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571-272-7822

Paper 10
Date: April 29, 2025

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LIBERTY ENERGY INC. and LIBERTY OILFIELD SERVICES LLC,
Petitioner,

v.

U.S. WELL SERVICES, LLC,
Patent Owner.

IPR2025-00066
Patent 10,598,258 B2

Before MEREDITH C. PETRAVICK, GEORGE R. HOSKINS, and SEAN P. O'HANLON, *Administrative Patent Judges.*

PETRAVICK, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. Background and Summary

Liberty Energy Inc. and Liberty Oilfield Service LLC (collectively "Petitioner") filed a Petition requesting *inter partes* review of claims 1–20 of U.S. Patent No. 10,598,258 B2 (Ex. 1001, "the '258 patent"). Paper 1

("Pet."). U.S. Well Services, LLC ("Patent Owner") filed a Preliminary Response. Paper 7 ("Prelim. Resp.").

With our authorization (Ex. 3001), Petitioner filed a Reply (Paper 8, "Prelim. Reply") and Patent Owner filed a Sur-reply (Paper 9, "Prelim. Sur-reply").

Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted unless the information presented in the petition "shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition."

After considering the Petition, the Preliminary Response, the Preliminary Reply, the Preliminary Sur-reply and the evidence of record, we determine the information presented fails to show a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of at least one of the challenged claims of the '258 patent. Accordingly, we do not institute an *inter partes* review of claims 1–20 of the '258 patent on the grounds asserted in the Petition.

B. Real Parties in Interest

Petitioner identifies Liberty Energy Inc., Liberty Oilfield Services LLC, and Liberty Advanced Equipment Technologies LLC as the real parties in interest. Pet. 1. Patent Owner identifies U.S. Well Services, LLC, U.S. Well Services Holdings, LLC, ProFrac Manufacturing, LLC, and ProFrac Services, LLC as the real parties in interest. Paper 5, 1.

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C. Related Matters

The parties identify the following related court proceeding: *U.S. Well Services, LLC, et al. v. Liberty Energy, Inc., et al.*, Case No. 4:24-cv-00839-KPE (S.D. Tex.). Paper 1; Paper 5, 2.

The parties also identify IPR2025-00105 as a related *inter partes* review. Paper 5, 2. We note that IPR2025-00105 has been dismissed. We also note that IPR2024-01274, IPR2025-00031, IPR2025-0139, IPR2025-00661, and IPR2025-00778 may be related.

D. The '258 Patent

The '258 patent is titled "Multi-plunger Pumps and Associated Drive Systems," issued from an application filed on December 5, 2018, and claims priority to December 5, 2017. Ex. 1001, codes (22), (54), (60).

The '258 patent addresses a problem with hydraulic fracturing pumps powered by diesel engines — they can run the pump above a critical speed, causing pump cavitation and damage. *See id.* at 1:56–2:14. The '258 patent explains:

> It has historically been believed that pump cavitation is caused by air entering the pump. Through testing and data-gathering, however, Applicants have observed that pump cavitation and damage are caused by the formation of vacuum bubbles as a result of fluid being accelerated too fast through the pump.

Id. 1:66–2:4.

To avoid the damage, the '258 patent observes that "multiple electric- or hydraulic-powered motors driving planetary gear trains can provide effective and efficient pumping power, thereby maintaining a consistent pump rate for fluid transfer, while also sustaining a pumping speed at or

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below the critical speed for the plungers." *Id.* at 2:28–34; *see also id.* at 5:1–33.

Figure 3 of the '258 patent is reproduced below.

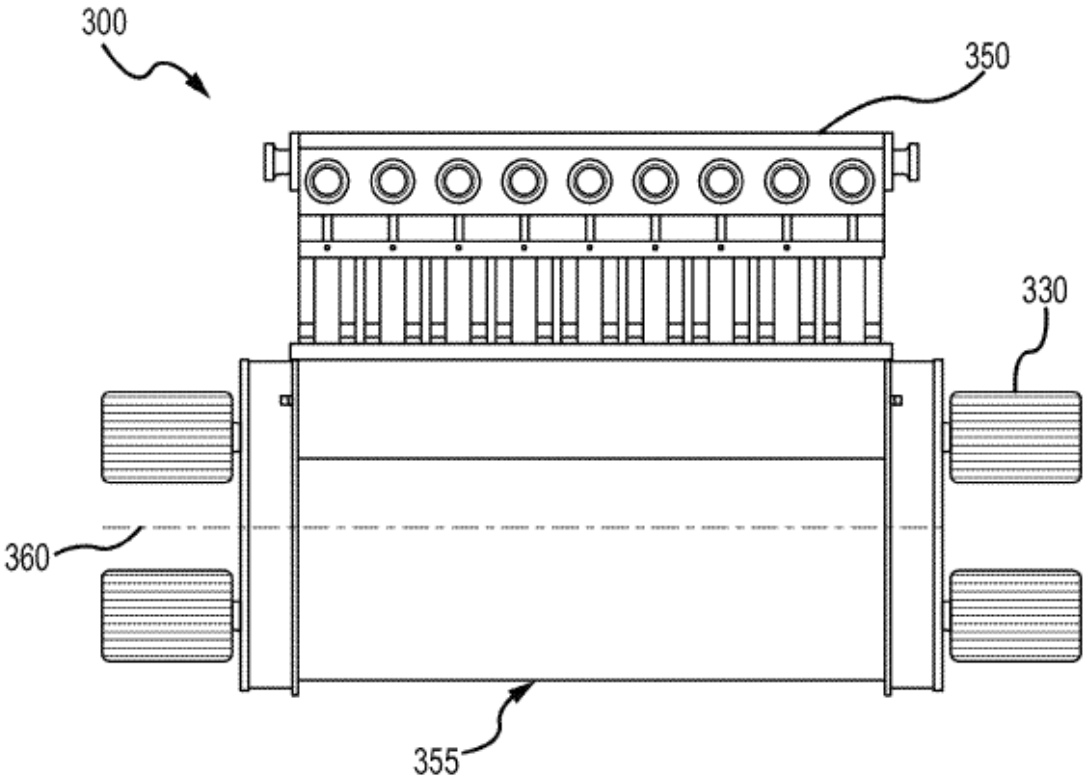

FIG.3

Figure 3 depicts an embodiment of multi-plunger pump 300 with four electric motors. *Id.* at 8:33–36. Multi-plunger pump 300 has a multi-plunger fluid end 350, motors 330, and a crankshaft centerline 360. *Id.* at 8:33–46.

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Figure 1 of the '258 patent is reproduced below.

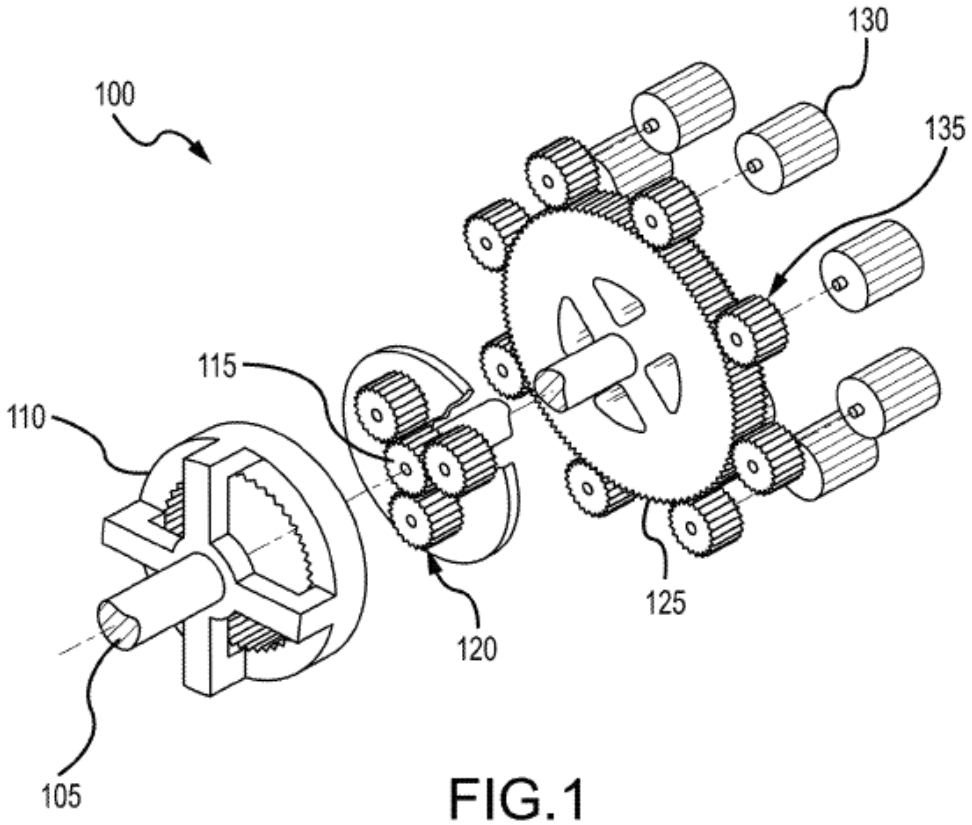

FIG.1

Figure 1 depicts an embodiment with planetary gear train 100. *Id.* at 7:4–7. Pump crankshaft 105 is powered by eight electric motors 130 through eight pinion gears 135 driving main planetary gear 125. *Id.* at 7:14–16. Main planetary gear 125 drives sun gear 115, which in turn drives three planetary gears 120. *Id.* at 7:17–18. Three planetary gears 120 drive gear 110, which has internal gear teeth. *Id.* at 7:18–20. Gear 110 causes rotations of pump crankshaft 105, which drives the multi-plunger pump. *Id.* at 7:21–25.

The '258 patent discloses that, in some embodiments, the speed of the motors may be controlled by variable frequency drives ("VFD"). An operator can interface with the VFDs to accelerate or decelerate the pump rotational speeds or turn the pumps off. *Id.* at 7:60–8:4.

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E. Illustrative Claims

Petitioner challenges claims 1–20 of the '258 patent. Claim 1 is illustrative and reproduced below.

> 1. A hydraulic fracturing system for fracturing a subterranean formation comprising:
>
> a multi-plunger hydraulic fracturing pump fluidly connected to a well associated with the subterranean formation, the multi-plunger pump configured to pump fluid into a wellbore associated with the well at a high pressure so that the fluid passes from the wellbore into the subterranean formation and fractures the subterranean formation;
>
> a plurality of motors positioned to simultaneously power the multi-plunger pump; and
>
> a planetary gear train having a plurality of input pinion gears in rotational contact with each of the plurality of motors,
>
> wherein a gear ratio of the planetary gear train and a speed at which the plurality of motors operates are selected so as to limit a maximum pump speed associated with the multi-plunger pump.

Ex. 1001, 9:2–19.

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F. Asserted Evidence and Grounds

Petitioner asserts that claims 1–20 would have been unpatentable on the following grounds:

Ground	Claim(s) Challenged	35 U.S.C. §	Basis
1A	1, 3, 6	103	Buckley,[1] Bergan,[2] the knowledge of a POSITA, and, in the alternative, Jelaska[3]
1B	1, 3, 6	103	Yi,[4] Bergan, the knowledge of a POSITA, and, in the alternative, Jelaska
2A	4, 5	103	Buckley, Bergan, the knowledge of a POSITA and, in the alternative, Jelaska and Tutterow[5]
2B	4, 5	103	Yi, Bergan, the knowledge of a POSITA and, in the alternative, Jelaska and Tutterow

[1] U.S. Patent Publication No. 2020/0256429 A1, filed Sept. 25, 2018, pub. Aug. 13, 2020 (Ex. 1004).
[2] U.S. Patent Publication No. 2015/0361736 A1, pub. Dec. 17, 2015 (Ex. 1006).
[3] D.T. Jelaska, "*Gears and Gear Drives*," John Wiley & Sons, (2012) (Ex. 1012).
[4] Chinese Patent Publication No. CN103742382A, pub. Apr. 23, 2014 (Ex. 1009). We reference herein the English language translation found at Exhibit 1010.
[5] V. Tutterow and A.T. McKane, *"Variable Speed Pumping: A Guide to Successful Application,"* Europump and Hydraulic Institute, 2004 (Ex. 1013).

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Ground	Claim(s) Challenged	35 U.S.C. §	Basis
3A	7, 15, 17	103	Buckley, Bergan, the knowledge of a POSITA and, in the alternative, Jelaska and Nesbitt[6]
3B	7, 15, 17	103	Yi, Bergan, the knowledge of a POSITA and, in the alternative, Jelaska and Nesbitt
4A	2, 16	103	Buckley, Bergan, Rosman,[7] the knowledge of a POSITA and, in the alternative, Jelaska and Nesbitt
4B	2, 16	103	Yi, Bergan, Rosman, the knowledge of a POSITA and, in the alternative, Jelaska and Nesbitt
5A	8–11, 13	103	Buckley, Bergan, Payne,[8] the knowledge of a POSITA, and, in the alternative, Jelaska
5B	8–11, 13	103	Yi, Bergan, Payne, the knowledge of a POSITA, and, in the alternative, Jelaska

[6] B. Nesbitt, *"Handbook of Pumps and Pumping: Pumping Manual International,"* Elsevier, 2006 (Ex. 1014).
[7] U.S. Patent No. 4,100,822, issued July 18, 1978 (Ex. 1007).
[8] U.S. Patent Publication No. 2016/0258267 A1, pub. Sept. 8, 2016 (Ex. 1008).

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Ground	Claim(s) Challenged	35 U.S.C. §	Basis
6A	12	103	Buckley, Bergan, Payne, Rosman, the knowledge of a POSITA, and, in the alternative, Jelaska and Nesbitt
6B	12	103	Yi, Bergan, Payne, Rosman, the knowledge of a POSITA, and, in the alternative, Jelaska and Nesbitt
7A	14	103	Buckley, Bergan, Payne, the knowledge of a POSITA, and, in the alternative, Jelaska and Tutterow
7B	14	103	Yi, Bergan, Payne, the knowledge of a POSITA, and, in the alternative, Jelaska and Tutterow
8A	18	103	Buckley, Bergan, the knowledge of a POSITA, and, in the alternative, Jelaska, Tutterow and Nesbitt
8B	18	103	Yi, Bergan, the knowledge of a POSITA, and, in the alternative, Jelaska, Tutterow and Nesbitt
9A	19, 20	103	Buckley, Bergan, Payne, the knowledge of a POSITA, and, in the alternative, Jelaska and Nesbitt

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Ground	Claim(s) Challenged	35 U.S.C. §	Basis
9B	19, 20	103	Yi, Bergan, Payne, the knowledge of a POSITA, and, in the alternative, Jelaska and Nesbitt

Pet. 9–11.

Petitioner also relies on the Declaration of Dr. Robert A. Durham. Ex. 1003. Patent Owner relies upon the Declaration of Michael Nikolaou, Ph.D. Ex. 2024.

II. ANALYSIS

A. Legal Standards

"In an IPR, the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d, 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")); *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (discussing the burden of proof in inter partes review).

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

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underlying factual determinations including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) when in evidence, objective evidence of obviousness or nonobviousness. *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966).

Whether a patent claiming the combination of prior art elements would have been obvious is determined by "whether the improvement is more than the predictable use of prior art elements according to their established functions." *KSR*, 550 U.S. at 417. One seeking to establish obviousness based on more than one reference also must articulate sufficient reasoning with rational underpinnings to combine teachings. *See id.* at 418.

To show obviousness, it is not enough to merely show that the prior art includes separate references covering each separate limitation in a challenged claim. *Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011). "This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." *KSR*, 550 U.S. at 418–19.

An obviousness analysis "need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 550 U.S. at 418; *accord In re Translogic Tech., Inc.*, 504 F.3d 1249, 1259 (Fed. Cir. 2007). However, a petitioner cannot satisfy its burden of proving obviousness by employing "mere conclusory statements." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016). Instead, a petitioner must articulate a reason why a person of ordinary skill in the art would have combined or modified the prior

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art references. *In re NuVasive, Inc.*, 842 F.3d 1376, 1382 (Fed. Cir. 2016); *see also Metalcraft of Mayville, Inc. v. The Toro Co.*, 848 F.3d 1358, 1366 (Fed. Cir. 2017) ("In determining whether there would have been a motivation to combine prior art references to arrive at the claimed invention, it is insufficient to simply conclude the combination would have been obvious without identifying any reason why a person of skill in the art would have made the combination."); *Belden Inc. v. Berk-Tek LLC*, 805 F.3d 1064, 1073 (Fed. Cir. 2015) ("[O]bviousness 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.") (citing *InTouch Techs., Inc. v. VGO Commc'ns, Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014)). As a factfinder, we also must be aware "of the distortion caused by hindsight bias and must be cautious of arguments reliant upon *ex post* reasoning." *KSR*, 550 U.S. at 421.

B. Level of Ordinary Skill in the Art

Petitioner proposes the following definition for a person of ordinary skill in the art ("POSITA"):

> A person of ordinary skill in the art would have either (1) a Bachelor of Science in Mechanical Engineering, Electrical Engineering, Petroleum Engineering or an equivalent field, as well as at least 2 years of academic or industry experience in the oil and gas industry, including well drilling, completion, or production, or (2) at least four years of industry experience in the oil and gas industry including well drilling, completion, or production.

Pet. 11–12 (citing Ex. 1003 ¶ 48).

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Patent Owner states: "For purposes of this preliminary response only, Patent owner applies the same level proposed by Petitioner." Prelim. Resp. 11.

For purposes of this Decision, we adopt Petitioner's assessment of the level of ordinary skill in the art as it is consistent with the '258 patent and the asserted prior art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001).

C. Claim Construction

In this *inter partes* review, we apply the same claim construction standard that would be used in a civil action under 35 U.S.C. § 282(b). 37 C.F.R. § 42.100(b). In applying this standard, we generally give claim terms their ordinary and customary meaning as would be understood by a person of ordinary skill in the art at the time of the invention and in the context of the entire patent disclosure. *See id.*; *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc).

Petitioner does not propose any explicit constructions. Pet. 12. Likewise, Patent Owner does not propose any explicit constructions. Prelim. Resp. 11.

We do not need to construe any terms explicitly to reach our decision. *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))).

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D. Ground 1A Against Claim 1

Petitioner contends that claim 1 is unpatentable over Buckley, Bergan, the knowledge of a POSITA, and, in the alternative Jelaska. Pet. 14–33.

1. Summary of Buckley

Buckley is a U.S. Patent Application Publication titled "Electric Drive Pump For Well Stimulation," published on August 13, 2020. Ex. 1004, codes (43), (54). Buckley claims priority to U.S. Provisional Application 62/562,943 (Ex. 1005, "Buckley Provisional"), filed on Sept. 25, 2017. *Id.* at code (60).

Because the '258 patent claims priority to December 5, 2017 (Ex. 1001, code (60)), and Petitioner does not dispute that claimed priority here, only the subject matter of Buckley supported by the Buckley Provisional is available as prior art to the '258 patent. *See Penumbra, Inc. v. RapidPulse, Inc.*, IPR2021-01466, Paper No. 34 at 32 (PTAB Mar. 10, 2023) (precedential) ("[U]nder the AIA, a reference patent document need only meet the 'ministerial requirements' of [35 U.S.C.] §§ 119 and 120, and the provisional . . . to which the reference patent document claims a right of priority must 'describe[ ] the subject matter' relied upon in the reference patent document as prior art.") (citing 35 U.S.C. § 102(d)). Petitioner asserts that "the Petition . . . relies on . . . disclosures from *Buckley* for their teachings regarding the use of multiple motors to power a multi-plunger pump, which are supported by [the] *Buckley Provisional*, rather than any teachings of a particular gearing system." [9] Prelim. Reply 4; *see also* Pet.

[9] Patent Owner disputes that the subject matter that Petitioner relies upon from Buckley has adequate written description support in the Buckley Provisional. *See* Prelim. Resp. 13–20; Prelim. Sur-reply 4–5. We do not reach Patent Owner's dispute. Even if we were to assume that the

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23–29 (citing to Ex. 1005 (the Buckley Provisional)). We, thus, limit our summary and our analysis below to only the portions of Buckley relied upon by Petitioner.

Buckley discloses "an electric drive pump used to drive a fluid end for the pumping of a fracturing fluid into a well." Ex. 1004 ¶ 1; Fig. 2. A plurality of individual motors "work together to provide power to a power end." *Id.* ¶ 9. Buckley states: "The motors are arranged around a gearbox which is used to convert the rotary motion of the electric motors into linear motion for operation of the plungers in the fluid ends. The system includes a transmission assembly that is composed of the gearbox and the plurality of motors." *Id.*

2. Summary of Bergan

Bergan is titled "Heave Compensation Winches" and published on December 17, 2015. Ex. 1006, codes (43), (54).

Bergan discloses that floating oil and gas drilling platforms may include a hoisting system for raising and lowering equipment, such as a drill string. *Id.* ¶ 3. Floating platforms heave (i.e., vertically rise and fall with the waves) and, thus, there is a need for compensation to reduce the vertical heaving of the drill string. *Id.* ¶¶ 3–5.

Bergan discloses an embodiment in which both active and passive heave compensation are provided at a winch. *Id.* ¶ 7.

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provisional provides adequate written description support for Buckley's subject matter relied upon in the Petition, we nonetheless determine, as explained in our analysis, that Petitioner fails to show a reasonable likelihood that any of the claims of the '258 patent are obvious under Ground 1A.

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Bergan's Figure 4 is reproduced below.

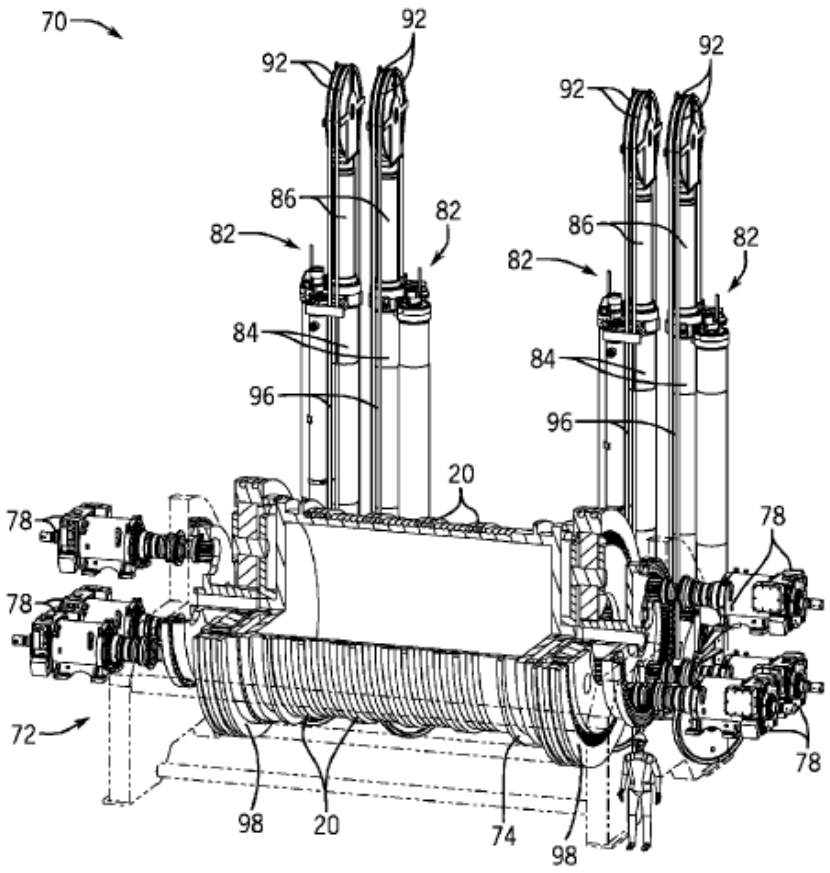

FIG. 4

Figure 4 depicts a sectional view of an embodiment of the winch having both active and passive heave compensation components. *Id.* ¶¶ 12–13.

Winch 72 has hoisting lines 20 wound around a rotatable drum 74. *Id.* ¶ 29. Motors 78 drive rotation of drum 74 to reel in or out the hoisting lines 20. *Id.* ¶ 30. Any suitable motors could be used, including electric motors. *Id.* Winch 72 includes a planetary gear system for driving rotation of the drum. *Id.* ¶ 32.

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Bergan's Figures 5 and 6 are reproduced below side-by-side.

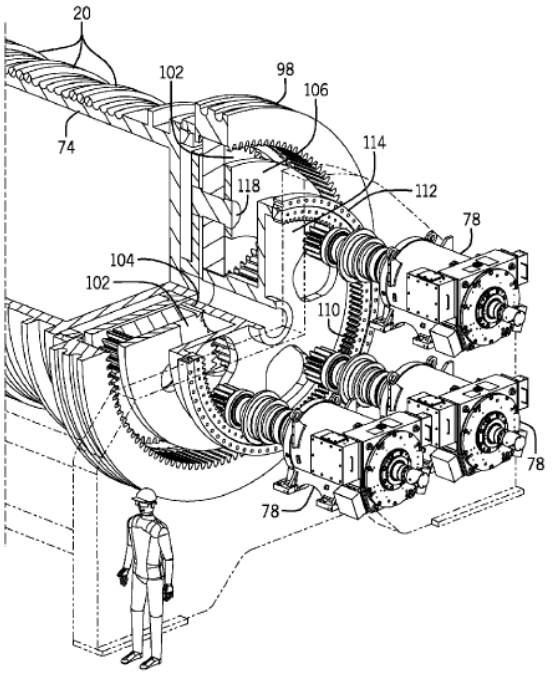

FIG. 5

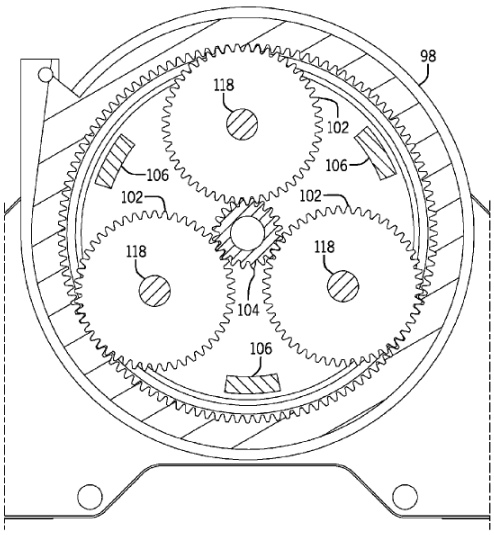

FIG. 6

Figure 5 is a sectional view of winch 72, showing the planetary gear system. *Id.* ¶ 14. Figure 6 is a cross-sectional view of winch 72 and depicts the details of the planetary gear system. *Id.* ¶ 15. Bergan states that

> [t]he planetary gear system includes the ring gear 98, planetary gears 102, and a sun gear 104. A carrier 106 is coupled to rotate with the planetary gears 102 as they orbit the sun gear 104 in operation. In this embodiment, the active drive system (here the motors 78, which provide both a primary hoisting function and active heave compensation) is connected to drive the sun gear 104. More specifically, the motors 78 are connected to drive rotation of a gear 110 of a slew bearing 112. The gear 110 is coupled to a sun wheel 114 having the sun gear 104 such that the motors 78 rotate the sun gear 104 via the wheel 114 and gear 110. The planetary gears 102 are mounted on axles 118 coupled to the carrier 106, which is coupled to drive the drum 74. This allows the orbit of planetary gears 102 to drive rotation of both the carrier 106 and the drum 74.

Id. ¶ 32.

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"[A]ctive heave compensation varies rotation of the sun gear 104 and passive heave compensation varies rotation of the ring gear 98." *Id.* ¶ 33. For active heave compensation, motion reference unit 32 detects the heave of vessel 12 and controls winch 72 by sending signals to motors 78 to control rotation of drum 74. *Id.* ¶ 26. For passive heave compensation, hydraulic cylinders 82, shown in Figure 4 above, rotate ring gear 98. *Id.* ¶ 31. "[H]ydraulic cylinders 82 are provided in a jigger winch assembly with tension lines 96 to rotate a ring gear 98 of a planetary gear system of the winch 72." *Id.* Rotation of ring gear 98 causes planetary gears 102 to orbit sun gear 104. *Id.* ¶ 33.

3. Summary of Jelaska

Jelaska is a text book titled *Gears and Gear Drives* and was published no later than May 16, 2013. Ex. 1012; Ex. 1037 ¶¶ 34–40, 55.

Jelaska states: "The second fundamental parameter of a mechanical driver is the *transmission ratio i* defined as the ratio of its driving n_1 and drive n_2 shaft speeds of rotation or angular speeds:

$$i = \frac{n_1}{n_2} = \frac{\omega_1}{\omega_2}.$$

Ex. 1012, 23.[10]

4. Analysis

Claim 1 recites: "a planetary gear train having a plurality of input pinion gears in rotational contact with each of the plurality of motors." Ex. 1001, 9:13–15.

[10] We refer to the pagination added by Petitioner to Exhibit 1012.

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To meet this claim element, Petitioner proposes to modify Buckley so that Bergan's planetary gear system, "with appropriate changes to gear sizes that would have been obvious to a POSITA," would couple Buckley's motors to its drive pump. Pet. 18, 30–31. Petitioner first argues that Buckley provides an express motivation to use Bergan's planetary gear system because Buckley broadly discloses using a gearbox with its motors. *Id.* at 18 (citing Ex. 1004 ¶ 9 ("motors are arranged around a gearbox which is used to convert the rotary motion of the electric motors into linear motion for operation of the plungers in the fluid ends"); Ex. 1003 ¶ 143). Petitioner next argues that using Bergan's planetary gear train, which uses pinions to connect motors to a load, is applying a known technique to improve a similar device in the same way. Pet. 19 (citing Ex. 1003 ¶ 150). Petitioner additionally argues that Bergan's planetary gear system was known in one field of endeavor and would have prompted a POSITA to use it in a different field based on design incentives. *Id.* Petitioner finally argues that "modifying *Buckley's* pumping system to use *Bergan's* planetary gearing system requires a simple substitution of one known element . . . for another . . . to obtain the predictable results." *Id.* at 20 (citing Ex. 1003 ¶ 150).

Patent Owner responds that all of Petitioner's articulated motivations are insufficient to establish obviousness. Prelim. Resp. 37–53. In particular, Patent Owner argues that Petitioner's combinations are based on impermissible hindsight. *Id.* at 1–2, 40, 52.

We find Patent Owner's arguments persuasive.

Although both Buckley and Bergan relate to oil and gas drilling systems, Buckley and Bergan do not use their motors and gear systems for a sufficiently similar purpose. Buckley and Bergan's gear systems drive different types of devices and, thus, are designed for different purposes.

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Buckley is concerned with "an electric drive pump used to drive a fluid end for the pumping of a fracturing fluid into a well." Ex. 1004 ¶ 1, Fig. 2. Bergan is concerned with driving the drum of a hoist in a manner that provides both active and passive heave compensation on a floating rig. Ex. 1006 ¶¶ 32–33.

Planetary gear systems are designed differently for different purposes. *See, e.g.,* Ex. 2002, iv ("All characteristics of the drive system from the driver to the driven equipment . . . can influence gearbox operation and must be considered . . . ."); Ex. 2024 ¶ 63 (testimony of Michael Nikolaou that "[f]ailing to meticulously design, test, and manufacture a gear system for a specific application can be catastrophic.").

Petitioner does not sufficiently show that a POSITA would have known that Bergan's planetary gear system, which is designed to drive, and provide heave compensation to, a hoisting drum on a floating platform, would be suitable for use in Buckley to drive an electric drive pump used to drive a fluid end for the pumping of a fracturing fluid into a well. Petitioner appears to acknowledge that at least some changes would be needed to Bergan's planetary gear system to make it suitable to drive Buckley's fracturing pump. Pet. 18 ("A POSITA would have been motivated to combine *Bergan's* planetary gear system, with appropriate changes to gear sizes that would have been obvious to a POSITA, with *Buckley's* pump system . . . ."). Neither Petitioner nor Dr. Durham sufficiently explains what changes would be needed or why a POSITA would have been motivated to make such changes. *See id.* at 18–19 (citing Ex. 1003 ¶¶ 143, 149).

We, thus, are not persuaded that a POSITA would have been motivated to used Bergan's planetary gear system to drive Buckley's fracturing pump. Petitioner has not sufficiently shown that Buckley

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expressly suggests the proposed combination, that the proposed combination is merely applying a known technique to improve a similar device in the same way, that design incentives would have prompted the propose combination, or that the proposed combination is a simple substitution of one known element for another to obtain predictable results.

To meet claim 1's next claim element — "wherein a gear ratio of the planetary gear train and a speed at which the plurality of motors operates are selected so as to limit a maximum pump speed associated with the multi-plunger pump" (Ex. 1001, 9:16–19), Petitioner proposes a further modification to Petitioner's first proposed modification of Buckley with Bergan. Petitioner relies upon alleged knowledge of a POSITA and Jelaska. Pet. 31–33. Petitioner contends:

> It was well-known in the art that the speed of the driver dictates the speed of the driven mechanism according to a transmission ratio, *i*, of the power transmission that links the driver to the driven mechanism, where the transmission ratio is defined as:
>
> $$i = \frac{n_1}{n_2},$$
>
> where n_1 is the driving shaft sped and n_2 is the driven shaft speed.

Pet. 31 (citing Ex. 1003 ¶ 174; Ex. 1012, 3). Jelaska discloses essentially the same equation for a transmission ratio. Ex. 1012, 3. Based on this contention, Petitioner concludes that " in order to 'limit a maximum pump speed associated with the multi-plunger pump,' a POSITA would simply choose a maximum desired speed of the pump and coordinate the speed of the motors with the gear ratio of the gear train so that the maximum speed is not exceeded." Pet. 31–32 (citing Ex. 1003 ¶ 174).

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Petitioner, however, does not sufficiently establish in the first instance that a POSITA would be motivated to modify the planetary gear system to have a gear ratio so as to limit a maximum pump speed associated with a multi-plunger pump. None of Buckley, Bergan, or Jelaska is concerned with limiting a maximum pump speed for a fracturing pump. Dr. Durham's cited testimony, which concerns the gear ratio equation, also does not sufficiently establish a sufficient motivation. Ex. 1003 ¶ 174; *InTouch Techs.,* 751 F.3d at 1352 (concluding that a party's expert "succumbed to hindsight bias in her obviousness analysis" where such analysis "primarily consisted of conclusory references to her belief that one of ordinary skill in the art *could* combine these references, not that they *would* have been motivated to do so").

Petitioner does not sufficiently show that a POSITA would have been motivated to first incorporate Bergan's planetary gear system into Buckley's pumping system and to then further modify the planetary gear system so that a gear ratio is selected to limit a maximum pump speed, given a POSITA's knowledge and Jelaska's teaching of how to calculate a gear ratio. As the Federal Circuit has stated, "[w]ithout any explanation as to how or why the references would be combined to arrive at the claimed invention, we are left with only hindsight bias that *KSR* warns against" and "we cannot allow hindsight bias to be the thread that stitches together prior art patches into something that is the claimed invention." *Metalcraft,* 848 F.3d at 1367.

We determine that Petitioner fails to show a reasonable likelihood that claim 1 would have been obvious over Buckley, Bergan, the knowledge of a POSITA, and Jelaska.

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E. Ground 1B Against Claim 1

Petitioner contends that claim 1 is unpatentable over Yi, Bergan, the knowledge of a POSITA, and, in the alternative Jelaska. Pet. 34–40.

1. Summary of Yi

Yi is titled "Fracturing Pump Transmission System and Fracturing Truck" and published on April 23, 2014. Ex. 1010, codes (43), (54).

Yi explains that "common fracturing trucks use a 'diesel engine–torque converter–drive shaft–fracturing pump' transmission scheme" and that this transmission scheme requires expensive and hard to get engines and components. *Id.* ¶¶ 3–4. Yi also explains that the reliability of this transmission scheme is low and, if a component fails, fracturing operations will halt. *Id.* ¶ 5.

Yi uses cheaper and readily available engines and components and is more reliable. *Id.* ¶¶ 7, 14, 19, 21, 46.

An embodiment of Yi's fracturing pump transmission system uses multiple engines 1 to drive multiple oil pumps 2, which supply pressurized oil to turn multiple motors 4. *Id.* ¶¶ 42, 46. Multiple motors 4 drive fracturing pump 5. *Id.*

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Yi's Figure 2 is reproduced below.

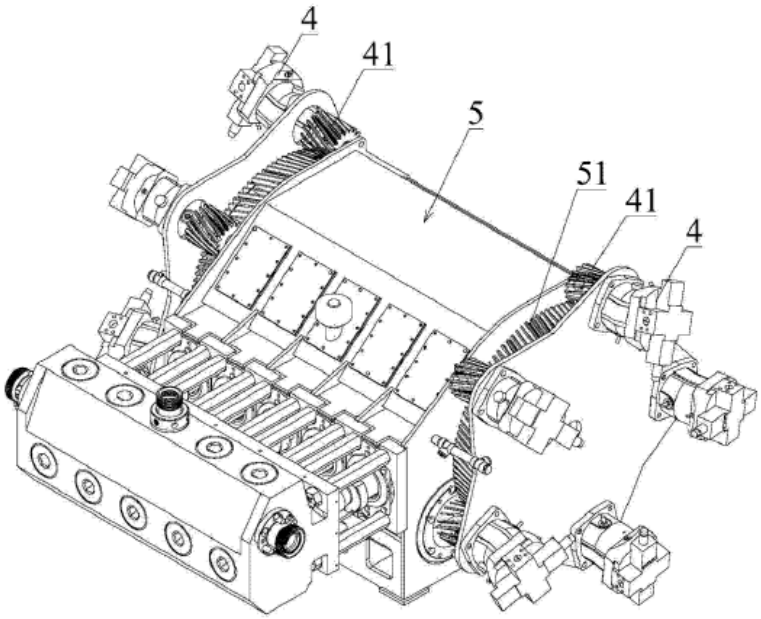

Figure 2

Figure 2 illustrates "a preferred transmission connection method between motors 4 and a fracturing pump 5." *Id.* ¶ 44. Yi states:

> [T]he fracturing pump 5 is a crankshaft-type plunger pump. At both ends of the crankshaft-type plunger pump, there are power input gears 51, and each motor 4 engages at least with the power input gears 51 at one end of the crankshaft-type plunger pump through a power output gear 41 (whose pitch circle diameter is smaller than that of the power input gear). More preferably, the number of power output gears 41 engaged with the power input gear 51 at both ends of the crankshaft-type plunger pump is the same, which enables more balanced power transmission and distribution at both ends of the crankshaft-type plunger pump. More preferably, the power output gears 41 at either end of the crankshaft-type plunger pump are arranged evenly around the power input gear 51, which enables more reliable power transmission at either end of the crankshaft-type plunger pump.

Id.

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2. Analysis of Claim 1

Petitioner's analysis for claim 1 under Ground 1B parallels Petitioner's analysis for claim 1 under Ground 1A, except that Petitioner substitutes Yi for Buckley. *See* Pet. 34–40. We note that, like Buckley, Yi is not concerned with a hoisting system with heave compensation. *See generally* Ex. 1010. Yi is concerned with designing a fracturing pump in which the components are reliable and readily available. *Id.* ¶¶ 5, 7, 14, 19, 21, 46.

Petitioner's rationales for modifying Yi with Bergan, the knowledge of a POSITA, and Jelaska are substantially similar to Petitioner's rationales for modifying Buckley with Bergan, the knowledge of a POSITA, and Jelaska. *See* Prelim. Resp. 37–38 (table comparing Petitioner's articulated rationales for Grounds 1A and 1B); Pet. 34–35.

For the same reasons explained in connection with Ground 1B, we determine Petitioner does not sufficiently establish that a POSITA would have been motivated to first incorporate Bergan's planetary gear system into Yi's fracturing pump and to then further modify the planetary gear system so that a gear ratio is selected to limit a maximum pump speed, given a POSITA's knowledge and Jelaska's teaching of how to calculate a gear ratio.

We determine that Petitioner fails to show a reasonable likelihood that claim 1 would have been obvious over Yi, Bergan, the knowledge of a POSITA, and Jelaska.

F. Remaining Claims and Grounds

Petitioner's challenges to the remaining claims under Grounds 1A through 9B incorporate Petitioner's proposed combination of Buckley,

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Bergan, the knowledge of a POSITA, and Jelaska and combination of Yi, Bergan, the knowledge of a POSITA, and Jelaska, used to challenge claim 1 under Grounds 1A and 1B. Pet. 33, 40–76.

For the same reasons explained in connection with Grounds 1A and 1B, we determine that Petitioner fails to show a reasonable likelihood that the remaining claims are unpatentable under Grounds 1A through 9B.

G. Discretionary Denials

Patent Owner requests that we exercise discretion to deny the Petition under 35 U.S.C. § 312(a)(3) and 35 U.S.C. § 314. Prelim. Resp. 59–66. Patent Owner's request is moot because we deny the Petition for failing to show a reasonable likelihood that any of claims 1–20 is unpatentable.

III. CONCLUSION

After considering the evidence and arguments presented in the Petition, Preliminary Response, Preliminary Reply, and Preliminary Sur-reply, we determine that the information presented in the Petition fails to shows a reasonable likelihood that Petitioner would prevail in establishing that any of claims 1–20 of the '258 patent is unpatentable.

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that the petition is *denied*.

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