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Paper 10
Date: August 24, 2022

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

EVOLUTION WELL SERVICES, LLC,
Petitioner,

v.

BJ ENERGY SOLUTIONS, LLC,
Patent Owner.

IPR2022-00399
Patent 9,395,049 B2

Before PATRICK R. SCANLON, JASON W. MELVIN, and SEAN P. O'HANLON, *Administrative Patent Judges*.

O'HANLON, *Administrative Patent Judge*.

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

I. INTRODUCTION

A. Background

Evolution Well Services, LLC ("Petitioner") filed a Petition for *inter partes* review of claims 1–3, 6–8, 10, 12, 13, 15, and 18–20 ("the challenged claims") of U.S. Patent No. 9,395,049 B2 (Ex. 1001, "the '049 patent"). Paper 2 ("Pet."), 1. BJ Energy Solutions, LLC ("Patent Owner") filed a Preliminary Response. Paper 6 ("Prelim. Resp."). With our authorization (*see* Paper 7), Petitioner filed a Preliminary Reply (Paper 8, "Prelim. Reply") and Patent Owner filed a Preliminary Sur-reply (Paper 9, "Prelim. Sur-reply").

Institution of an *inter partes* review is authorized by statute only when "the information presented in the petition . . . and any response . . . shows that there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition." 35 U.S.C. § 314(a) (2018). A decision to institute may not institute on fewer than all claims challenged in the petition. *SAS Inst. Inc. v. Iancu*, 138 S. Ct. 1348, 1354, 1359–60 (2018). If the PTAB institutes a trial, the PTAB will institute on all challenges raised in the petition. *See* Patent Trial and Appeal Board Consolidated Trial Practice Guide ("CTPG") 64 (Nov. 2019) ("The Board will not institute on fewer than all claims or all challenges in a petition.");[1] *see also AC Techs. S.A. v. Amazon.com, Inc.*, 912 F.3d 1358, 1364 (Fed. Cir. 2019) ("[I]f the Board institutes an IPR, it must . . . address all grounds of unpatentability raised by the petitioner.").

[1] *Available at* https://www.uspto.gov/TrialPracticeGuideConsolidated.

We have authority, acting on the designation of the Director, to determine whether to institute an *inter partes* review under 35 U.S.C. § 314 and 37 C.F.R. § 42.4(a). For the reasons set forth below, upon considering the Petition, Preliminary Response, Preliminary Reply, Preliminary Sur-reply, and evidence of record, we conclude that the information presented shows that there is a reasonable likelihood that Petitioner would prevail in establishing the unpatentability of at least one of the challenged claims. Thus, we institute *inter partes* review of all challenged claims based on all asserted grounds.

B. Real Parties in Interest

Petitioner identifies itself and Evolution Well Services Operating, LLC as real parties in interest. Pet. 83.

Patent Owner identifies itself as the sole real party in interest. Paper 3, 1.

C. Related Matters

The parties indicate that the '049 patent is the subject of the following district court proceeding:

> *BJ Energy Solutions, LLC v. Evolution Well Services, LLC*, Case No. 6:21-cv-00682 (W.D. Tex. filed June 29, 2021).

Pet. 83; Paper 3, 2. However, Petitioner asserts that "the litigation was . . . transferred to the Southern District of Texas on June 21, 2022." Prelim. Reply 1 (citing Ex. 1205).

D. The Challenged Patent

The '049 patent discloses "apparatus and methods for delivering a high volume of fluid from a mobile pumping unit into an underground well bore." Ex. 1001, 1:8–11. The fluid delivery system is illustrated in Figure 1, which is reproduced below.

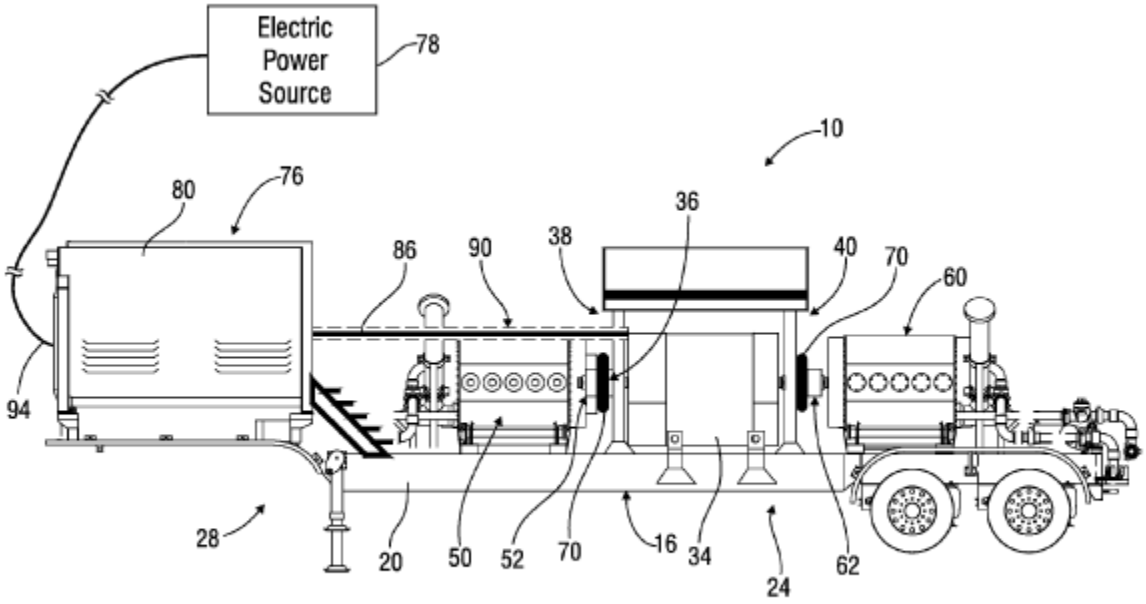

FIG. 1

Figure 1 shows a side view of the fluid delivery system 10. *Id.* at 3:22–24, 4:13–16. Chassis 16 is mounted on or integral with movable carrier 24, allowing the fluid delivery system to be transportable between multiple well sites. *Id.* at 4:18–19, 4:29–31. Electric motor 34 and first and second pumps 50, 60 are mounted on the chassis in an axially aligned manner. *Id.* at 4:33–35, 4:49–51. The pumps are operationally connected to the motor at opposite ends of drive shaft 36. *Id.* at 4:45–49. Flex couplings 70 may be positioned between the motor drive shaft and the drive shaft of each pump to accommodate relative movement between the motor and pumps during

operation. *Id.* at 5:54–58. The motor is controlled by variable frequency drive ("VFD") 76. *Id.* at 6:20–22. The motor drives the pumps concurrently or individually to deliver pressurized fluid to the well bore. *Id.* at 4:35–39, 4:51–55.

E. The Challenged Claims

Petitioner challenges claims 1–3, 6–8, 10, 12, 13, 15, and 18–20 of the '049 patent. Pet. 1. Claims 1, 13, 18, and 19 are independent. Claim 1 is illustrative of the challenged claims and is reproduced below.

> 1. A mobile hydraulic fracturing fluid delivery system for pumping high pressure fracturing fluid into an underground well bore at a well site and being transportable between multiple well sites, the mobile hydraulic fracturing fluid delivery system comprising:
>
> a chassis, said chassis being configured to be transportable between well sites;
>
> an electric motor disposed upon said chassis, said electric motor being electrically coupled to an external electric power source and having first and second opposing ends, said electric motor further having a single drive shaft extending axially therethrough and outwardly therefrom at said first and second opposing ends thereof;
>
> a first fluid pump disposed upon said chassis, coupled directly to said drive shaft of said electric motor at said first end of said motor and configured to pump fracturing fluid into the well bore;
>
> a second fluid pump disposed upon said chassis, coupled directly to said drive shaft of said electric motor at said second end of said motor and configured to pump fracturing fluid into the well bore at the same time as said first fluid pump,
>
> wherein said first and second fluid pumps are axially aligned with said electric motor at said opposing ends thereof, further

wherein said drive shaft of said electric motor is coupled to said first and second fluid pumps so that said electric motor is capable of concurrently driving both said fluid pumps;

at least a first flex coupling engaged with and between said electric motor and said first fluid pump and configured to allow movement of said electric motor and said first fluid pump relative to one another during and without disturbing the operation thereof; and

at least a second flex coupling engaged with and between said electric motor and said second fluid pump and configured to allow movement of said electric motor and said second fluid pump relative to one another during and without disturbing the operation thereof.

Ex. 1001, 8:5–42.

F. The Asserted Grounds of Unpatentability

The Petition relies on the following prior art references:

Name	Reference	Exhibit
Zhang	US 2015/0078924 A1, published March 19, 2015	1005
Stout	US 2010/0019626 A1, published January 28, 2010	1006
API Standard 674	*Positive Displacement Pumps—Reciprocating*, American Petroleum Institute Standard 674 (3d ed. 2010)	1007
Coli	US 2012/0255734 A1, published October 11, 2012	1009
API Standard 671	*Special Purpose Couplings for Petroleum, Chemical and Gas Industry Services*, American Petroleum Institute Standard 671 (4th ed. 2007)	1010
Sanborn	US 2013/0306322 A1, published November 21, 2013	1011
Naets	US 7,563,413 B2, issued July 21, 2009	1012

Name	Reference	Exhibit
Broussard	US 2014/0138079 A1, published May 22, 2014	1013

Petitioner asserts the following grounds of unpatentability:

Claim(s) Challenged	35 U.S.C. §	Reference(s)
1–3, 18	103[2]	Zhang, Stout, API Standard 674
6–8, 10, 12, 19, 20	103	Zhang, Stout, API Standard 674, Broussard
1–3, 6–8, 10, 12, 13, 15, 18–20	103	Zhang, Stout, API Standard 674, Broussard, API Standard 671
1–3, 6–8, 12, 13, 15, 18–20	103	Sanborn, Naets
10	103	Sanborn, Naets, Coli

Pet. 1. Petitioner submits a declaration of William D. Marscher, P.E. (Ex. 1003, "Marscher Declaration") in support of its contentions.

II. ANALYSIS

A. Discretionary Denial Under 35 U.S.C. § 314(a)

Patent Owner asserts that the Petition should be discretionarily denied under 35 U.S.C. § 314(a) by application of the factors ("*Fintiv* factors") set forth in *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 5–6 (PTAB Mar. 20, 2020) (designated precedential). Prelim. Resp. 3–12; *see also* Prelim. Sur-reply 1–5. We disagree.

[2] The application resulting in the '049 patent was filed on July 23, 2013, and is subject to the Leahy-Smith American Invents Act's ("AIA"), Pub. L. No. 112–29, 125 Stat. 284 (2011), revisions to 35 U.S.C. § 100 *et seq*. Thus, we refer to the AIA version of section 103.

"[W]here the PTAB determines that the information presented at the institution stage presents a compelling unpatentability challenge, that determination alone demonstrates that the PTAB should not discretionarily deny institution under *Fintiv*." Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation at 4–5.[3] "Compelling, meritorious challenges are those in which the evidence, if unrebutted in trial, would plainly lead to a conclusion that one or more claims are unpatentable by a preponderance of the evidence." *Id.* at 4.

On the current record, we agree with Petitioner that "the merits of the Petition are 'compelling.'" Prelim. Reply 1. For the reasons explained below, we determine that the merits of Petitioner's challenges to be compelling, and, therefore, we decline to exercise discretion under § 314(a) to deny institution.

Additionally, even if we were to consider the *Fintiv* factors in detail, we would not exercise discretion to deny institution. As noted above, the district court litigation between the parties was recently transferred to the U.S. District Court for the Southern District of Texas. *See* Ex. 1205. That Court has scheduled an initial pretrial conference for September 22, 2022, during which the Court will set a schedule for initial preparation and enter a scheduling order for the proceeding. *See* Ex. 1204, 1–2. Thus, any argument that we should deny institution based on the timing of the district court litigation would be speculative at best.

[3] *Available at* https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf.

B. Principles of Law

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")). Petitioner bears the burden of persuasion to prove unpatentability of each challenged claim by a preponderance of the evidence. 35 U.S.C. § 316(e). This burden never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). The Board may authorize an *inter partes* review if we determine that the information presented in the Petition and Patent Owner's Preliminary Response shows that there is a reasonable likelihood that Petitioner will prevail with respect to at least one of the claims challenged in the petition. 35 U.S.C. § 314(a).

A patent claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) when in evidence, any objective

evidence of nonobviousness.[4] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

C. Level of Ordinary Skill in the Art

The level of ordinary skill in the art is "a prism or lens" through which we view the prior art and the claimed invention. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). The person of ordinary skill in the art is a hypothetical person presumed to have known the relevant art at the time of the invention. *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995). In determining the level of ordinary skill in the art, we may consider certain factors, including the "type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field." *Id.* (internal quotation marks and citation omitted).

Petitioner contends that a person having ordinary skill in the art at the time of the invention ("POSITA") would have a "range of qualifications" including "a bachelor's degree in mechanical or chemical engineering and five years of work experience in the field of mechanical systems, motors, pumps, and/or oil field services." Pet. 7 (citing Ex. 1003 ¶¶ 22–23).

Patent Owner does not contest Petitioner's proposed definition or offer a definition of its own. Prelim. Resp. 2.

Based on the arguments presented and the cited references, we find Petitioner's definition of the level of ordinary skill reasonable and for purposes of this Decision, adopt it as our own.

[4] At this stage of the proceeding, the parties have not directed us to any such objective evidence.

D. Claim Construction

In an *inter partes* review, claims are construed using the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b), including construing the claims in accordance with the ordinary and customary meaning of such claims as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b). "[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention" and "after reading the entire patent." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1313, 1321 (Fed. Cir. 2005) (en banc). In addition to the specification and prosecution history, we also consider use of the terms in other claims and extrinsic evidence including expert and inventor testimony, dictionaries, and learned treatises, although extrinsic evidence is less significant than the intrinsic record. *Id.* at 1312–17. Usually, the specification is dispositive, and it is the single best guide to the meaning of a disputed term. *Id.* at 1315. We also consider "[a]ny prior claim construction determination concerning a term of the claim in a civil action . . . that is timely made of record" in this proceeding. 37 C.F.R. § 42.100(b).

"The Board is required to construe 'only those terms that . . . are in controversy, and only to the extent necessary to resolve the controversy.'" *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (alteration in original) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Neither party proffers a definition for any claim term. Pet. 2; Prelim. Resp. 2.

For purposes of this Decision, and based on the record before us, we determine that no construction of any term is necessary. We note that this determination does not preclude the parties from arguing their proposed constructions of the claims during trial. Indeed, the parties are hereby given notice that claim construction, in general, is an issue to be addressed at trial. A final determination as to claim construction will be made at the close of the proceeding, after any hearing, based on all the evidence of record. The parties are expected to assert all of their claim construction arguments and evidence in the Petition, Patent Owner's Response, Petitioner's Reply, or otherwise during trial, as permitted by our rules.

E. Overview of the Asserted Prior Art

1. Zhang

Zhang "relates to an oil-field fracturing apparatus, particularly to a fracturing pump." Ex. 1005 ¶ 1. Zhang recognizes that certain problems exist with typical fracturing sets that use a diesel engine, including a crowded field area, complicated pump manifold layout, high cost, and difficult control *Id.* ¶¶ 2–3. By using a motor to drive the fracturing pump instead of a diesel engine, Zhang purports to provide improvements including eliminating the need for a transmission structure, thereby reducing and simplifying the apparatus mounted on the fracturing car and improving safety and reliability. *Id.* ¶ 17. The space savings gained by using the motor in place of a diesel engine allows two pumps to be positioned on the same fracturing car. *Id.* ¶ 18.

Zhang's fracturing pump includes a motor coupled to the pump shaft, a control device, an air-cooled device for cooling the motor rotor, and a

water-cooled device for cooling the motor stator. Ex. 1005 ¶ 6. Figure 2 illustrates an air-cooled device of the fracturing pump and is reproduced below.[5]

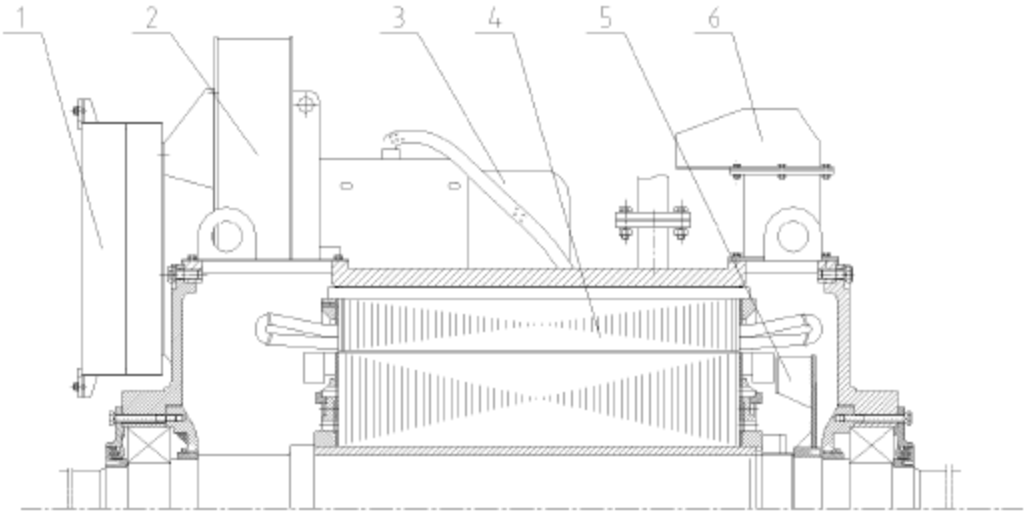

Figure 2 shows a fracturing pump air-cooled device. *Id.* ¶ 33. In operation, cool air enters through inlet 1 and is compressed by fan 2. *Id.* The compressed air flows into pump motor core 4 and removes heat therefrom. *Id.* Fan 5 draws the air out through outlet 6. *Id.*

Zhang's pump also includes a water-cooled device, illustrated in Figure 3. Ex. 1005 ¶ 34. In operation, cooled water in tank 11 is pressurized by water pump 12 (*see id.* at Fig. 4) and enters pump motor water jacket 7 via inlet 8. *Id.* ¶ 34, Fig. 3. The water passes through an S-shaped passage within the water jacket and removes heat therefrom. *Id.* ¶ 34. The water flows out through outlet 9, passes though heat sink 10 where its temperature is reduced, and flows back into tank 11. *Id.* at Fig. 3.

[5] We reproduce the version of Figure 2 from the cover page of the Zhang publication.

2. Stout

Stout relates to electric machines that convert mechanical movement into electrical power (i.e., generators) and convert electrical power into mechanical movement (i.e., motors). Ex. 1006 ¶ 2. Figure 1A is a schematic of an example electric machine system and is reproduced below.

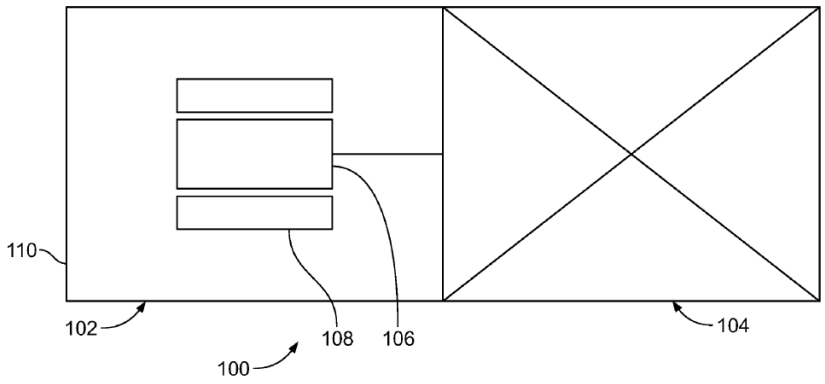

FIG. 1A

Figure 1A depicts electric machine system 100 comprising electric machine 102 coupled to companion device 104. *Id.* ¶ 87. Electric machine 102 can operate as a motor to output mechanical movement and drive the companion device. *Id.* The companion device may be a pump. *Id.* ¶ 90. Stout also discloses that the electric machine can be coupled to two or more companion devices (e.g., pumps) at the same time. *Id.* For example, companion devices may be provided at opposing ends of the electric machine. *Id.* ¶ 91.

Figure 1C illustrates a cross section of an example electric machine system with two companion devices and is reproduced below.

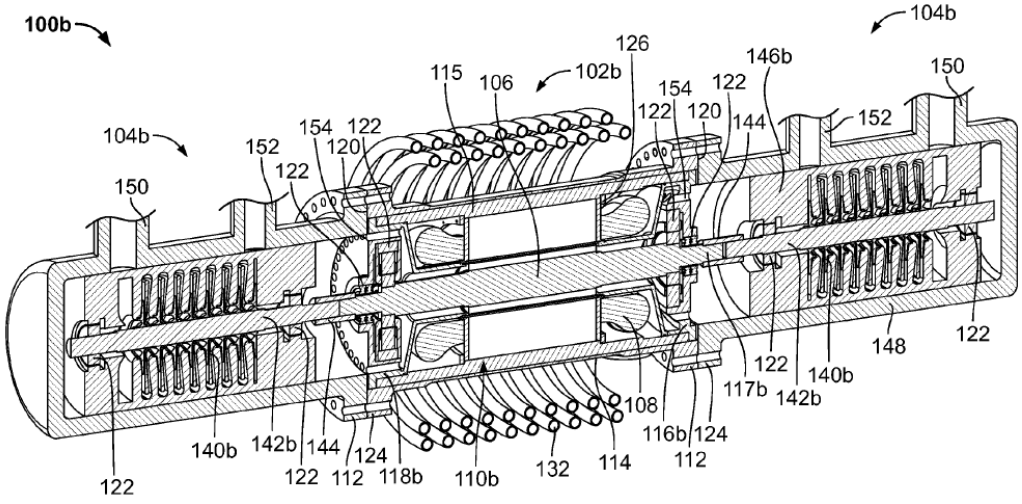

FIG. 1C

Figure 1C depicts an example electric machine system 100b including two compressor companion devices 104b arranged at opposite ends of electric machine 102b. Ex. 1006 ¶ 101. Although the companion devices are illustrated as compressors in Figure 1C (*id.*), pump companion devices 104a can be positioned in the same manner (*id.* ¶ 92).

3. API Standard 674

API Standard 674 is a publication by the American Petroleum Institute ("API") that "covers the minimum requirements for reciprocating positive displacement pumps and pump units for use in the petroleum, petrochemical, and gas industry services." Ex. 1007, 9. API Standard 674 specifies the use of flexible couplings between drivers and driven equipment. *Id.* at 42; *see also id.* at 40 (discussing electric motor drivers).

4. Coli

Coli relates to hydraulic fracturing in hydrocarbon-bearing wells. Ex. 1009 ¶ 3. Coli recognizes drawbacks of the diesel motors typically used in such drilling. *Id.* ¶¶ 5, 8. Coli purports to improve upon known

fracturing systems by using electric motors and generators powered by natural gas to drive the pumps. *Id.* ¶¶ 9–11, 38. Coli purports that this use of electric components beneficially reduces the amount of infrastructure, is safer and easier to control than known diesel systems, facilitates syncing the equipment within the system, and reduces costs. *Id.* ¶¶ 39, 66–71, 73.

Figure 3 is a schematic plan view of Coli's fracturing trailer and is reproduced below.

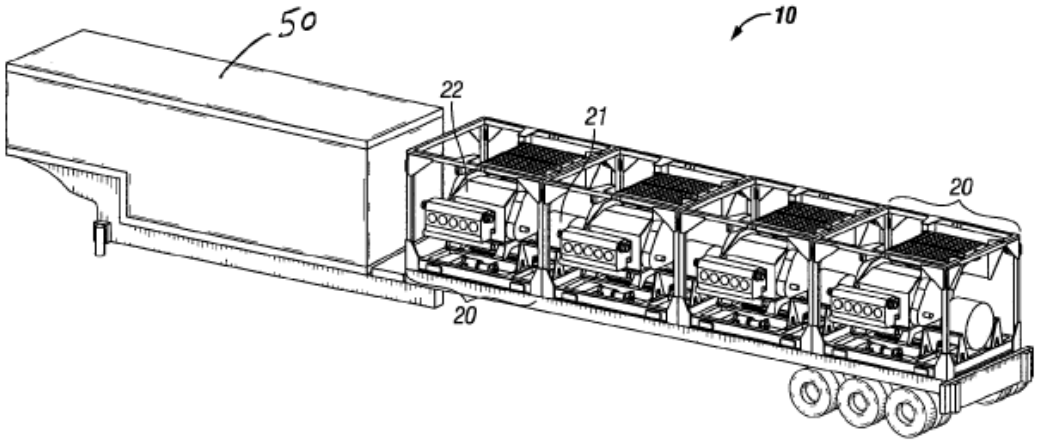

FIG. 3

Figure 3 is a schematic diagram of trailer 10 housing four fracturing modules 20. Ex. 1009 ¶ 40. Each fracturing module 20 includes electric motor 21 coupled directly to fluid pump 22. *Id.* ¶¶ 40, 52. The trailer housing also includes electrical transformer and drive unit 50 to step down the power voltage from turbine generator 30 (not shown) to electric motor 21. *Id.* ¶ 47. The "[f]racturing modules 20 utilize electric power from turbine generator 30 to pump the fracturing fluid directly to the wellbore." *Id.* ¶ 40. Multiple natural gas-powered turbine generators may provide a dedicated source of electric power on-site. *Id.* ¶ 38.

5. API Standard 671

API Standard 671 is an API publication that "specifies the requirements for couplings for the transmission of power between the rotating shafts of two machines in special-purpose applications in the petroleum, petrochemical and natural gas industries." Ex. 1010, 8. The couplings covered by API Standard 671 are designed to accommodate offset, angular misalignment, and axial displacement of coupled shafts without unacceptable mechanical loading. *Id.* For example, API Standard 671 applies to "gear, metallic flexible element, quill shaft and torsionally resilient type couplings." *Id.*

6. Sanborn

Sanborn discloses a system for hydraulically fracturing a rock formation to extract hydrocarbons. Ex. 1011 ¶ 2. Sanborn recognizes that traditional hydraulic fracturing systems comprising diesel engines to power fracturing pumps can be inefficient, can require extra safeguards to address potential safety, noise, and environmental issues, and can have an undesirably large footprint. *Id.* ¶¶ 4–7. Sanborn purports to improve upon such known systems by using electric motors to power the pumps. *Id.* ¶¶ 10–11. Figure 1 is a schematic representation of the hydraulic fracturing system and is reproduced below.

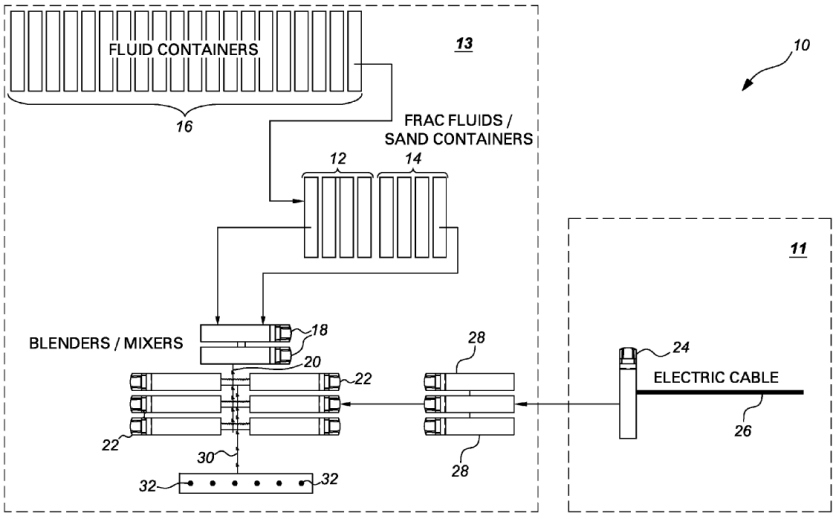

Fig. 1

Figure 1 is a schematic representation of the hydraulic fracturing system, including pumping sub-system 13 and power sub-system 11 that provides energy to the pumping sub-system. *Id.* ¶¶ 17, 33. The power sub-system includes electrical feed source 24, which may include a natural gas turbine engine and which may "be situated in a location remote from the pumping system." *Id.* ¶¶ 19, 39. The feed source includes a power distribution unit that may use a transformer to reduce the supplied voltage. *Id.* ¶ 39. Switchgears may be provided to "control multiple lines of power flow, such that faults or failures in individual components or units do not cause secondary damage to other components or units." *Id.* ¶ 32. The pumping sub-system includes a plurality of pumpers 22, each pumper including at least one pump and one or more electric motors to drive the pump(s). *Id.* ¶¶ 21, 38. The pumping sub-system includes variable frequency drives 28 to control the current supplied to the pumps. *Id.* ¶¶ 40–41.

7. Naets

Naets "relates to a compressor for use in a polyethylene high pressure reactor system, to a production plant including the compressor and to a process of making polyethylene homopolymers and copolymers." Ex. 1012, 1:13–16. Ethylene is polymerized in high pressure reactors that typically employ a primary compressor to perform a first compression of the ethylene feedstock and a secondary compressor to perform a second compression. *Id.* at 1:20–30. Naets describes a recognized need in the industry to increase throughput of such secondary compressors (*id.* at 1:44–46), and describes one prior attempt as providing two compressor frames on opposite sides of an electric motor. *Id.* at 2:6–9; *see also id.* at 1:53–58 (describing typically secondary compressors as being reciprocating compressors driven by an electric motor positioned at one end of the compressor frame). Naets purports to improve upon such a design by providing a system comprising "a motor and at least two compressor frames, with at least one of the compressor frames being coupled to the motor by means of a contoured diaphragm flexible coupling." *Id.* at 2:34–38. Such couplings "accommodate[] misalignment of the motor driveshaft and the compressor frame crankshaft" by flexing. *Id.* at 2:39–44. Figure 3 is a schematic drawing of a compressor and is reproduced below.

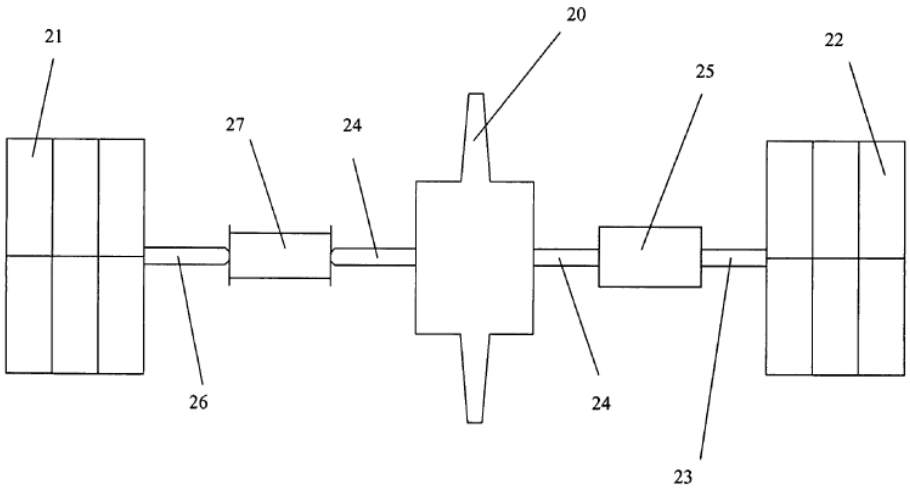

Fig. 3

Figure 3 illustrates a compressor comprising electric motor 20 arranged between compressor frames 21, 22. *Id.* at 6:45–48. Crankshaft 26 of compressor frame 21 is coupled to motor driveshaft 24 via contoured diaphragm flexible coupling 27. *Id.* at 6:51–54. Crankshaft 23 of compressor frame 22 is coupled to driveshaft 24 via rigid coupling 25, but a second contoured diaphragm flexible coupling could be used. *Id.* at 3:14–16, 6:48–51. The flexible coupling accommodates misalignment of the motor shaft and compressor frame crankshaft. *Id.* at 7:3–6.

8. Broussard

Broussard relates to hydraulic fracturing in oil and gas wells. Ex. 1013 ¶ 2. The system includes pumps powered by electric motors. *Id.* ¶ 18. Generators, such as natural gas turbine generators, are used to power the motors. *Id.* ¶ 24. A control system controls the speed of the motor via a variable frequency drive. *Id.* ¶ 27. The variable frequency drive also provides protection by frequently preforming motor diagnostics to prevent damage to a grounded or shorted motor. *Id.* ¶ 21. Broussard purports that its system provides several advantages over systems that use diesel-powered

pumps, including lighter weight, increased efficiency, lower cost, and reduced emissions. *Id.* ¶¶ 33–34.

F. Asserted Obviousness Based on Zhang, Stout, and API Standard 674

Petitioner argues that claims 1–3 and 18 would have been obvious over Zhang, Stout, and API Standard 674. Pet. 8–38. In support of its showing, Petitioner relies upon the Marscher Declaration. *Id.* (citing Ex. 1003). We have reviewed Petitioner's assertions and supporting evidence. For the reasons discussed below, and based on the record before us, we determine that Petitioner demonstrates a reasonable likelihood of prevailing in showing that at least one challenged claim would have been obvious over the combination of Zhang, Stout, and API Standard 674.

1. Independent Claims 1 and 18

Petitioner relies on Zhang to disclose a mobile hydraulic fracturing fluid delivery system substantially as recited in independent claim 1, and relies on Stout to teach an electric motor that drives two reciprocating machines mounted at opposing ends of a single drive shaft and API Standard 671 to teach the use of flexible couplings between drivers and driven equipment. Pet. 13–35. Claim 18 contains recitations that are substantially the same as those of claim 1. *Compare* Ex. 1001, 8:5–42, *with id.* at 10:11–41. Petitioner addresses claim 18 by relying on its arguments advanced for claim 1 (*id.* at 37–38), and Patent Owner addresses claims 1 and 18 collectively (Prelim. Resp. 13–27). Our analysis below focuses on claim 1 but applies equally to claim 18.

a. The Preamble

Claim 1 recites "[a] mobile hydraulic fracturing fluid delivery system for pumping high pressure fracturing fluid into an underground well bore at a well site and being transportable between multiple well sites." Ex. 1001, 8:5–9. Petitioner argues that Zhang discloses such a system. Pet. 13–14.

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Zhang discloses an oil-field fracturing apparatus including a fracturing pump and motor positioned on a fracturing car. Ex. 1005 ¶¶ 1, 26.

Accordingly, for the foregoing reasons and on this preliminary record, to the extent the preamble is limiting, Zhang supports Petitioner's contentions.

b. The Chassis Recitation

Claim 1 recites "a chassis, said chassis being configured to be transportable between well sites." Ex. 1001, 8:10–11. Petitioner maps Zhang's fracturing car to the recited chassis. Pet. 14.

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

As noted above, Zhang discloses an oil-field fracturing apparatus including a fracturing pump and motor positioned on a fracturing car. Ex. 1005 ¶¶ 1, 26.

Accordingly, for the foregoing reasons and on this preliminary record, Zhang supports Petitioner's contentions.

c. The Motor Recitation

Claim 1 recites "an electric motor disposed upon said chassis, said electric motor being electrically coupled to an external electric power source and having first and second opposing ends, said electric motor further having a single drive shaft extending axially therethrough and outwardly therefrom at said first and second opposing ends thereof." Ex. 1001, 8:12–17. Petitioner maps Zhang's motor to the recited motor. Pet. 15–16. Petitioner argues that it would have been obvious to power Zhang's motor using an external electric power source for a number of reasons. *Id.* at 22. Petitioner argues that Zhang's motor includes two opposing ends (*id.* at 20) and a drive shaft that extends through the motor and outwardly from the opposing ends (*id.* at 23).

Petitioner alternatively relies on Stout to teach the use of an electric motor having two opposing ends. *Id.* at 16–21. Petitioner argues that Stout teaches a drive shaft that extends through the motor and outwardly from the opposing ends. *Id.* at 23–24.

Patent Owner does not contest these aspects of the Petition. *See generally* Prelim. Resp.

Zhang discloses a fracturing pump that is driven by a motor rather than a diesel engine as used in conventional fracturing systems. Ex. 1005 ¶ 17. The motor is mounted on a car. *Id.* ¶¶ 17–18. The motor appears to have a single drive shaft extending therethrough and outwardly from opposing ends. *See, e.g.*, *id.* at Figs. 2, 3.

Stout discloses an electric machine that can operate as a motor. Ex. 1006 ¶ 87. The motor includes a rotor that extends therethrough and, in

certain embodiments, outwardly from two opposing ends of the motor. *Id.* ¶¶ 88, 101, 105–106, Fig. 1C.

Accordingly, for the foregoing reasons and on this preliminary record, Zhang and Stout support Petitioner's contentions.

d. The Pump Recitations

Claim 1 recites,

> a first fluid pump disposed upon said chassis, coupled directly to said drive shaft of said electric motor at said first end of said motor and configured to pump fracturing fluid into the well bore;
>
> a second fluid pump disposed upon said chassis, coupled directly to said drive shaft of said electric motor at said second end of said motor and configured to pump fracturing fluid into the well bore at the same time as said first fluid pump,
>
> wherein said first and second fluid pumps are axially aligned with said electric motor at said opposing ends thereof, further wherein said drive shaft of said electric motor is coupled to said first and second fluid pumps so that said electric motor is capable of concurrently driving both said fluid pumps.

Ex. 1001, 8:18–32. Petitioner asserts that "Zhang describes an embodiment where two fracturing pumps are 'provided on' (disposed upon) a fracturing car." Pet. 24 (emphasis omitted) (citing Ex. 1005 ¶¶ 6–7, 18, 31; Ex. 1003 ¶¶ 43–45). Petitioner argues that "Zhang teaches and illustrates an electric motor that drives two (first and second) fracturing pumps." *Id.* at 25 (emphases omitted) (citing Ex. 1005 ¶¶ 6–8, 17–18, 26, 31).

Patent Owner argues that Zhang does not disclose two pumps driven by a single electric motor. Prelim. Resp. 14–20. Patent Owner argues that Zhang describes the prior art as using "a single pump paired with a single engine" and does not deviate from that "1:1 ratio of one pump to one

engine/motor" when disclosing its improvement. *Id.* at 15 (citing Ex. 1005 ¶¶ 2–3). Rather, Patent Owner contends, Zhang discloses driving pumps with electric motors rather than diesel engines (*id.* (citing Ex. 1005, code (57))), and this substitution provides the benefits of simplifying the fracturing pump structure, reducing the apparatus mounted on the car, decreasing the failure rate, and increasing safety and reliability (*id.* at 17 (citing Ex. 1005 ¶ 17)). Patent Owner argues, however, "[n]owhere does Zhang state that two pumps are driven by a single motor." *Id.* at 17.

We agree that Petitioner has not shown persuasively that Zhang discloses or suggests two pumps driven by a single motor. Zhang discloses a fracturing pump that is driven by a motor rather than a diesel engine. Ex. 1005 ¶ 17. Zhang explains that, among other benefits, eliminating the diesel engine and its related equipment "reduc[es] the apparatus mounted on a fracturing car," which allows two pumps to be placed on a car. *Id.* ¶¶ 17–18. Nowhere, however, does Zhang disclose that two pumps are driven by a single motor. To the contrary, when discussing motor-pump connections, Zhang discloses only that *a* motor is coupled to the shaft of *a* fracturing pump. *See, e.g.*, *id.* ¶¶ 6, 17, 26. Nor does Petitioner explain adequately how Zhang's disclosure of mounting its cooling device between two fracturing pumps positioned on the same car translates to driving the two pumps with a single motor. *See id.* ¶ 31; *see also* Pet. 25 (citing same).

Alternatively, Petitioner relies on Stout to teach two pumps driven by a single motor. Pet. 25–26 (citing Ex. 1006 ¶¶ 90, 92, 107–108); *see also id.* at 16 (citing Ex. 1006 ¶¶ 2, 87–88, 90, 92, 100).

Patent Owner argues that Stout's "inventive concept" is "the inclusion of wedges in the stator slots to provide a fluid flow path" and that "Stout

describes a variety of electric machines to illustrate the breadth of its inventive concept." Prelim. Resp. 20 (citing Ex. 1006 ¶¶ 88–89). According to Patent Owner, however, Stout "does not suggest a preference for any particular configuration of a motor with one pump or a motor with two pumps." *Id.*

Stout discloses that electric machine 102 can "operate as a motor producing mechanical movement from electricity" and "can drive the companion device 104." Ex. 1006 ¶ 87. "[T]he companion device 104 can include . . . a rotating and/or reciprocating pump . . . ." *Id.* ¶ 90. "[T]he electric machine 102 can also be coupled to two or more companion devices 104 (to drive . . . the devices 104)." *Id.* ¶ 91. Stout also discloses that the "one or more companion devices 104 can be provided at each end of the electric machine 102" such that "one [companion device] may be provided at one end of the electric machine 102 and another provided at an opposing end of the electric machine." *Id.* Thus, Stout supports Petitioner's contentions.

Petitioner argues that it would have been obvious to an ordinarily skilled artisan to incorporate Stout's pump-motor-pump configuration into Zhang's system for a number of reasons (Pet. 17–20), each of which Patent Owner contends is improper (Prelim. Resp. 21–26). We discuss each of Petitioner's proffered rationale below.

First, Petitioner relies on Zhang to provide a teaching-suggestion-motivation rationale to drive two pumps with a single motor. Pet. 18.

Patent Owner argues that this rationale is based on the false premise that Zhang discloses two pumps driven by a single motor. Prelim. Resp. 21–23.

We agree with Patent Owner. As explained above, Zhang does not disclose driving two pumps with a single motor.

Next, Petitioner argues that "Zhang touts the beneficial effects of 'simplifying the structure of the entire fracturing pump, reducing the apparatus mounted on a fracturing car, [and] decreasing failure rate of the apparatus,'" and that "[i]t would have been apparent to [an ordinarily skilled artisan] that the pump-motor-pump configuration that Stout disclosed promotes these same benefits." Pet. 18–19 (first alteration in original) (emphases omitted) (quoting Ex. 1005 ¶ 17) (citing Ex. 1003 ¶ 54).

Patent Owner argues that "Zhang unambiguously explains that these 'beneficial effects' arise from the omission of a transmission between the pump and motor." Prelim. Resp. 23 (citing Ex. 1005, code (57), ¶ 17). Patent Owner argues that Petitioner's reliance on the testimony of its expert, Mr. Marscher, is unavailing because he fails to provide "any detailed explanation or analysis." *Id.* at 23–24 (citing Ex. 1003 ¶ 54).

Although we agree that Zhang discloses that the benefits noted by Petitioner result from the use of an electric motor rather than a diesel engine (*see* Ex. 1005 ¶ 17), we understand Petitioner to argue that Stout's pump-motor-pump configuration would provide similar benefits by simplifying the structure and reducing the number of components that would otherwise be needed to allow the motor to drive two pumps. Petitioner's declarant provides examples of such additional equipment that would not be needed, including an additional prime mover (presumably a second motor to drive the second pump) and a transfer case (presumably to split power from a single motor into two pumps). Ex. 1003 ¶ 54. We find this argument

persuasive to explain why an ordinarily skilled artisan would adopt the pump-motor-pump configuration disclosed by Stout.

Next, Petitioner argues that the benefits identified in Zhang of replacing a diesel engine with a motor yields additional benefits, providing examples of lower cost due to using fewer components, increased efficiency by eliminating components where losses typically occur, and freed space to accommodate use of larger fracturing pumps. Pet. 19 (citing Ex. 1005 ¶ 17; Ex. 1003 ¶¶ 55).

Patent Owner argues that Petitioner fails to provide adequate explanation for the asserted additional benefits. Prelim. Resp. 24–25. Patent Owner argues that Petitioner's first example fails to provide a "comparison of a two-pump-one-motor system to two one-pump-one-motor systems with the same overall power and flowrate capacities" and fails to account for the fact that "a single larger motor will be more expensive than each of the smaller motors." *Id.* at 24–25. Patent Owner argues that Petitioner's second example is unpersuasive because Mr. Marscher relies on the elimination of "the transmission and transfer case," which Zhang already omits. *Id.* at 25 (quoting Ex. 1003 ¶ 55) (citing Ex. 1005 ¶¶ 2, 17). Patent Owner argues that Petitioner's third example is unpersuasive because Zhang already provides additional space for larger pumps by providing fracturing pumps driven by motors. *Id.* at 25 (citing Ex. 1005 ¶ 18).

We agree with Patent Owner. Petitioner makes assertions for which neither the Petition nor the Marscher Declaration provide adequate support. As discussed above, Zhang does not teach or suggest driving two pumps with a single motor. The benefits touted by Petitioner and Mr. Marscher are achieved by the elimination of the diesel engine and its related equipment,

and neither Petitioner nor Mr. Marscher explains adequately how driving two pumps with a single motor would provide the asserted additional benefits. *See* Pet. 19; Ex. 1003 ¶ 55. For the most part, Petitioner and Mr. Marcher make unsupported assertions, failing to provide any comparison of Zhang's system and the proposed modified system.

Finally, Petitioner argues that using Stout's pump-motor-pump configuration in Zhang's system "would have yielded a predictable result from combining known prior art elements according to known methods." Pet. 19 (citing Ex. 1003 ¶¶ 56–57; *KSR*, 550 U.S. at 416). According to Petitioner, "[e]ach element in combination merely performs the same function as it does separately." *Id.* at 20 (citing Ex. 1003 ¶ 56).

Patent Owner notes that Mr. Marscher relies on several prior art references and argues that Mr. Marscher's testimony "is entirely devoid of analysis of why any of those references—none of which appear[s] to address systems for hydraulic fracturing—is relevant to the specific hydraulic fracturing systems recited in the challenged claims." Prelim. Resp. 26 (citing Ex. 1003 ¶¶ 56–57). Patent Owner argues that Petitioner's reliance on *KSR* is misplaced because "*KSR* reiterated the need 'to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.'" *Id.* (quoting *KSR*, 550 U.S. at 418).

We agree that both the Petition and Mr. Marscher's declaration testimony do not provide extensive detail regarding this rationale for combining the teachings of Zhang and Stout. Whether this rationale is adequate is an issue to be determined on a full record as developed during the trial.

e. The Flex Coupling Recitations

Claim 1 recites,

> at least a first flex coupling engaged with and between said electric motor and said first fluid pump and configured to allow movement of said electric motor and said first fluid pump relative to one another during and without disturbing the operation thereof; and
>
> at least a second flex coupling engaged with and between said electric motor and said second fluid pump and configured to allow movement of said electric motor and said second fluid pump relative to one another during and without disturbing the operation thereof.

Ex. 1001, 8:33–42. Petitioner argues that the '049 patent concedes that the recited flex couplings were known and are used in a typical manner. Pet. 30–32 (citing, *inter alia*, Ex. 1001, 5:58–67, 6:1–8). Petitioner also argues that API Standard 674 teaches the use of flexible couplings between drivers and driven equipment. Pet. 32–33 (citing Ex. 1007, 9, 42).

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

We agree that the '049 patent appears to concede that the recited flex couplings and the uses thereof were well known prior to the critical date of the '049 patent. For example, the '049 patent relies on an article published in 1989 to provide a description of the recited flex couplings. Ex. 1001, 5:58–67. The '049 patent also indicates that the recited flex couplings were commercially available prior to the filing date of the application resulting in the '049 patent. *Id.* at 6:1–8.

API Standard 674 is an API publication that sets forth "the minimum requirements for reciprocating positive displacement pumps and pump units for use in the petroleum, petrochemical, and gas industry services."

Ex. 1007, 9. This standard provides for the use of "flexible couplings and guards between drivers and driven equipment." *Id.* at 42.

Accordingly, for the foregoing reasons and on this preliminary record, API Standard 674 supports Petitioner's contentions. We determine that Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have included flex couplings in Zhang's system (as modified by Stout).

2. Conclusion

Accordingly, at this stage of the proceeding, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 1 and 18 would have been obvious over the combination of Zhang, Stout, and API Standard 674.

G. Asserted Obviousness Based on Zhang, Stout, API Standard 674, and Broussard

Petitioner argues that claims 6–8, 10, 12, 19, and 20 would have been obvious over Zhang, Stout, API Standard 674, and Broussard. Pet. 38–47. In support of its showing, Petitioner relies upon the Marscher Declaration. *Id.* (citing Ex. 1003). We have reviewed Petitioner's assertions and supporting evidence. For the reasons discussed below, and based on the record before us, we determine that Petitioner demonstrates a reasonable likelihood of prevailing in showing that at least one challenged claim would have been obvious over the combination of Zhang, Stout, API Standard 674, and Broussard.

1. Independent Claim 19

Independent claim 19 recites a method of providing a high volume of pressurized fluid from a single mobile high pressure fluid delivery system into an underground well bore containing recitations that are substantially the same as those of claim 1 and additional recitations regarding a variable frequency drive. Ex. 1001, 10:42–11:7. Petitioner relies on Zhang, Stout, and API Standard 674 as set forth in § II.F above regarding claim 1 and relies on Broussard to teach a variable frequency drive to power the motor. Pet. 42–44, 47. We rely on our discussion above regarding the similar recitations and the additional comments below regarding the variable frequency drive recitations.

Claim 19 recites "electrically connecting a remotely controllable variable frequency drive disposed on the chassis to the electric motor and an external electric power source" and "the variable frequency drive providing electric power to the electric motor from the external electric power source and allowing the speed of the electric motor to be remotely controlled." Ex. 1001, 11:1–7. Petitioner notes that Zhang discloses controlling the motor using a middle-voltage numerical control frequency converter and argues that an ordinarily skilled artisan "would have understood Zhang's use of the term 'frequency converter' in this context as referencing a VFD." Pet. 39. Thus, Petitioner argues, the skilled artisan would look to the teachings of Broussard. *Id.* at 39, 42.

Patent Owner does not contest Petitioner's challenge to claim 19 other than by relying on its arguments presented for claim 1 and discussed above. *See* Prelim. Resp 26.

Broussard discloses a fracturing system including pumps powered by electric motors. Ex. 1013 ¶¶ 2, 8. A control system, remote from the variable frequency drive, controls the speed of the motor via a variable frequency drive. *Id.* ¶ 27. The variable frequency drive also provides protection by frequently preforming motor diagnostics to prevent damage to a grounded or shorted motor. *Id.* ¶ 21.

Accordingly, for the foregoing reasons and those set forth in § II.F above, and on this preliminary record, Broussard supports Petitioner's contentions. We determine that Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have included a variable frequency drive in Zhang's system (as modified by Stout and API Standard 674).

2. Conclusion

Accordingly, at this stage of the proceeding, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claim 19 would have been obvious over the combination of Zhang, Stout, API Standard 674, and Broussard.

H. Asserted Obviousness Based on Zhang, Stout, API Standard 674, Broussard, and API Standard 671

Petitioner argues that claims 1–3, 6–8, 10, 12, 13, 15, and 18–20 would have been obvious over Zhang, Stout, API Standard 674, Broussard, and API Standard 671. Pet. 47–52. In support of its showing, Petitioner relies upon the Marscher Declaration. *Id.* (citing Ex. 1003). We have reviewed Petitioner's assertions and supporting evidence. For the reasons discussed below, and based on the record before us, we determine that

Petitioner demonstrates a reasonable likelihood of prevailing in showing that at least one challenged claim would have been obvious over the combination of Zhang, Stout, API Standard 674, Broussard, and API Standard 671.

Petitioner relies on Zhang, Stout, API Standard 674, and Broussard as set forth in §§ II.F and II.G above. Pet. 51. Petitioner relies on API Standard 671 "to address any interpretation that the claimed flex couplings of [claims 1, 18, and 19] must accommodate inadvertent misalignment by deformation through material flexure." Pet. 51 (emphasis omitted). Petitioner addresses independent claim 13 in substantially the same manner as claim 19 discussed in § II.G above. *Id.* at 52.

Petitioner argues that "[t]he 'metallic flexible-element coupling' endorsed by API Standard 671 is a 'coupling type that obtains its flexibility from the flexing of thin metallic discs, diaphragms or links.'" Pet. 50 (emphasis omitted) (quoting Ex. 1010, 11). Petitioner argues that an ordinarily skilled artisan would have used such couplings as the flexible couplings disclosed by API Standard 674. *Id.* at 48–50.

Patent Owner does not contest Petitioner's challenge other than by relying on its arguments presented for claim 1 and discussed above. *See* Prelim. Resp 26.

On this preliminary record, the cited portions of API Standard 671 support Petitioner's contentions. We determine that Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have combined the teachings of Zhang, Stout, API Standard 674, Broussard, and API Standard 671.

I. Asserted Obviousness Based on Sanborn and Naets

Petitioner argues that claims 1–3, 6–8, 12, 13, 15, and 18–20 would have been obvious over Sanborn and Naets. Pet. 53–76. In support of its showing, Petitioner relies upon the Marscher Declaration. *Id.* (citing Ex. 1003). We have reviewed Petitioner's assertions and supporting evidence. For the reasons discussed below, and based on the record before us, we determine that Petitioner demonstrates a reasonable likelihood of prevailing in showing that at least one challenged claim would have been obvious over the combination of Sanborn and Naets.

1. Independent Claims 1 and 18

Petitioner relies on Sanborn to disclose a mobile hydraulic fracturing fluid delivery system substantially as recited in claim 1 and relies on Naets to teach mounting two driven pumps on opposing ends of a single drive shaft via flexible couplings. Pet. 58–68. Petitioner addresses independent claim 18 by relying on its arguments advanced for claim 1 (*id.* at 75), and Patent Owner addresses claims 1 and 18 collectively (Prelim. Resp. 27–40). Our analysis below focuses on claim 1 but applies equally to claim 18.

a. The Preamble[6]

Petitioner argues that Sanborn discloses a mobile fracturing fluid delivery system. Pet. 58–59.

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

[6] The claim language is reproduced in § II.F.1.

Sanborn discloses a portable, modular system for hydraulically fracturing a rock formation to extract hydrocarbons. Ex. 1011 ¶ 2.

Accordingly, for the foregoing reasons and on this preliminary record, to the extent the preamble is limiting, Sanborn supports Petitioner's contentions.

b. The Chassis Recitation

Petitioner maps Sanborn's mobile platforms to the recited chassis. Pet. 59.

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Sanborn's system includes mobile platforms on which pumping units, referred to as "pumpers," comprising one or more pumps and one or more electric motors are positioned. Ex. 1011 ¶ 21.

Accordingly, for the foregoing reasons and on this preliminary record, Sanborn supports Petitioner's contentions.

c. The Motor Recitation

Petitioner maps Sanborn's motor to the recited motor. Pet. 60. Petitioner argues that all of Sanborn's motors are powered by a single electrical feed source that is external to the pumpers. *Id.* Petitioner relies on Naets to teach a motor having a single drive shaft that extends therethrough and outwardly from opposing ends of the motor. *Id.* at 61–62.

Sanborn's power sub-system 11 provides energy to the pumping sub-system. Ex. 1011 ¶¶ 17, 33. The power sub-system includes an electrical feed source, which may include a natural gas turbine engine and which may

"be situated in a location remote from the pumping system." *Id.* ¶ 19; *see also id.* ¶ 39 (discussing a power distribution unit).

Naets discloses a motor positioned between two compressor frames and having a drive shaft that extends through and outwardly therefrom. Ex. 1012, 6:45–54, Fig. 3.

Accordingly, for the foregoing reasons and on this preliminary record, Sanborn and Naets support Petitioner's contentions.

Patent Owner argues that Naets is not analogous art. Prelim. Resp. 33–35. Patent Owner argues that Petitioner's definition of the field of endeavor is based on the false premise that "Naets [has] anything to do with pumps" and broadly refers to "fluid" when "Sanborn pumps liquid" and "Naets compresses gas." *Id.* at 34 (emphases omitted); *see also* Pet. 55–56 (arguing that Naets is analogous art). Patent Owner acknowledges Petitioner's assertion that "Naets and the '049 patent similarly address the problem of coupling a prime mover to driven machinery" (*see* Pet. 55) and argues that "Petitioner makes no effort to identify such a problem in Sanborn." Prelim. Resp. 34.

A reference qualifies as prior art for a determination under § 103 when it is analogous to the claimed invention. *In re Clay*, 966 F.2d 656, 658 (Fed. Cir. 1992).

> Two separate tests define the scope of analogous prior art: (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) (citing *In re Deminski*, 796 F.2d 436, 442 (Fed. Cir. 1986)).

> The Supreme Court's decision in [*KSR*] directs us to construe the scope of analogous art broadly, stating that "*familiar items may have obvious uses beyond their primary purposes*, and a person of ordinary skill often will be able to fit the teachings of multiple patents together like pieces of a puzzle." [*KSR*, 550 U.S.] at 402 (emphasis added).

Wyers v. Master Lock Co., 616 F.3d 1231, 1238 (Fed. Cir. 2010).

The '049 patent is in the field of hydraulic fracturing. *E.g.*, Ex. 1001, 1:8–11. Sanborn is also in the field of hydraulic fracturing (*e.g.*, Ex. 1011 ¶ 2), and, thus, is analogous to the '049 patent. Naets is in the field of ethylene polymerization tubular reactors. *E.g.*, Ex. 1012, 1:13–16. Thus, on this preliminary record, it does not appear that Naets is in the same field of endeavor as the '049 patent.

Regarding the second part of the analogous art test, Petitioner argues that both the '049 patent and Naets address "the problem of coupling a prime mover to driven machinery." Pet. 55. The '049 patent discloses the use of flex couplings between its motor and pumps to accommodate relative movement between the motor and pumps during operation. Ex. 1001, 5:52–58. Naets also discloses the use of flexible couplings between its motor and compressors to accommodate misalignments therebetween. Ex. 1012, 2:39–44. Thus, on this preliminary record, it appears that Naets is analogous to the '049 patent because it addresses a problem addressed by the '049 patent. *See Donner Tech., LLC v. Pro Stage Gear, LLC*, 979 F.3d 1353, 1361 (Fed. Cir. 2020) ("[I]f the two references have 'pertinent similarities' such that [the asserted reference] is reasonably pertinent to one or more of the problems to which the [challenged] patent pertains, then [the asserted reference] is analogous art.").

We are not persuaded by Patent Owner's argument that Naets is not analogous art. Prelim. Resp. 33–35. As noted above, Patent Owner acknowledges, and does not contest, Petitioner's position that Naets and the '049 patent address a similar problem—"coupling a prime mover to driven machinery." Instead, Patent Owner argues that "Petitioner makes no effort to identify such a problem in *Sanborn*." *Id.* at 34 (emphasis added). This argument does not persuade us that Naets is not analogous art because, as explained above, the analogous art test compares the asserted reference to the challenged patent, not to other asserted references.

d. The Pump Recitations

Petitioner argues that Sanborn discloses that its motor can power multiple pumps concurrently. Pet. 63–64. Petitioner relies on Naets to teach positioning two concurrently driven components on opposing ends of the motor that drives the components. *Id.*; *see also id.* at 56–58 (presenting rationale for combining the teachings of Sanborn and Naets).

Patent Owner argues that a person of ordinary skill in the art would not modify Sanborn's system to use Naets's reciprocating machine configuration. Prelim. Resp. 35. According to Patent Owner, "nothing in Naets or the art generally cited by Petitioner would have led [an ordinarily skilled artisan] to modify Sanborn to drive two pumps with a single motor." *Id.*

As noted above, Petitioner relies on Naets to teach positioning driven components—reciprocating machines in Naets, pumps in Sanborn—on either side of a motor. *See* Pet. 63–64. Contrary to Patent Owner's suggestion, Petitioner relies on Sanborn to disclose driving two pumps with

a single motor. *See id.* at 63. We agree that Sanborn discloses driving two pumps with a single motor. *See* Ex. 1011 ¶ 21 ("An electrical motor could power multiple pumps.").

Patent Owner contests each of Petitioner's stated rationale for modifying Sanborn's system to position its pumps on either side of its motor in the same manner that Naets positions its reciprocating machines on either side of its motor. Prelim. Resp. 35–40. We discuss each of Petitioner's proffered rationale below.

First, Petitioner relies on Sanborn to provide a teaching-suggestion-motivation rationale to drive two pumps with a single motor. Pet. 56–57. Petitioner argues that it would have been obvious to use the design options taught by Naets.

Patent Owner argues that Petitioner has not provided adequate reasoning to explain why a skilled artisan would turn to the teachings of Naets when Sanborn "provides explicit guidance" as to the nature of the relevant art. *Id.* at 36–37 (quoting Ex. 1011 ¶ 2).[7]

Patent Owner appears to argue that Naets is not analogous art. However, as explained above, we find that Naets is analogous art with respect to the '049 patent. Furthermore, as also noted above, Sanborn discloses driving multiple pumps with a single motor. *See* Ex. 1011 ¶ 21.

Next, Petitioner argues that a skilled artisan would have relied on Naets to teach a design option having "the potential for enhanced performance—e.g., increased throughput." Pet. 57.

[7] Although Patent Owner cites to paragraph 11 of Sanborn, the language quoted by Patent Owner appears in paragraph 2.

Patent Owner argues that this rationale "is too generic to motivate reliance on Naets." Prelim. Resp. 37. Patent Owner argues that the benefit touted by Petitioner ("increased throughput") is "addressed in prior art electric fracturing pump trailers (*see, e.g.*, [Ex. 1009], Abstract, ¶[0024], FIG. 3), meaning Petitioner has not offered any explanation that would have motivated [an ordinarily skilled artisan] to turn to Naets's industrial polymerization compressor." *Id.*

Patent Owner again appears to argue that Naets is not analogous art. As explained above, Naets is analogous art with respect to the '049 patent. However, we agree that this rationale does not appear to support Petitioner's combination of Sanborn and Naets. Petitioner relies on Naets's compressor–motor–compressor arrangement rather than a serial (motor–pump–pump) arrangement, but Petitioner does not explain adequately how arranging the motor and pumps as disclosed in Naets provides an increased throughput versus a serial arrangement.

Next, Petitioner argues that "utilizing one electric motor to directly drive two pumps simplifies and consolidates the driveline by foregoing additional components such as prime movers, transmissions, transfer cases, etc." Pet. 57. Continuing, Petitioner argues that "avoiding additional components—each of which carries its own set of failure modes—bolsters system reliability." *Id.*

Patent Owner argues that Petitioner's "purported motivation is supported by nothing more than the unsupported contentions of Mr. Marscher." Prelim. Resp. 37 (citing Ex. 1003 ¶¶ 149–150).

We understand Petitioner to argue that *directly* driving each of the two pumps with the motor, rather than driving the pumps in another manner

(such as serially), would eliminate the need for additional equipment that would otherwise be needed to allow the motor to drive the two pumps. Petitioner provides examples of such additional equipment that would not be needed, including an additional prime mover (presumably a second motor to drive the second pump) and a transfer case (presumably to split power from a single motor into two pumps). Pet. 57; *see also* Ex. 1003 ¶ 149. We find this argument persuasive to explain why an ordinarily skilled artisan would adopt the pump-motor-pump configuration disclosed by Naets.

Additionally, the "bolster[ing] system reliability" reasoning is supported by Petitioner's expert, who testifies,

> in the serial arrangement of motors and pumps, the shaft of the pump closest to the motor would need to be much larger in order to carry the torque to drive both pumps in series, requiring the pump closest to the motor to be a special – and much more expensive – pump which would be heavier in weight and less reliable.

Ex. 1003 ¶ 150.

Next, Petitioner argues that "utilizing a single motor to drive multiple pumps was a cost-effective and space-saving design option." Pet. 57.

Patent Owner acknowledges that "the use of a single motor to drive multiple pumps was already known in electric fracturing pump trailers" and argues, therefore, that Petitioner has not explained why a skilled artisan would "turn to Naets's industrial polymerization compressor to drive two fracturing pumps." Prelim. Resp. 38 (citing Ex. 1009, code (57) ¶ 24, Fig. 3).

Patent Owner's arguments again improperly attempt to limit the scope of analogous prior art. However, we agree that this rationale does not appear to support Petitioner's combination of Sanborn and Naets. Petitioner relies

on Sanborn to teach driving two pumps with a single motor. *See* Pet. 63; Ex. 1011 ¶ 21. Petitioner's arguments do not appear to address adequately why an ordinarily skilled artisan would adopt Sanborn's component arrangement versus another type of arrangement.

Finally, Petitioner argues that implementing Naets's teachings into Sanborn's system "would have yielded a predictable result from combining known prior art elements according to known methods." Pet. 58 (citing Ex. 1003 ¶¶ 152–153; *KSR*, 550 U.S. at 416). According to Petitioner, "[e]ach element in combination merely performs the same function as it does separately." *Id.* at 58 (citing Ex. 1003 ¶¶ 152–153).

Patent Owner notes that Mr. Marscher relies on several prior art references and argues that Mr. Marscher's testimony "is entirely devoid of analysis of why any of those references—none of which appear[s] to address systems for hydraulic fracturing—is relevant to the specific hydraulic fracturing systems recited in the challenged claims." Prelim. Resp. 29 (citing Ex. 1003 ¶¶ 152–153).

We agree that both the Petition and Mr. Marscher's declaration testimony do not provide extensive detail regarding this rationale for combining the teachings of Sanborn and Naets. Whether this rationale is adequate is an issue to be determined on a full record as developed during the trial.

e. The Flex Coupling Recitations

Petitioner relies on Naets to teach the use of flexible couplings between the motor and pumps. Pet. 66–68. Petitioner argues that it would have been obvious to use such couplings in Sanborn's system to

accommodate misalignments between the motor and pumps during operation. *Id.*

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Naets teaches the use of flexible couplings between its motor and compressor to accommodate misalignments therebetween. Ex. 1012, 2:39–44.

Accordingly, for the foregoing reasons and on this preliminary record, Naets supports Petitioner's contentions. We determine that Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have included flex couplings as taught by Naets in Sanborn's system.

f. Conclusion

Accordingly, at this stage of the proceeding, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 1 and 18 would have been obvious over the combination of Sanborn and Naets.

2. Independent Claims 13 and 19

Independent claim 13 recites a mobile high pressure fluid pumping unit for pumping high pressure fluid into an underground well bore at a well site and being transportable between multiple well sites containing recitations that are substantially the same as those of claim 1 and additional recitations regarding a variable frequency drive. Ex. 1001, 9:22–59. Claim 19 contains substantially the same recitations. *See id.* at 10:42–11:7. Additionally, rather than reciting "flex couplings" as in claims 1 and 19,

claim 13 recites first and second "high horsepower elastic couplings." *Id.* at 9:42–52. Petitioner relies Sanborn and Naets as set forth in § II.I.1 above regarding claim 1 and relies on Sanborn to teach a variable frequency drive to power the motor and Naets to teach high horsepower elastic couplings. Pet. 69–74. We rely on our discussion above regarding the similar recitations and the additional comments below regarding the variable frequency drive and high horsepower elastic coupling recitations.

a. Variable Frequency Drive Recitations

Claim 13 recites,

> a remotely controllable variable frequency drive disposed upon said chassis and electrically coupled to said electric motor and an external electric power source, said variable frequency drive being configured to provide electric power to said electric motor from said external electric power source and allow the speed of said electric motor to be remotely controlled.

Ex. 1001, 53–59. Claim 19 contains substantially the same recitations (*id.* at 11:1–7), and Petitioner addresses independent claim 19 by relying on the same arguments advanced for claim 13 (Pet. 73–76). Our analysis below focuses on claim 13 but applies equally to claim 19.

Petitioner maps Sanborn's variable frequency drives to the recited variable frequency drive. Pet. 69–72.

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Sanborn discloses variable frequency drives to control the electrical power supplied from the electrical feed source to the motors. Ex. 1011 ¶¶ 40–41, Fig. 1. The variable frequency drives are controlled via a control system that coordinates the power generation sub-system and the pumping

sub-system. *Id.* ¶¶ 50–51. Sanborn discloses that the variable frequency drives are part of the pumping sub-system and are illustrated as being positioned on "trailers on which they might be situated." *Id.* ¶ 40. Petitioner's declarant testifies that it would have been obvious to position the variable frequency drives on the same trailer as the electrical motors that they control. Ex. 1003 ¶ 183.

Accordingly, for the foregoing reasons and on this preliminary record, Sanborn supports Petitioner's contentions.

b. High Horsepower Elastic Coupling Recitations

Claim 13 recites first and second "high horsepower elastic couplings." Ex. 1001, 9:42–52. Other than being "high horsepower elastic" couplings, the recitations are substantially the same as the "flex coupling" recitations of claim 1. *Compare id.*, *with id.* at 8:33–42. Petitioner relies on Naets to teach the use of flexible couplings between the motor and pumps. Pet. 74. Petitioner argues that an ordinarily skilled artisan would have tailored the flexible couplings to their use, including the high horsepower uses of Naets and Sanborn. *Id.*

Patent Owner does not contest this aspect of the Petition. *See generally* Prelim. Resp.

Naets teaches the use of flexible couplings between its motor and compressor to accommodate misalignments therebetween. Ex. 1012, 2:39–44. Petitioner's declarant testifies that an ordinarily skilled artisan would understand Naets to describe high horsepower applications, and that such an artisan would select couplings rated for use with high horsepower

components when selecting couplings for use in Sanborn's system. Ex. 1003 ¶ 137.

Accordingly, for the foregoing reasons and on this preliminary record, Naets supports Petitioner's contentions. We determine that Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have included flex couplings as taught by Naets in Sanborn's system.

c. Conclusion

Accordingly, at this stage of the proceeding, we determine that Petitioner has established a reasonable likelihood of prevailing on its assertion that claims 13 and 19 would have been obvious over the combination of Sanborn and Naets.

J. Asserted Obviousness Based on Sanborn, Naets, and Coli

Petitioner argues that claim 10 would have been obvious over Sanborn, Naets, and Coli. Pet. 76–80. In support of its showing, Petitioner relies upon the Marscher Declaration. *Id.* (citing Ex. 1003). We have reviewed Petitioner's assertions and supporting evidence. For the reasons discussed below, and based on the record before us, we determine that Petitioner demonstrates a reasonable likelihood of prevailing in showing that claim 10 would have been obvious over the combination of Sanborn, Naets, and Coli.

Claim 10 depends from claim 1 through claim 6 and further recites "wherein said electric motor is an AC permanent magnet motor having a power rating of 5,000 hp." Ex. 1001, 9:12–14. Petitioner notes that Sanborn discloses an example pump as having a capacity in the range of about

2,000 hp to about 3,000 hp. Pet. 79 (citing Ex. 1011 ¶ 22). Petitioner argues that, because Sanborn discloses its motor powering multiple pumps, an ordinarily skilled artisan would have understood "that the motor should have a power rating sufficient to drive such a multi-pump load." *Id.* (emphasis omitted) (citing Ex. 1011 ¶¶ 21–22; Ex. 1003 ¶ 200). Thus, Petitioner concludes, an ordinarily skilled artisan "would have understood Sanborn to provide an electric motor having a power rating within a range of 4,000hp to 6,000hp, as would have been appropriate for driving two 2,000hp to 3,000hp pumps at either end of the drive shaft." *Id.* (emphases omitted) (citing Ex. 1003 ¶¶ 200–201; *In re Peterson*, 315 F.3d 1325, 1330 (Fed. Cir. 2003)).

Petitioner relies on Coli to teach the use of a permanent magnet motor. Pet. 80; *see also id.* at 76–78.

Patent Owner does not contest Petitioner's challenge to claim 10 other than by relying on its arguments presented for claim 1 and discussed above. *See* Prelim. Resp 40.

Coli discloses a fracturing system that includes permanent magnet motors to power its pumps. Ex. 1009 ¶¶ 9, 11. Petitioner's expert testifies that permanent magnet motors were known to be compact, lightweight, highly efficient, and provide precise speed control. Ex. 1003 ¶¶ 194, 198.

Accordingly, for the foregoing reasons and on this preliminary record, Sanborn and Coli support Petitioner's contentions. We determine that Petitioner sets forth reasoning with rational underpinning as to why a person having ordinary skill in the art would have included a permanent magnet motor having a power rating of 5000 hp in Sanborn's system. Thus, Petitioner has established a reasonable likelihood of prevailing on its

assertion that claim 10 would have been obvious over the combination of Sanborn, Naets, and Coli.

III. CONCLUSION

For the foregoing reasons, we determine that the information presented establishes a reasonable likelihood that Petitioner would prevail in showing that at least one of the challenged claims of the '049 patent is unpatentable. At this preliminary stage, we have not made a final determination with respect to the patentability of the challenged claims or any underlying factual and legal issues. *See TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016) (noting that "there is a significant difference between a petitioner's burden to establish a 'reasonable likelihood of success' at institution, and actually proving invalidity by a preponderance of the evidence at trial").

Accordingly, *inter partes* review is instituted as to all challenged claims and all proposed grounds of unpatentability. *See SAS*, 138 S. Ct. at 1359–60; *see also PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (interpreting the statute to require "a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition"); CTPG 64 ("The Board will not institute on fewer than all claims or all challenges in a petition.").

IV. ORDER

Accordingly, it is:

ORDERED that pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–3, 6–8, 10, 12, 13, 15, and 18–20 of the '049 patent is instituted with respect to all grounds set forth in the Petition; and

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4, notice is hereby given of the institution of a trial, which commences on the entry date of this decision.

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