

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LIBERTY ENERGY, INC. AND LIBERTY OILFIELD SERVICES LLC,
Petitioners,

v.

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

IPR2025-00778
U.S. Patent No. 11,959,533

PATENT OWNER'S PRELIMINARY RESPONSE

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PATENT OWNER'S EXHIBIT LIST

Exhibit No.	Description
2001	Declaration of Richard Quarles ISO Motion for PHV
2002	Order Denying Motion to Stay Pending Inter Partes Review
2003	June 3, 2024 Amended Complaint
2004	Notice of Markman Hearing Set for April 30, 2025
2005	Markman Hearing Memorandum and Order
2006	<i>Liberty Energy, Inc. and Liberty Oilfield Services LLC v. U.S. Well Services, LLC</i> , IPR2025-00066, Paper No. 10 (Apr. 29, 2025) (Institution Decision Denying Institution of Inter Partes Review)
2007	May 15, 2025 Amended Scheduling Order
2008	Liberty Email to PTAB Requesting Board to Terminate IPR2025- 00105
2009	<i>Liberty Energy, Inc. and Liberty Oilfield Services LLC v. U.S. Well Services, LLC</i> , IPR2025-00105, Paper No. 7 (Apr. 8, 2025) (Order Dismissing Petition for Inter Partes Review as Premature)
2010	USPTO Rescission of Memorandum Addressing Discretionary Denial Procedures
2011	<i>Liberty Energy, Inc. and Liberty Oilfield Services LLC v. U.S. Well Services, LLC</i> , IPR2025-00105, Paper No. 1 (Nov. 5, 2024) (Petition)
2012	U.S. Patent No. 10,598,258
2013	Durham Declaration ISO 258 Patent IPR
2014	Petitioners Email Stipulation (dated June 16, 2025)
2015	Liberty's Preliminary Invalidity Contentions
2016	Dudley, Darle W., " <i>Gear Handbook</i> ," McGraw-Hill Book Co. ("Gear Handbook")

2017	Lynwander, Peter, " <i>Gear Drive Systems</i> ," Macrel Dekker, Inc., New York, 1983.
2018	About AGMA – American Gear Manufacturers Association, available at https://www.agma.org/membership/about-agma/ . ("About AGMA PDF")
2019	Member List – American Gear Manufacturers Association, available at https://www.agma.org/membership/member-list/ . ("Member List -AGMA PDF")
2020	Gear Engineering 50+ Years Of Experience, United Gear, Inc., available at https://www.ugaco.com/gear-engineering/ . ("United Gears PDF")
2021	Reserved
2022	ZipRecruiter, " <i>What is a Gear Design Engineer and How to Become One</i> ," available at ziprecruiter.com/career/Gear-Design-Engineer/What-Is-How-to-Become .
2023	proconpump (New Smyrna Beach): Gear Design Engineer, available at https://join.com/companies/proconpump/13469702-gear-design-engineer . ("Proconpump job")
2024	Weiss, Shannon, Mechanical Engineer-Gear Design & Automation, August 3, 2017, available at https://www.cgimotion.com/mechanical-engineer-gear-design-automation/ . ("CGI job")
2025	Gear Design Engineer @ American Axle & Manufacturing-AAM JobzMall, available at https://www.jobzmall.com/american-axle-manufacturing-aam/job/gear-design-engineer . ("American Axle job")
2026	PTO Classification Definitions Class 475, "Planetary Gear Transmission Systems or Components," February 2007.
2027	Excerpts from D. T. Jelaska, " <i>Gears and Gear Drives</i> ," John Wiley & Sons, 2012.
2028	Bachelor of Science in Electrical Engineering, Cullen College of Engineering, University of Houston. ("EE course requirements")

2029	Bachelor of Science in Petroleum Engineering, Cullen College of Engineering, University of Houston. (“Pet. Eng. course requirements”)
2030	Bachelor of Science in Mechanical Engineering, Cullen College of Engineering, University of Houston. (“ME course requirements”)
2031	MECE 4331 Design of Machine Elements, Spring 2025
2032	“ <i>Welcome to PEM</i> ,” Power Engineering and Mfg. (“PEM”).
2033	“ <i>ITAMCO’s Next Generation Gear Manufacturing Revolutionizes Fracking Efficiency in the Oil Industry</i> ,” Indiana Technology and Manufacturing Companies, January 29, 2024. (“website”)
2034	Reserved
2035	“Best-Practice Gearbox Lubrication,” Gear Solutions Magazine, Jan. 1, 2010
2036	“Fatigue Failure of a Helical Gear in a Gearbox,” Engineering Failure Analysis, available at https://www.sciencedirect.com/science/article/abs/pii/S1350630705001780
2037	<i>Curriculum Vitae</i> of Dr. Michael Nikolaou
2038	Declaration of Dr. Michael Nikolaou regarding the 258 and 533 Patents

I. INTRODUCTION

Petitioner challenges the validity of all claims of U.S. Patent No. 11,959,533 (the “533 Patent”). But the Petition’s Grounds for unpatentability are deficient for numerous reasons,¹ including: (1) all grounds rely on Joyner, which is non-analogous prior art; (2) the Petitioner failed to meet its burden to show a POSITA had sufficient motivation to combine the minimum of five different prior art references required by the Grounds in the Petition without relying on impermissible hindsight; and (3) half the grounds rely on Buckley, which is not prior art. Notably, the Board previously denied institution of another petition in a related proceeding (IPR2025-00066) involving the parent patent² of the 533 Patent for much the same reason as set forth in (2) above.

For all Grounds, the Petition’s proposed prior art combinations were all based on hindsight. First, every ground relies on Joyner, which a POSITA would have never considered because it is non-analogous prior art. The Petition does not attempt to explain why Joyner is in the same relevant field as the 533 Patent or addresses a particular problem the 533 inventors faced. Second, the Petition failed

¹ This is in addition to the many reasons why trial should be denied for discretionary reasons, as set forth in Paper No. 7.

² U.S. Patent No. 10,598,258 (“the 258 Patent”) (EX-2012).

to provide sufficient evidence demonstrating that a POSITA would have been motivated to combine the many different pieces of prior art in the way proposed. The Petition does not apply the *Graham* factors needed for an obviousness analysis, nor explain how or why a POSITA would have combined the five disparate references to arrive at the claimed invention. The evidence confirms that a POSITA would not have been motivated to combine the prior art in the way Petitioner proposes. Indeed, Petitioner relies on Jelaska, which squarely contradicts the Petition's purported motivations to combine the prior art. Accordingly, the Petition's combination is improperly predicated on hindsight.

In Grounds 1A through 8A, Petitioner relies on Buckley as its primary reference. But Buckley is not prior art to the challenged patent. Therefore, to antedate the challenged patent, it was Petitioner's burden to show that Buckley is entitled to a priority date of its provisional application. The Petition does not—and cannot—satisfy this burden. Instead, the Petition improperly relies on (1) certain disclosures in Buckley that are not present in Buckley Provisional; and (2) certain disclosures in Buckley Provisional that are not incorporated by reference nor present in Buckley. Because Petitioner failed to meet its burden to show Buckley is entitled to an earlier priority date, Buckley does not qualify as prior art and thus Grounds 1A through 8A cannot support institution.

For the reasons explained in detail below, Patent Owner respectfully requests that the Board deny institution.

II. CHALLENGED U.S. PATENT NO. 11,959,533

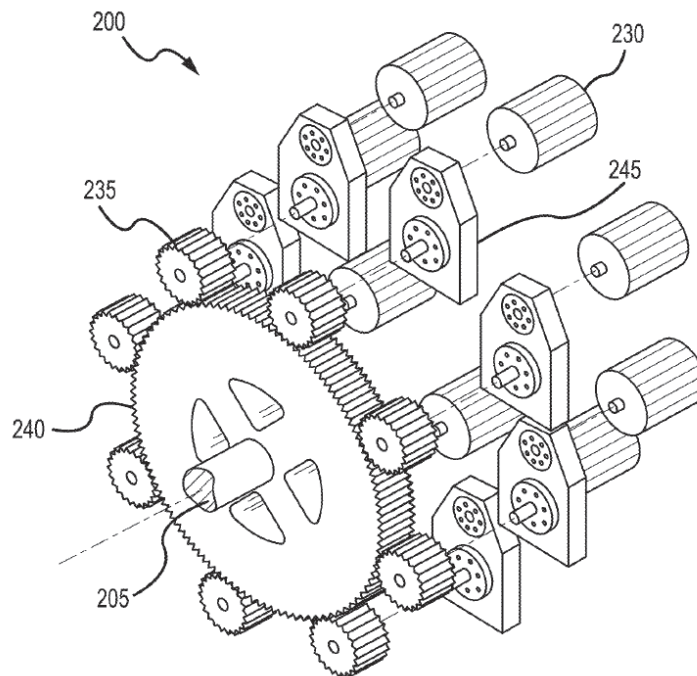
The effective filing date for the 533 Patent is December 5, 2017, which Petitioner does not dispute.

The 533 Patent is directed to hydraulic fracturing (fracking) in oil and gas wells, which entails pumping fluid into underground formations at high pressure using a multi-plunger pump configured to pressurize a fracturing fluid and injecting it into a wellhead for fracturing the subterranean formation. EX-1001, Abstract, 2:50–60. Pumping operations typically involve diesel-powered pumps, and these pumps work together for pressurizing fluid for delivery down a wellbore. *Id.*, 1:43–46. When a pump goes offline due to failure or maintenance, the speed of the remaining operational pumps must be increased to compensate. *Id.*, 1:46–49. But many top gears in these diesel transmissions provide speeds above the critical speed for associated plunger pumps, often resulting in pump damage. *Id.*, 1:49–55, 2:1–4.

To overcome this, the 533 Patent teaches a novel system and method of pumping fluid into a wellbore using a multi-plunger pump powered by multiple electric or hydraulic motors (230) coupled to a “planetary gear train [200]” with “input pinion gears [235] in rotational contact” with the motors. *Id.*, 2:52–64, 3:5–

7, Fig. 2. The 533 Patent further teaches using a gear ratio of the planetary gear train to select the operational speed of each motor using a “variable frequency drive (VFD)” to limit the maximum pump speed of the multi-plunger pump, preventing pump damage and increasing pump reliability. *Id.*, 2:64–67, 3:22–27.

To achieve this novel speed selection capability, the 533 Patent teaches that its planetary gear train includes speed reduction gearboxes (245) positioned between the input pinion gears and the motors to achieve a desired pump rate. *Id.*, 3: 1–4.



533 Patent, Fig. 2 (EX-1001)

III. ASSERTED PRIOR ART

Some of the prior art relied on in the Petition and discussed further herein is summarized below.

A. Buckley (EX-1004)

i. Buckley non-provisional

Buckley is directed to an “electric drive pump system” that includes a “power end” and a “detachable transmission assembly.” EX-1004, Abstract.

Buckley's transmission assembly is mounted to the power end (103) as shown in Figure 2 below.

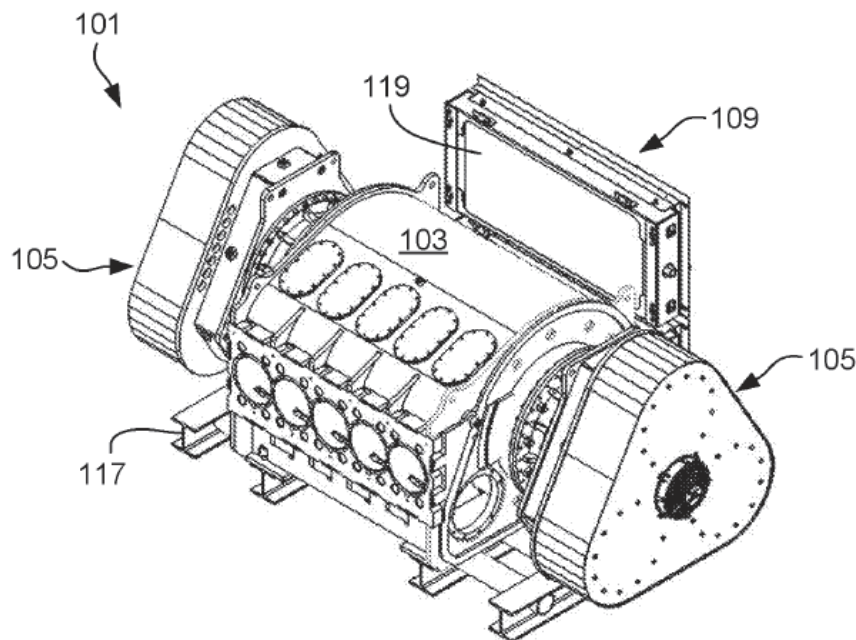


FIG. 2

Buckley, Fig. 2 (EX-1004)

Buckley's transmission provides "rotational power" to the power end using multiple electric motors. *Id.*, Abstract. The electric motors use a gearbox to drive an "output spline" that connects to the power end. *Id.* Buckley explains that the motors (111) within transmission assembly (105) are "arranged in a radial manner about output spline" as shown in Figure 9 below. *Id.*, [0052], Fig. 9.

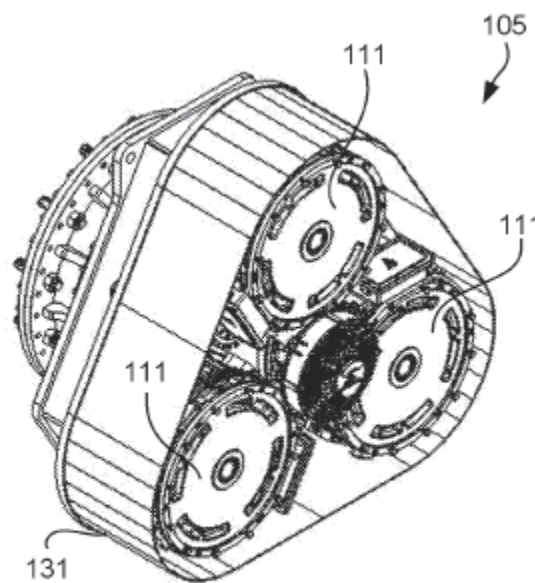


FIG. 9

Buckley, Fig. 9 (EX-1004)

ii. Buckley Provisional Application (EX-1005)

Buckley Provisional is directed to an electric pump "configured to incorporate a plurality of electric motors to the power end or pump portion of a pump system." EX-1005, 4, Fig. 2. Buckley Provisional explains that its motors are "configured to operate independently to vary the power supplied" to the pump,

without specifying any certain motor arrangement. *Id.* Buckley Provisional also explains that “[s]elected gearing may be used to assist in mating the electric motors to the power end” and that the gears “can be mounted at both ends of the pump,” though no specific gearing configuration is illustrated or specified so long as the chosen configuration permits the motors “to convey energy so as to operate the power end.” *Id.*, 5.

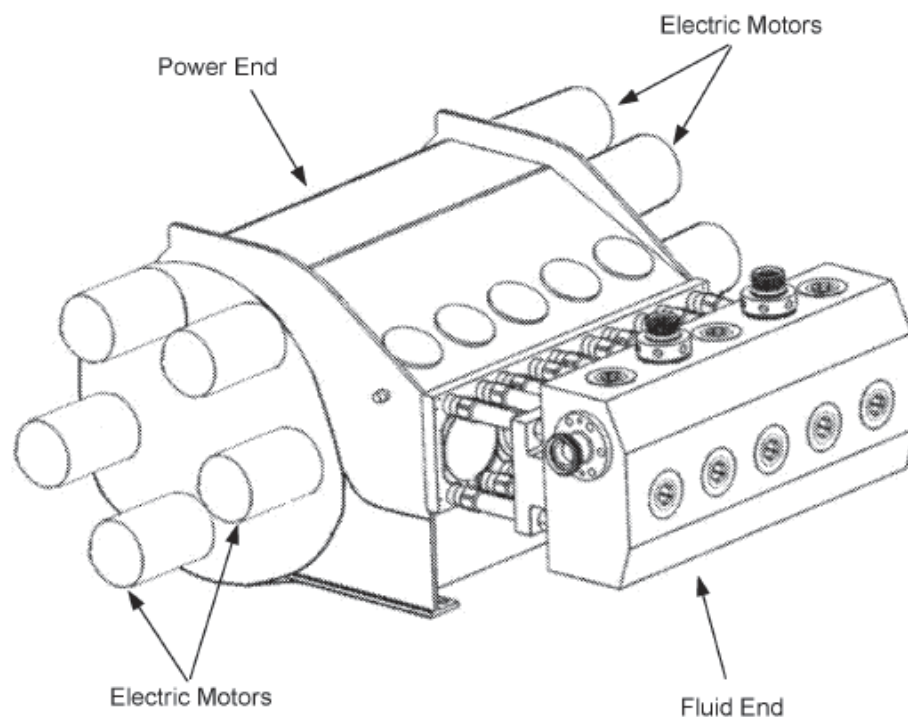


FIG. 2

Buckley Provisional, Fig. 2 (EX-1005)

B. Bergan (EX-1006)

Bergan is directed to a hoisting system with “drawworks” or winches that include compensation functions for use in floating drilling platforms such as

offshore drilling operations. EX-1006, [0003], [0007]. Bergan aims to solve disruptions created when offshore platforms “vertically rise and fall (i.e., heave) with waves in the water” by using active compensation functions to “compensate for [the] heaving motion of the floating vessel [] from wave action at the surface of the water.” *Id.*, [0003], [0024]. Drawworks control for active compensation is implemented using a controller that “send[s] command signals to motors of the drawworks [] that control rotation of [a] drum.” *Id.* [0027]. Figure 2, reproduced below, illustrates Bergan’s winch system in which “[m]otors 78 can be operated to drive rotation of the drum 74 to reel in or reel out the hoisting lines 20 to raise and lower an attached load,” and that “the motors are [also] actively controlled to compensate for heave.” *Id.*, [0030]. Bergan further explains that a “planetary gear system of the winch 72” connects the electric motors to the load and allows the electric motors to drive rotation of the drum to raise or lower the load. *Id.*, [0031]-[0032].

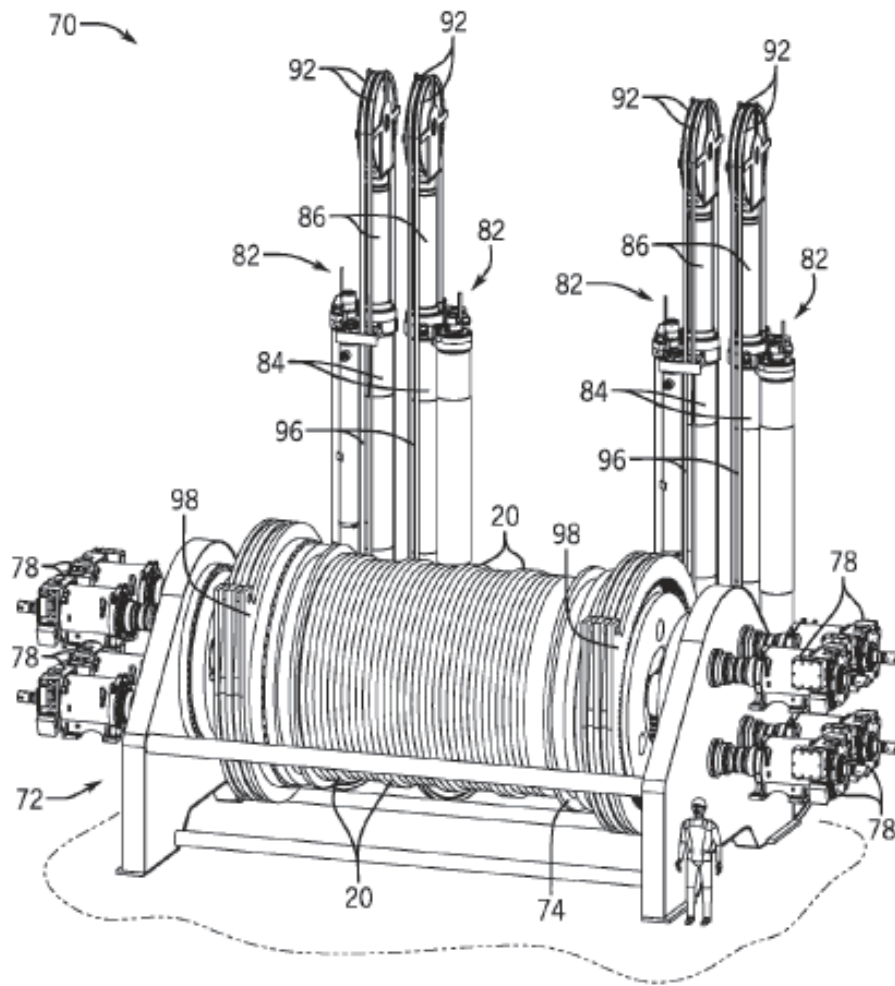


FIG. 3

Bergan, Fig. 3 (EX-1006)

C. Yi (EX-1010)

Yi is directed to a “fracturing pump transmission system” that includes “one or more engines, multiple oil pumps, and multiple motors.” EX-1010, [0007], [0008]. Yi’s system includes a “crankshaft-type plunger pump [5]” in which both

ends of the pump are “equipped with power input gears [51],” as illustrated in Figure 2 below. *Id.*, [0010], Fig. 2. Yi explains that each motor (4) “engages with the power input gears through a power output gear [41].” *Id.*

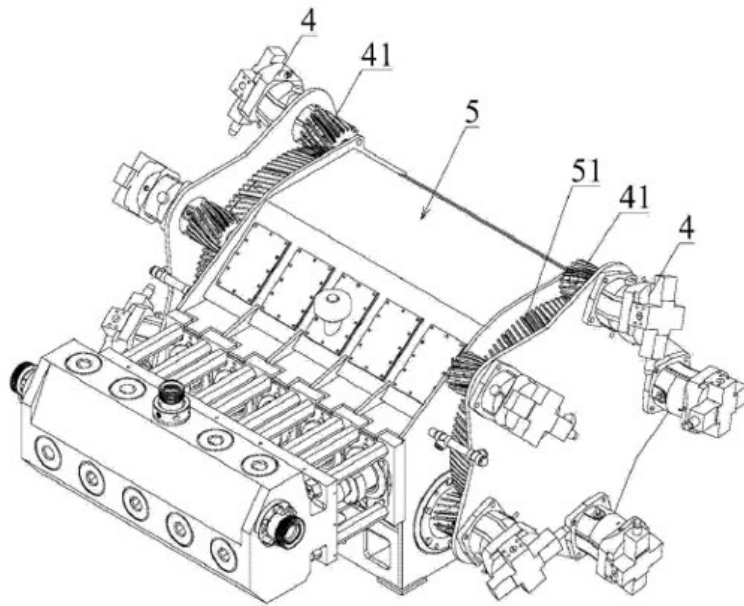


Figure 2

Yi, Fig. 2 (EX-1010)

D. Jelaska (EX-1012) and (EX-2027)

Jelaska describes multiple gear systems, the mathematical systems underlying their operation, their applications, and the pros and cons of each gear system depending on the application. *See generally* EX-1012. For example, Jelaska describes planetary gear systems and their relative shortcomings. These shortcomings include (1) increased complexity when compared to ordinary gear

drives (EX-2027, 341); (2) more frequent lubrication requirements due to smaller gear dimensions that accept less lubrication per application (*Id.*, 341); and (3) more challenging lubrication tasks, especially at high speeds (*Id.*, 382).

E. August (EX-1014)

August discusses a “star drive” configuration which has a “fixed carrier” to prevent relative motion from being introduced in the gear train. EX-1014, 154, Fig. B-1. This “star drive” configuration is shown in Fig. B-1 below:

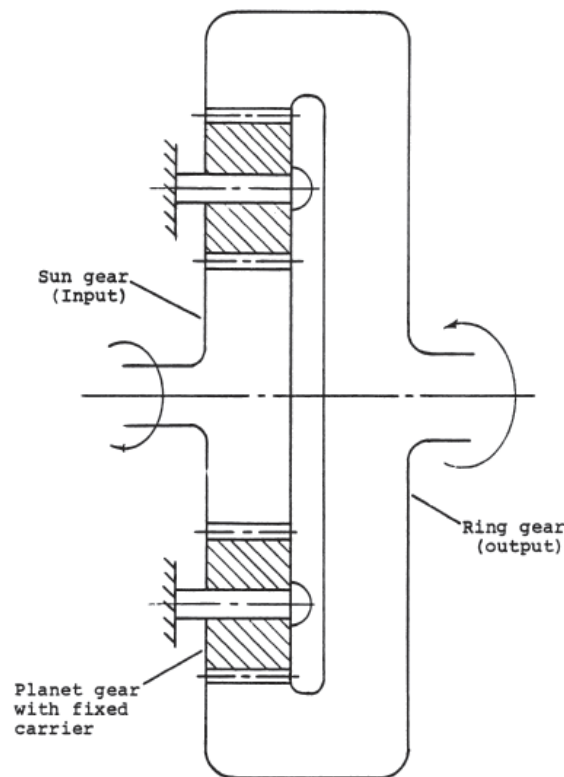
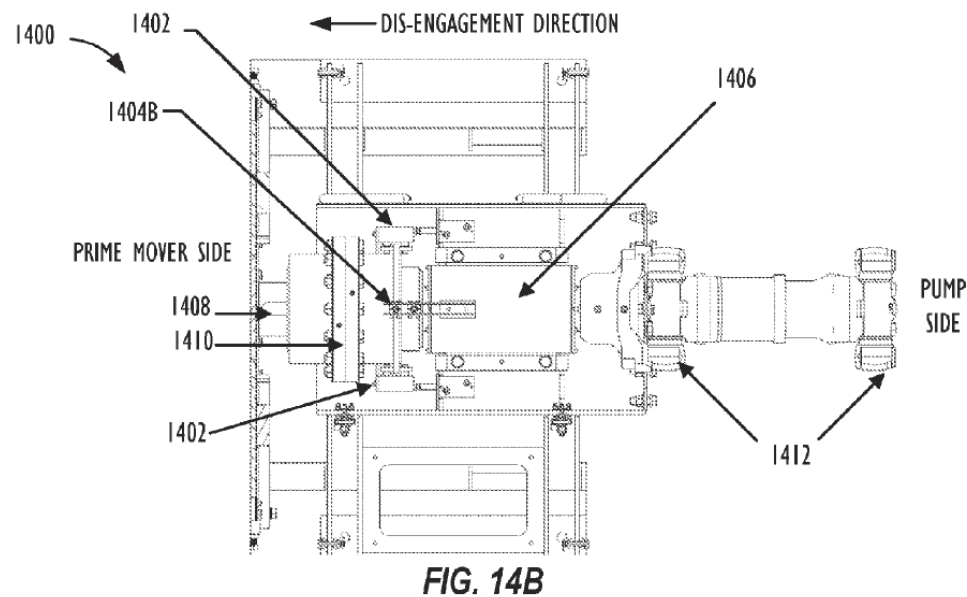


Figure B-1 - Star Arrangement

August, Fig. B-1 (EX-1014)

F. Morris (EX-1015)

Morris is directed to a “fracturing pump transport” comprising two fracturing pumps coupled on opposite sides of a “dual shaft electric motor.” EX-1015, Abstract. Morris explains that each pump may be engaged or disengaged from a “prime mover” (i.e., electric motor) using a “drive line assembly” (1400) as shown in Figure 14B below. *Id.*, [0092], Fig. 14B. Morris further explains that manual or remote instructions may be sent to switch “engagement coupling” (1410) to an engaged position or disengaged position to control pump operation. *Id.*



Morris, Fig. 14B (EX-1015)

G. Joyner (EX-1016)

Joyner is directed to a method of assembling components of a universal joint (10) that includes a “cross” (15) with a central body portion that has four “cylindrical trunnions (15a)” that extend outwardly as shown in Figure 1 below.

EX-1016, 3:19–22, Fig. 1. Joyner explains that two of the trunnions are adapted to be received in openings 13a and 14a of arms 13 and 14 of the “yoke” (11). *Id.*, 3:25–27. Joyner further explains that the assembly also includes hollow and cylindrical “Bearing cups” (16) that fit within openings 13a and 14a formed through arms 13 and 14 of the yoke and are retained by retainer clips 17. *Id.*, 3:27–31.

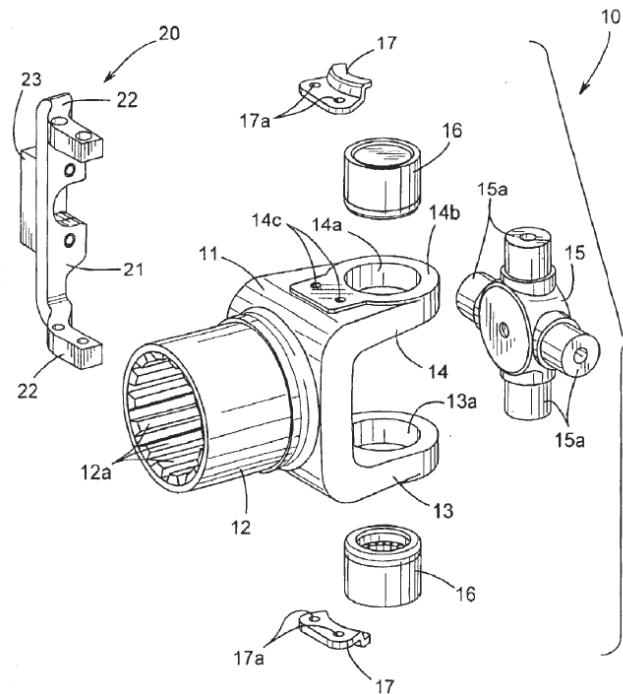


FIG. 1

Joyner, Fig. 1 (EX-1016)

IV. SKILL LEVEL OF A POSITA

For purposes of this preliminary response only, Patent Owner applies the same skill level proposed by Petitioner. *See* Pet., 12.

V. CLAIM CONSTRUCTION

Petitioner has not proposed any construction for the terms of the 533 Patent. Pet., 13. Patent Owner addresses claim construction positions, if any, in the body of its arguments below. Patent Owner reserves the right to propose constructions for any claim terms if the Board institutes trial.

**VI. ALL GROUNDS: EVERY GROUND IN THE PETITION IS
PREDICATED ON JOYNER, WHICH IS NON-ANALOGOUS ART.**

All Grounds of the Petition rely on Joyner (EX-1016), which is not analogous art to the 533 Patent. This deficiency dooms all Grounds.

Petitioner has the burden to show that all prior art used in a combination is analogous prior art. 35 U.S.C. § 316(e); *see Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1379 (Fed. Cir. 2015) (“[Petitioner] had the burden of persuasion to prove unpatentability by a preponderance of the evidence, and this burden never shifted.”). To do so, the Petition must show that the prior art satisfies one of two tests:

(1) whether the art is from the same field of endeavor, regardless of the problem addressed and, (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.

In re Bigio, 381 F. 3d 1320, 1325 (Fed. Cir. 2004). The Petition provides no such analysis for Joyner. This is not surprising because Joyner is non-analogous art.

Joyner is not in the field of art of the 533 Patent—drive systems for reciprocating plunger-style pumps used in hydraulic fracturing operations. *See* EX-1001, 1:22-25; *see also* Pet., 2 (stating that the 533 Patent generally relates to the same). Rather, Joyner is in the field of universal joints for providing a driving

connection between two members that are adapted to rotate about non-aligned axis of rotation. *See* EX-1016, 1:11-15; *see id.*, Abstract. Consequently, Joyner is not in the same field of endeavor as the 533 Patent.

The Petition's only reference to the field of endeavor of the 533 Patent is made when addressing Bergan (EX-1006). Specifically, the Petition notes that Bergan is in a field of art of the challenged 533 Patent: "using multiple motors and a planetary gear system for driving a load in oil and gas drilling." Pet., 8. Joyner is also inapplicable to this field of endeavor. *See* EX-1016, 1:11-15; *see id.*, Abstract.

The Petition also fails to explain how Joyner addresses a problem the 533 Patent inventors sought to solve. *See* Pet., 11, 23–25, 41-44. The only "potential problem" mentioned in the Petition concerning the 533 Patent is "coupling multiple electric motors to a load." Pet., 8. This alleged problem is identified in the context of discussing Bergan, not Joyner. *Id.* Regardless, Joyner has nothing to do with coupling electric motors to a load—indeed, Joyner never mentions motors or loads. Further, the Petition's reasoning for why a POSITA would have looked to Joyner is "to better understand details of such couplings that are not described in Morris." Pet., 23. But this, at most, shows that Morris and Joyner are analogous art—which is the incorrect test as a prior art needs to be analogous to the challenged 533 Patent.

Joyner cannot be reasonably pertinent to the problem facing the 533 Patent inventors because the 533 Patent never mentions any universal joint or joint. Notably, these terms do not appear anywhere in the 533 Patent's written description. *See* EX-1001. Without mentioning such terms, an inventor considering any problem addressed in the 533 Patent would not be motivated to turn to Joyner at the time of the invention, especially given that it is directed to universal joints and has no applicability to hydraulic fracturing. *See* EX-1016 *generally*. Joyner also would not have logically commended itself to the attention of the 533 Patent's inventor. *In re Clay*, 966 F.2d 656, 659 (Fed Cir. 1992). Consequently, Petitioner has not demonstrated a reasonable likelihood of prevailing in demonstrating that the challenged claims would have been obvious over any combination of prior art relying on Joyner, which is required in all 16 Grounds presented. *The Chamberlain Grp., LLC, v. Overhead Door Corp.*, IPR2022-00842, Paper 9 at 37 (PTAB Oct. 25, 2022) (denying institution because one of the two grounds relied on non-analogous prior art); *In re Nat. Alternatives, LLC*, 659 F. App'x 608, 614 (Fed. Cir. 2016). For this reason, trial should be denied.

VII. GROUNDS 1A THROUGH 8A: THE PETITION HAS NOT SHOWN A REASONABLE LIKELIHOOD OF SUCCESS IN PREVAILING GIVEN THAT THE PRIMARY REFERENCE, BUCKLEY, IS NOT PRIOR ART.

For Grounds 1A through 8A, the Petition relies on two different embodiments: one from Buckley (EX-1004) used in Grounds 1A-8A and another from Buckley's September 25, 2017, Provisional Application (EX-1005). Neither can invalidate the challenged claims. As to the former, Buckley's Provisional Application does not provide written description support for the first embodiment. As such, this first embodiment in Buckley is not prior art to the 533 Patent. As to the latter, the embodiment Petitioner relies on in Buckley's Provisional Application does not appear in Buckley and was not incorporated by reference into Buckley. This embodiment is therefore not part of Buckley and cannot be used as prior art in Grounds 1A-8A. Consequently, the Buckley disclosures relied on in the Petition cannot render the challenged claims unpatentable because they are either (1) not entitled to an earlier effective filing date that antedates the challenged patent, or (2) not included in the reference used in the Grounds.

A. The Petition relies on different embodiments and corresponding disclosures from Buckley's non-provisional and provisional applications.

Grounds 1A through 8A all rely on a combination of prior art with PCT No. PCT/US2018/052755 ("Buckley") being the primary reference. *See* Pet., 6; *see id.*,

11-12 (describing Grounds 1A through 8A challenging 533 Patent using Buckley as primary reference). Buckley was filed September 25, 2018, *see* EX-1004, cover—which is over nine months after the “effective filing date of the [challenged] ’533 patent [of] December 5, 2017,” Pet., 5.³ To establish Buckley as prior art, the Petition must rely on Buckley’s Provisional Application No. 62/562,943 (EX-1005) (“Buckley Provisional”) that was filed on September 25, 2017. But if Buckley Provisional does not describe the disclosures in Buckley relied on in the Petition as allegedly invalidating the challenged claims, Buckley does not qualify as prior art. *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 or other application(s) to which the reference patent document claims a right of priority must ‘describe [] the subject

³ The 533 Patent claims priority to a provisional application filed on December 5, 2017. EX-1001, cover page. Petitioner does not contest that this provisional application constitutes the “effective filing date” of the 533 Patent. Pet., 5. Thus, the effective filing date of December 5, 2017, predates Buckley’s September 25, 2018, filing date. *See* EX-1004.

matter' relied upon in the reference patent document as prior art.") (citing 35 U.S.C. § 102(d)(2)).

The Petition incorrectly contends that "the subject matter relied upon in Buckley is disclosed in Buckley provisional." Pet., 6. That is demonstrably not so. As explained below, the Petition relies on certain disclosures in Buckley that are not present in Buckley Provisional; put differently, Buckley provisional does not "describe the subject matter" in Buckley on which the Petition relies. In addition, the Petition relies on disclosures in Buckley Provisional that are not found in Buckley, nor is Buckley Provisional incorporated by reference into Buckley.

1. Buckley's cited disclosures are not present in Buckley Provisional.

The Petition cites disclosures from Buckley that are not included in Buckley Provisional. Consequently, as to those disclosures, Buckley does not antedate the 533 Patent and is not prior art.

Petitioner has the "initial burden, not just to compare the challenged claims with the disclosure in [Buckley], but to show that the subject matter that [Petitioner] relies on in [Buckley] is also found in the [Buckley] Provisional." *Forescout Tech., Inc., v. Fortinet, Inc.*, IPR2021-01328, Paper 12 at 9-10 (PTAB Jan. 27, 2022); *see also Lyft, Inc. v. Ikorongo Tech.*, IPR2021-00423, Paper 10 at 12 (PTAB July 26, 2021) (denying institution and holding that the "provisional

application must provide sufficient support for the subject matter relied upon for prior art purposes in the reference patent or published patent application.”).

Accordingly, “subject matter disclosed in [Buckley] is only available as prior art to the [challenged] patent to the extent it also is described in [Buckley Provisional].”

Forescout, at 9 (denying institution because the petition did not show that the lead reference qualified as prior art when a provisional application did not provide written description support for it). Section 102(d)(2) of 35 U.S.C. further confirms that the same subject matter must be described in both the non-provisional and provisional applications for entitlement of prior art:

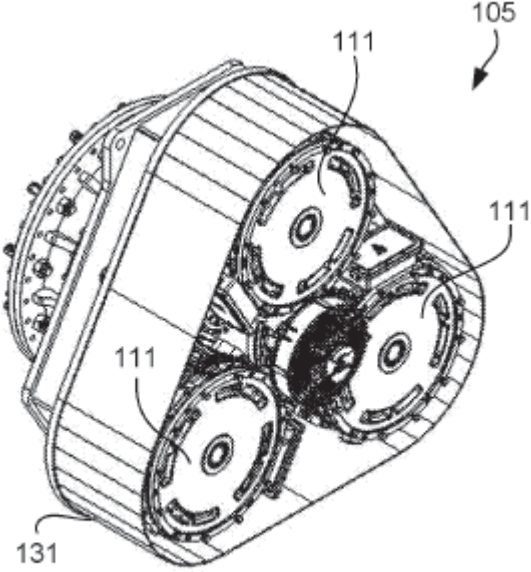
“For purposes of determining whether a patent or application for patent is prior art to a claimed invention under subsection (a)(2), such patent or application shall be considered to have been effectively filed, with respect to *any subject matter described in the patent or application . . . as of the filing date of the earliest such application that describes the subject matter.*

35 U.S.C. § 102(d)(2) (emphases added). For Buckley to be entitled to an earlier priority date, Petitioner is required to show that the subject matter relied on in Buckley is disclosed in both Buckley and Buckley Provisional.⁴

The Petition fails to meet this requirement for the disclosures in Buckley relied on in the Grounds in the Petition. Stated otherwise, the Petition relies on Figures and disclosures from Buckley in its Grounds that are not described anywhere in Buckley Provisional. These include the following disclosures:

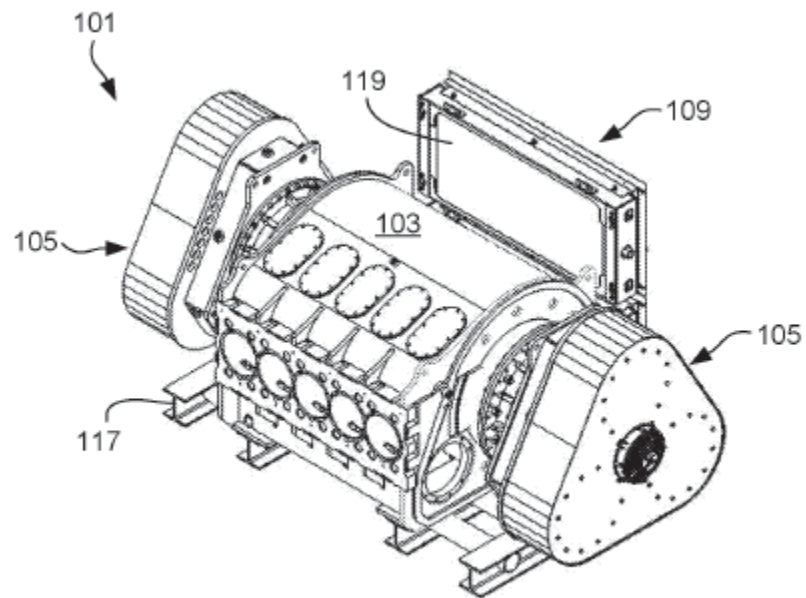
Petition Cite	Buckley Disclosure
Pet., 19	EX-1004, [0009]: Buckley discloses that its “motors are arranged around a gearbox which is used to convert the rotary motion of the electric motors into linear motion for operation of the plungers in the fluid ends.”

⁴ Patent Owner also notes that Buckley Provisional includes two inventors, EX-1005, 1—namely, Chris Buckley and Paul Lightfoot—while Buckley lists only one inventor, EX-1004, Face.

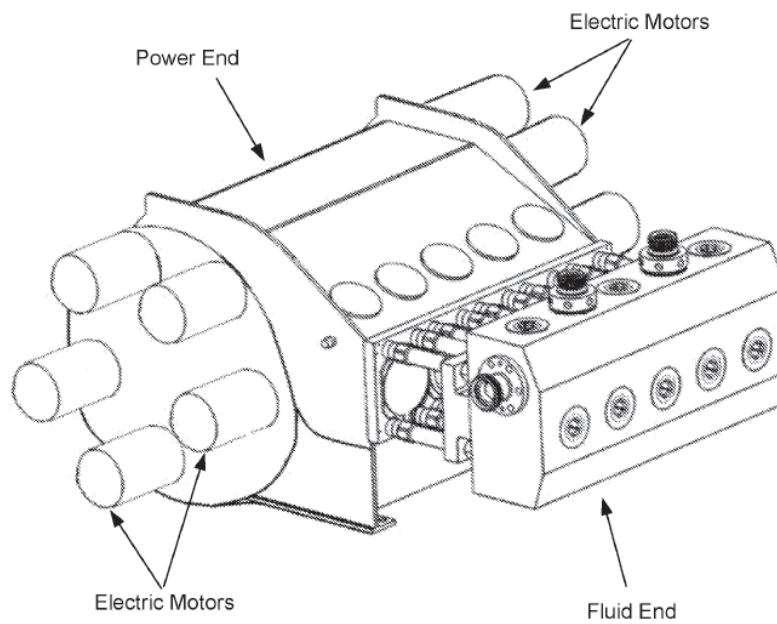
Petition Cite	Buckley Disclosure
Pet., 32	 FIG. 9 Buckley (EX-1004), Fig. 9
Pet., 30	EX1004, [0009]: Buckley discloses that its electric drive pump includes “a plurality of individual motors in selective configurations that work together to provide power to a power end,” and that the motors “are arranged 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 end” of the electric drive pump.

Petitioner points to no corresponding disclosures in Buckley Provisional that describe the above subject matter. As such, the Petition fails to show that the above subject matter is entitled to the filing date of Buckley Provisional. *Lyft*, at 15 (explaining Petition was deficient in showing prior art was entitled to its priority date for several reasons, including “Petitioner relie[d] on Figure 5B of Callegari, but Figure 5B *does not appear* in the Callegari ’187 Provisional” and Petition’s “quoted language does not appear anywhere in the Callegari ’187 Provisional.”) (emphasis in original); *see also Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351–52 (Fed. Cir. 2010) (en banc) (while *in haec verba* recitation is not necessary to determine whether an inventor has possession of the claimed subject matter as of the filing date, the disclosure must do more than “merely render[] the invention obvious”). Thus, the Petition failed to show that the same subject matter in the table above from Buckley is sufficiently described in Buckley Provisional.

In addition, the Petition relies on Figure 2 of Buckley multiple times in its Grounds. *See* Pet., 27, 29, 31 (each including annotated versions of Figure 2); *see also* Pet., 16. A comparison between Buckley Figure 2 and Buckley Provisional Figure 2 shows a different embodiment in each reference, as illustrated below:



Buckley (EX-1004), Fig. 2.



Buckley Provisional (EX-1005), Fig. 2.

The Petition confirms that the above Figures describe different embodiments (along with having different corresponding disclosures) because it already includes the key feature requiring a combination of Buckley with Bergan. Buckley's Figure 2's transmission assembly 105 has a planetary gear system, EX-1004, [0051] (describing the transmission assembly 105 includes a planetary assembly 129); *see also id.*, [0053]-[0054] (describing a planetary system 133 (i.e., gears) and depicted in Figures 11–14)—that is, the same planetary gear feature that the Petition relies on Bergan in combination with Buckley to disclose. *See* Pet., 19 (“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 to couple Buckley’s multiple motors with its pump crankshaft via Bergan’s planetary gear system.”). In contrast, Buckley Provisional contains no disclosure of any planetary gear system. Cf. EX-1005, 5 (identifying only “selected gearing” or a “transfer gear system”), Figs. 1, 2 (showing only black-box “gearing”).

If Buckley's Figure 2 were properly supported by Buckley Provisional, the Petition would have no need to combine Buckley with Bergan to address the challenged claims. The Petition thus failed to—and cannot—show that the same subject matter of Figure 2 is disclosed in both Buckley and Buckley Provisional.

For the above reasons, the subject matter from Buckley relied on in the Petition is not described in Buckley Provisional. Consequently, Buckley is not entitled to the earlier filing date of Buckley Provisional and does not antedate the 533 Patent.

2. Buckley Provisional disclosures are not present in Buckley because they are not incorporated by reference.

As explained above, section 102(d)(2) of 35 U.S.C. requires that the same subject matter must be described in both the non-provisional and provisional applications for a patent to be entitled to an earlier priority date for that subject matter. *See also* MPEP § 2136.02 (explaining similar treatment for pre-AIA patents required that, when a reference is used in a prior art rejection, “the disclosure relied on in the rejection must be present in the” prior art reference). Here, Buckley does not incorporate Buckley Provisional by reference. *See* EX-1004 (Buckley identifies Buckley Provisional only in the “Related U.S. Application Data” on the cover page, not in the written description). Because Buckley contains no incorporation by reference language, Buckley Provisional disclosures are not present in Buckley as a matter of law. *See Apple Inc. v. U.S. Int’l Trade Comm’n*, 725 F.3d 1356, 1362-63 (Fed. Cir. 2013) (rejecting argument that a prior art patent (Perski) incorporated by reference material from an earlier-filed provisional application (Morag): “[t]o incorporate material by reference, the host document

must identify with detailed particularity what specific material it incorporates and clearly indicate where that material is found in the various documents.”).⁵

Consequently, the Petition's reliance on disclosures in Buckley Provisional is improper, because those disclosures are not present in Buckley. This includes at least the following disclosures:

- Figure 2, including any annotations, from Buckley Provisional, Pet., 16, 28, 29, 33;
- Quoted passages from Page 4 of Buckley Provisional, Pet., 30, 32; and
- Quoted passages from page 5 of Buckley Provisional, Pet., 19–20.

By citing and relying on the above disclosures, the Petition's Grounds 1A through 8A cannot support institution because these disclosures are not subject matter found in Buckley. As such, they cannot be considered in analyzing how Buckley

⁵ In *Apple*, the Court found that Perski made only a “passing reference” to Morag and did not “affirmatively incorporate any information.” *Id.* at 1362. That applies equally here. Buckley does not “affirmatively incorporate any information,” *id.*, much less information found in Buckley Provisional.

discloses the challenged claims. *See Apple*, 725 F.3d at 1363 (“Because Perski ... does not incorporate by reference the anticipatory subject matter from Morag, the ITC’s finding that Perski ... anticipates [the asserted claim] lacks substantial evidence.”).

3. Buckley’s obvious differences from Buckley Provisional do not sufficiently support Buckley being entitled to an earlier date.

As confirmed above, Petitioner never attempts to explain how a POSITA would have understood that Buckley Provisional describes the subject matter in Buckley, as it was required to do. *Forescout*, at 9-10 (“Forescout has an initial burden ... to show that the subject matter that Forescout relies on in Thomas is also found in the Thomas Provisional.”). This failure is fatal to the Petition’s Buckley grounds. *Id.* at 10 (“Because Forescout has not met that burden, we determine that Forescout has not adequately shown that it is reasonably likely to prevail on the issue of whether Thomas is prior art to the challenged claims of the [challenged] patent under 35 U.S.C. § 102(a)(2).”).

Moreover, to the extent that Petitioner later argues that Buckley Provisional provides sufficient description for Buckley to be entitled to an earlier effective filing date, such an argument fails. In its proposed combination, and as explained above, the Petition effectively argues Figure 2 of Buckley is an obvious variant of the embodiment of Figure 2 in Buckley Provisional. An obvious variant found in

the provisional, however, is insufficient for Buckley's Figure 2 to be entitled to the earlier filing date. The Federal Circuit has held that "entitlement to a filing date" cannot be based on a disclosure that has obvious changes but must necessarily be disclosed. *Lockwood v. Am. Airlines*, 107 F.3d 1565, 1571–72 (Fed. Cir. 1997) ("Entitlement to a filing date does not extend to subject matter which is not disclosed but would be obvious over what is expressly disclosed. It extends only to that which is disclosed."); *see also* MPEP § 2163 (explaining "a description that merely renders a claimed invention obvious may not sufficiently describe the invention for the purposes of the written description requirement"). Because Figure 2 in Buckley is not found in Buckley Provisional and is (at best for Petitioner) only an obvious variant of Figure 2 in Buckley Provisional, Buckley Provisional does not provide sufficient written description support to entitle Buckley to an earlier priority date.

For all these reasons, Petitioner's Grounds 1A–8A are deficient and cannot support the conclusion that the Petition demonstrates a reasonable likelihood of showing that Petitioner will prevail in proving that the challenged claims would have been obvious.

**VIII. THE PETITION HAS NOT SHOWN A REASONABLE
LIKELIHOOD OF SUCCESS IN PREVAILING IN ANY GROUND
BECAUSE ITS OBVIOUSNESS ANALYSIS IS FLAWED.**

The Petition's obviousness analysis fails for at least three reasons. First, the petition fails to properly analyze the *Graham* factors in its prior art combination for all grounds. Second, the petition fails to explain how or why a POSITA would have combined the prior art to arrive at the claimed invention. The Petition instead presents a convoluted implementation requiring multiple, different gears and/or joints from four different references without sufficiently explaining how to combine such references. Finally, the Petition fails to provide a sufficient reason to combine Bergan's planetary gear system in the systems of Buckley and Yi.⁶ The POSITA as defined by Petitioner's expert Dr. Durham does not possess the level of skill needed for making such a combination. Indeed, Dr. Durham failed to explain how a POSITA as he defined it would have had enough knowledge of gear system design to appreciate the alleged obviousness of making the combinations Dr. Durham proposes. Instead, he provides only a cursory analysis of the alleged

⁶ In this Section, Patent Owner addresses the Buckley-based Grounds on the merits but continues to assert that those Grounds are deficient for the reasons discussed *supra*.

motivations to combine, and/or describes them as a simple substitution despite the Petition's own cited evidence showing otherwise. The Board previously found similar deficiencies in the IPR2025-00066 petition involving the 258 Patent (the parent to the 533 Patent), which resulted in the Board's denial of institution. *See Liberty Energy v. U.S. Well Servs.*, IPR2025-00066, Paper No. 10 (PTAB Apr. 29, 2025). Each of these three reasons renders all Grounds in the Petition deficient.

A. The Petition presents an improper obviousness analysis in combining Morris and Joyner that is fatal to its combination in all Grounds.

The Petition relies on a combination of secondary reference—that is, Morris and Joyner—without addressing the requisite obviousness analysis from *Graham v. Deere*. *See* Pet., 23–24; *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17 (1966) (“[o]ne of three conditions, each of which must be satisfied, lends itself to several basic factual inquiries,” including the factors of “the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained. . .”); *see id.*, 383 U.S. at 18 (“We believe that strict observance of the requirements laid down here will result in that uniformity and definiteness which Congress called for in the 1952 Act.”). When combining Morris and Joyner, the Petition presents no analysis of the “scope and content of the prior art” or any “differences between the prior art and the claims at issue” in the parent combination of Bergan, Yi, Buckley, or August—all of which must be

addressed as part of the *Graham* factors. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 407 (2007) (While the sequence of these [*Graham* factors] might be reordered in any particular case, the factors continue to define the inquiry that controls."). Notably, the Petition instead analyzes what is missing from Morris alone—a reference not involved in the purported combination: “[a] POSITA would have searched for other references to better understand details of such couplings that are not described in *Morris*.” Pet., 23. Rather than using the requisite *Graham* factors, the Petition improperly uses Morris as a guiding reference for a POSITA’s analysis and motivation to combine Morris and Joyner. Pet., 23 (“One such reference is Joyner, whose disclosure of particular details about universal joints and their components would be useful to a POSITA looking to implement the teachings of Morris to a practical system.”); see Pet., 23. Failing to address the requisite *Graham* factors is fatal to the Petition’s Grounds and further demonstrates that all of Petition’s Grounds are driven by hindsight.

B. The Petition fails to explain how or why a POSITA would combine the prior art without hindsight and presents a convoluted implementation requiring five disparate references without sufficiently explaining how to combine such references.

To appreciate the extreme nature of Petitioner’s hindsight-driven analysis, consider that the focus of the 533 patented invention is a multi-plunger pump for hydraulic fracturing operations driven by multiple motors, where a planetary gear

system is used to adjust the speed of the motors to limit the pump speed. EX-1001, Abstract; claim 1. The invention sought to avoid issues plaguing pump operation, such as damage caused by cavitation, and is advantageous because, *inter alia*, it reduces the likelihood of the pump malfunctioning from cavitation or running the pump at too great a speed, while still providing for efficient, effective pump operation. *Id.*, 1:46-58; 2:21-67.

The Petition fails to address the complexity of the proposed combination of prior art by incorrectly presenting the combination as a simple implementation. Petitioner committed the same error in IPR2025-00066. There, Petitioner challenged claims in the 258 parent patent relying on Bergan's planetary gear system in Buckley and Yi's fracturing pumps. In doing so, Petitioner advanced many of the same proposed rationales for why and how a POSITA would have made such a combination. *Compare* Pet., 15–21 *with* *Liberty Energy. v. U.S. Well Servs.*, IPR2025-00066, Paper No. 1 (Nov. 5, 2024) (Pet.), at 14–20. The Board determined that Petitioner's rationales failed to “sufficiently explain[] what changes would be needed or why a POSITA would have been motivated to make such changes.” *See* *Liberty Energy. v. U.S. Well Servs.*, IPR2025-00066, Paper No. 10 at 20 (“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.”). The present Petition again alleges such a combination would be a simple substitution, *see* Pet. 20–21, but notably proposes even more complicated prior art combinations than the petition in IPR2025-00066 by requiring disclosures from a minimum of five references to match the innovative design claimed in the 533 Patent: Buckley (EX-1004) or Yi (EX-1010), in combination with Bergan (EX-1006), August (EX-1014), Morris (EX-1015), and Joyner (EX-1016). Thus, Petitioner's motivation to combine arguments—which the Board found lacking in IPR2025-00066—are even more tenuous here.

It is true that Buckley and Yi are directed to operating multi-plunger pumps with multiple motors. But to those references, Petitioner proposes that a POSITA would then add:

- Bergan, which is directed to solving a problem specific to offshore drilling platforms floating on water—compensating for the vertical rise and fall (called “heave”) of the platform caused by waves. EX-1006, [0003]. Bergan proposes a system and method for using a motion detection unit that detects the heave of the platform and a controller to operate a rotatable drum and winch to compensate for the heave. *Id.*, [0007], [0026]. The Bergan system and method is not directed to controlling fracturing pumps. Thus, aside from being broadly directed toward the

petroleum industry, Bergan has no applicability to the Buckley and Yi systems, which are land-based and directed to operating pumps for hydraulic fracturing operations, not to compensate for heave in water-based drilling operations.

- August, which is a 1984 reference directed to a “comprehensive method for analyzing the static and dynamic loads in a planetary gear system.” EX-1014, 236. August discloses a “computer program so that the static and dynamic behavior of individual components can be examined.” *Id.* August has no disclosure of oil/gas drilling operations or hydraulic fracturing. And considering that August is from 1984, whatever innovation may have existed at the time regarding the disclosed computer program, a POSITA in 2017 would have found August hopelessly outdated. Thus, Petitioner's addition of August is based on its assumption that a POSITA in 2017 would have found August relevant to designing a gear system for hydraulic fracturing operations. That assumption has no basis and is not supported by August.

- Morris, which is directed to a mobile transport for two fracturing pumps, with a drive assembly that selectively connects one pump or the other to a dual shaft electric motor. EX-1015, Abstract; Figs. 11-12; [0006]. Although not entirely clear, the advantage of the Morris system appears to be the use of “electric fracturing components,” including a mobile source of electricity. This allows the fracturing operation to “reduce its ‘footprint’ at a site.” *Id.*, [0039]. Morris,

however, appears to *teach away* from the planetary gear system proposed in the 533 Patent, by explaining that use of a gear system may result in a gear breaking and causing “damage [to] the pump.” *Id.*, [0085]. Morris concludes that to avoid this, a pump would need to be “customized,” but this would “lead to an increase in manufacturing cost” and would “also decrease the operational and maintenance flexibility” of the pump system. *Id.* Not surprisingly, Petitioner ignores this passage from Morris that would plainly dissuade a POSITA from combining Morris with Buckley or Yi.

- Joyner (discussed above), which is directed to improving the manufacturing and assembly process for producing so-called “universal joints,” which are “devices that provide a driving connection between two members that are adapted to rotate about non-aligned axes of rotation.” EX-1016, 1:17-19. Joyner discloses a “method and an apparatus for assembling components of a universal joint, such as a cross and a yoke, such that the rotational center axes thereof are co-axially aligned during the assembly process.” *Id.*, 2:8-11. Joyner does not disclose that such universal joints are used in the petroleum industry, much less have applicability to hydraulic fracturing operations. Joyner has no connection to the 533 patented technology other than Petitioner's need to find a reference to fill missing gaps in its obviousness analysis.

Petitioner's argument that a POSITA would have been motivated to cobble together these disparate references is not credible and is a textbook example of impermissibly using the claimed invention as a guide for assembling the prior art. As the Federal Circuit has long held, when analyzing obviousness under § 103, it is critical that the claimed invention "be viewed not with the blueprint drawn by the inventor." *Interconnect Planning Corp. v. Feit*, 774 F.2d 1132, 1138 (Fed. Cir. 1985). In *Interconnect*, the Court vacated an obviousness finding because the district court fell victim to hindsight: "[f]rom its discussion of the prior art it appears to us that the court, guided by the defendants, treated each reference as teaching one or more of the specific components for use in the Feil system, although the Feil system did not then exist. Thus, the court reconstructed the Feil system, using the blueprint of the Feil claims. As is well established, this is legal error." *Id.* at 1139.

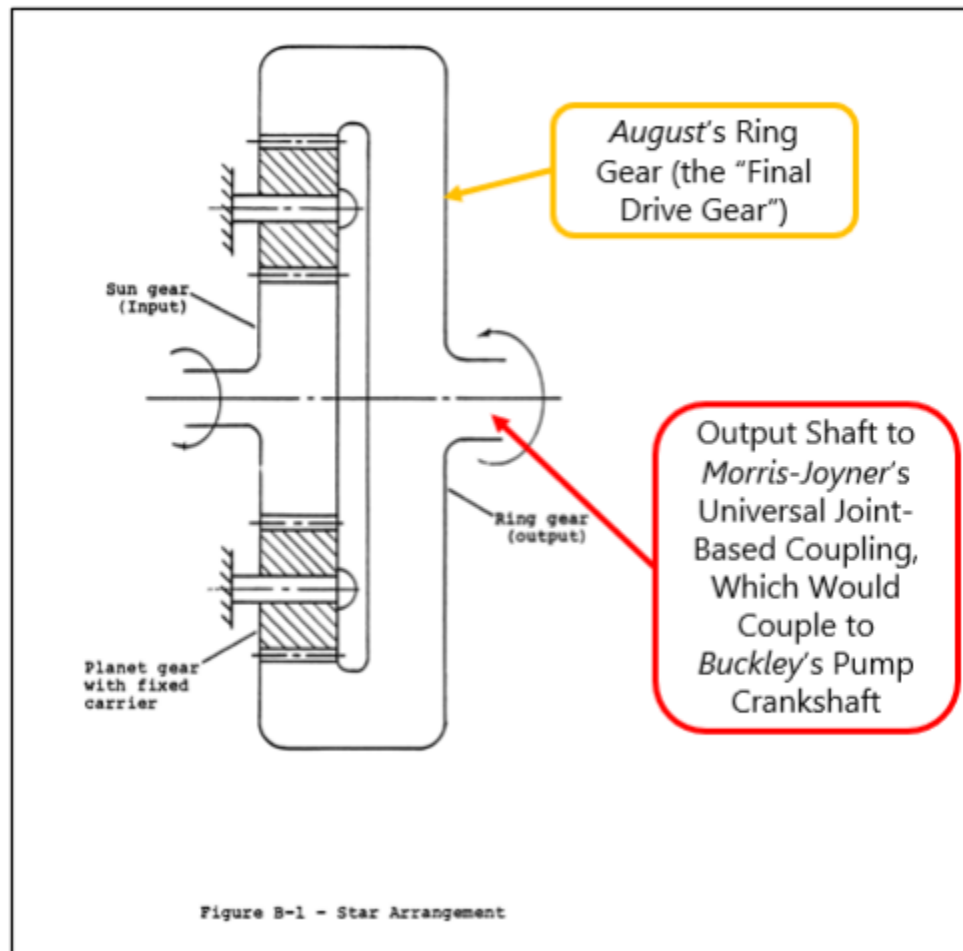
Petitioner urges the Board to commit the same error. Just as Petitioner does here, the district court in *Interconnect* improperly based its obviousness analysis on the "features" of the claims, rather than the "claimed ... system as whole." *Id.* at 1141 ("It is impermissible to first ascertain factually what appellants did and then view the prior art in such a manner as to select from the random facts of that art

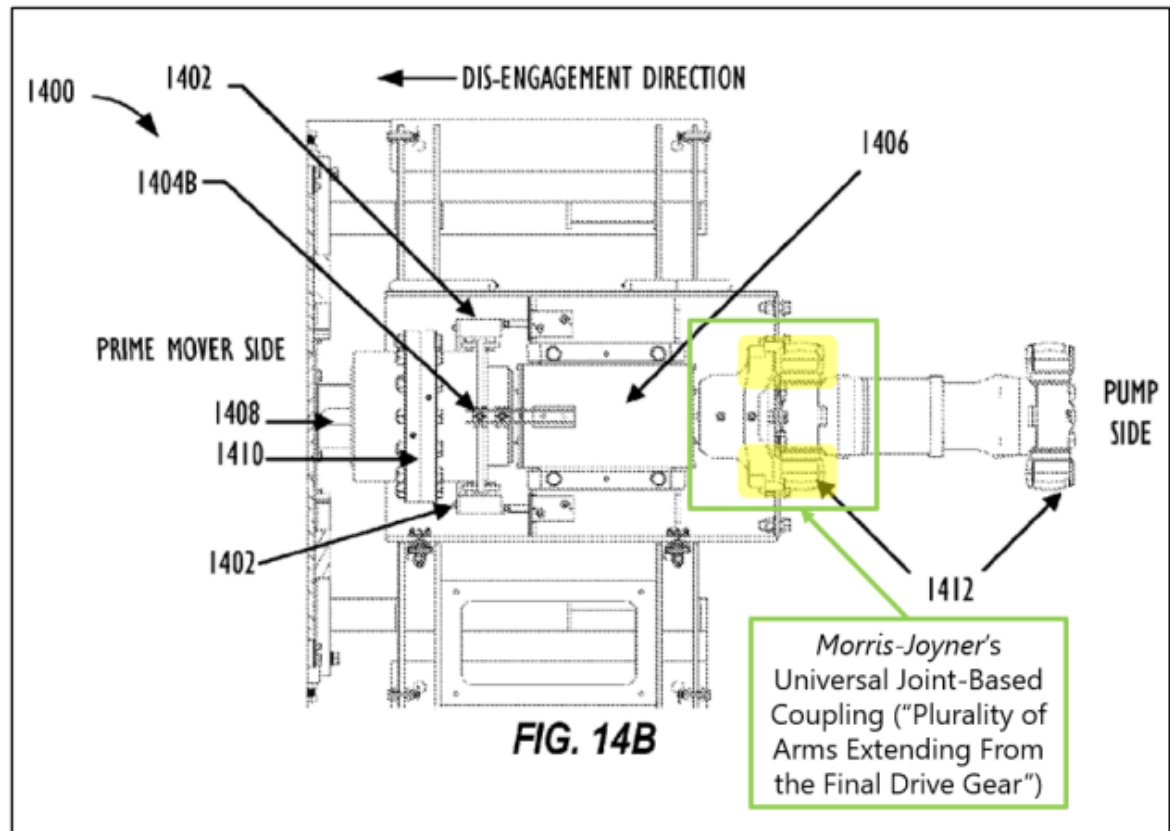
only those which may be modified and then utilized to reconstruct appellants' invention from such prior art."').⁷

Even if a POSITA would have combined all these references without hindsight, the Petition further complicates the proposed combination in how it combines the references. The Petition first combines Morris and Joyner—with each other and not individually with Buckley-Bergan-August—to make a standalone combination. Pet., 23-24. After doing so, the Petition improperly⁸ proposes combining two different prior art combinations—that is, “the pumping system of the Buckley-Bergan-August combination with the fixed couplings of the Morris-Joyner combination,” Pet., 24—resulting in a Frankenstein combination that finds no support in the law. Worse, it is unclear how the resulting combination is implemented in the systems of Buckley or Yi or how each combination connects to the other combination, as shown in the Petition's annotated drawings:

⁷ Put differently, the 533 Patent claims are being “used as a frame, and individual, marked parts of separate prior art references [are] employed as a mosaic to recreate a facsimile of the claimed invention.” *W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1552 (Fed. Cir. 1983). The Federal Circuit has rejected this approach. *Id.*; see *Interconnect*, 774 F.2d at 1143.

⁸ See *supra* § VIII.A.





Annotated Figures from Pet., 42–43:

see also Pet., 24-25 (failing to explain how a POSITA would have combined the prior art to arrive at the claimed invention). The above diagrams do not sufficiently show how it is possible to arrive at any proposed combination of prior art that purportedly renders the challenged claim obvious—that is, incorporate Bergan's planetary gear system—along with the further modifications necessary from August, Morris and Joyner—into the Buckley and Yi systems. Pet., 18. *See Palo Alto Networks, Inc. v. Centripetal Networks, LLC*, 122 F.4th 1378, 1386 (Fed. Cir.

2024) (“The question in an obviousness inquiry is whether it would have been obvious to a [POSITA] to combine the relevant disclosures of the two references, not whether each individual reference discloses all of the necessary elements.”).

Without such an explanation, the Petition fails to show how “the prior art, taken as a whole, [enables] a skilled artisan to make and use the claimed invention.”

Raytheon Techs. Corp. v. Gen. Elec. Co., 993 F.3d 1374, 1380 (Fed. Cir. 2021).

Petitioner has not met its burden of explaining ***how or why*** a POSITA ***would*** have been motivated to combine Buckley or Yi with Bergan, August, Morris, and Joyner. Instead, Petitioner has plainly assembled its prior art lineup by using the 533 Patent claims as its guide.⁹ Patent Owner respectfully requests that the Board reject this hindsight-driven approach to obviousness. *In re Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992) (reversing an obviousness rejection, because “one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior

⁹ The impermissible approach to obviousness applied by Petitioner is only amplified when considering some of the grounds attacking dependent claims from the 533 Patent, where Petitioner relies on seven and eight reference combinations. *See* Pet., Grounds 7A, 7B (each requiring a combination of seven references); and Grounds 8A, 8B (each requiring a combination of eight references).

art to deprecate the claimed invention.”). The Petition provides insufficient reasons for why a POSITA would have been motivated to combine Bergan's planetary gear with the systems of Buckley or Yi.

C. The Petition's motivations to combine are predicated on Dr. Durham's flawed testimony that fails to address that a POSITA would not have had sufficient understanding of gear system technology to make the modifications petitioner proposes without hindsight knowledge gained from the challenged patent.

Petitioner and its expert define a POSITA as one having “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., 12–13; *see also* EX-1003, ¶ 49. The invention in the 533 Patent and claims, however, is directed to using a “planetary gear train” for driving motors used to power a multi-plunger pump and requires selecting “a gear ratio of the planetary gear train and a speed at which the plurality of motors operates” to “limit a maximum pump speed associated with the multi-plunger pump.” EX-1001, Abstract; claim 1; EX-2038, ¶ 60.

Petitioner has not shown that a POSITA as defined, without the benefit of the 533 Patent teachings, would have the required knowledge and experience to

understand gear system design from the prior art to combine¹⁰ the references in the way that the Petition proposes, much less to be able to select gear ratios and motor speeds in the way specified in the claims. EX-2038, ¶ 59. Even though gears and gear systems have been used for many decades, the design of gear systems for specified applications is a complex field that requires specialized knowledge that is beyond the expertise of Petitioner's POSITA. EX-2038, ¶ 61, *see, e.g.*, EX-2027, 382 (“[l]ubrication of the planet bearings [in a planetary gear system] can be challenging, especially at higher carrier speeds. This task can be overcome by experience, better some other engineer's than one's own.”). In an early textbook from McGraw-Hill (*Gear Handbook*) (EX-2016), the Executive Director of the American Gear Manufacturers Association (“AGMA”) explained that the “design and manufacture of a gear that is no better than the requirement for its successful

¹⁰ Patent Owner notes that the prior art must enable a POSITA to arrive at the claimed invention. The Federal Circuit has held “[t]o render a claim obvious, the prior art, taken as a whole, must enable a skilled artisan to make and use the claimed invention.” *Raytheon*, 993 F.3d at 1380. The Petition has a deficient explanation for how a POSITA would combine the prior art to purportedly satisfy limitation 1[e], Pet., 39–44, as explained above, *see supra* § VIII.B.

application is an art rather than a science,” and that “[v]olumes have been written and said in attempts to attain good gears.” *Id.*, xi. The *Gear Handbook* itself is “approximately one thousand pages of moderately fine print” that attempts to cover “all aspects of the gear art.” *Id.*, xiii.

“Planetary gear systems are designed differently for different purposes.” *See Liberty Energy v. U.S. Well Servs.*, IPR2025-00066, Paper No. 10 at 20.

Accounting for such design differences makes gear system design a complex challenge. EX-2038, ¶ 63. The book *Gear Drive Systems* (EX-2017) aptly explained why:

It has become apparent that gear units, when incorporated into a system of rotating machinery, ***are susceptible to a variety of problems***. All characteristics of the drive system from the driver to the driven equipment, including the lubrication system and accessories, can influence gearbox operation and must be considered in the specification, installation, operation, and maintenance of the unit.

Id., iv (emphasis added). Failing to meticulously design, test, and manufacture a gear system for a specific application can be catastrophic. EX-2038, ¶ 63. “In many applications, the cost one day’s lost production due to a gearbox malfunction far exceeds the initial cost of the unit....” *Id.*, iii. This includes understanding the environment in which the gear system will be used, as “detrimental environments

... can have an adverse effect on lubricant, bearings, gears, or seals” and therefore such environments “require special consideration in the design of the gearbox lubrication system and seals.” *Id.*, 18; EX-2038, ¶ 63. Such environments include those commonly associated with oil and gas extraction— “dusty atmosphere,” “high ambient temperature,” “wide temperature variation,” and “high humidity.” *Id.*; *see also* EX-1003, ¶ 54 (identifying fracturing production areas including Texas); EX-2038, ¶ 64; O. Asi, *Fatigue Failure of a Helical Gear in a Gearbox, Engineering Failure Analysis* 13, 1116-1117 (2006) (EX-2036) (“Gears can fail in many different ways.... Several causes of [] failure have been identified. These include poor design of the gears set, incorrect assembly or misalignment of the gears, overloads, inadvertent stress raisers or subsurface defects in critical areas, and the use of incorrect materials and heat treatments.”).

Given the complexity and criticality of gear system design, it is not surprising that companies needing a gear system rely on industry experts. EX-2038, ¶ 65. For example, the AGMA is an “association of companies, consultants, and academicians with a direct interest in the design, manufacture, and application of gears, couplings, and related power transmission components and equipment.” *See* EX-2018, 1. AGMA lists over 495 member companies that design and manufacture gear systems. *Id.*, 2; *see* EX-2019. In one example, United Gear, Inc. offers engineering services wherein its teams “work closely with customers from

the initial request for quote stage, providing creative solutions and incorporating their feedback to optimize both cost-effectiveness and manufacturability.” EX-2020, 6.

This objective evidence shows that gear system design is not something that engineers merely dabble in. EX-2038, ¶ 66. Instead, gear system design requires a person with specialized engineering experience. *See* EX-2022, 1 (“A Gear Design Engineer is responsible for developing and designing geared assemblies for various industrial purposes, ... Gear Design Engineers work to design, develop, and manufacture new and existing gear systems to help power vehicles and machines. They often meet customer specifications to create products designed precisely for clients’ needs.”); *see id.* (“The responsibilities of a gear design engineer involve designing gearing systems. . . [in which you] analyze existing systems or create a new configuration that meets the needs of the project. Your duties include performing mechanical analysis on designs and creating plans that engineers can use during assembly of the gearing system[,] [testing gearing systems] for function, form, and efficiency. . . . [for] designs include[ing] a gearmotor or similar driving device.”).

The evidence shows numerous examples of the specialized expertise of gear design engineers. EX-2038, ¶ 67. *See* EX-2023, 1 (seeking “an experienced Gear Design Engineer to become part of our dedicated team. . . [who will be]

responsible for designing and developing new gear systems, optimizing existing ones, and ensuring all our products meet industry standards for safety and functionality.”);¹¹ EX-2024, 1 (“The Mechanical Engineer-Gear Design and Automation Engineer designs various types of gears, gearing arrangements and complete Planetary Gearboxes to meet customer requirements and new CGI product requirements. Designs and supports electro-mechanical test equipment for testing and improving new and existing gear and gearbox designs. Creates design specifications for (use of CGI products in) customer applications....”);¹² EX-2025,

¹¹ Expected tasks for gear design engineer include “design and develop gears for commercial and service industry machinery;” “perform detailed analysis and calculations to ensure gear functionality and durability;” and “collaborate with cross-functional teams to create innovative gear designs that meet customer requirements.” *Id.*, 1.

¹² Expected functions for gear design engineer include “Design (and review designs for) gears, gear arrangements and gearboxes (utilizing the following gear types and arrangements: spur, helical, worm, bevel, planetary face gearing, etc.);” and “Perform analysis and calculations to support the required performance and specifications of gear design projects.” *Id.*, 1–2.

1 (seeking “an experienced and creative Gear Design Engineer to join our team.... [who] will have a solid background in gear design and manufacturing [and] experience in CAD and other design software.”).

The specialized nature of gear system design is also reflected in the fact that the PTO has a separate class (475) dedicated to “planetary gear transmission systems or components.” EX-2026, 475-1 (PTO classification definition class 475).

Petitioner and its expert fail to account for the complexity and challenges of implementing a specific gear system into an oil/gas extraction system. EX-2038, ¶ 68. Notably, the Jelaska textbook (EX-1012)—used in every ground of the Petition—identifies four shortcomings or challenges of using planetary gear systems in any system—none of which was addressed by Petitioner:

- More complex design in regard to ordinary gear drives;
- Considerable centrifugal forces appear on planets and their bearings;
- Due to robust design, the control and maintenance are more difficult;
- Due to small dimensions, the quantity of lubricant is less and consequently its replacement has to be more frequent.

EX-2027, 341; EX-2038, ¶ 68.

Petitioner does not acknowledge the fact that gear system design is a specialized field requiring expertise that is well beyond Petitioner's defined level of skill in the art—especially given that Jelaska says exactly that. EX-2038, ¶ 69. *See, e.g.*, EX-2027, 382 (“[l]ubrication of the planet bearings [in a planetary gear system] can be challenging, especially for higher carrier speeds. This task can be overcome by experience, better some other engineer's than one's own.”). The crux of the claimed 533 Patent invention is the “planetary gear train” that includes selecting a “a plurality of input pinion gears connected to the plurality of motors.” EX-1001, claim 1; EX-2038, ¶ 69. Yet, Petitioner's level of skill makes no mention of gear system expertise at all. Pet., 12–13; EX-1003, ¶ 49; EX-2038, ¶ 69.

Nor can it be reasonably inferred that Petitioner's POSITA would have the requisite gear system knowledge. EX-2038, ¶ 70. Petitioner effectively proposes two possible skill levels: (1) a person with a B.S. in M.E., E.E., or petroleum engineering with at least two years of 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., 12–13, EX-1003, ¶ 49. As to the former, Petitioner does not show how such a person would have gained the requisite knowledge of gear system design, nor could it. Persons with a B.S.E.E. or B.S. in petroleum

engineering would have received minimal (if any) mechanical engineering education, much less enough to understand and design gear systems for industrial applications. EX-2038, ¶ 71. For example, the University of Houston offers bachelor's degrees in E.E., M.E., and petroleum engineering. EX-2038, ¶ 72. As the course requirements for the E.E. and petroleum engineering majors confirm, gear systems are not part of any courses that such students must take to earn their degrees. *See* EX-2038, ¶ 72; EX-2028; EX-2029. As to a person with a B.S.M.E., the University of Houston program requires that a student take only one course where gear systems are taught, but for that course the discussion of gears is less than 15% of the total course. EX-2038, ¶ 72. EX-2030; EX-2031.

Further, having either two years or four years of experience with “well drilling, completion, or production” does not make up for the lack of formalized education in gear systems.¹³ EX-2038, ¶ 74. As the evidence shows, in industrial

¹³ Indeed, under Petitioner's second proposed level of skill, the POSITA does not even have an undergraduate degree in engineering design. EX-2038, ¶ 73. Given the undisputed complex nature of gear system design, Petitioner fails to show that four years of work in “well drilling, completion, or production” would provide a POSITA with knowledge sufficient to understand the intricacies of gear

applications, gear system design is regularly farmed out to engineering companies that specialize in gear design. EX-2038, ¶ 74. Put another way, a company in the fracturing industry would not entrust gear system design to a person with merely a B.S. engineering degree and two years of generalized oil field experience. EX-2038, ¶ 74. Rather, such a company would rely on persons having years of specialized knowledge in gear system design. EX-2038, ¶ 75.

Objective evidence confirms this. EX-2038, ¶¶ 75–76. The company Power Engineering and Mfg. (“PEM”) specializes in “custom design and manufacturing of heavy-duty gearboxes.” EX-2032, 1. In 2024, PEM publicized that it “recently shipped serial number 1 of our new design pump drive gearbox for the Oil & Gas industry. This pump drive gearbox will be used on the new electric hydraulic fracturing pump trailers. The PEM Engineering and Sales Teams worked with our

system design. EX-2038, ¶ 73; Pet., 12. This is demonstrated by the fact that, across many dozens of paragraphs describing the background of the technology and the state of the art, Petitioner’s expert never once identifies planetary gear systems as being regularly employed in fracturing pumps. EX-1003, ¶¶ 46-119; EX-2038, ¶ 73. Instead, when discussing gear systems, he relies on textbooks and papers specific to the specialized field of gear design. *Id.*, ¶¶ 79-86; EX-2038, ¶ 73.

customers' engineering team and four other vendors on this project to ensure the design met all required e-frac pump trailer specifications." *Id.*, 6. This is directly on-point to the 533 Patent claimed invention and proves that the gearbox design for a hydraulic fracturing application required specialized gear design knowledge. EX-2038, ¶ 75.

Similarly, in 2024, Indiana Technology and Manufacturing Companies (ITAMCO) publicized that it was "leveraging cutting-edge technologies to optimize gear manufacturing for fracking applications." EX-2033. This is yet another example showing that the industry relies on companies and people with specialized knowledge to design gear systems. EX-2038, ¶ 76.

Thus, Petitioner's argument that, before the 533 Patent, a POSITA would have been motivated to use the gear system disclosed in Bergan (EX-1006) in either Buckley's (EX-1004) or Yi's (EX-1010) fracturing pump system fails. EX-2038, ¶ 78. A POSITA as defined by Petitioner instead would have understood that the gear systems in place in Buckley and Yi were acceptable for their purpose and would not have looked to modify or change them with Bergan's gear system. EX-2038, ¶ 78. This is particularly so given that, as explained in Section III.B, Bergan's gear system is used for an entirely different purpose from the ones in Buckley and Yi. *See Liberty Energy v. U.S. Well Servs.*, IPR2025-00066, Paper

No. 10 at 19 (“Buckley and Bergan’s gear systems drive different types of devices and, thus, are designed for different purposes.”).

Thus, Petitioner has failed to show that a POSITA as defined would have had the knowledge and experience with gear systems before the 533 Patent necessary to have been motivated to make the § 103 combinations it asserts.¹⁴ This supports denying institution.

D. The Petition failed to provide a sufficient reason why a POSITA would modify Buckley or Yi with Bergan in its combinations for all Grounds.

The Petition advances the same reasons why a POSITA would have been motivated to combine Bergan’s planetary gear system with either Buckley’s pump system or Yi’s pump system:

Reasons to combine Bergan with Buckley	Reasons to combine Yi with Buckley
Buckley’s “express motivation to combine.” Pet., 19.	Yi’s “express motivation to combine.” Pet., 48.
“[I]ncorporating <i>Bergan</i> ’s planetary gear train and use of pinions to connect the	“[I]ncorporating <i>Bergan</i> ’s planetary gear train and the use of pinions to

¹⁴ In contrast, a POSITA having the 533 Patent would have understood the terms used in the claims and would have been able to make and use the claimed invention without difficulty, given the detailed disclosure in the specification. EX-2038, ¶ 77.

Reasons to combine Bergan with Buckley	Reasons to combine Yi with Buckley
motors to the load is applying a known technique (planetary gear trains and motors with pinions) to improve similar devices (<i>Buckley's</i> gearbox) in the same way." Pet., 20.	connect the motors to the load is applying a known technique (planetary gear trains and motors with pinions) to improve similar devices (<i>Yi's</i> gearing system) in the same way." Pet., 48.
" <i>Bergan's</i> planetary gear system and motors with pinions was known in one field of endeavor (oil and gas drilling, as taught by <i>Bergan</i>) and would have prompted a POSITA to use it in either the same field or a different one (oil and gas fracturing) based on design incentives (ability to connect multiple motors to a single load and the advantages of a planetary gear train)." Pet., 20.	" <i>Bergan's</i> planetary gear system and motors with pinions was known in one field of endeavor (oil and gas drilling) and would have prompted a POSITA to use it in either the same [field] or a different one (oil and gas fracturing) based on design incentives (ability to connect multiple motors to a single load and the advantages of a planetary gear train) because the variations used for a pump (as in <i>Yi</i>) would have been predictable to a [POSITA]." Pet., 49.
"[M]odifying <i>Buckley's</i> pumping system to use <i>Bergan's</i> planetary gearing system requires a simple substitution of one known element (<i>Bergan's</i> gearing system) to obtain the predictable result of transferring rotational energy from <i>Buckley's</i> motors to <i>Buckley's</i> pump." Pet., 20–21.	

This Petition advances the same reasoning—that is, the explanation of how and why a POSITA would have combined Bergan's planetary gear system with the pump system of Buckley or Yi—that the Board found deficient in IPR2025-00066. See Paper 7 at 18-24. In IPR2025-00066, Petitioner advanced the same motivation

to combine arguments as those in the table above. *See Liberty Energy v. U.S. Well Servs.*, IPR2025-00066, Paper No. 1 (Pet.) at 14–20, 34–35. There, the Board found that the same rationales failed to show a POSITA would have been motivated to combine Bergan's planetary gear system with either Buckley's pump system or Yi's pump system. EX-2006 at 22 ("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 ..."); *id.*, 25 ("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 ..."); *id.*, 26 (denying institution). This Petition suffers from the same deficiency, as explained below, which is only worsened by this Petition's further modification of the Buckley-Bergan or Yi-Bergan combinations by using teachings from August, Morris, and Joyner.

All the rationales in the table are deficient for the reasons described in the sections below, especially considering, as explained in section VIII.C above, that Dr. Durham's POSITA lacks the knowledge necessary to make decisions concerning the advantages and disadvantages a specific gear system brings to the table in a fracturing system. Without any sufficient reason motivating a POSITA to combine the prior art, the Petition fails to show a reasonable likelihood of success for the Grounds challenging the 533 Patent.

1. The Petition's supposed express motivations to combine Bergan with either Buckley or Yi show only that the combination could be made, not that a POSITA would be motivated to make such a combination.

The Petition's express motivations merely show that the Petition's proposed combination could be made—not that a POSITA would have been motivated to do so. Notably, the Petition's motivations to combine recognize that multiple “different gearing solutions” exist, but provide no reason why a POSITA would have implemented Bergan's planetary gear solution over any other gear configuration:

“A POSITA would have been motivated to understand different gearing configurations to connect multiple motors to a single load, and would have understood that *Bergan* offers one such solution,” Pet., 20; and

“*Yi* . . . does not provide detail regarding the particular gearing utilized to transmit rotation from the motors to the pump. . . . A POSITA would have been motivated to look for other references that disclose particular gearing configurations for. . . coupling multiple motors to a single load, such as *Bergan*, when implementing the pumping system disclosed by *Yi*,” Pet., 48 (citations omitted).

The above statements are not sufficient to evidence a motivation for combining the references. *See Liberty Energy v. U.S. Well Servs.*, IPR2025-00066, Paper No. 10

at 20–21 (“Petitioner has not sufficiently shown that Buckley expressly suggests the proposed combination” of Bergan and Buckley based on the same express teachings from Buckley.). Petitioner argues that the above arguments demonstrate express motivations to combine, but there is no such express statement in either reference. At most, the Petition’s statements show that a POSITA could have considered multiple “different gearing configurations” and that at most “Bergan offers one such solution.” *See* Pet., 20, 48. Thus, these statements merely show that a POSITA could combine the references—not that a POSITA would have been motivated to do so. *InTouch Techs., Inc. v. VGO Commc’ns, Inc.*, 751 F.3d 1327, 1352 (Fed. Cir. 2014) (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 [a POSITA] *could* combine these references, not that they *would* have been motivated to do so”). These purported express statements from the prior art are thus insufficient to show a POSITA would have been motivated to combine Bergan with either Buckley or Yi. *See Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363, 1273-74 (Fed. Cir. 2008) (rejecting generalized testimony concerning a motivation to combine to specific references).

2. The Petition’s remaining motivations are contradicted by the same evidence cited by the Petition to support them.

The Petition's remaining arguments concerning motivation to combine are also inadequate and contradicted by the Petition's evidence. The Petition, as shown above, proposes three *KSR* obviousness rationales: (1) a simple substitution of a known element to obtain a predictable result, Pet., 20, 48; (2) improvement of a similar device in the same way, Pet., 20, 48, and (3) design incentives to select one of multiple, known design choices, Pet., 20, 48. The cited evidence in the Petition, however, contradicts each of these rationales.

- a. The Petition's rationale predicated on a simple substitution is conclusory and unsupported by the cited evidence.

As another *KSR* rationale, the Petition contends for Grounds 1A through 8A that the purported modification requires only a simple substitution. Pet., 20–21. (“[M]odifying Buckley’s pumping system to use Bergan’s planetary gearing system requires a simple substitution of one known element (Bergan’s planetary gearing system) for another (Buckley’s gearing system) to obtain [] predictable result[s],”). Not so. *See Liberty Energy v. U.S. Well Servs.*, IPR2025-00066, Paper No. 10 at 20-21 (determining Petitioner failed to sufficiently show why a POSITA would have been motivated to use Bergan’s planetary gear system to drive Buckley’s fracturing pump because either “the proposed combination is merely applying a known technique to improve a similar device in the same way... or [] the proposed combination is a simple substitution of one known element for

another to obtain predictable results”). In addition to reasons provided in the previous section, Petitioner's Grounds 5A and 5B include Jelaska (EX-1012), which squarely contradicts that such a substitution would be simple and obvious. Specifically, Jelaska describes that one of the “shortcomings” of planetary gear systems is that such systems involve a “[m]ore complex design in regard to ordinary gear drives.” EX-2027, 341. Similarly, the same textbook explains that implementing planetary gear systems involve lubrication “shortcomings” which can only be overcome from design experience. EX-2027, 382 (“Lubrication of the planet bearing can be challenging, especially at higher carrier speeds. This task can be overcome by experience, better some other engineer's than one's own.”); *id.*, 341. This extra design experience further confirms that no POSITA—especially one with Dr. Durham's qualifications, *see* § I, VII.A above—would consider a planetary gear system to be a simple substitution. A best-practices industry article further confirms that lubrication will not last indefinitely and that lubrication challenges are especially difficult in “severe operating conditions,” EX-2035, 5, such as those fracturing operations in “moist and dusty environments,”:

Any statement regarding the service life of gear oils should include information regarding operating, environmental, and mechanical conditions of the equipment. ***Even in the best of situations, gear and circulating oils will not last indefinitely.*** Therefore, from

the standpoint of both service and economy, gear oil should be removed and replaced with fresh lubricant when the oil has deteriorated or has become contaminated. When severe operating conditions are present, change intervals may need to be shortened depending on oil analysis results.

EX-2035, 7 (emphasis added); *see also* EX-1003, ¶ 64 (describing that fracturing operations occur in Texas). Based on the above evidence, planetary gear systems are complex solutions—not simple ones—that bring complex challenges in their implementations.

- b. The Petition's rationales predicated on any improvement or design incentives are conclusory and unsupported by the cited evidence.

The Petition does not mention any purported advantage or improvement to substitute Bergan's planetary gear system over the transmission systems already used in Buckley or Yi. *See* Pet., 20 ("applying a known technique (planetary gear trains and motors with pinions) to improve similar devices (Buckley's gearbox) in the same way"); *id.*, 48 (same for Bergan-Yi combination), *id.* at 20 (explaining what "would have prompted a POSITA to use [planetary gears] in either the same field or a different one. . . based on design incentives (ability to connect multiple motors to a single load and *the advantages of a planetary gear train.*"); *id.*, at 49 (emphasis added) (same for Bergan-Yi combination). The Petition fails to explain

what the alleged advantages of using a planetary gear system were, much less why those alleged advantages would have improved the Buckley and Yi systems. *See Liberty Energy v. U.S. Well Servs.*, IPR2025-00066, Paper No. 10 at 20–21 (determining Petitioner failed to sufficiently show why a POSITA would have been motivated to use Bergan's planetary gear system to drive Buckley's fracturing pump based on "design incentives [that] would have prompted the propose[d] combination.").

The Petition mentions "advantages of a planetary gear train" and that such gears "improve similar devices," Pet., 20, but the Petition never identifies what those advantages are or how they would improve a device. Without doing so, the Petition lacks any "reasoned explanation" required of an obviousness analysis. *In re Nuvasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) ("[C]onclusory statements alone are insufficient and, instead, the finding must be supported by a reasoned explanation.") (internal quotes omitted). This deficiency in the Petition is further emphasized by the cited portion of Dr. Durham's declaration that parrot the conclusory statements in the Petition. *See* EX-1003, ¶¶ 156, 227; *Kinetic Techs., Inc. v. Skyworks Sols., Inc.*, IPR2014-00529, Paper 8 at 15 (PTAB Sep. 23, 2014) ("Merely repeating an argument from the Petition in the declaration of a proposed expert does not give that argument enhanced probative value."). Dr. Durham's lack of further analysis of any improvements or advantages renders the Petition's

purported *KSR* rationales for advantages, improvements, or design incentives as “merely offered conclusory assertions without underlying factual support” and thus deficient. *See Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 12 (on Director Review) at 5 (PTAB Feb. 10, 2023) (precedential) (giving little weight to expert declaration for merely offering conclusory assertions because “[t]he declaration does not provide any technical detail, explanation, or statements supporting *why* the Expert determines that the feature in question was required or would have been obvious based on the prior art disclosure.”) (emphasis in original). Like the Petitioner in *Nuvasive*, the Petition has presented only “insufficient articulations of motivation[s] to combine.” *Nuvasive*, 842 F.3d at 1383–85.

Given the differences between Bergan and Yi/Buckley, *see supra*, § VII.B.1, the petition's proposed modification is driven by hindsight using the 533 Patent as a blueprint. *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1143, (Fed.Cir.1985) (holding that it is insufficient to select from the prior art the separate components of the inventor's combination, using the blueprint supplied by the inventor); *see also KSR*, 550 U.S. at 401 (“[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.”).

To mitigate hindsight concerns, Petitioner and its expert should have identified any alleged improvement or advantage, along with an analysis, that would motivate a POSITA to substitute the gearing systems used by Buckley's or Yi's systems with a planetary gear system. Without doing so, the Petition's purported motivations for advantages, improvements, or design incentives are impermissible hindsight. *InTouch Techs., Inc. v. VGO Commc'ns, Inc.*, 751 F.3d 1327, 1348–49 (Fed. Cir. 2014) (“[Expert] testimony was nothing more than impermissible hindsight; she opined that all of the elements of the claims disparately existed in the prior art, but failed to provide the glue to combine these references. While she opined that the references were like separate pieces of a simple jigsaw puzzle, she did not explain what reason or motivation [a POSITA] would have had to place these pieces together.”).

3. Dr. Durham's purported advantages of planetary gear systems are not cited in the Petition and are contradicted by his own evidence.

Paragraph 87 of Dr. Durham's testimony mentioning the purported “advantages” of a planetary gear system is not cited in the Petition¹⁵ and is

¹⁵ The Petition cites paragraphs 156 and 227 of Dr. Durham's declaration, which reference a section from Dr. Durham's declaration—namely, Section IX.D—

contradicted by other evidence relied on by Dr. Durham and in the Petition.

Unified Patents, LLC v. Engle Grange, LLC, IPR2020-01334, Paper 7 at 45 (PTAB Jan. 21, 2021) (“To the extent exhibits are not cited by the parties, [the Board] typically do[es] not rely upon them.”). Without specifically relying on this paragraph, the Petition fails to cite any testimony from Dr. Durham that describes a specific advantage or improvement of planetary gear systems over other gear systems. *See* § VII.B.2.b above. This alone renders the Petition deficient.

If the Board considers Dr. Durham's uncited testimony, the other evidence of record shows that Dr. Durham's testimony is contradicted by his own evidence. Dr. Durham appears to identify two alleged advantages of planetary gear systems in industrial applications: “high torque in compact ... and light ... package” and an “advantage in lubrication.” *See* EX-1003, ¶ 87. Notably, Dr. Durham refers to

—that spans nine paragraphs over six pages, one of which is paragraph 87. This nested citation to over six pages is improper. *Apple Inc. v. ContentGuard Holdings, Inc.*, IPR2015-00445, Paper No. 9 at 7 (PTAB July 9, 2015) (“The Petition's practice of citing multiple pages of the [expert] Declaration to support conclusory statements and, more generally, using the [expert] Declaration to vastly expand its thin analysis and reasoning violates our rules....”).

these only as “advantageous in an industrial application”—not fracking operations. EX-1003, ¶ 87 *quoting* EX-1038, 150–51 (describing one “industrial application” as a parking garage gate). Industrial applications, as quoted by Dr. Durham in paragraph 105, also include building HVAC systems and other factory systems. *See* EX-1042 (describing industrial application examples including kilns and office HVAC systems). Thus, Dr. Durham has failed to show that these alleged advantages would apply to hydraulic fracturing operations.

At any rate, Dr. Durham's first alleged advantage is unsupported by the evidence. Dr. Durham cites EX-1038, a paper authored by Pawar, in stating that “[p]lanetary gears are commonly used in applications where there is a need for high torque in compact (a high torque/volume) and light (a high torque/weight ratio) package.” EX-1003, ¶ 87. But Pawar is focused on an application for “design of compact planetary gear train used in gear boxes used for automation in car parking systems,” EX-1038, 2—that is, a gate system to stop a car before exiting the parking garage. The advantages described by Pawar for a light, compact system (i.e., system to lift a parking gate) are wholly inapplicable to the hydraulic fracturing systems of Yi and Buckley. This becomes further evident when considering other “important” aspects of planetary gear systems in Pawar:

High rotational stiffness is important for applications
with positioning accuracy and repeatability requirements;

especially under fluctuating loading conditions. Hence planetary gears are used for such applications in automation. Added inertia results in an additional torque/energy requirement for both acceleration and deceleration. The smaller gears in planetary system result in lower inertia. Compared to a same torque rating standard gearbox, it is a fair approximation to say that the planetary gearbox inertia is smaller by the square of the number of planets.

EX-1038, 1. Unlike a light compact motor to lift a parking gate, the prior art systems here involve plunger pumps that require “high horsepower.” *See* EX-1004, [0005] (describing Buckley’s electric pumps having between 3600 and 6000 hydraulic horsepower). Further, a POSITA would not look to Bergan’s planetary gear as a “light” or “compact package” solution that Dr. Durham identified as an advantage of planetary gears, EX-1003, ¶ 87, as Bergan’s planetary gear (shown below) is plainly neither light nor compact:

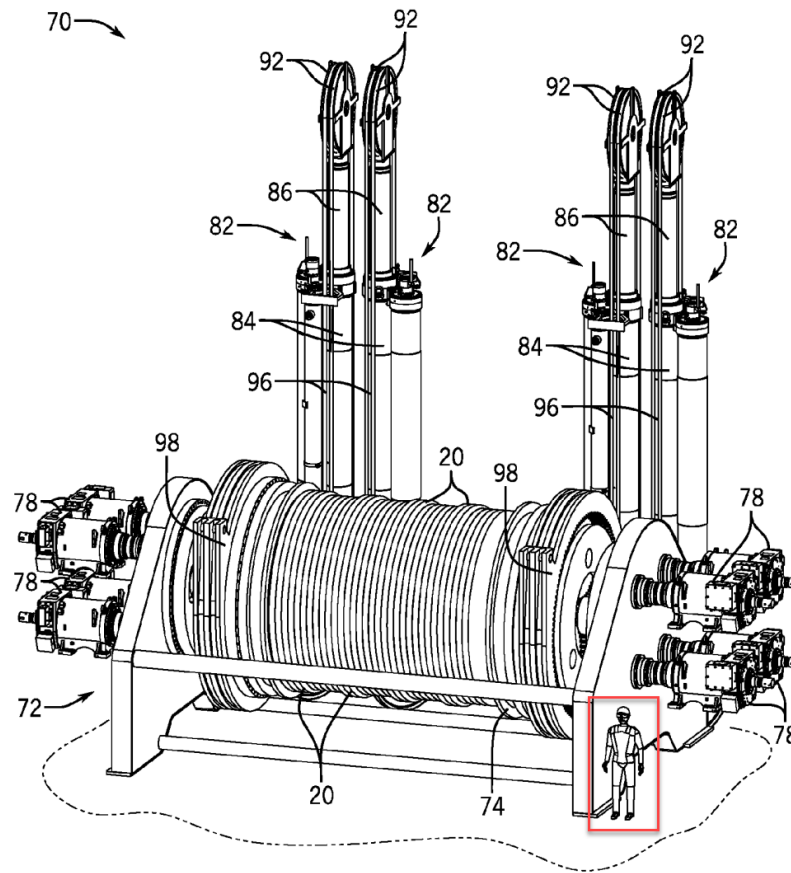


FIG. 3

EX-1006, Fig. 3 (annotated) (showing a system many times larger than the person standing next to the system). Based on the above disclosures, Dr. Durham's cited evidence concerning the advantages of a planetary gear system having "high torque density, compact, and low inertia" may be applicable for small, low horsepower applications—like systems to lift parking gates—but Dr. Durham has not demonstrated those advantages would still apply for high-horsepower—like those required in Buckley and Yi—or attained by large-size systems, like that in Bergan.

Second, and again relying on Pawar (EX-1038), Dr. Durham asserts that a planetary gear train has a lubrication advantage because the lubrication is allegedly “continuously redistribute[d]” and can be “grease lubricated for life.” EX-1003, ¶ 87 (quoting Pawar). But Jelaska (EX-1012), relied on in Grounds 5A and 5B, squarely contradicts this testimony by describing lubrication as a “shortcoming” of planetary gear systems: “[t]he shortcomings of [planetary gear transmissions] are. . . due to smaller dimensions, the quantity of lubricant is less and consequently its replacement has to be more frequent.” EX-2027, 341; *see id.*, 382 (“Lubrication of the planet bearings can be challenging, especially at higher carrier speeds. This task is overcome by experience, better some other engineer’s than one’s own.”). Given this express evidence of lubrication being a “shortcoming” of planetary gear systems, Dr. Durham’s testimony asserting that a planetary’s gear system has a lubrication advantage over other systems should be given no weight. *Ericsson Inc. v. Intell. Ventures I LLC*, 890 F.3d 1336, 1346 (Fed. Cir. 2018) (“To contradict a reference, an unsupported opinion is not substantial evidence.”). Rather the Board should consider that Jelaska explains that lubrication is a disadvantage of planetary gears, among other shortcomings, and thus, teaches away from the proposed combination, which Petitioner fails to reconcile given that Jelaska is included in some of the unpatentability Grounds. *See Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1069 (Fed. Cir. 2018) (“A reference may be said to teach away

when a [POSITA], upon reading the reference, would be discouraged from following the path set out in the reference.”) (internal citations omitted).

For the above reasons, the Board should not consider Dr. Durham's purported advantages of planetary gears because they are not cited in the petition and at any rate, he has not shown that those alleged advantages are applicable to the specific Buckley, Yi, and Bergan prior art.

IX. CONCLUSION

For the above reasons, the Board should decline to institute *inter partes* review.

Dated: July 16, 2025

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CERTIFICATE OF COMPLIANCE

The undersigned certifies that this response complies with the word-count limitations of 37 C.F.R. § 42.24(b)(1). This response contains 13,030 words as calculated by the word-count feature of Microsoft Word, the word-processing program used to create it.

The undersigned further certifies that this Petition complies with the typeface requirements of 37 C.F.R. § 42.6(a)(2)(ii) and typestyle requirements of 37 C.F.R. § 42.6(a)(2)(iii). This petition has been prepared in a proportionally spaced typeface using Microsoft Word in Times New Roman 14-point font.

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CERTIFICATE OF SERVICE

I hereby certify that on this 16th day of July, 2025, I caused to be served a true and correct copy of the foregoing "Patent Owner's Preliminary Response" and accompanying exhibits by electronic mail on the following:

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