not describe the "significant fluid pressure to cause" the claimed permanent yielding, and, thus, is fundamentally different. *Id.* at 44 (citing Ex. 2011 ¶¶ 136, 137).

Patent Owner further responds that Meling fails to disclose a sealing member for sealing before radial expansion and plastic deformation. PO Resp. 45–49. In Patent Owner's view, Petitioner "admits that the straightening process is what 'seals the threaded connection,'" but claim 1 requires a sealing member that seals before radial expansion and plastic deformation. *Id.* at 45 (citing Pet. 45). According to Patent Owner, "[i]n Meling, the fluid straightening creates the seal, so there can be no seal **prior** to straightening" because Meling "indicates that the straightening process causes the seal to occur during straightening, and not before." *Id.* at 45–46 (alternation in original) (citing Ex. 1003, 4; Ex. 2011 ¶¶ 138–139).

Patent Owner also argues that, even if Meling's fluid straightening is considered "radial expansion and plastic deformation," "there is no disclosure in Meling of a pre-expansion seal, *i.e.*, sealing the interface **before** straightening." PO Resp. 46 (citing Ex. 2011 ¶ 140). Patent Owner further argues that Meling's straightening is only "expansion" of pipes (3), (4) because "Meling only teaches using fluid pressure to return the profiled pipes to their original dimensions," "there is no further expansion," and Meling's underreamer does not expand pipes (3), (4). *Id.* at 46–47 (citing Ex. 1003, Figs. 1, 2; Ex. 2011 ¶¶ 141, 142).

Patent Owner reiterates that "[t]he increase in diameter of the profiled pipe is not a product of radial expansion and plastic deformation, but rather is a natural result of unbending the folds in the pipe." PO Resp. 47 (citing Ex. 2011 ¶¶ 145, 146). Patent Owner also quotes Meling's statement that "the underreamer 'is used to expand the **connection sections** to ensure their tight fit against the walls of the well'" to emphasize that Meling's pipes are merely re-formed without any additional expansion and to argue that "[a]ny post-straightening expansion is only to the **connection sections**." *Id.* at 47–48 (citing Ex. 1003, 4; Ex. 2011 ¶¶ 147, 148). Patent Owner additionally argues that Meling's underreamer is "the only expansion device mentioned," but there is insufficient detail for one of ordinary skill in the art "to conclude that Meling discloses radial expansion and plastic deformation." *Id.* at 48 (citing Ex. 1003, Fig. 3; Ex. 2011 ¶ 124). As for Petitioner's declarant testimony regarding Meling's underreamer, Patent Owner argues that the testimony cites back to an earlier part of the declaration and, even if the testimony was correct, "a rotary expansion tool– especially one that is **not**

shown and **not described** in any manner– does not equate to radial expansion and plastic deformation, as properly construed in the context of solid expandables" because "[i]t simply means the tool rotates," "[t]here is no disclosure of how or to what extent the pipes are expanded," and there is "no disclosure of causing a liner to permanently yield in a radial direction throughout the liner wall." *Id.* at 49 (citing Ex. 2011 ¶¶ 151–153).

(2) Petitioner's Reply

Petitioner replies that Meling's sealing member is "disposed within the annular chamber . . . after radial expansion" because Patent Owner's proposed interpretations are wrong and should be rejected. Pet. Reply 14 (citing PO Resp. 33–38). Petitioner argues that, if Patent Owner's contention that "before, during, and after" modifies "disposed within" is rejected, "then Meling teaches this limitation because seal (9) is disposed exclusively within recess (7) before expansion." *Id.* (citing Ex. 1003, 4, Fig. 1).

Petitioner also argues that, if Patent Owner's contention that "disposed within" means "disposed exclusively within," "then Meling teaches this limitation because seal (9) or part of seal (9) is disposed within recess (7) at all times." Pet. Reply 14 (citing Ex. 1003, 4, Figs. 1, 5). Petitioner further argues that, if Patent Owner's contention that "annular chamber" refers only to recess (7) is incorrect, "then Meling teaches this limitation because seal (9) is disposed exclusively within the chamber formed by recess (7) and the gaps in the threads before, during, and after expansion." *Id.* at 14–15 (citing Ex. 1003, 4, Figs. 1, 5).

Petitioner additionally argues that, even if all three proposed interpretations were correct, "Meling discloses two adjacent annular chambers, the first being recess (7) and the second being the gap in the threads." Pet. Reply 15 (citing Ex. 1003, Figs. 1, 5). According to Petitioner, two annular chambers would meet the limitation "at least one annular chamber" and Meling's seal (9) is exclusively within the two annular chambers (recess (7) and the gap) before, during, after expansion. *Id.* at 15–16 (citing Ex. 1003, Fig. 5).

Regarding "radial expansion and plastic deformation," Petitioner replies that the limitation is met under Patent Owner's proposed interpretation because connection sections are part of pipes (3), (4) and start with a cylindrical profile that an underreamer expands into larger cylinders. Pet. Reply 16–17 (citing PO Resp. 38–45; Ex. 1003, 4, Figs. 1, 3; Ex. 1053, 24:13–18, 25:18–23). Petitioner argues that Patent Owner's declarant agreed that Meling describes the limitation. *Id.* at 17 (citing Ex. 1053, 25:24–26:6, 27:5–7, 28:15–29:13).

Petitioner also argues that this theory was presented in the Petition, Patent Owner does not respond to it, and Patent Owner admitted in another review that Meling teaches radial expansion and plastic deformation. Pet. Reply 17–18 (citing Pet. 45–46; PO Resp. 38–45; Ex. 1051, 26). Petitioner further argues that Meling describes radially expanding and plastically deforming the profiled sections, including the hinge points as admitted by Patent Owner, and the expanding of the profiled section is apparent from Meling's figures. *Id.* at 18–19 (citing PO Resp. 41; Ex. 1003, Fig. 4; Ex. 1053, 21:5–15). According to Petitioner, because Meling shows that

"the *entire* perimeter of the patch . . . *permanently* expands into a circular shape by deforming throughout the liner wall," Meling teaches radial expansion and plastic deformation, in accordance with Patent Owner's proposed interpretation. *Id.* at 19 (citing Ex. 1003, Figs. 2, 3; Ex. 1052 ¶¶ 38–40).

Petitioner also contends that Patent Owner admits that Meling's "straightening . . . results in a 'slightly ***larger final diameter***." Pet. Reply 19 (citing PO Resp. 35, 40). Petitioner further contends that Patent Owner "concedes that portions of the profiled pipe exceed yield strength and thus are plastically deformed." *Id.* at 20 (citing PO Resp. 41; Ex. 1053, 21:5–15). Petitioner additionally contends that Patent Owner's arguments regarding stresses and forces "are not tied to any claim limitation" and reliance on another patent "is misplaced because its own expert admitted that EX2016 does not disclose radial expansion and plastic deformation." *Id.* (citing PO Resp. 41–43; Ex. 1053, 37:12–38:10; Ex. 2016, 10:15–20).

Regarding sealing members that seal before radial expansion, Petitioner replies that "Meling teaches a pre-expansion seal because its pipes straighten (radially expand) *after* forming a seal" and that Patent Owner's declarant agreed with Petitioner's understanding. Pet. Reply 21 (emphasis in original) (citing PO Resp. 45–49; Ex. 1053, 29:14–31:11). Petitioner argues that Meling "discloses that receiving the internal pressure causes the seal," "pressure is what then causes the straightening," and "[s]traightening necessarily occurs after sealing because sealing 'ensure[s] a more complete straightening.'" *Id.* (citing Ex. 1003, 4, col. 1). Petitioner also argues that "Meling teaches radially expanding the pipe's connection sections after a

seal forms" and "the connection sections are part of pipes (3) and (4)." *Id.* (citing PO Resp. 48; Ex. 1003, 4, col. 1). Petitioner further argues that claim 1 does not require any particular tool for radial expansion and plastic deformation, and that Patent Owner's "exhibit includes expanding tubulars with rotary tools." *Id.* at 21–22 (citing PO Resp. 48–49; Ex. 2012, 2).

(3) Patent Owner's Sur-Reply

Patent Owner replies that Petitioner newly argues that there are two annular chambers, and this argument is improper and should be ignored with citations to our rules and case law. PO Sur-reply 17–18 (citing Pet. 41–42; Pet. Reply 15–16).

Patent Owner also replies that Meling's straightening of pipes is not radial expansion and plastic deformation. PO Sur-reply 18. Patent Owner argues that, by asserting that radial expansion means expanding to a larger circle, Petitioner ignores Patent Owner's positions and proposed interpretation. *Id.* (citing Pet. Reply 4, 7, 9, 17, 19, 27).

Patent Owner further replies that Meling teaches that its connection components are distinct from pipes (3) and (4) and does not teach that pipes (3) and (4) are expanded further like the connection components. PO Sur-reply 18–19. According to Patent Owner, "[a]fter straightening, the profiled pipes **cannot** be further expanded because they are already unfolded to meet the wellbore surface." *Id.* at 19 (emphasis in original) (citing Ex. 1003, Figs. 1, 2). Patent Owner contends that "[t]he perimeter of the Meling straightened pipe is the same when the pipe is profiled" and its unfolding to a new shape to meet the borehole "is not radial expansion as described and claimed in the '763 Patent." *Id.* (citing Ex. 2011, 104, 134).

Regarding sealing members that seal before radial expansion, Patent Owner replies that "a seal cannot be created if it already exists," "Meling expressly states '**During** [the straightening] operation, sealing member (9) receives the internal pressure **and seals the threaded connection**," and "[t]his language directly contradicts Petitioner's allegation of a pre-expansion seal." PO Sur-reply 20 (emphases in original) (citing Ex. 1003, 4).

(4) Petitioner Shows that Meling Discloses the Recited One or More Sealing Members

Based on the full record, we find that a relied-upon portion of Meling discloses that "sealing member (9) is located in recess (7) and is locked therein by nipple (2) after expansion" and that "[i]nternal sealing members (9) ensure leak tightness of the threaded connection." Ex. 1003, 3, Fig. 1. We also find that a relied-upon portion of Meling discloses that "[p]umping fluid increases the pressure inside the packer, which causes the profiled sections thereof to straighten, same as in case of the conventional technology" and that "[d]uring this operation, sealing member (9) receives the internal pressure and seals the threaded connection, so as to ensure a more complete straightening of the profiled sections of the packer." *Id.* at 4.

Meling also discloses that, "[n]ext, an underreamer is used to expand the connection sections to ensure their tight fit against the walls of the well," and that "as a result of expansion, the upper part of nipple (2) becomes partially inserted into recess (7), thus, sealing and locking sealing member (9), and forcing it to 'flow' into the gaps of the threaded connection." Ex. 1003, 4, Fig. 5.

Patent Owner does not present any arguments that Meling's sealing member (9) fails to disclose "one or more sealing members." *See* PO Resp. 33–51; PO Sur-reply 16–20. Patent Owner, however, argues that Petitioner fails to show that Meling's sealing member (9) is disposed in an annular chamber before, during, and after expansion. PO Resp. 33–37. As discussed above for the required "annular chamber," Petitioner argues, and we find, that Meling's recess (7) and gaps between the threaded connection disclose "at least one annular chamber defined between the first and second tubular members." Pet. 42; Ex. 1002 ¶¶ 135, 136; Ex. 1003, 4.

Therefore, based on the full record, because Meling discloses that "sealing member (9) is located in recess (7)" and forced "to 'flow' into gaps of the threaded connection," Petitioner persuades us that Meling discloses "one or more sealing members disposed within the annular chamber for sealing the interface between the first and second tubular members." Also, because Meling discloses recess (7), where sealing member (9) is located before expansion, and gaps between the threaded connection, into which sealing member (9) flows during and after expansion, Petitioner persuades us that Meling discloses "one or more sealing members disposed within the annular chamber for sealing the interface between the first and second tubular members before, during, and after" expansion of pipes (3), (4).

Even if we were to agree with Patent Owner and exclude Meling's gaps between threads as part of the asserted "annular chamber," Petitioner would still persuade us that Meling discloses the recited sealing members because Patent Owner does not dispute that all of sealing member (9) is disposed within recess (7) before expansion of pipes (3), (4) and, at least, a

portion of sealing member (9) is still disposed within recess (7) during and after expansion. *See* PO Resp. 33–38; *see also* Pet. 43 (arguing that dependent claim 8 supports that Meling's recess (7) and gaps of the threaded connection is within the scope of claim 1); Ex. 1001, 174:55–58 (reciting in claim 8, that "wherein the threaded connection further comprises one or more male threads for engaging one or more female threads; and wherein the annular chamber is disposed between the male threads").

Regarding Patent Owner's response that claim 1 requires, and would be understood to require, the sealing member to be retained or disposed within the annular chamber before, during, and after expansion, Patent Owner does not propose an interpretation for "disposed within" that would require the sealing member stay entirely within the annular chamber before, during, and after expansion. *See* PO Resp. 22–28 (proposing interpretations for "radial expansion and plastic deformation" and "tubular member"), 36.

In support, Patent Owner points to portions of the Specification that do not limit the expansion of a sealing member to only within the annular chamber. PO Resp. 35–36 (citing Ex. 1001, 152:19–22, 152:66–153:2, 153:47–50, 154:45–48); Ex. 1001, 152:19–22 ("In this manner, deformation of the outer surface 4345 of the second tubular member 4310 during and upon the completion of the radial expansion process is minimized."), 152:66–153:2 ("In this manner, deformation of the outer surface 4545 of the second tubular member 4510 during and upon the completion of the radial expansion process is minimized."), 153:47–50 ("In this manner, deformation of the outer surface 4750 of the second tubular member 4710 during and upon the completion of the radial expansion process is minimized."),

154:45–48 ("In this manner, deformation of the outer surface 4955 of the second tubular member 4910 during and upon the completion of the radial expansion process is minimized."). The phrase "[i]n this manner" used in the cited portions of the Specification refers the volumetric size of O-ring grooves 4320, 4520, 4720, 4920, 4925 being "preferably selected" to permit O-ring 4325, 4525, 4725, 4730, 4930, 4935 "to expand at least approximately 20% in the axial direction" during a radial expansion process. *Id.* at 152:15–19, 152:63–66, 153:42–46, 154:27–30, 154:41–44.

Even if we accepted Patent Owner's implied argument that the recited "annular chamber" is only the O-ring groove, these portions of the Specification do not support Patent Owner's responsive arguments because the Specification states that an O-ring groove's volumetric size is "preferably selected" to permit an O-ring "to expand at least approximately 20% in the axial direction." *See id.* at 152:15–22, 152:63–153:2, 153:47–50, 154:27–30, 154:41–48. The cited portions of the Specification do not limit O-rings 4325, 4525, 4725, 4730, 4930, 4935 from expanding beyond the preferred volumetric sizes of O-ring grooves 4320, 4520, 4720, 4920, 4925 after "expand[ing] at least approximately 20% in the axial direction." *See id.* at 152:15–22, 152:63–153:2, 153:47–50, 154:27–30, 154:41–48.

Even if these portions were understood to describe that an O-ring axially expands only within the preferred volumetric size of an O-ring groove, the full record does not indicate that the '763 patent excludes other embodiments where an O-ring expands beyond the O-ring groove. *See* Ex. 1001, 152:15–22, 152:63–153:2, 153:47–50, 154:27–30, 154:41–48.

Furthermore, claim 6, which depends from claim 1, recites that "the size of the annular chamber permits the sealing members to expand at least approximately 20% in the axial direction during the radial expansion and plastic deformation of the first and second tubular members." Claim 1, thus, should not be limited to only preferred embodiments where volumetric sizes of O-ring grooves permit O-rings to expand about 20% in the axial direction or embodiments where the O-ring expands only within the O-ring groove, as argued by Patent Owner.

For the reasons above, Petitioner, therefore, persuades us that Meling discloses "one or more sealing members disposed within the annular chamber for sealing the interface between the first and second tubular members before, during, and after" expansion of Petitioner's asserted tubular members.

(5) Petitioner Shows that Meling Discloses the Recited Radial Expansion and Plastic Deformation of Tubular Members

Turning to "radial expansion and plastic deformation of the first and second tubular members," based on the full record, we find that Meling "relates to the oil and gas production industry, and specifically, to means of isolating lost circulation zones using profile packers when drilling wells" and that Meling "improve[s] the leak tightness of the connection between the profile packer sections." Ex. 1003, 4. Meling's "Figure 1 shows a partial view of the connection between the profiled pipes of the packer in transport position" and "Fig. 2 shows a partial view the connection between the profiled pipes of the packer lowered into the well and straightened by internal hydraulic pressure." *Id.*

We also find that Meling discloses that "[p]rofiled pipes (3) and (4) of the packer are screwed together at the wellhead while controlling integrity and correctness of the installation of sealing members (9) and (10)." Ex. 1003, 4. As discussed above, Petitioner persuades us that Meling's profiled pipes (3), (4) disclose the recited first and second tubular members. Meling also discloses that "[p]umping fluid increases the pressure inside the packer, which causes the profiled sections thereof to straighten." *Id.*

Meling's "connection includes the connectable cylindrical ends of pipes (3) and (4)." Ex. 1003, 4. In other words, Meling discloses that its pipes (3), (4) include connectable ends. *Id.* "[A]n underreamer is used to expand the connection sections to ensure their tight fit against the walls of the well." *Id.* Meling's "Fig. 3 shows a partial view of the connection after passing of the tool and increasing its diameter to the well diameter." *Id.*

Meling discloses that it "promotes a more complete straightening of the packer and facilitates the underreamer operation, making the installation of the packer 5 to 6 hours quicker depending on the length thereof" and that "the external sealing members reliably separate the isolated layers of the formations, while eliminating crossflows." Ex. 1003, 4. We credit Petitioner's declarant testimony regarding the radial expansion and plastic deformation of Meling's pipes (3), (4) because the record supports it. Ex. 1002 ¶¶ 139–141.

Based on our findings above, because Meling discloses pipes (3), (4) are straightened by fluid pressure and then their "connectable cylindrical ends" are expanded by an underreamer so that they have a "tight fit against the walls of the well" to "reliably separate the isolated layers of the

formations, while eliminating crossflows," Petitioner persuades us that Meling discloses a radial expansion and plastic deformation of its profiled pipes (3), (4). Ex. 1002 ¶¶ 139–141; Ex. 1003, 4, Fig. 2, 3.

Even under Patent Owner's proposed interpretation of "radial expansion and plastic deformation" to mean "causing a liner to yield in a radial direction throughout the liner wall" (PO Resp. 22), Petitioner shows that Meling discloses such "radial expansion and plastic deformation" because we find that Meling's "connection includes the connectable cylindrical ends of pipes (3) and (4)," and "an underreamer is used to expand the connection sections to ensure their tight fit against the walls of the well." Ex. 1003, 4. Meling's "Fig. 3 shows a partial view of the connection after passing of the tool and increasing its diameter to the well diameter." *Id.*; *see also* Ex. 2011 ¶ 143 ("The connection sections may be enlarged by an underreamer . . . ; however, Meling fails to show that the underreamer actually expands pipes (3), (4) after they are straightened.").

Meling, thus, discloses that pipes (3), (4) are caused to yield in a radial direction throughout their walls because their "diameter [is increased] to the well diameter" so as to have a "tight fit against the walls of the well" for "isolating lost circulation zones using profile packers when drilling wells," "improv[ing] the leak tightness of the connection between the profile packer sections," and "reliably separat[ing] the isolated layers of the formations, while eliminating crossflows." Ex. 1003, 4; *see also* PO Resp. 39 (arguing that "the hinge points exceed yield strength, not the entire circumference of the tubular, as in radial expansion"), 41 (arguing that

Meling has "a natural stretching that results from folding and unfolding a malleable substance").

Patent Owner's arguments pointing to the differences between re-forming or restoring a corrugated pipe and radial expansion and plastic deformation do not show a deficiency in Petitioner's arguments regarding "radial expansion and plastic deformation" because, for the reasons above, at least the "connectable cylindrical ends of pipes (3), (4)" undergo a radial expansion and plastic deformation under Patent Owner's proposed interpretation. PO Resp. 38–43; PO Sur-reply 18. Patent Owner's arguments about higher forces and stresses are irrelevant because the challenged claims do not require any particular force or stress. PO Resp. 43–44. Patent Owner's arguments that attempt to distinguish the connection sections from pipes (3), (4) also do not show a deficiency in Petitioner's argument because Meling describes the connections sections as being parts of pipes (3), (4). PO Resp. 47–48; PO Sur-reply 18–19; Ex. 1003, 4 ("The connection includes the connectable cylindrical ends of pipes (3) and (4) in the form of sleeve (1) and nipple (2) of pipes (3) and (4).").

(6) Petitioner Shows that Meling Discloses that Sealing Member (9) is Disposed for Sealing the Interface between the First and Second Tubular Members Before, During, and After Expansion of the Tubular Members

Meling discloses that "[i]nternal sealing members (9) ensure leak tightness of the threaded connection." Ex. 1003, Abstract. Meling's objective "is to improve the leak tightness of the connection between the profile packer sections." *Id.* at 4.

As discussed above, we find that Meling discloses that "[p]umping fluid increases the pressure inside the packer, which causes the profiled sections thereof to straighten, same as in case of the conventional technology" and that "[d]uring this operation, sealing member (9) receives the internal pressure and seals the threaded connection, so as to ensure a more complete straightening of the profiled sections of the packer." Ex. 1003, 4. Meling also discloses that, "[n]ext, an underreamer is used to expand the connection sections to ensure their tight fit against the walls of the well." *Id.*; *see also id.* at Fig. 5 (showing the connection after passing of a tool and diameter increased to well diameter).

Also, as determined above, Petitioner persuades us that Meling discloses a radial expansion and plastic deformation of its profiled pipes (3), (4), because fluid pressure straightens Meling's pipes (3), (4) and then their "connectable cylindrical ends" are expanded by an underreamer so that they have a "tight fit against the walls of the well." Ex. 1002 ¶¶ 139–141; Ex. 1003, 4, Figs. 2, 3.

Based on these findings and determinations, Petitioner persuades us that Meling discloses "one or more sealing members disposed within the annular chamber for sealing the interface between the first and second tubular members before, during, and after a radial expansion and plastic deformation of the first and second tubular members." In particular, Meling discloses that sealing member (9) "seals the threaded connection" before the underreaminer expands, at least, the "connection section" or "connectable cylindrical ends of pipes (3), (4)." Ex. 1002 ¶ 140; Ex. 1003, 4; Ex. 1053,

29:14–31:11; *see also* Ex. 2011 ¶ 143 ("The connection sections may be enlarged by an underreamer.").

Patent Owner's responsive argument that Meling's straightening is only "expansion" of pipes (3), (4) does not show a deficiency in Petitioner's contentions. *See* PO Resp. 46–47. We also agree with Petitioner that claim 1 does not require any particular tool for radial expansion and plastic deformation, and that Patent Owner's "exhibit includes expanding tubulars with rotary tools." *See* Pet. Reply 21–22 (citing PO Resp. 48–49); Ex. 2012, 2.

> *e) "wherein the size of the annular chamber permits the sealing members to expand in the axial direction during the radial expansion and plastic deformation of the first and second tubular members."*

For the wherein clause of claim 1 quoted above, Petitioner contends that "recess (7) and the adjacent 'gaps' are sized such that they permit sealing member (9) to expand in the axial direction" during expansion of pipes (3) and (4). Pet. 47 (citing Ex. 1002 ¶¶ 145–146); *see also id.* at 23–26 (asserting what Meling discloses). According to Petitioner, "Meling explains that 'as a result of expansion, the upper part of nipple (2) [i.e., the pin] becomes partially inserted into recess (7), thus, sealing and locking sealing member (9), and forcing it to "flow" into the gaps of the threaded connection.'" *Id.* at 47–48 (citing Ex. 1003, 4). Petitioner provides annotated Figures 1 and 5 from Meling, which are reproduced below.

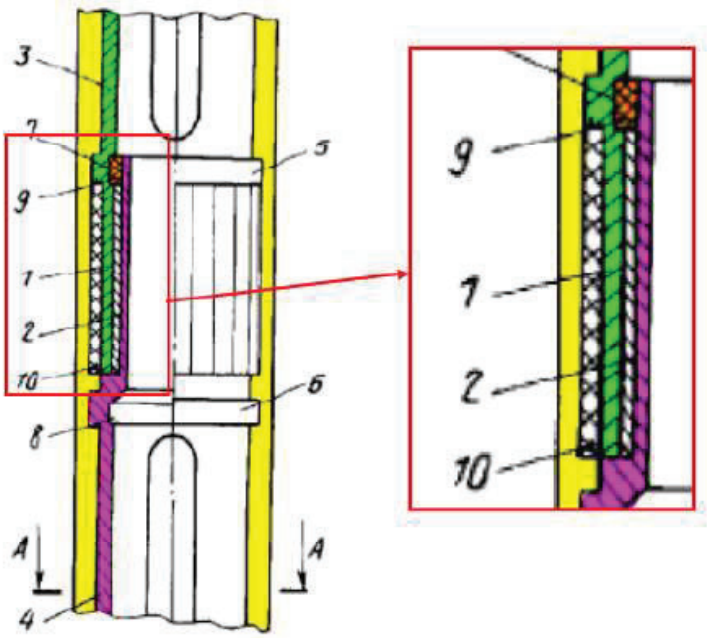


Fig. 1

EX1003, Fig. 1 (pre-expansion) (annotated)

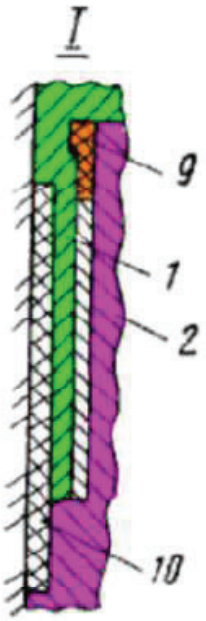


Fig. 5

EX1003, Fig. 5 (post-expansion) (annotated)

Annotated Figures 1 and 5 show a partial sectional view of Meling's connection pre-expansion and post-expansion with color added to distinguish different parts. Pet. 48; Ex. 1003, 4.

(1) Patent Owner's Response

Patent Owner responds that Meling fails to disclose the wherein clause of claim 1 "because Meling's recess (7) is not sized to permit the sealing member to expand in the axial direction during the expansion" and "Meling's recess is sized so expansion purposefully causes the sealing member (9) to 'flow' into the gaps, outside of the annular chamber and into the threaded connection." PO Resp. 50 (citing Ex. 2011 ¶¶ 161–162). According to Patent Owner, "the plain language [of claim 1] requires, the

sealing member must be 'disposed within' the annular chamber before, during, and after expansion." *Id.* (citing Ex. 2011 ¶ 162).

Patent Owner argues that "Meling's recess (7) does not accommodate the expansion of the sealing member such that the expansion of the outer pipe (sleeve (1)) is minimized" and "the figures of Meling indicate that the expansion process significantly deforms the outer pipe." PO Resp. 50–51 (citing Ex. 1001, 152:19–22; Ex. 1003, Figs. 2, 3; Ex. 2011 ¶ 163). Patent Owner also argues that "Meling's recess (7) is not sized to accommodate axial expansion so the sealing member stays within the recess, or so deformation of the outer pipe (sleeve (1)) is not significantly deformed" and, thus, "Meling does not disclose an annular chamber that permits the sealing member(s) to expand in the axial direction as described and claimed in the '763 Patent." *Id.* at 51 (citing Ex. 1001, 152:19–22, 152:66–153:2, 153:47–50, 154:31–34; Ex. 2011 ¶¶ 164–165).

(2) Petitioner's Reply

Regarding the recitation "permits the sealing members to expand in the axial direction during . . . expansion," Petitioner replies that Patent Owner "does not dispute that Meling's seal expands in an axial direction." Pet. Reply 16 (citing PO Resp. 49–51; Ex. 1003, Figs. 1, 5). Petitioner argues that, under the proper interpretation of "annular chamber," "Meling's recess and thread gap (the claimed 'annular chamber') is sized to permit the seal's axial expansion." *Id.* Petitioner alternatively argues that "'annular chamber' in this limitation covers two adjacent chambers, which are also sized to permit axial expansion." *Id.* Petitioner also argues that the claims

do not have a limitation for minimizing outer tubular deformation. *Id.* (citing PO Resp. 50–51; Ex. 1001, 174:16–32, 174:35–37).

(3) Patent Owner's Sur-Reply

Patent Owner replies that "Meling's unfolding process specifically and expressly forces the seal out of the annular chamber." PO Sur-reply 17 (citing Ex. 2011, 155–165). Patent Owner also argues that "Meling's recess is explicitly sized to force the seal out of the recess and into the threads of the connection." *Id.* (citing Ex. 1003, 4; Ex. 2011 ¶ 161).

(4) Petitioner Shows that Meling Discloses the Wherein Clause.

As determined above, based on the full record, we find that Meling discloses that "sealing member (9) is located in recess (7)" and forced "to 'flow' into gaps of the threaded connection." Ex. 1002 ¶¶ 135, 136; Ex. 1003, 3, 4, Figs. 1, 5. Also, because Meling discloses pipes (3), (4) are straightened by fluid pressure and then their "connectable cylindrical ends" are expanded by an underreamer so that they have a "tight fit against the walls of the well," Petitioner persuades us that Meling discloses a radial expansion and plastic deformation of its profiled pipes (3), (4). Ex. 1002 ¶¶ 139–141; Ex. 1003, 4, Fig. 2, 3. We also agree with Petitioner that Patent Owner does not dispute that Meling's sealing member (9) expands in an axial direction. *See* PO Resp. 49–51; Pet. Reply 16.

Petitioner, thus, persuades us that Meling discloses "wherein the size of the annular chamber permits the sealing members to expand in the axial direction during the radial expansion and plastic deformation of the first and second tubular members."

3. Dependent Claim 3

For dependent claim 3, Petitioner argues that Meling's sealing member (9) is adjacent an end portion of a threaded connection in an annular chamber. Pet. 48–49 (citing Ex. 1002 ¶¶ 146, 147; Ex. 1003, 4). Petitioner also argues that the position of Meling's sealing member (9) meets the '763 patent's description of claim 3's limitation. *Id.* at 49 (citing Ex. 1001, 152:57–60, Fig. 28; Ex. 1003, Fig. 1); *see also id.* at 23–26 (asserting what Meling discloses).

We find that that a relied-upon portion of Meling discloses that "[s]ealing member (9) is located in recess (7) of the sleeve on the side of the internal thread joint." Ex. 1003, 4. We also find that Figures 1–3 and 5 show sealing member (9) at an end portion of a threaded connection in, at least, recess (7). We further credit Petitioner's declarant testimony regarding claim 3 because the record supports it. Ex. 1002 ¶¶ 146, 147.

Patent Owner responds that "Petitioner fails to show in Meling every element recited in claim 1" and "Meling does not anticipate claim 1 or claim 3." PO Resp. 51. For the reasons discussed for claim 1, Petitioner persuades us that Meling discloses every element of claim 1.

Thus, in view of the full record, Petitioner persuades us that Meling discloses the limitations of claim 3.

4. Conclusion as to the Asserted Anticipation by Meling

Based on our findings from Meling in view of the full record, Petitioner persuades us by a preponderance of the evidence that Meling anticipates claims 1 and 3.

E. Asserted Obviousness Based on Abdrakhmanov and Meling

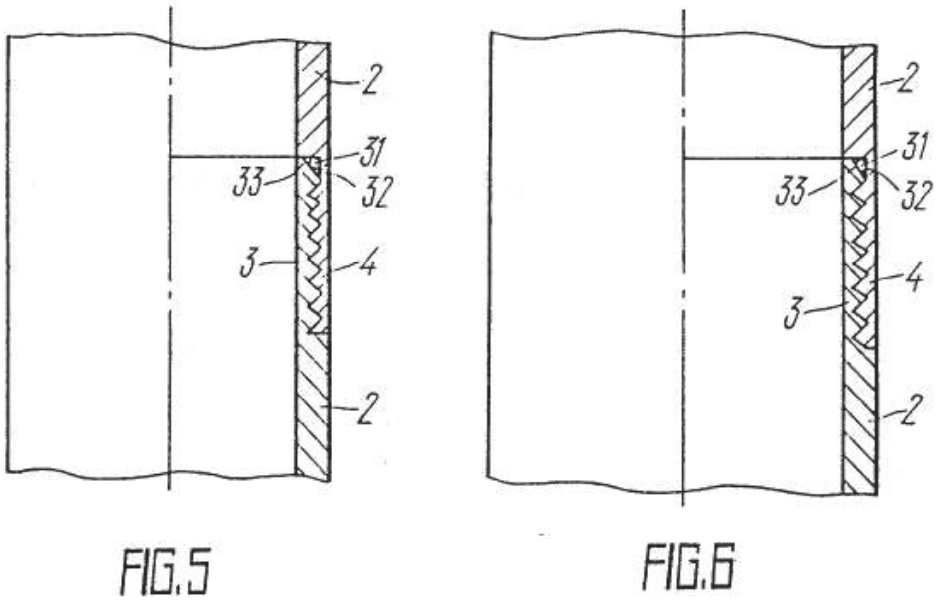
Petitioner argues that Abdrakhmanov teaches substantially all the limitations of claims 1 and 3 and relies on Meling for teaching a sealing member that seals before, during, and after radial expansion. Pet. 62–67, 69–72. Petitioner also argues that one of ordinary skill in the art would have modified Abdrakhmanov in view of Meling to provide a pre-expansion seal. *Id.* at 67–69.

Patent Owner responds that Abdrakhmanov and Meling fail to teach or suggest "one or more sealing members disposed within the annular chamber . . . before, during, and after a radial expansion and plastic deformation," "radial expansion and plastic deformation of the first and second tubular members," and "an annular chamber sized to permit the sealing members to expand in the axial direction during radial expansion and plastic deformation." PO Resp. 60–61, 63–67. Patent Owner also responds that Petitioner fails to show that one of ordinary skill in the art would have combined these references. *Id.* at 61–63.

For the reasons below, based on the full record before us, we determine that Petitioner has shown by a preponderance of the evidence that Abdrakhmanov and Meling would have rendered obvious claims 1 and 3.

1. Abdrakhmanov (Ex. 1004)

Abdrakhmanov "relates to an arrangement for isolating or patching off troublesome zones in a well." Ex. 1004, 1:8–10. Figures 5 and 6 of Abdrakhmanov are reproduced below.



Figures 5 and 6 show a joint in the arrangement before and after a calibration of the profile pipes. Ex. 1004, 3:57–58, 3:61–63. The arrangement includes a string of pipes 1 that have at their ends cylindrical portions 2. *Id.* at 4:4–8. Cylindrical portions 2 are provided with internal threads 3 or external threads 4 to join pipes 1 to one another. *Id.* at 4:7–10. Annular seal 31 is provided in a gap that is defined by annular groove 32 at an end of internal thread 4 and beveled end portion 33 of external thread 3. *Id.* at 4:58–63.

2. Independent Claim 1

a) "An apparatus, comprising:"

Petitioner argues, and Patent Owner does not dispute, that, if the preamble is considered limiting, Abdrakhmanov teaches it. Pet. 62–63 (citing Ex. 1002 ¶¶ 176, 177; Ex. 1004, 2:24–41); *see also id.* at 26–30 (asserting what Abdrakhmanov teaches); PO Resp. 60–67 (arguing that the

proposed combination fails to teach other recitations and there is insufficient reason to combine).

We find that the relied-upon portion of Abdrakhmanov teaches "an arrangement for patching off troublesome zones in a well, comprising a string of profile pipes" that "is provided with a device for setting the profile pipe string in the well" and includes "a reamer of the cylindrical portions of the profile pipes." Ex. 1004, 2:24–32. Abdrakhmanov "provides for performing the operations of running in the profile pipe string, expanding and calibrating the profile pipes within a single round trip, which simplifies and speeds up the process of patching off troublesome zones in a well." *Id.* at 2:37–41. We also credit Petitioner's declarant testimony regarding the preamble because the record supports it. Ex. 1002 ¶¶ 176, 177.

Based on the full record, even if the preamble is limiting, because Abdrakhmanov teaches an arrangement that includes, at least, profile pipes and a reamer, Petitioner persuades us that Abdrakhmanov teaches the preamble of claim 1.

b) "a first tubular member; a second tubular member; a threaded connection for coupling the first tubular member to the second tubular member;"

Petitioner argues that Abdrakhmanov teaches the above-quoted limitation because it teaches a string of profile pipes 1 with cylindrical end portions 2 having threads 3, 4. Pet. 63–64 (citing Ex. 1002 ¶¶ 178, 179; Ex. 1004, 4:4–11); *see also id.* at 26–30 (asserting what Abdrakhmanov teaches), 40 (labeling these limitations "[1a]," "[1b]," and "[1c]"). Petitioner's annotated Figure 5 of Abdrakhmanov is reproduced below.

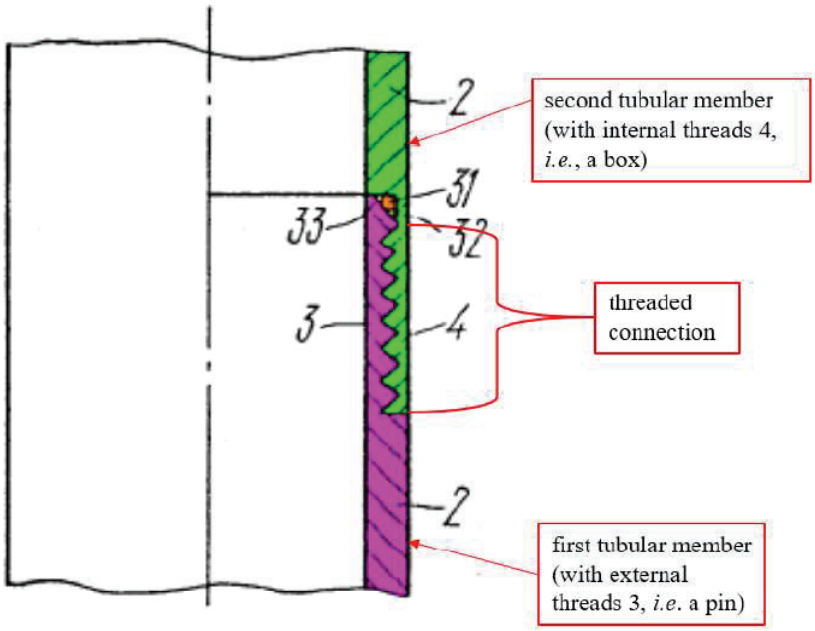


FIG. 5

EX1004, Fig. 5 (annotated)

Figure 5 shows a joint in a lower part of an arrangement with Petitioner's labels for "second tubular member (with internal threads 4, *i.e.*, a box," "threaded connection," and "first tubular member (with external threads 3, *i.e.* a pin)," and coloring for the first and second tubular members. Pet. 64; Ex. 1001, 3:57–58, 3:61.

In its arguments for the limitations regarding the "one or more sealing members," Patent Owner responds that "the 'profiled pipe' described in Abdrakhmanov is not a tubular" because "[i]t is a thinner, folded pipe akin to a corrugate that would not be used . . . in the '763 Patent," "would not solve the problems in the prior art disclosed by the '763 Patent," and "is simply not as reliable as a steel tubular in generalized well applications." PO Resp. 65 (citing Ex. 2011 ¶ 114).

Petitioner replies that profiled pipes are tubulars for the same reasons asserted in the anticipation challenge. Pet. Reply 28 (citing PO Resp. 65). Patent Owner does not provide a reply regarding tubular members. *See generally* PO Sur-reply.

> We find that a relied-upon portion of Abdrakhmanov teaches that the arrangement for patching off troublesome zones in a well comprises a string of profile pipes 1 . . . (FIGS. 1 and 3) provided at their ends with cylindrical portions 2 which are alternatingly provided with external threads 3 and internal threads 4 for joining the pipes 1 to one another and to other components of the disclosed arrangement, as it can be seen in FIGS. 2, 5 and 6.

Ex. 1004, 4:4–11, Figs. 1–3, 5.

Based on the full record, because Abdrakhmanov teaches pipes 1 with cylindrical portions 2 having external and internal threads 3, 4, Petitioner persuades us that Abdrakhmanov teaches "a first tubular member; a second tubular member; a threaded connection for coupling the first tubular member to the second tubular member."

Patent Owner's argument regarding tubular members does not show a deficiency in Petitioner's contention that Abdrakhmanov teaches the recited tubular members. For the reasons explained above in Section V.C.2., we do not accept Patent Owner's proposed interpretation of tubular member to mean "casing strings (or pipes) made of hardened steel."

Patent Owner's proposed interpretation also does not require any particular thickness. *See* PO Resp. 26–28. Patent Owner, however, relies on its proposed interpretation to distinguish over Abdrakhmanov based on thickness. *See* PO Resp. 27 (arguing that "[t]ubulars include Oil Country Tubular Goods ('OCTG'), which is a class of pipe that is much thicker than

that used in prior art corrugated expandables"), 65 (arguing that Abdrakhmanov's profile pipe "is a thinner, folded pipe akin to a corrugate that would not be used . . . in the '763 Patent").

As pointed out by Petitioner (Pet. Reply 20), according to the '763 patent, in "a particularly preferred embodiment," "[t]he . . . wall thickness of the intermediate section 810 of the tubular member 715 may range, for example, from about . . . 1/16 to 1.5 inches" or "about . . . 1/8 to 1.25 inches." Ex. 1001, 19:42–43, 20:59–60. The '763 patent does not support Patent Owner's argument that a thin pipe would not be used in an application of the '763 patent or that a thin pipe would not solve a problem of the '763 patent. PO Resp. 45.

The full record, thus, does not indicate that claim 1 would exclude Abdrakhmanov's profile pipes or that Abdrakhmanov's profile pipes fail to teach the recited tubular members. Ex. 1001, 19:42–43, 20:59–60.

c) "at least one annular chamber defined between the first and second tubular members; and"

Petitioner argues, and Patent Owner does not dispute, that annular groove 32 of Abdrakhmanov teaches the above-quoted limitation. Pet. 64–65 (citing Ex. 1002 ¶¶ 180, 181; Ex. 1004, 4:58–63); *see also id.* at 26–30 (asserting what Abdrakhmanov teaches), 41 (labeling the limitation "[1d]"); PO Resp. 60–67 (arguing that the proposed combination fails to teach other recitations and there is insufficient reason to combine). Petitioner's annotated Figure 5 from Abdrakhmanov is reproduced below.

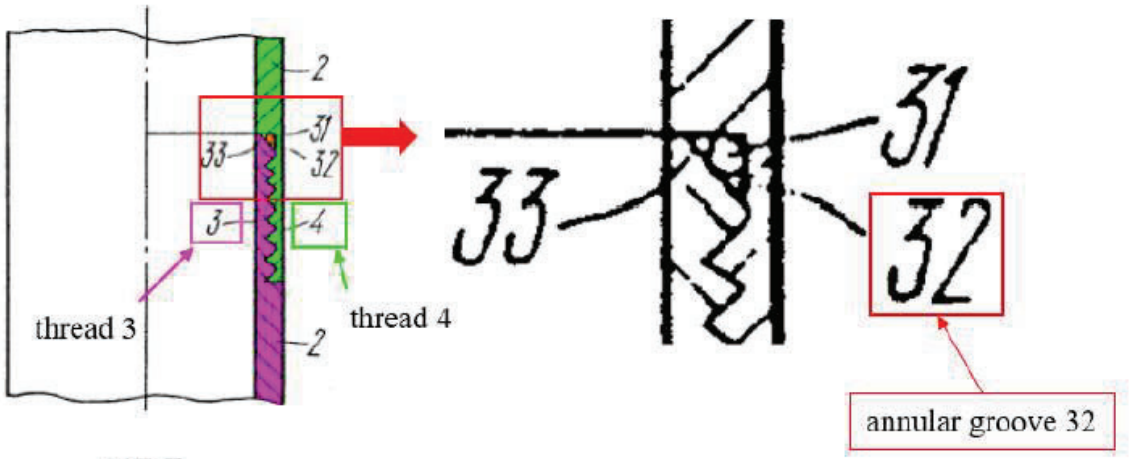


FIG.5

EX1004, Fig. 5 (annotated)

Figure 5 shows a joint in a lower part of an arrangement with Petitioner's labels for "thread 3," "thread 4," and "annular groove 32" and coloring for the first and second tubular members. Pet. 65; Ex. 1001, 3:57–58, 3:61.

Based on the full record, we find that a relied-upon portion of Abdrakhmanov teaches that

> The threaded joints 3, 4 (FIGS. 5 and 6) of the profile pipes 1 are provided with annular seals 31 accommodated in a gap defined by an annular groove 32 at the end of the internal thread 4 and a tapering (bevelled) end portion 33 of the external thread 3 of the respective cylindrical portions 2 of the profile pipes 1.

Ex. 1004, 4:58–63, Figs. 5, 6. We also credit Petitioner's declarant testimony regarding the recited annular chamber because the record supports it. Ex. 1002 ¶¶ 180, 181.

Because Abdrakhmanov teaches annular groove 32 and tapering or beveled end portion 33 defined between pipes 1, Petitioner persuades us that Abdrakhmanov teaches "at least one annular chamber defined between the first and second tubular members."

d) "one or more sealing members disposed within the annular chamber for sealing the interface between the first and second tubular members before, during, and after a radial expansion and plastic deformation of the first and second tubular members;"

Petitioner argues that seal 31 of Abdrakhmanov teaches the limitation quoted above except that seal 31 does not provide a seal before radial expansion. Pet. 65–67 (citing Ex. 1002 ¶¶ 182–189; Ex. 1004, 1:10–15, 3:31–34, 4:58–63, 5:14–22, 5:27–34, 5:42–45); *see also id.* at 26–30 (asserting what Abdrakhmanov teaches), 43 (labeling the limitation "[1e]"). Petitioner also argues that Meling teaches sealing member (9) disposed in an annular chamber for the reasons asserted in the anticipation challenge based on Meling (*id.* at 65–66), "Meling is also directed towards patching troublesome zones" (*id.* at 66–67 (citing Ex. 1003, 4)), "Meling discloses a pre-expansion sealing technique with sealing member (9), which does provide a seal prior to the radial expansion of pipes (3) and (4)" for the reasons asserted in the anticipation challenge (*id.* at 67), and Meling's pre-expansion seal ensures "a more complete straightening of the profiled sections" (*id.* at 67–68 (quoting Ex. 1003, 4)).

(1) Patent Owner's Response

Patent Owner responds that Petitioner fails to show limitation 1[e]. PO Resp. 63 (citing Ex. 2011 ¶¶ 202, 203). Patent Owner refers to its arguments for the Meling anticipation challenge. *Id.* at 64. Patent Owner also argues that, like Meling, "Abdrakhmanov discloses re-forming profiled pipes using fluid pressure," "not the claimed radial expansion and plastic deformation." *Id.* (citing Ex. 1004, 5:3–9, Fig. 3; Ex. 2011 ¶¶ 205, 206).

Patent Owner further argues that, like Meling, Abdrakhmanov uses a reaming device "to compress and secure the threaded connection only, not to radially expand and plastically deform tubular members." *Id.*

In Patent Owner's view, "it is impossible for Meling to teach a seal **before** radial expansion and plastic deformation" because Petitioner relies on the straightening as part of the radial expansion. PO Resp. 64 (emphasis in original) (citing Pet. 45, 67; Ex. 2011 ¶ 207). Patent Owner also contends that "Petitioner has proven that Meling/Abdrakhmanov does not teach a seal formed **before**, during and after the radial expansion and plastic deformation." *Id.* at 65 (emphasis in original).

As discussed above, Patent Owner contends that the profiled pipes of Abdrakhmanov are not tubulars. PO Resp. 65 (citing Ex. 2011 ¶ 114). Patent Owner also contends that Petitioner's proposed combination "fails to show expansion of the sealing members in an axial direction" because "Petitioner seemingly relies on Meling's sealing member 'flowing' into the threaded connection as meeting the axial expansion feature of claim 1" but that flowing does not teach a sealing member before, during, and after expansion for the reasons asserted in the anticipation challenge. *Id.* (citing Ex. 2011 ¶¶ 208, 209).

(2) Petitioner's Reply

Petitioner replies that Patent Owner conceded that Abdrakhmanov teaches radial expansion. Pet. Reply 26 (citing PO Resp. 64; Ex. 1040, 119). According to Petitioner, Patent Owner "also admits Abdrakhmanov teaches expanding its profiled pipes 'into tight engagement with the wall of the borehole'" and Abdrakhmanov teaches expansion because its "pipe's radius

was smaller than the wall of the borehole before expansion." *Id.* at 26–27 (citing PO Resp. 64; Ex. 1004, 2:24–36, Figs. 3, 4).

Petitioner also replies that, under Patent Owner's interpretation, "Figure 3's profiled section yields throughout the wall as the patch is radially expanded." Pet. Reply 27 (citing also Ex. 1004, 5:27–34; Fig. 7). Petitioner contends that such expansion "is also apparent by looking at how the *entire* perimeter of the patch shown [in Figures 3 and 4] permanently expands into a circular shape to engage the borehole wall, thereby deforming throughout the liner wall." *Id.* (emphasis in original) (citing also Ex. 1052 ¶¶ 41, 42).

Petitioner further contends that "Abdrakhmanov teaches expanding cylindrical connections into larger cylinders" and that "the connections are cylindrical parts of the tubular members." Pet. Reply 27 (citing PO Resp. 64; Ex. 1004, 2:55–61, 5:10–14; Ex. 1050, 26:13–18). According to Petitioner, "Abdrakhmanov also teaches its expander expands the pipes' profiled portions and specifically shows it in Figure 7." *Id.* (citing Pet. 26–30; Ex. 1004, 5:10–14, 5:27–34; Ex. 1052 ¶ 42).

Petitioner further replies that Meling teaches a pre-expansion seal for the same reasons asserted in the anticipation challenge. Pet. Reply 28 (citing PO Resp. 64–65).

(3) Patent Owner's Sur-Reply

Patent Owner replies that the proposed combination "fails to show a seal before radial expansion and plastic deformation." PO Sur-reply 23 (citing Ex. 2011 ¶¶ 202, 203). Patent Owner also replies that "Abdrakhmanov discloses re-forming profiled pipes using fluid pressure"

and the proposed combination does not teach the claimed radial expansion and plastic deformation because "they are re-forming profiled pipes to original pre-profiled dimensions" for the reasons previously asserted. *Id.* (citing Ex. 1004, 5:3–9, Fig.3; Ex. 2011 ¶ 205).

(4) Petitioner Shows that Abdrakhmanov Teaches the Recited Sealing Members

We find that a relied-upon portion of Abdrakhmanov teaches that its "string of the profile pipes is provided with annular seals received between the matching surfaces of the profile pipes." Ex. 1004, 3:31–34. Another relied-upon portion of Abdrakhmanov details that

> The threaded joints 3, 4 (FIGS. 5 and 6) of the profile pipes 1 are provided with annular seals 31 accommodated in a gap defined by an annular groove 32 at the end of the internal thread 4 and a tapering (bevelled) end portion 33 of the external thread 3 of the respective cylindrical portions 2 of the profile pipes 1.

Id. at 4:58–63. Abdrakhmanov also teaches that reamer 14 expands threaded joints 3, 4 of profile pipes 1, during which "annular seal 31 is deformed to ensure reliable joining and fluid-tight sealing of the adjacent profile pipes." *Id.* at 5:14–22.

Patent Owner does not dispute that Abdrakhmanov's seal 31 in annular groove 32 and tapering (beveled) end portion 33 teaches the recited sealing members disposed within an annular chamber. *See* PO Resp. 63–67. Patent Owner also does not dispute that Abdrakhmanov's seal 31 provides fluid-tight sealing during and after expansion of pipes 1. *See id.*

Based on the full record, because Abdrakhmanov teaches seal 31 in groove 32 and end portion 33, Petitioner persuades us that Abdrakhmanov teaches "one or more sealing members disposed within the annular chamber

for sealing the interface between the first and second tubular members" during and after expansion of tubular members.

For reasons discussed above in the anticipation challenge, Petitioner persuades us that Meling teaches "one or more sealing members disposed within the annular chamber for sealing the interface between the first and second tubular members" *before*, during, and after expansion of tubular members. Ex. 1002 ¶ 140; Ex. 1003, 4; Ex. 1053, 29:14–31:11.

(5) Petitioner Shows that Abdrakhmanov Teaches Radial Expansion and Plastic Deformation of Tubular Members

Regarding "radial expansion and plastic deformation of tubular members," we find that Abdrakhmanov teaches that an "appropriate fluid is pumped from the surface into the pipe string to build up therein the sufficient pressure (with the ball valve member 10 automatically closing) for straightening the profile pipes 1 and thus for urging them into tight engagement with the wall of the borehole." Ex. 1004, 5:4–9.

Abdrakhmanov also teaches that:

> Then the drill pipe string (not shown) is rotated with an axial load applied to it to be transmitted to the reamer 14, for its reaming elements 16 to expand the threaded joints 3, 4 (FIGS. 1 and 6) of the profile pipes 1 and also to ultimately straighten them. While performing this, the reaming elements 16 of the reamer 14 press the tapering end 33 of the thread 3 of each respective cylindrical portion 2 of the profile pipe 1 into the annular groove 32 at the end of the inner thread 4 of the respective other cylindrical portion 2 of the matching profile pipe 1, so that the annular seal 31 is deformed to ensure reliable joining and fluid-tight sealing of the adjacent profile pipes 1.

Id. at 5:10–22. Abdrakhmanov further teaches that:

> The subsequent expansion of the passage diameter of the threaded joints 3, 4 of the profile pipes 1, the calibration of their internal diameter and strength-enhancing burnishing of their walls is performed by the successive sections 23, 22 and 21 of the expander 20, which, owing to their working diameters growing in successive steps, consistently expand the inner diameter of the profile pipes 1 to the required value.

Id. at 5:27–34. We credit Petitioner's declarant testimony regarding radial expansion and plastic deformation because the record supports it. Ex. 1002 ¶¶ 121, 185; *see also id.* ¶¶ 90–94 (describing what one of ordinary skill in the art knew of expanding circular tubulars).

Based on the full record, because Abdrakhmanov teaches straightening profile pipes 1 to urge them into "tight engagement with the wall of the borehole," using reamer 14 "to expand threaded joints 3, 4," and using expander 20 to "expand the inner diameter of profile pipes 1 to the required value," Petitioner persuades us that Abdrakhmanov teaches "a radial expansion and plastic deformation of the first and second tubular members." Ex. 1002 ¶¶ 121, 185; Ex. 1004, 5:4–9, 5:10–22, 5:27–34; *see also id.* at Fig. 4; PO Resp. 41 (arguing that only the hinge points of a corrugated pipe may exceed yield strength and that unfolding a malleable substance results in "natural stretching").

Even under Patent Owner's proposed interpretation of "radially expanding and plastically deforming" to mean "causing a liner to yield in a radial direction throughout the liner wall" (PO Resp. 22–26), Petitioner shows that Abdrakhmanov teaches "a radial expansion and plastic deformation of the first and second tubular members," because we find that Abdrakhmanov's pipes 1 yield in a radial direction throughout its liner wall

so that they have a "tight engagement with the wall of the borehole" and their inner diameter is expanded "to the required value" for "patching off the troublesome zone with the string of the profile pipes 1." Ex. 1002 ¶¶ 121, 185; Ex. 1004, 5:4–9, 5:10–22, 5:27–34, 5:42–44; *see also id.* at Figs. 3, 4.

(6) Petitioner Shows that Meling Teaches a Pre-Expansion Seal

Based on the full record, for the same reasons discussed above in the anticipation challenge based on Meling, Petitioner persuades us that Meling teaches "one or more sealing members disposed within the annular chamber for sealing the interface between the first and second tubular members before, during, and after a radial expansion and plastic deformation of the first and second tubular members." Ex. 1002 ¶¶ 139–141; Ex. 1003, 4, Figs. 2, 3; Ex. 1053, 29:14–31:11.

Also, as discussed above, we find that Meling "relates to the oil and gas production industry, and specifically, to means of isolating lost circulation zones using profile packers when drilling wells" and that Meling "improve[s] the leak tightness of the connection between the profile packer sections." Ex. 1003, 4. Thus, based on the full record, Petitioner persuades us that Meling is directed towards patching troublesome zones, like Abdrakhmanov.

e) "wherein the size of the annular chamber permits the sealing members to expand in the axial direction during the radial expansion and plastic deformation of the first and second tubular members."

Petitioner argues that annular groove 32 of Abdrakhmanov teaches the above-quoted limitation. Pet. 69–70 (citing Ex. 1002 ¶¶ 190–193; Ex. 1004,

5:14–22, Figs. 5, 6); *see also id.* at 26–30 (asserting what Abdrakhmanov teaches), 47 (labeling the limitation "[1f]"). Reproduced below are Petitioner's annotated Figures 5 and 6.

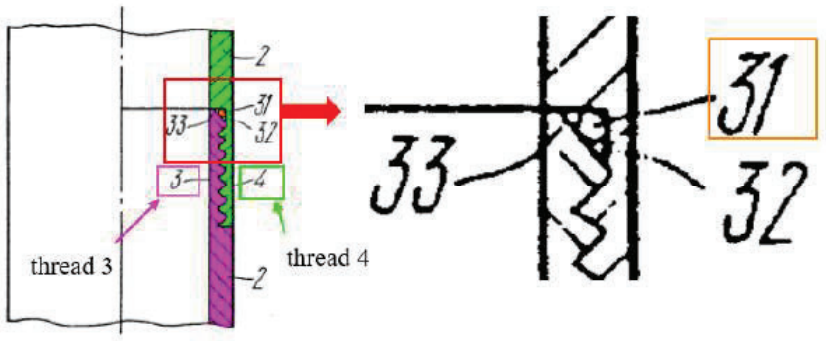


FIG.5

EX1004, Fig. 5 (pre-expansion) (annotated)

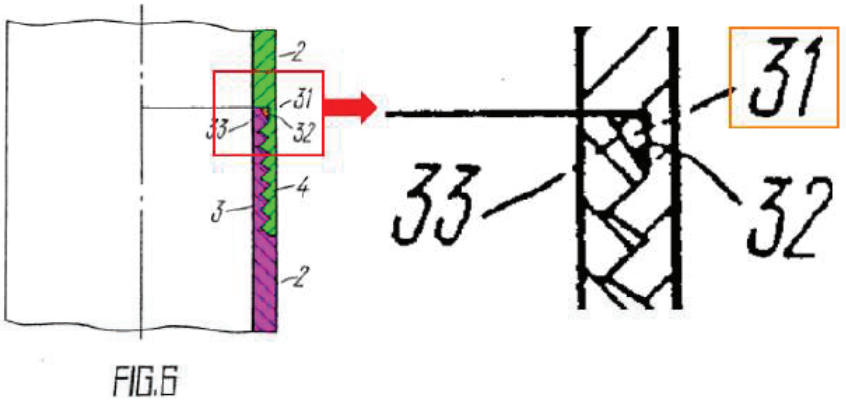


FIG.6

EX1004, Fig. 6 (post-expansion) (annotated)

Figures 5 and 6 show a joint in a lower part of an arrangement and the same joint after calibration of profile pipes with Petitioner's labels for threads 3, 4 and coloring for the first and second tubular members. Pet. 70; Ex. 1001, 3:57–58, 3:61–63. Petitioner also argues that "[t]he seal in annular groove 32 would operate the same way when Meling's pre-expansion sealing teaching is combined with Abdrakhmanov" and "would expand in the axial direction in groove 32, just as it previously did (and just

as sealing member (9) is designed to do as described in Meling)." Pet. 70–71 (citing Ex. 1002 ¶ 193).

(1) Patent Owner's Response

Patent Owner responds that Petitioner fails to show limitation 1[f], the wherein clause of claim 1. PO Resp. 63 (citing Ex. 2011 ¶¶ 202, 203). Patent Owner combines its arguments for this limitation with arguments for the "one or more sealing members." *See* PO Resp. 63–67.

Specific to the "wherein" clause, Patent Owner argues that Petitioner's proposed combination "fails to show expansion of the sealing members in an axial direction" because "Petitioner seemingly relies on Meling's sealing member 'flowing' into the threaded connection as meeting the axial expansion feature of claim 1" but that flowing does not teach a sealing member before, during, and after expansion for the reasons asserted in the anticipation challenge. *Id.* (citing Ex. 2011 ¶¶ 208, 209).

Patent Owner also argues that Petitioner fails to show that Abdrakhmanov teaches a seal deforming in the axial direction because Petitioner's annotated Figures 5 and 6 "may show a slight deformation of annular seal 31 by beveled portion 33 entering annular groove 32," as described by Abdrakhmanov. PO Resp. 65–66 (citing Pet. 69, 70; Ex. 1004, 5:20–22; Ex. 2011 ¶¶ 210, 211). According to Patent Owner, the figures are not clear enough, and "[t]here is no disclosure of any axial expansion." *Id.* at 66–67. Patent Owner also argues that "[d]eformation, without additional explanation, is not expansion in the axial direction," and "there is no disclosure of an annular chamber sized to permit expansion of the seal in the

axial direction during radial expansion and plastic deformation." *Id.* at 67 (citing Ex. 2011 ¶¶ 212, 213).

(2) Petitioner's Reply

Petitioner replies that Patent Owner's declarant "agreed that Abdrakhmanov's Figures 5 and 6 appear to show axial expansion of the sealing member." Pet. Reply 28 (citing Ex. 1053, 31:15–34:25). Petitioner also replies that Patent Owner "admits Abdrakhmanov discloses 'a slight deformation of annular seal 31 by beveled portion 33 entering annular groove 32.'" *Id.* (citing PO Resp. 66; Ex. 1004, 5:14–22).

Petitioner also argues that "Abdrakhmanov's Figures 5 and 6 show groove 32 accommodating axial expansion, *i.e.*, deformation, of seal 31." Pet. Reply 28 (citing Ex. 1002 ¶¶ 191, 192; Ex. 1053, 31:15–34:25). Petitioner contends that Figure 5 shows a gap beneath seal 31 pre-expansion and Figure 6 shows no gap post-expansion. *Id.* at 28–29 (citing Ex. 1004, Figs. 5, 6). Petitioner also contends that neither Abdrakhmanov's disclosure nor figures are ambiguous. *Id.* at 29 (citing Ex. 1004, 5:20). Petitioner also points to prosecution history of a continuation application. *Id.* at 29–30 (citing Ex. 1040, 40–53, 60–62).

(3) Patent Owner's Sur-Reply

Patent Owner replies that the proposed combination fails to show the wherein clause of claim 1. PO Sur-reply 23 (citing Ex. 2011 ¶¶ 202, 203). Patent Owner also replies that Abdrakhmanov's figures are "fuzzy and unclear" and that reliance on such figures for a teaching would be speculative and insufficient to meet the preponderance of the evidence burden. *Id.* at 24.

(4) Petitioner Shows that Abdrakhmanov Teaches the Wherein Clause

Based on the full record, we find that a relied-upon portion of Abdrakhmanov teaches that

> While performing this, the reaming elements 16 of the reamer 14 press the tapering end 33 of the thread 3 of each respective cylindrical portion 2 of the profile pipe 1 into the annular groove 32 at the end of the inner thread 4 of the respective other cylindrical portion 2 of the matching profile pipe 1, so that the annular seal 31 is deformed to ensure reliable joining and fluid-tight sealing of the adjacent profile pipes 1.

Ex. 1004, 5:14–22, Figs. 5, 6.

Also, as discussed above, because Abdrakhmanov teaches straightening profile pipes 1 to urge them into "tight engagement with the wall of the borehole," using reamer 14 "to expand threaded joints 3, 4," and using expander 20 to "expand the inner diameter of profile pipes 1 to the required value," Petitioner persuades us that Abdrakhmanov teaches "a radial expansion and plastic deformation of the first and second tubular members." Ex. 1002 ¶¶ 121, 185; Ex. 1004, 5:4–9, 5:10–22, 5:27–34.

Petitioner, thus, persuades us that Abdrakhmanov teaches that "the size of the annular chamber permits the sealing members to expand . . . during the radial expansion and plastic deformation of the first and second tubular members."

Turning to whether Abdrakhmanov's seal 31 expands in the axial direction, Abdrakhmanov teaches that reamer 14 presses tapering end portion 33 into annular groove 32. Ex. 1004, 5:15–20. Abdrakhmanov also teaches that this results in annular seal 31 being "deformed to ensure reliable

joining and fluid-tight sealing of the adjacent profile pipes 1." *Id.* at 5:20–22. A "subsequent expansion of the passage diameter of the threaded joints 3, 4," according to Abdrakhmanov, "expand[s] the inner diameter of the profile pipes 1 to the required value." *Id.* at 5:27–34. As discussed above, threads 3, 4, are provided with annular groove 32 and tapering end portion 33. *Id.* at 4:58–63.

In view of these teachings, we find that Abdrakhmanov teaches, at least, an axial deformation of seal 31, because tapering end portion 33 is pressed into annular groove 32, and then both tapering end portion 33 and annular groove 32 are expanded further to a required diameter value. *See* Ex. 1004, 5:15–22, 5:27–34. We credit Petitioner's declarant testimony regarding the wherein clause of claim 1. Ex. 1002 ¶¶ 190–193.

Even if Figures 5 and 6 are not clear, as argued by Patent Owner, the related description teaches or suggests that seal 31 expands in an axial direction while retained in a gap defined by tapering end portion 33 and annular groove 32. *See* Ex. 1004, 4:58–63. Turning to Figures 5 and 6 in view of the related description, pressing tapering end portion 33 into annular groove 32 would be in the radial direction, and thus, seal 31 would also be pressed in the radial direction. *See id.* at Figs. 1, 2, 5, 6. Seal 31, therefore, would have to compress radially and expand axially. *See id.* The subsequent expansion by expander 20 would also be in the radial direction, and thus, seal 31 would further expand in the axial direction.

For the reasons above, based on the full record, Petitioner persuades us that Abdrakhmanov teaches "wherein the size of the annular chamber permits the sealing members to expand in the axial direction during the

radial expansion and plastic deformation of the first and second tubular members."

f) Reason to Combine

Petitioner argues that both Abdrakhmanov and Meling "disclose very similar systems that serve to seal off troublesome zones, and both systems use the expansion process to push the pin end of the threaded connection into the annular chambers to further deform the sealing member." Pet. 68–69 (comparing Ex. 1003, 4 and Ex. 1004, 5:14–20).

Petitioner also argues that "[i]t would have been obvious to use Meling's pre-expansion sealing technique with . . . sealing member (9) with Abdrakhmanov's annular seal 31 to provide a pre-expansion seal" and the "combination would teach a sealing member that provides a seal before, during, and after radial expansion and plastic deformation of pipes 1," thus rendering obvious the claim. Pet. 67 (citing Ex. 1002 ¶ 186). Petitioner further argues that "the sealing member would remain small enough such that it expands in the axial direction within the annular chamber (groove 32 in this case)." *Id.*

According to Petitioner, one of ordinary skill in the art "would have been motivated to use Meling's teaching of a pre-expansion sealing technique with sealing member (9) with Abdrakhmanov's apparatus to gain the benefits of pre-expansion sealing described in Meling." Pet. 67 (citing Ex. 1002 ¶ 187). Petitioner contends that "Abdrakhmanov and Meling both start the radial expansion by pumping fluid into profile pipes to 'straighten' (i.e., remove) the profiles" and that "Meling explains that a pre-expansion seal aids in this straightening step." *Id.* at 67–68 (quoting Ex. 1003, 4).

Petitioner, thus, contends one of ordinary skill in the art "would have been motivated to gain this same benefit when performing the three-step expansion process of Abdrakhmanov." *Id.* (citing Ex. 1002 ¶ 187). Petitioner additionally argues that "given these finite number of predictable solutions (a pre-expansion seal or not) it would be obvious for Abdrakhmanov to use Meling's pre-expansion sealing technique." *Id.*

Petitioner contends that one of ordinary skill in the art would have had a reasonable expectation of success in making the proposed modification because "Meling teaches that sealing member (9) is large enough to form a pre-expansion seal, but small enough such that it expands axially in the annular chamber when the threaded connection is radially expanded (as taught in both Abdrakhmanov and Meling)" and the proposed modification was well within ordinary skill in the art. *Id.* (citing Ex. 1002 ¶ 188).

(1) Patent Owner's Response

Patent Owner responds that one of ordinary skill in the art would not have been motivated to combine Abdrakhmanov and Meling. PO Resp. 60 (citing Ex. 2011 ¶ 192). Patent Owner argues that "Petitioner fails to explain or account for vast differences in the structures of the respective systems, or that any such combination would be inoperable without significant experimentation or system redesign." *Id.* at 61. In Patent Owner's view, Meling disposes sealing member (9) in a recess (7) formed during manufacture, but Abdrakhmanov disposes a seal "in a gap defined by an annular groove 32 at the end of the internal thread 4 and a tapering (beveled) end portion 33 of the external thread 3." *Id.* at 61–62 (citing Ex. 1003, 4, Fig. 1; Ex. 1004, 4:60–63, Fig. 5). Patent Owner, thus, argues

that "[r]eplacing the specifically designed groove 32 and tapering end portion 33 of the threaded connection of Abdrakhmanov with an extruded shoulder with a recess for a sealing member is a fundamental change to the design, shape and operation of Meling's and Abdrakhmanov's systems," and Petitioner fails to explain how its proposed modification would work. *Id.* at 62 (citing Ex. 2011 ¶¶ 196, 197).

Patent Owner also argues that "apply[ing] the 'sealing techniques' of Meling to replace the specifically designed threaded connection of Abdrakhmanov . . . would involve adding components specially formed with protective shoulders that define the recess of the sealing member" and "is not a trivial substitution." PO Resp. 62–63 (citing Ex. 1003, 1; Ex. 2011 ¶¶ 198, 199). Patent Owner further argues that one of ordinary skill in the art "would understand that compression of the seal in Abdrakhmanov's connection, forcing the seal out of the groove and into the threads would compromise integrity of the connection, either disrupting the threaded engagement or tearing the O-ring, rendering the connection inoperable" and "would not alter the three-component threaded connection (pin/box/seal) design of Abdrakhmanov with the multi-layered extruded shoulder-sleeve/nipple/first pipe/second pipe/sealing member configuration of Meling." *Id.* at 63 (citing Ex. 2011 ¶¶ 200, 201).

(2) Petitioner's Reply

Petitioner replies that "Meling's pre-expansion seal formed because its sealing member occupied a high fraction of recess (7)'s volume," and that, for a pre-expansion seal in Abdrakhmanov, one of ordinary skill in the art "simply needed to adopt Meling's teaching that sealing member (9) is

large enough to form a pre-expansion seal, but small enough such that it expands axially during radial expansion," which is a "simple" design change. Pet. Reply 25–26 (citing Pet. 68, 73–75; Ex. 1003, Fig. 1).

Petitioner also replies that Patent Owner's "other arguments are misdirection" because the proposed modification does not require "grafting Meling's entire connection onto Abdrakhmanov" and one of ordinary skill in the art would not have worried "about Abdrakhmanov's seal extruding into the threaded connection . . . because Petitioner never proposed that design." Pet. Reply 26 (citing Pet. 65–71; PO Resp. 62, 63).

(3) Patent Owner's Sur-Reply

Patent Owner replies that Petitioner fails to show how the ordinary skilled artisan would have created a pre-expansion seal and fails to "account for the vast differences between [Abdrakhmanov and Meling]." PO Sur-reply 22. Patent Owner again argues that "[i]t is not a trivial substitution to apply the 'sealing techniques' of Meling to replace the specifically designed threaded connection of Abdrakhmanov" and that "[t]he substitution would involve adding components specially formed with protective shoulders that define the recess of the sealing member." *Id.* at 23 (citing Ex. 1003, 1; Ex. 2011 ¶¶ 198, 199).

According to Patent Owner, "Petitioner argues it can cherry-pick elements in a vacuum to create invalidating combinations." PO Sur-reply 23 (citing Pet. Reply 26).

(4) Petitioner Shows that One of Ordinary Skill in the Art Would Have Made the Proposed Combination.

Based on the full record, we find that Abdrakhmanov teaches pressing tapering end 33 of thread 3 of profile pipe 1 into annular groove 32 at the end of thread 3 of another profile pipe 1 to deform seal 31, and Meling teaches expanding a connection between profiled pipes (3), (4) so that nipple (2) is partially inserted into recess (7) causing sealing member (9) to flow. Ex. 1003, 4; Ex. 1004, 5:14–20.

For the reasons discussed above for the anticipation challenge based on Meling, we find that Meling discloses that "[p]umping fluid increases the pressure inside the packer, which causes the profiled sections thereof to straighten, same as in case of the conventional technology" and that "[d]uring this operation, sealing member (9) receives the internal pressure and seals the threaded connection, so as to ensure a more complete straightening of the profiled sections of the packer." Ex. 1003, 4. Also, for the reasons discussed above, we find that Meling teaches sealing member (9) "seals the threaded connection" before the underreaminer expands, at least, the "connection section" or "connectable cylindrical ends of pipes (3), (4)." Ex. 1002 ¶ 140; Ex. 1003, 4; Ex. 1053, 29:14–31:11.

We further find that, similar to Meling, Abdrakhmanov teaches pumping an appropriate fluid "into the pipe string to build up therein the sufficient pressure (with the ball valve member 10 automatically closing) for straightening the profile pipes 1 and thus for urging them into tight engagement with the wall of the borehole." Ex. 1004, 5:4–9.

Thus, in view of these findings, Petitioner persuades us that one of ordinary skill in the art would have been motivated to modify Abdrakhmanov's seal 31 in view of Meling's teachings of a pre-expansion seal "to gain the benefits of pre-expansion sealing described in Meling" and that "Meling explains that a pre-expansion seal aids in this straightening step." Pet. 67–68; Ex. 1002 ¶ 187; Ex. 1003, 4. The relied-upon portions of Meling provide factual support for Petitioner's asserted motivation, and we credit Petitioner's declarant testimony regarding the asserted motivation because Meling supports it. Ex. 1002 ¶ 187; Ex. 1003, 4.

Petitioner also persuades us that "[i]t would have been obvious to use Meling's pre-expansion sealing technique with . . . sealing member (9) with Abdrakhmanov's annular seal 31 to provide a pre-expansion seal" and the "combination would teach a sealing member that provides a seal before, during, and after radial expansion and plastic deformation of pipes 1." Pet. 67; Ex. 1002 ¶ 186. Petitioner further persuades us that there is a "finite number of predictable solutions (a pre-expansion seal or not)," and, thus, "it would be obvious for Abdrakhmanov to use Meling's pre-expansion sealing technique." Pet. 68; Ex. 1002 ¶ 187.

We also find that one of ordinary skill in the art would have had a reasonable expectation of success in making the proposed modification because "Meling teaches that sealing member (9) is large enough to form a pre-expansion seal, but small enough such that it expands axially in the annular chamber when the threaded connection is radially expanded (as taught in both Abdrakhmanov and Meling)." Pet. 68; Ex. 1002 ¶ 188. The full record supports that the proposed modification was well within ordinary

skill in the art because the record supports it. Pet. 14–19, 68; Ex. 1002 ¶¶ 47–50, 98–105, 108, 109, 111, 112, 188; Ex. 1007, 10; Ex. 1008, 3, 7, Figs. 2–4; Ex. 1014; Ex. 1015, 1:50–54; Ex. 1016; Ex. 1024, 1, 2, 3, 5; Ex. 1026, 1, 15; Ex. 1032, 2:52–3:18, 4:20–36, 5:55–59, Fig. 2; Ex. 1034, 15; Ex. 1038, 2; Ex. 1042, 30–42.

We credit Petitioner's declarant testimony that the proposed modification was within ordinary skill in the art because "[i]t would have only required selecting a 'thicker' annular seal 31." Ex. 1002 ¶ 188. We also credit Petitioner's declarant testimony that one of ordinary skill in the art would have understood that adjusting O-ring sealing performance can be accomplished by adjusting the volume of the O-ring relative to the space in which it is disposed because the record supports is. Ex. 1002 ¶ 108; Ex. 1024, 2 (stating that "a better seal may result by using the minimum applicable groove width and gland depth."); Ex. 1026, 1, 15.

Patent Owner's arguments regarding the "vast differences in the structures of the respective systems" and asserted inoperability "without significant experimentation or system redesign" do not show a defect in Petitioner's asserted motivation. PO Resp. 60–62; PO Sur-reply 22. As Petitioner's declarant states, the proposed modification "would have only required selecting a 'thicker' annular seal 31." Ex. 1002 ¶ 188. With only that modification made in Abdrakhmanov, Petitioner persuades us that the combined references would have had the required pre-expansion seal. Pet. 67–68.

The proposed modification does not further require replacing Abdrakhmanov's tapering end 33 and annular groove 32, as asserted by

Patent Owner. Pet. 67–68; PO Resp. 62; PO Sur-reply 23. It also does not require "adding components specially formed with protective shoulders that define the recess of the sealing member," as asserted by Patent Owner. Pet. 67–68; PO Resp. 62–63; PO Sur-reply 23. Petitioner's modification further would not require compressing Abdrakhmanov's seal 31 so that it was forced out of the groove and into the threads, as argued by Patent Owner. Pet. 67–68; PO Resp. 63. The proposed modification is not "cherry-pick[ing] elements in a vacuum to create invalidating combinations," as characterized by Patent Owner, because the modification involves elements already present in Abdrakhmanov in the arrangement taught but adjusts the size of Abdrakhmanov's seal 31 relative to the space in which it is disposed. PO Sur-reply 23.

3. Dependent Claim 3

Claim 3 recites "wherein the sealing members are positioned adjacent to an end portion of the threaded connection within the annular chamber." Ex. 1001, 174:35–37. Petitioner argues that Abdrakhmanov teaches the limitations of claim 3. Pet. 71–72 (citing Ex. 1002 ¶¶ 194, 195; Ex. 1004, 4:59–61, Fig. 5).

We find that that a relied-upon portion of Abdrakhmanov teaches that "threaded joints 3, 4 (FIGS. 5 and 6) of the profile pipes 1 are provided with annular seals 31 accommodated in a gap defined by an annular groove 32 at the end of the internal thread 4." Ex. 1004, 4:59–61. We find that Figure 5 shows seal 31 in annular groove 32 at an end portion of a threaded connection. We further credit Petitioner's declarant testimony regarding claim 3 because the record supports it. Ex. 1002 ¶¶ 194, 195.

Patent Owner responds that "Petitioner fails to show Abdrakhmanov/Meling renders claims 1 or 3 obvious, at least because the combination is unsupported and any alleged combination fails to disclose every element of claim 1." PO Resp. 67. For the reasons above, Petitioner persuades us that Abdrakhmanov and Meling teach all the limitations of claim 1.

Thus, in view of the full record, Petitioner persuades us that Abdrakhmanov teaches the limitations of claim 3 and that one of ordinary skill in the art would have combined Abdrakhmanov and Meling in the manner argued with a reasonable expectation of success.

4. Objective Indicia of Nonobviousness

Petitioner states that "[n]either [it] nor [its declarant] is aware of any secondary considerations that support non-obviousness." Pet. 80 (citing Ex. 1002 ¶ 251). Patent Owner responds that Petitioner was "well aware of objective evidence of non-obviousness, including longstanding need, unsuccessful attempts of others . . . , licensing activities, and commercial success" and yet fails to address such evidence. PO Resp. 74–75 (citing Pet. 80). Patent Owner argues that "Petitioner, however, has publicly acknowledged advantages of solid expandables technology and systems in its public statements." *Id.* at 75 (quoting Ex. 2023, 3); *see also* Opp. 8 (indicating that Ex. 2023 should have been cited instead of Ex. 2006).

Patent Owner also argues that Petitioner tried "to acquire Shell's 'mother set' of patents covering all solid expendables [sic] technology," but "Shell refused to give Enventure's patent to Weatherford, leaving Weatherford with an alternative, and less successful technology using

'rotating rollers.'" PO Resp. 75 (citing Ex. 2017; Ex. 2020 ¶¶ 13–15). Patent Owner further argues that Petitioner, thereafter, "obtained a license to the other subset of Shell's SET patents" and described as "'a new casing' that an operator could 'expand it into place.'" *Id.* at 75–76 (citing Ex. 2017). Patent Owner additionally argues that "[a]nalysts **in 2002** referred to expandables as 'very promising' with the potential to 'grow into something really large down the road,' and characterizing expandables as the type of cost-savings technology 'that oil companies will pay for.'" *Id.* at 76 (emphasis in original) (citing Ex. 2011 ¶¶ 238–240). The parties do not provide reply arguments regarding licensing. *See generally* Pet. Reply; PO Sur-reply.

Patent Owner's evidence indicates there was a license, but that the license excluded the patent at issue in this proceeding. Ex. 2009, 3 (stating in a Weatherford brochure that, "[o]n securing a license from Shell in 2002, Weatherford gained access to fixed-cone solid expandable technology"); Ex. 2017, 1 (stating in an article that "Weatherford International has gained a worldwide license to Shell Technology Ventures' down-hole expandable pipe technology, making it and another Houston-based company the world's only license holders" and that "[t]he other Houston company with license rights is Enventure, a 50-50 joint venture between Shell and Halliburton"); Ex. 2020 ¶¶ 14, 128–138. We, thus, determine that Patent Owner's licensing evidence does not indicate sufficiently that Petitioner was "well aware of objective evidence of non-obviousness" concerning the '763 patent.

To the extent that the other patents in the license would have raised awareness of objective evidence of non-obviousness regarding the '763 patent, Patent Owner does not provide adequate supporting argument or evidence. *See* PO Resp. 74–76; Ex. 2006, 3; Ex. 2011 ¶¶ 238–240; Ex. 2017; Ex. 2020 ¶¶ 13–15. At best, Patent Owner suggests an implication that, because certain other patents were valuable enough for a license, objective evidence of non-obviousness can be imputed somehow for the '763 patent. We determine, however, that Patent Owner's licensing evidence does not show any objective evidence of non-obviousness for the '763 patent.

Turning to the other asserted objective indicia of non-obviousness, Patent Owner responds that such indicia include, but are not limited to, commercial success and long-felt need. PO Resp. 71 (citing Ex. 2011 ¶¶ 70–72, 224–227; Ex. 2012, 6).

a) Nexus

Patent Owner argues that the "solid expandable drilling liner is included in product/service offerings embodying the Challenged Claims," and "[c]ommercially, those products/services are known as 'SET, ESeal Liner, ESeal HP Liner, ESeal Patch, ESeal HP Patch, ESeal Flex, OneStep Monodiameter, MonoSET, ESET, and SameDrift solid expandable technology solutions' (referred to as 'Enventure Products/Services')." PO Resp. 72 (citing Ex. 2011 ¶ 228). Patent Owner asserts that the "Enventure Products/Services include an apparatus, comprising" the limitations of claim 1 of the '763 patent. *Id.* at 63 (citing Ex. 2011 ¶ 231); *see also id.* (stating that "[a] nexus exists between Patent Owner's claimed solid

expandable technology and a long-felt need for advancements overcoming the loss of internal diameter in a wellbore as discussed above") (citing Ex. 2011 ¶¶ 232, 233).

Petitioner replies that Patent Owner fails to show nexus and the asserted indicia of nonobviousness. Pet. Reply 33 (citing PO Resp. 72). Petitioner argues that Patent Owner "provides ***no evidence or analysis*** that those products meet the claim limitations" and that Patent Owner's declarant "merely states that a subset of the Enventure Products/Services practice the claims with no support or analysis." *Id.* (citing Ex. 2008 ¶¶ 228, 231, 232).

Patent Owner replies that Petitioner is requiring "perfect or near perfect correspondence," which has been rejected. PO Sur-reply 26 (citing *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1374 (Fed. Cir. 2019)). Patent Owner also argues that industry praise can be sufficient for a presumption of nexus. *Id.* (citing *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1332–33 (Fed. Cir. 2019)). Patent Owner further argues that it submitted evidence that solid expandable tubular technology "has enjoyed considerable industry praise." *Id.* at 26–27 (citing PO Resp. 70–74; Ex. 2012, 5–6; Ex. 2020, 2).

"In order to accord substantial weight to secondary considerations in an obviousness analysis, the evidence of secondary considerations must have a nexus to the claims, i.e., there must be a legally and factually sufficient connection between the evidence and the patented invention." *Fox Factory*, 944 F.3d at 1373. "[A] patentee is entitled to a rebuttable presumption of nexus between the asserted evidence of secondary considerations and a patent claim if the patentee shows that the asserted evidence is tied to a

specific product and that the product 'is the invention disclosed and claimed.'" *Id.* Applying *Fox Factory*, the Board uses a two-step analysis in evaluating nexus between the claimed invention and the evidence of secondary considerations. *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 33 at 33 (PTAB Jan. 24, 2020) (precedential). We first consider whether the patent owner has demonstrated "that its products are coextensive (or nearly coextensive) with the challenged claims," resulting in a rebuttable presumption of nexus. *Id*. If not, that "does not end the inquiry into secondary considerations"; "the patent owner is still afforded an opportunity to prove nexus by showing that the evidence of secondary considerations is the 'direct result of the unique characteristics of the claimed invention.'" *Id.* (quoting *Fox Factory*, 944 F.3d at 1373–75).

Based on the full record, Patent Owner does not show adequately nexus between the products and services asserted to embody the claims of the '763 patent and the challenged claims. Patent Owner does not provide sufficient argument and evidence that the products and services identified as "SET, ESeal Liner, ESeal HP Liner, ESeal Patch, ESeal HP Patch, ESeal Flex, OneStep Monodiameter, MonoSET, ESET, and SameDrift solid expandable technology solutions" are coextensive with the challenged claims. *See* PO Resp. 72; PO Sur-reply 26–27; Ex. 2011 ¶¶ 228, 231–233. Other than the bare assertion that the identified products and services embody the challenged claims, Patent Owner does not point to any record evidence that would indicate that the identified products and services include the claimed features. PO Resp. 72. Patent Owner's cited declarant testimony merely states that the identified products and services embody the

challenged claims without further analysis or citation to evidence in the record. *See* Ex. 2011 ¶¶ 228, 231–233. For example, there is no chart comparing claim limitations with the identified products and services. *See* PO Resp. 72; PO Sur-reply 26–27; Ex. 2011 ¶¶ 228, 231–233.

Patent Owner, however, may still prove nexus by showing that the evidence of objective indicia of non-obviousness is the direct result of the unique characteristics of the claimed invention. We address this nexus with respect to the individual, asserted objective indicia, below.

b) Commercial Success

Patent Owner argues that, since the availability of solid expandable tubulars, "more than 1600 systems have been installed globally" equating to "over 260 miles" of solid expanded pipes. PO Resp. 72 (citing Ex. 2019, 2). Patent Owner also argues that solid expandable technology "'can handle temperatures up to 450°F.'" *Id.* (citing Ex. 2019, 4); *see also id.* at 74 (contending that "[t]he potential savings from a solution eliminating internal diameter loss was valued at 'millions and potentially billions of dollars'") (citing Ex. 2011 ¶¶ 234–237; Ex. 2018, 4). Patent Owner further quotes one of Petitioner's former employees for commercial success. *Id.* at 71–72 (citing Ex. 2012, 6).

Petitioner replies that Patent Owner does not provide "***any*** evidence of sales volume or market share." Pet. Reply 33 (citing Ex. 1052 ¶¶ 45–48). Patent Owner replies that the Federal Circuit and the Board have found sufficient other types of evidence beyond "Petitioner's demand for revenue and market share data." PO Sur-reply 26 (citing *Henny Penny*, 938 F.3d at 1332–33). Patent Owner also replies that "the industry considers solid

expandables the most economical solution" and that "'Enventure was the first company to bring a solid [expandable drilling liner] to market and has enjoyed considerable success.'" *Id.* at 27 (citing Ex. 2012, 6; Ex. 2020, 2). Patent Owner further replies that "'the desired performance [] will only ever be achieved through the use of a solid expandable.'" *Id.* (quoting Ex. 2016, 5–6).

"When a patentee can demonstrate commercial success, usually shown by significant sales in a relevant market, and that the successful product is the invention disclosed and claimed in the patent, it is presumed that the commercial success is due to the patented invention." *Galderma Labs., L.P. v. Tolmar, Inc.*, 737 F.3d 731, 740 (Fed. Cir. 2013).

Patent Owner's evidence does not sufficiently demonstrate nexus to commercial success or "significant sales in a relevant market." The cited evidence does not show nexus between the "Enventure Products/Services" and the challenged claims. Ex. 2011 ¶¶ 234–237; Ex. 2012, 6; Ex. 2019, 2, 4. Also, the cited evidence does not show nexus between the challenged claims and the asserted number of systems installed and the miles of solid expanded pipe. Ex. 2011 ¶¶ 234–237; Ex. 2012, 6; Ex. 2019, 2, 4. The cited evidence does not indicate if the asserted products and services are the "solid expandable technology" that is the subject of Exhibit 2019. Even if nexus could be established, the cited evidence does not indicate how the number of systems installed or miles of expanded pipe correspond to "significant sales in a relevant market." Ex. 2019, 2, 4. For example, Patent Owner does not point to any record evidence that would indicate that the number of systems

installed and the miles of expanded pipe are significant compared to other systems. *See* PO Resp. 71–72; PO Sur-reply 26.

Thus, based on the full record, Patent Owner does not show adequately (1) nexus between the challenged claims and the asserted commercial success and (2) commercial success of the identified products and services.

c) Long-Felt Need

Patent Owner argues that telescoping casing designs were used in wells prior to the claimed invention and that Petitioner's employee described its success. PO Resp. 71 (citing Ex. 2012, 1), 72 (citing Ex. 2019, 2). According to Patent Owner, there was a "long-felt need for advancements overcoming the loss of internal diameter in a wellbore." *Id.* at 73.

Patent Owner also argues that there is nexus between the claimed apparatus and the asserted long-felt need, as confirmed by a former employee of Petitioner. PO Resp. 73 (citing Ex. 2011 ¶¶ 232, 233; Ex. 2012). In Patent Owner's view, "[p]rior to Enventure Products/Services, there was no other solution to satisfy the long-felt need" and points to an "article by a former employee of a Petitioner-affiliated company" that "confirms/describes the long-felt need as '[t]elescoping casing designs have existed since the very first wells and reservoir completion practices have remained stagnant, dominated by gravel packing" and states that "'[t]he basic design of liner hangers, packers and through tubing straddles has not changed either; expandable technology will, and already has revolutionized techniques in these areas.'" *Id.* at 74 (citing Ex. 2012, 1). Patent Owner also contends that "[t]he potential savings from a solution eliminating

internal diameter loss was valued at 'millions and potentially billions of dollars.'" *Id.* (citing Ex. 2011 ¶¶ 234–237; Ex. 2018, 4).

Petitioner points to its declarant testimony in reply. Pet. Reply 33 (citing Ex. 1052 ¶¶ 45–48). Patent Owner replies that "[t]he industry exclaimed that Enventure's '763 Patent's technology as implemented was the solution to a long-felt need." PO Sur-reply 27 (citing Ex. 2011 ¶ 191; Ex. 2012, 1; Ex. 2019, 4). Patent Owner also replies that "'Enventure was the first company to bring a solid [expandable drilling liner] to market and has enjoyed considerable success'" and that "'the desired performance [] will only ever be achieved through the use of a solid expandable.'" *Id.* at 27 (citing Ex. 2012, 5–6; Ex. 2020, 2).

Establishing long-felt need requires objective evidence that an art-recognized problem existed in the art for a long period of time without solution. In particular, the evidence must show that the need was a persistent one that was recognized by those of ordinary skill in the art. *See Orthopedic Equip. Co. v. All Orthopedic Appliances, Inc.*, 707 F.2d 1376, 1382 (Fed. Cir. 1983). The claimed invention must in fact satisfy the long-felt need. *See In re Cavanagh*, 436 F.2d 491, 496 (CCPA 1971) (One must also show that the others who failed had knowledge of the critical prior art.). "[L]ong-felt need is analyzed as of the date of an articulated identified problem and evidence of efforts to solve that problem." *Texas Instruments, Inc. v. ITC*, 988 F.2d 1165, 1178 (Fed. Cir. 1993).

Patent Owner's evidence does not sufficiently demonstrate that the identified products and services satisfied the asserted long-felt need. The cited evidence does not show that the "Enventure Products/Services" are the

"expandable technology" discussed in Patent Owner's evidence. *See* Ex. 2013, 4. Even if we agreed with Patent Owner's assertions about the long-felt need, Patent Owner's cited evidence does not explain how the identified products and services satisfied the asserted long-felt need. *See* Ex. 2011 ¶¶ 191, 232–237.

Thus, based on the full record, Patent Owner does not show adequately that the identified products and services satisfied the asserted long-felt need.

d) Industry Praise

Patent Owner, in reply, argues that "[s]olid expandable tubular (SET) technology of the '763 Patent has enjoyed considerable industry praise for its products capturing this technology." PO Sur-reply 26–27 (citing PO Resp. 70–74; Ex. 2012, 5–6; Ex. 2020, 2).

Praise from industry participants, especially competitors, is probative as to obviousness because such participants "are not likely to praise an obvious advance over the known art. Thus, if there is evidence of industry praise of the claimed invention in the record, it weighs in favor of the nonobviousness of the claimed invention." *Apple Inc. v. Samsung Elecs. Co.*, 839 F.3d 1034, 1053 (Fed. Cir. 2016).

To the extent industry praise was raised in Patent Owner's Response, we determine that the cited evidence does establish that at least some of the praise is directed to the claimed features of a connecter. *See* PO Sur-reply 26–27. The cited portion of Exhibit 2012 describes "Expandable Solid Tubulars" but does not specifically address any products or services encompassed by Patent Owner's "Enventure Products/Services." Ex. 2012,

5–6. Exhibit 2020 is a complaint from related litigation, and the cited portion states that there was a "ground-breaking development of solid expandables solutions" but does not indicate any "industry praise" for such solutions. Ex. 2020, 2.

Based on the full record, Patent Owner does not show adequately (1) nexus between the challenged claims and the industry praise and (2) industry praise for the identified products and services.

5. Conclusion as to the Asserted Obviousness in view of Abdrakhmanov and Meling

"Once all relevant facts are found, the ultimate legal determination [of obviousness] involves weighing of the fact findings to conclude whether the claimed combination would have been obvious to an ordinary artisan." *Arctic Cat*, 876 F.3d at 1361. Above, based on full record before us, we provide our factual findings regarding (1) the level of ordinary skill in the art, (2) the scope and content of the prior art, (3) any differences between the claimed subject matter and the prior art, and (4) objective evidence of nonobviousness.

In particular, we find that (1) Petitioner's proposed level of ordinary skill in the art is consistent with the prior art of record, (2) Abdrakhmanov and Meling teach or suggest all the limitations of claims 1 and 3, (3) one of ordinary skill in the art would have combined Abdrakhmanov and Meling with a reasonable expectation of success, and (4) nexus has not been established with the objective evidence of nonobviousness presented in relation to claims 1 and 3. Weighing these underlying factual determinations, a preponderance of the evidence persuades us that claims 1

and 3 of the '763 patent are unpatentable over Abdrakhmanov and Meling. *Arctic Cat*, 876 F.3d at 1361.

F. Remaining Challenges

Petitioner also argues that, if Patent Owner contends that Meling does not disclose the recited annular chamber, in which sealing members are disposed, then one of ordinary skill in the art would have combined Meling with a groove design in OTC 6131 with citations to the record. Pet. 49–54. Building on the Meling anticipation and obviousness challenges, Petitioner further argues that claims 1 and 3 would have been obvious in view of knowledge in the art regarding expanding conventionally-shaped or round tubulars. *Id.* at 55–57. Alternatively, building on the same anticipation and obviousness challenges, Petitioner argues that it would have been obvious to combine Meling with conventionally-shaped casing 20 of the '799 publication. *Id.* at 58–61.

Petitioner additionally argues that the proposed combination of Abdrakhmanov and Meling would have been further modified in view of knowledge in the art "to increase the size of Abdrakhmanov's annular seal 31 or decrease the size of Abdrakhmanov's groove 32 to provide a pre-expansion seal." Pet. 72; *see also id.* at 72–75 (arguing that such adjustments were known in the art and asserting reasons why such adjustments would have been done). Building on the previous proposed combinations, Petitioner argues with citations to the record that, "if [Patent Owner] argues that the claims are limited to expanding tubulars without profiles," then the challenged claims would have been obvious in view of knowledge in the art about expanding conventionally-shaped tubulars. *Id.* at

75–78. Petitioner alternatively argues with citations to the record that one of ordinary skill in the art would have further modified the proposed combination with the conventionally-shaped casing 20 of the '799 publication. *Id.* at 78–80.

Because we determine above that Petitioner shows that Meling anticipates and Abdrakhmanov combined with Meling would have rendered obvious the challenged claims, we need not reach these additional challenges to claims 1 and 3. *See SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1359 (2018) (holding a petitioner "is entitled to a final written decision addressing all of the claims it has challenged"); *see also Bos. Sci. Scimed, Inc. v. Cook Grp. Inc.*, 809 F. App'x 984, 990 (Fed. Cir. 2020) (non-precedential) (recognizing that the "Board need not address issues that are not necessary to the resolution of the proceeding" and, thus, agreeing that the Board has "discretion to decline to decide additional instituted grounds once the petitioner has prevailed on all its challenged claims").

VI. CONCLUSION[5]

In summary:

Claims	35 U.S.C. §	References/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 3	102	Meling	1, 3	
1, 3	103	Meling, OTC 6131[6]		
1, 3	103	Meling, '799 Publication[7]		
1, 3	102	Meling, OTC 6131, '799 Publication		
1, 3	103	Abdrakhmanov, Meling	1, 3	
1, 3	103	Abdrakhmanov, Meling, '799 Publication[8]		
Overall Outcome			1, 3	

[5] Should Patent Owner wish to pursue amendment of the challenged claim in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding. See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

[6] As explained above in Section V.F., we do not reach this challenge, because we determine that the same claims are anticipated by Meling and rendered obvious in view of Abdrakhmanov and Meling.

[7] As explained above in Section V.F., we do not reach this challenge, because we determine that the same claims are anticipated by Meling and rendered obvious in view of Abdrakhmanov and Meling.

VII. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1 and 3 of U.S. Patent No. 6,604,763 B2 have been shown, by a preponderance of the evidence, to be unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Expunge is *granted* and the originally filed Sur-reply (Paper 22) is expunged;

FURTHER ORDERED that Petitioner's Motion to Exclude is *denied*;

FURTHER ORDERED that the Motions to Seal are *granted*;

FURTHER ORDERED that Petitioner's Reply (Paper 19) and Exhibits 1049 and 1057 are sealed;

FURTHER ORDERED that the default Protective Order submitted with the Motions to Seal is entered; and

FURTHER ORDERED that, because this is a Final Written Decision, the 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.

[8] As explained above in Section V.F., we do not reach this challenge, because we determine that the same claims are anticipated by Meling and rendered obvious in view of Abdrakhmanov and Meling.

FOR PETITIONER:

Leslie Payne
J. Boone Baxter
HEIM PAYNE & CHORUSH LLP
lpayne@hpcllp.com
bbaxter@hpcllp.com

Douglas R. Wilson
ARMOND WILSON LLP
doug.wilson@armondwilson.com

FOR PATENT OWNER:

George Haight
Brian Michaelis
Lisa Meyeroff
SEYFARTH SHAW LLP
ghaight@seyfarth.com
bmichaelis@seyfarth.com
lmeyerhoff@seyfarth.com