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Paper 26
Entered: November 20, 2020

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BOART LONGYEAR LTD.,
Petitioner,

v.

AUSTRALIAN MUD COMPANY PTY LTD.,
Patent Owner.

IPR2019-01129
Patent 7,584,055 B2

Before GRACE KARAFFA OBERMANN, JO-ANNE M. KOKOSKI, and CHRISTOPHER C. KENNEDY, *Administrative Patent Judges*.

KENNEDY, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

Petitioner Boart Longyear Ltd.[1] challenges the patentability of claims 16–18, 22, and 23 of U.S. Patent No. 7,584,055 B2 (Ex. 1001, "the '055 patent"). We have jurisdiction under 35 U.S.C. § 6, and we issue this Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons below, we determine that Petitioner has not proven by a preponderance of the evidence that any of the challenged claims is unpatentable.

A. PROCEDURAL HISTORY

Petitioner filed a Petition seeking *inter partes* review of claims 16–18, 22, and 23 of the '055 patent. Paper 1 ("Pet."). Patent Owner filed a Preliminary Response. Paper 7. We instituted trial. Paper 8 ("DI" or "Institution Decision").

During trial, Patent Owner filed a Response (Paper 15, "PO Resp."), Petitioner filed a Reply (Paper 17), and Patent Owner filed a Sur-reply (Paper 19).

Petitioner relies on the declaration testimony of Keith A. Heasley, Ph.D. *See* Ex. 1003. Patent Owner relies on the declaration testimony of Jonathan Tapson, Ph.D. *See* Ex. 2007.

Oral argument was held on August 26, 2020. The transcript of that argument was entered into the record. Paper 25 ("Hearing Tr.").

[1] Petitioner identifies Boart Longyear Company and Globaltech Corporation Pty Ltd. as additional real parties in interest. Pet. 1.

B. RELATED MATTERS

The parties agree that "[n]o known related matters are pending currently." Pet. 1; Prelim. Resp. 10. However, Patent Owner identifies a number of completed Australian proceedings that concerned Australian patents having related subject matter. *See* Prelim. Resp. 10–12.

C. THE '055 PATENT

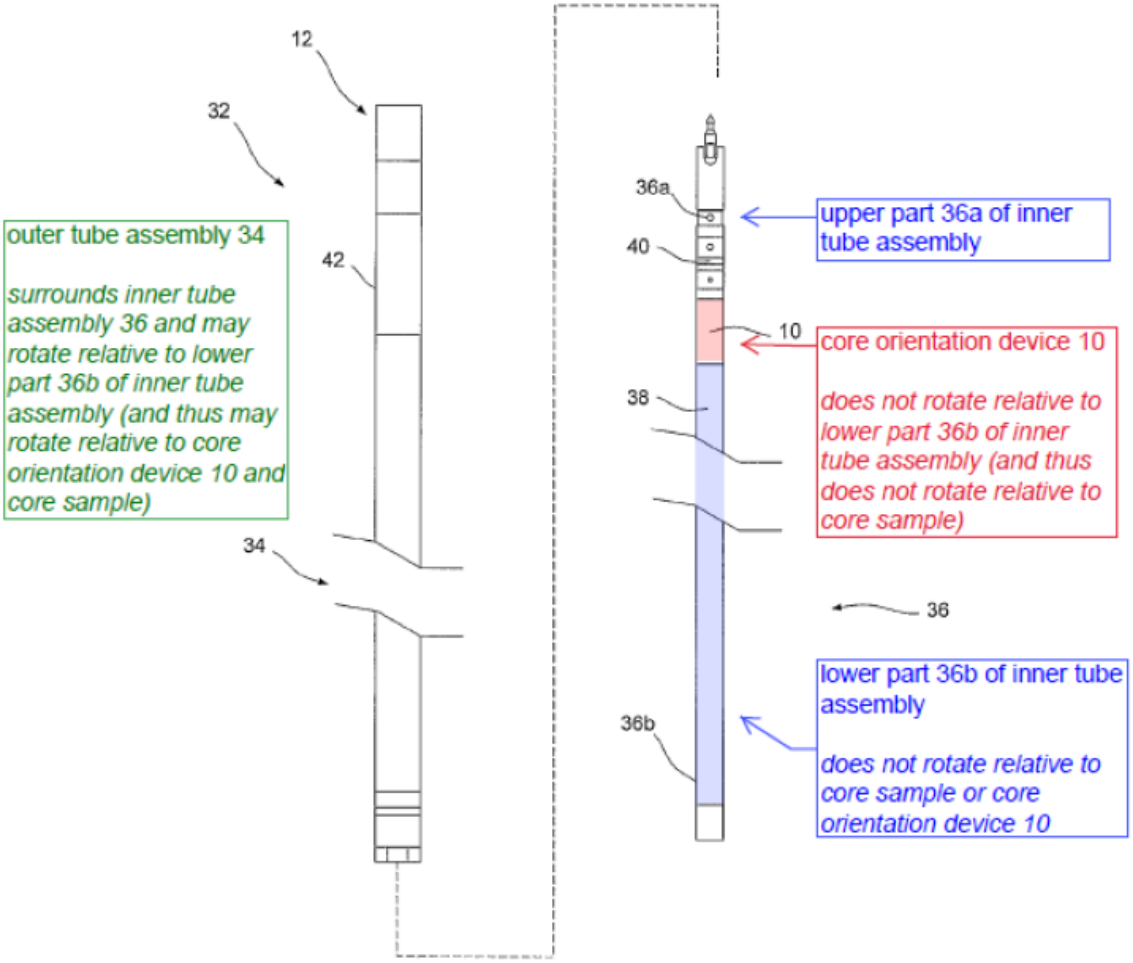
The '055 patent relates to "core sampling in geological surveying operations." Ex. 1001 at 1:14–15. A "core" is a sample of the earth that is extracted from the earth and that can be brought to the surface for evaluation. *E.g.*, *id.* at 1:5–10. The '055 patent explains that core drilling operations are typically "performed at an angle to the vertical," and that, for analytical purposes, it is desirable "to have an indication of the orientation of the core sample relative to the ground from which it was extracted." *Id.* at 1:31–37. In other words, it is "important that there be some means of identifying the orientation the core sample had within the ground prior to it having been brought to the surface." *Id.*

To that end, the '055 patent discloses a "core orientation device" that measures the orientation of the core sample during drilling and extraction. *Id.* at 6:27–33. The core orientation device may comprise, for example, means for providing signals associated with a physical orientation of the core orientation device, such as accelerometers; processing means for processing the signals; memory for storing processed data; and display means for displaying the measure of the physical orientation of the device. *E.g.*, *id.* at 2:1–16, 2:49–50. While a core sample is being drilled/extracted, the device measures its rotational orientation (and that of the core sample) at regular intervals and stores those measurements in memory, thereby

permitting an operator to subsequently determine the pre-extraction orientation of the core sample after that core sample (and the device) has been extracted from the drill hole. *Id.* at 7:58–8:21.

Figure 2 of the '055 patent, as annotated by Patent Owner, *see* PO Resp. 5, is reproduced below.

Figure 2



Annotated Figure 2 depicts "a schematic side elevational view" of a core drill with orientation device 10. Ex. 1001 at 6:13–14. "[T]he inner tube assembly 36 comprises upper and lower parts 36*a*, 36*b* between which the orientation device 10 is fitted." *Id.* at 6:55–56. "The upper part 36*a*

includes a bearing 40, with the portion above the bearing 40 being rotatable with the outer tube assembly 34 and the portion below the bearing 40 being restrained against rotation because of frictional engagement with the core being generated." *Id.* at 6:57–61. "Thus, in this manner the bearing 40 allows the core orientation device 10 to rotate relative to the outer tube assembly 34 but not relative to the core sample when the core is received." *Id.* at 6:61–64; *see also id.* at 8:16–21 ("The orientation of the orientation device 10 of course corresponds to the orientation of the lower part 36*b* of the inner tube assembly 36 which in turn corresponds to the orientation of a core sample progressively entering the inner tube assembly 36, as the lower part 36*b* does not rotate relative to the core sample.").

D. ILLUSTRATIVE CLAIM

Claim 16, reproduced below,[2] is illustrative of the challenged claims.

16. [P] A method of obtaining and orientating a core sample comprising:

[1] moving a core drill having a core orientation device from a first location to a drilling location and thereafter operating the core drill to drill a core;

[2] maintaining a physical orientation of the core stationary with respect to a physical orientation of the core orientation device;

[3] generating signals associated with the physical orientation of the core orientation device between the first location and the drilling location;

[4] processing the signals to provide processed data from which a measure of the physical orientation of the core

[2] Consistent with the Petition, *e.g.*, Pet. 20, bracketed identifiers have been added to claim recitations to simplify reference to the individual recitations.

orientation device at the drilling location can be established;

[5] storing the processed data in memory such that the measure of the physical orientation of the core orientation device can be obtained therefrom; and

[6] displaying a related measure of the physical orientation of the device and

[7] varying that related measure upon rotation of the core orientation device such that a user can position the core in the measured physical orientation for marking.

Ex. 1001 at 12:21–43.

E. PRIOR ART RELIED UPON

Petitioner relies on the following references:

Reference	Title or Patent/Pub. No.	Date	Exhibit
Puymbroeck[3]	US 6,006,844	Dec. 28, 1999	1005
Skopec '92	Horizontal Core Acquisition and Orientation for Formation Evaluation	Mar. 1992	1006
Enderlin	US 5,105,894	Apr. 21, 1992	1007
Scott	CA 2,456,506 A1	Jan. 3, 2005	1008

F. INSTITUTED GROUNDS OF UNPATENTABILITY

We instituted *inter partes* review based on the following grounds of unpatentability asserted by Petitioner:

[3] The first named inventor is "Luc Van Puymbroeck." Consistent with the Petition and Patent Owner Response, we use "Puymbroeck."

Claims Challenged	35 U.S.C. §[4]	References
16–18, 22, 23	103(a)	Puymbroeck, Enderlin
16–18, 22, 23	103(a)	Puymbroeck, Scott
16–18, 22, 23	103(a)	Skopec '92, Enderlin
16–18, 22, 23	103(a)	Skopec '92, Scott

II. DISCUSSION

A. LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the art is "a prism or lens" through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

In the Institution Decision, we adopted Petitioner's description of the level of ordinary skill in the art and determined that a person of ordinary skill in the art "would have had a bachelor's degree in petroleum, mining, mechanical, or electrical engineering (or a closely related field), and at least two years' experience in designing and developing drills or related instruments." DI 7. "Alternatively, a [person of ordinary skill] would have had a Master's degree in one of those disciplines with fewer years of experience." *Id.*

Because Patent Owner "does not dispute Petitioner's proposed level of ordinary skill," PO Resp. 12, and because we find the stated level of ordinary skill to be consistent with the record, we maintain our

[4] The relevant section of the Leahy-Smith America Invents Act ("AIA"), Pub. L. No. 112–29, took effect on March 16, 2013. Because the application from which the '055 patent issued was filed before that date, the pre-AIA statutory framework applies.

determination from the Institution Decision as to the ordinary level of skill in the art.

B. CLAIM CONSTRUCTION

To the extent any claim term needs to be construed, we do so below in our discussion of Petitioner's proposed grounds of unpatentability. *See Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (claim terms need only be construed "to the extent necessary to resolve the controversy"); *see also Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (applying *Vivid Techs.* in the context of an *inter partes* review).

C. OBVIOUSNESS OF CLAIMS 16–18, 22, AND 23 IN VIEW OF PUYMBROECK AND ENDERLIN.

Petitioner asserts that claims 16–18, 22, and 23 would have been obvious over Puymbroeck and Enderlin. Pet. 15–41. For the reasons set forth below, we determine that Petitioner has not carried its burden of showing that the challenged claims would have been obvious to a person of ordinary skill in the art. *See Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) ("In an IPR, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.").

1. Puymbroeck (Ex. 1005)

Puymbroeck discloses an apparatus for drilling and coring that may include "sensors for logging borehole parameters" and a data transmission assembly. Ex. 1005, code (57). Puymbroeck contemplates use of its apparatus in oil and gas applications. *E.g.*, *id.* at 3:21–23 (distinguishing

existing coring systems that were not "suitable for use in oil and gas exploratory wells"); 5:13–15 (identifying "a hydrocarbon-producing zone" as a "zone or stratum of potential interest"). A goal of Puymbroeck is "to conduct such core logs immediately after core passage through the throat of the core bit when the core is in its most pristine state and the least likely to have become excessively contaminated by drilling mud or to have lost its physical integrity." *Id.* at 4:49–53. Puymbroeck discloses that, with its apparatus, "the orientation of the core will be determined, both in an absolute sense and with respect to the surrounding formation from which it is cut." *Id.* at 4:54–57.

A cropped portion of Figure 6A of Puymbroeck is reproduced below.

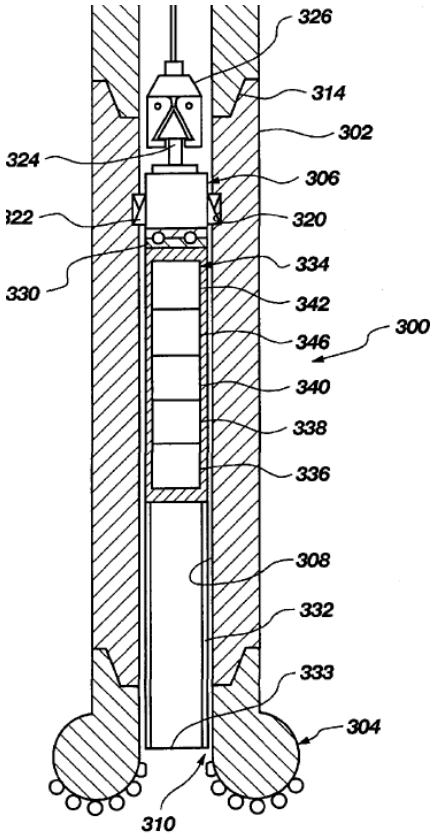


Fig. 6A

Cropped Figure 6A is "a schematic of a first preferred embodiment of a coring apparatus with an inner tube assembly in place in an arrangement suitable for concurrent coring and logging of borehole parameters and transmitting acquired borehole parameter data to the surface of the earth." *Id.* at 5:48–52.

The apparatus of Figure 6A includes (1) core barrel 302, (2) inner tube assembly 306, (3) instrument and data transmission module 334 "including a pressure housing within which electronic instrumentation for obtaining borehole data and at least part of the data transmission device may be contained," (4) directional instrumentation 336 "to determine borehole position and orientation (azimuth, slope, etc.)," and (5) rotational bearing assembly 330. *Id.* at 9:29–10:2. Bearing assembly 330 "permit[s] rotation of core barrel 302 about inner tube assembly 306 below bearing assembly 330 to cut a core of formation material without rotationally-induced stress thereon, a technique well known in the art." *Id.* at 9:52–57; *see also id.* at 6:42–47 ("[B]earing assembly 44 . . . permits the upper and lower portions of inner tube assembly 40 to rotate with respect to one another and . . . in combination with bit end bearing assembly 36[] allows outer barrel assembly 16 to rotate while inner tube assembly 40 remains stationary"). Puymbroeck discloses that directional instrumentation 336 "is typically provided with at least some processing capability as well as electronic machine-readable memory . . . for storage of obtained data, and is in communication with data transmission device 342 for transmitting real-time data to the surface of the earth." *Id.* at 10:8–14.

Puymbroeck also discloses that "surface instrumentation on or below the rig floor may be employed to monitor drilling-related parameters which

may be correlated and used in combination with the data received from the downhole instrumentation." *Id.* at 13:12–16. With reference to Figure 6B, Puymbroeck teaches that surface instrumentation 500 "may be used in combination with computer 502 and with data received from downhole [instrumentation] through receiver 504 to provide data to the operator through display 506, which may comprise a digital or graphic display." *Id.* at 13:16–20.

2. Enderlin (Ex. 1007)

Enderlin discloses "[a] method and apparatus for determining the location in space of a formation sample." Ex. 1007, code (57). Enderlin's coring apparatus includes a "tool" that comprises magnetometers and accelerometers "for measuring movement of the tool along the well borehole whereby components of the magnetic field and gravity field are measured to enable determination of the well in space." *Id.* Enderlin's "tool," including its orientation sensors, is separate from Enderlin's drilling apparatus, and Enderlin's orientation device does not enter the borehole until "[a]fter a well has been drilled [and] the drill string and core bit with core is removed from the well." *See id.* at 6:1–12; *see also id.* at 3:10–30 (tool placed into borehole after core is drilled). Enderlin teaches that data is obtained from the tool "at the well head when the equipment is first placed in the well" to "provide[] a beginning point for the data," and that additional data is continuously recorded as the tool is lowered into the borehole. *See id.* at 4:36–43, 6:7–12.

Enderlin also discloses the use of "one or more sharp points which scratch the core with a scratch or scribe mark along the length of the core so that the core can be pieced together." *Id.* at 4:64–68. "[T]he conventional

core is scratched with a mark which serves as a reference mark on the core when retrieved to the surface and when subsequently tested." *Id.* at 5:15–18. Like Puymbroeck, Enderlin contemplates use of its apparatus in oil and gas applications. *E.g.*, *id.* at 1:9–10.

3. Analysis

Based on the complete trial record, and as explained below, we find Petitioner's analysis to be inadequate to establish by a preponderance of the evidence that the challenged claims would have been obvious over Puymbroeck and Enderlin.

a. Claim 16

Claim 16 recites a step [16.6] of "displaying a related measure of the physical orientation of the device." Ex. 1001 at 12:39–40. In the Institution Decision, we observed:

> Neither party expressly discusses the meaning of the term "related measure." Petitioner's analysis implies Petitioner's view that the term "related measure" encompasses "data [that] relates to a measure of the device's orientation." Pet. 27. That interpretation of the term is consistent with disclosures in the written description of the '055 patent. *See, e.g.*, Ex. 1005 at 2:42–47, 9:35–46, 10:20–24. Patent Owner is free to contest Petitioner's implied construction in a timely filed Response.

DI at 25–26.

In post-institution briefing, neither party contested our understanding of the term "related measure" as encompassing "data that relates to a measure of the device's orientation." *See* DI at 25–26. Because we find that understanding to be consistent with the record, we apply it in our analysis below.

Claim 16 next recites a step [16.7] of "varying th[e] related measure upon rotation of the core orientation device such that a user can position the core in the measured physical orientation for marking." Ex. 1001 at 12:40–43. In combination with the "displaying" step, we understand this limitation to require that the displayed "related measure" is "var[ied] . . . upon rotation of the core orientation device." In other words, the "related measure" that is displayed, as recited in limitation [16.6], changes (varies) as the core orientation device is rotated. The purpose of this limitation is to enable a user to position and mark the core. *See, e.g., id.* at 10:20–24 ("Once the orientation device 10 is at the required orientation the display 74 provides an image 85 representing that condition."). Petitioner describes claim 16 as requiring "rotating and relating the device's orientation at the surface after the core's separation from the ground." Pet. 14.

In its analysis of the "varying" limitation, Petitioner argues that "Puymbroeck discloses a user evaluating the related measure of the device's orientation, which can be used to position the core in the measured orientation for marking." Pet. 28 (citing various portions of Puymbroeck).

Patent Owner argues that "the Petition fails to even allege that Puymbroeck's display varies a measure of the core's orientation as the user rotates the core orientation device, instead merely stating that 'Puymbroeck discloses a user evaluating the related measure of the device's orientation . . . .'" PO Resp. 32. Patent Owner also argues that Puymbroeck "does not contain any teaching" relevant to limitation [16.7], that Puymbroeck does not expressly disclose rotating a core to a desired position, and that Puymbroeck does not include any express disclosures concerning marking a core. *Id.* at 32–34.

As an initial matter, we agree with Patent Owner that Petitioner's argument that "Puymbroeck discloses a user evaluating the related measure of the device's orientation, which can be used to position the core in the measured orientation for marking," does not on its face appear to correspond to the requirements of limitation [16.7]. Limitation [16.7] does not merely recite "evaluating" a related measure; it recites "varying [the] related measure upon rotation of the core orientation device such that a user can position the core in the measured physical orientation for marking." Ex. 1001 at 12:40–43.

Petitioner cites several portions of Puymbroeck in support of its contention that Puymbroeck teaches or suggests limitation [16.7]. Petitioner first cites and quotes Puymbroeck at 4:53–57: "***[I]t is contemplated that the orientation of the core will be determined*** . . . using the directional instrumentation of the apparatus." Pet. 28 (emphasis in original). As the quotation makes clear, that portion of Puymbroeck states only that the orientation of the core will be determined using the directional instrumentation of the apparatus. Ex. 1005 at 4:53–57. It says nothing about varying a displayed related measure, or a user positioning a core for marking, and the Petition provides no meaningful explanation as to how the cited disclosure might inherently or implicitly teach or suggest the "varying" limitation.

Petitioner next cites and quotes claim 10 of Puymbroeck: "[D]irectional instrumentation opera[tes] to obtain data relating to position and orientation of the apparatus, and wherein the directional instrumentation and . . . inner tube . . . are cooperatively configured to provide orientation data for the received core." Pet. 28. Again, that quotation says nothing

about varying a displayed related measure or a user positioning the core for marking, and the Petition provides no meaningful explanation as to how the cited disclosure might inherently or implicitly teach or suggest the "varying" limitation.

Petitioner also cites Puymbroeck at 9:66–10:3, 10:35–41, 11:24–33, and claim 9, and a portion of another reference (Juergens) incorporated by reference into Puymbroeck. *Id.* As above, however, those portions of the record discuss core orientation and directional instrumentation. We do not discern an apparent disclosure about varying a displayed related measure or a user positioning the core for marking, and the Petition provides no meaningful explanation as to how the cited evidence might inherently or implicitly teach or suggest the "varying" limitation.

Petitioner also cites pages 59–60 of the Heasley Declaration. *Id.* Dr. Heasley's analysis largely repeats the Petition, *see* Ex. 1003 at pp. 59–60, and Petitioner does not explain if or how Dr. Heasley's discussion supplements the Petition in a material way, *see* Pet. 28 n.54 (citing Heasley Declaration without discussion). Other than a citation to Dr. Heasley's Declaration in a footnote, the Petition says nothing about Dr. Heasley's opinions concerning the "varying" limitation. *See* Pet. 28; *see also* 37 C.F.R. § 42.6(a)(3) ("Arguments must not be incorporated by reference form one document into another document.").

In that regard, we observe that the Petition, particularly with respect to the "varying" limitation, provides little or no discussion of the prior art. The Petition, in relevant part, consists of a claim chart in which the claim limitation is reproduced in the left column. *See, e.g.*, Pet. 28. The right column includes a conclusory assertion that Puymbroeck teaches the claim

limitation (and, as noted above, the assertion in this instance does not on its face correspond to the requirements of the disputed limitation). *See id.* And the right column includes naked citations to and quotations from Puymbroeck, with no discussion of those disclosures. *See id.* That may be adequate when the correspondence of the cited portion of the reference to the disputed claim limitation is reasonably clear. But with respect to the "varying" limitation, as discussed above, it is not adequately apparent how the cited portions of Puymbroeck correspond to the disputed limitation. It appears that a significant amount of inference and/or assumption is necessary. As noted, Petitioner's citations say nothing about varying a related measure or a user positioning the core for marking, and the Petition includes no discussion attempting to bridge that gap. It is not reasonably clear from the Petition how the cited portions of Puymbroeck allegedly correspond to the disputed claim limitation. The Petition's analysis of the "varying" limitation leaves too many gaps and fails to establish obviousness.

In his deposition, Dr. Heasley acknowledged that Puymbroeck does not expressly disclose rotating a core to obtain a desired position and took the position that a person of ordinary skill "would understand that *you could do that if desired*." Ex. 2009 at 83:23–84:7 (emphasis added). Petitioner does not persuasively identify where in the Petition it explained from where that understanding would come. Conclusory assertions and citations, without meaningful explanation, are inadequate to support a determination of obviousness. *See TQ Delta, LLC v. CISCO Sys., Inc.*, 942 F.3d 1352, 1359 (Fed. Cir. 2019) (noting that the Federal Circuit has "repeatedly recognized that conclusory expert testimony is inadequate to support an obviousness determination on substantial evidence review."). Moreover,

"obviousness concerns whether a skilled artisan not only *could have made* but *would have been motivated to make* the combinations or modifications of prior art to arrive at the claimed invention." *Belden Inc. v. Berk–Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015).

As Patent Owner points out, Dr. Heasley also conceded that Puymbroeck does not disclose the concept of marking a retrieved core. *See* Ex. 2009 at 132:11–16, 138:13–24; *see also* Ex. 2007 (Tapson Decl.) ¶ 57 ("[T]he Puymbroeck patent is silent regarding any rotation, reorientation, or marking of a core sample after being retrieved above-ground . . . ."). Dr. Tapson, Patent Owner's declarant, indicated that Puymbroeck includes no such disclosure because "a 'logging while drilling' system [such as that of Puymbroeck] does not entail re-orientation and marking of the core sample above-ground"; it "allows real-time data to be returned to the surface while drilling." Ex. 2007 ¶¶ 56–57.

Consistent with Patent Owner's arguments, *see* PO Resp. 30–34, and for the reasons set forth above, we determine that the Petition does not adequately establish that Puymbroeck teaches or suggests the "varying" limitation of claim 16. *See* 35 U.S.C. § 312(a)(3) (petition must "identif[y] . . . *with particularity*, each claim challenged . . . and the evidence that supports the grounds for the challenge to each claim." (emphasis added)).

We now consider whether Petitioner's Reply adequately, and permissibly, addresses the shortcomings of the Petition identified above. *Cf.* Sur-reply 1 (alleging that Petitioner's Reply "advances an array of new arguments and theories"). We determine that it does not. The Trial Practice Guide states that a "Petitioner may not submit new evidence or argument in

reply that it could have presented earlier, e.g. to make out a prima facie case of unpatentability." *See* Consolidated Trial Practice Guide ("TPG") 73 (Nov. 2019), *available at* https://www.uspto.gov/sites/default/files/documents/tpgnov.pdf. If a petition includes only a minimal, conclusory analysis (e.g., bald assertions and unexplained citations to the prior art), a petitioner generally cannot provide substantial additional argument and evidence in the reply that could have and should have been presented in the petition. *See* TPG at 73; *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369–70 (Fed. Cir. 2016) (holding that "the Board did not abuse its discretion" in refusing to consider new arguments and evidence raised for the first time in a reply brief). We indicated that in the Institution Decision. *E.g.*, DI at 29–30 ("This does not represent an invitation for Petitioner to supplement argument or evidence presented in the Petition."). We find that the deficiencies in the Petition identified above are not the types of deficiencies that can be corrected in a Reply, and that the new arguments and evidence in the Reply are untimely, as explained further in our discussion below.[5] *See* TPG at 73 ("Petitioner may not submit new evidence or argument in reply that it could have presented earlier, e.g. to make out a prima facie case of unpatentability.").

In the alternative, and for completeness, we discuss Petitioner's Reply arguments below and find them to be unpersuasive. Petitioner argues that claim 16 "doesn't require the user to hold and rotate the device." Reply 17. Even accepting that as accurate, however, claim 16 explicitly recites

[5] The Petition includes only *a single sentence* of discussion concerning Puymbroeck and the "varying" limitation. *See* Pet. 28. The Reply includes *eight pages* of discussion. *See* Reply 17–24.

"varying [the] related measure upon rotation of the core orientation device such that a user can position the core in the measured physical orientation for marking." Ex. 1001, 12:40–44. As set forth above, neither Petitioner's conclusory assertion that Puymbroeck teaches this limitation, nor Petitioner's unexplained citations to Puymbroeck, meaningfully address the actual claim language.

Petitioner also argues that the "*can* position the core . . . for marking" limitation recited in [16.7] "is permissive language not required to practice the claim," such that "element 16.7 is properly understood to only require 'varying that related measure upon rotation of the core orientation device.'" Reply 18. This argument disregards the recitation in [16.7], "such that a user can position the core in the measured physical orientation for marking." Petitioner's position in the Reply stands in contrast to, and in apparent tension with, Petitioner's statement in the Petition that "claim 16 and 22's methods require rotating and relating the device's orientation at the surface after the core's separation from the ground." *See* Pet. 14.

Even if we were to agree with Petitioner, the Petition does not meaningfully address the claim language that even Petitioner agrees limits the claim (i.e., "varying that related measure upon rotation of the core orientation device"). In any event, we decline to disregard that claim language for two reasons.

First, nowhere in the Petition's analysis of the "varying" limitation does the Petition indicate that Petitioner is treating the limitation in the way that Petitioner proposes in the Reply. On the contrary, the Petition argues that "Puymbroeck discloses a user evaluating the related measure of the device's orientation, which can be used to position the core in the measured

orientation for marking." Pet. 28. In other words, Petitioner argued that Puymbroeck teaches or suggests the "varying" limitation; not that a portion of the limitation should be ignored.

We recognize that the Petition includes a short claim construction section in which Petitioner argues that the term "can be" in claims 16 and 17 should be interpreted as "may potentially be." *See* Pet. 3. But even there, Petitioner does not clearly suggest that the claim language, "such that a user can position the core in the measured physical orientation for marking," could be wholly ignored, as Petitioner does in the Reply. *See* Pet. 3; Reply 18. The Petition's analysis of claim 16 does not clearly apply such a construction. *See* Pet. 28. Petitioner's argument in the Reply is new and untimely because it could have and should have been raised in the Petition.

Second, even were we to find that Petitioner had adequately raised in the Petition an argument that the claim language, "such that a user can position the core in the measured physical orientation for marking," could be ignored, we determine that Petitioner does not persuasively support that argument. "A claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so." *Merck & Co. v. Teva Pharm. USA, Inc.*, 395 F.3d 1364, 1372 (Fed. Cir. 2005); *Power Mosfet Techs., LLC v. Siemens AG*, 378 F.3d 1396, 1410 (Fed. Cir. 2004) ("[I]nterpretations that render some portion of the claim language superfluous are disfavored."). The only legal authority that Petitioner cites in support of its position is *CIF Licensing v. Agere Sys.*, 565 F. Supp. 2d 533, 545–46 (D. Del. 2008). In that case, the disputed claim language was, "such that a fractional number Q of bits per frame *can be* transmitted without constellation switching." *CIF Licensing*, 565 F. Supp. 2d at 545–46

(emphasis added). The district court determined that the "plain meaning of the phrase 'can be' is permissive, rather than mandatory." *Id.* But the district court did not find the disputed claim language to be irrelevant; the district court recognized that the language "certainly indicates that the invention is capable of achieving its objective without the use of constellation switching." *Id.* (emphasis omitted). Using that line of reasoning, the "varying" step "indicates that the invention is capable of" being used "such that a user can position the core in the measured physical orientation for marking." *See id.*; *see also* Ex. 1001 at 12:41–43 (claim 16). As set forth above, the Petition fails to identify persuasive evidence that Puymbroeck discloses a method in which a user can position a core in a particular orientation for marking. For example, Petitioner fails to identify any suggestion in Puymbroeck of a user marking a core, or how Puymbroeck's method would be used in that way.

Petitioner also cites new evidence in the Reply. *E.g.*, Reply 19–24. That new evidence, and the new arguments concerning that evidence, are not merely support for arguments and evidence presented in the Petition; they are attempts to fill significant gaps that could have—and should have—been addressed in the Petition itself. The new arguments and evidence are untimely. *See* TPG at 73. But even if they were timely, we would find them unpersuasive because Petitioner does not adequately explain how the fact that certain newly cited evidence may contemplate user rotation or marking of a core would have led a person of ordinary skill in the art to incorporate those steps into the method of Puymbroeck, which describes obtaining and evaluating core orientation data in real time, rather than after a core has been brought to the surface. *E.g.*, Ex. 1005 at 4:49–53 ("[I]t is desirable to

conduct such core logs immediately after core passage through the throat of the core bit when the core is in its most pristine state and the least likely to have become excessively contaminated by drilling mud or to have lost its physical integrity."). As set forth above, Petitioner has not persuasively identified any indication in Puymbroeck that a core could or should be marked in a way that identifies its orientation.

Additionally, even were we to agree with Petitioner that the state of the art as a whole at the time of the invention indicates that a core's orientation could be evaluated and marked, *see, e.g.*, Reply 22–24, Petitioner's position appears to be that a person of ordinary skill "could have" applied that knowledge to Puymbroeck, not that a person of ordinary skill in the art "would have been motivated" to apply that knowledge to Puymbroeck. *See Belden,* 805 F.3d at 1073; *see also* Ex. 2009 at 83:23–84:7 (Heasley transcript) (stating that a person of ordinary skill "would understand that *you could do that if desired*." (emphasis added)).

Accordingly, although we find that the analytical gaps in the Petition are too significant to be filled in the Reply without running afoul rules and case law concerning new arguments in a reply, we also find that Petitioner's Reply fails to persuasively show that Puymbroeck teaches or suggests limitation [16.7].

That determination, however, is not dispositive of Petitioner's proposed ground of unpatentability based on Puymbroeck and Enderlin. Petitioner also argues that, if Puymbroeck alone does not teach the "varying" step, Enderlin in combination with Puymbroeck teaches or suggests the "varying" step. Pet. 28–30; Ex. 1003 at p.60.

As we did in the Institution Decision, *see* DI at 27–29, and consistent with Patent Owner's arguments, *see* PO Resp. 37–41, we find unpersuasive Petitioner's reliance on Enderlin. Before turning to Petitioner's specific contentions, we first note, as we did in the Institution Decision, that the differences between the apparatuses of Puymbroeck and Enderlin are significant. DI at 22. Enderlin, for example, drills and removes its core *before* sending a core orientation device into the borehole. *See, e.g.*, Ex. 1007 at 6:1–12. Puymbroeck, by contrast, "conduct[s] such core logs immediately after core passage through the throat of the core bit," i.e., while drilling. Ex. 1005 at 4:49–54. Additionally, scribe marks play an important role in Enderlin's orientation method, *e.g.*, Ex. 1007 at 4:64–68, Fig. 2, but Petitioner does not identify any role that scribe marks play in Puymbroeck's apparatus. The use of "plugs" cut from the sidewall of the borehole are also significant to Enderlin's method of core orientation, *see, e.g.*, *id.* at 1:55–60, 6:46–56, Fig. 1, Fig. 2, but Petitioner does not identify any role that sidewall plugs play in Puymbroeck's method. Thus, although Puymbroeck and Enderlin both concern core orientation and evaluation, they describe distinctly and substantially different approaches.

Petitioner cites Enderlin's statements concerning determination of core orientation using sample data, retrieving a core sample "to the surface so that the formation sample can be oriented," the use of accelerometers to continuously record borehole information, and rotation of a core around its long axis to determine the azimuthal position of the scribe mark. Pet. 28–29. Without explaining those disclosures in Enderlin, Petitioner asserts that "it would have been obvious to a POSITA to vary the related measure of Puymbroeck's device upon rotation of the core so a user can position the

core for marking." Pet. 30. Petitioner asserts that "[a] POSITA would have been motivated to do so because Enderlin teaches varying the device's related measure allows for accurate marking of the core's original orientation based on accelerometer data." *Id.*

Petitioner's assertions are conclusory and lack sufficient meaningful explanation; therefore, we determine that Petitioner has not carried its burden of showing that Enderlin in combination with Puymbroeck teaches or suggests limitation [16.7]. *See In re NuVasive, Inc.*, 842 F.3d 1376, 1381–82 (Fed. Cir. 2016) (the "factual inquiry" into the reasons for "combin[ing] references must be thorough and searching, and the need for specificity pervades . . . ." (internal quotation marks omitted)). As above, the Petition provides no meaningful discussion of its citations to the Heasley Declaration, and Dr. Heasley's testimony again appears largely to repeat the analysis in the Petition.

In the Institution Decision, we observed that, although the disclosures of Enderlin cited by Petitioner "reasonably suggest core orientation, and the disclosure concerning rotation of a core around its long axis specifically suggests core rotation . . . the apparatus of Enderlin is sufficiently different from the apparatus of Puymbroeck that it is not reasonably clear what Petitioner is proposing." DI at 27. We also observed that Enderlin's disclosure concerning core rotation must be evaluated in context. *Id.* Enderlin discloses:

> By testing *the plugs 33 and 34* for their paleomagnetic vectors, the included angle between the plugs 33 and 34 can be measured. Each *plug is measured* to determine the paleomagnetic vector. *Both plugs* extend as radial lines from the axis of the well borehole 11; since the azimuthal position of *the plug 33 is known*, the core 30 can be rotated around its long axis until the

> paleomagnetic vector *of core plug 34 is in the same direction as the paleomagnetic vector of the plug 33*. The azimuthal position of the scribe mark 32 can then easily be determined.

Ex. 1007 at 6:46–56 (emphasis added); DI at 28. We noted that "[i]t does not appear that Petitioner is proposing modification of Puymbroeck's apparatus to obtain the plugs used in Enderlin's process, so it is not immediately evident why Enderlin's disclosures of rotating the core to orient it are relevant to Puymbroeck's apparatus and process." DI at 28. Finally, we observed that "it is not clear what modification Petitioner is proposing that an ordinarily skilled artisan would have made to Puymbroeck's apparatus or method. Petitioner neither adequately explains how a person of ordinary skill would make the proposed modification nor how the proposed modification would benefit the apparatus and method of Puymbroeck." DI at 28–29.

We maintain that analysis for purposes of this Final Written Decision. Moreover, we observe that Petitioner does not allege that Enderlin teaches a "displaying" step within the scope of claim 16. *See* Pet. 27. Nor does Petitioner's claim chart specifically identify what the alleged "related measure" of Enderlin is, or explain how any displayed related measure is varied in Enderlin. *See* Pet. 28. The mere fact that Enderlin teaches core orientation and borehole analysis fails to bridge those gaps. Additionally, given that Enderlin's core is marked (scribed) by its drilling apparatus and removed from the earth before Enderlin's core orientation device even enters the borehole, it is unclear why or how a person of ordinary skill in the art would have been motivated by Enderlin to achieve the recited "varying" step of claim 16. In Enderlin, the core is marked as it is being drilled and before the directional instrumentation enters the borehole. *See* Ex. 1007 at 4:64–

5:18; 5:39–42. Petitioner does not persuasively identify a reason that Enderlin would have motivated a person of ordinary skill to position and mark a core in Puymbroeck.

Petitioner states for the first time in the Reply that "[m]odifying Puymbroeck in view of Enderlin doesn't involve any changes to Puymbroeck's apparatus. Rather, it simply adds to Puymbroeck's orientation process by having the technician rotate the core to a desired orientation for marking." Reply 25. Given that, as set forth above, Petitioner has not adequately established that Enderlin itself teaches or suggests the "varying" step, Petitioner also has not persuasively established that Enderlin would have motivated a person of ordinary skill practicing Puymbroeck to achieve that step.

For those reasons, we determine that Petitioner has not carried its burden of showing that the combination of Puymbroeck and Enderlin teaches or suggests the "varying" step of claim 16. Accordingly, we conclude that Petitioner does not show by a preponderance of the evidence that claim 16 would have been obvious over Puymbroeck and Enderlin.

b. Claims 17 and 18

Because claims 17 and 18 depend from claim 16 and therefore also include the "varying" step, and because Petitioner's analysis of claims 17 and 18 does not remedy the deficiencies described above, we likewise conclude that Petitioner has not shown by a preponderance of the evidence that claims 17 and 18 would have been obvious over Puymbroeck and Enderlin.

c. Claims 22 and 23

Independent claim 22 recites "[a] method of providing an indication of a rotation orientation of a core relative to a body of material from which the core has been extracted." Ex. 1001 at 14:9–11. Claim 22 does not include a "varying" step similar to that of claim 16. *See id.* at 14:9–31. Accordingly, the deficiencies described above as to Petitioner's analysis of the "varying" step do not apply to Petitioner's analysis of claims 22 and 23.

Claim 22 includes a step of "recording the rotational orientation of the inner tube assembly at predetermined time intervals with reference to an initial reference time during said drilling." Ex. 1001 at 14:19–21. Claim 23 depends from claim 22 and thereby includes the same limitation. We refer to this limitation as the "predetermined time interval" limitation. Claim 22 (and claim 23 through dependency) also includes a step of "recording the specific time interval beyond the reference time at which the core sample was separated from the body of material." *Id.* at 14:22–24. We refer to this limitation as the "specific time interval" limitation.

Petitioner alleges that Puymbroeck discloses the "predetermined time interval" limitation. Pet. 35. Petitioner asserts: "Puymbroeck discloses recording orientation data for the device and inner tube 306 in real-time via instrumentation 336. A POSITA would understand Puymbroeck's real-time data transmission provides an initial reference time." Pet. 35–36. Petitioner cites and quotes disclosures in Puymbroeck (1) concerning directional instrumentation that determines borehole position and orientation, (2) that state data stored in Puymbroeck's logging tool may be "periodically retrieved," and (3) that state that Puymbroeck's directional instrumentation "maintain[s] a record of the orientation of the core as it is being cut, so as to

correlate the core data with the borehole data." Pet. 36 (emphasis omitted, alteration in original). Petitioner also cites various other portions and claims of Puymbroeck, as well as the Heasley Declaration. As above, Petitioner provides no meaningful discussion of any of the citations, and Petitioner does not provide any explanation as to whether or how Dr. Heasley's testimony materially supplements the information that is in the Petition. We have reviewed the cited portions of the Heasley Declaration and, as above, it essentially repeats the information and citations in the Petition and provides no more discussion of the quoted and cited portions of Puymbroeck than does the Petition. *See* Ex. 1003 at pp. 73–75.

In its Response, Patent Owner argues that "[t]he Petition fails to show how Puymbroeck allegedly discloses 'predetermined time intervals,'" and that, rather than teaching recording data at predetermined time intervals as required by claim 22, "Puymbroeck teaches recording data 'continuously' and in 'real-time.'" PO Resp. 34–35.

We agree with Patent Owner. We have carefully reviewed the portions of Puymbroeck cited by Petitioner and described above, and determine that Petitioner has not persuasively identified any disclosure of recording data at predetermined time intervals. Additionally, neither the Petition nor the Heasley Declaration directly allege that Puymbroeck teaches or suggests the "predetermined time interval" limitation. Pet. 35–36 (not using the word "interval" anywhere but in the quotation of the claim language); Ex. 1003 at pp. 73–75 (same). Nor, in the Petition, does Petitioner attempt to explain why data recording at predetermined time intervals would have been obvious in view of Puymbroeck's disclosures.

Dr. Heasley describes Puymbroeck's data recording as being "continuous[]" and "in real-time." Ex. 1003 at p.73.

Petitioner identifies a disclosure in Puymbroeck that data is "periodically retrieved." Pet. 36 (citing Ex. 1005 at 4:3–21) (emphasis omitted); Reply 26. This disclosure of periodic retrieval of data, however, is not adequate to meet the "predetermined time interval" limitation for at least two reasons. First, the "predetermined time interval" limitation is not concerned with data retrieval; it is concerned with data recording. Ex. 1001 at 14:22. Petitioner does not persuasively explain why data retrieval should be considered to fall within the scope of data recording. Second, claim 22 does not merely require "periodic" recording; it requires recording "at predetermined time intervals." Something can be "periodic" without being "at predetermined time intervals." For example, in the context of drilling, it is plausible that a data recording interval could be based on the number of rotations of the drill bit, and that drill bit rotation speed could vary based on the composition of the earth being drilled. Such a recording interval would appear to be "periodic" without being "at predetermined time intervals." *Cf.* Sur-reply 20 (observing that a reference cited by Petitioner "teaches using an 'external trigger input,' such as a 'pressure sensor,' in order to 'trigger a reading.'" (citing Ex. 1019 at 29)). The Petition's analysis of the "predetermined time interval" limitation is not adequately developed to show that Puymbroeck teaches or suggests this limitation without the Board attempting to fill evident analytical gaps for Petitioner.

For the first time in the Reply, Petitioner argues that "the record shows 'continuous' and 'real-time' orientation recording," as disclosed by Puymbroeck, "means recording data at predetermined intervals." Reply 28.

We find this new theory to be untimely because it could have, and should have, been articulated in the Petition. *See* Sur-reply 17 (arguing that Petitioner's Reply arguments concerning the time interval limitations "attempt to provide a new theory . . . and should be disregarded"). The Petition fails to articulate a position that the term "predetermined time interval" inherently encompasses "continuous" or "real-time" recording. *See generally* Pet.; *see also* Ex. 2009 at 143:25–144:6, 146:12–19 ("Q: Where in your declaration do you state that recording in realtime or continuously satisfies the recording at predetermined time intervals element of claim 22? A [Dr. Heasley]: I don't have that stated in my declaration.").

Even if this argument were timely, it would be unpersuasive. The references cited by Petitioner for the first time in the Reply specify predetermined time intervals. *See* Reply 28 (describing time intervals of "every 2 minutes" and "every five seconds" (emphasis omitted)). Petitioner identifies no such disclosure in Puymbroeck, and as Dr. Heasley acknowledges, Puymbroeck includes no such disclosure. Ex. 2009 at 145:13–146:6; PO Resp. 35–36. Additionally, even if we were to accept Petitioner's apparent position that data recording described as "continuous" is inherently periodic, something being "periodic" does not necessarily mean that it is at a "predetermined time interval," as explained above. Petitioner has not addressed that, and we decline to do so in the first instance ourselves.

Based on the full trial record, we determine that Petitioner has not carried its burden of showing that Puymbroeck teaches or suggests the "predetermined time interval limitation."

We next consider whether the Petition shows that the combination of Puymbroeck and Enderlin teaches or suggests the limitation. We find that it does not. Petitioner cites disclosures in Enderlin concerning "continuously recording orientation data" and plotting that data. Pet. 37. We discern no disclosure in the cited portions of Enderlin concerning recording data at predetermined time intervals. Nor do we discern an adequate explanation in the Petition as to how a data plot inherently implies recording data at predetermined time intervals. Even if we were to assume that a data plot implies that data has been recorded periodically, rather than continuously, Petitioner does not explain why "periodic" data recording necessarily implies data recording at predetermined time intervals. As set forth above, it appears that there are ways in which data could be recorded periodically that would not involve recording at predetermined time intervals.

For these reasons, we determine that Petitioner has not carried its burden of showing that the combination of Puymbroeck and Enderlin teaches or suggests the "predetermined time intervals" step of claims 22 and 23. Accordingly, we conclude that Petitioner has not shown by a preponderance of the evidence that claims 22 and 23 would have been obvious over Puymbroeck and Enderlin.

As an independent basis for our determination that Petitioner has not shown that claims 22 and 23 would have been obvious over Puymbroeck and Enderlin, we also find that Petitioner fails to establish that the prior art teaches or suggests the "specific time interval" limitation of claims 22 and 23. We have reviewed the cited portions of Puymbroeck and Enderlin, *see* Pet. 37–38, and we do not discern any disclosure of recording a specific time interval, much less the specific time interval at which the core is separated

from the earth. We recognize that Puymbroeck discloses "develop[ing] and maintain[ing] a record of the orientation of the core as it is being cut," Ex. 1005 at 10:38–39, but that disclosure says nothing about recording a specific time interval. Moreover, we understand the word "cut" in that disclosure, and in Puymbroeck generally, to be synonymous with "drilled," rather than as being synonymous with "separated from" the earth. *See, e.g.*, *id.* at code (57) ("the core being *cut as it proceeds into the inner tube assembly*"), 4:41–42 (similar). As above, there is an evident gap between the cited disclosures and the actual requirements of the claim, and the Petition does not adequately fill it.

The Petition also does not persuasively explain how Enderlin teaches or suggests the "specific time interval" limitation. Petitioner's citations to Enderlin do not on their face say anything about recording a time interval. *See* Pet. 38. Additionally, and as explained above, the instrumentation (e.g., accelerometers) referred to in the quoted portions of Enderlin enters the borehole *after* the core has been separated from the earth and removed from the borehole. Thus, it is not adequately clear how the cited disclosures teach or suggest recording a time interval at which the core is separated from the earth.

We recognize that, after citing the evidence discussed above, the Petition includes a conclusory assertion that "it would have been obvious to have Puymbroeck's device record the specific time interval the core separates from the ground." Pet. 38. But as noted above, we fail to discern where either cited reference includes a discussion of recording specific time intervals, and the Petition's analysis fails to bridge the gap from what is actually disclosed by the references to the Petition's assertion that the

"specific time interval" limitation would have been obvious over the prior art. Dr. Heasley's declaration, cited by Petitioner in a footnote without accompanying explanation, *see* Pet. 38 n.67, relies on the same evidence cited by the Petition and is similarly unpersuasive. *See TQ Delta*, 942 F.3d at 1359 (noting that the Federal Circuit has "repeatedly recognized that conclusory expert testimony is inadequate to support an obviousness determination on substantial evidence review.").

On the record before us, we determine that Petitioner has not carried its burden of showing that the prior art teaches or suggests the "specific time interval" limitation of claims 22 and 23. That determination provides an independent basis for our conclusion that Petitioner has not shown by a preponderance of the evidence that claims 22 and 23 would have been obvious over Puymbroeck and Enderlin.

D. OBVIOUSNESS OF CLAIMS 16–18, 22, AND 23 IN VIEW OF PUYMBROECK AND SCOTT.

In the Petition, Petitioner asserts that claims 16–18, 22, and 23 would have been obvious over Puymbroeck and Scott. Pet. 41–56. In the Institution Decision, we determined on the preliminary record that Petitioner did not adequately establish that Scott qualifies as prior art to the challenged claims. DI at 32–37. Petitioner does not address Scott in the Reply. *See generally* Reply. At the oral hearing, Petitioner confirmed that it is no longer relying on Scott. Hearing Tr. 15:25–16:1 (Q (The Board): "Is Petitioner abandoning reliance on the Scott reference?" A (Petitioner): "Yes.").

Accordingly, this proposed ground of unpatentability reduces to obviousness over Puymbroeck alone. Because, as set forth above, we

determine that the Petition fails to establish that Puymbroeck renders obvious the subject matter of the disputed claims, we determine that the Petition fails to establish that the subject matter of the disputed claims would have been obvious on the basis of this proposed ground of unpatentability.

E. OBVIOUSNESS OF CLAIMS 16–18, 22, AND 23 IN VIEW OF SKOPEC '92 AND ENDERLIN

Petitioner asserts that claims 16–18, 22, and 23 would have been obvious in view of Skopec '92 and Enderlin. Pet. 57–73. For the reasons set forth below, we determine that Petitioner has not carried its burden of showing that the challenged claims would have been obvious to a person of ordinary skill in the art. *See Harmonic*, 815 F.3d at 1363 ("In an IPR, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable.").

1. Skopec '92 (Ex. 1006)

Skopec '92 is an article that published in the Society of Petroleum Engineers Drilling Engineering journal. Ex. 1006. Skopec '92 discloses a drilling apparatus that comprises a fiberglass inner barrel and "a slip scribe . . . used in conjunction with an electronic multishot instrument (EMI)." *Id.* at 1[6]; *see also id.* Fig. 8. The EMI "is a solid-state survey device that uses an array of accelerometers for determination of inclination. Magnetometers determine orientation with respect to geographic north." *Id.* at 1.

[6] Our pinpoint citations to Skopec '92 refer to the page number stamp added by Petitioner to the lower right corner of each page.

Skopec ’92 discloses that its EMI periodically records orientation data during coring, which is retrieved by a technician when the inner tube and EMI return to the surface. *Id.* at 3, 4 (Fig. 6), 6. A computer may be used to optimize “core orientation parameters.” *Id.* at 3.

2. Analysis

As we did in the Institution Decision, DI at 40–43, we focus our analysis on the “maintaining” step of claim 16. Petitioner argues that “Skopec [’92] discloses that its EMI strives to maintain the core’s physical orientation stationary relative to the EMI’s orientation so the EMI can record the core’s movement in space.” Pet. 62. Petitioner argues that “[t]his stationary alignment is due, in part, to inwardly-facing projections on the inner tube that grip the core being formed therein and cut scribe lines on the core. The EMI connects to the inner tube to remain stationary to the core during coring.” *Id.*

For support, Petitioner cites statements in Skopec ’92 that describe, e.g., “alignment of the [scribe] knives cutting the core (slip scribe) and the survey instrument” as being “necessary for accurate core orientation data.” Pet. 63 (citing Ex. 1006 at 1–2). Petitioner also cites Skopec ’92’s disclosure of the use of “a laser alignment system (LAS)” that “ensure[s] positive alignment of the coring assembly.” *Id.* Petitioner also cites Figure 10 of Skopec ’92, which illustrates a “[c]ore section with orientation grooves,” and Figure 12 of Skopec ’92, which illustrates a “[c]omparison of EMI and observed principal-scribe-line rotation.” *Id.* at 63–64. Petitioner also cites the Heasley Declaration, which in turn cites essentially the same

disclosures of Skopec '92 as the Petition. *See* Ex. 1003 at pp. 113–16 (¶ 101).

For reasons consistent with Patent Owner's arguments, *see* PO Resp. 44–48, we determine that the Petition's analysis does not adequately establish that Skopec '92 teaches or suggests the "maintaining" step of claim 16. A disclosure of aligning any particular element of the coring apparatus with another element of the coring apparatus does not, of itself, suggest that those elements of the coring apparatus also have a fixed orientation relative to the core.

On the contrary, certain aspects of Skopec '92 strongly indicate that Skopec '92's inner tube does not have an orientation that is fixed relative to the core. For example, Figure 11 depicts and describes a core where the groove rotation angle changes with the depth of the core. *See* Ex. 1006 at 5. Table 1 includes similar data. *See id.* at 3. In describing its apparatus, Skopec '92 observes that "[l]ow rotary speeds . . . were used to . . . prevent *excessive* inner-barrel rotation." *Id.* at 2 (emphasis added). Although the scribe knives of Skopec '92 are described as "be[ing] sharp and set to a tolerance that will aid in catching the core," Skopec '92 also states that "[i]mproper knife tolerance can lead to . . . *additional* rotation of the inner barrel," which indicates that even proper knife tolerance yields some inner barrel rotation. *See id.* at 6; *see also id.* (section titled "Scribe Rotation or Discontinuity"). Thus, even accepting that Skopec '92's scribe knives assist in *limiting* inner barrel rotation, Skopec '92 indicates that they do not *prevent* rotation, and Skopec '92 does not appear to disclose a method or

apparatus that maintains the orientation of the core stationary with respect to an inner tube or a core orientation device, as required by the claims.

Consistent with those disclosures of Skopec '92, during examination of the application that resulted in the '055 patent, the Examiner found that a related Skopec reference, Skopec '90, which includes relevant disclosures nearly identical to the disclosures of Skopec '92 cited by Petitioner, *see* Prelim. Resp. 17–20 (table comparing Skopec '92 and Skopec '90), "does not disclose or suggest the improvement of the instant application comprising maintaining a rotational orientation of a core stationary with respect to the rotational orientation of the core orientation device." Ex. 1002 at 246. The Examiner made that finding in response to an argument from the applicant that Skopec '90's disclosures of core groove rotation during drilling show that "the core orientation device is not stationary with respect to the core." *Id.* at 225–26 (emphasis omitted).

The Petition fails to acknowledge or address those relevant disclosures in Skopec '92, which—consistent with the Examiner's analysis during prosecution—suggest that Skopec '92's core orientation device and inner tube are not maintained stationary with respect to the core.

In its Reply, Petitioner asserts for the first time, without elaboration or meaningful discussion of claim construction, that the "maintaining" step encompasses a method in which "the orientation device has a fixed orientation relative to the core *for at least some of the drilling operation*." Reply 31 (emphasis added). Petitioner emphasizes that, in Figure 12 of Skopec '92, a vertical line indicates that, for a brief period during drilling, the core was stationary relative to the inner tube. *Id.* at 32 (reproducing and annotating Figure 12 of Skopec '92).

Petitioner's argument is inadequate because Petitioner fails to provide any discussion of the proper interpretation of the "maintaining" limitation in either the Petition or the Reply. *See* 37 C.F.R. § 42.104(b)(3) (requiring a petition to identify "[h]ow the challenged claim is to be construed."); *see also* Hearing Tr. 16:4–9 (Petitioner: "There's no explicit claim construction discussion [of the "maintaining" step] in the Petition."). It is not clear from the plain language of claim 16 that the "maintaining" step encompasses fleeting or momentary periods during drilling where the core happens to remain stationary relative to the core orientation device. On the contrary, the word "maintain" seems to imply some level of sustained alignment of the core and the core orientation device. Indeed, it is unclear that it would even be possible to orient a core sample using the method of claim 16 if the core and the orientation device were only aligned for brief periods of the drilling process. The Specification contemplates, for instance, "a mechanism for preventing rotational movement about the length of the core sample, relative to the core orientation device." Ex. 1001 at 3:22–24.

For Petitioner to prevail on this issue, the Board would be required in the first instance to provide a claim construction analysis of the "maintaining" term in support of Petitioner's position. We decline to do so. We determine that Petitioner fails to carry its burden of showing that Skopec '92 teaches or suggests the "maintaining" step in view of Petitioner's failure to provide any meaningful discussion of why the "maintaining" step should be interpreted as encompassing the type of momentary alignment allegedly shown by Figure 12 of Skopec '92.

We next consider whether Petitioner has adequately shown that the combination of Skopec '92 and Enderlin teaches or suggests the

"maintaining" limitation. We determine that it does not. Petitioner argues that "Enderlin discloses maintaining stationary the orientations of the core and inner tube to etch a straight scribe mark for accurate orientation marking at the surface." Pet. 65. Petitioner argues that "it would have been obvious to a POSITA to maintain Skopec's core orientation [device] stationary with respect to the [core's] orientation or to re-orient a scribed core back to stationary alignment" "because keeping stationary the core's and device's orientations creates a straight scribe mark and allows for more accurate marking of the core's orientation at the surface." *Id.*

That argument is inadequate to carry Petitioner's burden. As described above, Skopec '92 indicates that its apparatus and method do not maintain alignment of the core and inner tube. *E.g.*, Ex. 1006 at 2, 3, 5 (Fig. 11), 6. Petitioner does not propose any modification of Skopec '92 in view of Enderlin that would allow Skopec '92's method or apparatus to achieve the maintaining step. We explained in the Institution Decision that Petitioner's proposed combination was unpersuasive for the same reasons that Petitioner's proposed combination of Enderlin with Puymbroeck was unpersuasive; i.e., it is unclear from the Petition what modification Petitioner is proposing to achieve the disputed limitation. *See* DI at 43. In the Reply, Petitioner argues only that Skopec '92 itself teaches or suggests the "maintaining" limitation and does not address the concern identified by the Board in the Institution Decision or otherwise clarify the proposed combination of Skopec '92 and Enderlin. Reply 30–33.

On the complete trial record, we determine that the Petition fails to adequately show that the combination of Skopec '92 and Enderlin teaches or suggests the "maintaining" limitation of claim 16.

Because claims 17 and 18 depend from claim 16 and therefore also include the "maintaining" step, and because Petitioner's analysis of claims 17 and 18 does not remedy the deficiency described above, we likewise conclude that Petitioner has not shown by a preponderance of the evidence that claims 17 and 18 would have been obvious over Skopec '92 and Enderlin.

Claims 22 and 23 likewise include a "maintaining" step. Although the "maintaining" step of claims 22 and 23 differs somewhat from that of claim 16, the differences are not material to the analysis set forth above, and the Petition's analysis of claims 22 and 23 does not remedy the deficiency described above. Accordingly, we determine that Petitioner has not shown by a preponderance of the evidence that claims 22 and 23 would have been obvious over Skopec '92 and Enderlin.

F. OBVIOUSNESS OF CLAIMS 16–18, 22, AND 23 IN VIEW OF SKOPEC '92 AND SCOTT

As noted above, at the oral hearing, Petitioner abandoned reliance on Scott. Hearing Tr. 15:25–16:1. Accordingly, this proposed ground reduces to obviousness over Skopec '92 alone. Because we conclude above that the Petition fails to establish that the challenged claims would have been obvious over Skopec '92, we determine that Petitioner has not carried its burden as to this proposed ground of unpatentability.

G. PETITIONER'S ALLEGATIONS REGARDING PATENT OWNER'S DECLARANT

Petitioner alleges that Patent Owner's declarant, Dr. Tapson, "lacks credibility and impartiality."[7] Reply 10–13. Petitioner alleges that Dr. Tapson is a named inventor on patent applications "stemming from projects for" Imdex Ltd., Patent Owner's parent company, and that Dr. Tapson failed to disclose those applications in this case. *Id.* Petitioner also alleges that Dr. Tapson "previously performed expert witness work for Imdex." *Id.* Petitioner asserts that "Dr. Tapson's opinions should be afforded little to no weight." *Id.*

Patent Owner responds that, in Australian cases involving similar subject matter, "Australian tribunals have repeatedly rejected these same bias allegations that Petitioner now advances here." Sur-reply 24. Patent Owner also notes that Petitioner has not alleged that Dr. Tapson has any interest in Patent Owner, Imdex, or the outcome of this proceeding. *Id.* Patent Owner also indicates that Dr. Tapson was named as an inventor on Imdex applications "without his knowledge." *Id.* at 26.

As an initial matter, we observe that the outcome of this case does not hinge on Dr. Tapson's testimony. As set forth above, our decision is based on deficiencies in the Petition that are apparent without reliance on Dr. Tapson's testimony. Accordingly, even were we to limit the weight

[7] In a footnote in the Reply, Petitioner also states that "Dr. Tapson's credentials weren't appropriate for a POSITA or expert." Reply 11 n.36. Petitioner provides no elaboration on this statement and did not file a motion to exclude. Petitioner's naked assertion in a footnote in the Reply warrants no consideration from the Board beyond noting that Petitioner has not requested any relief on the basis of this assertion, nor shown that it is entitled to any relief.

attributed to Dr. Tapson's testimony, the outcome of this case would be the same.

In any event, we decline to reduce the weight attributable to Dr. Tapson's testimony on the basis of Petitioner's arguments. Petitioner does not address the fact that Dr. Tapson was allegedly unaware that he had been named as an inventor on Imdex patent applications, and Petitioner does not allege that Dr. Tapson has an interest in any party or the outcome of this case. Moreover, we note that an Australian federal court found Dr. Tapson to be reliable. *See* Ex. 2006 ¶ 57.

We have taken Petitioner's concerns into account in our evaluation of this case, but we decline to reduce the weight attributable to Dr. Tapson's testimony.

III. CONCLUSION

After reviewing the record and weighing the evidence offered by both parties, we determine that Petitioner has not shown that any of the challenged claims is unpatentable.

In summary:

Claims	35 U.S.C. §	Reference(s)	Claims Shown Unpatentable	Claims Not Shown Unpatentable
16–18, 22, 23	103(a)	Puymbroeck, Enderlin		16–18, 22, 23
16–18, 22, 23	103(a)	Puymbroeck, Scott		16–18, 22, 23
16–18, 22, 23	103(a)	Skopec ’92, Enderlin		16–18, 22, 23
16–18, 22, 23	103(a)	Skopec ’92, Scott		16–18, 22, 23
Overall Outcome				**16–18, 22, 23**

IV. ORDER

It is hereby:

ORDERED that claims 16–18, 22, and 23 of the ’055 patent have not been shown to be unpatentable;

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

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