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Paper 40
Entered: August 30, 2023

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HALLIBURTON ENERGY SERVICES, INC.,
Petitioner,

v.

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

IPR2022-00610
Patent 10,934,824 B2

Before LYNNE H. BROWNE, GEORGE R. HOSKINS, and SEAN P. O'HANLON, *Administrative Patent Judges*.

HOSKINS, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
Denying Patent Owner's Contingent Motion to Amend
35 U.S.C. § 318(a)

I. INTRODUCTION

Halliburton Energy Services, Inc. ("Petitioner") filed a Petition (Paper 2, "Pet.") pursuant to 35 U.S.C. §§ 311–319 to institute an *inter partes* review of U.S. Patent No. 10,934,824 B2 (Ex. 1001, "the '824 patent"), claims 1–15. We issued an Institution Decision (Paper 15, "Inst. Dec.") instituting the petitioned review.

U.S. Well Services, LLC ("Patent Owner") then filed a Patent Owner Response (Paper 23, "PO Resp.") to the Petition, defending the '824 patent claims. Petitioner filed a Reply (Paper 28, "Pet. Reply") to the Patent Owner Response. Patent Owner filed a Sur-reply (Paper 32, "PO Sur-reply") to the Reply.

Patent Owner also filed a contingent Motion to Amend the '824 patent (Paper 24, "Mot."), to which Petitioner filed an Opposition (Paper 27, "Mot. Opp."). We issued Preliminary Guidance (Paper 29, "Prelim. Guid.") concerning the Motion to Amend and the Opposition. Patent Owner then filed a Reply to the Opposition (Paper 31, "Mot. Reply"), and Petitioner filed a Sur-reply to Patent Owner's Reply (Paper 37, "Mot. Sur-reply").

An oral hearing was held on June 12, 2023, for which the transcript was entered into the record (Paper 39, "Tr.").

We have jurisdiction under 35 U.S.C. § 6(b)(4) and § 318(a). This Decision is a final written decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of claims 1–15 of the '824 patent, and as to Patent Owner' Motion to Amend the '824 patent proposing to add substitute claims 16–30. We determine Petitioner has shown by a preponderance of the evidence that claims 1–15 of the '824 patent are unpatentable under 35 U.S.C. § 103. Accordingly, we reach Patent Owner's contingent Motion

to Amend, which we deny as to adding proposed substitute claims 16–22 because those claims are unpatentable under 35 U.S.C. § 103, and we deny as to proposed substitute claims 23–30 because those claims add new matter to the application that issued as the '824 patent in violation of 35 U.S.C. § 316(d)(3).

II. BACKGROUND

A. Real Parties-in-Interest and Related Proceedings

Petitioner identifies itself (i.e., Halliburton Energy Services, Inc.), Halliburton Company, and Halliburton Holdings LLC as real parties-in-interest. *See* Pet. 1. Patent Owner identifies itself (i.e., U.S. Well Services, LLC), USWS Holdings, LLC, U.S. Well Services, Inc., and ProFrac Holding Corporation as real parties-in-interest. *See* Paper 5, 1; Paper 25.

The parties represent that the '824 patent has not been asserted in litigation. *See* Pet. 1; Paper 5, 1.

Petitioner has also filed several other IPR proceedings to challenge patents owned by Patent Owner. *See, e.g.*, Pet. 1–2; Paper 5, 1. They are:

Proceeding No.	**U.S. Patent No.**
IPR2021-01032	9,410,410 B2
IPR2021-01033	8,789,601 B2
IPR2021-01034	10,337,308 B2
IPR2021-01035	9,970,278 B2
IPR2021-01036	9,611,728 B2
IPR2021-01037	9,745,840 B2
IPR2021-01038	10,408,030 B2
IPR2021-01065	9,840,901 B2
IPR2021-01066	10,020,711 B2
IPR2021-01238	10,526,882 B2
IPR2021-01315	9,893,500 B2

IPR2021-01316	10,280,724 B2
IPR2021-01538	10,408,031 B2
IPR2021-01539	10,648,311 B2
IPR2022-00074	10,254,732 B2
IPR2022-00557	9,659,871 B2
IPR2023-00558	11,136,870 B2

B. The '824 Patent

The '824 patent is directed to a system for reducing vibrations in the piping of an electrically powered hydraulic fracturing system. *See* Ex. 1001, codes (54) and (57). Figure 2, reproduced below, illustrates piping in a hydraulic fracturing system having vibration reducing equipment. *See id.* at 3:63–65.

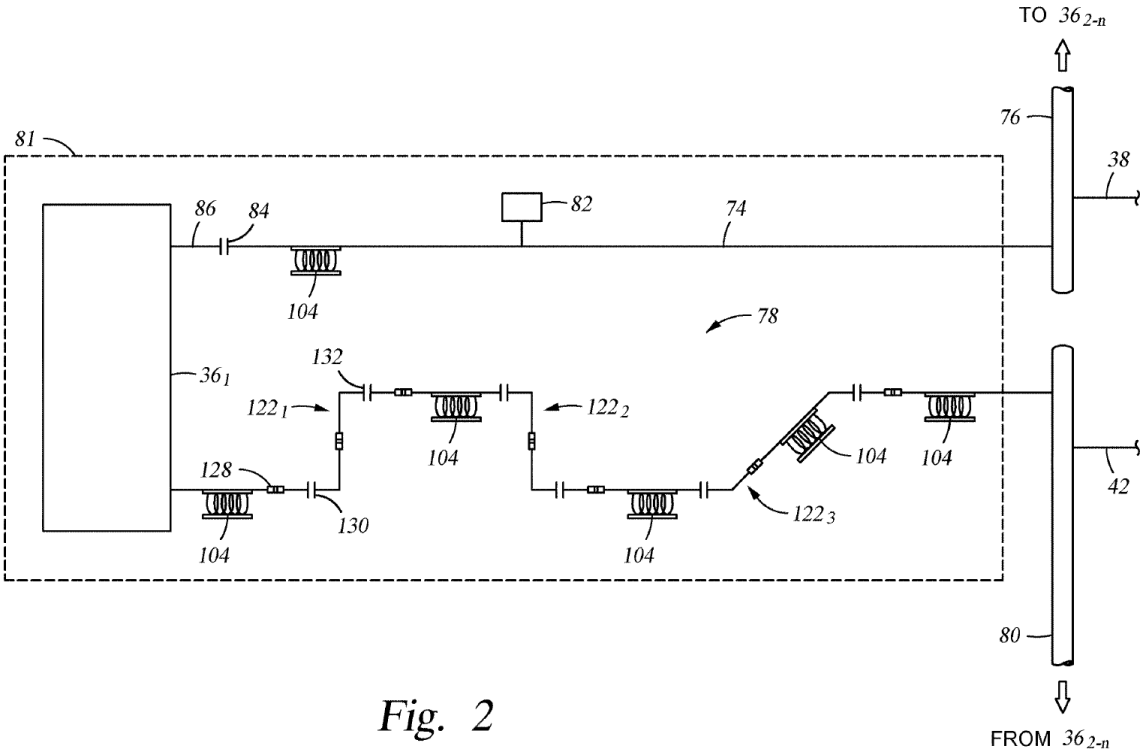


Fig. 2

'824 Patent, Figure 2.

Figure 2 depicts pump 36_1 connected by suction branch 74 piping to suction manifold 76 to receive fracturing fluid via line 38, and connected by

discharge branch 78 piping to deliver pressurized fracturing fluid to discharge manifold 80 and thence to discharge piping 42 which leads to a wellhead assembly. *See id.* at 4:65–67, 5:21–25, 6:8–23. Further, pumps 36_{2-n} (not shown) are similarly connected to suction manifold 76 and discharge manifold 80. *See id.* at 6:8–23.

Multiple structures reduce vibration within suction branch 74 piping, including: pulsation dampener 82; grooved connection joint 84; and cable coil assembly 104. *See id.* at 6:41–55, 7:14–17. Multiple structures also reduce vibration within discharge branch 78 piping, including: five cable coil assemblies 104; and three swivel assemblies 122_{1-3}. *See id.* at 7:14–17, 7:38–40.

Figure 5, reproduced below, illustrates an exemplary swivel assembly 122. *See id.* at 7:53–54.

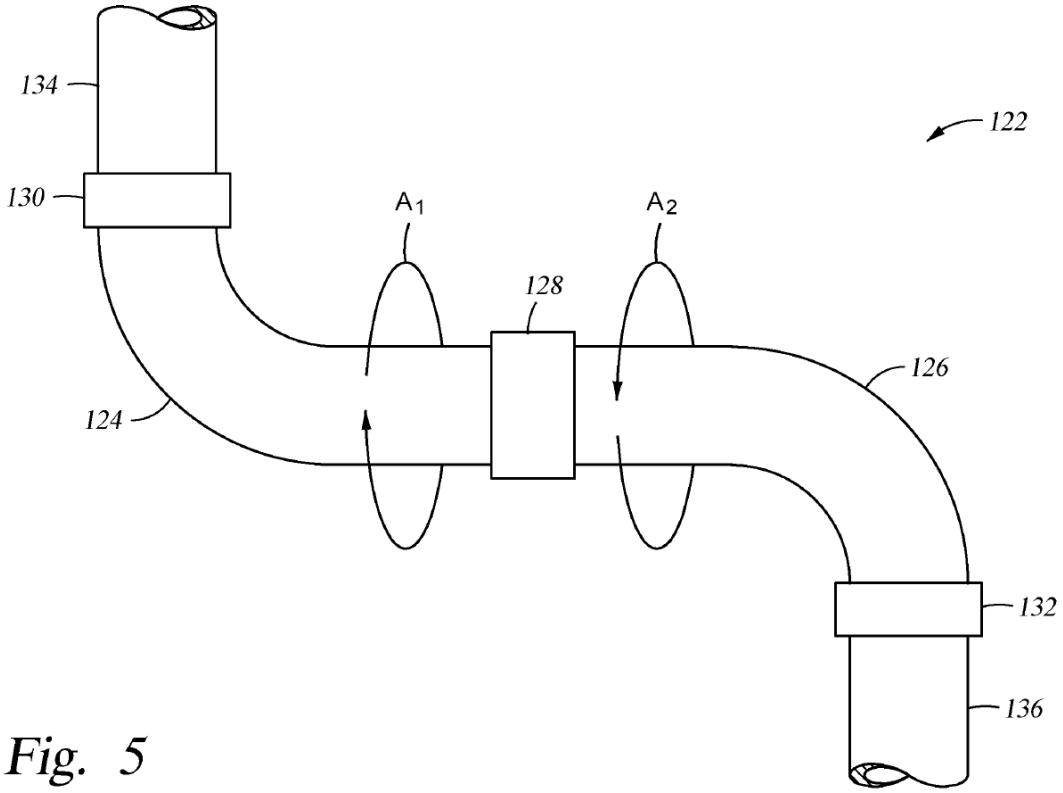


Fig. 5

'824 Patent, Figure 5.

Figure 5 depicts swivel assembly 122 comprising adjacent pipe sections 124, 126 joined to one another by swivel joint 128 to allow the pipe sections to "swivel, i.e. rotate with respect to one another." *Id.* at 7:40–42, 7:53–56. "Swivel joint 128 sealingly couples together the sections of pipe 124, 126 and yet allows relative rotation of the pipes 124, 126 as illustrated by arrows A_1, A_2." *Id.* at 7:56–59. Fittings 130, 132 connect pipe sections 124, 126 to further pipe sections 134, 136 within discharge branch 78. *Id.* at 7:63–8:5.

In an alternative embodiment, a swivel assembly may include more than one swivel joint. *See id.* at 8:9–15 (Fig. 6 shows alternate swivel assembly 122A having multiple swivel joints 128A).

C. Parent Applications of the '824 Patent

The '824 patent was filed as U.S. Patent Application No. 16/158,756 ("the '756 Application") on October 12, 2018. *See* Ex. 1001, codes (21) and (22).

The '756 Application is a continuation of U.S. Patent Application No. 15/145,414 ("the '414 Application"), filed on May 3, 2016. *See* Ex. 1001, code (63), 1:7–9.

The '756 Application also is a continuation-in-part of U.S. Patent Application No. 13/679,689 ("the '689 Application"), filed on November 16, 2012. *See* Ex. 1001, code (63), 1:11–14.

The '756 Application further asserts priority to U.S. Provisional Application No. 62/156,306 ("the '306 Provisional"), filed on May 3, 2015. *See* Ex. 1001, code (60) (page 2), 1:9–11.

D. Testimonial Evidence

Petitioner relies on the expert witness testimony of Robert Durham, Ph.D. (Exhibits 1002 and 1050). Patent Owner relies on the expert witness testimony of Mr. William D. Marscher (Exhibits 1049 and 2007).[1] Patent Owner also relies on the testimony of Mr. Joel N. Broussard (Ex. 2009), previously proffered in IPR2021-01032 and IPR2021-01033, as relating to objective indicia of nonobviousness for the '824 patent.

III. PETITIONER'S CHALLENGES TO THE '824 PATENT CLAIMS

A. Statement of Law

Petitioner bears the burden of proving unpatentability of the challenged claims, and the burden of persuasion never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). Petitioner must prove unpatentability by a preponderance of the evidence. *See* 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d).

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 before the effective filing date of the claimed invention[2] to a person having ordinary skill in the art to which the claimed invention pertains. *See KSR Int'l Co. v. Teleflex*

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[1] The Preliminary Response (Paper 6) relied on the declaration testimony of Mr. Robert Schaaf (Exhibit 2006). However, the Patent Owner Response refers only to Mr. Marscher as "Patent Owner's expert" (PO Resp. 7) and never cites Exhibit 2006. Accordingly, we do not consider Exhibit 2006 in this Decision.

[2] As discussed below in Section III.F.1, the first-inventor-to-file provisions of the Leahy-Smith America Invents Act (Pub. L. No. 112-29, 125 Stat. 284 (2011) ("the AIA") apply to the '824 patent.

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 ordinary skill in the art; and (4) objective indicia of nonobviousness, if made available in the record as Patent Owner has done in this case. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). "While the sequence of these questions might be reordered in any particular case," *KSR*, 550 U.S. at 407, the Federal Circuit has explained that an obviousness determination can be made only after consideration of all of the *Graham* factors. *See, e.g.*, *Kinetic Concepts, Inc. v. Smith & Nephew, Inc.*, 688 F.3d 1342, 1360 (Fed. Cir. 2012).

B. Level of Ordinary Skill in the Art

Petitioner contends a person having ordinary skill in the art pertaining to the '824 patent:

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

Pet. 18; Ex. 1002 ¶ 55.

In the Institution Decision, we applied Petitioner's formulation of the level of ordinary skill in the art. *See* Inst. Dec. 18. The Patent Owner Response utilizes this formulation too. *See* PO Resp. 7; Ex. 2007 ¶ 16.

We conclude Petitioner's formulation of the level of ordinary skill in the art is consistent with the level of skill reflected in the '824 patent and the prior art of record. We, therefore, apply it in our analysis below.

C. The Challenged Claims of the '824 Patent

The '824 patent contains fifteen claims, all of which are challenged, including two independent claims 1 and 8. *See* Ex. 1001, 9:19–10:48. We reproduce illustrative claim 1 below.

> 1. A hydraulic fracturing system for fracturing a subterranean formation comprising:
>
> an electrically powered fracturing pump having a discharge side;
>
> a discharge branch of piping having therein pressurized fracturing fluid supplied from the fracturing pump; and
>
> swivel connections strategically located in the discharge branch of piping, so that when pressurized fracturing fluid flows through the discharge branch of piping, a section of the discharge branch of piping is axially rotatable with [respect to][3] an adjacent section of the discharge branch of piping.

Id. at 9:19–30.

Claim 8 recites a hydraulic fracturing system comprising the same components as claim 1, and adds "a tubular suction lead" for the pump, which is coupled to "a suction branch of piping" "by a grooved connection" so that the suction lead and the suction branch are "pivotal with respect to" each other. *Id.* at 10:4–23.

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[3] As stated in the Institution Decision, and not thereafter disputed by either party, the "with" term in claim 1 was meant to be "with respect to." *See* Inst. Dec. 5 n.1.

D. Asserted Prior Art

Petitioner relies principally on the following six references to challenge the '824 patent claims, listed in order of their publication date. *See* Pet. 17–18 (listing of grounds).

Name	Reference	Publication Date	Exhibit No.
Piping Handbook	Mohinder L. Nayyar, *Piping Handbook* (7th Ed.)	≤ 2000	1010
Burns	WO 00/47893	Aug. 2000	1013
Garner	US 2010/0193057 A1	Aug. 2010	1008
Sanborn	US 2013/0306322 A1	Nov. 2013	1009
Enidine	*Wire Rope Isolator Technologies*, ITT Enidine, Inc.	Mar. 2014	1011
Rashid	US 10,690,131 B2	June 2020	1012

The identified publication dates of Piping Handbook, Burns, Garner, Sanborn, and Enidine are derived from Petitioner's contentions in the Petition, which Patent Owner does not dispute. *See* Pet. 15 (Piping Handbook, citing Ex. 1014 ¶¶ 39, 40, 42), 17 (Burns, citing Ex. 1013, code (43)), 13 (Garner, citing Ex. 1008, code (43)), 14 (Sanborn, citing Ex. 1009, code (43)), 16 (Enidine, citing Ex. 1015). We conclude Petitioner's contentions in these regards are supported by a preponderance of the evidence cited in the Petition.

Petitioner's remaining reference, Rashid, was published in June 2020. *See* Ex. 1012, code (45). Petitioner contends Rashid is prior art because Rashid's filing date precedes the effective filing date of claims 7 and 15 of the '824 patent, the only claims against which Petitioner cites Rashid. *See* Pet. 16 (discussing Rashid, citing 35 U.S.C. § 102(a)(2)); *id.* at 6–8 (discussing the effective filing date of the '824 patent claims); *id.* at 17–18

(listing Petitioner's grounds of unpatentability). Patent Owner argues in opposition that the '824 patent claims have an effective filing date that precedes Rashid's filing date. *See* PO Resp. 11–18, 28, 32. For reasons provided below in Section III.F.2, we conclude Petitioner's contentions in this regard are supported by a preponderance of the evidence, so Rashid is prior art to claims 7 and 15 of the '824 patent.

E. Asserted Grounds

Petitioner proposes the following seven grounds of unpatentability for claims 1–15 of the '824 patent. *See* Pet. 17–18.

Ground	Claim(s) Challenged	35 U.S.C. §	References
1	1, 4–6	103	Garner, Sanborn
2	2, 3	103	Garner, Sanborn, Enidine
3	7	103	Garner, Sanborn, Rashid
4	8, 11–14	103	Garner, Sanborn, Piping Handbook
5	9, 10	103	Garner, Sanborn, Piping Handbook, Enidine
6	15	103	Garner, Sanborn, Piping Handbook, Rashid
7	11	103	Garner, Sanborn, Piping Handbook, Burns

F. Effective Filing Date of the '824 Patent Claims

The parties disagree as to the effective filing date of the '824 patent claims. *See* Pet. 6–8; PO Resp. 11–18; Pet. Reply 1, 3–5; PO Sur-reply 1–3. We provide a chart below to illustrate the various possibilities.

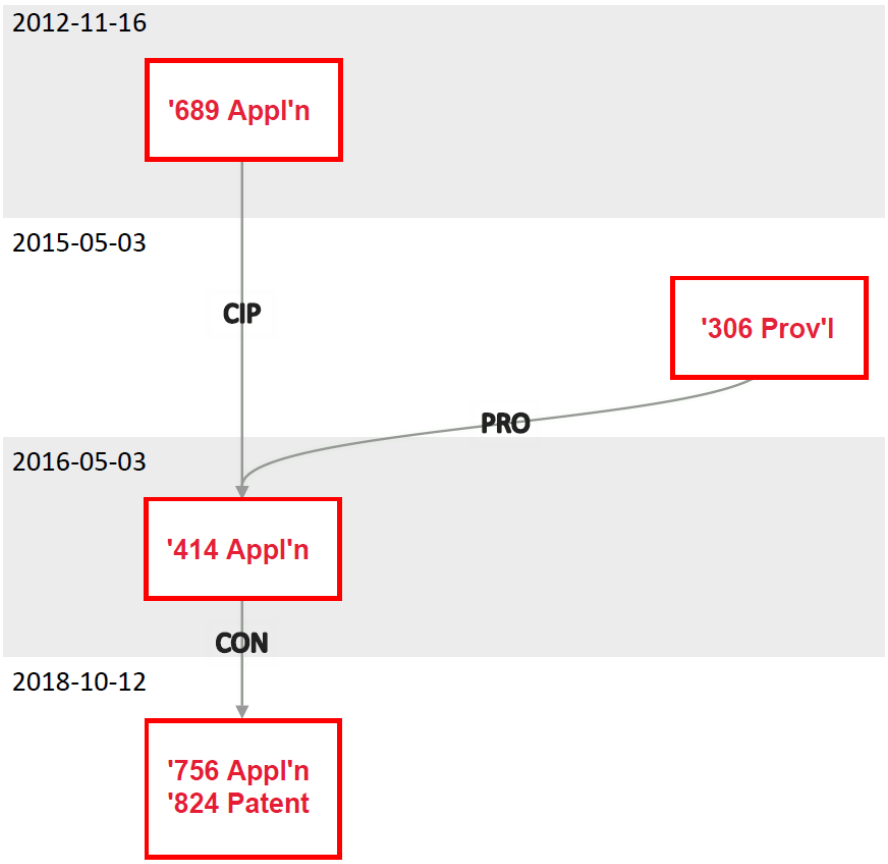


Chart of the Parent Applications of the '824 Patent.

This chart illustrates the respective filing dates of the '824 patent and its parent applications, plotted along a vertical time axis that is not to scale. The chart reflects the nature of the asserted priority as a continuation ("CON"), a continuation-in-part ("CIP"), or provisional ("PRO").

Petitioner asserts the effective filing date of the '824 patent claims is May 3, 2016 — the filing date of the '414 Application. *See* Pet. 6–8; Pet. Reply 3–5; Ex. 1002 ¶¶ 51–54. Specifically, Petitioner argues neither the '689 Application nor the '306 Provisional provides written description support for any of: the "swivel connections" limitation in independent claims 1 and 8; the "grooved connection" limitation in independent claim 8; and the "controller" limitation in dependent claims 7 and 15. *See* Pet. 7–8 (citing Exs. 1001, 1006, and 1007); Pet. Reply 3–5; Ex. 1002 ¶¶ 53–54.

Patent Owner argues the effective filing date of the '824 patent claims is May 3, 2015 — the filing date of the '306 Provisional. *See* PO Resp. 11. Patent Owner asserts claims 1–15 each have written description support in the '306 Provisional. *See id.* at 11–18 (citing Ex. 1007); PO Sur-reply 1–3. In particular, Patent Owner relies on the entire written description in the '306 Provisional (i.e., paragraphs 1–3) and annotates several of the '306 Provisional's twenty-eight illustrations to identify "Swivels," "Helical Coils," a "Pulsation Dampener," a "Truck/Trailer," and "Vibration Data" as being shown therein. *See* PO Resp. 11–18.

The effective filing date of the '824 patent claims was previously at issue in the Institution Decision. *See* Inst. Dec. 7–11. At that time, Patent Owner had not attempted to establish that either the '689 Application or the '306 Provisional provides written description support for the '824 patent claims, and we "decline[d] to sift through the disclosures of the '689 Application and the '306 Provisional *sua sponte* on Patent Owner's behalf, attempting to discern written description support for the claimed subject matter." *Id.* at 8, 10. We further stated: "If Patent Owner desires to maintain this dispute . . . then Patent Owner should cite specific disclosure(s) in the subject parent application that support Patent Owner's contention that" the '824 patent claims have written description support therein. *Id.* at 10–11.

We now consider, based on the entire trial record, the proper effective filing date of the '824 patent claims. We address the '689 Application and the '306 Provisional separately.

1. The '689 Application

The effective filing date of the '824 patent claims can be the filing date of the '689 Application only if, *inter alia*, the '824 patent "is entitled, as to [the claimed] invention . . . to the benefit of" the '689 Application's filing date under 35 U.S.C. § 120. 35 U.S.C. § 100(i) (defining the term "effective filing date"). Section 120, in turn, requires that the '689 Application must disclose the claimed invention "in the manner provided by [35 U.S.C. §] 112(a)." 35 U.S.C. § 120. In other words, the '689 Application must provide written description support for the invention claimed in the '824 patent. *See Paice LLC v. Ford Motor Co.*, 881 F.3d 894, 906 (Fed. Cir. 2018); *PowerOasis, Inc. v. T-Mobile USA, Inc.*, 522 F.3d 1299, 1306–11 (Fed. Cir. 2008); *Augustine Medical, Inc. v. Gaymar Indus., Inc.*, 181 F.3d 1291, 1302–03 (Fed. Cir. 1999). The test for sufficiency of a written description under 35 U.S.C. § 112(a) is whether the prior application's disclosure "reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date." *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). The written description "test requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art." *Id.*

As mentioned above, the Institution Decision advised Patent Owner that, if Patent Owner desired to maintain that the '824 patent claims have an effective filing date corresponding to the '689 Application's filing date, then Patent Owner should cite specific disclosure(s) in the '689 Application that provide written description support for the claims. *See* Inst. Dec. 10–11. In

response, Patent Owner has opted to stand silent on this issue. *See, e.g.*, PO Resp. 11–18.

Based on the record now presented, we find a preponderance of the evidence supports Petitioner's contention that the '689 Application does not provide written description support for the "swivel connections" limitation in independent claims 1 and 8. *See* Pet. 7 (citing Ex. 1006); Ex. 1002 ¶¶ 53–54. Petitioner relies on the disclosure of U.S. Patent No. 9,410,410 B2 (Ex. 1006, "the '410 patent"), which issued from the '689 Application. We have reviewed the two figures and the eight columns of disclosure in the '410 patent, and we find nothing therein that might demonstrate possession of a swivel connection in a branch of piping. *See* Ex. 1006.

We accordingly conclude the first-inventor-to-file provisions of the AIA apply to the '824 patent. Those provisions apply to any patent issuing from an application that contains or contained at any time a claim to an invention that has an effective filing date on or after March 16, 2013. *See* AIA § 3(n)(1). In this case, as can be seen from the chart above illustrating the respective filing dates of the '824 patent and its parent applications, only the '689 Application was filed prior to March 2013. Thus, due to the '689 Application's lack of written description support for both independent claims of the '824 patent, the '824 patent cannot be a pre-AIA patent.

2. The '306 Provisional

Next we consider the parties' dispute over whether the '306 Provisional provides an effective filing date for the '824 patent claims.

Exhibit 1007 is a copy of the '306 Provisional.[4] We consider claims 1–6 and 8–14 as a first group, then we consider claims 7 and 15 as a second group.

a) Claims 1–6 and 8–14 of the '824 Patent

As to claims 1–6 and 8–14, for the following reasons, we need not resolve the parties' dispute over whether the '306 Provisional provides written description support.

The parties' dispute in this regard might possibly affect this Decision in one of two ways. The first is that it might affect whether Petitioner's cited references qualify as prior art. However, the five references cited against claims 1–6 and 8–14 (i.e., Garner, Sanborn, Enidine, Piping Handbook, and Burns) were all published prior to Patent Owner's earlier date, so they are prior art to those claims even applying the earlier date. *See supra* Section III.D; 35 U.S.C. § 102(a)(1). Therefore, we need not resolve the parties' dispute to determine whether the references cited against claims 1–6 and 8–14 qualify as prior art.

The second possible effect of the parties' dispute in this Decision is that it determines the time frame for evaluating obviousness, as either May 2015 (Patent Owner's view) or May 2016 (Petitioner's view). However, even viewing Petitioner's obviousness challenges from the perspective of Patent Owner's earlier date, we still conclude the Petition demonstrates the challenged claims are unpatentable as having been obvious. In particular, Patent Owner does not allege and we do not discern

[4] Petitioner identifies this exhibit as App. No. 62/242,173. *See* Pet. iv. However, we have confirmed it corresponds to App. No. 62/156,306.

from the evidence presented that there were any technological advances in the one-year time span between the parties' competing dates that materially changes the obviousness inquiry. Therefore, we need not resolve the parties' dispute to weigh the parties' competing contentions as to obviousness.

b) Claims 7 and 15 of the '824 Patent

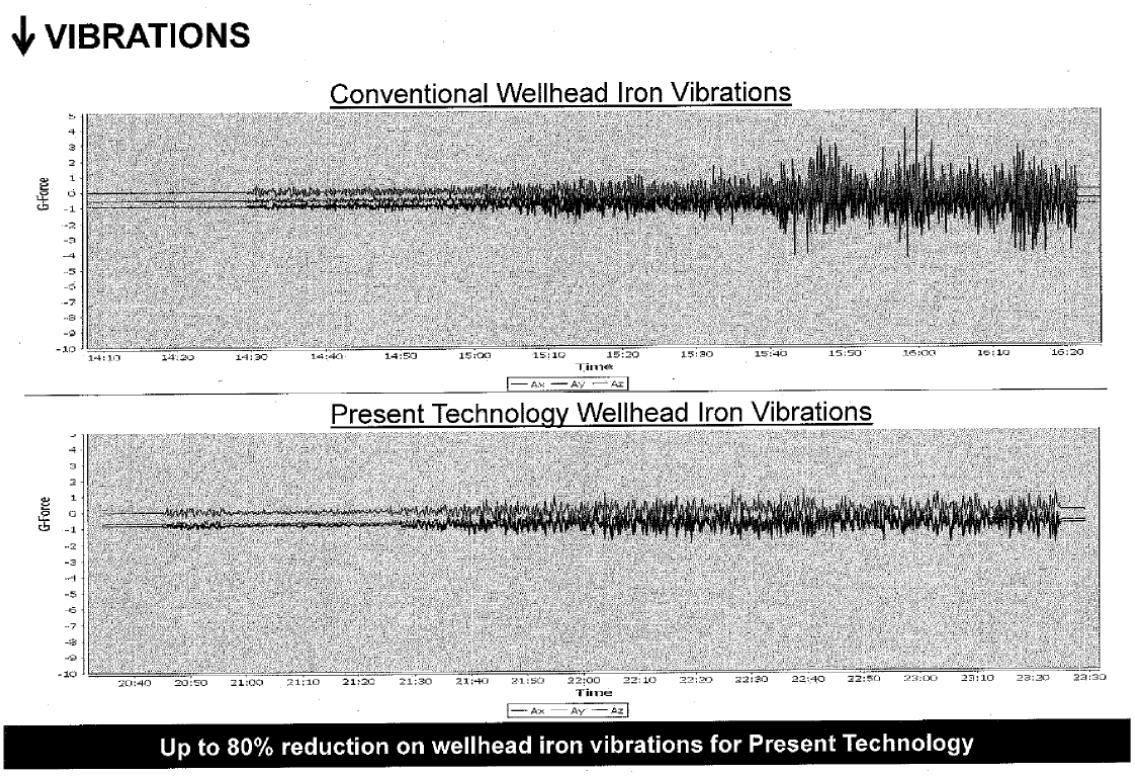
As to claims 7 and 15, for the following reasons, we conclude the '306 Provisional does not provide written description support.

We reach this issue as to claims 7 and 15 because it determines whether Rashid is prior art to these claims. In particular, Petitioner contends Rashid was filed in January 2016 and qualifies as prior art under 35 U.S.C. § 102(a)(2). *See* Pet. 16 (citing Ex. 1012, code (22)). The Patent Owner Response does not dispute that Rashid was filed in January 2016. *See, e.g.*, PO Resp. 28, 32; *but see* Paper 6, 8 n.4 (the Preliminary Response, stating "Rashid has a § 371(c)(1), (2) date of July 25, 2017"). Patent Owner instead relies on the '306 Provisional as establishing a May 2015 effective filing date for claims 7 and 15, which would precede Rashid's January 2016 filing date, disqualifying Rashid as prior art. *See* PO Resp. 11–18, 28, 32.

Claim 7 recites: "The hydraulic fracturing system of claim 1, further comprising a controller that uses vibration data to monitor and/or adjust control commands of the system." Ex. 1001, 10:1–3. Claim 15 depends from claim 8, and recites the same limitation as claim 7. *See id.* at 10:46–48.

Petitioner argues the '306 Provisional lacks written description support for the limitation recited in claims 7 and 15. *See* Pet. 7–8; Pet. Reply 1, 4; Ex. 1002 ¶¶ 53–54.

Patent Owner responds that claims 7 and 15 are supported by a vibration data chart in the '306 Provisional, reproduced below.



'306 Provisional, Vibration Data Chart (Ex. 1007, 31).

As described in the '306 Provisional, this chart shows "experimental results" indicating that "[o]ne benefit of the technology described [in the '306 Provisional] is an overall reduction in the vibrations and forces on the equipment by up to about 80% or more." Ex. 1007, 2 (¶ 1), 31. Specifically, the chart contains two graphs, a top graph titled "Conventional Wellhead Iron Vibrations" and a bottom graph titled "Present Technology Wellhead Iron Vibrations." *Id.* at 31. Each graph plots "G-Force" data on a vertical axis delineated on a scale ranging from -10 to +5, against "Time" along the horizontal axis, apparently recorded by three vibration sensors identified as "Ax", "Ay", and "Az". *Id.* The chart also states a conclusion:

"Up to 80% reduction on wellhead iron vibrations for Present Technology." *Id.*

According to Patent Owner, the '306 Provisional's vibration data chart "illustrate[s] a graphical representation of vibration data, which would necessarily be acquired using sensors and a controller," so the chart provides written description support for claims 7 and 15 of the '824 patent. PO Resp. 15–18 (citing Ex. 2007 ¶¶ 27, 49). Mr. Marscher testifies in support that: "There is no way to get that data without sensors, which are thus referenced by implication." Ex. 2007 ¶¶ 27, 49. Mr. Marscher further states: "Also implied to a [person of ordinary skill in the art] is a controller, since there is no point in acquiring data in a fracking operation unless it is going to be used as actionable information," "i.e. to control the process in a manner that optimizes reliability and production." *Id.*

Petitioner replies that Patent Owner and Mr. Marscher "fail[] to explain why a 'controller' would be required" to generate the '306 Provisional's vibration data chart, "much less [a controller] that 'uses vibration data to monitor and/or adjust control commands'" as recited in claims 7 and 15 of the '824 patent. Pet. Reply 4. Petitioner adds: "Even taking [Patent Owner's] argument at face value, acquiring data by a controller is not the same as *using* the data for control commands." *Id.*

Patent Owner responds that "Mr. Marscher has demonstrated that a person of skill in the art . . . would recognize that data acquisition would be coupled with a controller to use the acquired data," so claims 7 and 15 are "fully supported" by the '306 Provisional. PO Sur-reply 2.

We conclude Petitioner's position is supported by a preponderance of the evidence. In particular, we find the '306 Provisional does not

demonstrate possession of "a controller that uses vibration data to monitor and/or adjust control commands of the system," as recited in claims 7 and 15. Ex. 1001, 10:1–3, 10:46–48.

For example, the '306 Provisional's vibration data chart does not demonstrate possession of that claimed subject matter. It instead "show[s] *experimental results*." Ex. 1007, 2 (¶ 1) (emphasis added). This experimental data compares vibrations that result from a conventional wellhead system with vibrations that result from the technology of the '306 Provisional, showing the latter are up to 80% reduced versus the former. *See id.* at 2 (¶ 1), 31. Such experimental data bears little relationship to the claimed subject matter, which recites a *controller* for *monitoring and/or adjusting control commands of the system*. *See, e.g.*, Ex. 1001, 8:44–67 (Figure 1 of the '824 patent illustrates sensor(s) 154 which transmit vibration data to information handling system 156, and controller 160 "utilizes" the vibration data "to adjust control commands" during a hydraulic fracturing operation).

We agree with Mr. Marscher's testimony to the limited extent that a person of ordinary skill in the art would have understood the experimental data reported in the '306 Provisional's vibration data chart was derived using sensors and a processor monitoring the sensor data. *See* Ex. 2007 ¶¶ 27, 49. However, Mr. Marscher's further testimony that this "implie[s]" possession of the claimed "controller" monitoring the sensor data, as claimed, is not supported by the '306 Provisional. *Id.* Based on the evidence presented, the '306 Provisional's vibration data chart could just as well have been generated using a processor dedicated solely to gathering and processing the experimental sensor data, as opposed to the claimed controller.

In particular, we disagree with Mr. Marscher's testimony that "there is no point in acquiring data in a fracking operation unless it is going to be used as actionable information," "i.e. to control the process in a manner that optimizes reliability and production." *Id.* Instead, as described in the '306 Provisional, the point of presenting the vibration data chart was to compare a conventional hydraulic system with the '306 Provisional's system, to show the latter reduces vibrations by up to about 80% versus the former. *See* Ex. 1007, 2 (¶ 1), 31. A controller is not needed to record data for that purpose.

We find nothing in the '306 Provisional that indicates its experimental data was collected by a *controller* of the system being monitored. Indeed, the sparse written description of the '306 Provisional does not refer to any sort of controller for adjusting control commands of the system in any respect. *See* Ex. 1007, 1–2 (¶¶ 1–3). Nor do Patent Owner's various annotations to the photographs of the '306 Provisional identify where such a controller might be shown therein. *See* PO Resp. 13–17 (annotating photographs to identify "Swivels," "Helical Coils," a "Pulsation Dampener," and a "Truck/Trailer," but not a "Controller"). Much less, then, can the '306 Provisional demonstrate possession of a controller of a hydraulic fracturing system that monitors vibration data of the system.

For the foregoing reasons, we conclude the '306 Provisional does not provide written description support for claims 7 and 15 of the '824 patent.

3. Conclusion Regarding Effective Filing Date of the '824 Patent Claims

Based on the record presented in this case, we conclude that we need not determine whether the effective filing date of claims 1–6 and 8–14 is

May 3, 2015 (Patent Owner's date) or May 3, 2016 (Petitioner's date), and that the effective filing date of claims 7 and 15 is no earlier than May 3, 2016. Further, all claims are subject to the first-inventor-to-file provisions of the AIA, and Rashid is prior art to claims 7 and 15.

G. Claim Construction

We interpret the '824 patent claims "using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b)." 37 C.F.R. § 42.100(b). This "includ[es] construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." *Id.*

"Petitioner does not present any constructions." Pet. 18; Ex. 1002 ¶ 56. Patent Owner similarly "believes that no construction is necessary beyond the plain and ordinary meaning." PO Resp. 8.

However, at the same time, both parties provide arguments concerning claim construction, partly as a result of how their disputes evolved during the trial. *See, e.g.*, Pet. 30; PO Resp. 2–3, 18–19, 21–23; Pet. Reply 5–6, 7–9; PO Sur-reply 4–8. We therefore discuss those arguments here.

1. Alleged Point(s) of Novelty

In summarizing the prosecution history of the '824 patent, Petitioner concludes: "[T]he *point of purported novelty of the claims* lies in the use of swivel connections in the discharge piping to allow adjacent sections of piping to be axially rotatable with one another." Pet. 5–6 (emphasis added).

Patent Owner objects that Petitioner thereby "attempts to improperly limit the novel and non-obvious features of the claims," based on Patent Owner's having "declined to file comments on reasons for allowance during prosecution of" a parent application of the '824 patent. PO Resp. 18 (section heading modified). According to Patent Owner: "It is well established that 'an Examiner's Statement of Reasons for Allowance "will not necessarily limit a claim"'" and "an applicant's silence regarding statements made by the examiner during prosecution, without more, cannot amount to a 'clear and unmistakable disavowal' of claim scope." *Id.* at 18–19 (citations omitted).

We conclude that no formal claim construction is needed to address the forgoing arguments. Instead, we apply the plain and ordinary meaning of the "swivel connections" limitation (Ex. 1001, 9:25–30 (claim 1), 10:18–23 (claim 8)) to the disclosures of Garner at issue. We do not apply any sort of disavowal of claim scope or other special definition of the "swivel connections" limitation based on the prosecution history of the '824 patent. *See, e.g.*, *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) ("The Board is required to construe 'only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.'") (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

2. The "strategically located" Claim Term

Claim 1 recites "swivel connections *strategically located* in the discharge branch of piping, so that when pressurized fracturing fluid flows through the discharge branch of piping, a section of the discharge branch of

piping is axially rotatable with [respect to] an adjacent section of the discharge branch of piping." Ex. 1001, 9:25–30 (emphasis added). Claim 8 contains a substantially identical limitation. *See id.* at 10:18–23.

The Petition argues "it is unclear what 'strategically located' means." Pet. 30. Petitioner nonetheless refers to the specification's disclosure that "[b]y strategically locating swivel assemblies $122_{1\text{-}3}$ in portions of a piping run that includes turns or elbows, entire segments of the piping run can be moveable with respect to other pipe segments." Ex. 1001, 7:42–45; Pet. 30; Pet. Reply 7–8; Ex. 1002 ¶ 149. Petitioner argues a person of ordinary skill in the art "would have understood that swivel joints/connections allow adjacent sections of piping on either side of the swivel connection [to] rotate with respect to one another." Pet. 30 (citing Ex. 1018, 18); Ex. 1002 ¶¶ 100, 149.

Prior to institution, Patent Owner criticized the Petition for failing to construe the "strategically located" claim term, and cited various disclosures in the '824 patent specification that, in Patent Owner's view, help to elucidate the meaning of that term. *See* Inst. Dec. 19–20.

The Institution Decision accordingly "construe[d] the 'swivel connections' limitation of claims 1 and 8 to require swivel connections that are located in the discharge branch of piping to accomplish the function recited in the claims" which "is to permit one piping section to be axially rotatable with respect to an adjacent piping section." *Id.* at 20–23; *see also id.* at 20 ("In this context, the claim term 'strategically' requires the locations to be chosen to accomplish the function recited in the claim."). As a result, "we disagree[d] with Petitioner's position that 'it is unclear what "strategically located" means.'" *Id.* at 20 (quoting Pet. 30).

Patent Owner now makes a few different arguments concerning the import of the "strategically located" claim term, in opposition to Petitioner's reliance on Garner as disclosing strategically located swivel connections. *See, e.g.*, PO Resp. 2–3 ("Petitioner at least fails to show that the references teach or suggest 'strategically located' swivel connections[.]"). Patent Owner asserts that in Garner, "the swivel joints appear to be placed at random or at a designer's convenience," but "*[m]erely allowing the segments to rotate is insufficient to identify strategic locations of the swivel joints*." *Id.* (emphasis added) (citing Ex. 2007 ¶¶ 25, 44). Patent Owner also argues the swivel joints within Garner's articulated arm 22 permit articulation "during initial installation and/or when leaving the site," but are "*not located* to facilitate flow through the pipes and accommodate vibrations caused by the pipe." *Id.* at 23 (emphasis added) (citing Ex. 1008 ¶ 8; Ex. 2007 ¶¶ 47–48); *see also* Mot. 17–18 (arguing that the "full rotation and articulation" of Garner's articulated arm 22 is "not the same, and in fact, [is] incompatible" with the "strategic locations of swivel connections" in claim 1).

Patent Owner's Sur-reply argues Petitioner "failed to consider Mr. Marscher's explanation" of the meaning of the "strategically located" claim term. PO Sur-reply 6–7. Patent Owner relies here on Mr. Marscher's deposition testimony, during which he was asked "what [he] think[s] 'strategically located' means in the context of" the '824 patent. Ex. 1049, 179:20–180:5. Mr. Marscher responded:

> It means locating, in a particular string of pipe — in a location within that string of pipe to permit vibration reduction per the purpose of the '824 Patent, using a minimum number of swivel joints, which minimizes costs and the amount of time being spent

> by personnel in assembling the unit; and, also, that would accomplish the purpose without having adverse side affects [sic], such as excessive lateral vibration that might overload nozzles or piping flanges or the swivel joints themselves.

Id. at 180:6–17; *see also id.* at 86:2–5 (stating "'strategically located' has got a technical meaning to it" and "it's not a trivial instruction"). Patent Owner contends "[t]his arrangement of swivel joints is not taught or suggested in Garner," and Petitioner improperly "attempts to parse out the claim element." PO Sur-reply 7–8.

Patent Owner further addresses the meaning of the "strategically located" claim term in the Motion to Amend, in the context of proposed substitute claim 16, which includes the entire "swivel connections" limitation of original claim 1. *See* Mot. App. A (pgs. 5–6) (proposed substitute claim 16). Here, Patent Owner argues the '824 patent specification "clearly sets forth what 'strategically located' means," and Petitioner has not shown how Garner discloses this claim requirement. Mot. Reply 10–11 (citing Ex. 1001, 7:42–51).

Petitioner, for its part, opposes any construction of the "strategically located" claim term that would exclude Garner's swivel joints from claims 1 and 8. *See* Pet. Reply 1, 7–9; Mot. Opp. 20–22; Mot. Sur-reply 7–9. Petitioner cites portions of Mr. Marscher's deposition testimony that, in Petitioner's view, demonstrate his understanding of this claim term is ambiguous and therefore should be rejected. *See* Mot. Opp. 21–22 (citing Ex. 1049, 72:7–13, 74:10–75:8, 75:23–79:22). Petitioner also parses the '824 patent's description of swivel connections to assert that Patent Owner's argument would improperly import a limitation into claims 1 and 8 from the

'824 patent specification. *See* Mot. Sur-reply 7–8 (discussing Ex. 1001, 7:42–51).

During oral argument, Patent Owner's counsel maintained that "Garner does not illustrate the strategically located swivel connections." Tr. 22:2–7. Patent Owner's counsel was then asked "What is your understanding of this strategic location limitation from a claim construction standpoint?," and whether Patent Owner agreed with the Institution Decision's claim construction. *Id.* at 22:8–18. Patent Owner's counsel stated "Patent Owner [does] not advance any alternative" to the construction provided in the Institution Decision. *Id.* at 22:19–21. Petitioner's counsel similarly stated Petitioner does not disagree with the Institution Decision's claim construction. *See id.* at 8:14–9:2.

Upon our review of the entire record, we do not discern any reason to depart from the Institution Decision's claim construction of the "strategically located" claim term as requiring swivel connections located in the discharge branch of piping to permit one piping section to be axially rotatable with respect to an adjacent piping section. *See* Inst. Dec. 20–23.

This construction is supported by the claim language. *See id.* at 20 (lines 14–25).

This construction also is supported by the '824 patent specification. The most pertinent passage is that "[b]y strategically locating swivel assemblies $122_{1\text{-}3}$ in portions of a piping run that includes turns or elbows, entire segments of the piping run can be moveable with respect to other pipe segments." Ex. 1001, 7:42–45. That sentence was initially cited in the Petition. *See* Pet. 30.

By contrast, Patent Owner's reliance on the next two sentences (Ex. 1001, 7:45–51) as potentially requiring a narrower claim construction was not articulated until Patent Owner's Reply concerning its Motion to Amend, which was the very last brief filed by Patent Owner in this case. *See* Mot. Reply 10–11. This is untimely. *See, e.g.*, Paper 16, 9 (Scheduling Order, stating "Patent Owner is cautioned that any arguments for patentability not raised in the [Patent Owner Response] may be deemed waived."). For example, it prevented Petitioner from possibly presenting evidence to establish Garner discloses strategically located swivel assemblies, even applying Patent Owner's narrower claim construction.

It also is unpersuasive. Construing the generic claim term "strategically located" to require that the swivel connections permit relative motion "without introducing stress or strain into the pipe itself" so the swivel connections "can absorb vibrational motion through stress free flexing thereby further reducing and attenuating vibration" (Ex. 1001, 7:45–51) would improperly incorporate a limitation into the claim from the specification. The '824 patent specification does not demonstrate a manifest exclusion, or rise to the level of lexicography in this regard. *See* Ex. 1001, 7:42–51; *Teleflex, Inc. v. Ficosa North America Corp.*, 299 F.3d 1313, 1325 (Fed. Cir. 2002) ("The patentee may demonstrate an intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope."); *Bell Atlantic Network Servs., Inc. v. Covad Commc'ns Group, Inc.*, 262 F.3d 1258, 1268 (Fed. Cir. 2001) (a patent applicant may be a lexicographer by clearly setting forth a special

definition of a claim term "so as to put one reasonably skilled in the art on notice that the patentee intended to so redefine the claim term").

Mr. Marscher's testimony as to the meaning of the "strategically located" claim term is untethered to the intrinsic evidence relating to the '824 patent, or other objective evidence, and therefore is not persuasive. *See* Ex. 2007 ¶¶ 25, 44; Ex. 1049, 72:7–13, 74:10–79:22, 179:20–180:17. In particular, his attempt to equate the "strategic" claim term with *optimizing* vibration reduction, in various fashions, is not supported by reference to intrinsic evidence.

Thus, we maintain the construction in the Institution Decision of claims 1 and 8 as requiring swivel connections located in the discharge branch of piping to permit one piping section to be axially rotatable with respect to an adjacent piping section.

3. The "discharge branch" Claim Term

Claim 1 recites "a *discharge branch* of piping having therein pressurized fracturing fluid supplied from the fracturing pump." Ex. 1001, 9:23–24 (emphasis added). Claim 8 contains a substantially identical limitation. *See id.* at 10:14–16.

Patent Owner argues the "discharge branch of piping" must extend all the way to the discharge manifold, as is shown in Figure 2 of the '824 patent. *See* PO Resp. 21–22. Petitioner responds that there is no such requirement. *See* Pet. Reply 5–6.

We address this dispute below in Section III.H.3(a)(iii)(1), in the context of the Garner disclosures at issue.

4. Remaining Claim Terms

We determine no further explicit construction of any claim term is needed to resolve the issues presented by the arguments and evidence in this case. *See Realtime Data*, 912 F.3d at 1375.

H. Ground 1 — Obviousness Over Garner and Sanborn

In Ground 1, Petitioner argues claims 1 and 4–6 of the '824 patent are unpatentable as having been obvious over Garner and Sanborn. *See* Pet. 13–14, 17, 20–33; Ex. 1002 ¶¶ 110–113, 127–158. Patent Owner disagrees. *See* PO Resp. 19–27, 32–54; Ex. 2007 ¶¶ 22–26, 28–29, 31–32, 34–36, 40–48, 50–52. We conclude a preponderance of the evidence supports Petitioner's assertions as to all challenged claims. We begin our analysis with brief summaries of Garner and Sanborn, then we address the parties' contentions as to obviousness, including objective indicia of nonobviousness.

1. Garner

Garner discloses a discharge arm assembly for high pressure pumping units to perform fracturing operations within an oil or gas well. *See* Ex. 1008, code (54), ¶ 3. Figure 1 is reproduced below, with our annotations.

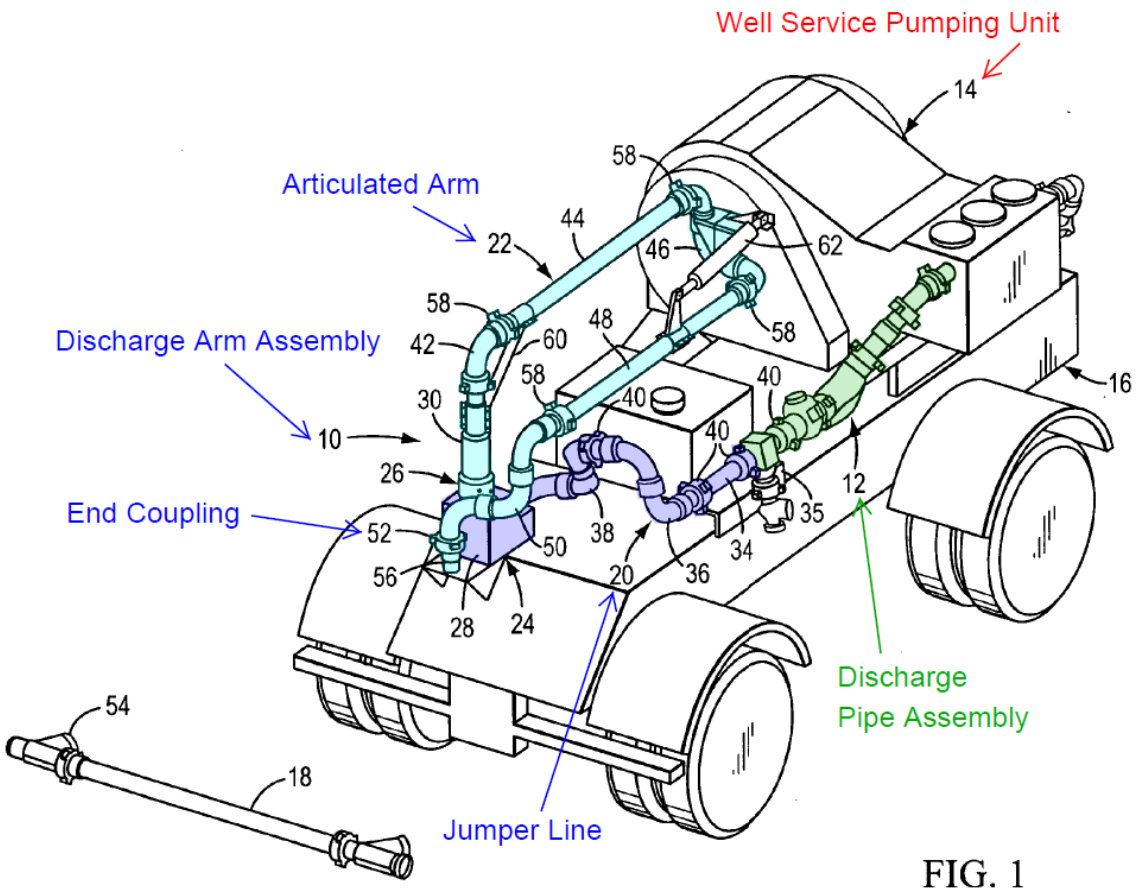


FIG. 1

Garner, Figure 1 (Annotated).

Figure 1 is a perspective view of discharge arm assembly 10 (colored dark blue and light blue) connected to discharge pipe assembly 12 (colored green) of well service pumping unit 14 mounted on trailer 16, in the vicinity of collection manifold 18 which is connected to a well (not shown). *See id.* ¶¶ 10, 13–14. Articulated arm 22 and base swivel joint 26 (colored light blue) are manipulated so end coupling 52 may be coupled to coupling 54 of collection manifold 18. *See id.* at Figs. 1–3, ¶¶ 10–11, 13–14, 17.

Pumping unit 14 pumps high pressure fracturing fluid into discharge pipe assembly 12. *See id.* ¶¶ 3, 13. Discharge pipe assembly 12 conveys the fluid to jumper line 20 (colored dark blue). *See id.* ¶¶ 13–14. Jumper line 20 conveys the fluid to base unit 24 (also colored dark blue), which

leads to base swivel joint 26. *See id.* ¶ 14. "The jumper line 20 may comprise any combination of generally straight pipes and/or swivel joints . . . to isolate the base unit 24, and thus the articulated arm 22, from vibration and movement of the pumping unit 14." *Id.* ¶ 15. Accordingly, first swivel joint 36 and second swivel joint 38 together "provide five degrees of freedom between the first pipe 34 and the base swivel 26" so "the base unit 24 will not be affected by vibration and movement of the pumping unit 14." *Id.* ¶¶ 15–16.

Articulation of arm 22 above trailer 16 is provided by several swivel joints. In particular, base conduit 26 comprises a swivel joint bolted to frame member 28 so upper arm 30 is rotatable about a vertical axis. *See id.* ¶¶ 14, 19, 23, Figs. 1–3. Apex swivel joint 46 and outlet swivel joint 50 provide further articulation. *See id.* ¶¶ 17, 19, 23, Figs. 1–3.

2. Sanborn

Sanborn discloses a system for extracting oil and gas by hydraulic fracturing within a well. *See* Ex. 1009, codes (54) and (57). Figure 2 is reproduced below.

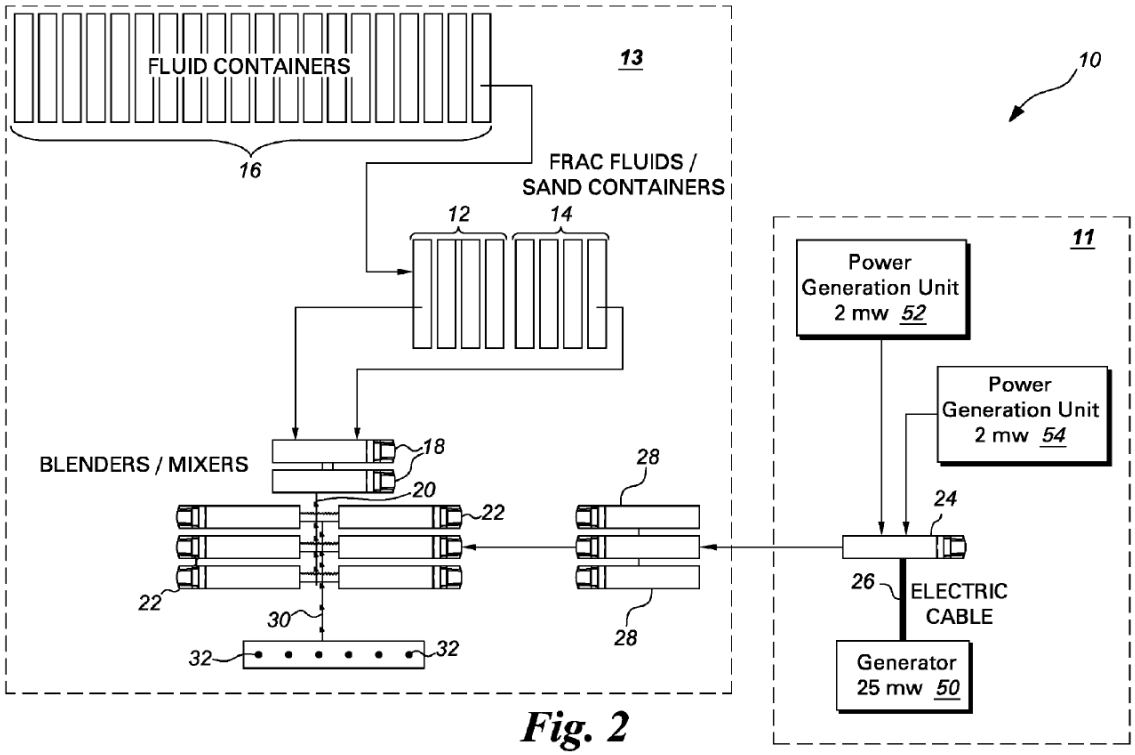


Fig. 2

Sanborn, Figure 2.

Figure 2 is a schematic representation of a hydraulic fracturing system located at wellpad site 10, comprising power system 11 and pumping system 13. *See id.* ¶¶ 33, 45.

Pumping system 13 includes blenders 18 to mix a fracturing fluid such as water stored in containers 12 and 16 with a proppant such as sand stored in containers 14. *See id.* ¶¶ 34, 36. Piping array 20 conveys the blended fracturing fluid to pumpers 22 which bring the fracturing fluid to sufficiently high pressures to be conveyed by wellhead conduit piping 30 to one or more wellheads 32 to perform a fracturing operation. *See id.* ¶¶ 37, 43.

Each pumper 22 includes a pump driven by an electric motor. *See id.* ¶ 38. The electric motors are powered by electrical feed source 24 of power system 11, fed through variable frequency drives 28. *See id.* ¶¶ 38, 40, 45.

Electrical feed source 24 obtains electrical power from on-site generators 50, 52, 54 of various sizes. *See id.* ¶¶ 46–47. According to Sanborn, using electricity to power pumpers 22 instead of conventional diesel engines provides advantages. *See id.* ¶¶ 5–11, 42, 49.

3. Claim 1

Petitioner provides arguments and evidence in support of contending claim 1 is unpatentable as having been obvious over Garner and Sanborn. *See* Pet. 13–14, 20–30; Ex. 1002 ¶¶ 110–113, 127–150. Patent Owner provides arguments and evidence in opposition. *See* PO Resp. 19–26, 32–54; Ex. 2007 ¶¶ 22–26, 28–29, 31–32, 34–36, 40–48, 50–52. We address Petitioner's contentions and Patent Owner's opposition in relation to Petitioner's two alternative theories of obviousness (in Sub-Sections (a) and (b) below), then we address Patent Owner's reliance on objective indicia (in Sub-Section (c) below), prior to weighing all of the arguments and evidence to reach a conclusion as to obviousness (in Sub-Section (d) below).

a) Petitioner's First Theory of Obviousness

Petitioner's first theory of obviousness posits that Garner discloses the subject matter of claim 1 except Garner's pumping unit 14 is not disclosed to be *electrically powered*; Sanborn discloses an electrically powered hydraulic fracturing pump; and a person of ordinary skill in the art would have been motivated to combine these disclosures. *See, e.g.*, Pet. 20–22, 24 (line 18) – 25 (line 8), 26–30. We consider these contentions on a limitation-by-limitation basis.

(i) "A hydraulic fracturing system for fracturing a subterranean formation comprising:"

Petitioner argues that, assuming claim 1's preamble is a limitation, Garner discloses a hydraulic fracturing system for fracturing a subterranean formation. *See* Pet. 20, 26 (citing Ex. 1008 ¶¶ 2–4); Ex. 1002 ¶¶ 129, 140–141. Patent Owner does not dispute this contention, and we find it is supported by a preponderance of the evidence. For example, Garner states that its pumping unit 14 may be used "during a fracturing operation . . . to inject a particle-containing slurry into the well in order to fracture the hydrocarbon bearing formation." Ex. 1008 ¶¶ 3, 13.

(ii) "an electrically powered fracturing pump having a discharge side;"

Petitioner argues Garner "does not discuss the power source that would be used to power its pumping units [14]," whereas Sanborn discloses an electrically powered pumping system 13. Pet. 22; *id.* at 14, 26–27 (citing Ex. 1009, code (57), ¶¶ 7–8, 21, 23, 38, 43, 46); Ex. 1002 ¶¶ 98, 113, 132, 142–144. Petitioner also asserts the pumps of Garner and Sanborn both have a discharge side, i.e., the side of the pump where fracturing fluid exits the pump. *See* Pet. 27–28 (citing Ex. 1008, Fig. 1, ¶ 13; Ex. 1009, Fig. 2, ¶ 43); Ex. 1002 ¶¶ 142–144.

Patent Owner does not dispute these contentions, and we find they are supported by a preponderance of the evidence. For example, Garner is silent regarding how its pumping unit 14 is powered. *See, e.g.*, Ex. 1008 ¶ 13 (referring simply to "well service pumping unit 14"). And, Sanborn discusses at length how its electrically powered pumping system 13 provides several advantages versus prior diesel powered pumping systems. *See* Ex. 1009 ¶¶ 5–12, 42, 49. Further, Garner describes the discharge side of its

pumping unit 14 as including discharge pipe assembly 12 and discharge arm assembly 10 (*see* Ex. 1008, Fig. 1, ¶ 13), and Sanborn describes the discharge side of its pumping system 13 as including wellhead conduit 30 (*see* Ex. 1009, Fig. 2, ¶¶ 43, 45).

Petitioner next asserts that a person of ordinary skill in the art would have been motivated to use an *electrically powered* pumping unit within the context of Garner's hydraulic fracturing system based on teachings from Sanborn. *See* Pet. 20–22, 24–25, 26–27; Ex. 1002 ¶¶ 129–132, 136, 138, 143. Petitioner cites Sanborn's discussion of "drawbacks associated with traditional fracturing operations using . . . diesel engines to power pumps" and the benefits of "replacing a conventional diesel-powered fracturing system . . . with an electrically-powered operation to 'reduce the amount of large equipment required at a hydraulic fracturing site, thereby reducing the ecological footprint.'" Pet. 20–22 (citing Ex. 1009, Fig. 2, ¶¶ 6–8, 21, 23, 38, 42, 46, 49); Ex. 1002 ¶¶ 130–132. This could have been accomplished with a reasonable expectation of success, according to Petitioner, because Garner and Sanborn both provide pumping units mounted on mobile platforms to perform hydraulic fracturing operations. *See* Pet. 21–22, 24–25 (citing Ex. 1008, Fig. 1, ¶ 13; Ex. 1009, Fig. 2, ¶¶ 21, 23, 38); Ex. 1002 ¶¶ 129–131, 136.

Patent Owner opposes Petitioner's foregoing motivation contentions as too conclusory to satisfy Petitioner's burden to demonstrate obviousness, and as based on impermissible hindsight. *See* PO Resp. 24–25. Patent Owner particularly asserts: "Although a problem in the prior art may form the basis of a motivation to combine, Petitioner must demonstrate that the alleged 'problem was known in the art or that [Petitioner's] formulation of

the problem was derived directly from the prior art rather than from the challenged claims.'" *Id.* at 24 (quoting *Purdue Pharma L.P. v. Depomed, Inc.*, 643 F. App'x 960, 966 (Fed. Cir. 2016); citing *Insite Vision Inc. v. Sandoz, Inc.*, 783 F.3d 853, 859 (Fed. Cir. 2015)).

Petitioner replies that "[t]he Petition lays out specific reasons to combine" based on specific teachings of Garner and Sanborn, and based on Dr. Durham's testimony. Pet. Reply 12 (citing Pet. 20–25; Ex. 1002, ¶¶ 128–138). Petitioner maintains a person of ordinary skill in the art "would have been motivated to use the electric pumper 22 of Sanborn with the discharge arm assembly 10 of Garner to obtain Sanborn's benefits of reduced costs and environment footprint by replacing traditional diesel-powered components with electric components." *Id.* at 13 (citing Pet. 22; Ex. 1002 ¶ 132).

Patent Owner's Sur-reply generally maintains that Petitioner's motivation contentions are too conclusory and are based on impermissible hindsight, but does not specifically address the proposed obviousness of using electrical power in Garner in light of Sanborn. *See* PO Sur-reply 13–17 (Patent Owner's arguments opposing motivation to combine).

We conclude Petitioner articulates a sufficient motivation for the proposed use of electrical power in Garner's mobile fracturing pumps, based on Sanborn's electrically powered mobile fracturing pumps, without the use of hindsight. First, a preponderance of the evidence supports Petitioner's contention that Garner is silent concerning exactly how its pumping unit 14 is powered, whether with electricity, diesel engines, or otherwise. *See* Pet. 22; Ex. 1008 ¶ 13; Ex. 1002 ¶ 132. Yet, a person of ordinary skill in the art would have appreciated that Garner's pumping unit 14 would need some

sort of power source to perform the pumping operations described in Garner, thereby motivating a search for suitable options. *See* Ex. 1008 ¶¶ 2–3, 13; Ex. 1002 ¶ 132.

Next, Sanborn discusses advantages afforded by electrical power over diesel engines in powering fluid pumps in hydraulic fracturing systems. In particular, Sanborn discusses how using electrical power advantageously reduces the number and size of on-site equipment required to perform fracturing operations, thereby improving the ecological footprint of the system, versus diesel engines. *See* Ex. 1009 ¶¶ 5–11, 42, 49. Electrical power also is "generally cleaner and more reliable than the diesel power systems" according to Sanborn. *Id.* ¶ 42. The combination of Garner's silence as to its power source with Sanborn's discussion of advantages provided by electrical power provide a preponderance of evidence to support Petitioner's motivation contentions, without hindsight.

Dr. Durham's testimony supports the foregoing findings. *See* Ex. 1002 ¶¶ 130–132, 136, 138. Further, Mr. Marscher's testimony is not to the contrary. In particular, Mr. Marscher does not grapple with the foregoing disclosures of Garner and Sanborn to any material extent. *See* Ex. 2007 ¶¶ 22–26, 28–29, 31–32, 34–36, 40–48, 50–52.

(iii) "a discharge branch of piping having therein pressurized fracturing fluid supplied from the fracturing pump;"

Petitioner argues Garner discloses a discharge branch of piping to convey pressurized fracturing fluid supplied from a fracturing pump. *See* Pet. 23, 27 (citing Ex. 1008, Fig. 1, ¶¶ 3, 13); Ex. 1002 ¶¶ 133, 145. Petitioner particularly asserts "Garner teaches a discharge arm assembly 10 that connects the pump discharge pipe assembly 12 of a pumping unit 14 to

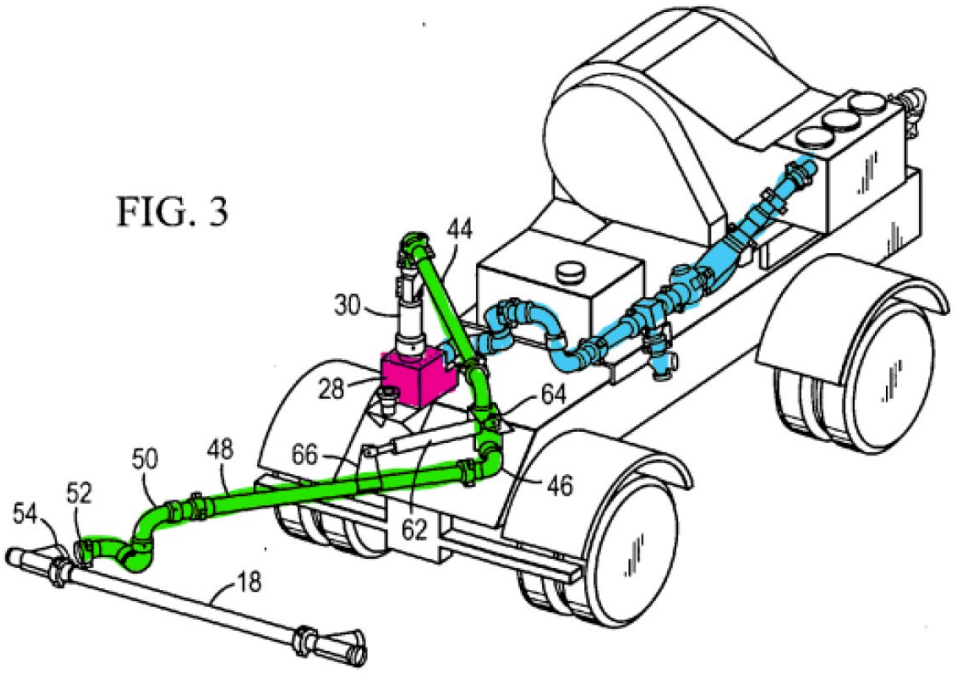
a collection manifold 18 for fracturing operations" and "Garner's discharge arm assembly 10 is 'a discharge branch of piping.'" Pet. 27; *see also id.* at 24 ("Garner teaches a discharge arm assembly 10 (i.e., 'discharge branch' of the '824 Patent) that connects each of its high pressure pumping units 14 to a collection manifold 18.").

Patent Owner asserts "Petitioner identifies a 'pump discharge pipe assembly 12' in Garner as allegedly corresponding to the claimed discharge branch" of claim 1. PO Resp. 21 (citing Pet. 27, 29). Patent Owner argues the "discharge branch of piping" in claim 1 must extend all the way to the discharge manifold, as shown in Figure 2 of the '824 patent. *Id.*; *id.* at 22 (referring to "the equivalent discharge branch of claim 1, which extends from the outlet flange of the pump to the discharge manifold"); Ex. 2007 ¶¶ 26, 47–48; *see also* Tr. 21:11–12 (Patent Owner's counsel stating: "As noted in the ['824 patent] specification, the discharge branch 78 distal from the pump 36 connects to a discharge manifold 80."); Ex. 1001, Fig. 2 (showing discharge branch 78 extending from pump 36_1 to discharge manifold 80). Patent Owner then objects that Garner's discharge pipe assembly 12 "does not extend to the discharge manifold [18] . . . and instead terminates at a base unit 24," with Garner's articulated arm 22 being needed to complete the fluid connection to discharge manifold 18. PO Resp. 21–22 (citing Ex. 1008, Figs. 1–3, ¶¶ 7–8); Ex. 2007 ¶¶ 26, 47–48.

Petitioner replies that "there is no requirement in [claim 1] that the 'discharge branch . . . extend to the discharge manifold' as [Patent Owner] suggests," and Patent Owner's argument improperly reads a limitation into claim 1 from Figure 2 of the '824 patent. Pet. Reply 6 (quoting PO Resp. 21; citing Ex. 1001, 3:63–65). Petitioner also argues that, even

accepting Patent Owner's claim construction, "the Petition identifies the discharge arm assembly 10 of Garner as an example of a 'discharge branch' of [claim 1], which connects each high pressure pumping unit 14 to a collection manifold." *Id.* at 7 (citing Pet. 20, 24, 27; Ex. 1008, Fig. 1, ¶ 13).

Patent Owner replies that "Petitioner has improperly interpreted the claimed 'discharge branch' to include any portion of piping extending from the pump," as ignoring how a person of ordinary skill in the art would understand claim 1 in light of the '824 patent specification. PO Sur-reply 4 (citing Ex. 1001, Fig. 2, 6:18–20; Ex. 2007 ¶¶ 47–48). According to Patent Owner, Mr. Marscher testifies that Garner's base unit 24 is provided at an "intermediate fixed location on the trailer," which "breaks up the alleged discharge branch in Garner and, as a result, changes both the function and operation of Garner." *Id.* (citing Ex. 2007 ¶¶ 47–48; Ex. 1049, 138:17–139:11). To illustrate this, Patent Owner annotates Figure 3 of Garner, as reproduced below.



Garner, Figure 3 (Annotated by Patent Owner, PO Sur-reply 5).

Patent Owner's annotations to Garner's Figure 3 color: discharge pipe assembly 12 and jumper line 20 in blue; base unit 24 in pink; and articulated arm 22 in green. *See* PO Sur-reply 5–6; Ex. 1008, Fig. 1, ¶¶ 13–14. According to Patent Owner, base unit 24 "breaks up the piping configuration between the pump and the discharge manifold," such that "the entirety of the structure in Garner is not properly interpreted as the discharge branch." PO Sur-reply 4–5; *id.* at 5 ("This base unit 24 is no longer part of the discharge branch, it does not include piping, fittings, or the like.").

Patent Owner argues the blue piping cannot be the discharge branch of claim 1, because it does not extend to collection manifold 18. *See id.* at 5–6. Patent Owner argues the green piping cannot be the discharge branch of claim 1, because it does not extend from pump unit 14. *See id.* at 6 (citing Ex. 2007 ¶¶ 47–48; Ex. 1049, 146:4–11, 150:5–12).

The foregoing argument raises issues of claim construction which we address prior to turning to the Garner disclosures at issue.

(1) Claim Construction of "discharge branch"

First, we reject the claim construction underlying Patent Owner's argument, that the "discharge branch" of claim 1 must be a single pipe that extends all the way from the pump to a discharge manifold. It is directly contradicted by the '824 patent specification, which indicates multiple pipes are connected together to form a discharge branch.

Patent Owner relies on Figure 2 of the '824 patent. It is true that Figure 2 illustrates "discharge branch 78" as a single line that extends all the way from pump 36_1 to discharge manifold 80. *See* Ex. 1001, Fig. 2, 6:15–23. However, the '824 patent specification explains that discharge

branch 78 connects to discharge manifold 80 "*outside of* a support platform 81 (schematically illustrated by the dashed line)," and "[e]xamples of support surfaces 81 include skids [and] trailers." *Id.* at 6:23–29 (emphasis added), 6:37–39. A person of ordinary skill in the art would have appreciated from these disclosures that the portion of discharge branch 78 disposed on trailer platform 81 is connected and disconnected from the portion of discharge branch 78 disposed off of trailer platform 81, so the trailer can be moved from one well location to another. *See also id.* at 1:50–52 ("Heavy duty trailers, skids, or trucks are required for transporting the large and heavy pumps and engines to sites where wellbores are being fractured."). In other words, discharge branch 78 is formed by multiple pipes connected together.

Further, Figure 2 also illustrates that discharge branch 78 includes swivel joints 128 having fittings 130, 132. *Id.* at Fig. 2, 7:56, 7:65–66. This is more particularly shown in Figure 5, reproduced below.

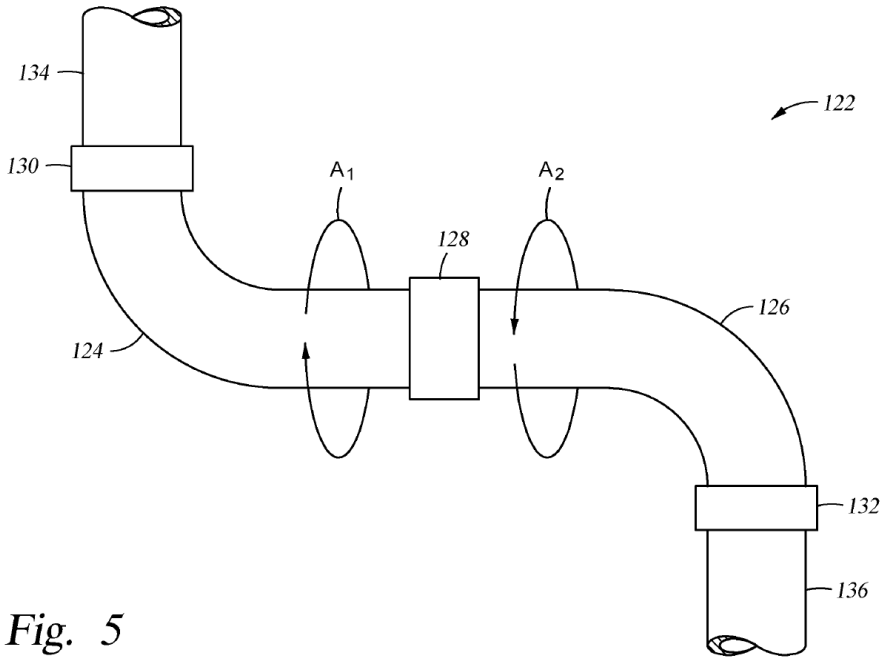


Fig. 5

'824 Patent, Figure 5.

Figure 5 depicts swivel assembly 122, including "fittings 130, 132 shown on the ends of pipes 124, 126" to "allow for connection to lines 134, 136 where lines make up piping within the discharge branch 78 of FIG. 2." *Id.* at 7:63–67. Thus, once again, the '824 patent specification indicates multiple pipes are connected together to form discharge branch 78.

Second, we also reject Patent Owner's position that Garner's base unit 24 must be the end, and not a middle, of a discharge branch of piping because it is fixed to Garner's trailer 16. Patent Owner's argument and Mr. Marscher's related testimony is unsupported by citation to the intrinsic evidence concerning the '824 patent. *See* PO Resp. 21–22; PO Sur-reply 4–6; Ex. 2007 ¶¶ 26, 47–48; Ex. 1049, 138:17–139:11, 146:4–148:1, 150:5–152:12. We independently discern no such support.

(2) Garner Disclosure of a Discharge Branch

Claim 1 recites "a discharge branch of piping having therein pressurized fracturing fluid supplied from the fracturing pump." Ex. 1001, 9:23–24. We find Garner discloses such a discharge branch of piping as the successive combination of its jumper line 20, base unit 24, base swivel joint 26, and articulated arm 22. *See, e.g.*, Pet. 24, 27 (mapping the claimed "discharge branch" to Garner's discharge arm assembly 10); Ex. 1008, Figs. 1–3, ¶¶ 13–15. This branch of piping conveys pressurized fracturing fluid from discharge pipe assembly 12 of pumping unit 14 to collection manifold 18, which in turn leads to a well to perform a hydraulic fracturing operation. *See* Ex. 1008, Figs. 1–3, ¶¶ 2–3, 13. Thus, Garner discloses a discharge branch, even applying Patent Owner's claim construction that

would require the discharge branch to extend to a discharge manifold such as Garner's manifold 18.

In addition, the upstream end of jumper line 20 is connected to discharge pipe assembly 12 of pumping unit 14 in a similar fashion as in the '824 patent, where the upstream end of discharge branch 78 is connected to an outlet pipe of pump 36. *See id.* at Fig. 1, ¶ 13 (discharge arm assembly 10 "is shown connected to the discharge pipe assembly 12 of a well service pumping unit 14"), ¶ 15 (referring to "the outlet pipe assembly 12 of the pumping unit 14"); Ex. 1001, Fig. 6, 7:65–8:5 (discharge branch 78 is connected to a pipe segment of pump 36 by a hammer union fitting comprising a wing with three large lugs); *see also id.* at Fig. 3, 6:46–55 (suction branch 74 is connected to suction lead 86 of pump 36 by grooved connection joint 84).

(iv) "swivel connections strategically located in the discharge branch of piping, so that when pressurized fracturing fluid flows through the discharge branch of piping, a section of the discharge branch of piping is axially rotatable with [respect to] an adjacent section of the discharge branch of piping."

Petitioner argues Garner discloses the entire "swivel connections" limitation of claim 1. *See* Pet. 20, 24, 28–30 (citing Ex. 1008, Fig. 1, ¶¶ 13–16, 19–21); Ex. 1002 ¶¶ 100, 129, 134, 148–150.

Prior to institution, Patent Owner argued Garner does not disclose the claimed "swivel connections" because Garner's swivel joints 26, 36, 38, 46, and 52 swivel in a different fashion than the '824 patent's swivel connections. *See* Inst. Dec. 30–31. Now, Patent Owner concedes Garner's swivel joints are "swivel connections" as that specific term is used in claim 1, but argues Garner's swivel joints (1) are not strategically located in

the discharge branch of piping, and (2) do not convey pressurized fracturing flow, as further required by claim 1. *See* PO Resp. 22–24.

For the following reasons, we conclude a preponderance of the evidence supports Petitioner's contention that Garner discloses the entire "swivel connections" limitation of claim 1.

(1) Whether Garner's Swivel Connections are Strategically Located in Discharge Branch of Piping

As construed above in Section III.G.2, the "swivel connections" limitation of claim 1 requires swivel connections located in the discharge branch of piping to permit one piping section to be axially rotatable with respect to an adjacent piping section.

Petitioner argues Garner correspondingly discloses swivel joints 36 and 38 in jumper line 20, which isolate vibrations caused by pumping unit 14 from passing to base unit 24 or to articulated arm 22. *See* Pet. 20, 24, 28–30 (citing Ex. 1008, Fig. 1, ¶¶ 13–16, 19–21); Ex. 1002 ¶¶ 100, 129, 134–135, 148–150. Dr. Durham testifies in support that Garner's swivel joints 36 and 38 satisfy the axial rotation claim requirement based on Garner's express description of its other swivel joint 26 permitting pipe 44 "to *rotate generally horizontally relative to*" base unit 24. Ex. 1008 ¶ 19 (emphasis added); *see* Ex. 1002 ¶¶ 100, 148. Dr. Durham also cites Garner's express description of its further swivel joint 46 permitting pipe 48 "to *rotate both horizontally and vertically relative to*" pipe 44. Ex. 1008 ¶ 19 (emphasis added); *see* Ex. 1002 ¶¶ 100, 148.

Patent Owner argues Dr. Durham's testimony "merely states that 'swivel joints allow segments of piping to move (rotate) relative to one another.'" PO Resp. 22 (quoting Ex. 1002 ¶ 149). According to Patent

Owner: "There is no discussion regarding strategic placement or how specific swivel locations may be positioned," and Dr. Durham instead "state[s] that swivel connections can be used, and therefore, are necessarily strategically located" which is merely "conclusory reasoning." *Id.* at 22–23.

Patent Owner also argues Dr. Durham's testimony improperly "equates full rotation and articulation of the arm 22 with the rotational movement of the claimed swivel connections," and a person of ordinary skill in the art "would recognize the two are not equivalent" and indeed are "incompatible." *Id.* at 25–26 (citing Ex. 1002 ¶ 148); Ex. 2007 ¶¶ 25, 43–45, 48. This is because "[t]he articulation and movement of the arm 22 in Garner is prior to forming a connection with associated piping," and "[s]uch movement would be completely undesirable when the system were fully connected because the drastic rotation (such as been the positions in FIGS. 1 and 3) would impart stresses onto the piping, leading to a greater likelihood of failure." PO Resp. 26; Ex. 2007 ¶¶ 44, 48. Patent Owner concludes Petitioner's contentions fail to consider how a person of ordinary skill in the art would evaluate and consider the operation of Garner's swivel joints. PO Resp. 26.

Patent Owner further argues "the swivel joints and other features within Garner, particularly for the articulated arm 22, are to enable the arm 22 to collapse and then extend at the well site during initial installation and/or when leaving the site." *Id.* at 23 (citing Ex. 1008 ¶ 8[5]); Ex. 2007 ¶¶ 25, 43–44, 48. Patent Owner asserts "[t]he locations of [Garner's] swivel joints are, therefore, not located to facilitate flow through the pipes and

[5] Patent Owner may have meant to cite ¶ 18 (not ¶ 8) here.

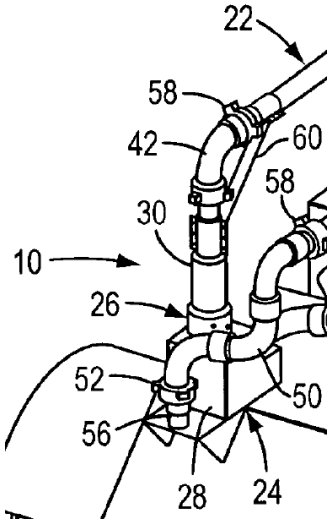
accommodate vibrations caused by the pipe," and instead "the swivel joints in the arm 22 are located for ease of movement of the arm 22." PO Resp. 23; Ex. 2007 ¶¶ 25, 43–44, 48.

Petitioner replies that "[t]he Petition explains that Garner teaches 'strategically located' swivel connections" as claimed. Pet. Reply 7–9 (citing Pet. 28–30; Ex. 1002 ¶¶ 148–150). "Specifically," according to Petitioner, "Garner discusses the placement of 'enough swivel joints to isolate the base unit 24, and thus the articulated arm 22, from vibration and movement of the pumping unit 14.'" *Id.* at 8 (quoting Ex. 1008 ¶ 15). Petitioner asserts Garner further "teaches using a number and placement of swivel connections to allow various 'arms' — for example, the 'third pipe 48' — to 'rotate both horizontally and vertically relative to the second pipe 44.'" *Id.* (quoting Ex. 1008 ¶ 19).

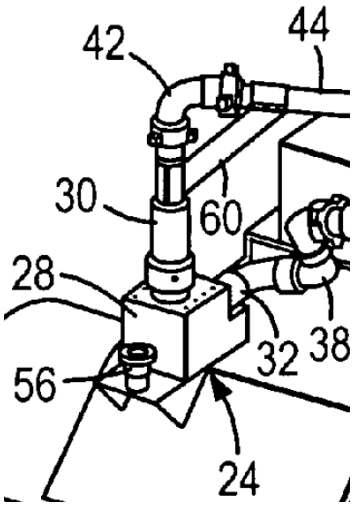
Patent Owner responds that Petitioner's reply "fail[s] to consider Mr. Marscher's explanation and the plain language of the '824 Patent specification" and "[i]nstead . . . continues to advance [an incorrect] theory that positioning swivel joints at any location is equivalent to 'strategically locat[ing]' those swivel joints." PO Sur-reply 6–8 (citing Pet. Reply 8; Ex. 1049, 86:2–5, 180:6–17).

We find Garner's swivel joints 36 and 38 are swivel connections located in a discharge branch of piping (specifically, jumper line 20) to permit one piping section to be axially rotatable with respect to an adjacent piping section, as we have construed the "strategically located" claim term to require. *See supra* Section III.G.2.

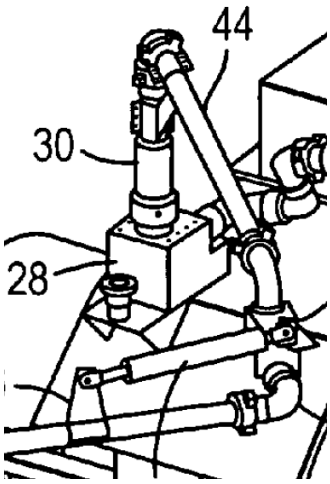
We first focus on Garner's other "base swivel joint 26" (Ex. 1008 ¶ 14), which is shown in three different positions in the following excerpts of Figures 1–3:



Garner, Figure 1 (Excerpt)



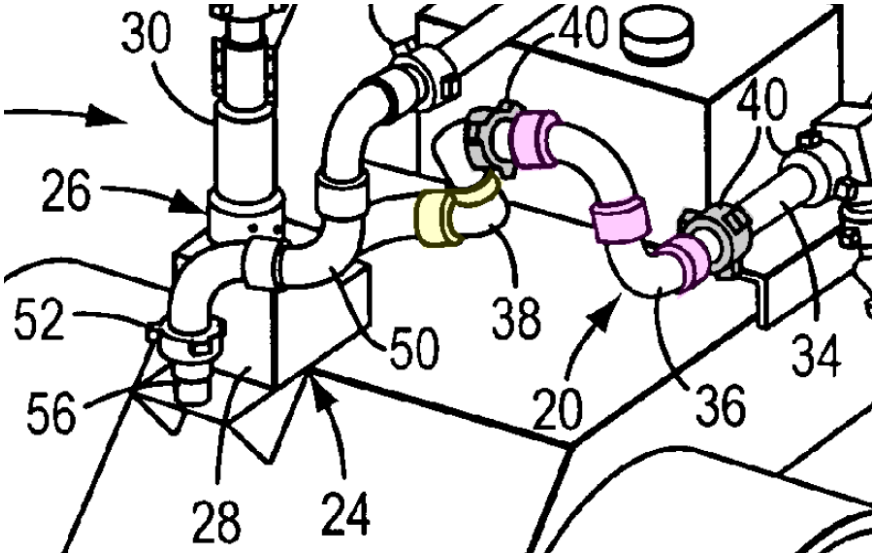
Garner, Figure 2 (Excerpt)



Garner, Figure 3 (Excerpt)

These Figures present a series of perspective views of Garner's articulated arm 22 being rotated in a clockwise direction from a stowed position (Figure 1), to an intermediate position (Figure 2), to an extended and deployed position (Figure 3). *See id.* ¶¶ 10–11, 14, 21. As part of this rotation, Garner describes how "base swivel joint 26 includes an upper arm 30 *which is rotatable about a vertical axis* and a lower arm 32 which is fixed relative to the frame member 28." *Id.* ¶ 14 (emphasis added). Garner's description of swivel joints 46 and 50 in articulated arm 22 is to the same rotational effect. *See id.* at Figs. 1–3, ¶¶ 17–19. Thus, the term "swivel," as used in Garner, denotes *an axial rotation* of one piping section (e.g., upper arm 30) with respect to an adjacent piping section (e.g., frame member 28 and lower arm 32), as recited in claim 1.

Next turning to Garner's swivel joints 36 and 38, they are illustrated in the annotated excerpt from Garner's Figure 1 shown here:

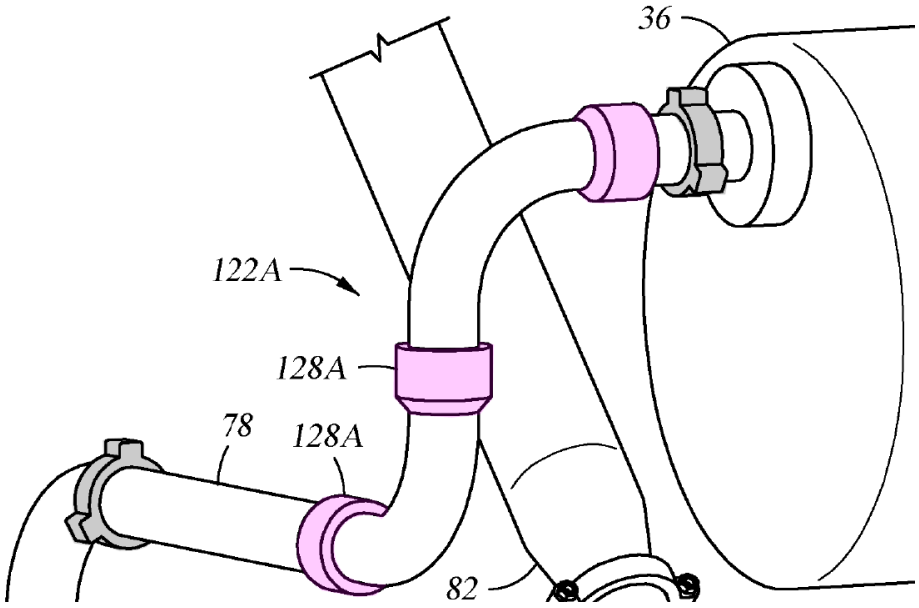


Garner, Figure 1 (Excerpt, Annotated).

Garner's Figure 1 is a perspective view of Garner's pumping system, which we have excerpted to focus on jumper line 20 that carries fluid from discharge pipe assembly 12 to base unit 24. *See id.* ¶¶ 10, 13–14. As described in Garner, this excerpt shows first swivel joint 36 connected by threaded couplings 40 (colored gray) between straight pipe 34 and second swivel joint 38, as well as second swivel joint 38 extending from first swivel joint 36 to base swivel joint 26. *See id.* ¶ 15. Garner further describes how first swivel joint 36 has two [sic three] swivel connections (colored purple), and second swivel joint 38 has three [sic two] swivel connections (colored yellow), to "provide five degrees of freedom between the first pipe 34 and the base swivel 26." *Id.* ¶ 16. We find that each of the five swivel connections provided by swivel joints 36 and 38 (colored purple and yellow) operates in the same fashion as Garner's base swivel joint 26, that is, they

provide an *axial rotation* of one pipe section with respect to an adjacent pipe section, as recited in claim 1. *See id.* ¶¶ 14–16.

Indeed, the depiction in Garner's Figure 1 of swivel joints 36 and 38 is remarkably similar to the depiction in the '824 patent's Figure 6 of a swivel assembly. We reproduce an excerpt of the '824 patent's Figure 6 here, annotated in a similar fashion to the excerpt of Garner's Figure 1 reproduced above, for comparison:



The '824 patent, Figure 6 (Excerpt, Annotated).

The '824 patent's Figure 6 is a side perspective view of alternate swivel assembly 122A which forms part of discharge branch 78 conveying fluid away from pump 36. *See* Ex. 1001, 4:7–9, 8:9–12. Swivel assembly 122A includes sections of piping, multiple swivel joints 128A (colored purple), and fittings (colored gray) to connect assembly 122A to other pipe sections within discharge branch 78. *See id.* at 8:12–15; *id.* at 7:63–8:4 (describing how Figure 5 illustrates swivel assembly 122 connected by fittings 130, 132 to other piping sections 134, 136, and the fittings may be "hammer unions, which are female threaded wings with three large lugs on the outside which

are struck with sledge hammers to ensure that they are tight"). We understand that the scope of claim 1 must be discerned from the claim language and not necessarily what is shown in Figure 6. Nonetheless, Figure 6 appears to disclose one embodiment of the claimed invention, and we are unable to discern any material difference between its depiction of alternate swivel assembly 122A and Garner's Figure 1 depiction of first swivel joint 36.

Garner further describes how swivel joints 36 and 38 "*isolate* the base unit 24, and thus the articulated arm 22, *from vibration and movement of the pumping unit 14*." Ex. 1008 ¶ 15 (emphases added). Thus, Garner's swivel joints 36 and 38 perform the vibration-reduction function that the '824 patent ascribes to its swivel connections. *See, e.g.*, Ex. 1001, 7:38–53.

Patent Owner's opposition to the foregoing findings focuses on the "strategically located" claim term as allegedly missing from Garner, and also focuses on Garner's swivel joints 46 and 50 in articulated arm 22. *See* PO Resp. 22–23; PO Sur-reply 6–8; Ex. 2007 ¶¶ 25, 43–45, 48. However, we have construed the "strategically located" claim term above to require swivel connections located in the discharge branch of piping to permit one piping section to be axially rotatable with respect to an adjacent piping section. *See supra* Section III.G.2. That claim requirement is satisfied by Garner's swivel joints 36 and 38 in jumper line 20, as described above.

We find Garner discloses swivel connections located in the discharge branch of piping to permit one piping section to be axially rotatable with respect to an adjacent piping section.

(2) Whether Garner's Swivel Connections Permit Axial Rotation When Pressurized Fluid Flows Through Discharge Branch of Piping

The "swivel connections" limitation of claim 1 further requires that the swivel connections permit axial rotation of adjacent piping sections "when pressurized fracturing fluid flows through the discharge branch of piping." Ex. 1001, 9:25–30.

Patent Owner argues Garner's swivel joints do not satisfy this claim requirement. *See* PO Resp. 23–24. Patent Owner asserts "Garner specifically discloses the use of a Chiksan® Style Swivel Joint" which "at the time of the '824 Patent, [was] 'not recommended for services requiring continuous rotary motion.'" *Id.* at 23 (citing Ex. 1008, Table 1 (¶ 22); quoting Ex. 1018,[6] 23). Patent Owner therefore concludes a person of ordinary skill in the art would have "recognize[d] that the swivel joints in Garner are used for rotation/movement during make-up and/or assembly, and not intended to rotate or move during operation (e.g., with pressurized fluid)." *Id.* at 23–24; *see also id.* at 26 (arguing that movement of Garner's articulated arm 22 "would be completely undesirable when the system [is] fully connected because the drastic rotation . . . would impart stresses onto the piping, leading to a greater likelihood of failure"); Ex. 2007 ¶¶ 25, 43–45, 48. This is supported, in Patent Owner's view, by the "drastic movement" of articulated arm 22 from the stored position shown in Figure 1 to the operational position shown in Figure 3. PO Resp. 24, 26; Ex. 2007 ¶¶ 43, 48.

[6] Exhibit 1018 is a catalog of Chiksan® equipment, including swivel joints. *See* Ex. 1018, 1, 18, 23. When citing to Exhibit 1018, we refer to the page numbering added by Petitioner in the bottom right corner of each page.

Petitioner replies that Garner's swivel connections allow for axial rotation when pressurized fluid flows through the discharge branch of piping. *See* Pet. Reply 9. Petitioner relies on Garner's express teaching that its swivel joints 36 and 38 "isolate the base unit 24, and thus, the articulated arm 22, ***from vibration and movement of the pumping unit***." *Id.* (quoting Ex. 1008 ¶ 15). Petitioner argues Patent Owner "fails to address this disclosure from Garner, or explain how Garner's swivel joints would isolate the base unit 24 and articulated arm 22 from vibration and movement if the swivel joints are not intended to rotate or move during operation." *Id.* Petitioner also argues "Garner does not require its swivel joints to be Chiksan swivel joints, but rather, provides exemplary Chiksan swivel joint models in 'one embodiment.'" *Id.* at 9–10 (quoting Ex. 1008 ¶ 22); Ex. 1050 ¶ 39.

Petitioner further argues that, assuming Chiksan swivel joints must be used in Garner, the Chiksan catalog cited by Patent Owner "states in full" that "[a]though Chiksan swivel joints can be rotated while under fluid pressure, they are not recommended for service requiring continuous rotary motion." Pet. Reply 9 (quoting Ex. 1018, 23). Petitioner asserts this statement cautions against *continuous rotary motion under fluid pressure*, not simply *rotary motion under fluid pressure* as Patent Owner and Mr. Marscher would have it. *See id.* at 9, 10 (citing PO Resp. 24; Ex. 2007 ¶¶ 25, 43). Dr. Durham testifies in support that "continuous" rotary motion refers to "rotary unions" that permit "full 360° rotation," and such full rotation "is not required for reciprocal pumping applications" in high pressure fracturing operations for which the Chiksan swivel joints are designed. Ex. 1050 ¶¶ 40–41 (citing Ex. 1018, 18, 21; Ex. 1063; Ex. 1064);

Pet. Reply 10. Further, according to Petitioner, "the Chiksan catalog states that its swivel joints are 'designed especially for high-pressure abrasive applications such as fracturing,' and 'can handle pressures from vacuum to 20,000 psi'" including "[h]igh-pressure discharge lines." Pet. Reply 10 (quoting Ex. 1018, 18, 21, 24).

Patent Owner maintains in reply that "the swivel joints of Garner are not intended for operation when pressurized," and instead "are intended to facilitate makeup of the piping, and then are secured to prevent further movement." PO Sur-reply 8 (citing Ex. 1008, Figs. 1–3; Ex. 1049, 109:12–110:5); Ex. 2007 ¶¶ 25, 43. In support, Patent Owner focuses on Garner's swivel joints 46 and 50 in articulated arm 22. *See* PO Sur-reply 8–11 (annotating Garner's Figs. 1–3) (citing Ex. 1008 ¶¶ 14, 20, 21, 23; Ex. 1049, 109:21–111:17, 141:15–21, 183:15–184:13). Patent Owner further relies on Mr. Marscher's testimony that "the 'vibration and movement of the pumping unit' described in Garner [¶ 15] . . . are describing *environmental vibrations prior to operation of a given pumping unit*." *Id.* at 11 (emphasis added) (citing Ex. 1049, 95:14–97:19).

Concerning Chiksan swivel joints, Patent Owner argues "Petitioner's introduction of a 'rotary union' is unrelated to the discussion of swivel joints provided by Mr. Marscher" that instead concerns "swivel joints, such as those provided in the Chiksan Catalog (Ex. 2021) and the Jereh Catalog (Ex. 2023)." *Id.* at 12. Patent Owner further maintains that Petitioner ignores limitations on the actual operating conditions of Chiksan swivel joints. *See id.* (citing Ex. 1049, 53:19–54:14, 55:24–56:2, 109:21–110:5, 177:4–178:12).

We find Garner's swivel joints 36 and 38 permit axial rotation of adjacent piping sections, even when pressurized fracturing fluid flows through the discharge branch of piping. This is the clear and direct import of Garner's express disclosure that swivel joints 36 and 38 "*isolate* the base unit 24, and thus the articulated arm 22, *from vibration and movement of the pumping unit 14*." Ex. 1008 ¶ 15 (emphases added). In identifying "the" pumping unit there, Garner is referring to pumping unit 14 located on trailer 16 along with swivel joints 36 and 38, not to other pumping unit(s) on different trailer(s) that are also connected to collection manifold 18. *See id.* ¶¶ 13–15. Further, a person of ordinary skill in the art would have understood that the pumping unit generates vibration and movement when it pumps hydraulic fracturing fluid through the piping shown in Figure 1 at a high pressure for a fracturing operation. *See id.* ¶¶ 2–3, 13. Thus, we are persuaded by Dr. Durham's testimony on this point, and we reject Mr. Marscher's testimony because it is contradicted by the foregoing disclosures in Garner. *See* Ex. 1002 ¶¶ 100, 129, 134, 148; Ex. 1050 ¶ 39; Ex. 2007 ¶¶ 25, 43, 48; Ex. 1049, 53:10–54:14, 55:24–56:2, 95:14–97:19, 141:10–21. Further, Garner's disclosure of using Chiksan swivel joints "[i]n one embodiment" (Ex. 1008 ¶ 22) does not contradict the more general teachings of Garner that swivel joints can accommodate the high fluid pressures of hydraulic fracturing operations (*id.* ¶ 15).

We also agree with Petitioner's position on Chiksan joints, for at least two reasons. First, Garner states that, in one embodiment, its swivel joints 36 and 38 can be Chiksan Style 10 or Style 80 swivel joints used in hydraulic fracturing operations. *See* Ex. 1008 ¶¶ 2–3, 15, 22 (Table 1). This disclosure provides objective evidence that those Chiksan joints (at least)

can swivel to provide vibration isolation functionality under high fluid pressures, as described in Garner.

Second, the Chiksan catalog disclosure is consistent with that disclosure in Garner. The Chiksan catalog describes how its swivel joints can be used "when handling abrasives at extremely high pressures," which is what Garner's hydraulic fracturing involves. Ex. 1018, 18; Ex. 1008 ¶¶ 2–3 ("[D]uring a fracturing operation such pumping units are used to inject a particle-containing slurry into the well in order to fracture the hydrocarbon bearing formation[.]"); *see also* Ex. 1009 ¶¶ 4, 34–36 (Sanborn, discussing proppants used in hydraulic fracturing slurries). The Chiksan catalog similarly indicates its swivel joints are useful at cold working pressures of 10,000 psi, 15,000 psi, and 20,000 psi for "high-pressure abrasive applications such as fracturing." Ex. 1018, 21; *see also* Ex. 1009 ¶ 43 (Sanborn, describing how its pumpers 22 increase the fluid pressure to "very high levels typically needed for fracturing, e.g., usually above about 5,000 psi, and often, about 10,000 psi or higher").

Patent Owner relies on the Chiksan catalog's statement that: "Although Chiksan swivel joints can be rotated while under fluid pressure, they are not recommended for service requiring continuous rotary motion." Ex. 1018, 23. This disclosure, however, must be read in the context of the other Chiksan catalog disclosures discussed above, stating expressly that Chiksan swivel joints can accommodate the high fluid pressures of hydraulic fracturing operations. In that overall context, we agree with Petitioner's position that the term "continuous" is the critical aspect of the Chiksan catalog's cautionary statement. Mr. Marscher's testimony on behalf of Patent Owner cites the cautionary statement, but he does not grapple

meaningfully with the Chiksan catalog's overall disclosure to support his conclusion that Chiksan swivel joints were "NOT axially rotatable when under high pressure," such as during hydraulic fracturing operations. *See* Ex. 2007 ¶¶ 25, 43; Ex. 1049, 109:7–111:17, 177:4–178:12, 183:15–184:22.

(v) Conclusion

We conclude a preponderance of the evidence supports Petitioner's reliance on Garner and Sanborn as disclosing the subject matter of claim 1, and Petitioner has articulated reasons why a person of ordinary skill in the art would have employed Sanborn's electrically-powered pump within Garner's hydraulic fracturing system. In Section III.H.3(c) below, we consider Patent Owner's proffered evidence of objective indicia of nonobviousness, prior to reaching a final determination as to Petitioner's unpatentability contentions.

b) Petitioner's Second Theory of Obviousness

Petitioner's second theory of obviousness posits that Sanborn discloses the subject matter of claim 1 except for the *swivel connections strategically located in the discharge branch of piping*; Garner discloses such swivel connections; and a person of ordinary skill in the art would have been motivated to combine these disclosures. *See, e.g.*, Pet. 23 (line 1) – 24 (line 17), 25 (lines 9–19), 26–30. We consider these contentions on a limitation-by-limitation basis.

(i) "A hydraulic fracturing system for fracturing a subterranean formation comprising:"

Petitioner argues that, assuming claim 1's preamble is a limitation, Sanborn discloses a hydraulic fracturing system for fracturing a subterranean

formation. *See* Pet. 20, 26 (citing Ex. 1009 ¶¶ 3, 12); Ex. 1002 ¶¶ 129–130, 140–141. Patent Owner does not dispute this contention, and we find it is supported by a preponderance of the evidence. For example, Sanborn indicates its pumping system 13 may be "used to stimulate production from an oil or gas well" via "[h]ydraulic fracturing." Ex. 1009 ¶¶ 2–3, 43.

(ii) "an electrically powered fracturing pump having a discharge side;"

Petitioner argues Sanborn discloses an electrically powered pumping system 13. *See* Pet. 22; *id.* at 14, 26–27 (citing Ex. 1009, code (57), ¶¶ 7–8, 21, 23, 38, 43, 46); Ex. 1002 ¶¶ 98, 113, 132, 142–144. Petitioner also asserts Sanborn's pumpers 22 have a discharge side, i.e., the side of the pump where fracturing fluid exits the pump. *See* Pet. 27–28 (citing Ex. 1009, Fig. 2, ¶ 43); Ex. 1002 ¶¶ 142–144.

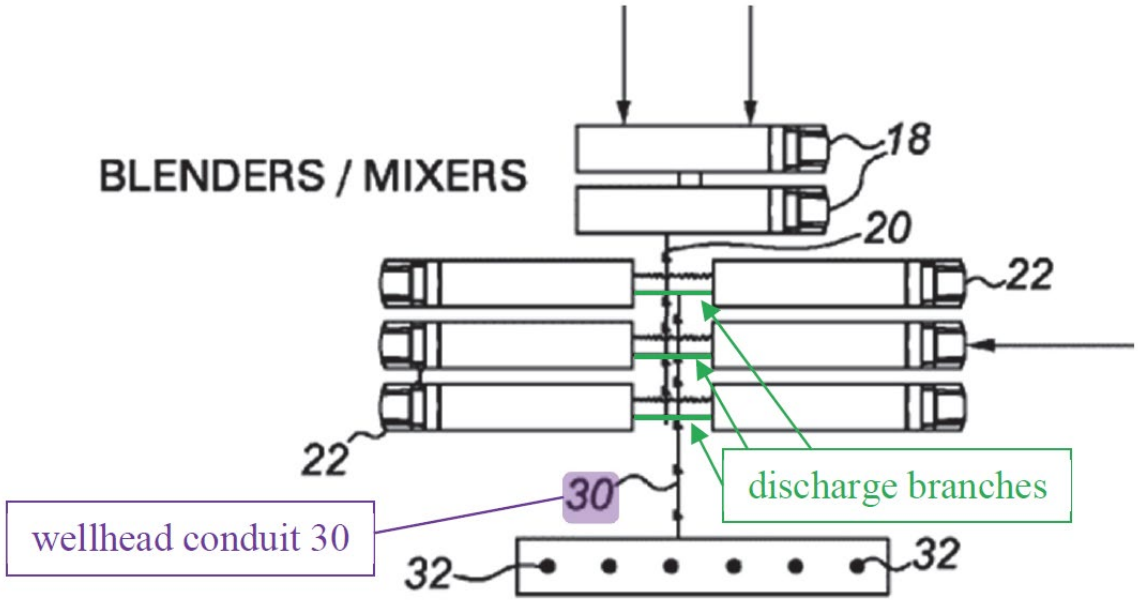
Patent Owner does not dispute these contentions, and we find they are supported by a preponderance of the evidence. *See supra* Section III(H)(3)(a)(ii).

(iii) "a discharge branch of piping having therein pressurized fracturing fluid supplied from the fracturing pump;"

Petitioner argues Sanborn discloses a discharge branch of piping to convey pressurized fracturing fluid supplied from a fracturing pump. *See* Pet. 23, 27–28 (citing Ex. 1009, Figs. 1–2, ¶ 43); Ex. 1002 ¶¶ 133, 146. Patent Owner does not dispute this contention, and we find it is supported by a preponderance of the evidence. For example, Sanborn describes how its pumpers 22 pump fluid into wellhead conduit 30 to be delivered to wellhead(s) 32 to perform fracturing in a well. *See* Ex. 1009, Fig. 2, ¶¶ 2–3, 43, 45.

(iv) "swivel connections strategically located in the discharge branch of piping, so that when pressurized fracturing fluid flows through the discharge branch of piping, a section of the discharge branch of piping is axially rotatable with [respect to] an adjacent section of the discharge branch of piping."

Petitioner acknowledges Sanborn "does not discuss the details of its 'discharge branches'" between pumpers 22 and wellhead conduit 30, so Sanborn does not disclose the "swivel connections" limitation of claim 1. Pet. 23–24 (citing Ex. 1009, Fig. 2, ¶ 43); Ex. 1002 ¶ 133. Petitioner's annotations to Sanborn's Figure 2 are reproduced below.



Sanborn, Figure 2 (Excerpt Annotated by Petitioner, Pet. 23).

Figure 2 is a schematic representation of a hydraulic fracturing system, which Petitioner has annotated to identify "discharge branches" (colored green) leading from pumpers 22 to wellhead conduit 30 (colored purple), which in turn leads to wellhead(s) 32. *See* Pet. 23; Ex. 1002 ¶ 133; Ex. 1009, Fig. 2, ¶¶ 33, 36–38, 43, 45.

Petitioner relies on Garner as disclosing the entire "swivel connections" limitation of claim 1. *See* Pet. 20, 23–24, 28–30 (citing

Ex. 1008, Fig. 1, ¶¶ 13–16, 19–21); Ex. 1002 ¶¶ 100, 129, 133–135, 148–150. Patent Owner argues Garner fails to disclose the "swivel connections" limitation of claim 1. *See* PO Resp. 22–24; PO Sur-reply 6–13. For reasons provided above in Section III.H.3(a)(iv), we conclude a preponderance of the evidence supports Petitioner's contention that Garner discloses the "swivel connections" limitation of claim 1.

Petitioner further asserts a person of ordinary skill in the art would have been motivated to employ Garner's swivel connections in the pump discharge branch of Sanborn's hydraulic fracturing system based on various similarities between the two systems and further "to obtain Garner's benefits of isolating vibration from a high-pressure pumping unit — like the pumper 22 of Sanborn — using swivel joints." Pet. 23 (line 1) – 24 (line 17) (citing Ex. 1008, Fig. 1, ¶¶ 13, 15; Ex. 1009, Figs. 1–2, ¶ 43); *id.* at 25 (lines 9–19); Ex. 1002 ¶¶ 103, 133–135, 137.

Patent Owner opposes Petitioner's foregoing motivation contentions as too conclusory to satisfy Petitioner's burden to demonstrate obviousness, and as based on impermissible hindsight. *See* PO Resp. 24–25. Patent Owner particularly asserts: "Although a problem in the prior art may form the basis of a motivation to combine, Petitioner must demonstrate that the alleged 'problem was known in the art or that [Petitioner's] formulation of the problem was derived directly from the prior art rather than from the challenged claims.'" *Id.* at 24 (quoting *Purdue Pharma*, 643 F. App'x at 966; citing *Insite Vision*, 783 F.3d at 859).

Patent Owner particularly asserts "Petitioner has not shown how [Sanborn and Garner] show *strategic locations of swivel connections*," and instead Petitioner relies on Dr. Durham's testimony "to try and fill in the

gaps while having the benefit of the '824 Patent to guide modifications and adjustments." *Id.* at 25 (emphasis added); Ex. 2007 ¶ 44. As an example of this, Patent Owner focuses on the "full rotation and articulation of [Garner's] arm 22" as being "not equivalent" and "incompatible" with the swivel connections limitation of claim 1 because it is implemented "prior to forming a connection with associated piping [18]." PO Resp. 25–26 (citing Ex. 1002 ¶ 148); Ex. 2007 ¶ 48.

Petitioner replies that "[t]he Petition lays out specific reasons to combine" based on specific teachings of Garner and Sanborn, and based on Dr. Durham's testimony. Pet. Reply 12 (citing Pet. 20–25; Ex. 1002, ¶¶ 128–138). Petitioner maintains a person of ordinary skill in the art "would have been motivated to use the discharge arm assembly 10 of Garner with the pumper 22 of Sanborn to obtain Garner's benefits of isolating vibration from a high-pressure pumping unit." *Id.* at 13 (citing Pet. 24; Ex. 1002 ¶¶ 100, 128–138). Petitioner also concludes that Patent Owner's opposition to Petitioner's motivation to combine merely "re-argues" Patent Owner's opposition to Garner's disclosing the swivel connections limitation. *Id.*

Patent Owner's Sur-reply generally maintains that Petitioner's motivation contentions are too conclusory and are based on impermissible hindsight. *See* PO Sur-reply 13–15. Patent Owner then argues "Petitioner's interpretation of Garner would render the reference, and therefore the proposed combination, unsuitable for its intended purpose . . . such that it would teach [a person of ordinary skill in the art] away from its use." *Id.* at 15 (section heading modified). Patent Owner relies here on Mr. Marscher's testimony that "the swivel joints in Garner would not be

used to permit rotation and vibration attenuation during operation" and "the [person of ordinary skill in the art] would not want the swivel joints to permit rotation during operation" due to "an increased risk of failure of the joints, the manufacturer's warning not to do so, and also risks with under or over-constraining a piping system." *Id.* at 15–16 (citing Ex. 1049, 83:17–24, 84:17–24, 94:20–24, 95:23–96:24). Patent Owner similarly asserts that the "swivel connections" limitation of claim 1 is "contrary to conventional wisdom" and therefore "illustrates non-obviousness." *Id.* at 16 (section heading modified) (citing Ex. 1049, 54:15–57:6; *In re Hedges*, 783 F.2d 1038 (Fed. Cir. 1986)).

We conclude Petitioner articulates a sufficient motivation for the proposed use of Garner's swivel connections in the discharge branches of Sanborn's hydraulic fracturing system, without the use of hindsight. In particular, both Garner and Sanborn provide mobile pumps for performing hydraulic fracturing operations. *See* Ex. 1008, Fig. 1, ¶¶ 2–3, 13; Ex. 1009, Fig. 2, ¶¶ 21, 23, 45. Based on this similarity, we are persuaded by Dr. Durham's testimony that Garner's disclosure of using swivel connections in a discharge branch of piping to isolate downstream piping from vibration and movement caused by the pump would benefit the Sanborn system in the same fashion. *See supra* Section III.H.3(a)(iv) (discussing Garner's disclosure in relation to the "swivel connections" limitation); Ex. 1002 ¶¶ 103, 133–135, 137. Patent Owner's and Mr. Marcher's opposition are not persuasive, because they are contradicted by disclosures in Garner and the Chiksan catalog. *See supra* Section III.H.3(a)(iv).

(v) Conclusion

We conclude a preponderance of the evidence supports Petitioner's reliance on Sanborn and Garner as disclosing the subject matter of claim 1, and Petitioner has articulated reasons why a person of ordinary skill in the art would have employed Garner's swivel connections in Sanborn's pump discharge branch. In Section III.H.3(d) below, we consider Patent Owner's proffered evidence of objective indicia of nonobviousness prior to reaching a final determination as to Petitioner's unpatentability contentions.

c) Objective Indicia of Nonobviousness

The '824 patent issued from a continuation-in-part of the '689 Application, which issued as the '410 patent. *See supra* Section II.C; Ex. 1006, code (21). During prosecution of the parent '410 patent, Patent Owner advanced objective indicia evidence in support of the patentability of the '410 patent claims. Patent Owner now relies on that evidence as objective indicia for the nonobviousness of the '824 patent claims at issue here.

(i) Whether the Petition is Deficient for Failing to Address Objective Indicia of Nonobviousness from Prosecution of the Parent '410 Patent

Petitioner did not address, in the Petition, the objective indicia evidence from the parent '410 patent prosecution. Patent Owner argues the Petition therefore is fatally deficient because "[i]t is well-established that objective evidence 'must be considered in every case where present,'" and Petitioner bears the burden to demonstrate unpatentability. PO Resp. 33–34 (quoting *Apple Inc. v. Samsung Elecs. Co., Ltd.*, 839 F.3d 1034, 1048 (Fed. Cir. 2016) (en banc), and citing several other legal authorities).

Petitioner replies that a petition need not address objective indicia, because "[w]hile the burden of persuasion remains with the challenger, *a patentee bears the burden of production* with respect to" objective indicia. Pet. Reply 16–17 (quoting *ZUP, LLC v. Nash Mfg., Inc.*, 896 F.3d 1365, 1373 (Fed. Cir. 2018) (emphasis added by Petitioner)). Petitioner also argues Patent Owner's argument improperly attempts to shift the burden to Petitioner to show a lacks of nexus. *See id.*

Patent Owner's Sur-reply does not address the facial deficiency issue raised in the Patent Owner Response. *See* PO Sur-reply 18–23 (argument directed to objective indicia).

In this case, where the objective indicia evidence appears in the prosecution history of a parent patent (the '410 patent) of the patent at issue (the '824 patent), we do not fault Petitioner for not addressing this evidence in the Petition. Patent Owner raised the issue in its Response to the Petition. *See* PO Resp. 32–54. Petitioner responded by addressing objective indicia in its Reply. *See* Pet. Reply 16–24. After which, Patent Owner addressed objective evidence once again. *See* PO Sur-reply 18–23. We proceed to decide the case on this record.

(ii) Nexus of Objective Indicia of Nonobviousness to the '824 Patent

Patent Owner bears the burden to establish a nexus between the objective indicia evidence from the parent '410 patent prosecution history and the '824 patent claims being challenged here. "For objective indicia of nonobviousness to be accorded substantial weight, *its proponent* must establish a nexus between the evidence and the merits of the claimed invention." *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 33,

32 (PTAB Jan. 24, 2020) (precedential) (emphasis added). "[T]he patentee bears the burden of showing that a nexus exists." *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1332 (Fed. Cir. 2019) (quoting *WMS Gaming, Inc. v. Int'l Game Tech.*, 184 F.3d 1339, 1359 (Fed. Cir. 1999)).

"In order to accord substantial weight to secondary considerations in an obviousness analysis, 'the evidence of secondary considerations must have a "nexus" to the claims, i.e., there must be "a legally and factually sufficient connection" between the evidence and the patented invention.'" *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019) (quoting *Henny Penny*, 938 F.3d at 1332); *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988).

A nexus is presumed when "the patentee shows that the asserted objective evidence is tied to a specific product and that product 'embodies the claimed features, and is coextensive with them.'" *Fox Factory*, 944 F.3d at 1373 (quoting *Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1072 (Fed. Cir. 2018)). "A finding that a presumption of nexus is inappropriate does not end the inquiry into secondary considerations," however, as "the patent owner is still afforded an opportunity to prove nexus by showing that the evidence of secondary considerations is the 'direct result of the unique characteristics of the claimed invention.'" *Id.* at 1373–74 (quoting *In re Huang*, 100 F.3d 135, 140 (Fed. Cir. 1996)).

Patent Owner argues that evidence of commercial success, attempts at copying, industry praise, long-felt but unsolved need, and failure of others, all as presented during prosecution of the parent '410 patent, support the patentability of the '824 patent claims at issue here. *See, e.g.*, PO Resp. 34–35. Patent Owner asserts a nexus should be presumed (*see id.* at 36–39),

and alternatively that the evidence shows the objective indicia is the direct result of the unique characteristics of the '824 patent claims (*see id.* at 39–41).

We address both possibilities in turn. We ultimately find there is no nexus between the proffered objective indica evidence and the invention recited in claim 1 of the '824 patent. This evidence, therefore, does not weigh in favor of nonobviousness in this case.

(1) Presumption of Nexus

Patent Owner's proffered objective indicia evidence is tied to Patent Owner's Clean Fleet® product, which Patent Owner argues embodies the '824 patent claims and is coextensive with them. *See* PO Resp. 36–39; *see also Fox Factory*, 944 F.3d at 1373 (stating nexus is presumed when "the patentee shows that the asserted objective evidence is tied to a specific product and that product 'embodies the claimed features, and is coextensive with them'").

In particular, according to Patent Owner, "the Clean Fleet® product comprises electric pumps, discharge branches, and swivel connections" as recited in claim 1. PO Resp. 36–37 (citing Ex. 1048, 2; Ex. 2005, 189; Ex. 2008). In support, Patent Owner relies on Exhibit 2008, which Patent Owner identifies as: "Firefly Digital, *U S Well Services Clean Fleet® technology*, YOUTUBE (October 21, 2015), https://www.youtube.com/watch?v=BpC5mBUPeAM" (hereafter, "the Clean Fleet Video"). *Id.* at xi, 37. The Patent Owner Response reproduces what it purports to be three screen shots from the Clean Fleet Video, and argues they demonstrate "the swivel connections, among other claimed features, are shown in marketing

material that was available in 2015." *Id.* at 37–38 (citing Ex. 2008, 0:26, 0:40, 0:48). Patent Owner additionally relies on the testimony of Mr. Marscher to support a finding of nexus. *See id.* at 39 (citing Ex. 2007 ¶ 52); *see also* Ex. 2007 ¶¶ 24, 28, 31–33, 35–36, 42, 50–51. Patent Owner emphasizes that "[t]he claimed combination as a whole serves as a nexus for the objective evidence." PO Resp. 33; Ex. 2007 ¶¶ 24, 35, 41.

Petitioner replies that no presumption of nexus applies here for several reasons. *See* Pet. Reply 17–20. First, any objective indicia evidence submitted during the prosecution history of the '410 patent is "attributable to the prior art" not to the '824 patent claims, due to the pre-issuance publication of the '689 Application. *See id.* at 17 (citing Ex. 1006, code (65); 35 U.S.C. § 102(a)(1)–(2)). Second, the evidence does not establish that the Clean Fleet® product embodies claim 1 or is coextensive with claim 1. *See id.* at 17–18 (discussing PO Resp. 36–39; Ex. 2007 ¶ 52). Third, there cannot be coextensiveness here because the '824 patent claims "have 'significant differences' from" the parent '410 patent claims. *Id.* at 18–19 (quoting *Halliburton Energy Services, Inc. et al. v. U.S. Well Services, LLC*, IPR2021-01038, Paper 71 at 39–40 (PTAB Jan. 17, 2023)).

In particular, Petitioner observes that Patent Owner "points to the ***same*** Clean Fleet® product for non-obviousness across ***sixteen*** patents" in several IPR proceedings, yet "[w]here a product embodies claims from two patents, a presumption of nexus can be appropriate only if the claims of both patents generally cover the same invention." *See id.* at 19–20 (quoting *Fox Factory*, 944 F.3d at 1377, and summarizing some of the claims at issue in the other IPR proceedings). Petitioner similarly adds: "'[T]he same evidence of secondary considerations cannot be presumed to be attributable

to two different features,' much less the dozens of features recited by [Patent Owner's] other patents." *Id.* at 20 (quoting *Unified Patents Inc. v. DivX, LLC*, IPR2019-01379, Paper 52 at 51 (PTAB Feb. 8, 2021), other citations omitted).

Patent Owner replies that the Federal Circuit has "never held that the existence of one or more unclaimed features, standing alone, means nexus may not be presumed," and has stated "there is rarely a *perfect correspondence* between the claimed invention and the product." PO Sur-reply 18 (quoting *Fox Factory*, 944 F.3d at 1374). Patent Owner then reproduces the same three screen shots of the Clean Fleet Video that were previously reproduced in the Patent Owner Response, except that this time, Patent Owner's counsel annotates the screen shots to identify where they allegedly show "Swivel connection(s)" and an "Electric Pump."[7] *Id.* at 18–20 (citing Ex. 2008, 0:26, 0:40, 0:48). Patent Owner also argues: "[T]here is no requirement that 'objective evidence must be tied exclusively to claim elements that are not disclosed in a particular prior art reference in order for that evidence to carry substantial weight.'" PO Resp. 39–40 (quoting *Lectrosonics*, Paper 33 at 33 (quoting *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1331 (Fed. Cir. 2016)).

We conclude Patent Owner is not entitled to a presumption of nexus because the evidence fails to establish the Clean Fleet product is coextensive with claim 1. Patent Owner relies principally on the Clean Fleet Video in this regard, but it is insufficient to establish coextensiveness. We note first

[7] Patent Owner also annotates one screen shot to identify where it allegedly shows "Portion of suction branch" and "Grooved connection," limitations found in claim 8 but not claim 1. PO Sur-reply 21 (citing Ex. 2008, 0:48).

that the Clean Fleet Video itself is not in the record. Instead, Exhibit 2008 is a one-page print-out of what appears to be the YouTube website cited in the Patent Owner Response. *See* Ex. 2008; PO Resp. xi. Thus, we are unable to rely on anything that might be in the Clean Fleet Video other than the screen shots reproduced in the Patent Owner Response and the Patent Owner Sur-reply to support a finding of nexus.

Those screen shots are insufficient for us to find that the Clean Fleet product embodies the "swivel connections" limitation of claim 1, which is a significant limitation in the claim. Patent Owner does not proffer any witness testimony to identify particular structure(s) in the screen shots that correspond to the claimed *swivel connections* located in a *discharge branch* of piping. *See* PO Resp. 37–39; PO Sur-reply 19–21. The only such identification is found in the Patent Owner Sur-reply, which is untimely, because it forecloses any realistic opportunity for Petitioner to challenge Patent Owner's assertions. *See, e.g.*, Paper 16, 9 (Scheduling Order, stating "Patent Owner is cautioned that any arguments for patentability not raised in the [Patent Owner Response] may be deemed waived."). It is also unpersuasive. We cannot tell, from the bare screen shots provided in Patent Owner's briefs with counsel's annotations, whether the identified structures are in fact swivel connections in a discharge branch of piping. For example, they might be a simple joining of two pipe sections, without providing a swivel interaction.

We acknowledge Mr. Marscher's statements that the Clean Fleet product "comprises electric pumps, discharge branches, and swivel connections," and that the Clean Fleet product was "shown in a promotional video [i.e., the Clean Fleet Video] at 0:28 and other locations showing the

vibration reducing components[].” Ex. 2007 ¶¶ 24, 31–32, 42, 50–51. However, Mr. Marscher does not actually identify any structure(s) in the Clean Fleet Video that correspond to swivel connections in a discharge branch of piping. *See id.* Thus, we do not know whether he reviewed the Clean Fleet Video himself as part of his testimony, or whether he was informed by Patent Owner’s counsel of what the Clean Fleet Video allegedly shows. We note, further, that Mr. Marscher cites “0:28” of the video, whereas the screen shots in Patent Owner’s briefs are from “0:26/1:34,” “0:40/1:34,” and “0:48/1:34.” Moreover, as noted above, the video itself is not part of the record presented for us to review.

Patent Owner’s other cited evidence of nexus fares no better. *See* Ex. 1048, 2 (Clean Fleet Services brochure, stating “Clean Fleet® runs on electric power,” but not indicating that Clean Fleet employed swivel connections in a discharge branch of piping); Ex. 2005, 189 (the ’410 patent prosecution history, referring to environmental gains such as reduced emissions provided by the Clean Fleet product, but not indicating that it employed swivel connections in a discharge branch of piping).

Nor has Patent Owner addressed meaningfully the fact that it asserts the same Clean Fleet product is embodied by several of its patents. *See Fox Factory*, 944 F.3d at 1378 (“The same evidence of secondary considerations cannot be presumed to be attributable to two different combinations of features.”); *see also id.* at 1377 (“Where a product embodies claims from two patents, a presumption of nexus can be appropriate only if the claims of both patents generally cover the same invention.”). As Petitioner points out, some of the other patents at issue here contain markedly different subject

matter than claim 1 of the '824 patent. *See* Pet. Reply 19–20 (discussing five of the sixteen patents at issue).

Thus, we find that Patent Owner has not established the Clean Fleet product is coextensive with claim 1 of the '824 patent, so Patent Owner is not entitled to a presumption of nexus of objective indicia in that regard. *See, e.g.*, *Fox Factory*, 944 F.3d at 1374 ("Although we do not require the patentee to prove perfect correspondence to meet the coextensiveness requirement, what we do require is that the patentee demonstrate that the product is essentially the claimed invention.").

(2) Direct Result of Unique Characteristics of Claimed Invention

Patent Owner argues its proffered objective indicia evidence has a nexus because it is the direct result of the unique characteristics of the '824 patent claims. *See* PO Resp. 39–41; *see also Fox Factory*, 944 F.3d at 1373–74 (stating nexus may be proved "by showing that the evidence of secondary considerations is the 'direct result of the unique characteristics of the claimed invention'" (quoting *Huang*, 100 F.3d at 140)). In support, Patent Owner asserts claim 1 is directed to a system for hydraulic fracturing including an electric pump and swivel connections to reduce vibrations in a discharge branch, and Patent Owner's objective indicia evidence is tied to that claimed subject matter. *See* PO Resp. 39 (lines 1–13), 40–41; Ex. 2007 ¶¶ 24, 28, 31–33, 35–36, 42, 50–51.

Petitioner replies that Patent Owner has not shown that its objective indicia evidence is the direct result of the '824 patent claims. *See* Pet. Reply 21–22. Petitioner asserts Patent Owner's evidence is limited "to the replacement of diesel engines with electric motors and electric pumps."

Id. at 21 (citing PO Resp. 53; Ex. 1049, 157:4–7). "However," according to Petitioner, "using electric motors was already disclosed by Sanborn (among others) before the '824 Patent," and "[t]here is no nexus when the claimed feature tied to secondary evidence was 'indisputably known in the prior art.'" *Id.* at 21–22 (quoting *Novartis AG v. Torrent Pharms. Ltd.*, 853 F.3d 1316, 1331 (Fed. Cir. 2017); citing Pet. 20–22; Ex. 1009 ¶¶ 7–8, 21, 38; Ex. 1049, 168:24–169:9; *Lectrosonics*, Paper 33 at 33).

We have reviewed the parent '410 patent claims that Patent Owner relies on as having been allowed due to objective indicia. *See* Ex. 1006, 7:19–8:60. At a high level, the independent claims each recite a system for hydraulically fracturing an underground well formation comprising at least one pump driven by one or more electric motors, and a variable frequency drive to control the speed of the motor(s) and perform motor diagnostics. *See id.* at 7:19–33 (claim 1), 7:57–8:10 (claim 10), 8:31–51 (claim 19). None of the parent '410 patent's claims recites swivel connections located in the pump's discharge piping branch as recited in claim 1 of the '824 patent at issue here. *See id.* at 7:19–8:60. And, claim 1 of the '824 patent does not recite an electric motor, or a variable frequency drive, like the parent '410 patent's claims do. Thus, even if the prosecution history of the parent '410 patent establishes a nexus between Clean Fleet product(s) and one or more claims of the '410 patent, it is not at all clear to us how this nexus might also apply to claim 1 of the '824 patent. We reached the same conclusion in the Institution Decision. *See* Inst. Dec. 41.

Patent Owner responds that the evidence nonetheless shows the Clean Fleet product achieved commercial success "due to the 'pumps' that are powered by the electric motor *and the improved reliability provided due to*

the reduced vibrations." PO Resp. 40 (emphasis added) (citing Ex. 2005, 154). Patent Owner also cites the Clean Fleet Video as "provid[ing] specific examples of different piping configuration for the Clean Fleet® product, including the swivel connections, helical coils, and the like." *Id.* at 42 (citing Ex. 2008). Patent Owner further cites Exhibit 2013 as indicating that the Clean Fleet product included "electric pump elements *and swivel connections*." *Id.* at 43 (emphasis added).

However, the cited evidence does not support Patent Owner's contentions. Exhibit 2005 at page 154 contains the applicant's remarks in support of patentability during prosecution of the parent '410 patent, including that Patent Owner's customers choose the Clean Fleet product for its "reduced emissions and environmental impact, reduced fuel costs, reduced fire risks, reduced truck traffic, reduced noise pollution, *reduced surface vibrations at the wellbore*, and increased operational efficiency." Ex. 2005, 154 (emphasis added); *see also id.* at 167, 168 (Exhibit A, ¶¶ 4 and 7, as cited in the applicant's remarks). However, the applicant's remarks do not refer to *reduced vibrations in the piping system*, much less reduced vibrations due to swivel connections in the piping system, as a benefit of the Clean Fleet product. *See id.* at 154. Deficiencies with respect to the Clean Fleet Video are discussed above in Section III.H.3(c)(ii)(1). Finally, Exhibit 2013 is an Investor and Analyst Update published by Patent Owner, which provides financial highlights and also describes three generations of the Clean Fleet product, but it focuses on the use of electrical power without mentioning swivel connections in the piping system. *See* Ex. 2013. Thus, there is no nexus here.

Patent Owner also argues the evidence shows the Clean Fleet product "received widespread industry praise and recognition due to the electric pumps and improved reliability." PO Resp. 40–41; *id.* at 48–52 (citing Ex. 2005, 158–161; Ex. 2009, 7–8; Exs. 2017–2020). We have reviewed the cited evidence and find that it focuses on using electrical power to perform hydraulic fracturing operations with a reduced environmental impact and not on swivel connections in the piping system. For example, Exhibit 2018 reflects an Environmental Award given to Patent Owner in recognition of the Clean Fleet technology that does briefly refer to "reduced equipment and discharge iron vibrations by 80%." Ex. 2018. However, this is in combination with a laundry list of other factors that are given more prominence such as noise reduction, using electrical power generated by natural gas rather than diesel power, and a reduced environmental footprint. *See* Ex. 2018. Exhibit 2020 is a Patent Owner news release to the same effect as Exhibit 2018.

Patent Owner further argues the evidence shows the Clean Fleet product was copied by others. *See* PO Resp. 40, 43–48. However, the only mention here of vibration reduction measures such as swivel connections is an annotation of a photograph of one competitor's product allegedly identifying a "Swivel," which we find not probative for similar reasons discussed above in connection with the Clean Fleet Video. *See id.* at 46 (citing Ex. 2014, 37).

Patent Owner finally argues the evidence demonstrates that Clean Fleet succeeded where others had failed, and satisfied a long-felt but unmet need. *See id.* at 41, 52–54. This includes, according to Patent Owner, "Green Field Energy Service's attempts to create a natural gas powered

hydraulic fracturing system that experienced several failures related to their turbine designs as well as high vibrations within the system," which the invention of claim 1 of the '824 patent overcame. *Id.* at 53 (citing Ex. 2005, 156; Ex. 2007 ¶ 52). However, the cited evidence does not support Patent Owner's contentions. Exhibit 2005 at page 156 contains the applicant's remarks in support of patentability during prosecution of the parent '410 patent, including that Green Field failed in creating *small natural gas turbines* to drive fluid pumps, in part because these turbines generated "high vibrations" leading to high maintenance costs. Ex. 2005, 156. However, the applicant's remarks do not identify *reduced vibrations in the piping system*, much less reduced vibrations due to swivel connections in the piping system, as a benefit of the Clean Fleet product. *See id.*

Moreover, to the extent Patent Owner asserts that it is simply the use of electrically powered pumps in hydraulic fracturing that corresponds to objective indicia of nonobviousness, the evidence of record establishes that the prior art disclosed such use of electrically powered pumps. *See* Ex. 1009 ¶¶ 9–11, 38. We appreciate, as Patent Owner points out, that "there is no requirement that 'objective evidence must be tied exclusively to claim elements that are not disclosed in a particular prior art reference in order for that evidence to carry substantial weight.'" *Lectrosonics*, Paper 33 at 33 (quoting *WBIP*, 829 F.3d at 1331); *see* PO Resp. 39–40. Nonetheless, "there must be a nexus to some aspect of the claim not already in the prior art." *Lectrosonics*, Paper 33 at 33 (quoting *In re Kao*, 639 F.3d 1057, 1068–69 (Fed. Cir. 2011)). In the facts presented here, the difficulty for Patent Owner is that its evidence of objective indicia overwhelmingly points to electrically powered pumps as the characteristic of the claimed invention relating to the

objective indicia, as opposed to "the claimed combination as a whole" (*id.*) — that is, as opposed to the combination of electrically powered motors with swivel connections in a discharge branch of piping. *See also Yita LLC v. MacNeil IP LLC*, 69 F.4th 1356, 1364–65 (Fed. Cir. 2023) ("[O]ur case law makes clear that 'objective evidence of nonobviousness lacks a nexus if it exclusively relates to a feature that was '*known* in the prior art[.]'" (citations omitted, distinguishing *WBIP*)).

d) Conclusion Regarding Claim 1

Petitioner has shown by a preponderance of the evidence that claim 1 of the '824 patent is unpatentable as having been obvious over Garner and Sanborn. Garner and Sanborn together disclose each and every claim limitation as arranged in the claim. Further, a person of ordinary skill in the art would have been motivated to combine the references in one of two alternative ways, either using Sanborn's electrically powered pumps in Garner's system, or using Garner's swivel connections in Sanborn's system, both of which would have resulted in the invention of claim 1. Further, Patent Owner has not established a nexus between its proffered objective indicia evidence and the claimed invention, so it does not weigh in favor of nonobviousness in this case.

4. Claims 4–6

Petitioner provides arguments and evidence in support of contending claims 4–6 are unpatentable as having been obvious over Garner and Sanborn. *See* Pet. 30–33; Ex. 1002 ¶¶ 151–158. In defense of these claims, Patent Owner relies solely on arguments considered above in relation to their common parent claim 1. *See* PO Resp. 26–27; PO Sur-reply 18. For the

reasons provided above in Section III.H.3 in the context of claim 1, we conclude Patent Owner's arguments are unavailing. We additionally adopt Petitioner's case for obviousness of claims 4–6 as our own in this Decision, and we accordingly conclude Petitioner has demonstrated by a preponderance of the evidence that claims 4–6 are unpatentable as having been obvious over Garner and Sanborn.

I. Ground 2 — Obviousness over Garner, Sanborn, and Enidine

In Ground 2, Petitioner argues claims 2 and 3 of the '824 patent are unpatentable as having been obvious over Garner, Sanborn, and Enidine. *See* Pet. 13–14, 16, 17, 33–42; Ex. 1002 ¶¶ 110–113, 118–121, 159–174. Patent Owner disagrees. *See* PO Resp. 27–28; Ex. 2007 ¶¶ 24, 29–30, 42, 46, 53–54. We conclude a preponderance of the evidence supports Petitioner's assertions as to both challenged claims. We begin our analysis with a brief summary of Enidine, then we address the parties' contentions as to obviousness.

1. Enidine

Enidine is a product catalog produced by ITT Enidine Incorporated, titled "Wire Rope Isolator Technologies." Ex. 1011,[8] 1, 4. Enidine indicates one "Application[]" for such "WR" isolators is "Pump, Generator & Compressor Isolation." *Id.* at 2.

Enidine provides photographs of its wire rope isolators, reproduced below.

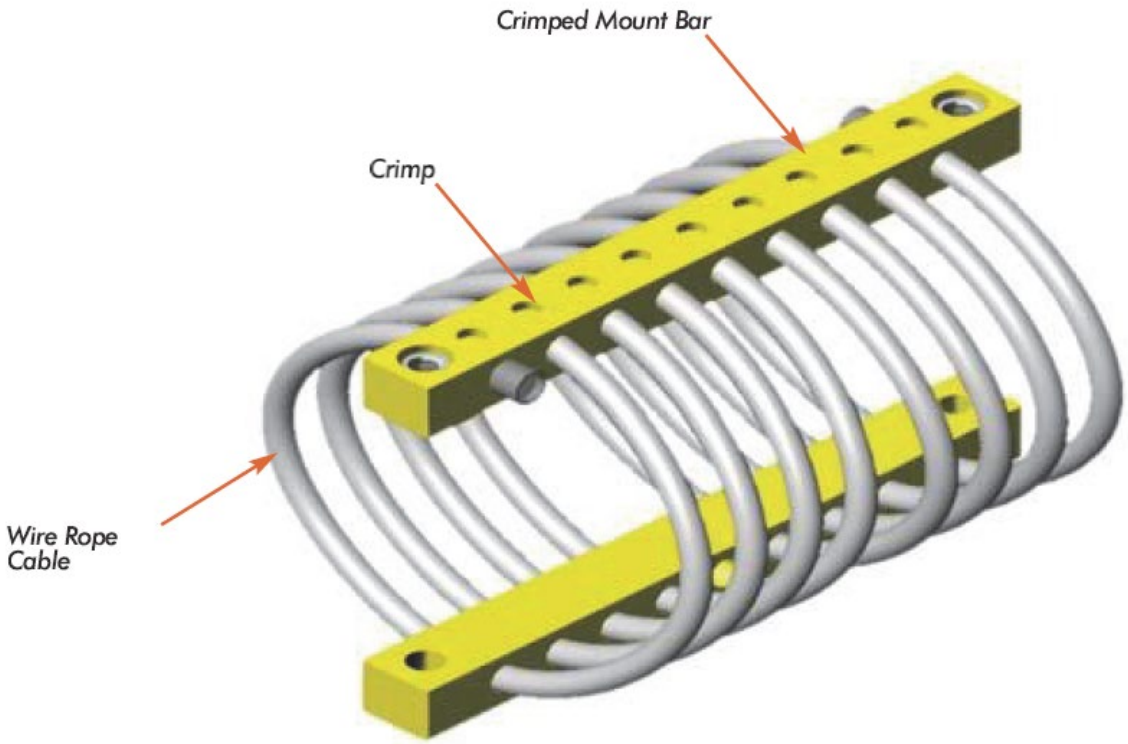
[8] When citing to Exhibit 1011, we refer to the page numbering added by Petitioner in the bottom right corner of each page.



Enidine Wire Rope Isolator Photographs (Ex. 1011, 6).

These photographs depict several wire rope isolators, which Enidine describes as "comprised of stainless steel stranded cable threaded through aluminum alloy retaining bars that are mounted for effective shock and vibration isolation." *Id.* at 6.

Enidine also provides a diagram of wire rope isolator Crimp Models WR2 – WR8, reproduced below.



Enidine Wire Rope Isolator Diagram (Ex. 1011, 7).

This diagram depicts a wire rope isolator, and identifies its components as two "Mount Bar[s]" with "Crimp[s]," and a "Wire Rope Cable" extending between the two mount bars. *Id.* at 7.

2. Claim 2

Claim 2 recites: "The hydraulic fracturing system of claim 1, further comprising at least one helical coil supporting discharge branches of piping at a strategically located position." Ex. 1001, 9:31–33.

Petitioner relies on the combination of Garner and Sanborn as set forth in Ground 1 above to address the subject matter of claim 1, and Patent Owner likewise incorporates its Ground 1 opposition arguments. *See* Pet. 33; PO Resp. 27. For reasons provided above in Section III.H.3, we

conclude Petitioner's contentions in these regards are supported by a preponderance of the evidence.

Petitioner then argues "Enidine teaches wire rope isolators for reducing 'harmful effects of shock and vibration,'" and asserts an Enidine wire rope isolator corresponds to the "helical coil" of claim 2. Pet. 37 & n.1 (citing Ex. 1011, 3, 6; Ex. 1001, 7:17–24); Ex. 1002 ¶¶ 161, 166. Patent Owner does not oppose these contentions, and we find they are supported by a preponderance of the evidence. *See* Ex. 1011, 6 (photographs of Enidine's wire rope isolators, reproduced above); Ex. 1001, Fig. 4, 7:14–26 (illustrating and describing exemplary helical cable coil assemblies); PO Resp. 27–28 (Patent Owner's arguments opposing Ground 2).

Petitioner next argues a person of ordinary skill in the art "would have been motivated to combine Enidine with the Garner-Sanborn combination, particularly in view of Garner's stated object to isolate its discharge piping from the vibration of its pumping unit." Pet. 37–38 (citing Ex. 1008 ¶ 15); Ex. 1002 ¶¶ 167–169. According to Petitioner, a person of ordinary skill in the art "would have been motivated to add the wire rope isolators of Enidine to the Garner-Sanborn combination *to further reduce and isolate vibration from the pump*, for example, on the discharge branch piping of Garner." Pet. 35 (emphasis added); *id.* at 35–38; Ex. 1002 ¶¶ 160–165. In support, Petitioner contends this "is merely a combination of off-the-shelf piping components (swivel joints like those in Garner and wire rope isolators like those in Enidine) that were well-known in the oil and gas industry long before the '824 Patent" to implement pump vibration isolation. Pet. 34–35 (citing *inter alia* Ex. 1008 ¶¶ 6, 15; Ex. 1011, 2–3, 6–7); Ex. 1002 ¶¶ 88–95, 100–101, 160.

Patent Owner opposes Petitioner's foregoing motivation contentions as too conclusory to satisfy Petitioner's burden to demonstrate obviousness, and as based on impermissible hindsight. *See* PO Resp. 27–28; Ex. 2007 ¶¶ 24, 29–30, 42, 46, 53–54. Patent Owner particularly objects that "Petitioner has not provided rationale for why a helical coil would be selected over other potential vibration isolation equipment" and "provides no rationale for combining different types of vibration reduction equipment other than to 'further address the issue of vibration.'" PO Resp. 27 (quoting Pet. 38); Ex. 2007 ¶¶ 30, 42, 46, 53–54. "By this logic," according to Patent Owner, a person of ordinary skill in the art would have been "motivated to add any and all vibration reduction components, as well as position as many as possible to further address the issue of vibration." PO Resp. 27–28; Ex. 2007 ¶ 46. Patent Owner asserts that, instead, a person of ordinary skill in the art "would only be motivated to install particular equipment suitable for unique scenarios after careful evaluation of the system as a whole," which Petitioner's case for obviousness overlooks. PO Resp. 28; Ex. 2007 ¶¶ 42, 53–54.

Petitioner replies that the Petition provides detailed reasons to combine Enidine with Garner and Sanborn. *See* Pet. Reply 13–14 (citing Pet. 34–35; Ex. 1002 ¶¶ 160–165; Ex. 1011, 2, 77; Ex. 1049, 27:13–21). Petitioner asserts "Garner's swivel joints and Enidine's wire rope isolators are directed to the same problem (i.e., mitigating vibration effects from pumping), and a [person of ordinary skill in the art] would have been motivated to combine the references to better address that problem." *Id.* at 14 (citing Pet. 35; Ex. 1002 ¶ 162). Therefore, Petitioner's view is that "the problem of vibration was known in the art (e.g., in Garner and Enidine),

and Petitioner's 'formulation of the problem was derived directly from the prior art, rather than the challenged claims.'" *Id.* (quoting *Purdue Pharma*, 643 F. App'x at 966). Further according to Petitioner, "Mr. Marscher even agreed during deposition that wire ropes would have been an obvious choice to add to a hydraulic fracturing piping system if the goal was to reduce vibration." *Id.* (citing Ex. 1049, 69:12–70:3).

Patent Owner replies that Mr. Marscher explains "there is no rationale for randomly combining different vibration reducing components in the manner proposed by Petitioner, other than" hindsight. PO Sur-reply 17 (citing Ex. 1049, 121:15–122:22). Patent Owner does not otherwise address Ground 2. *See id.* at 18 ("PO respectfully submits that the dependent claims in each of Grounds 1–7 are patentable[.]").

We conclude Petitioner articulates a sufficient motivation for the proposed use of Enidine's helical coil assemblies in the Garner-Sanborn hydraulic fracturing system. "The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR*, 550 U.S. at 416. For example, "when a patent 'simply arranges old elements with each performing the same function it had been known to perform' and yields no more than one would expect from such an arrangement, the combination is obvious." *Id.* at 416–17 (quoting *Sakraida v. Ag Pro, Inc.*, 425 U.S. 273, 282 (1976)).

This is such a case. Dr. Durham testifies persuasively that Garner provides swivel connections to isolate vibrations generated by Garner's pumps from traveling down Garner's piping array, and Enidine correspondingly discloses helical coil assemblies that perform the same vibration-reduction function. *See* Ex. 1002 ¶¶¶ 90, 95, 160–161 (citing

Ex. 1008 ¶¶ 6, 15–16; Ex. 1011, 2, 3, 5, 8); Ex. 1011, 2 (stating that one "Application[]" for Enidine's wire rope isolators is "Pump, Generator & Compressor Isolation"), 3 (referring to "energy absorption and vibration isolation solutions" including a "Wire Rope Isolator"). We also agree with Dr. Durham's testimony that this commonality would have motivated a person of ordinary skill in the art to use one of Enidine's helical coil assemblies in the discharge branch piping of the Garner-Sanborn system, along with Garner's swivel connections, in order to further reduce and isolate vibrations generated by the pump from traveling down the piping array. *See* Ex. 1002 ¶¶ 162–164, 166–167.

Patent Owner's opposition is not persuasive. In particular, although it is true that Garner already employs swivel connections to provide some amount of vibration reduction, we are persuaded by Dr. Durham's testimony that adding helical coil assemblies will be useful in at least some circumstances to increase the vibration reduction. *See id.* ¶¶ 160–166. Mr. Marscher disagrees, as follows:

> To claim that such a combination of existing components is trivial and obvious neglects the fact that such a combination includes tradeoffs, that would discourage a less bold POSITA/ innovator from pursuing such a combination. For example, the vibration isolation provided by the flexible wire rope components make it more difficult to achieve and maintain alignment between a powerful motor and pump, unless the wire rope components are mounted in a manner to discourage[] this, as accomplished in the ['824] patent.

Ex. 2007 ¶ 42. Mr. Marscher further testifies: "When designing a piping branch, various factors much be considered, such as expected flow rate, pressure, and the different constraints within the systems due to connections to other equipment." *Id.* ¶ 53. Also: "Combining different vibration

reducing components that work in different ways, such as the swivel connections [of Garner] and the wire rope supports [of Enidine], is not a trivial matter and involves detailed analysis." *Id.* Mr. Marscher thus refers to "engineering considerations" such as how "using different types of mounting configurations would add a variety of potential constraints to the piping branch, which could lead to over- or under-constraining the system without careful consideration" and "may lead to premature failures." *Id.* ¶ 54. His deposition testimony cited in Patent Owner's Sur-reply is to a similar effect. *See* Ex. 1049, 121:15–123:23.

This testimony from Mr. Marscher is too conclusory and lacking in supporting evidence to persuade us that Dr. Durham's motivation testimony is deficient. Mr. Marscher overlooks that a person of ordinary skill in the art is a person of ordinary creativity, not an automaton, and that engineers routinely make tradeoffs between expense, complexity, and reliability when considering and making design modifications. *See, e.g.*, *KSR*, 550 U.S. at 418, 421; *Intel Corp. v. PACT XPP Schweiz AG*, 61 F.4th 1373, 1380 (Fed. Cir. 2023) (finding it obvious to substitute one known element for another because the facts "[t]hat Kabemoto and Bauman address the same problem and that Bauman's cache was a known way to address that problem is precisely the reason that there's a motivation to combine under *KSR* and our precedent"); *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) ("[O]bviousness must be determined in light of all the facts, and . . . a given course of action often has simultaneous advantages and disadvantages, and this does not necessarily obviate motivation to combine."); *Winner Int'l Royalty Corp. v. Wang*, 202 F.3d 1340, 1349 n.8 (Fed. Cir. 2000) ("The fact that the motivating benefit comes at the expense

of another benefit, however, should not nullify its use as a basis to modify the disclosure of one reference with the teachings of another. Instead, the benefits, both lost and gained, should be weighed against one another.").

Further, as Petitioner points out (*see* Pet. Reply 14), the problem of vibration was known in the art as established by Garner and Enidine, so Dr. Durham's motivation testimony derives from the prior art and not the '824 patent. Indeed, Mr. Marscher agreed during deposition that wire rope isolators would have been one choice to add to a hydraulic fracturing piping system if the goal was to reduce vibration, even though he himself would not have preferred to use them. *See* Ex. 1049, 69:12–70:3.

Moreover, Petitioner is not required to establish that a person of ordinary skill in the art would have been motivated to employ a helical coil to the exclusion of other such equipment, as Patent Owner would have it. *See Intel Corp. v. Qualcomm Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021) ("[It is] not necessary to show that a combination is 'the *best* option, only that it be a *suitable* option.'").

Thus, we conclude a preponderance of the evidence supports Petitioner's contention that claim 2 is unpatentable as having been obvious over Garner, Sanborn, and Enidine.

3. Claim 3

Claim 3 recites: "The hydraulic fracturing system of claim 1, wherein at least one of the helical coils has an axis that is disposed oblique with an axis of an adjacent amount of piping." Ex. 1001, 9:34–36. Petitioner correctly notes "there is no antecedent basis for the term 'the helical coils' in claim 3 as written," and "[i]t appears that claim 3 should be dependent upon

claim 2" rather than claim 1. Pet. 39 n.2. Patent Owner does not oppose Petitioner's reading of claim 3. *See* PO Resp. 27–28 (Patent Owner's arguments opposing Ground 2). We agree with Petitioner's reading, so we apply it here.

Petitioner then relies on the combination of Garner, Sanborn, and Enidine as set forth above in Section III.I.2 to address the subject matter of claim 2, and Patent Owner does likewise. *See* Pet. 33, 39; PO Resp. 27; PO Sur-reply 18. For reasons provided above in Section III.I.2, we conclude Petitioner's contentions in these regards are supported by a preponderance of the evidence.

Petitioner further argues Enidine "teaches that '[w]ire rope isolators are multi-axis isolators,' and may be mounted at a number of different orientations/angles." Pet. 39 (citing Ex. 1011, 8). Petitioner discusses the '824 patent specification as it relates to the limitation of claim 3. *See id.* at 39–40 (citing Ex. 1001, Figs. 4, 6, and 7, 2:42–44, 8:24–27); Ex. 1002 ¶ 171. Petitioner concludes Enidine discloses at least three wire rope isolators that have an axis disposed oblique with an axis of an adjacent pipe, as recited in claim 3. *See* Pet. 39–41 (citing Ex. 1011, 8 ("COMPRESSION," "45° COMPRESSION/ROLL," and "FIXED SHEAR" illustrations)); Ex. 1002 ¶¶ 170, 172. Petitioner asserts a person of ordinary skill in the art would have understood that "changing the mounting orientation of the wire rope isolators as taught by Enidine would have the effect of changing the stiffness value (e.g., vibration stiffness Kv and shock stiffness Ks) of the wire rope isolators," thus motivating one "to rotate the wire rope isolators at any suitable angle to vary the stiffness behavior . . . of the wire rope isolator,

depending on the needs of a given system." *See* Pet. 41–42 (citing Ex. 1011, 5, 8, 10); Ex. 1002 ¶¶ 102, 173.

Patent Owner does not oppose Petitioner's foregoing contentions as to claim 3, and we conclude they are sufficiently articulated and supported by the evidence cited by Petitioner to establish claim 3 of the '824 patent is unpatentable as having been obvious over Garner, Sanborn, and Enidine.

J. Ground 3 — Obviousness over Garner, Sanborn, and Rashid

In Ground 3, Petitioner argues claim 7 of the '824 patent is unpatentable as having been obvious over Garner, Sanborn, and Rashid. *See* Pet. 13–14, 16–17, 42–46; Ex. 1002 ¶¶ 110–113, 122–123, 175–183. Patent Owner disagrees. *See* PO Resp. 28. We conclude a preponderance of the evidence supports Petitioner's assertions.

Claim 7 recites: "The hydraulic fracturing system of claim 1, further comprising a controller that uses vibration data to monitor and/or adjust control commands of the system." Ex. 1001, 10:1–3.

Petitioner relies on the combination of Garner and Sanborn as set forth in Ground 1 above to address the subject matter of claim 1, and Patent Owner likewise incorporates its Ground 1 opposition arguments. *See* Pet. 42; PO Resp. 28; PO Sur-reply 18. For reasons provided above in Section III.H.3, we conclude Petitioner's contentions in these regards are supported by a preponderance of the evidence.

Patent Owner's only other opposition to Ground 3 is that Rashid does not qualify as prior art to claim 7 of the '824 patent. *See* PO Resp. 28 (Patent Owner's arguments opposing Ground 3). For reasons provided above in Sections III.D and III.F.2, we disagree.

Petitioner argues "Rashid teaches a 'technique for reducing harmonic vibration in a multiplex multi-pump system,'" including "a control unit 110 [that] may store pressure variation or other information indicative of vibration that is particular to the system 100" as monitored by vibration sensor 201 at discharge pipe 230. Pet. 45–46 (citing Ex. 1012, code (57), 1:57–67, 2:29–3:3, 5:4–6, 6:63–7:11, 9:45–47, 10:16–21); Ex. 1002 ¶ 182. Petitioner asserts Rashid's control unit 110 uses this monitored vibration data to minimize vibration by "inducing 'random perturbations' or adjustments to the rpm of one of the pumps 140–149" in a fracturing operation. Pet. 46 (citing Ex. 1012, 4:66–5:19, 6:50–67, 7:5–15, 9:17–21, 10:1–5); Ex. 1002 ¶ 182.

Petitioner next argues a person of ordinary skill in the art would have been motivated to incorporate Rashid's controller 110 and vibration controlling methods with Garner-Sanborn's pumping system because they are all multi-pump systems, and "[l]ike Garner, Rashid seeks to minimize vibration [that arises from] a multi-pump system used in oilfield operations, including hydraulic fracturing." Pet. 42–44 (citing Ex. 1008 ¶¶ 4, 6, 15; Ex. 1012, 1:18–31, 1:57–60, 2:59–3:3, 4:58–62, 4:66–5:13, 5:55–67, 6:25–27, 6:52–55, 6:63–7:11, 9:45–47); Ex. 1002 ¶¶ 176–179. Petitioner and Dr. Durham additionally provide two specific examples of how this might have been done. *See* Pet. 44–45; Ex. 1002 ¶¶ 180–181.

Patent Owner does not oppose Petitioner's foregoing contentions as to claim 7, and we conclude they are sufficiently articulated and supported by the evidence cited by Petitioner to establish claim 7 of the '824 patent is unpatentable as having been obvious over Garner, Sanborn, and Rashid.

K. Ground 4 — Obviousness over Garner, Sanborn, and Piping Handbook

In Ground 4, Petitioner argues claims 8 and 11–14 of the '824 patent are unpatentable as having been obvious over Garner, Sanborn, and Piping Handbook. *See* Pet. 13–15, 18, 46–65; Ex. 1002 ¶¶ 110–117, 184–219. Patent Owner disagrees. *See* PO Resp. 29–31; Ex. 2007 ¶¶ 23–24, 41–42, 46. We conclude a preponderance of the evidence supports Petitioner's assertions as to all challenged claims. We begin our analysis with a brief summary of Piping Handbook, then we address the parties' contentions as to obviousness.

1. Piping Handbook

Piping Handbook is a reference handbook concerning the field of piping. *See* Ex. 1010,[9] 1–3, 19. Petitioner relies on various disclosures relating to grooved mechanical pipe joints. Thus: "The grooved piping method for mechanically joining pipe is recognized as the fast, easy, economical, and reliable method of joining pipe for many services." *Id.* at A.426. "With over 70 years of service experience, the grooved piping method is now accepted along with the pipe joining methods, such as welding, flanging, and threading." *Id.*

These grooved pipe joints may be flexible, so each manufacturer publishes the "[l]inear and angular movement available" from the manufacturer's products. *Id.* at A.435; *see also id.* ("Flexible grooved-type couplings allow angular flexibility and rotational movement to take place at

[9] Here, we refer to the page numbering added by Petitioner in the bottom right corner of each page. In subsequent citations, we refer to the native page numbering of the document.

joints."). Figure A9.15 illustrates angular movement provided by a flexible grooved pipe joint. *See id.* at A.435–A.437.

2. Claim 8

Claim 8 is independent, and recites a hydraulic fracturing system comprising the same components as claim 1, adding "a tubular suction lead" for the pump which is coupled to "a suction branch of piping" "by a grooved connection" so that the suction lead and the suction branch are "pivotal with respect to" each other. Ex. 1001, 10:4–23.

Petitioner relies on the combination of Garner and Sanborn as set forth in Ground 1 and claim 1 above to address the common subject matter in claim 8, and Patent Owner likewise incorporates its Ground 1 opposition arguments. *See* Pet. 46–48, 50, 55–58, 61; PO Resp. 29. For reasons provided above in Section III.H.3, we conclude Petitioner's contentions in these regards are supported by a preponderance of the evidence.

To address the additional suction-side limitations of claim 8, Petitioner argues Garner and Sanborn both have piping to convey fracturing fluid to their respective pumps. *See* Pet. 49–51, 56–58; Ex. 1002 ¶¶ 187–188, 197–198, 201–204. Petitioner particularly points to Garner's Figure 1 as illustrating but not labeling a suction pipe leading into pumping unit 14, and Sanborn's Figure 2 as illustrating suction piping array 20 leading into pumpers 22. *See* Pet. 49–51 (annotating the figures to identify the "suction" piping or branches depicted therein); Ex. 1002 ¶¶ 187–188, 198, 201 (the same). Petitioner then asserts: "Neither Garner nor Sanborn disclose the specific connectors that would be used in the suction branches

connecting the pumps to the piping/manifold conveying fracturing fluid from the blenders to the pumps." Pet. 51; Ex. 1002 ¶ 189.

Petitioner nonetheless contends a person of ordinary skill in the art would have appreciated that Garner's stated concern with isolating pump-generated vibrations from propagating down the pump's *discharge* piping also applies to the pump's *suction* piping. *See* Pet. 47–48, 51, 52–54 (citing Ex. 1008, Fig. 1, ¶¶ 4, 6, 16); Ex. 1002 ¶¶ 185–186, 189, 191–193. Petitioner asserts this knowledge would have motivated the person to look to Piping Handbook "to identify connectors for the suction side of the pumps to further reduce the effects from vibration in [the Garner-Sanborn] pumping system," because Piping Handbook "teaches piping fundamentals, including basic piping components . . . including oil and gas systems." Pet. 51 (citing Ex. 1010, v, xvii–xviii); Ex. 1002 ¶¶ 189–190. According to Petitioner, Piping Handbook correspondingly describes how "'decoupling' the vibrating piping system from the source of excitation" can be accomplished by "breaking the system into smaller segments by introducing flexible elements" such as a flexible grooved joint. Pet. 51–52, 59–61 (quoting Ex. 1010, B.50, and citing Ex. 1010, A.429, A.454–A.456, B.49–B.51, B.232, C.94, C.316–C.317, C.365, C.386, C.609); Ex. 1002 ¶¶ 190, 206–207.

Petitioner further asserts a person of ordinary skill in the art would have been particularly drawn to Piping Handbook's flexible grooved joints to reduce vibrations in the suction-side piping of the Garner-Sanborn system, because they are "used to 'minimize[] noise and vibration transmission to the piping system generated by pumps or other equipment,'" "while maintaining a positive seal and a self-restrained joint." Pet. 51–52 (quoting

Ex. 1010, A.429, A.428); Ex. 1002 ¶ 190. Petitioner argues flexible grooved joints further advantageously "allow for both 'angular flexibility and rotational movement to take place at the joints'" and thereby permit "easy assembly, system access, and installation in confined spaces." Pet. 52–53, 59–61 (quoting Ex. 1010, A.435, A.426, and citing Ex. 1010, A.428, A.429, A.437 (Fig. A9.15)); Ex. 1002 ¶¶ 190–193, 206–207. Petitioner moreover asserts a person of ordinary skill in the art "would have understood that grooved connection joints are preferable to swivel joints on the suction side of the pump" because grooved connection joints are less expensive than swivel joints, and the higher pressure capabilities provided by swivel joints are not needed on the suction side of the pump. Pet. 54, 55; Ex. 1002 ¶¶ 193, 195.

Patent Owner argues "Petitioner improperly equates discharge piping with suction piping." PO Resp. 29 (section heading modified). Patent Owner asserts Petitioner's "addition of Piping Handbook is based on [a] conclusory rationale regarding suction and discharge piping configurations and is contrary to how the [person of ordinary skill in the art] would interpret the cited references." *Id.* at 30 (citing Pet. 51–55); Ex. 2007 ¶ 41. For example, according to Patent Owner, "the suction nipple shown in FIG. 1 of Garner is insufficient to teach the [person of ordinary skill in the art] how to configure a suction branch in view of Piping Handbook." PO Resp. 30; Ex. 2007 ¶ 41.

Patent Owner contends "there are drastically different considerations for suction piping than for discharge piping, such as different pressure and vibration considerations" and, for example, "suction piping is often flexible tubing and not rigid pipe at all, which may reduce costs and provide natural

vibration reduction features." PO Resp. 30; Ex. 2007 ¶ 23. According to Patent Owner, Petitioner improperly "does not consider this possibility, or the desirability of this type of configuration, when advancing its grounds." PO Resp. 30. Patent Owner also asserts Piping Handbook "do[es] not indicate that flexible joints would be desirable for use on the suction side of the pipe," and Petitioner attempts to cure this deficiency by "rel[ying] on conclusory statements regarding the 'ease of installation' without considering whether this configuration would be desirable at all," thereby demonstrating hindsight bias. *Id.* (quoting Pet. 59); Ex. 2007 ¶¶ 23, 41, 46.

Petitioner replies that "Petitioner does not rely on Garner alone as teaching the suction-side features of claim 8, and instead relies on the combination of Garner, Sanborn, and Piping Handbook." Pet. Reply 11 (citing Pet. 56–61). Petitioner maintains Garner's Figure 1 shows pumping unit 14 has a suction branch of piping, as would have been understood by a person of ordinary skill in the art. *See id.* (citing Pet. 57–58; Ex. 2007 ¶ 41; Ex. 1049, 98:19–99:19).

Concerning motivation to combine, Petitioner argues Patent Owner's position is "unclear" and "vague[]," and the Petition provides detailed reasons to combine Piping Handbook with Garner and Sanborn. Pet. Reply 11, 15 (citing PO Resp. 29–30). Petitioner emphasizes Dr. Durham's testimony of the motivation "to use the grooved connection joints [of Piping Handbook] on the suction side because . . . grooved joints are better-suited for the lower pressures on the suction side." *Id.* at 15 (citing Pet. 54; Ex. 1002 ¶¶ 192–193). Petitioner further asserts Patent Owner "improperly attacks the references individually in arguing that 'the cited portions of Piping Handbook do not indicate that flexible joints would be desirable for

use on the suction side of the pipe'" because obviousness is premised on the combination of Garner, Sanborn, and Piping Handbook. *Id.* at 15–16 (quoting PO Resp. 30; citing Ex. 1002 ¶¶ 189–193).

Patent Owner replies that its argument does not attack the references individually, but instead "point[s] out that the combination of references has failed to teach each element of the claims." PO Sur-reply 13. Patent Owner also maintains that Petitioner's combination of Garner, Sanborn, and Piping Handbook is based on improper hindsight and conclusory statements. *See id.* at 16–17.

We conclude Petitioner articulates a sufficient motivation for the proposed use of Piping Handbook's grooved connection in the suction-side piping of the Garner-Sanborn hydraulic fracturing pump. As noted above, the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results, and when a patent simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious. *See KSR*, 550 U.S. at 416–17.

This is such a case. Dr. Durham testifies that a person of ordinary skill in the art would have appreciated that the suction-side piping of Garner's Sanborn's high pressure pumps would be subject to the same undesirable pump-generated vibrations as the discharge-side piping. *See* Ex. 1002 ¶¶ 185–186 (citing Ex. 1008 ¶¶ 6, 15–16). We agree, because this is readily apparent from Garner's Figure 1 (showing but not labeling suction inlet piping in the upper-right corner leading into pumping unit 14), and Sanborn's Figure 2 (showing piping array 20 leading to pumpers 22).

Indeed, Mr. Marscher does not materially dispute this fact. *See, e.g.*, Ex. 2007 ¶¶ 23–24, 41–42, 46.

Dr. Durham then testifies persuasively that a person of ordinary skill in the art would have been motivated to use Piping Handbook's grooved connection within the suction-side piping of the Sanborn-Garner system, in order to isolate the suction-side piping from vibrations produced by the high pressure pump. *See* Ex. 1002 ¶ 85 (citing Ex. 1010, A.429); *id.* ¶¶ 185, 189–192 (citing Ex. 1008 ¶¶ 6, 15–16; Ex. 1010, A.426, A.428, A.429, A.435, A.437, B.50). This testimony is supported by the cited disclosures of Garner and of Piping Handbook. The pertinent disclosures of Garner are discussed above in Section III.H.3(a). Piping Handbook discloses that pivotal grooved connections were one type of known flexible joint that helps to reduce pump-generated vibrations in piping. *See* Ex. 1010, A.428–A.429, A.435–A.437, B.50.

In response, Mr. Marscher testifies that Garner's or Sanborn's suction-side piping could be flexible conduit, or could include flexible connections such as Victaulic couplings or swivels, which would not require vibration damping. *See* Ex. 2007 ¶¶ 23, 41. This speculation is not supported by citation to evidence in the record or persuasive explanation, so it is not persuasive.

Moreover, Petitioner is not required to establish that a person of ordinary skill in the art would have been motivated to employ a grooved connection to the exclusion of other such equipment, as Patent Owner would have it. *See Intel*, 21 F.4th at 800 ("[It is] not necessary to show that a combination is 'the *best* option, only that it be a *suitable* option.'").

Similarly, obviousness does not require that the cited prior art itself provide a teaching, motivation, or suggestion for combination. *See, e.g., KSR*, 550 U.S. at 419 ("The obviousness analysis cannot be confined by . . . overemphasis on the importance of published articles and the explicit content of issued patents."); *Otsuka Pharm. Co. v. Sandoz, Inc.*, 678 F.3d 1280, 1292 (Fed. Cir. 2012) ("In keeping with the flexible nature of the obviousness inquiry, the reason or motivation for modifying . . . may come from any number of sources and need not necessarily be explicit in the prior art."). Thus, it is not fatal to Petitioner's case for obviousness that none of Garner, Sanborn, and Piping Handbook expressly suggests the desirability of vibration reduction in suction-side piping. As discussed above, the combination of their disclosures would have motivated a person of ordinary skill in the art to reach this result without the use of hindsight.

Finally, for the reasons provided in Section III.H.3(c), Patent Owner has not established a nexus between its proffered objective indicia evidence and the invention of claim 1 (and by extension claim 8), so it does not weigh in favor of nonobviousness in this case.

Thus, we conclude a preponderance of the evidence supports Petitioner's contention that claim 8 is unpatentable as having been obvious over Garner, Sanborn, and Piping Handbook.

3. Claims 11–14

Petitioner provides arguments and evidence in support of contending claims 11–14 are unpatentable as having been obvious over Garner, Sanborn, and Piping Handbook. *See* Pet. 61–65; Ex. 1002 ¶¶ 211–219. In defense of these claims, Patent Owner relies solely on arguments considered

above in relation to their common parent claim 8. *See* PO Resp. 31; PO Sur-reply 18. For the reasons provided above in Section III.K.2 in the context of claim 8, we conclude Patent Owner's arguments are unavailing. We additionally adopt Petitioner's case for obviousness of claims 11–14 as our own in this Decision, and we accordingly conclude Petitioner has demonstrated by a preponderance of the evidence that claims 11–14 are unpatentable as having been obvious over Garner, Sanborn, and Piping Handbook.

L. Ground 5 — Obviousness over Garner, Sanborn, Piping Handbook, and Enidine

In Ground 5, Petitioner argues claims 9 and 10 of the '824 patent are unpatentable as having been obvious over Garner, Sanborn, Piping Handbook, and Enidine. *See* Pet. 18, 65–67; Ex. 1002 ¶¶ 220–224. Patent Owner disagrees. *See* PO Resp. 31.

Claim 9 recites: "The hydraulic fracturing system of claim 8, further comprising helical coils supporting suction branches of piping at strategically located positions." Ex. 1001, 10:24–26.

Claim 10 recites: "The hydraulic fracturing system of claim 8, wherein at least one of the helical coils has an axis that is disposed oblique with an axis of an adjacent amount of piping." *Id.* at 10:27–29.

Petitioner relies on the combination of Garner, Sanborn, and Piping Handbook as set forth in Ground 4 above to address the subject matter of claim 8. *See* Pet. 65. Petitioner then relies on Enidine essentially as in Ground 2 against claims 2 and 3 for the "helical coils" required by claims 9 and 10, with additional analysis to address the fact that claim 9 (at least)

requires the helical coils to support a suction branch of piping. *See* Pet. 65–67; Ex. 1002 ¶¶ 220–224.

In opposition, Patent Owner relies solely on arguments considered above in relation to claim 8. *See* PO Resp. 31; PO Sur-reply 18. For the reasons provided above in Section III.K.2 in the context of claim 8, we conclude Patent Owner's arguments are unavailing.

We adopt Petitioner's case for obviousness of claims 9 and 10 as our own in this Decision, and we accordingly conclude Petitioner has demonstrated by a preponderance of the evidence that claims 9 and 10 are unpatentable as having been obvious over Garner, Sanborn, Piping Handbook, and Enidine.

M. Ground 6 — Obviousness over Garner, Sanborn, Piping Handbook, and Rashid

In Ground 6, Petitioner argues claim 15 of the '824 patent is unpatentable as having been obvious over Garner, Sanborn, Piping Handbook, and Rashid. *See* Pet. 18, 67–68; Ex. 1002 ¶¶ 225–227. Patent Owner disagrees. *See* PO Resp. 31–32.

Claim 15 recites: "The hydraulic fracturing system of claim 8, further comprising a controller that uses vibration data to monitor and/or adjust control commands of the system." Ex. 1001, 10:46–48.

Petitioner relies on the combination of Garner, Sanborn, and Piping Handbook as set forth in Ground 4 above to address the subject matter of claim 8. *See* Pet. 67. Petitioner then relies on Rashid as in Ground 3 against claim 7 for the "controller" required by claim 15. *See id.* at 67–68; Ex. 1002 ¶¶ 225–227.

In opposition, Patent Owner relies solely on arguments considered above in relation to claims 7 and 8. *See* PO Resp. 31–32; PO Sur-reply 18. For the reasons provided above in Section III.J in the context of claim 7, and in Section III.K.2 in the context of claim 8, we conclude Patent Owner's arguments are unavailing.

We adopt Petitioner's case for obviousness of claim 15 as our own in this Decision, and we accordingly conclude Petitioner has demonstrated by a preponderance of the evidence that claim 15 is unpatentable as having been obvious over Garner, Sanborn, Piping Handbook, and Rashid.

N. Ground 7 — Obviousness over Garner, Sanborn, Piping Handbook, and Burns

In Ground 7, Petitioner argues claim 11 of the '824 patent is unpatentable as having been obvious over Garner, Sanborn, Piping Handbook, and Burns. *See* Pet. 18, 68–72; Ex. 1002 ¶¶ 228–236. Patent Owner disagrees, relying solely on arguments considered above in relation to the parent claim 8. *See* PO Resp. 32. Having already found claim 11 to be unpatentable above in Section III.K based on Ground 4, we need not and we do not reach Ground 7.

IV. PATENT OWNER'S MOTION TO AMEND THE '824 PATENT

The Motion to Amend proposes, "in the event the Board finds [claims 1–15 of the '824 patent] unpatentable," to add substitute claims 16–30 to the '824 patent. Mot. 1, 2, App. A. Having determined above that Petitioner has shown each of the original claims 1–15 is unpatentable, we now consider the contingent Motion to Amend.

A. The Proposed Substitute Claims

Patent Owner proposes to amend the '824 patent by adding new claims 16–30, as respective substitutes for original claims 1–15. *See* Mot. 2, App. A.

Claim 16 (proposed as a substitute for original claim 1) is reproduced below. Underlined language reflects subject matter added to original claim 1, and double-bracketed language reflects subject matter omitted from original claim 1:

> 16. A hydraulic fracturing system for fracturing a subterranean formation comprising:
>
> an electrically powered fracturing pump having a discharge side;
>
> a discharge branch of piping having therein pressurized fracturing fluid supplied from the fracturing pump; [[and]]
>
> swivel connections strategically located in the discharge branch of piping, so that when pressurized fracturing fluid flows through the discharge branch of piping, a section of the discharge branch of piping is axially rotatable with an adjacent section of the discharge branch of piping; and
>
> at least one helical coil supporting the discharge branch of piping, the at least one helical coil comprising:
>
> an upper plate;
>
> a lower plate; and
>
> a mounting arrangement coupled to the upper plate, the mounting arrangement surrounding at least a portion of the discharge branch and separating the portion of the discharge branch from the upper plate.

Mot. App. A (pgs. 5–6). Figure 4 of the '824 patent illustrates two exemplary embodiments of the structures added by proposed substitute claim 16 to original claim 1. The first embodiment is cable coil

assembly 104, including helical coil 106 disposed between upper plate 114 and lower plate 112, and a mounting arrangement (i.e., U-bolt 116 and grommet 118) coupled to upper plate 114 and surrounding branch 74 of piping. *See* Ex. 1001, Fig. 4, 7:14–32. The second embodiment is alternate cable coil assembly 104A, including a helical coil disposed between upper plate 114A and a lower plate, and a mounting arrangement (i.e., yoke 120) coupled to upper plate 114A and surrounding branch 78 of piping. *See id.* at Fig. 4, 7:32–37.

Claim 23 (proposed as a substitute for original claim 8) is reproduced below. Underlined language reflects subject matter added to original claim 8, and double-bracketed language reflects subject matter omitted from original claim 8:

> 23. A hydraulic fracturing system for fracturing a subterranean formation comprising:
>
> an electrically powered fracturing pump having a suction side;
>
> a suction branch of piping having fracturing fluid therein; [[and]]
>
> a tubular suction lead having an end mounted to the suction side and an opposite end coupled to an end of the suction branch by a grooved connection, and which is pivotal with respect to the suction branch; [[and]]
>
> a discharge branch of piping having therein the pressurized fracturing fluid supplied from the fracturing pump; [[and]]
>
> swivel connections strategically located in the discharge branch of piping, so that when the pressurized fracturing fluid flows through the discharge branch of piping, a section of the discharge branch of piping is axially rotatable with an adjacent section of the discharge branch of piping;

a first helical coil supporting the discharge branch of piping, the first helical coil comprising:

a first upper plate;

a first lower plate; and

an elastomer yoke coupled to the first upper plate and encircling at least a portion of the discharge branch; and

a second helical coil supporting the suction branch of piping, the second helical coil comprising:

a second upper plate;

a second lower plate; and

a grommet coupled to the second upper plate and encircling at least a portion of the suction branch;

wherein a first orientation of the first helical coil is different from and perpendicular to a second orientation of the second helical coil.

Mot. App. A (pgs. 7–9).

B. Threshold Criteria of 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121

"Before considering the patentability of any substitute claims . . . the Board first must determine whether the motion to amend meets the statutory and regulatory requirements set forth in [35 U.S.C.] § 316(d) and 37 C.F.R. § 42.121." *Lectrosonics*, Paper 15 at 4 (precedential).

"[T]he patent owner must satisfy the Board that the statutory criteria in [35 U.S.C.] § 316(d)(3) are met and that any reasonable procedural obligations imposed by the Director are satisfied." *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1305–06 (Fed. Cir. 2017) (lead plurality opinion by J. O'Malley); *see also id.* at 1341 ("There is no disagreement that the patent

owner bears a burden of production in accordance [with] 35 U.S.C. § 316(d).") (majority opinion by J. Reyna).

We accordingly address these threshold criteria here.

1. Must Propose a Reasonable Number of Substitute Claims

A motion to amend must propose a reasonable number of substitute claims. *See* 35 U.S.C. § 316(d)(1)(B); 37 C.F.R. § 42.121(a)(3). "The presumption is that only one substitute claim would be needed to replace each challenged claim." 37 C.F.R. § 42.121(a)(3); *Lectrosonics*, Paper 15 at 4. Here, the Motion to Amend is entitled to that presumption, because it proposes fifteen substitute claims to replace the fifteen original claims of the '824 patent. *See* Mot. 2–3, App. A. Further, Petitioner does not argue that the Motion to Amend proposes an unreasonable number of substitute claims. *See generally* Mot. Opp. Based on this record, we conclude the Motion to Amend proposes a reasonable number of substitute claims.

2. Must Respond to Ground of Unpatentability

"A motion to amend may be denied where . . . [t]he amendment does not respond to a ground of unpatentability involved in the trial." 37 C.F.R. § 42.121(a)(2)(i). Patent Owner asserts the Motion to Amend responds to a ground of unpatentability presented in the Petition, by "further distinguish[ing] the claims from the art of record." Mot. 3–4. Petitioner does not oppose this aspect of the Motion to Amend. *See generally* Mot. Opp. Based on this record, we conclude the Motion to Amend responds to a ground of unpatentability involved in the trial, for the reasons provided in the Motion to Amend.

3. Must Not Enlarge Scope of Claims

A motion to amend "may not enlarge the scope of the claims of the patent." 35 U.S.C. § 316(d)(3); *see* 37 C.F.R. § 42.121(a)(2)(ii). Patent Owner asserts the Motion to Amend does not enlarge the scope of the '824 patent's original claims. *See* Mot. 4. Petitioner does not oppose this aspect of the Motion to Amend. *See generally* Mot. Opp. Based on this record, we conclude the Motion to Amend does not enlarge the scope of the '824 patent's original claims, for the reasons provided in the Motion to Amend.

4. Must Not Introduce New Matter

A motion to amend "may not . . . introduce new matter." 35 U.S.C. § 316(d)(3); *see* 37 C.F.R. § 42.121(a)(2)(ii). Further: "A motion to amend claims must . . . set forth . . . [t]he support in the original disclosure of the patent for each claim that is added or amended." 37 C.F.R. § 42.121(b)(1); *see* PTAB Consolidated Trial Practice Guide (Nov. 2019),[10] 69, 71. The test for new matter is whether an application's disclosure "reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter." *Ariad*, 598 F.3d at 1351; *see also Senju Pharm. Co. v. Apotex Inc.*, 746 F.3d 1344, 1352 (Fed. Cir. 2014) (citing *Ariad* as providing the test for determining new matter under 35 U.S.C. § 132(a)). We perform "an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art" to determine whether it

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

demonstrates possession of the claimed subject matter. *Ariad*, 598 F.3d at 1351.

Patent Owner asserts proposed substitute claims 16–30 have written description support in the application that issued as the '824 patent — that is, the '756 Application. *See* Mot. 5–11; *supra* Section II.C (identifying the '756 Application). Patent Owner cites various disclosures of the '756 Application that Patent Owner contends support these claims. *See* Mot. 5–11. The '756 Application is in the record as Exhibit 2002 (the prosecution history of the '824 patent), at pgs. 2908–30 and 2940–48.

We first address whether the '756 Application provides written description support for proposed substitute claims 16–22, then we turn to proposed substitute claims 23–30.

a) Whether the '756 Application Provides Written Description Support for Proposed Substitute Claims 16–22

Petitioner does not oppose Patent Owner's argument that the '756 Application provides written description support for proposed substitute independent claim 16, and its dependent claims 17–22. *See generally* Mot. Opp.; Mot. Sur-reply 1–7 (arguing the '756 Application does not provide written description support for proposed substitute claim 23, but not addressing proposed substitute claim 16). We conclude proposed substitute claims 16–22 do not add new matter to the '756 Application, for the reasons provided in the Motion to Amend.[11]

[11] This includes the Motion's reliance on paragraph 28 of the '756 Application as supporting claim 22, which recites "a controller that uses vibration data to monitor and/or adjust control commands of the

b) Whether the '756 Application Provides Written Description Support for Proposed Substitute Claims 23–30

Petitioner did not, in its initial Opposition to the Motion to Amend, oppose Patent Owner's argument that the '756 Application provides written description support for proposed substitute independent claim 23, and its dependent claims 24–30. *See generally* Mot. Opp.

Nonetheless, in the Preliminary Guidance, we preliminarily concluded that the '756 Application does not provide written description support for proposed substitute claim 23. *See* Prelim. Guid. 6–8. Petitioner's Sur-reply agrees with that preliminary conclusion. *See* Mot. Sur-reply 1–7. For the following reasons, we now conclude again that the '756 Application does not provide written description support for the limitation of claim 23 reciting "wherein a first orientation of the first helical coil is different from and perpendicular to a second orientation of the second helical coil." Mot. App. A (pg. 9).

For support, Patent Owner cites the '756 Application at its Abstract, paragraphs 5, 6, 24, and 27, and Figures 2, 4, 6 and 7. *See* Mot. 9; Mot. Reply 1–8. Patent Owner recognizes that the claim term "perpendicular" does not appear in the '756 Application, but asserts "[i]t is not necessary that the exact terms of a claim be used *in haec verba* [in these words] in the specification" to demonstrate possession. Mot. Reply 2 (quoting *Nalpropion Pharms., Inc. v. Actavis Labs. FL, Inc.*, 934 F.3d 1344, 1350 (Fed. Cir.

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system." *See* Mot. 7–8. That paragraph contains disclosures that are not found in the '306 Provisional, discussed above in Section III.F.2. *See* Ex. 2002, 2924–26 (¶ 28).

2019); citing *Blue Calypso, LLC v. Groupon, Inc.*, 815 F.3d 1331, 1347 (Fed. Cir. 2016)).

Patent Owner then argues the '756 Application "uses words that express the concept of various orientations of helical coils positioned in a system," such as a helical coil "hav[ing] an axis that is disposed oblique with an axis of an adjacent amount of piping" — that is, "a slanting direction or position." *Id.* at 2–3 (quoting Ex. 2002, 2912 (¶ 5)). Patent Owner accordingly annotates Figure 2 of the '756 Application to identify one cable coil assembly 104 shown therein, which Patent Owner asserts is one example of an "oblique orientation" such that the assembly "is positioned at an angle with respect to different sections of the suction branch and discharge branch of piping, elements 74 and 78, respectively" and with respect to other cable coil assemblies 104. *Id.* at 3 (citing Ex. 2002, 2941 (Fig. 2)). Patent Owner also relies on the '756 Application's alleged disclosure that "changing the orientations of the axes of the helical coils can have various effects, and the orientation chosen will be for a particular design goal for the system." *Id.* at 3–4 (citing Ex. 2002, 2924 (¶ 27); Ex. 2007 ¶ 29; Ex. 1049, 29:20–30:22). Patent Owner concludes the '756 Application reflects that a person of ordinary skill in the art "may choose to orient the helical coils parallel to each other, perpendicular to each other, or at any other angle to accomplish the specific vibration-reduction goal of the system." *Id.* at 4–5 (citing Ex. 2002, 2012–13 (¶ 5), 2924 (¶ 27)).

Patent Owner further annotates Figures 4 and 6 of the '756 Application, in support of arguing they demonstrate possession of proposed substitute claim 23. *See id.* at 5–8. Patent Owner's annotations to Figure 4 are reproduced below.

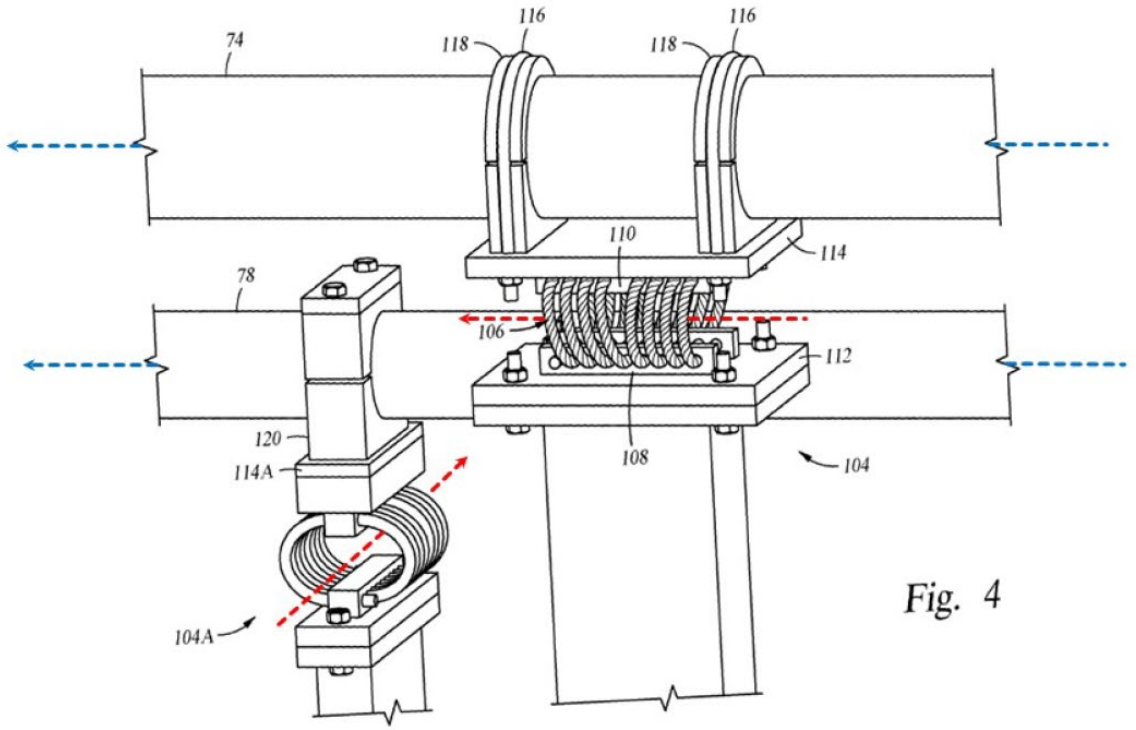


Fig. 4

'756 Application, Figure 4 (Annotated by Patent Owner, Mot. Reply 6).

Figure 4 of the '756 Application is a side perspective view of exemplary cable coil assembly 104 supporting suction branch 74 of piping, and alternate cable coil assembly 104A supporting discharge branch 78 of piping. *See* Ex. 2002, 2915 (¶ 12), 2922 (¶ 24), 2943 (Fig. 4). Patent Owner asserts Figure 4 illustrates branches 74 and 78 are "aligned parallel" to each other (as shown by the blue dashed arrows added by Patent Owner). Mot. Sur-reply 5–6. Patent Owner also asserts that the axis of cable coil assembly 104 (shown by a red dashed arrow added by Patent Owner) is "aligned parallel to the axis of the suction branch 74," and the axis of alternate cable coil assembly 104A (shown by another red dashed arrow added by Patent Owner) is "aligned perpendicular to the axis of the discharge branch 78." *Id.* Therefore, Patent Owner concludes, the respective axes of the cable coil assemblies are perpendicular to each other, as recited in proposed substitute claim 23. *Id.* at 6.

Patent Owner provides a similar analysis of three cable coil assemblies illustrated in Figure 6, another side perspective view of suction and discharge piping having vibration reducing equipment. *See id.* at 7 (citing Ex. 2002, 2945 (Fig. 6)).

Petitioner replies that Patent Owner "fails to identify any 'equivalent language'" in the written specification of the '756 Application to two helical coils having "perpendicular" orientations as recited in proposed substitute claim 23. Mot. Sur-reply 2. Petitioner characterizes Patent Owner's position as "there is support for *any* specifically claimed orientation" in the '756 Application, which Petitioner attacks on the basis that even an assumed disclosure of "a broad *range* of orientations for helical coils" would not demonstrate possession of "the specifically claimed *perpendicular* orientation." *Id.* at 2–3. Petitioner adds that a description that merely renders a claimed invention obvious does not demonstrate possession of the invention. *Id.* at 3 (citing *Idenix Pharms. LLC v. Gilead Scis. Inc.*, 941 F.3d 1149, 1165 (Fed. Cir. 2019)). Petitioner also reads various '756 Application disclosures cited by Patent Owner as pertaining to "helical coils that are oriented at angles with respect to the *piping*, and not to other helical coils." *Id.* at 3–4 (citing Ex. 2002, 2912 (¶ 5), 2924 (¶ 27); Ex. 2007 ¶ 29; Ex. 1049, 29:20–30:22).

Petitioner further argues that Figures 4 and 6 of the '756 Application do not provide written description support for proposed substitute claim 23. *See id.* at 4–7. Petitioner asserts Patent Owner's argument in this regard "is based on two faulty assumptions: (1) that the suction piping and discharge piping are parallel to one another; and (2) that the helical coils are mounted perpendicular to the piping." *Id.* at 4–5. According to Petitioner, Patent

Owner "provides no evidence to support that the suction piping and discharge piping are parallel to one another" in Figures 4 and 6, "and drawing lines through the piping does not make them so," especially because the '756 Application "expressly states that Figures 4 and 6 are 'side ***perspective*** view[s].'" *Id.* at 5 (quoting Ex. 2002, 2915 (¶¶ 12, 14) (emphasis added by Petitioner)). Petitioner asserts: "[P]atent drawings do not define the precise proportions of elements depicted and may not be relied on to show particular sizes if the specification is completely silent on the issue." *Id.* at 5–6 (quoting *Source Vagabond Sys. Ltd. v. Hydrapak, Inc.*, 753 F.3d 1291, 1300 (Fed. Cir. 2014)). Petitioner additionally contends that the '756 Application's description of helical coils being *oblique* to their associated piping sections contradicts Patent Owner's assertion that Figures 4 and 6 illustrate helical coils being *perpendicular* to their associated piping sections, because "oblique means ***not*** perpendicular (or parallel)." *Id.* at 6 (citing Ex. 2002, 2012 (¶ 5), 2943 (Fig. 4), 2945 (Fig. 6); Ex. 1049, 119:9–120:1, 188:2–19).

Patent Owner replies that "Petitioner cites to case law with respect to proportions and size" in patent drawings, but this "is irrelevant to" Patent Owner's reliance on the '756 Application figures as showing "orientation." Tr. 32:2–8.

We conclude proposed substitute claim 23 adds new matter to the '756 Application, in reciting "wherein a first orientation of the first helical coil is different from and perpendicular to a second orientation of the second helical coil." Mot. App. A (pg. 9). When combined with the claim's definition of the "first" and "second" helical coils, this limitation requires a

discharge branch helical coil and a *suction branch helical coil* having *perpendicular orientations*.

None of the '756 Application's written disclosures cited by Patent Owner demonstrate possession of that subject matter, regardless of how open the '756 Application might be to various orientations of its helical assemblies. *See* Ex. 2002, 2912–13 (¶ 5), 2913–14 (¶ 6), 2922 (¶ 24), 2924 (¶ 27), 2930 (Abstract). The most pertinent disclosures here are that "[a]t least one of the helical coils can have an axis that is disposed oblique with an axis of an adjacent amount of piping" (¶ 5); "resting the suction and discharge branches on helical coils" (¶ 6 and Abstract); Figure 4 illustrates cable coil assembly 104 along suction branch 74 and alternate cable coil assembly 104A along discharge branch 78 (¶ 24); and "examples of the cable coil assembly 104 exist[] wherein *an axis of the helix of the coil 106 is oriented at angles that vary from an axis of the associated piping* supported by the cable coil assembly 104" such that "[c]hanging the direction of the axis of the helix of the coil 106 can provide for different frame constant values thereby [a]ffecting continuation of vibration in different manners" (¶ 27 (emphasis added)).

It may very well be that a person of ordinary skill in the art would have understood from these disclosures that one "may choose" to orient a helical coil at "any" angle with respect to its associated pipe, as Patent Owner suggests. Mot. Reply 4. Nonetheless, these disclosures do not demonstrate possession of an invention in which such a choice would involve a *discharge branch helical coil* and a *suction branch helical coil* having *perpendicular orientations*. Demonstration of possession "requires that the written description actually or inherently discloses the claim

element"; obviousness is not sufficient. *PowerOasis*, 522 F.3d at 1306–07 (citation omitted); *Tronzo v. Biomet, Inc.*, 156 F.3d 1154, 1158 (Fed. Cir. 1998).

That leaves the illustrations in Figures 2, 4, 6, and 7 of the '756 Application, as cited by Patent Owner.

Figure 2 (Ex. 2002, 2941) illustrates one helical coil 104 supporting suction branch 74, and five helical coils 104 supporting discharge branch 78. *See id.* at 2922 (¶ 24). However, Figure 2 does not illustrate the suction branch helical coil having an orientation that is *perpendicular to* an orientation of any one of the discharge branch helical coils.

Figure 4 (*id.* at 2943) and Figure 6 (*id.* at 2945) are both "side perspective" views of cable coil assemblies 104 and 104A, and associated suction branch 74 and discharge branch 78. *See id.* at 2922 (¶ 24), 2924 (¶ 26). We agree with Petitioner's position that, due to the perspective nature of the views shown in these Figures, Patent Owner's analysis of what they depict is not supported by the evidence.

For example, suction branch 74 and discharge branch 78 are not necessarily parallel, as Patent Owner would have it. This is a three-dimensional consideration. It may very well be that the respective axes of the two branches 74 and 78 are not perfectly aligned in the direction of fluid flow. They could deviate in a left-right fashion with respect to the direction of fluid flow (roughly, "in" and "out" of the plane of the paper showing Figure 4), or in an up-down fashion with respect to the direction of fluid flow (roughly, "up" and "down" within the plane of the view shown in Figure 4). As discussed above, there is no written description in the

'756 Application to support Patent Owner's contention that branches 74 and 78 are parallel.

Also, as Petitioner points out, "patent drawings do not define the precise proportions of the elements depicted and may not be relied on to show particular sizes if the specification is completely silent on the issue." *Source Vagabond*, 753 F.3d at 1300 (quoting *Hockerson–Halberstadt, Inc. v. Avia Grp. Int'l, Inc.*, 222 F.3d 951, 956 (Fed. Cir. 2000)). We acknowledge Patent Owner's point that the factual issue presented here concerns the relative orientation of structures shown in the '756 Application's drawings, not whether they are numerically to scale. Nonetheless, Patent Owner is relying solely on those drawings to demonstrate possession of the specifically claimed "perpendicular" orientation, which is a similar if not identical factual circumstance as was presented in *Source Vagabond* and related cases.

Moreover, Patent Owner's analysis of Figures 4 and 6 is not supported by testimony from Patent Owner's expert witness Mr. Marscher. *See* Ex. 2007 ¶¶ 22–30 (summarizing Opinions 1–10).

Next, we examine the respective orientations of the suction branch helical coils and the discharge branch helical coils (which is what is claimed), as illustrated in Figures 4 and 6. Similar considerations of the perspective nature of these views as just discussed lead us to find these figures do not necessarily show *perpendicular* orientations.

Figure 7 (Ex. 2002, 2946) also falls short of that claimed subject matter. It shows only one pipe, so it has little to do with a suction branch helical coil having an orientation that is perpendicular to a discharge branch helical coil.

Patent Owner additionally cites photographs in the '306 Provisional that, in Patent Owner's view, demonstrate possession of the subject matter at issue in proposed substitute claim 23. *See* Mot. 9; Mot. Reply 8–9; Tr. 30:20–31:19. However, this is irrelevant to the prohibition against new matter in 35 U.S.C. § 316(d)(3), which turns on whether the claimed subject matter finds support in the application that issued as the challenged patent. Even assuming the '306 Provisional discloses the subject matter now at issue, if that subject matter was not carried forward into the '756 Application, then it would still constitute new matter to the '756 Application in violation of § 316(d)(3).

Moreover, Patent Owner's reliance on the '306 Provisional's photographs is supported only by attorney argument, not by any witness testimony. *See* Mot. 9 (citing Ex. 1007, 4, 13–16, 30); Mot. Reply 8–9 (annotating Ex. 1007, 13); Tr. 30:20–31:19. Patent Owner's attorney argument is not persuasive, for reasons similar to those articulated above in the context of the '756 Application's Figure 4. That is, these photographs provide perspective views of a three-dimensional apparatus, from which one cannot discern whether the helical coils shown therein are oriented perpendicularly to one another. *See, e.g.*, Mot. Sur-reply 5–6.

For the foregoing reasons, we conclude that adding proposed substitute independent claim 23, and proposed substitute claims 24–30 dependent from claim 23, would introduce new matter to the '756 Application that issued as the '824 patent. Accordingly, we deny the Motion to Amend the '824 patent as to these claims.

5. Conclusion Regarding Threshold Criteria

Patent Owner has met its burden to establish that the statutory and regulatory requirements set forth in 35 U.S.C. § 316(d) and 37 C.F.R. § 42.121 have been satisfied as to proposed substitute claims 16–22, but not as to proposed substitute claims 23–30 because claim 23 introduces new matter that is not supported by the '756 Application.

C. Petitioner's Unpatentability Grounds

We now turn to the unpatentability grounds asserted in Petitioner's Opposition to the Motion to Amend. The Opposition relies on the six prior art references cited in the Petition against the original claims of the '824 patent, and adds "Stauff" (Exhibit 1055). *See* Mot. Opp. 1–3. Patent Owner does not oppose Petitioner's contention that Stauff is prior art to the '824 patent. *See, e.g.*, *id.* at 1–2 (asserting Stauff is prior art); Mot. Reply 10–12 (Patent Owner's opposition to Petitioner's obviousness grounds).

Petitioner relies on five grounds of unpatentability to challenge proposed substitute claims 16–30. *See* Mot. Opp. 2–3. They are:

Ground	Claim(s) Challenged	35 U.S.C. §	References
8	16–21	103	Garner, Sanborn, Enidine, Stauff
9	22	103	Garner, Sanborn, Enidine, Stauff, Rashid
10	23–29	103	Garner, Sanborn, Piping Handbook, Enidine, Stauff
11	26	103	Garner, Sanborn, Piping Handbook, Enidine, Stauff, Burns
12	30	103	Garner, Sanborn, Piping Handbook, Enidine, Stauff, Rashid

We discuss each Ground in turn. Patent Owner "does not bear the burden of persuasion to demonstrate the patentability of" proposed substitute

claims 16–30, rather Petitioner bears "the burden of persuasion . . . to show [these claims] are unpatentable by a preponderance of the evidence." *Lectrosonics*, Paper 15 at 3–4.

1. Ground 8 — Obviousness Over Garner, Sanborn, Enidine, and Stauff

In Ground 8, Petitioner argues proposed substitute claims 16–21 are unpatentable as having been obvious over Garner, Sanborn, Enidine, and Stauff. *See* Mot. Opp. 1–16, 20–25; Mot. Sur-reply 7–10; Ex. 1050 ¶¶ 25–50. Patent Owner disagrees. *See* Mot. 12–14, 16–21; Mot. Reply 10–12; Ex. 2007 ¶¶ 29–30, 53–54. We conclude a preponderance of the evidence supports Petitioner's assertions as to all of these claims. We begin our analysis with a brief summary of Stauff, then we address the parties' contentions as to obviousness.

a) Stauff

Stauff is a sell sheet for Stauff Clamps, describing various components having optional dimensional and material characteristics, and associated order codes. *See, e.g.*, Ex. 1055,[12] A26; *see also* Ex. 1051 (printout from www.stauff.com, stating Stauff has "become an internationally leading developer, manufacturer and supplier of pipework equipment and hydraulic components under the brand name STAUFF" including "STAUFF Clamps").

An image of a representative Stauff Clamp is reproduced below.

[12] When citing to Exhibit 1055, we refer to the native page numbering of the reference.



Stauff Clamp and Pipe (Ex. 1055, A93).

This image shows a Stauff Clamp surrounding a pipe. *See id.* at A93 (referring to "Maximum Loads in Pipe Direction F"). The Stauff Clamp is composed of two clamp body halves made of polypropylene, polyamide, thermoplastic elastomer, or aluminum, along with "Cover Plates and Hexagon Head Bolts" to hold the two clamp bodies together around the pipe. *Id.* at A26, A92–A93.

b) Proposed Substitute Claim 16

Petitioner provides arguments and evidence in support of contending proposed substitute claim 16 is unpatentable as having been obvious over Garner, Sanborn, Enidine, and Stauff. *See* Mot. Opp. 1–16, 20–25; Mot. Sur-reply 7–10; Ex. 1050 ¶¶ 25–50. Patent Owner provides arguments and evidence in opposition. *See* Mot. 12–14, 16–21; Mot. Reply 10–12; Ex. 2007 ¶¶ 29–30, 53–54.

First, Petitioner relies on the combination of Garner and Sanborn as set forth in Ground 1 above against original claim 1, to address the subject matter in proposed substitute claim 16 carried forward from the original claim. *See, e.g.*, Mot. Opp. 4 ("All other limitations of Substitute Claim 16

are taught or suggested by Garner, Sanborn, and Enidine; and a POSITA would have been motivated to combine those references to arrive at that subject matter as presented in the Petition for Original Claims 1 and 2."), 5 ("As discussed in Petition Grounds 1 and 2, a POSITA would have been motivated to combine Garner, Sanborn, and Enidine."). Thus, Petitioner repeats arguments discussed above in Section III.H.3(a)(iv) comparing Garner with the "swivel connections" limitation in original claim 1 and proposed substitute claim 16. *See id.* at 10–11 (citing Pet. 20–30), 20–24; Mot. Sur-reply 7–9. Petitioner also repeats arguments discussed above in Section III.H.3(a)–(b) concerning motivation to combine Garner and Sanborn. *See* Mot. Opp. 24–25; Mot. Sur-reply 9–10.

Patent Owner likewise repeats its Ground 1 opposition arguments in support of original claim 1, as supporting patentability of proposed substitute claim 16. *See* Mot. 16–18, 21; Mot. Reply 10–11. For reasons provided above in Section III.H.3(a)–(b), we conclude Petitioner's contentions in these regards are supported by a preponderance of the evidence.

Second, Petitioner relies on Enidine as set forth in Ground 2 above against original claim 2, to address the addition of "at least one helical coil supporting the discharge branch of piping" in proposed substitute claim 16 versus original claim 1. *See, e.g.*, Mot. Opp. 4 ("All other limitations of Substitute Claim 16 are taught or suggested by Garner, Sanborn, and Enidine; and a POSITA would have been motivated to combine those references to arrive at that subject matter as presented in the Petition for Original Claims 1 and 2."), 5 ("As discussed in Petition Grounds 1 and 2, a POSITA would have been motivated to combine Garner, Sanborn, and Enidine."). Thus, Petitioner repeats arguments discussed above in

Section III.I.2 concerning motivation to combine Enidine with Garner and Sanborn. *See id.* at 10–11 (citing Pet. 33–38), 24–25.

Patent Owner likewise repeats its Ground 2 opposition arguments in support of original claim 2, as supporting patentability of proposed substitute claim 16. *See* Mot. 18–21; Mot. Reply 11–12. For reasons provided above in Section III.I.2, we conclude Petitioner's contentions in these regards are supported by a preponderance of the evidence.

Petitioner further contends Enidine discloses the "upper plate" and "lower plate" of proposed substitute claim 16, for mounting Enidine's helical coil to other system components. *See* Mot. Opp. 11–14 (citing Ex. 1011, 3, 54–55; Ex. 1050 ¶¶ 17–24, 44–45; Ex. 1049, 41:8–22). Petitioner's annotation to Enidine's photographs in support of this contention is reproduced below.



Enidine Photographs (Annotated by Petitioner, Mot. Opp. 12).

Here, Petitioner has drawn a red box around one of Enidine's wire rope isolators. We find this photograph shows a wire rope isolator that is combined with an upper plate and a lower plate to be mounted to other

system components. *See id.* at 11–12; Ex. 1050 ¶¶ 42–43. In particular, Enidine's wire rope isolators comprise a helical coil and two mount bars, as shown in diagrams (*see* Ex. 1011, 7), and in other photographs reproduced above outside of Petitioner's red box (*see id.* at 3). *See also id.* at 54–55 (Enidine discussing another product, a "helical wire rope isolator encased in a proprietary elastomeric compound" disposed between two plates illustrated as light blue rectangles in a diagram, in a "Mounting identical to traditional Wire Rope Isolators"). It is clear from this context that Petitioner's red box annotation identifies a wire rope isolator combined with an upper plate and a lower plate.

Patent Owner argues the combination of Garner, Sanborn, and Enidine does not teach the "upper plate" and the "lower plate" of proposed substitute claim 16. *See* Mot. 13–14. However, Patent Owner does not address Petitioner's red box annotation to Enidine's photographs reproduced above as showing an upper plate and a lower plate. *See id.*; Mot. Reply 10–12. We conclude Petitioner's red box annotation identifies a helical coil, an upper plate, and a lower plate, for the reasons provided above.

Third, Petitioner relies on Stauff for the proposed obviousness of mounting Enidine's helical coil, upper plate, and lower plate, to the discharge branch piping of Garner or of Sanborn using the Stauff Clamp, thereby leading to the "mounting arrangement" added by proposed substitute claim 16 versus original claim 1. *See* Mot. Opp. 1, 3, 5–16; Mot. Sur-reply 10; Ex. 1050 ¶¶ 30–38, 47–50. In particular, Petitioner contends "Stauff teaches a well-known block clamp assembly that a [person of ordinary skill in the art] would have reason to use to mount the wire rope isolators of Enidine to the piping [of Garner-Sanborn]." Mot. Opp. 5; Ex. 1050

¶¶ 30–37. In this combination, according to Petitioner, the Stauff Clamp would be attached to the pipe as shown in Stauff (Ex. 1055, A93), to be supported by the top plate of Enidine's helical coil assembly (identified within Petitioner's red box above). *See* Mot. Opp. 5–7, 13–16; Ex. 1050 ¶¶ 30–32, 34–37, 48–49. This would have been done, according to Petitioner, in order to "further address vibration from the pump" of Garner-Sanborn. Mot. Opp. 5–6, 8–9 (citing Ex. 1008 ¶ 14; Ex. 1055, A26–A27); Ex. 1050 ¶¶ 30–32, 34–37.

Patent Owner does not materially dispute Petitioner's foregoing contentions as to why and how the addition of Stauff to Petitioner's previously-articulated combination of Garner, Sanborn, and Enidine, leads to the invention of proposed substitute claim 16. For example, Patent Owner's Motion to Amend was filed prior to Petitioner's initial reliance on Stauff as set forth in the Opposition, so it does not address Stauff. The Motion to Amend argues the combination of Garner and Sanborn does not teach the "at least one helical coil" limitation of proposed substitute claim 16 (*see* Mot. 12–13), but as discussed above Petitioner relies on Enidine as teaching this claim limitation. The Motion to Amend also argues the combination of Garner, Sanborn, and Enidine does not teach the "mounting arrangement" limitation of proposed substitute claim 16 (*see id.* at 13–14), but as discussed above Petitioner relies on Stauff as teaching this claim limitation. Finally, Patent Owner's Reply to Petitioner's Opposition focuses on Garner and Enidine, and does not discuss the addition of Stauff. *See* Mot. Reply 10–12; Tr. 32:9–33:2, 34:7–14, 35:19–36:3.

Finally, as noted by Petitioner, Patent Owner does not rely on objective indicia of nonobviousness to support the patentability of proposed substitute claim 16. *See* Mot. 12–21; Mot. Opp. 20; Mot. Reply 10–12.

Upon our review of the entire record, we adopt Petitioner's case for obviousness of proposed substitute claim 16 (as summarized above) as our own in this Decision, and we accordingly conclude Petitioner has demonstrated by a preponderance of the evidence that proposed substitute claim 16 is unpatentable as having been obvious over Garner, Sanborn, Enidine, and Stauff.

c) Proposed Substitute Claims 17–21

Petitioner's Opposition, apart from referring to proposed substitute dependent claims 17–21 being part of Ground 8, does not appear to address these claims. *See* Mot. Opp. 3–25 (discussing only independent claims 16 and 23). Nonetheless, we understand Petitioner's challenge to proposed substitute claims 17–21 to rely on the combination of Garner, Sanborn, and Enidine, as set forth in the Petition against original claims 2–6, which these substitute claims are proposed to replace. *See* Mot. App. A (pgs. 6–7); Pet. 30–33 (addressing original claims 4–6), 33–42 (addressing original claims 2 and 3). In support of proposed substitute claims 17–21, Patent Owner relies solely on arguments considered above in relation to their common parent claim 16. *See* Mot. 21; Mot. Reply 10–12. For the reasons provided above in Section IV.C.1(b), we conclude Patent Owner's arguments are unavailing. We additionally adopt Petitioner's case for obviousness of proposed substitute claims 17–21 as our own in this Decision, and we accordingly conclude Petitioner has demonstrated by a

preponderance of the evidence that proposed substitute claims 17–21 are unpatentable as having been obvious over Garner, Sanborn, Enidine, and Stauff.

2. Ground 9 — Obviousness Over Garner, Sanborn, Enidine, Stauff, and Rashid

Petitioner's Opposition, apart from referring to proposed substitute dependent claim 22 as being challenged in Ground 9 as unpatentable over Garner, Sanborn, Enidine, Stauff, and Rashid, does not appear to address this claim. *See* Mot. Opp. 3–25. Nonetheless, we understand Petitioner's challenge to proposed substitute claim 22 to rely on the combination of Garner, Sanborn, and Rashid, as set forth in the Petition against original claim 7, which this substitute claim is proposed to replace. *See* Mot. App. A (pg. 7); Pet. 42–46. In support of proposed substitute claim 22, Patent Owner relies solely on arguments considered above in relation to its parent claim 16. *See* Mot. 21; Mot. Reply 10–12. For the reasons provided above in Section IV.C.1(b), we conclude Patent Owner's arguments are unavailing. We additionally adopt Petitioner's case for obviousness of proposed substitute claim 22 as our own in this Decision, and we accordingly conclude Petitioner has demonstrated by a preponderance of the evidence that proposed substitute claim 22 is unpatentable as having been obvious over Garner, Sanborn, Enidine, Stauff, and Rashid.

3. Grounds 10–12 — Obviousness Over Garner, Sanborn, Piping Handbook, Enidine, Stauff, Burns, and Rashid

In Grounds 10–12, Petitioner argues proposed substitute claims 23–30 are unpatentable over Garner, Sanborn, Piping Handbook, Enidine, and Stauff (for claims 23–29), further in view of Burns (for claim 26) or Rashid

(claim 30). *See* Mot. Opp. 3. In light of our determination above that these proposed substitute claims would introduce new matter to the '756 Application, we do not reach these grounds of unpatentability.

V. SUMMARY OF CONCLUSIONS

In summary, we determine a preponderance of the evidence establishes claims 1–15 of the '824 patent are unpatentable, as shown in the following table:[13]

Claim(s)	35 U.S.C. §	Reference(s)/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 4–6	103	Garner, Sanborn	1, 4–6	
2, 3	103	Garner, Sanborn, Enidine	2, 3	
7	103	Garner, Sanborn, Rashid	7	
8, 11–14	103	Garner, Sanborn, Piping Handbook	8, 11–14	
9, 10	103	Garner, Sanborn, Piping Handbook, Enidine	9, 10	

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

15		Garner, Sanborn, Piping Handbook, Rashid	15	
11	103	Garner, Sanborn, Piping Handbook, Burns[14]		
Overall Outcome			1–15	

We further *deny* Patent Owner's Motion to Amend, proposing to add substitute claims 16–30 to the '824 patent, as shown in the following table:

Motion to Amend Outcome	Claim(s)
Original Claims Canceled by Amendment	
Substitute Claims Proposed in the Amendment	16–30
Substitute Claims: Motion to Amend Granted	
Substitute Claims: Motion to Amend Denied	16–30
Substitute Claims: Not Reached	

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–15 of the '824 patent have been proven by a preponderance of the evidence to be unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Amend is *denied* as to adding proposed substitute claims 16–30 to the '824 patent; and

[14] We do not reach this asserted ground, because we find claim 11 to be unpatentable in Ground 4. *See supra* Sections III.K and III.N.

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

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