

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LIBERTY ENERGY INC. AND LIBERTY OILFIELD SERVICES LLC
Petitioners

v.

U.S. WELL SERVICES, LLC
Patent Owner

Case No. IPR2025-00661
Patent 11,459,863

PETITION FOR *INTER PARTES* REVIEW OF CLAIMS 1-20 OF
U.S. PATENT NO. 11,459,863

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LIST OF EXHIBITS

Ex. No. ¹	Description
1001	U.S. Patent No. 11,459,863 to Robinson <i>et al.</i> , “Electric Powered Hydraulic Fracturing Pump System With Single Electric Powered Multi-plunger Fracturing Pump” (the “’863 Patent”)
1002	File History for U.S. Patent No. 11,459,863
1003	Declaration of Dr. Robert Durham
1004	Plaintiffs’ Original Complaint, <i>U.S. Well Services, LLC, et al v. Liberty Energy, Inc. et al</i> , 4:24-cv-00839-KPE (S.D. Tex.), March 6, 2024
1005	Return of Service, <i>U.S. Well Services, LLC, et al v. Liberty Energy, Inc. et al</i> , 4:24-cv-00839-KPE (S.D. Tex.), March 11, 2024
1006	Plaintiffs’ Amended Complaint, <i>U.S. Well Services, LLC, et al v. Liberty Energy, Inc. et al</i> , 4:24-cv-00839-KPE (S.D. Tex.), June 3, 2024
1007	Claim Listing of Challenged Claims of ’863 Patent
1008	U.S. Patent No. 10,988,998 to Fischer <i>et al.</i> , “Electric Driven Hydraulic Fracking Operation” (“ <i>Fischer</i> ”), filed Feb. 14, 2020 and issued April 27, 2021
1009	U.S. Provisional Application No. 62.805,521 to Fischer, “Electric Driven Hydraulic Fracking System” (“ <i>Fischer Provisional</i> ”), filed February 14, 2019
1010	U.S. Patent Publication No. 2020/0040878 to Morris, “Engagement and Disengagement with External Gear Box Style Pumps” (“ <i>Morris</i> ”), filed July 29, 2019 and published February 6, 2020
1011	International Publication No. WO 2018/201118 to Orban <i>et al.</i> , “Integrated Power and Electronics Unit for Drilling Machine” (“ <i>Orban</i> ”), filed April 30, 2018 and published November 1, 2018

¹ Citations to patents are made by column and line cite; citations to patent publications are made by paragraph number; citations to Exhibit 1002 are made with reference to the Bates-stamped pagination; citations to other exhibits are made to the page number of the document itself.

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1012	U.S. Patent Publication No. 2017/0030177 to Oehring <i>et al.</i> , “Slide Out Pump Stand for Hydraulic Fracturing Equipment” (“ <i>Oehring-I</i> ”), published February 2, 2017
1013	Karassik, Igor J., et al., “Pump Handbook,” 4 th Edition, McGraw Hill, 2008 (“ <i>Karassik</i> ”)
1014	<i>Nesbitt</i> , B., “Handbook of Pumps and Pumping: Pumping Manual International,” Elsevier, 2006 (“ <i>Nesbitt</i> ”)
1015	Declaration of Sylvia Hall-Ellis, Ph.D.
1016	U.S. Patent No. 9,893,500 to Oehring et al., “Switchgear Load Sharing for Oil Field Equipment” (“ <i>Oehring-II</i> ”), filed April 14, 2017 and issued February 13, 2018
1017	“Weir Oil & Gas introduces new continuous duty 5000-horsepower pump,” Drilling Contractor Magazine, published July 25, 2019, archived on July 28, 2019 at https://web.archive.org/web/20190728223155/http://www.drillingcontractor.org/weir-oil-gas-introduces-first-continuous-duty-5000-horsepower-pump-for-electric-or-gas-turbine-driven-applications-52953
1018	U.S. Patent No. 2,789,714 to Norris, “Heavy Duty Gooseneck Trailer,” filed August 11, 1954 and issued April 23, 1957
1019	Camara, John A., “Electrical Engineering Reference Manual for the Electrical and Computer PE Exam,” 6 th ed. (Professional Publications, Inc. 2002), ISBN: 1-888577-56-8.
1020	Lionel B. Roe, PRACTICES AND PROCEDURES OF INDUSTRIAL ELECTRICAL DESIGN (McGraw-Hill: 1972), ISBN: 0-07-053390-3
1021	IEEE100: THE AUTHORITATIVE DICTIONARY OF IEEE STANDARDS TERMS, 7 th ed. (IEEE Press: 2000), ISBN: 0-7381-2601-2 (“IEEE Standards Dictionary”)
1022	U.S. Patent No. 1,743,771 to Hall <i>et al.</i> , entitled “System of Electric Distribution,” filed March 25, 1926 and issued January 14, 1930
1023	Donald G. Fink, STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS, 13 th ed. (McGraw-Hill, New York: 1993), ISBN: 0-07-020984-7
1024	U.S. Patent Publication No. 2011/0241590 to Horikoshi et al., entitled “Motor Driving Apparatus Having Fault Diagnostic Function,” filed Feb. 11, 2011 and published Oct. 6, 2011
1025	U.S. Patent Publication No. 2012/0255734 to Coli et al., entitled “Mobile, Modular, Electrically Powered System for Use in Fracturing Underground Formations,” filed April 6, 2012 and published Oct. 11, 2012

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1026	U.S. Patent No. 9,410,410 to Broussard et al., entitled “System for Pumping Hydraulic Fracturing Fluid using Electric Pumps,” filed Nov. 16, 2012 and issued Aug. 9, 2016
1027	U.S. Patent No. 2,533,001 to Eberhard, entitled “Flip-Flop Counter Circuit,” filed April 30, 1949 and issued December 5, 1950
1028	NEMA ICS-61800-4 Adjustable Speed Electrical Power Drive Systems, Part 4: General Requirements – Rating Specifications for A.C. Power Drive Systems Above 1000 V A.C. and Not Exceeding 35 kV, National Electrical Manufacturers Association, 2004
1029	C. M. Chang, “An N-P-N high power fast germanium core driver transistor,” 1957 International Electron Devices Meeting, Washington, DC, USA, 1957, pp. 114-114, doi: 10.1109/IEDM.1957.187057
1030	F. B. Golden, “Liquid Cooling of Power Thyristors,” in IEEE Transactions on Industry Applications, vol. IA-8, no. 5, pp. 601-606, Sept. 1972, doi: 10.1109/TIA.1972.349789
1031	A. H. Iversen and S. Whitaker, “A uniform temperature, ultra high heat flux liquid cooled, power semiconductor package,” Conference Record of the IEEE Industry Applications Society Annual Meeting,, San Diego, CA, USA, 1989, pp. 1340-1347 vol.2, doi: 10.1109/IAS.1989.96817
1032	Hefner, A. R. 1992. “A dynamic electro-thermal model for the IGBT.” In Conference Record of the 1992 IEEE Industry Applications Society Annual Meeting, 1094-104 vol.1
1033	Morton, M., “Unlocking the Earth: A Short History of Hydraulic Fracturing,” GEO ExPro, Vol. 10, No. 6, December 2013 (https://geoexpro.com/unlocking-the-earth-a-short-history-of-hydraulic-fracturing/) (last accessed September 16, 2024)
1034	Gardner Denver GD-2500 Quintuplex Well Servicing Pump Operating and Service Manual, captured by the Internet Archive on Sept. 17, 2005, available at < https://web.archive.org/web/20120917102614/http://www.quincieoilfield.com/pdf/3.0%20Gardner%20Denver/2500/GD2500Q%20Op%20&%20Service%20Manual.pdf >
1035	Merriam-Webster Online Dictionary, “Quintuple,” captured by the Internet Archive on February 2, 2017, available at < https://web.archive.org/web/20170202121725/https://www.merriam-webster.com/dictionary/quintuple >
1036	Mark’s Standard Handbook for Mechanical Engineers, Eleventh Edition, McGraw-Hill Companies, New York, 2007

I. MANDATORY NOTICES

Real Party in Interest: Liberty Energy Inc., Liberty Oilfield Services LLC (collectively, “Liberty” or “Petitioners”), and Liberty Advanced Equipment Technologies LLC are the real parties in interest.

Related Matters: The ’863 Patent was involved in a pending lawsuit between Petitioners and U.S. Well Services, LLC (“Patent Owner,” or “PO”) entitled *U.S. Well Services, LLC, et al v. Liberty Energy, Inc. et al*, 4:24-cv-00839-KPE (S.D. Tex.) (“Liberty Litigation”), filed March 6, 2024 and served on Liberty Advanced Equipment Technologies LLC on March 7, 2024. EX1004 (Complaint); EX1005 (Return of Service, noting date of service). The ’863 Patent was subsequently dropped from the Liberty Litigation as evidenced by an Amended Complaint, filed June 3, 2024. EX1006.

Lead Counsel and Back-Up Counsel: Petitioners designate lead and back-up counsel as noted below. A Power of Attorney is filed concurrently herewith under 37 C.F.R. §42.10(b).

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Service Information: Correspondence to lead and back-up counsel can be provided at the postal and electronic addresses above. Petitioners also consent to service by electronic mail at chad.walters@bakerbotts.com, andrew.grado@bakerbotts.com, and jacob.mcdonald@bakerbotts.com.

II. STANDING AND FEES

Standing: Petitioners certify under 37 C.F.R. §42.104(a) that the '863 Patent is eligible for *inter partes* review and that Petitioners are not barred or estopped from requesting *inter partes* review on the grounds set forth herein.

Fees: The Office is authorized to charge the fee set forth in 37 C.F.R. §42.15(a) to Deposit Account No. 02-0384 as well as any additional fees that might be due in connection with this Petition.

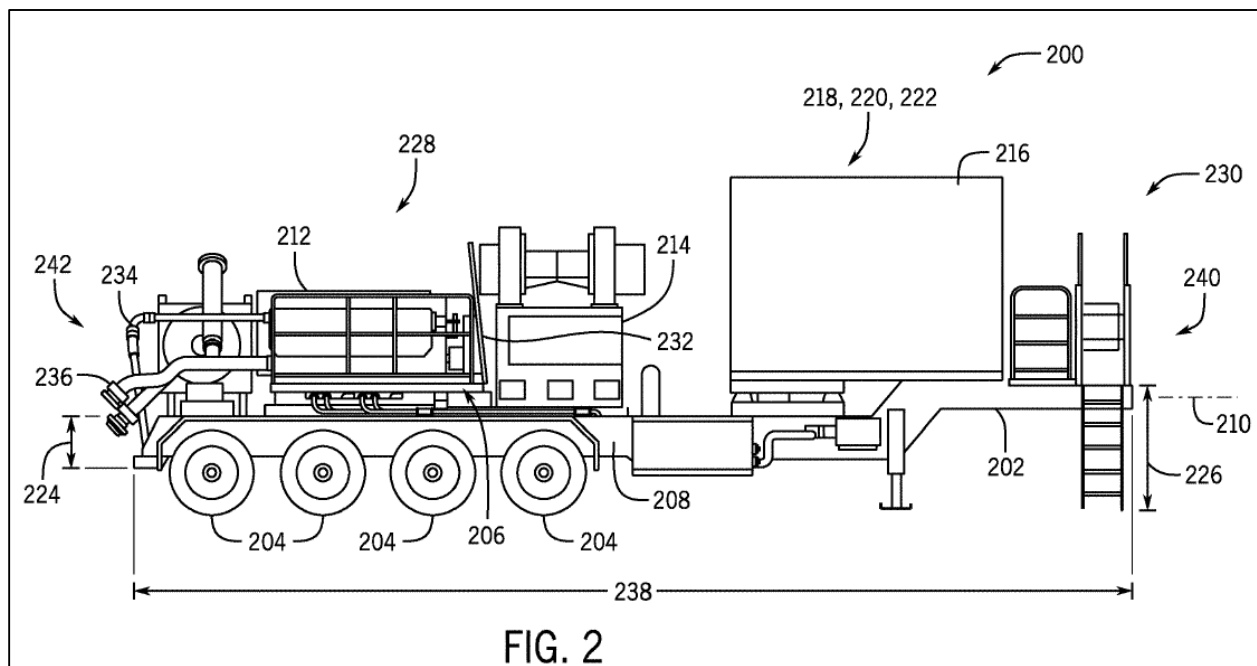
III. OVERVIEW OF THE '863 PATENT

A. *Subject Matter of the '863 Patent*

The '863 Patent generally relates to “systems and methods for compact modular trailer arrangements for electric powered multi-plunger fracturing pump systems.” EX1001, 1:21-24.

The system taught by the '863 Patent includes a “support structure having a first area at a first height and a second area at a second height, the first and second

areas adjacent one another.” *Id.*, 2:27-29. An “electric powered, multi-plunger pump with an odd number of plungers” is arranged in the first area, coupled to a well via outlet piping, and is powered by an electric motor also located in the first area. *Id.*, 2:29-33. In the second area are (1) a variable frequency drive (VFD) configured to control the speed of the electric motor and (2) a transformer configured to distribute power to the electric pump, wherein the VFD and the transformer are within an enclosure in the second area. *Id.*, 2:33-40. The VFD includes “a cooling system that may utilize water/glycol as the cooling fluid.” *Id.*, 11:30-32. Figure 2 of the ’863 Patent, copied below, depicts this configuration:



EX1001, Fig. 2 (showing pump 212, motor 214, and enclosure 216 for VFD 220 and transformer 222, *id.*, 6:40-56).

Further, the support structure may include a “slide out platform 206, which may be extendable away from a trailer body 208 in a direction substantially perpendicular to a trailer axis 210.” *Id.*, 6:27-30.

B. Priority Date and Prosecution History of the '863 Patent

The application leading to the '863 Patent was filed on October 1, 2020 as Application 17/060,647 and claimed priority to provisional application No. 62/910,163, which was filed on October 3, 2019. EX1001, items (21), (22), (60). For purposes of this petition, Petitioners assume without conceding that under AIA §102(a), the effective filing date of the '863 Patent is October 3, 2019.

The Patent Office issued a first Non-Final Office Action on September 20, 2021, rejecting Claims 1, 3-11, and 13-20 as being anticipated by, or, in the alternative, rendered obvious over, U.S. Patent No. 10,988,998 (“*Fischer*,” EX1008), and rejecting Claims 2 and 12 as being rendered obvious under *Fischer* in view of U.S. Patent Publication 2017/0030177 (“*Oehring-I*,” EX1012). EX1002, 219-229.

In response, the Applicant argued that *Fischer* is not prior art. *Fischer*’s filing date is February 14, 2020, and it claims priority to U.S. Provisional Application No. 62/805,521 (“*Fischer Provisional*,” EX1009), which has a filing date of February 4, 2019. The Applicant argued that *Fischer* is not entitled to *Fischer Provisional*’s filing date, because *Fischer* does not meet the *Dynamic Drinkware* requirement that

a reference patent's claims must have written description support in its provisional application to be entitled to the filing date of the provisional application. *See* EX1002, 185-186 (citing *Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1381 (Fed. Cir. 2015)). In particular, the Applicant argued that *Fischer Provisional* does not describe elements in Claims 1 and 2 of Fischer related to “a first vibration damping assembly” and a “power cell assembly.” EX1002, 186.

Further, the Applicant argued that “the cited portions of *Fischer* are directed to subject matter not found in the Provisional,” such as “the disclosure of FIGS. 4-6” in *Fischer*. *Id.*, 187-188 (also arguing that the “switchgear transformer 335” of *Fischer Provisional* “is illustrated as being part of a power distribution system 320 and does not appear to be associated with the VFD 340n,” and therefore does not read on Claim 1 of the '863 Patent).

Following these arguments, the Patent Office withdrew *Fischer* as a prior art reference and issued a notice of allowance on May 25, 2022. *Id.*, 13.

IV. SUMMARY OF PRIOR ART

A. Fischer (EX1008)

Fischer is U.S. Patent No. 10,988,998, was filed on February 14, 2020, and issued on April 27, 2021. EX1008. *Fischer* claims priority to U.S. Provisional Application No. 62/805,521 (EX1009, “*Fischer Provisional*”) filed on February 14, 2019. *Fischer* properly claimed benefit to (EX1008, item (60)), was filed copending

with (*id.*, item (22)), and shared a common inventor with (*id.*, item (72)) *Fischer Provisional*. See AIA 35 U.S.C. §102(d); MPEP §2154.01(b). Also, the subject matter relied of *Fischer* that was relied upon in this Petition is disclosed in *Fischer Provisional*. See MPEP §2154.01(b).

Dynamic Drinkware does not apply. See *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1379-80 (Fed. Cir. 2015). The Board has determined that, “for prior-art determinations under AIA §102, ‘there is no need to evaluate whether any claim of [a reference] patent document is *actually entitled to priority* or benefit under 35 U.S.C. 119, 120.’” See, e.g., *Penumbra, Inc. v. RapidPulse, Inc.*, IPR2021-01466, Paper 34 (P.T.A.B. March 20, 2023) (precedential), at 31-32 (emphasis original; citing MPEP §2154.01(b); holding that the requirement in *Dynamic Drinkware* (that under pre-AIA 35 U.S.C. §102(e), a reference patent’s claims must have written description support in its provisional application to be entitled to the filing date of the provisional application) does not apply to AIA 35 U.S.C. §102(d)); see also *Apple Inc. v. Telefonaktiebolaget LM Ericsson*, IPR2022-00341, Paper 10 (P.T.A.B. Sept. 14, 2022), at 19.

Thus, for prior art purposes, *Fischer* was effectively filed on February 14, 2019, and qualifies as prior art under AIA §102(a)(2). Like the ’863 Patent, *Fischer* describes a hydraulic fracturing system that includes a “pump trailer” on which “a medium-voltage VFD [variable frequency drive] 132, a single, single-shaft electric

motor 134 and a single hydraulic pump 136,” are mounted EX1008, 12:3-8; EX1009, [0031]. Thus, *Fischer* is from the same field of endeavor as the ’863 Patent and describes a pump trailer that is similar to the support structure described in the ’863 Patent. EX1003, ¶132.

B. *Morris (EX1010)*

Morris is U.S. Patent Publication No. 2020/0040878, was filed on July 29, 2020, and published on February 6, 2020. *Bergan* is prior art at least under 35 U.S.C. §102(a)(2).

Morris discloses a system for producing fracturing fluid that includes a “lay-down trailer” that comprises “main trailer beams” on which an electric motor and two pumps are mounted as well “an upper section above the trailer axles that may hold or have mounted the power and control systems 104.” EX1010, [0047]. Thus, *Morris* is from the same field of endeavor as the ’863 Patent and describes a lay-down trailer that is similar to the support structure described in the ’863 Patent. EX1003, ¶134.

C. *Orban (EX1011)*

Orban is International Publication No. WO 2018/201118, was filed on April 30, 2018, and published on November 1, 2018. *Orban* is prior art at least under 35 U.S.C. §§102(a)(1) and 102(a)(2). *Orban* teaches the use of a water-cooled radiator to cool a VFD. EX1011, [0045], Fig. 3. Thus, *Orban* is reasonably pertinent to a

problem faced by the inventor of '863 Patent, namely, cooling a VFD. EX1003, ¶136; *see* EX1001, 7:28-42 (describing implementation of a cooling system to “maintain a temperature and/or humidity level for the various electronic components”).

D. Oehring-I (EX1012)

Oehring-I is U.S. Patent Application Publication No. 2017/0030177, was filed on July 22, 2016, and published on February 2, 2017. *Oehring-I* is prior art at least under 35 U.S.C. §102(a)(1). *Oehring-I* discloses “platform assembly” that is mounted, along with a hydraulic pump and an electric motor that drives the pump, onto a trailer, wherein the platform assembly “is selectively moveable between deployed and stowed configurations.” EX1012, Abstract. When in the deployed position, the work platform “provides work surface so that operations personnel can readily access the pump on the trailer.” *Id.* Thus, *Oehring-I* is in from the same field of endeavor—a trailer-mounted fracturing system that includes a platform assembly for accessing the fracturing equipment—as the '863 Patent, which describes a similar configuration. EX1003, ¶138.

E. Karassik (EX1013)

Karassik is a book titled *Pump Handbook*, by Igor Karassik *et al.* *Karassik* was publicly available no later than 2008, and is prior art at least under 35 U.S.C. §102(a)(1). *See* EX1015, ¶¶40-41. *Karassik* describes pump theory and operation,

including the use of seven- and nine-plunger pumps. EX1013, 3.11. Thus, *Karassik* is from the same field of endeavor—the utilization of multi-plunger pumps—as the ’863 Patent. EX1003, ¶140.

F. Oehring-II (EX1016)

Oehring-II is U.S. Patent No. 9,893,500, was filed on April 14, 2017, and was issued on February 13, 2018. *Oehring-I* is prior art at least under 35 U.S.C. §102(a)(1). *Oehring-II* describes a “switchgear trailer” that provides electric connections for various components of a fracturing system. EX1016, 7:21-28. The switchgear trailer includes an elevated platform that provides access to the trailer. *Id.*, Fig. 3A. Thus, *Oehring-II* is from the same field of endeavor—a hydraulic fracturing system that includes platforms for access components of the system—as the ’863 Patent. EX1003, ¶143.

G. Summary of Grounds

Ground	Claims	Basis (35 U.S.C. §)	Prior Art
1	1, 9	103	<i>Fischer</i>
2	2	103	<i>Fischer, Oehring-I</i>
3	3	103	<i>Fischer, Oehring-II</i>
4	4, 5	103	<i>Fischer, Orban</i>
5	6-8	103	<i>Fischer, Karassik</i>
6	10, 11, 19, 20	103	<i>Fischer in view of the knowledge of a POSITA and, in the alternative, Karassik</i>
7	12	103	<i>Fischer, Oehring-I in view of the knowledge of a POSITA and, in the alternative, Karassik</i>

8	13	103	<i>Fischer, Oehring-II in view of the knowledge of a POSITA and, in the alternative, Karassik</i>
9	14, 15	103	<i>Fischer, Orban in view of the knowledge of a POSITA and, in the alternative, Karassik</i>
10	16-18	103	<i>Fischer, Karassik in view of the knowledge of a POSITA and, in the alternative, Karassik</i>
11	1	103	<i>Morris</i>
12	2	103	<i>Morris, Oehring-I</i>
13	3	103	<i>Morris, Oehring-II</i>
14	4, 5	103	<i>Morris, Orban</i>
15	6-8	103	<i>Morris, Karassik</i>
16	10, 11, 19, 20	103	<i>Morris in view of the knowledge of a POSITA and, in the alternative, Karassik</i>
17	12	103	<i>Morris, Oehring-I in view of the knowledge of a POSITA and, in the alternative, Karassik</i>
18	13	103	<i>Morris, Oehring-II in view of the knowledge of a POSITA and, in the alternative, Karassik</i>
19	14, 15	103	<i>Morris, Orban in view of the knowledge of a POSITA and, in the alternative, Karassik</i>
20	16-18	103	<i>Morris, Karassik in view of the knowledge of a POSITA and, in the alternative, Karassik</i>

EX1003, ¶19; EX1007 (listing challenged claim elements).

V. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art (POSITA) 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. EX1003, ¶45.

VI. CLAIM CONSTRUCTION

Claim terms in IPR are construed according to their “ordinary and customary meaning” to those of skill in the art. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*); 37 C.F.R. §42.100(b). Constructions are proposed “only to the extent necessary.” *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). For the purposes of this proceeding and the grounds presented herein, Petitioners do not present any constructions. EX1003, ¶46.

VII. INSTITUTION IS PROPER

A. Discretionary denial under §314(a) is not warranted

As noted above, the ’863 Patent was asserted in the original complaint filed in the Liberty Litigation on March 6, 2024, but is no longer at issue in that case as of the Amended Complaint on filed June 3, 2024. *See supra*, I. Accordingly, the Board’s efforts here will not be duplicative of the district court’s efforts in the Liberty Litigation, so the Board should not discretionarily deny this petition under §314(a).

B. Institution is Proper under §325(d)

Under the *Board's* two-part *Advanced Bionics* framework for evaluating whether to exercise discretion under Section 325(d), the Board must consider (1) whether the same or substantially the same art previously was presented to the Office or whether the same or substantially the same arguments previously were presented to the Office and (2) if either condition of the first part of the framework is satisfied, whether the petitioner has demonstrated that the Office erred in a manner material to the patentability of challenged claims. *Advanced Bionics, LLC, v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 8 (P.T.A.B. Feb. 13, 2020) (precedential). Here, the first part of this framework is met, as both *Fischer* (EX1008) and *Oehring-I* (EX1012) were presented to the Office during prosecution of the '863 Patent. *See supra*, III.B. However, the examiner materially erred by withdrawing *Fischer* as prior art for allegedly failing to meet the *Dynamic Drinkware* requirement that a reference patent's claims must have written description support in its provisional application to be entitled to the filing date of the provisional application.

As discussed above in Section III.B, *Fischer* and *Oehring-I* were cited in a September 20, 2021 Non-Final Office Action rejecting Claims 1-20 of the '863 Patent. *Supra*, III.B (citing EX1002, 219-229 (9/20/2021 Office Action)). In response, the Applicant argued that *Fischer* is not entitled to *Fischer Provisional's*

filing date because *Fischer* does not meet the *Dynamic Drinkware* requirement. *Supra*, III.B (citing EX1002, 185-186 (Applicant’s argument)). Patent Owner also argued that various cited portions of *Fischer* are directed to subject matter not found in *Fischer Provisional*, such as “the disclosure of FIGS. 4-6” in *Fischer*. *Id.* (citing EX1002, 187-188). Following these arguments, the examiner withdrew *Fischer* as a prior art reference and issued a notice of allowance on May 25, 2022. *Id.* (citing EX1002, 13 (notice of allowance)).

However, as discussed above, the Board has determined that the *Dynamic Drinkware* requirement does not apply to AIA 35 U.S.C. §102(d). *See supra*, IV.A. And, as explained by the Board in *Penumbra*, both M.P.E.P. §2154.01(b) and an April 2018 Memorandum to the Patent Examining Corps directed patent examiners, as of the September 20, 2021 Office Action, as to the inapplicability of *Dynamic Drinkware*’s requirement to AIA references. *See Penumbra*, IPR2021-01466, Paper 34 at 31-32 (quoting April 2018 Memorandum); *see also* M.P.E.P. §2154.01(b), Rev.10.2019 (June 2020 Publication), available at <https://www.uspto.gov/web/offices/pac/mpep/old/e9r10-2019/mpep-2100.pdf>, 2100-375. Accordingly, the examiner’s withdrawal of *Fischer* during prosecution of the application resulting in the ’863 Patent was improper, and *Fischer* should have been maintained as prior art during prosecution. And as discussed below in Section VIII, *Fischer* discloses, or at least renders obvious, Claims 1, 9-11, 19, and 20;

therefore, *Fischer* not being fully considered was material error, so the Board should decline to exercise its discretion to deny institution based on the Office's prior consideration of *Fischer* and *Oehring-I*. See *Advanced Bionics*, IPR2019-01469 Paper 6 at 8, fn. 9 ("Another example [of a material error] may include an error of law, such as misconstruing a claim term, where the construction impacts patentability of the challenged claims."). Accordingly, *Fischer* is prior art to the '863 Patent to the extent the relied upon subject matter is described in *Fischer Provisional*. Further, this Petition does not rely on the portions of *Fischer* that were identified by the Applicant as being directed to subject matter purportedly not found in *Fischer Provisional*. See EX1002, 187-188.

Finally, although the '863 Patent lists *Morris* on its face, *Morris* was not used in a rejection of the claims. EX1001, item (56), 3; EX1003, ¶144. The Board has declined to exercise its discretion to deny institution in situations where the petitioner relied upon prior art that was cited on the face of the challenged patent, but was "not applied by the examiner . . . in any rejection of claims." *Comcast Cable Communs., LLC v. Promptu Sys. Corp.*, Case No. IPR2018-00342, Paper 13 at 17 (P.T.A.B. July 19, 2018).).

VIII. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Ground 1: Fischer renders obvious Claims 1 and 9

1. Claim 1

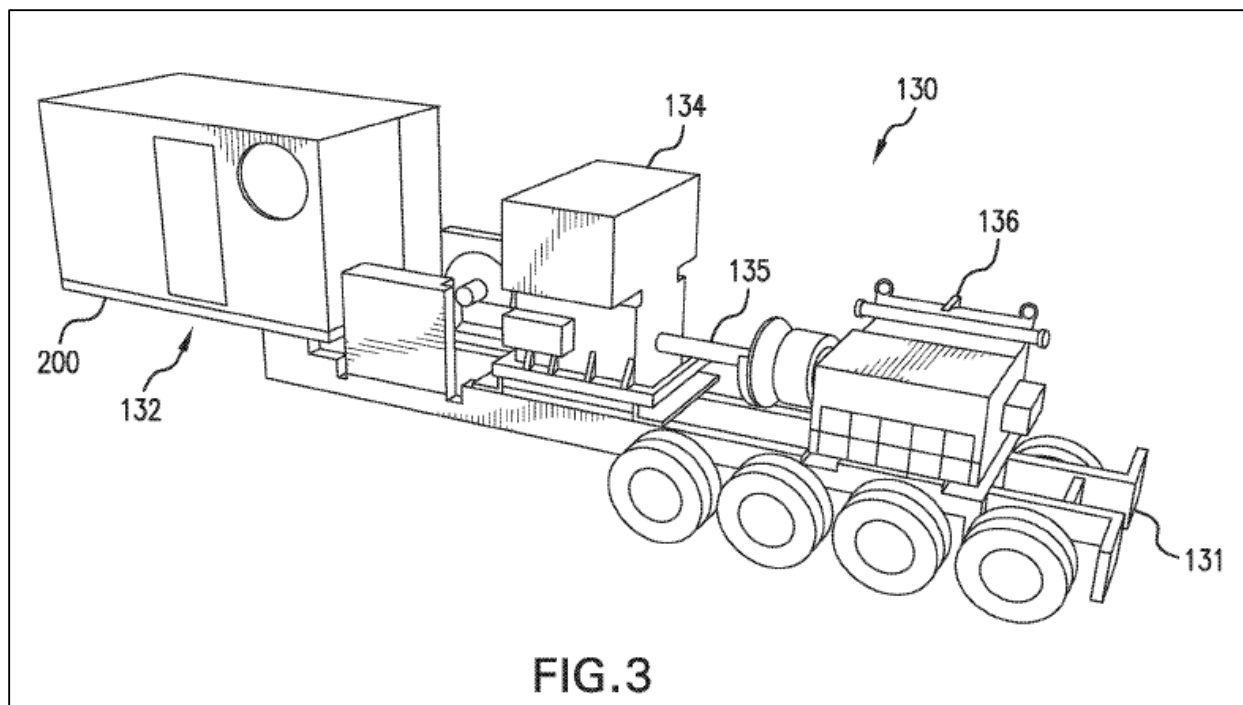
- a) 1[p]: A hydraulic fracturing system, comprising:

To the extent the preamble is limiting, *Fischer* discloses the preamble. *Fischer* describes “electrically-driven hydraulic fracturing systems.” EX1008, 1:14-17; EX1009, [0001]. In particular, *Fischer* describes “a hydraulic fracking operation 100 in which hydraulic pumps may pump a fracking media into a fracking well 109 to execute a fracking operation in order to extract a fluid from the fracking well 109.” EX1008, 4:16-20; EX1009, [0016].

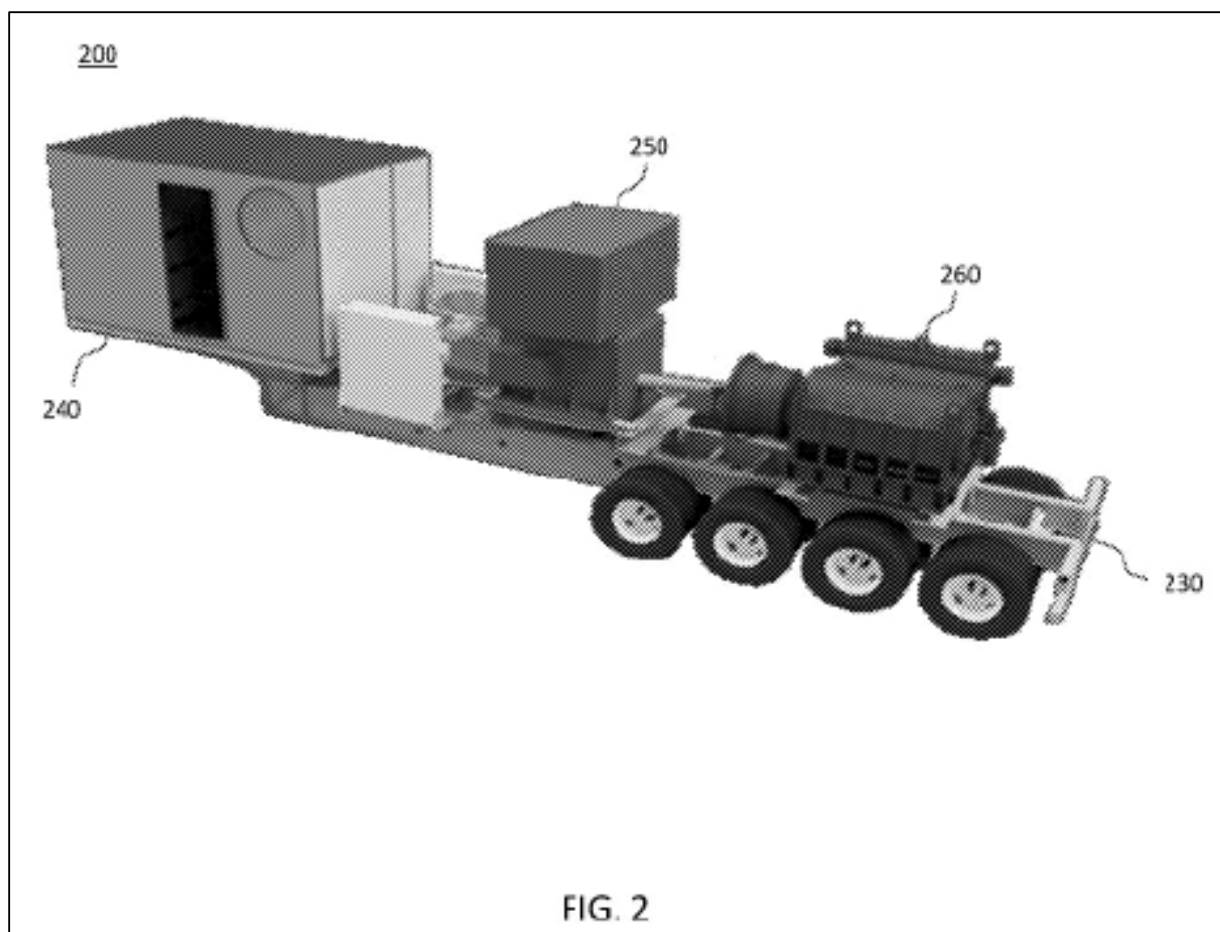
Accordingly, *Fischer* discloses Limitation 1[p].

b) 1[a]: a support structure having a first area at a first height and a second area at a second height, the first and second areas adjacent one another;

Fischer describes “a single, single-pump configuration 130 that includes a medium-voltage VFD [variable frequency drive] 132, a single, single-shaft electric motor 134 and a single hydraulic pump 136, each of which is mounted on a single pump trailer 131.” EX1008, 12:3-8; EX1009, [0031]. The pump trailer therefore discloses “a support structure.” Figure 3 of *Fischer* and Figure 2 of *Fischer Provisional*, which depict the pump trailer, are copied below:

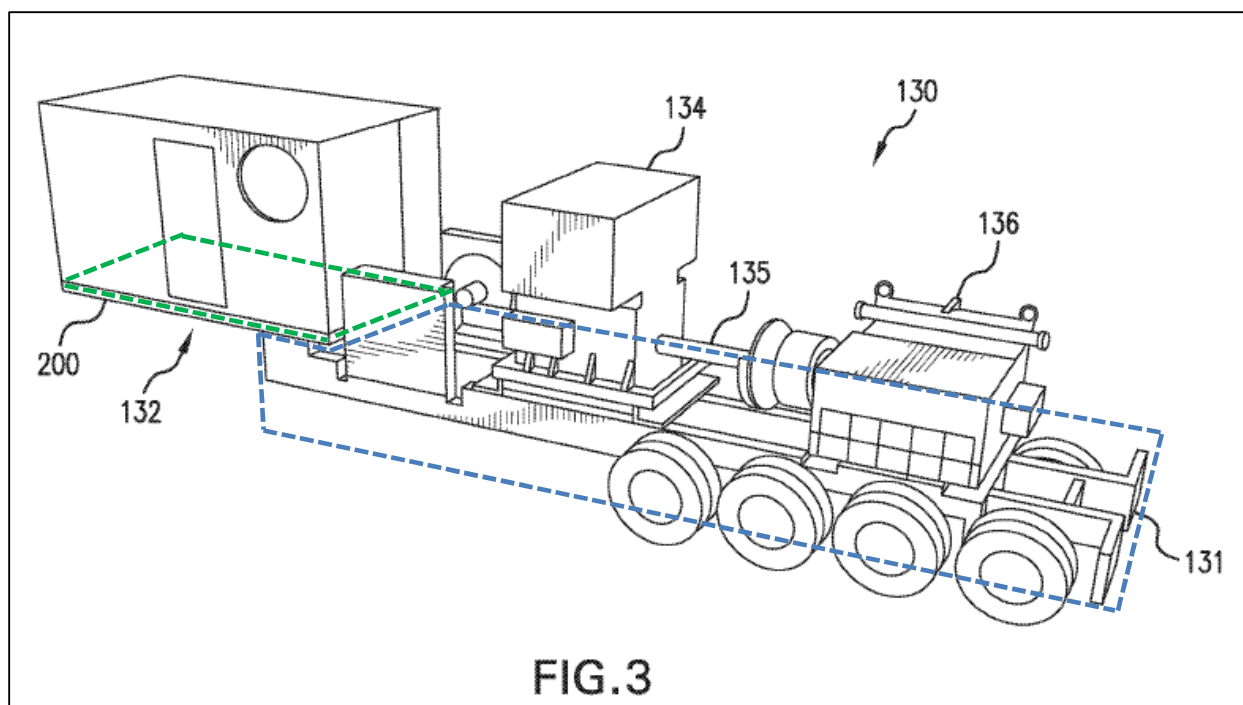


EX1008, Fig. 3.

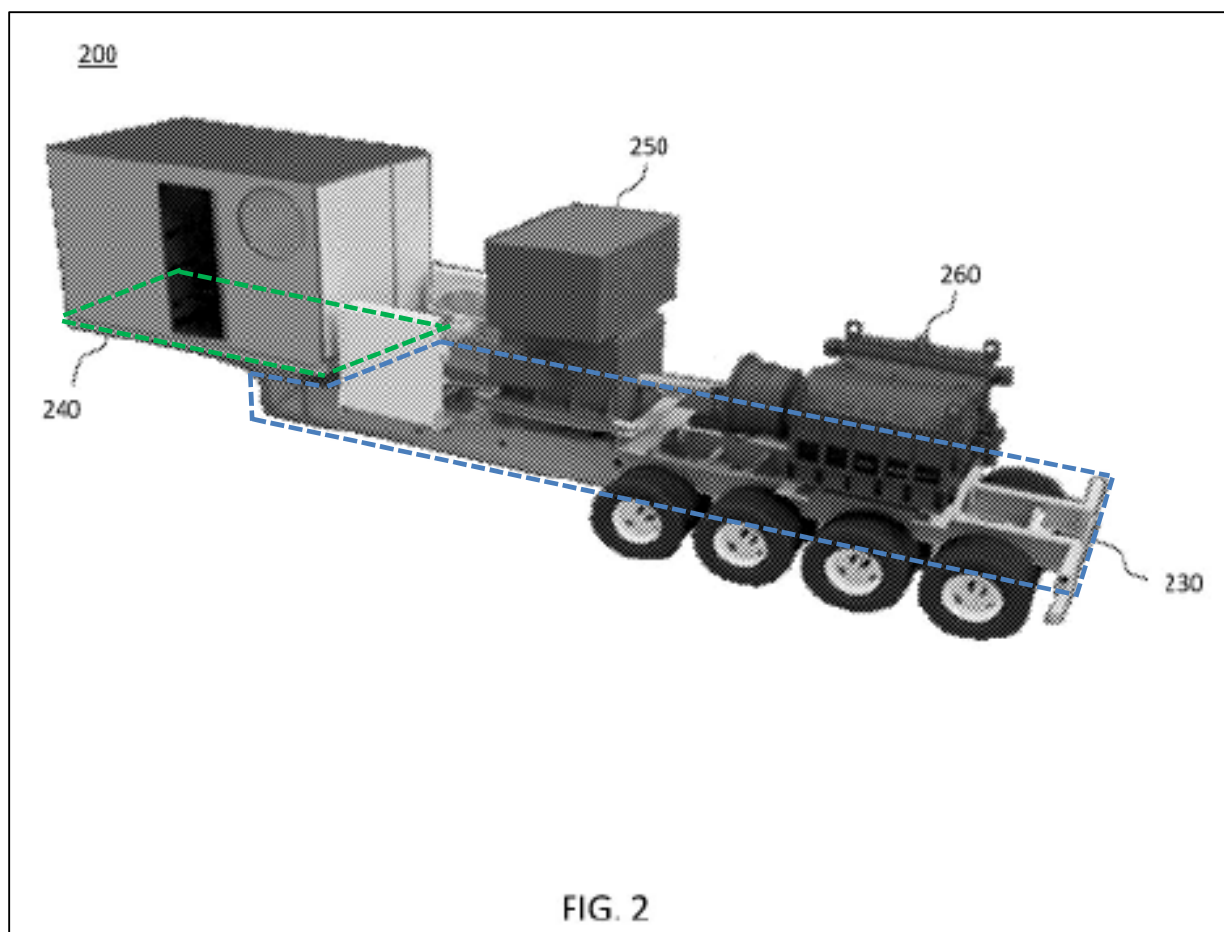


EX1009, Fig. 2.

As shown, *Fischer* and *Fischer Provisional*'s pump trailers comprise two adjacent areas, where a first area is lower than a second area. Annotated copies of Figure 2 of *Fischer* and Figure 3 of *Fischer Provisional* are provided below to highlight the first area (annotated in blue) and the second area (annotated in green).



EX1008, Fig. 3 (annotated).



EX1009, Fig. 2 (annotated).

Accordingly, *Fischer* discloses Limitation 1[a].

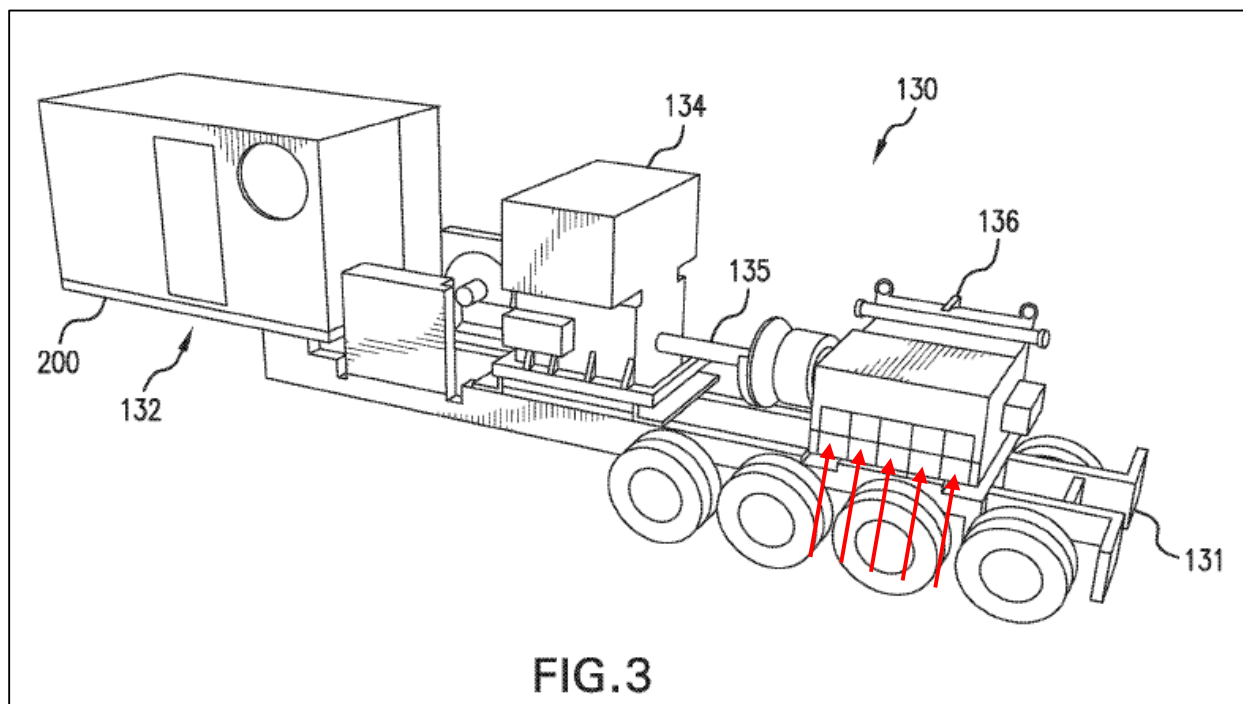
c) 1[b]: an electric powered, multi-plunger pump with an odd number of plungers, arranged in the first area, the electric powered pump coupled to a well, via outlet piping, and powered by at least one electric motor, also arranged in the first area;

As discussed above with reference to Limitation 1[a], *Fischer's* pump trailer includes an electric motor and a hydraulic pump, both of which are located in the “*first area*” of the pump trailer. *See supra*, VIII.A.1.(b). The electric motor “may be coupled to the single hydraulic pump 136 and drive the single hydraulic pump

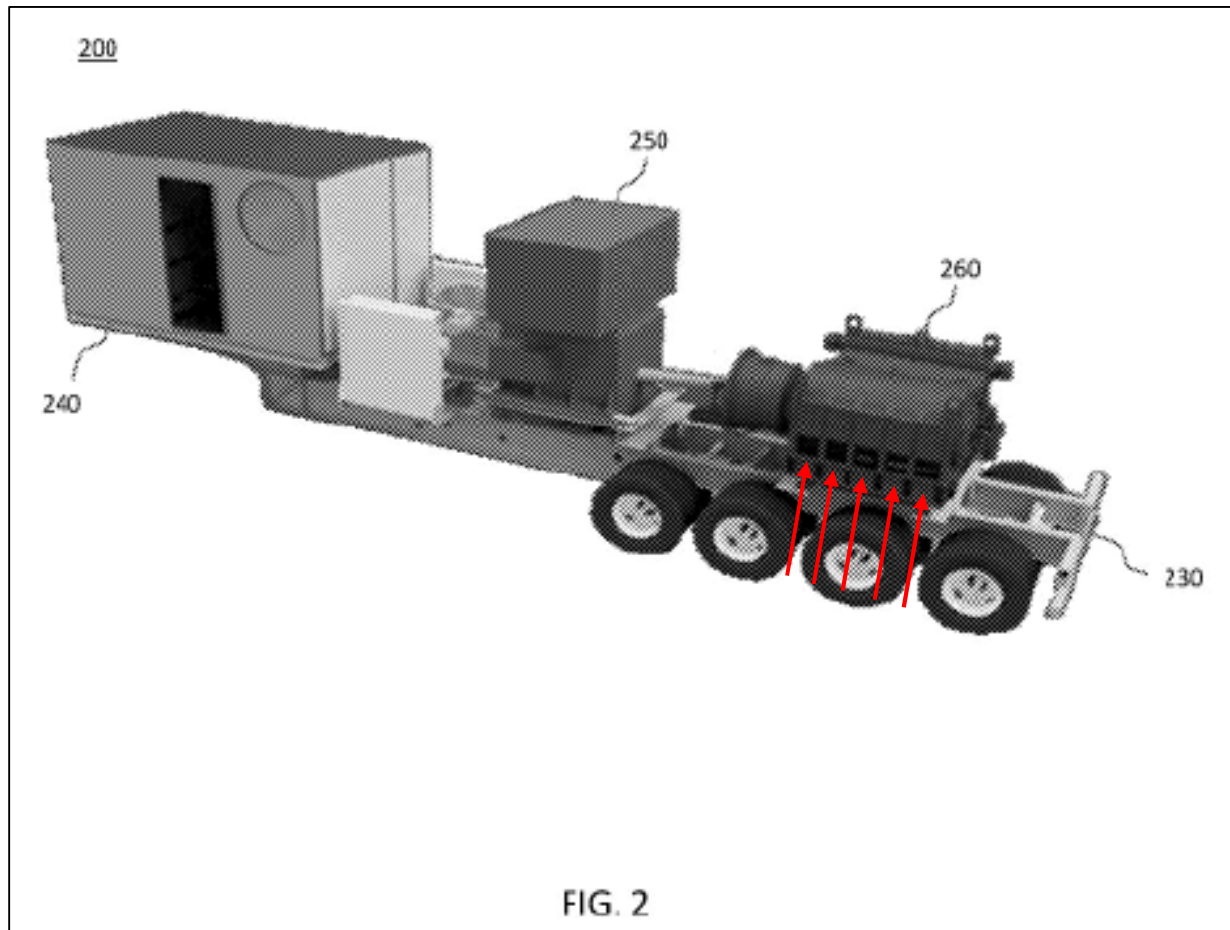
136.” EX1008, 14:52-54; *see also id.*, 14:46-51; EX1009, [0035], [0038].

Accordingly, *Fischer*’s hydraulic pump is “*electric powered*” and “*powered by at least one electric motor.*”

Fischer’s hydraulic pump is also a “*multi-plunger pump,*” for several reasons. First, a POSITA would have understood that *Fischer*’s hydraulic pump is a “*multi-plunger pump*” based at least on its appearance in Figure 3 of *Fischer* and Figure 2 of *Fischer Provisional*. Although *Fischer* does not specifically identify its hydraulic pump as a “*multi-plunger pump,*” a POSITA would have understood that *Fischer*’s hydraulic pump comprises five plungers, which are annotated with red arrows in the below copies of the hydraulic pumps disclosed by *Fischer* and *Fischer Provisional*. EX1003, ¶155.



EX1008, Fig. 3 (annotated).



EX1009, Fig. 2 (annotated).

Second, *Fischer* provides that the hydraulic pump may be a “Weir QEM5000 pump,” which was a well-known hydraulic pump that comprised five plungers. EX1008, 15:26-28; EX1009, [0040]; EX1003, ¶156 (explaining that the “Quintuplex Extended Max (QEM)” pump (as identified in EX1017) would comprise five plungers, citing EX1013, 3.11 (Table 7, identifying “Quintuplex” as the industry term for a five-plunger pump)).

Accordingly, *Fischer*'s hydraulic pump is a “*multi-plunger pump with an odd number of plungers.*”

Fischer's hydraulic pump is also “*coupled to a well, via outlet piping.*” *Fischer*'s hydraulic pump “continuously pumps the fracking media into the fracking well 109 to execute the fracking operation to extract the fluid from the fracking well 109.” EX1008, 14:54-57; EX1009, [0034]. A POSITA would have understood that to execute such a fracking operation, the hydraulic pump would be “*coupled to*” the fracking well. EX1003, ¶158. And a POSITA would have understood that such coupling would occur via piping, which was a well-known mechanism for transporting the “fracking media,” a liquid substance, from a pump to a well. *Id.* (citing EX1012, Abstract, [0018], [0025] (describing “discharge piping” used to connect the discharge of a hydraulic pump with a wellhead assembly to provide a “conduit for the slurry between the pump 136 and the wellhead assembly 141”, Figs. 1, 5).

In the alternative, it would have been obvious to a POSITA that *Fischer*'s pump would be coupled to the fracking well into which it pumps fracking media “*via outlet piping,*” as piping was a commonly-used and well-known mechanism for transporting the “fracking media,” a liquid substance, from a pump to a well. EX1003, ¶162.

Accordingly, *Fischer* discloses, or at least renders obvious, Limitation 1[b].

d) 1[c]: a variable frequency drive (VFD), arranged in the second area, connected to the at least one electric motor, the VFD configured to control at least a speed of the at least one electric motor; and

As discussed above with reference to Limitation 1[a], *Fischer's* pump trailer includes a VFD in the “*second area*” of the pump trailer. *See supra*, VIII.A.1.(b). The VFD may “drive the single, single-shaft electric motor 134 and the single hydraulic pump 136 as well as control the operation of the single, single-shaft electric motor 134 and the single hydraulic pump 136 as the single-shaft electric motor 134 continuously drives the single hydraulic pump 136 to cause the single hydraulic pump 136 to continuously pump the fracking media.” EX1008, 12:18-25; EX1009, [0032]. A POSITA would have understood that because *Fischer's* VFD “drive[s]” and “control[s] the operation of” the electric motor, the VFD is “*connected to*” and “*configured to control at least a speed of*” the electric motor, consistent with the well-known functionality of VFDs. EX1003, ¶¶91-98, 165 (citing EX1023-1026).

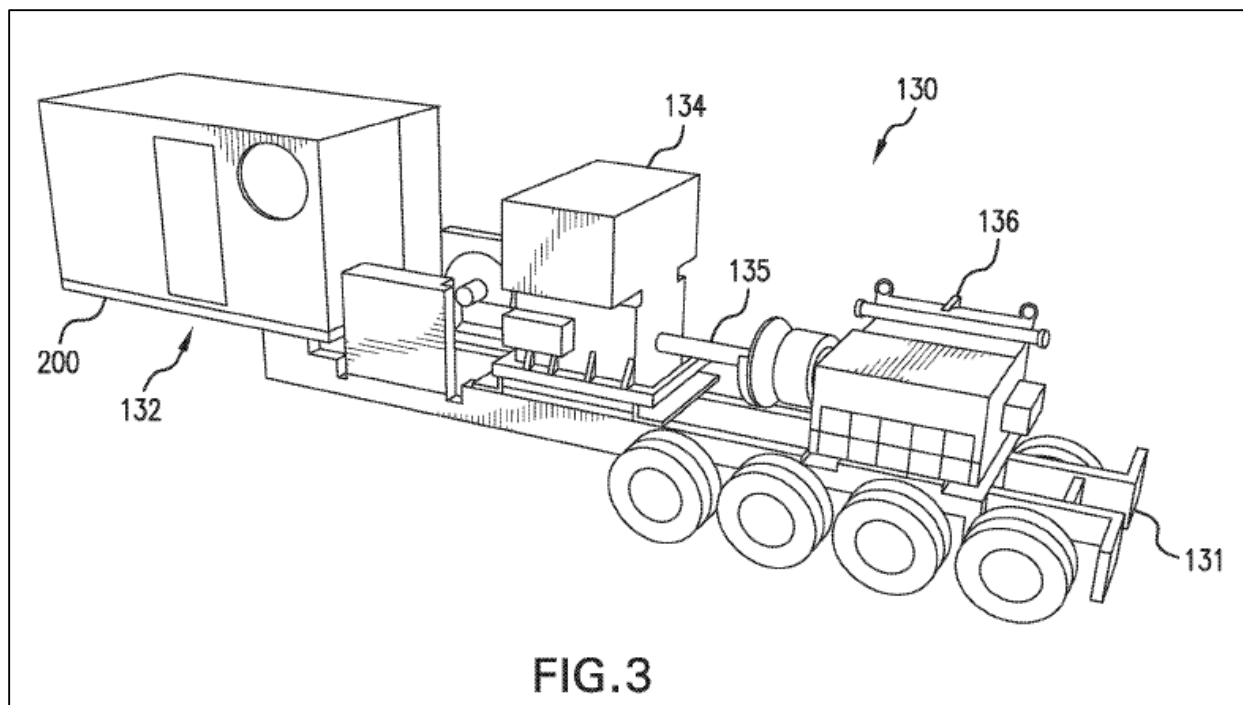
In the alternative, it would have been obvious to a POSITA that *Fischer's* VFD controls the speed of the electric motor. VFDs are well-known components that control the speed of electric motors by varying the frequency of the power delivered to the motors. *Id.* Further, the use of VFDs to control electric motors in hydraulic fracturing operations was well-known in the art before the '863 Patent's priority date. *Id.*

Accordingly, *Fischer* discloses, or at least renders obvious, Limitation 1[c].

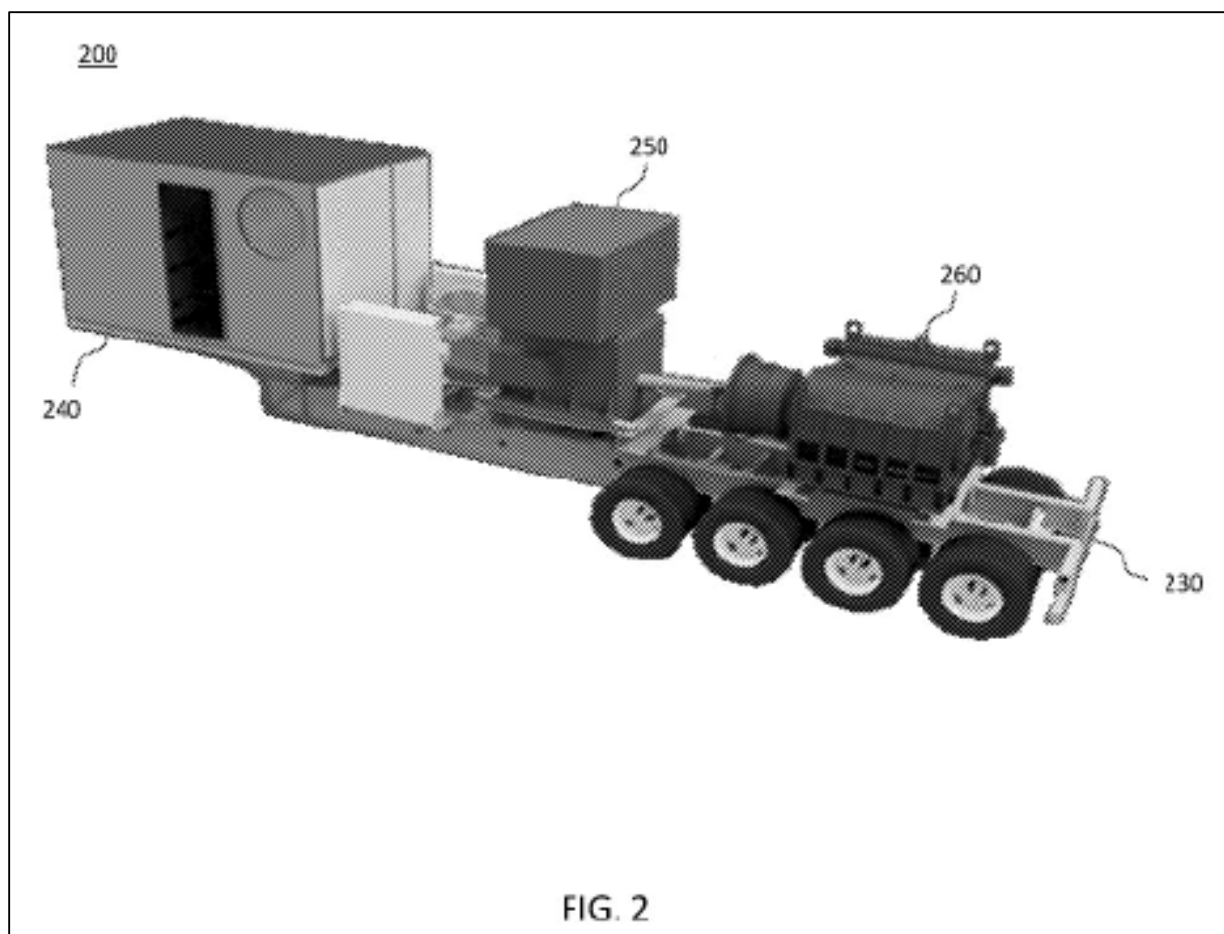
e) 1[d]: a transformer, arranged in the second area, the transformer positioned within an enclosure with the VFD, the transformer configured to distribute power for operation of the electric pump.

As discussed above with reference to Limitations 1[a] and 1[c], *Fischer's* pump trailer includes a VFD in the “second area” of the pump trailer. *See supra*, VIII.A.1.(b), VIII.A.1.(d). The VFD “includes a transformer assembly 230.” EX1008, 20:62-66; EX1009, [0080] (“[T]he the single VFDs 340(a-n) may incorporate . . . a transformer that is incorporated with the single VFDs 340(a-n) to generate the VFD voltage signal to be a sinusoidal signal.”). Accordingly, a POSITA would have understood that the “*second area*,” which includes the VFD, also includes “*a transformer*,” because *Fischer's* VFD includes a transformer. EX1003, ¶168.

Further, a POSITA would have understood that *Fischer's* transformer is “*positioned within an enclosure with the VFD.*” As shown in Figure 3 of *Fischer* and Figure 2 of *Fischer Provisional*, copied below, the “*second area*” of the disclosed pump trailer is depicted as an enclosed room, with an entrance through which personnel may enter.



EX1008, Fig. 3.



EX1009, Fig. 2.

Because the VFD (item 132 in Figure 3 *Fischer* and item 240 in Figure 3 of *Fischer Provisional*) is identified as being located in this “*enclosure*,” a POSITA would have understood that both the VFD and its associated transformer are “*positioned within an enclosure*.” EX1003, ¶¶168-171 (explaining that a POSITA would have understood that *Fischer Provisional*’s VFD 240 is housed within the component marked as item 240 in Figure 2 of *Fischer Provisional*).

Finally, *Fischer*’s transformer is used to convert electric power that is generated at an “initial voltage level” to electric power at a lower voltage level that

is usable by the VFD. EX1008, 35:32-57 (“In certain embodiments, block 532 involves converting, by the transformer 232, the electric power at the initial voltage level to electric power at a transformer voltage level, and converting, by the plurality of power cells 242, the electric power at the transformer voltage level to electric power at the VFD voltage level.”); *see also id.*, 7:51-8:7 (describing that the “initial voltage level” may be 13.8 kV), 35:58-36:10; EX1009, [0082] (“The transformer incorporated into the single VFDs 340(a-n) may then step-down the voltage level of 13.8kV for the AC voltage signal 360 to the voltage level of 4160V for the VFD voltage signal”); *see also id.*, [0032]-[0033], [0035], [0084].

Because *Fischer*’s transformer converts power from a higher, initial voltage level of, for example, 13.8 kV to power at a lower voltage that is usable by the VFD to drive the electric motor, which, in turn, powers the hydraulic pump (*see supra*, VIII.A.1.(c)), the transformer is “*configured to distribute power for operation of the electric pump.*”

Thus, *Fischer* discloses Limitation 1[d].

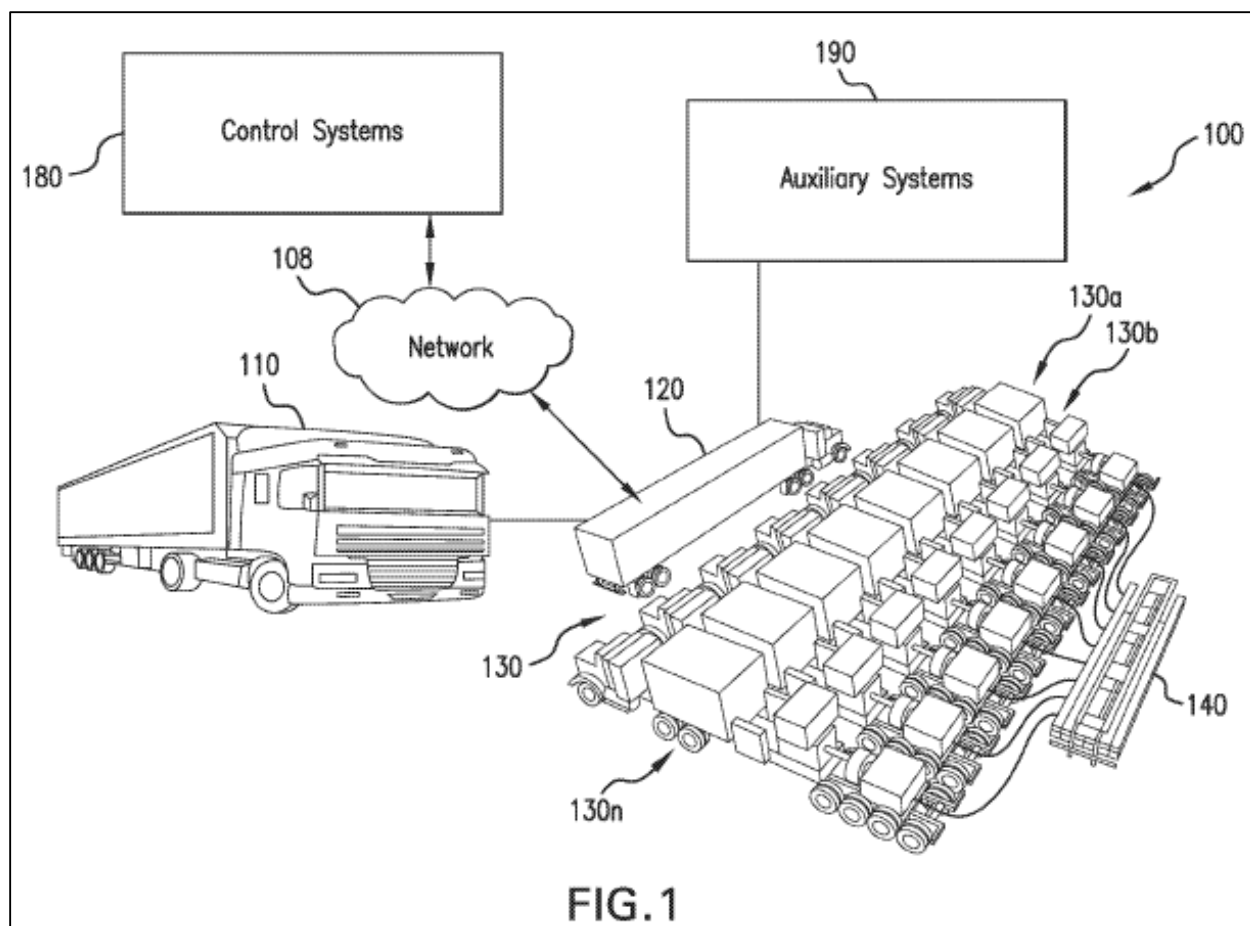
2. Claim 9

- a) The hydraulic fracturing system of claim 1, wherein the first area is opposite the second area and the second area includes a hitch for coupling to a prime mover.

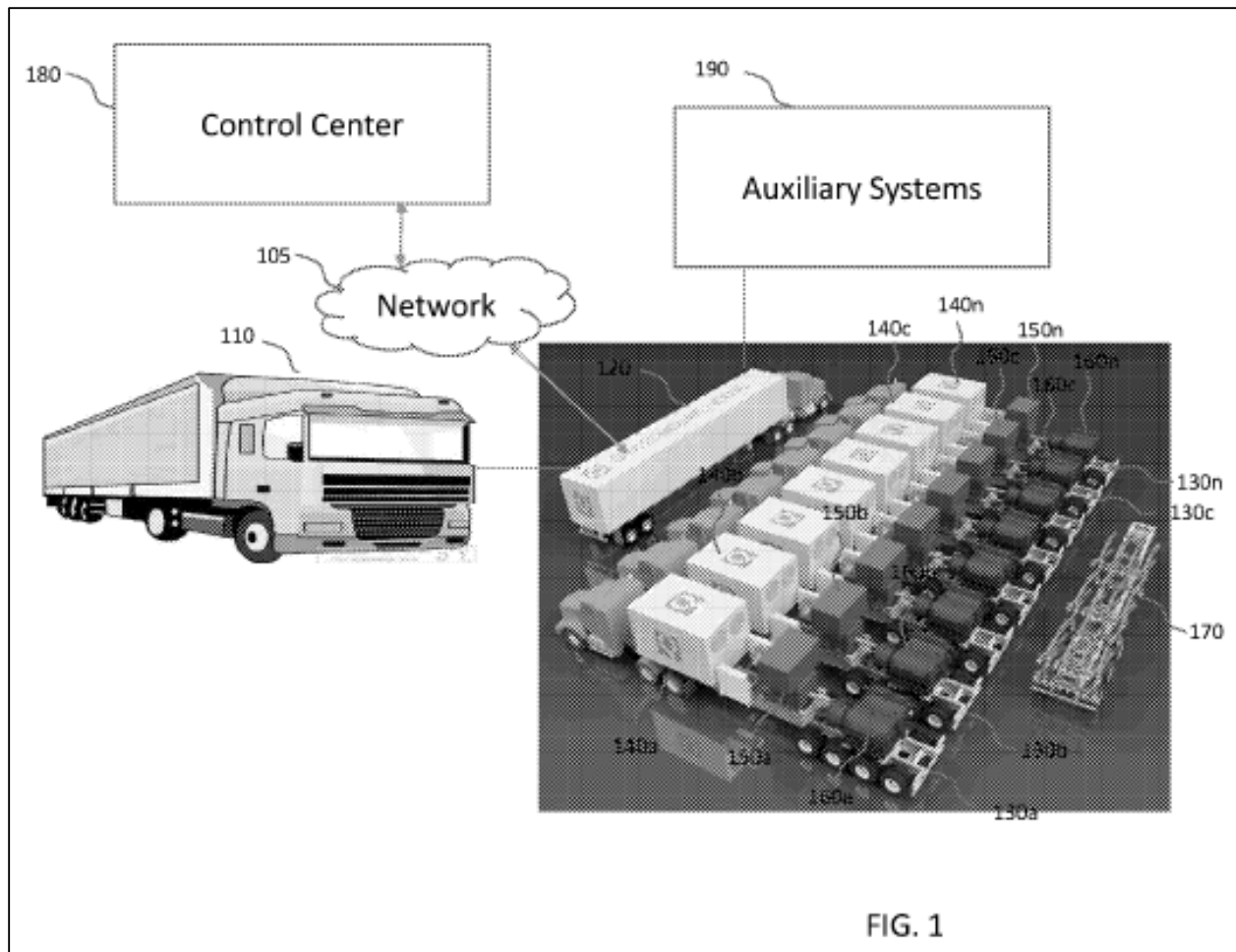
As discussed above with reference to Limitation 1[a], *Fischer*’s pump trailer includes a “*first area*,” wherein an electric motor and a hydraulic pump are mounted,

and a “*second area*” wherein a VFD is located. *Supra*, VIII.A.1.(b). As depicted in Figure 3 of *Fischer* and Figure 2 of *Fischer Provisional*, the “*first area*” and “*second area*” are on opposite ends of the pump trailer, such that *Fischer* discloses “*wherein the first area is opposite the second area.*” *See id.*

Further, the pump trailer “is hauled in via a semi-truck and is positioned closest to the fracking well 109 as compared to other components in order to execute the fracking operation.” EX1008, 6:45-49; EX1009, [0017]. A POSITA would have understood that for *Fischer*’s pump trailer to be “hauled in via a semi-truck,” the pump trailer would be hitched to the semi-truck (“*couple[ed] to a prime mover*”). EX1003, ¶176. Hitching a trailer to a prime mover to move pumping equipment was a well-known technique in drilling operations. *Id.* (citing EX1012, Abstract (“The pump and motor are mounted on a trailer that is hitched to a tractor.”); EX1018, 2:65-70, Fig. 3 (depicting a trailer that is attached, via a hitch, “to the fifth wheel 18 on a prime mover”)). And a POSITA would have understood that the hitch is included in the second area of *Fischer*’s pump trailer, as indicated by Figure 1 of *Fischer* and Figure 1 of *Fischer Provisional*, both of which show that the pump trailer is coupled to a semi-truck at the “*second area*” of the pump trailer. *Id.*



EX1008, Fig. 1.



EX1009, Fig. 1.

In the alternative, it would have been obvious to a POSITA that for *Fischer*'s pump trailer to be "hailed in via a semi-truck," the pump trailer would be hitched to the semi-truck ("*couple[ed] to a prime mover*"), as hitching a trailer to a prime mover to move pumping equipment was a well-known technique in drilling operations EX1003, ¶176 (citing EX1012, Abstract; EX1018, 2:65-70, Fig. 3).

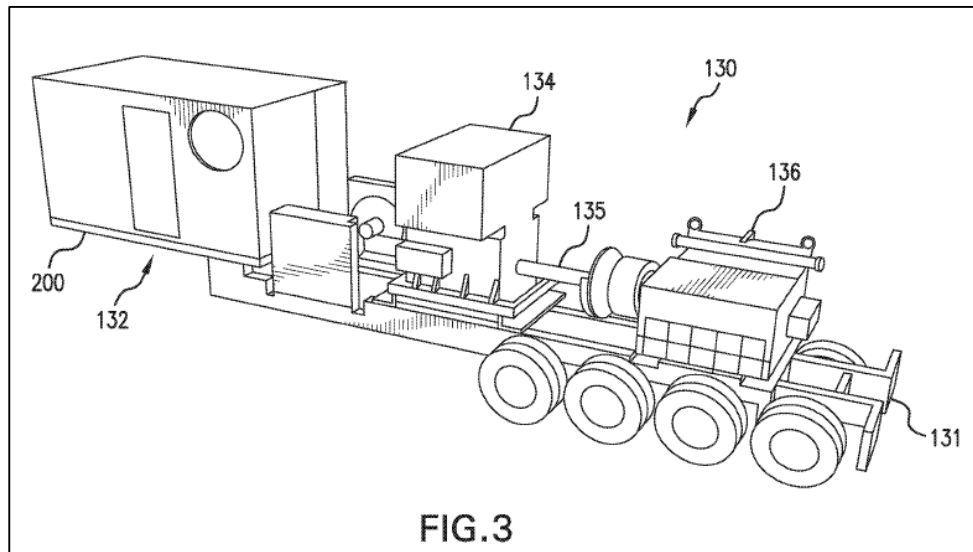
Thus, *Fischer* teaches Claim 9.

B. Ground 2: The combination of Fischer and Oehring-I renders obvious Claim 2

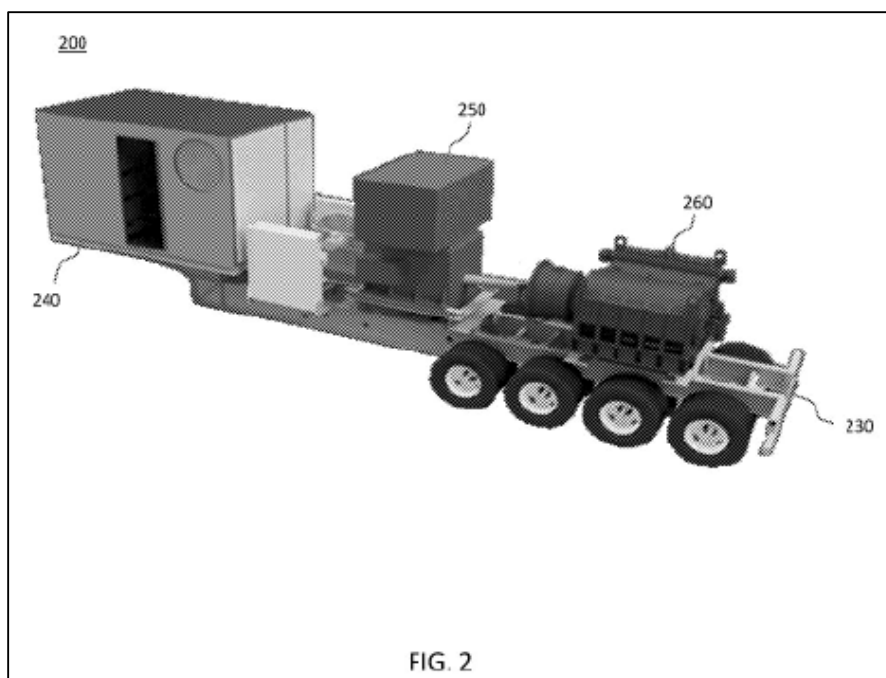
1. Motivation to combine

a) Fischer with Oehring-I

Fischer describes “a single, single-pump configuration 130 that includes a medium-voltage VFD [variable frequency drive] 132, a single, single-shaft electric motor 134 and a single hydraulic pump 136, each of which is mounted on a single pump trailer 131.” EX1008, 12:3-8; EX1009, [0031]. Copies of Figure 3 of *Fischer* and Figure 2 of *Fischer Provisional*, which depict the pump trailers, are provided below:

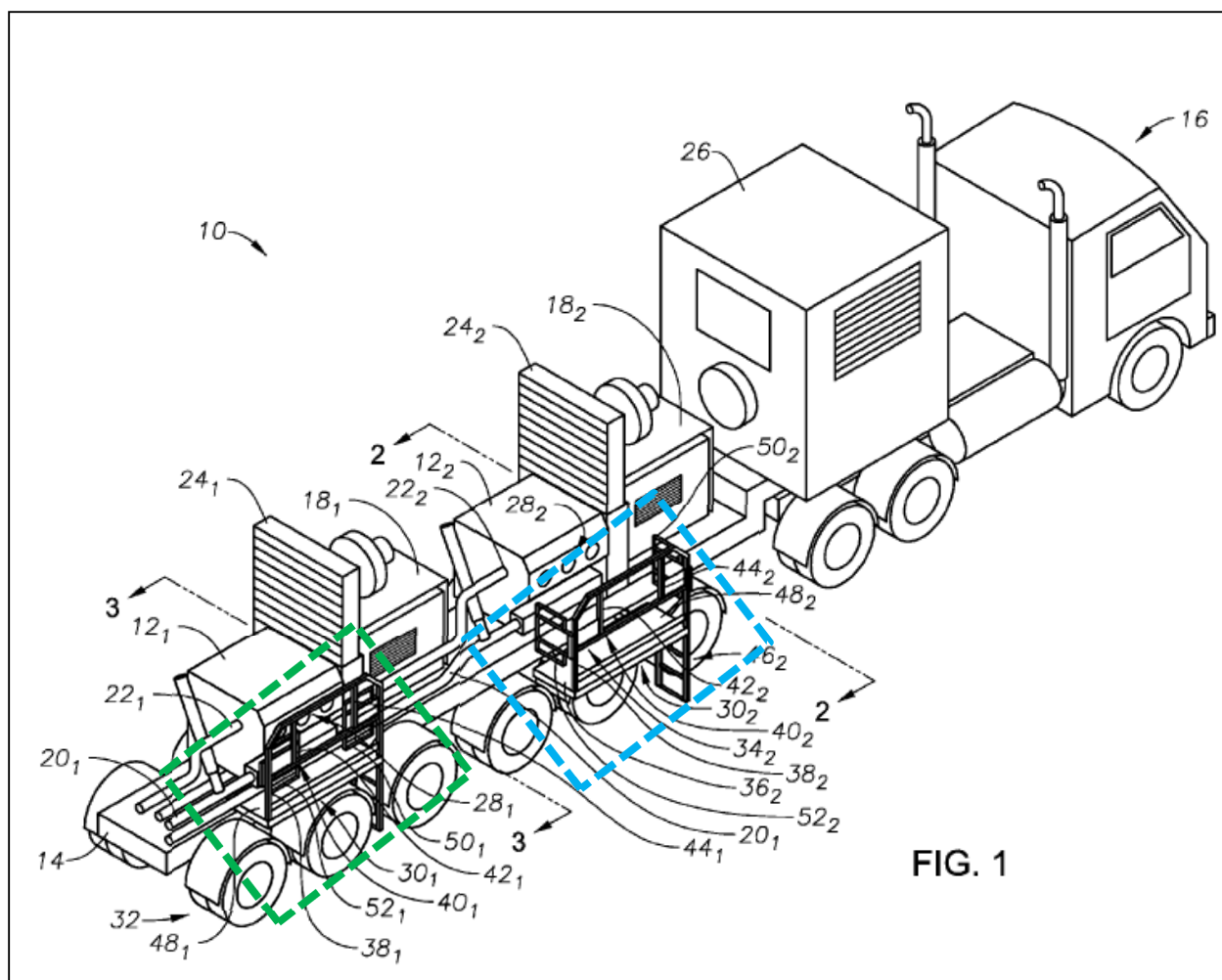


EX1008, Fig. 3 (depicting pump 136).



EX1009, Fig. 2 (depicting pump 260).

Similarly, *Oehring-I* discloses a trailer on which an electric motor and a pump are mounted. EX1012, Abstract. Further, a “platform assembly is mounted onto the trailer, and which is selectively moveable between deployed and stowed configurations.” *Id.* Figure 1 of *Oehring-I*, annotated below, depicts examples of the platform assembly configurations, where “platform assembly 30₁ is shown in a stowed position” (annotated in green) and “platform assembly 30₂ is shown in a deployed configuration” (annotated in blue, providing access to pump 12₂). *Id.*, [0019].



EX1012, Fig. 1 (annotated).

A POSITA would have been motivated to incorporate *Oehring-I*'s platform assembly into *Fischer*'s pump trailer for several reasons. First, design incentives would have motivated a POSITA to make this combination. *Oehring-I* explains that maintenance of trailer-mounted pump can be "frequent" due to erosion experienced by several pump components, and that such maintenance can be "hazardous" when the pump is mounted "above grade on mobile trailers." EX1012, [0006]. Accordingly, a POSITA implementing *Fischer*'s pump trailer, which supports a

hydraulic fracturing pump, would have been motivated to seek solutions to provide more reliable and safer access to *Fischer's* pump for maintenance, such as *Oehring-I's* moveable platform. EX1003, ¶182.

Second, incorporating *Oehring-I's* platform assembly to provide access to *Fischer's* trailer-mounter pump is applying a known technique (*Oehring-I's* retractable, trailer-mounted platform assembly) to improve similar devices (*Fischer's* pump trailer) in the same way. EX1003, ¶183; *KSR In 'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). The results of the combination would be predictable: a pump trailer with a retractable platform assembly that provides maintenance operators access to *Fischer's* pump mounted on the pump trailer. EX1003, ¶183. Indeed, a POSITA would have recognized that *Oehring-I's* platform assembly would be implemented in *Fischer's* pump trailer just as it is in *Oehring-I*, *i.e.*, such that it is installed over the wheels on *Fischer's* pump trailer to provide access to *Fischer's* pump. *Id.*, ¶182. Accordingly, a POSITA would have been motivated to combine *Fischer* and *Oehring-I* and would have had a reasonable expectation of success in doing so. EX1003, ¶¶182-183.

2. Claim 2

a) The hydraulic fracturing system of claim 1, further comprising: a slide out platform integrated into the first area, the slide out platform being driven between a retracted position and a deployed position, wherein the deployed position provides a work area proximate the electric powered, multi-plunger pump.

Oehring-I discloses a trailer on which a hydraulic pump and an electrically powered motor are mounted. EX1012, Abstract. Further, a “platform assembly is mounted onto the trailer, and which is selectively moveable between deployed and stowed configurations.” *Id.* The platform assembly is coupled to support rails, which “slidingly engage” with mount assemblies on the trailer such that the platform can be “readily moved between the stowed and deployed configurations.” *Id.*, [0022]-[0023]. “In the stowed configuration the platform assembly is anchored in place over wheels on the trailer. In the deployed configuration, the platform assembly provides work surface so that operations personnel can readily access the pump on the trailer.” *Id.*, Abstract. Figure 1 of *Oehring-I*, annotated below, depicts examples of the platform assembly configurations, where “platform assembly 30₁ is shown in a stowed position” (annotated in green) and “platform assembly 30₂ is shown in a deployed configuration” (annotated in blue). *Id.*, [0019].

Oehring-I's platform assembly discloses that “*the deployed position provides a work area proximate the electric powered, multi-plunger pump.*” *Id.*, ¶¶186-189; see also EX1012, Fig. 1 (depicting deployed platform assembly 30₂ proximate to pump 12₂).

A POSITA would have understood that in the combined *Fischer-Oehring-I* system, *Oehring-I*'s platform assembly would have been incorporated into *Fischer*'s pump trailer to provide a “selectively movable” platform that gives operations personnel access to *Fischer*'s pump, as taught by *Oehring-I*. See *supra*, VIII.B.1.(a). And because *Fischer*'s pump is located in the “*first area*” of *Fischer*'s pump trailer, a POSITA would have understood that *Oehring-I*'s platform assembly, which is proximate to and provides access to the pump, would be “*integrated into the first area.*” EX1003, ¶189.

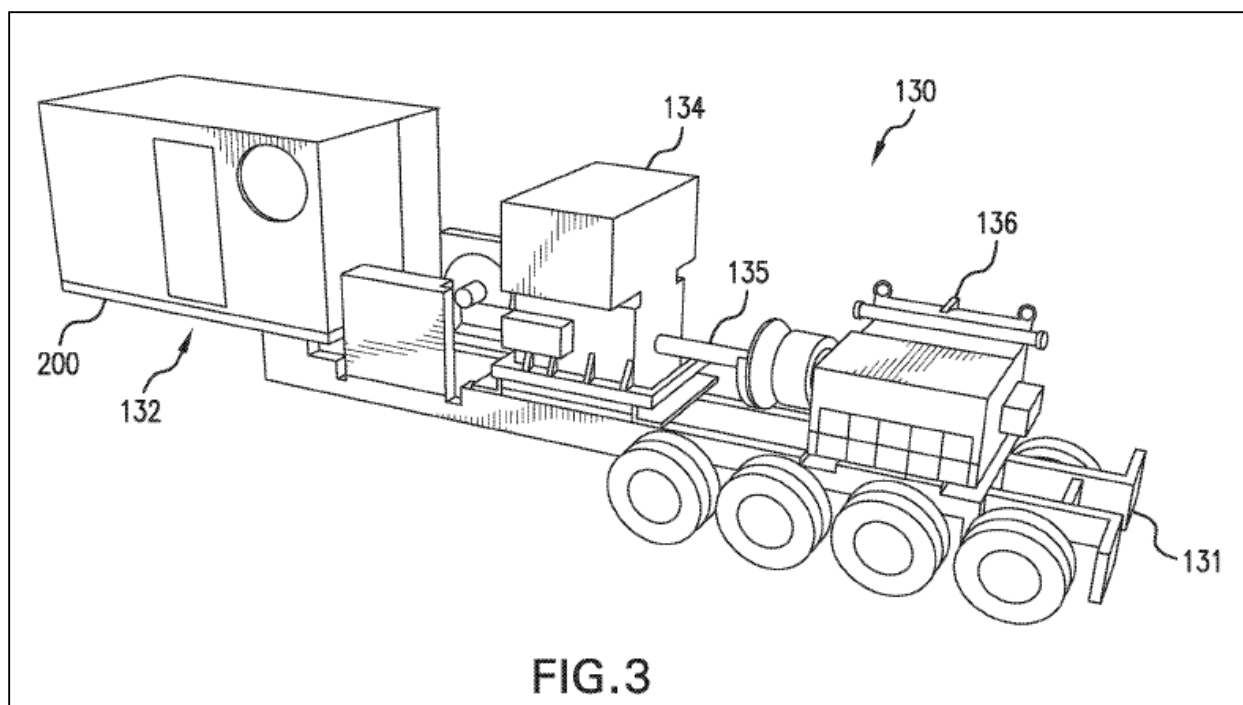
Accordingly, the *Fischer-Oehring-I* combination renders obvious Claim 2.

C. Ground 3: The combination of Fischer and Oehring-II renders obvious Claim 3

1. Motivation to combine

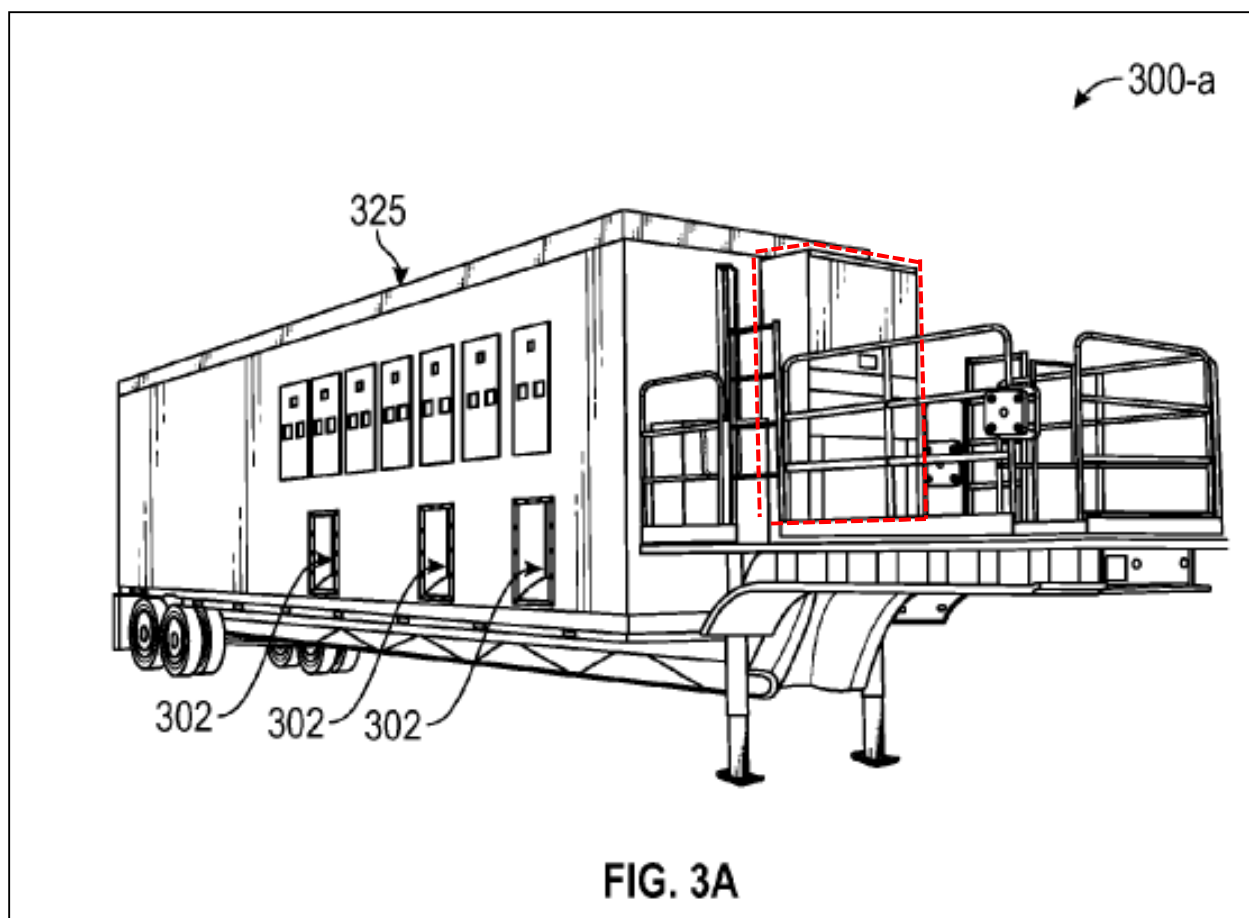
a) *Fischer with Oehring-II*

Fischer describes a pump trailer that includes a first area in which an electric motor and a hydraulic pump are mounted and a second, elevated area that features an enclosure wherein a VFD is housed. See *supra*, VIII.A.1.(b)-(e). Figure 3 of *Fischer*, depicting the pump trailer, is copied below:



EX1008, Fig. 3; *see also* EX1009, Fig. 2.

Oehring-II describes a “switchgear trailer” that provides electric connections for various components of a fracturing system. EX1016, 7:21-28. Annotated Figure 3A of *Oehring-II*, provided below, depicts the switchgear trailer:



EX1016, Fig. 3A (annotated).

As depicted, the switchgear trailer further comprises an elevated platform that is located along the trailer's longitudinal axis and provides access to the switchgear trailer as well as an enclosure adjacent to the trailer (annotated in red above).

A POSITA would have been motivated to incorporate *Oehring-II*'s elevated platform into *Fischer*'s pump trailer for multiple reasons. First, design incentives would have motivated a POSITA to make this combination. As depicted in Figure 3 of *Fischer*, the second area of *Fischer*'s pump trailer (wherein the VFD enclosure is located) is elevated above the ground; however, *Fischer* does not describe how

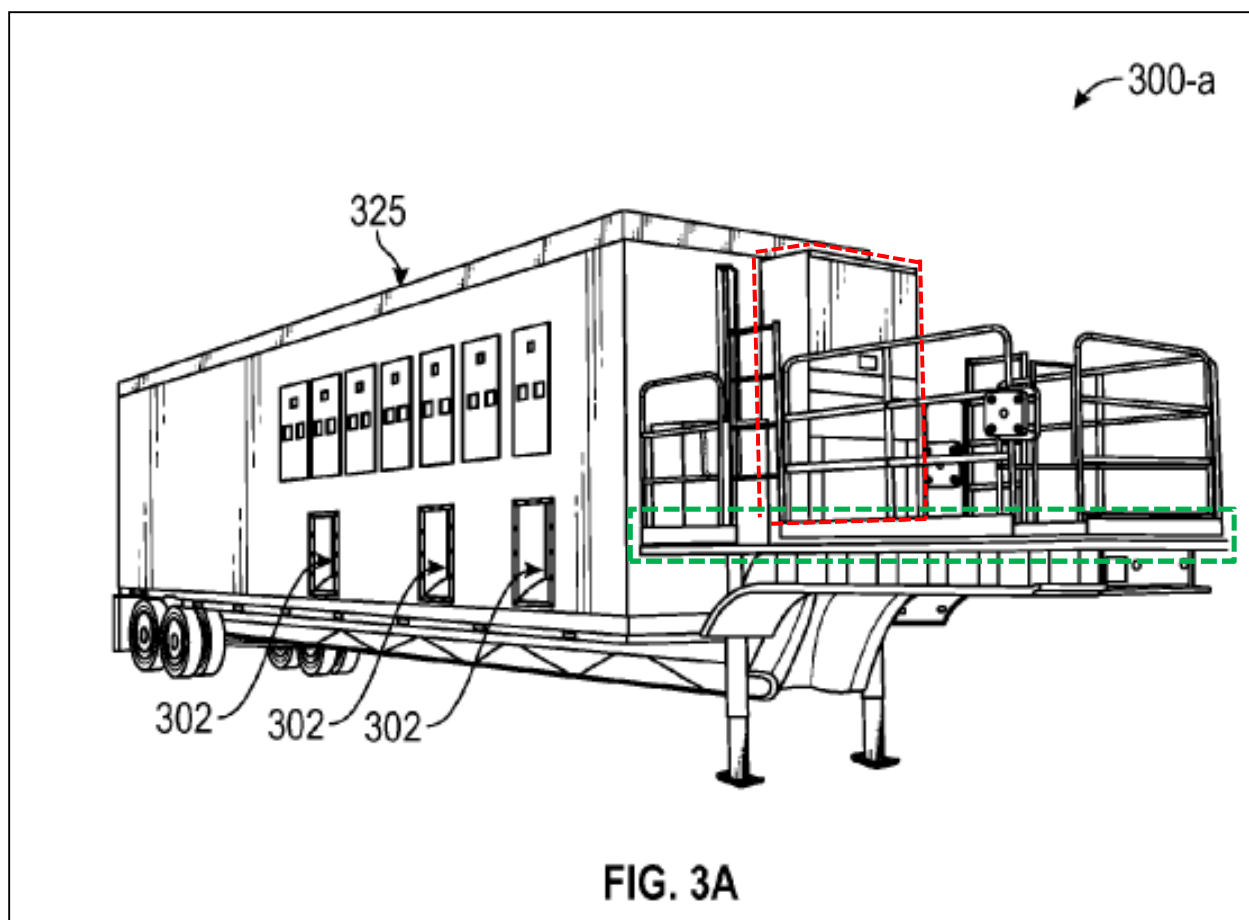
this area is actually accessed by an operator. A POSITA implementing *Fischer's* pump trailer therefore would have been motivated to incorporate some sort of apparatus to access these components, such as the elevated platform depicted in *Oehring-II*. EX1003, ¶193.

Second, incorporating *Oehring-II's* platform to provide access to the second area of *Fischer's* pump trailer is applying a known technique (a platform coupled to a trailer as taught by *Oehring-II*) to improve similar devices (*Fischer's* pump trailer) in the same way. *Id.*, ¶194; *KSR 'Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). The results of the combination would be predictable: a pump trailer with a platform located along trailer's longitudinal axis at the front of the trailer that provides operators access to the elevated areas of *Fischer's* pump trailer. EX1003, ¶194. Accordingly, a POSITA would have been motivated to combine *Fischer* and *Oehring-II* and would have had a reasonable expectation of success in doing so. *Id.*

2. Claim 3

a) The hydraulic fracturing system of claim 1, further comprising: a work platform proximate the enclosure in the second area, the work platform providing access to the enclosure, the work platform arranged such that the enclosure is between the work platform and the first area.

Oehring-II describes a “switchgear trailer” that provides electric connections for various components of a fracturing system. EX1016, 7:21-28. Annotated Figure 3A of *Oehring-II*, provided below, depicts the switchgear trailer:

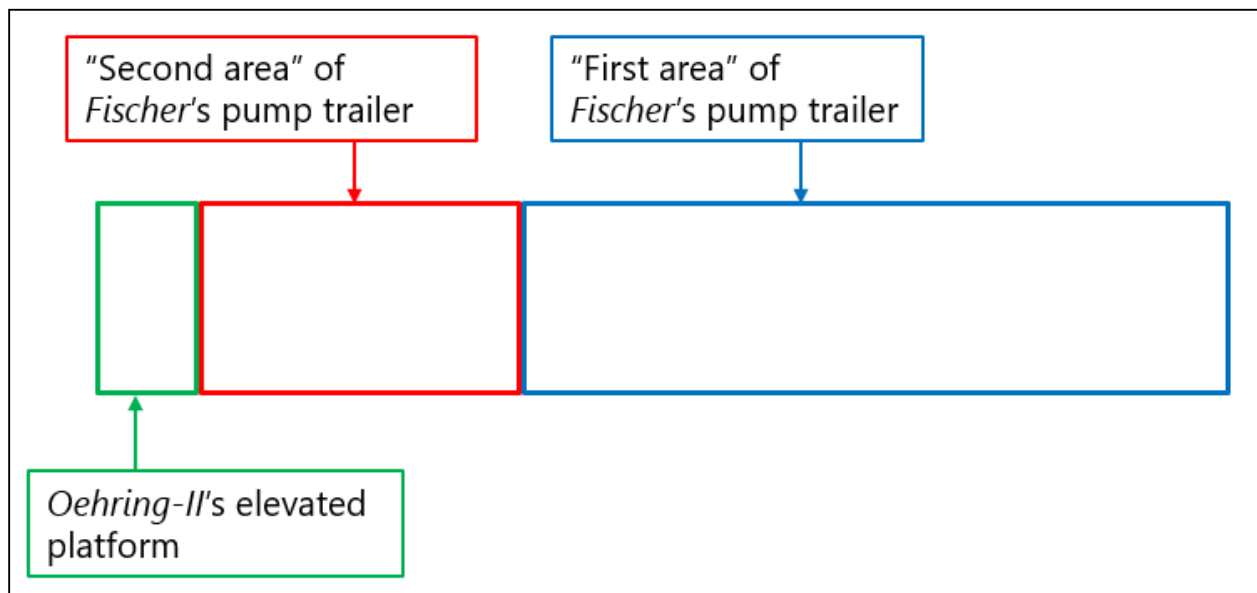


EX1016, Fig. 3A (annotated).

As depicted, the switchgear trailer further comprises an elevated platform (annotated in green) that is located along the trailer's longitudinal axis at the front of the trailer and provides access to the switchgear trailer as well as an enclosure adjacent to the trailer (annotated in red above).

And as discussed above with reference to Ground 1, *Fischer* describes a pump trailer that includes a second, elevated area that features an enclosure wherein a VFD is housed. *See supra*, VIII.A.1.(b), (d)-(e).

A POSITA would have understood that in the combined *Fischer-Oehring-II* system, *Oehring-II*'s elevated platform would be incorporated into *Fischer*'s pump trailer to provide operators access to the second area of *Fischer*'s pump trailer. EX1003, ¶198. That is, a POSITA would have understood that *Oehring-II*'s elevated platform would be placed along the trailer's longitudinal axis the front of *Fischer*'s pump trailer (as taught by *Oehring-II*) at the floor height of the second, elevated area of *Fischer*'s pump trailer to provide access to this area. *Id.*; *see supra*, VIII.A.1.(b) (highlighting the “second area” of *Fischer*'s pump trailer). The annotation below depicts a top-down view of the combined *Fischer-Oehring-II* system.



A POSITA would have understood that in this combined system, *Oehring-II*'s elevated platform (annotated in green above) would be “*proximate the enclosure in the second area, the work platform providing access to the enclosure,*” because

Fischer’s “*enclosure*” is located in the second area of the pump trailer, as discussed above with reference to Limitations 1[c] and 1[d]. EX1003, ¶198; *supra*, VIII.A.1.(d)-(e). Further, the elevated platform being configured in this manner is also “*arranged such that the enclosure is between the work platform and the first area,*” as depicted in the annotation above. EX1003, ¶198.

Further, although *Fischer* depicts that the “*enclosure*” in the pump trailer’s second area includes an opening to the side of the trailer, it would have been obvious to a POSITA that such an opening would instead be located at the front of the enclosure such that *Oehring-II*’s elevated platform also provides access to this opening and, as a result, the components located within the “*enclosure.*” EX1003, ¶199 (explaining that such a modification would involve a simple rearrangement of *Fischer*’s enclosure that is within the skill of a POSITA).

Accordingly, the *Fischer-Oehring-II* combination renders obvious Claim 3.

D. Ground 4: The combination of Fischer and Orban renders obvious Claims 4 and 5

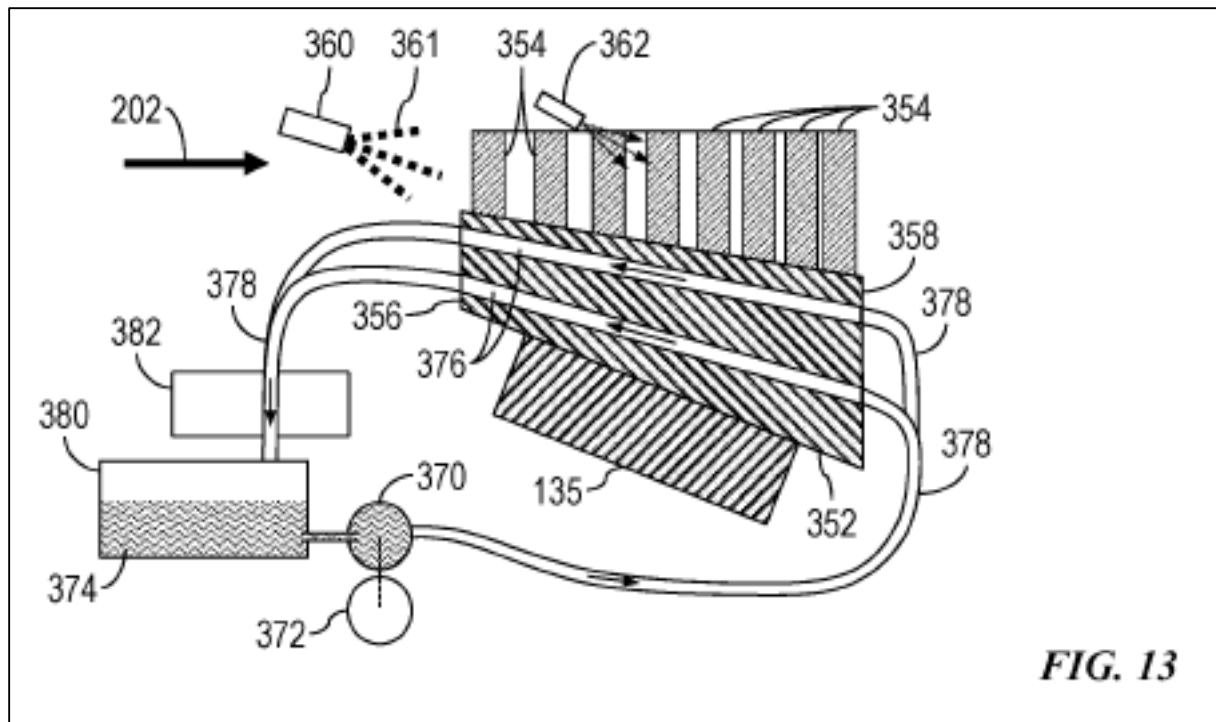
1. Motivation to combine

a) *Fischer with Orban*

Fischer describes “a single, single-pump configuration 130 that includes a medium-voltage VFD [variable frequency drive] 132.” EX1008, 12:3-8; EX1009, [0031]. And as discussed above with reference to Limitation 1[d], a POSITA would

have understood that the VFD is located within an enclosure located in the “*second area*” of *Fischer*’s pump trailer. *See supra*, VIII.A.1.(e).

Orban discloses a VFD, located in a “housing,” that comprises insulated-gate bipolar transistor (IGBT) devices that are “operable to convert input power to the output power” used to drive an electric motor in a drilling environment. EX1011, [0005]. The IGBTs are coupled to a “radiator,” which is mounted within the housing, “such that heat generated by the IGBTs is transferred out of the housing via the radiator.” *Id.*’ *Orban*’s radiator may implement a water cooling system, wherein “cooling fluid (e.g., water)” is pumped through channels 376 in the base plate 356 of the radiator such that the “heat carried from the base plate 356 by the cooling fluid 374 may dissipate in a collection 380 and/or via a radiator 382.” *Id.* Figure 13 of *Orban* depicts this configuration:



Id., Fig. 13.

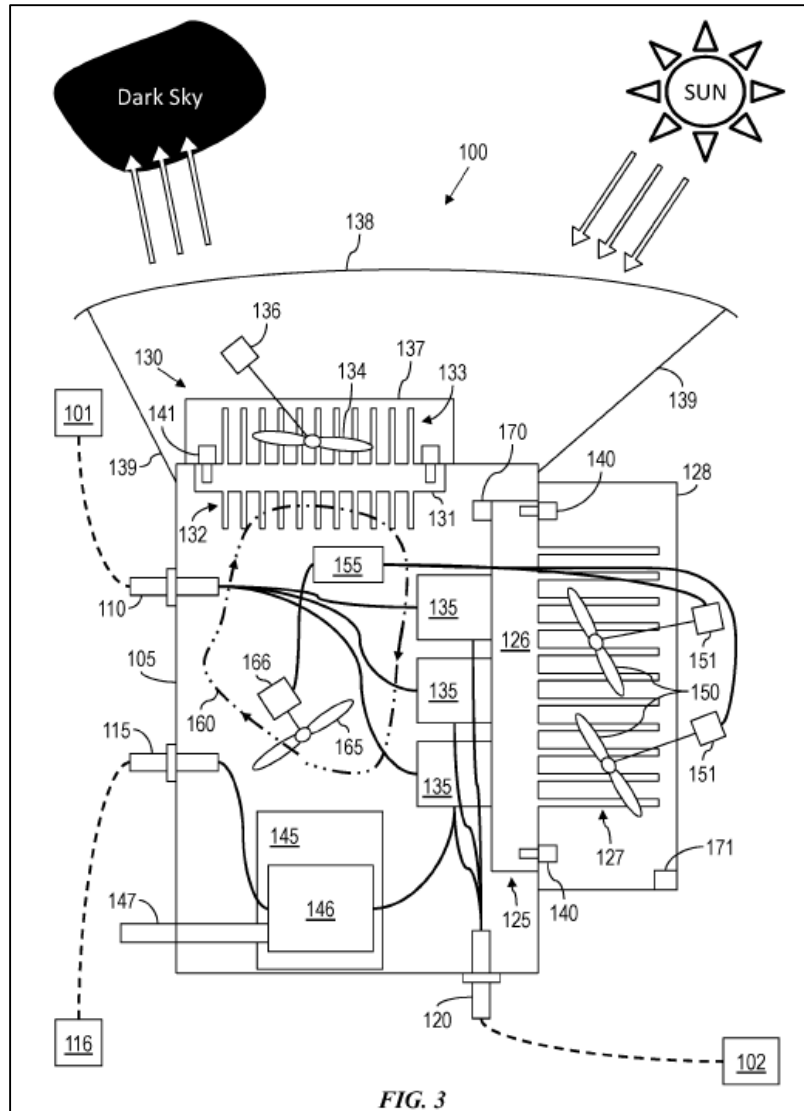
A POSITA would have been motivated to incorporate *Orban*'s water-based radiator alongside *Fischer*'s VFD for several reasons. First, design incentives would have motivated a POSITA to make this combination. A POSITA would have understood that it is important to control the VFD's temperature and to avoid overheating caused by the VFD's operation, and would have sought out solutions like *Orban*'s water-based radiator when implementing *Fischer*'s VFD. EX1003, ¶ 202. A POSITA would have recognized *Orban*'s radiator, whose design allows a VFD to "operate at substantially the same temperature," would achieve such goals. EX1011, [0065]; EX1003, ¶202.

Further, incorporating *Orban*'s water-based radiator to cool *Fischer*'s VFD is applying a known technique (a water-based VFD cooling system) to improve similar devices (*Fischer*'s VFD) in the same way. EX1003, ¶204; *KSR Int'l*, 550 U.S. at 417. The results of the combination would be predictable: a VFD coupled to a water-based radiator for cooling the VFD and, by extension, the enclosure in which the VFD is located. EX1003, ¶204. Accordingly, a POSITA would have been motivated to combine *Fischer* and *Orban* and would have had a reasonable expectation of success in doing so. *Id.*

2. Claim 4

- a) The hydraulic fracturing system of claim 1, further comprising: a cooling system for the enclosure, the cooling system being a liquid cooling system thermally coupled to at least one of the VFD or the transformer.

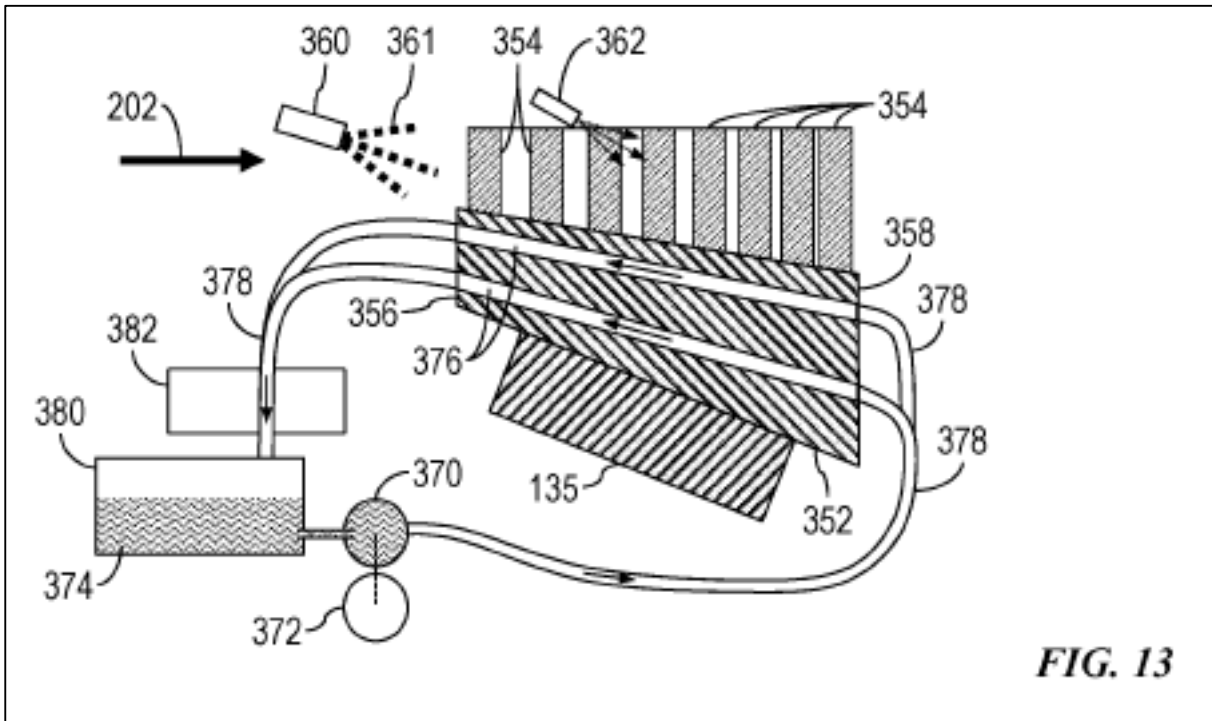
Orban discloses a VFD, located in a “housing,” that comprises insulated-gate bipolar transistor (IGBT) devices that are “operable to convert input power to the output power” used to drive an electric motor in a drilling environment. EX1011, [0005]. The IGBTs are coupled to a “radiator,” which is mounted within the housing, “such that heat generated by the IGBTs is transferred out of the housing via the radiator.” *Id.* Figure 3 of *Orban*, copied below, depicts the general configuration of the VFD and radiator:



EX1011, Fig. 3. As depicted, *Orban's* VFD is “implemented via three insulated-gate bipolar transistor (IGBT) devices 135,” which are “secured to the plate 126” of the primary radiator 125. *Id.*, [0045]. This coupling “permit[s] heat transfer (via conduction and/or otherwise) from the IGBTs 135 to the radiating members 127” of the primary radiator 125. *Id.*

In one embodiment, *Orban's* radiator implements an additional technique wherein the IGBTs 135 (*i.e.*, the VFD) are cooled “as a conventional water-cooled

VFD.” EX1011, [0070]. In this embodiment, depicted by Figure 13 of *Orban*, copied below, IGBTs 135 are coupled to base plate 352, which is further coupled to radiating members 354.



Id., Fig. 13, [0065] (explaining that base plate 352 comprises a “leading edge 356” and a trailing edge 358,” and that “[t]he base plate 352 and the radiating members 354 are substantially the same as the base plate 126 and the radiating members 127 shown in FIG. 3.”). In this configuration, “cooling fluid (e.g., water)” is pumped through channels 376 in the base plate 356 of the radiator such that the “heat carried from the base plate 356 by the cooling fluid 374 may dissipate in a collection 380 and/or via a radiator 382.” *Id.*, [0070].

Under the *Fischer-Orban* combination, a POSITA would have understood that *Orban*'s water-based radiator would have been incorporated into *Fischer*'s VFD to cool the VFD as described in *Orban*. EX1003, ¶208. Under such an implementation, *Orban*'s water-based radiator is a “*liquid cooling system thermally coupled to . . . the VFD*,” because the radiator baseplate is thermally coupled to *Fischer*'s VFD as taught by *Orban*. *Id.* Further, a POSITA would have understood *Orban*'s water-based radiator to be a “*cooling system for the enclosure*” because it cools the VFD, thereby cooling “*the enclosure*” in which the VFD is located (as discussed above with reference to Limitation 1[d], *supra* VIII.A.1.(e)) by limiting the amount of heat radiated by the VFD into the enclosure. EX1003, ¶208.

Thus, the *Fischer-Orban* combination renders obvious Claim 4.

3. Claim 5

- a) The hydraulic fracturing system of claim 4, wherein the liquid cooling system includes water or glycol.

As discussed above with reference to Claim 4, *Orban*'s water-based radiator (“*the liquid cooling system*”) uses water as the cooling liquid. *Supra*, VIII.D.2. Thus, the *Fischer-Orban* combination renders obvious Claim 5.

E. Ground 5: The combination of Fischer and Karassik renders obvious Claims 6-8

1. Motivation to combine

- a) *Fischer* with *Karassik*

Fischer discloses a quintuplex (five-plunger) fracturing pump. *See supra*, VIII.A.1.(c). A POSITA would have searched for other references to better understand details of multi-plunger pumps that are not described in *Fischer*. EX1003, ¶213. One such reference is *Karassik*, which is a publication that provides granular details about plunger pumps and describes fundamental pump theory and operations, including the use of one-, two-, three-, four-, five- six-, seven-, and nine-plunger pumps, that would be invaluable to a POSITA looking to apply the teachings of *Fischer* to a practical system. EX1013, 3.11 (Table 7).

In particular, *Karassik*'s description of the ideal flowrate produced by plunger pumps would aid a POSITA's selection of pump speed and stroke length when implementing *Fischer*'s pumping system to achieve a desired flowrate. EX1003, ¶216; EX1013, 3.4.

Further, *Karassik*'s description of discharge flow pulsations produced by plunger pumps would aid a POSITA's selection of the number of plungers incorporated into a pump when implementing *Fischer*'s pumping system and would have motivated a POSITA to implement higher count plunger pumps to obtain the additional flowrates and reduced fluid pulsation of those pumps, as taught by *Karassik*. EX1003, ¶216; EX1013, 3.10-3.11.

A POSITA would have recognized that modifying *Fischer* to use seven plungers or nine plungers, as taught by *Karassik*, rather than five plungers would

involve the simple substitution of one known element (a seven- or nine-plunger pump, as taught by *Karassik*) for another (*Fischer's* five-plunger pump) to obtain the predictable result of performing fracturing operations with a seven-plunger or nine-plunger pump, and the associated increased flowrates and reduced pressure variations that come from using the higher plunger count pumps. EX1003, ¶ 217. Accordingly, a POSITA would have been motivated to combine *Karassik's* description of inherent characteristics of plunger pumps with the *Fischer* system and would have had a reasonable expectation of success in doing so. *Id*

2. Claim 6

a) The hydraulic fracturing system of claim 1, wherein the electric powered, multi-plunger pump is a septuplex pump having seven plungers.

As discussed above with reference to Limitation 1[b], a POSITA would have understood that the pump disclosed by *Fischer* is a quintuplex (five-plunger) pump. *See supra*, Section VIII.A.1.(c).

In addition to “quintuplex” pumps, *Karassik* discloses “septuplex” (seven-plunger) pumps. *See, e.g.*, EX1013, 3.11 (Table 7, identifying “Septuplex” as the industry term for a seven-plunger pump). A POSITA would have understood that *Fischer's* quintuplex pump could be substituted for a septuplex pump, as these types were well-known alternatives for each other, as indicated by *Karassik*. EX1003,

¶219. Accordingly, Claim 6 is rendered obvious by the *Fischer-Karassik* combination.

3. Claim 7

- a) The hydraulic fracturing system of claim 1, wherein the electric powered, multi-plunger pump includes at least one of 9 plungers or 11 plungers.

As discussed above with reference to Limitation 1[b], a POSITA would have understood that the pump disclosed by *Fischer* is a quintuplex (five-plunger) pump. *See supra*, Section VIII.A.1.(c).

In addition to “quintuplex” pumps, *Karassik* discloses “nonuplex” (nine-plunger) pumps. *See, e.g.*, EX1013, 3.11 (Table 7, identifying “Nonuplex” as the industry term for a nine-plunger pump). A POSITA would have understood that *Fischer*’s quintuplex pump could be substituted for a nonuplex pump, as these types were well-known alternatives for each other, as indicated by *Karassik*. EX1003,

¶221. Accordingly, Claim 7 is rendered obvious by the *Fischer-Karassik* combination.

4. Claim 8

- a) The hydraulic fracturing system of claim 1, wherein the electric powered, multi-plunger pump includes more than 5 plungers.

As discussed above with reference to Claims 6 and 7, a POSITA would have understood that *Fischer*’s quintuplex pump could be substituted for a septuplex or a nonuplex pump, as these types were well-known alternatives for each other, as

indicated by *Karassik*. EX1003, ¶¶218-222. Accordingly, Claim 8 is rendered obvious by the *Fischer-Karassik* combination.

F. Ground 6: Fischer renders obvious Claims 10, 11, 19, and 20 in view of the knowledge of a POSITA and, in the alternative, Karassik

1. Motivation to combine

a) *Fischer with Karassik*

See supra, VIII.E.1; EX1003, ¶223.

2. Claim 10

a) The hydraulic fracturing system of claim 1, wherein the electric powered, multi-plunger pump is a single pump and a first pump output meets or exceeds a second pump output associated with two quintuplex pumps.

As discussed above with reference to Limitation 1[b], *Fischer* discloses that its hydraulic pump is a five-plunger pump powered by an electric motor. It was well known in the art that the ideal flow rate of a single cylinder reciprocating pump is given by the following equation (“Equation 1”):

$$D = A \times m \times n \times s \times 6 \times 10^{-5},$$

where D = displacement (volume flow rate, m³/h), A = cross-sectional area of plunger or piston (mm²), m = number of plungers or pistons, n = rpm of pump, s = stroke of pump (mm) (half the distance the plunger moves in one rev). *See* EX1003, ¶224 (citing *Karassik* (EX1013), 3.4).

As can be seen from Equation 1, there is a direct relationship between a pump’s flowrate (D) (*i.e.*, its “*pump output*”) and the pump’s stroke length (s), pump

speed (n), number of plungers (m), and cross-sectional area of the plungers (A). *Id.* This is an inherent characteristic of plunger pumps. EX1003, ¶224. Accordingly, it would have been obvious to a POSITA that operating *Fischer*'s hydraulic pump at a first speed with a first stroke length and a first cross-sectional area of the plungers would result in a first flowrate (“*first pump output*”) that is equal to a second flowrate (“*meets . . . a second pump output*”) achieved by two quintuplex pumps each operating at either half of the first speed, with half of the first stroke length, or with half of the cross-sectional area for each plunger. *Id.*, ¶226 In the alternative, *Karassik* renders obvious Claim 10 for the same reasons. *Id.*

Accordingly, Claim 10 is rendered obvious by *Fischer* in view of the knowledge of a POSITA and, in the alternative, by *Fischer* in view of *Karassik*.

3. Claim 11

- a) 11[p]: A hydraulic fracturing system, comprising:

See supra, VIII.A.1.(a).

- b) 11[a]: an electric powered, multi-plunger pump, arranged on a support structure, the electric powered multi-plunger pump powered by at least one electric motor;

As discussed above with reference to Limitations 1[a] and 1[b], *Fischer*'s pump trailer (“*support structure*”) includes a five-plunger (“*multi-plunger*”) pump powered by an electric motor. *Supra*, VIII.A.1.(b)-(c). For at least the same reasons, *Fischer* teaches Limitation 11[a].

c) 11[b]: a variable frequency drive (VFD), arranged on the support structure, connected to the at least one electric motor to control a speed of the at least one electric motor, the VFD positioned separate from the electric powered, multi-plunger pump and within an enclosure; and

As discussed above with reference to Limitations 1[a], 1[c], and 1[d], *Fischer's* pump trailer (“*support structure*”) includes a VFD that is connected to the electric motor to control the speed of the electric motor and is located within an enclosure that is separate from *Fischer's* hydraulic pump (“*the electric-powered multi-plunger pump*”). *Supra*, VIII.A.1.(b), VIII.A.1.(d), VIII.A.1.(e). For at least the same reasons, *Fischer* teaches Limitation 11[b].

d) 11[c]: a transformer, arranged on the support structure, configured to distribute power for operation of the electric powered, multi-plunger pump, the power being received from at least one generator at a voltage higher than an operating voltage of the electric powered pump, the transformer positioned within the enclosure;

As discussed above with reference to Limitations 1[a] and 1[d], *Fischer's* pump trailer (“*support structure*”) includes a VFD that further includes a transformer that steps down an “initial voltage” (e.g., 13.8 kV) to a lower voltage level usable by the VFD to power the electric motor which, in turn, powers the hydraulic pump (“*the electric powered pump*”). *Supra*, VIII.A.1.(b), VIII.A.1.(e). This stepping down is provided because “the initial voltage level of the electric power distributed by the power distribution system 120 as generated by the power generation system 110 may be at a voltage level that is significantly higher than a voltage level that is appropriate

to drive the single-shaft electric motor 134.” EX1008, 12:30-34, 13:64-14:3; EX1009, [0032]-[0033].

Further, the power generated at the “initial voltage level” is generated by a “power generation system,” which may include “at least one gas power source (e.g., a gas turbine engine and/or generator).” EX1008, 7:28-30; EX1009, [0019]. Accordingly, *Fischer* discloses that its transformer receives power “*from at least one generator.*”

Fischer therefore discloses Limitation 1[c].

e) 11[d]: wherein the electric powered, multi-plunger pump includes an odd number of plungers configured to reduce kinematic flow ripple.

As discussed above with reference to Limitation 1[b], *Fischer* teaches an electric-powered hydraulic pump with five plungers. *Supra*, VIII.A.1.(c). A POSITA would have understood that *Fischer*’s hydraulic pump is “*configured to reduce kinematic flow ripple.*” It was well-known in the art that kinematic flow ripple, as indicated by flow variation/pulsations, is reduced by (1) using an odd number of cylinders/plungers and (2) increasing the number of cylinders/plungers of a displacement (e.g., plunger) pump. EX1003, ¶¶236-238 (citing EX1013 (*Karassik*), 3.10 (“The pulsating characteristics of the fluid flowing into and out of power pumps are significantly influenced by the number of plungers or pistons. Discharge flow pulsations are the most critical because of the high energy

potential generated when the system resistance reacts with the flow to create pressure. Since the magnitude of the discharge pulsation is mostly affected by the number of cylinders, increasing the number of cylinders will reduce the flow pulsations.), 3.11-12 (explaining that Figures 6 and 7 and Tables 8 and 9 of *Karassik* show “that pumps with an even number of cylinders have a higher flow variation than pumps with an odd number of cylinders”)). Table 5 of *Karassik*, copied below, depicts how the flow pulse amplitude decreases when an odd number of cylinders is used and as the number of plungers in a pump increases:

TABLE 5 The pulses per revolution and pulse amplitude for various pump types			
Pump Type	No. of Cylinders	Pulses per Rev.	Pulse Amplitude
Duplex, double-acting	4	8	+24% - 22%
Triplex, single-acting	3	6	+ 6% - 17%
Quintuplex, single-acting	5	10	+ 2% - 5%
Septuplex, single-acting	7	14	+1.2% - 2.6%
Nonoplex, single-acting	9	18	+0.6% - 1.5%

EX1013, 3.9.

Accordingly it would have been obvious to a POSITA that *Fischer*’s five-plunger pump is “*configured to reduce kinematic flow ripple*” when compared to pumps with a lower number of plungers. EX1003, ¶240. Thus, *Fischer* renders obvious Limitation 11[d] in view of the knowledge of a POSITA. In the alternative, *Fischer* renders obvious Limitation 11[d] in view of *Karassik* for the same reasons.

This understanding is consistent with the ’863 Patent, which explains that a “septuplex pump may produce less kinematic flow ripple than the standard

quintuplex, which is the most common pump in the oil service industry.” EX1001, 2:65-3:2.

4. Claim 19

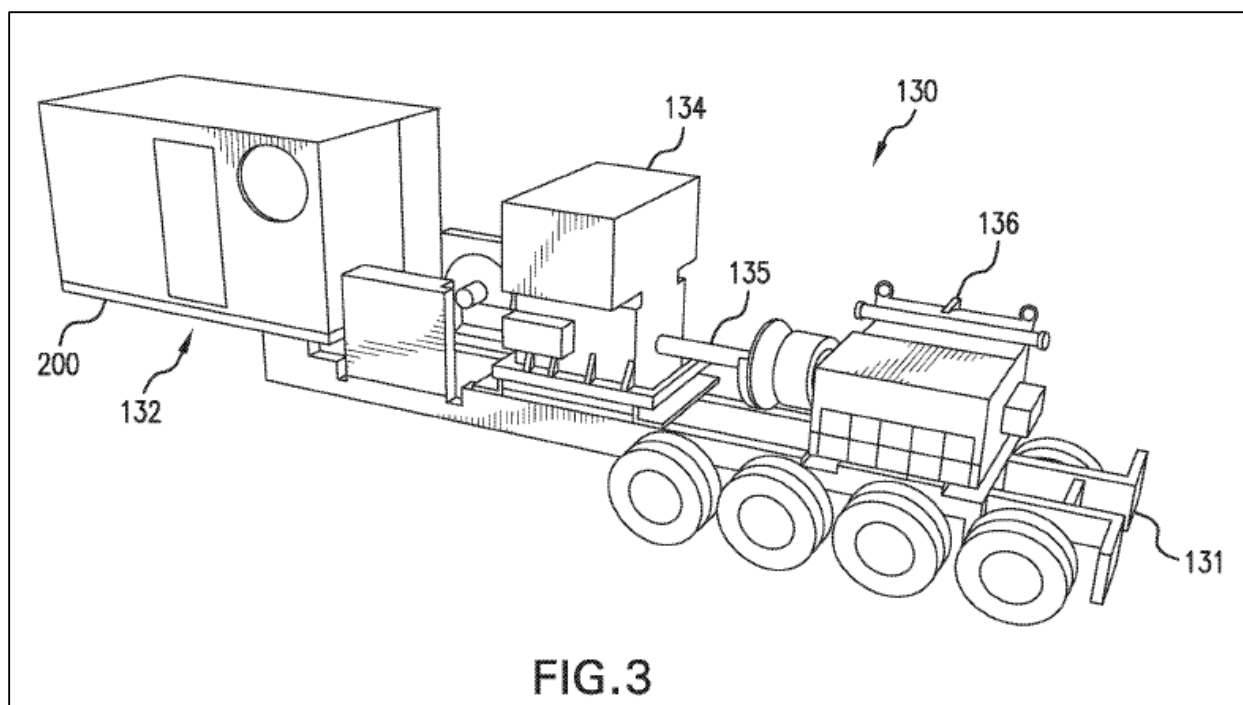
- a) The hydraulic fracturing system of claim 11, wherein the motor is powered by at least one of a turbine generator, a diesel generator, a natural gas generator, grid power, or a combination thereof.

As discussed above with reference to Limitation 11[c], *Fischer*’s VFD, which controls its electric motor, is powered by a power generation system which includes “at least one gas power source (e.g., a gas turbine engine and/or generator).” *Supra*, VIII.B.2.(d); EX1008, 7:28-30; EX1009, [0019]. *Fischer* therefore discloses Claim 19.

5. Claim 20

- a) The hydraulic fracturing system of claim 11, wherein a first length of the support structure is less than or equal to a second length of a second support structure associated with two quintuplex pumps.

As discussed above with reference to Limitation 1[a], *Fischer* discloses a pump trailer that includes “a single, single-shaft electric motor 134 and a single hydraulic pump 136.” *Supra*, VIII.A.1.(b). Figure 3 of *Fischer*, which depicts the pump trailer, is copied below and shows the pump trailer (“*the support structure*”) having a “*first length*.”



EX1008, Fig. 3; *see also* EX1009, Fig. 2.

Claim 20 appears to compare the “*first length*” of “*the support structure*” to the length of a different “*second*” support structure that is “*associated with two quintuplex pumps.*” A POSITA would have understood that such a “*second support structure*” would have been, for example, an elongated version of *Fischer’s* pump trailer that fits an additional electric motor and an additional hydraulic pump along the pump trailer’s longitudinal axis, as depicted in annotated Figure 3 of *Fischer* below. EX1003, ¶246.

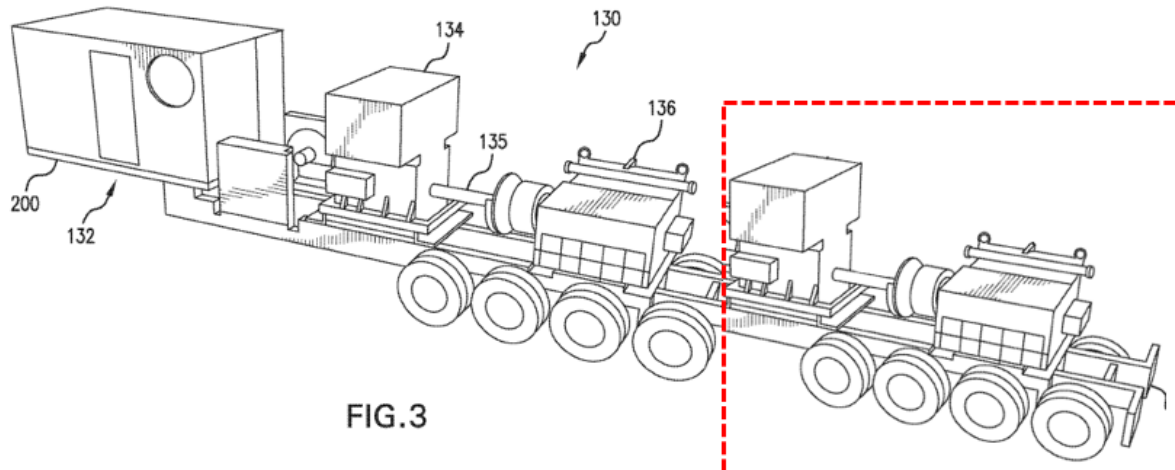


FIG. 3

EX1008, Fig. 3 (annotated, highlighting the additional electric motor and pump).

As shown, the length of this different pump trailer, which includes two quintuplex pumps, is greater than the length of *Fischer's* pump trailer, which includes a single quintuplex pump. EX1003, ¶247. Thus, a POSITA would have understood that the “*first length*” of *Fischer's* pump trailer is “*less than or equal to a second length of a second support structure associated with two quintuplex pumps,*” and that *Fischer* discloses Claim 20. *Id.*

G. Ground 7: Fischer renders obvious Claim 12 in view of Oehring-I, the knowledge of a POSITA and, in the alternative, Karassik

1. Motivation to combine

a) *Fischer with Oehring-I*

See supra, VIII.B.1; EX1003, ¶248.

b) *Fischer with Karassik*

See supra, VIII.E.1 EX1003, ¶248.

2. Claim 12

- a) The hydraulic fracturing system of claim 11, further comprising: a slide out platform proximate the electric powered, multi-plunger pump being driven between a retracted position and a deployed position, wherein the deployed position provides a work area proximate the electric powered, multi-plunger pump.

As discussed above with reference to Claim 2, the *Fischer-Oehring-I* combination renders obvious “a slide out platform integrated into the first area, the slide out platform being driven between a retracted position and a deployed position, wherein the deployed position provides a work area proximate the electric powered, multi-plunger pump.” *Supra*, VIII.B.2.(a). A POSITA would have further understood that because *Oehring-I*’s platform assembly “provides access to the pump” (and “provides a work area proximate the electric powered, multi-plunger pump” as recited in Claim 2) the platform assembly (“slide out platform”) itself would be “proximate the electric powered, multi-plunger pump” when incorporated in *Fischer*’s pump trailer. *Id.*; EX1003, ¶249.

For at least these reasons and the reasons provided in the Claim 2 analysis above, the *Fischer-Oehring-I* combination renders obvious Claim 12 in view of the knowledge of a POSITA and, in the alternative, *Karassik*. EX1003, ¶249.

H. Ground 8: Fischer renders obvious Claim 13 in view of Oehring-II, the Knowledge of a POSITA and, in the alternative, Karassik

1. Motivation to combine

- a) *Fischer* with *Oehring-II*

See supra, VIII.C.1 EX1003, ¶250.

b) *Fischer with Karassik*

See supra, VIII.E.1 EX1003, ¶250.

2. Claim 13

- a) The hydraulic fracturing system of claim 11, further comprising: a work platform proximate and external to the enclosure, the work platform providing access to the enclosure, wherein the work platform is positioned at an elevation greater than the electric powered, multi-plunger pump.

As discussed above with reference to Claim 3, the *Fischer-Oehring-II* combination renders obvious incorporating *Oehring-II*'s elevated platform such that the platform is located "*proximate and external to the enclosure, the work platform providing access to the enclosure.*" *Supra*, VIII.D.2. And as discussed above with reference to Claim 3, the elevated platform of the combined *Fischer-Oehring-II* system would be placed at the floor level of *Fischer*'s VFD enclosure to provide operators access to the enclosure. *Id.* Because the VFD enclosure, which is located in the "*second area*" of *Fischer*'s pump trailer, is located at an elevation greater than the elevation of the first area on which *Fischer*'s "*electric powered, multi-plunger pump*" is mounted, a POSITA would have understood that *Oehring-II*'s elevated platform is also "*positioned at an elevation greater than the electric powered, multi-plunger pump.*" EX1003, ¶251. Accordingly, the *Fischer-Oehring-II* combination renders obvious Claim 13 in view of the knowledge of a POSITA and, in the alternative, *Karassik*.

I. Ground 9: Fischer renders obvious Claims 14 and 15 in view of Orban, the Knowledge of a POSITA and, in the alternative, Karassik

1. Motivation to combine

a) *Fischer with Orban*

See supra, VIII.D.1 EX1003, ¶252.

b) *Fischer with Karassik*

See supra, VIII.E.1 EX1003, ¶252.

2. Claim 14

a) The hydraulic fracturing system of claim 11, further comprising: a cooling system for the enclosure, the cooling system being a liquid cooling system thermally coupled to at least one of the VFD or the transformer.

Claim 14 is rendered obvious by the *Fischer-Orban* combination in view of the knowledge of a POSITA and, in the alternative, *Karassik* for the same reasons provided in Ground 4 regarding Claim 4. *See supra*, VIII.D.2; EX1003, ¶253.

3. Claim 15

a) The hydraulic fracturing system of claim 14, wherein the liquid cooling system includes water or glycol.

Claim 15 is rendered obvious by the *Fischer-Orban* combination in view of the knowledge of a POSITA and, in the alternative, *Karassik* for the same reasons provided in Ground 4 regarding Claim 5. *See supra*, VIII.D.3; EX1003, ¶254.

J. Ground 10: Fischer renders obvious Claims 16-18 in view of Karassik, the knowledge of a POSITA and, in the alternative, Karassik

As discussed below, *Karassik* renders obvious the subject matter of Claims 16-18. Because Claim 11, from which Claims 16-18 depend, is challenged based on *Fischer* in view of the knowledge of a POSITA and, in the alternative, *Karassik*, Ground 10 is based on *Fischer* in view of *Karassik*, the knowledge of a POSITA and, in the alternative, *Karassik*.

1. Motivation to combine

a) *Fischer* with *Karassik*

See supra, VIII.E.1 EX1003, ¶256.

2. Claim 16

a) The hydraulic fracturing system of claim 11, wherein the electric powered, multi-plunger pump is a septuplex pump having seven plungers.

Claim 16 is rendered obvious by the *Fischer-Karassik* combination in view of the knowledge of a POSITA and, in the alternative, *Karassik* for the same reasons provided in Ground 5 regarding Claim 6. *See supra*, VIII.E.2; EX1003, ¶257.

3. Claim 17

a) The hydraulic fracturing system of claim 11, wherein the electric powered, multi-plunger pump includes at least one of 9 plungers or 11 plungers.

Claim 16 is rendered obvious by the *Fischer-Karassik* combination in view of the knowledge of a POSITA and, in the alternative, *Karassik* for the same reasons provided in Ground 5 regarding Claim 7. *See supra*, VIII.E.3; EX1003, ¶258.

4. Claim 18

- a) The hydraulic fracturing system of claim 11, wherein the electric powered, multi-plunger pump includes more than 5 plungers.

As discussed above with reference to Claims 16 and 17, a POSITA would have understood that *Fischer*'s quintuplex pump could be substituted for a septuplex or a nonuplex pump, as these types were well-known alternatives for each other, as indicated by *Karassik. Supra*, VIII.J.2-3; EX1003, ¶259. Accordingly, Claim 18 is rendered obvious by the *Fischer-Karassik* combination in view of the knowledge of a POSITA and, in the alternative, *Karassik*.

K. Ground 11: Morris renders obvious Claim 1

1. Claim 1

- a) 1[p]

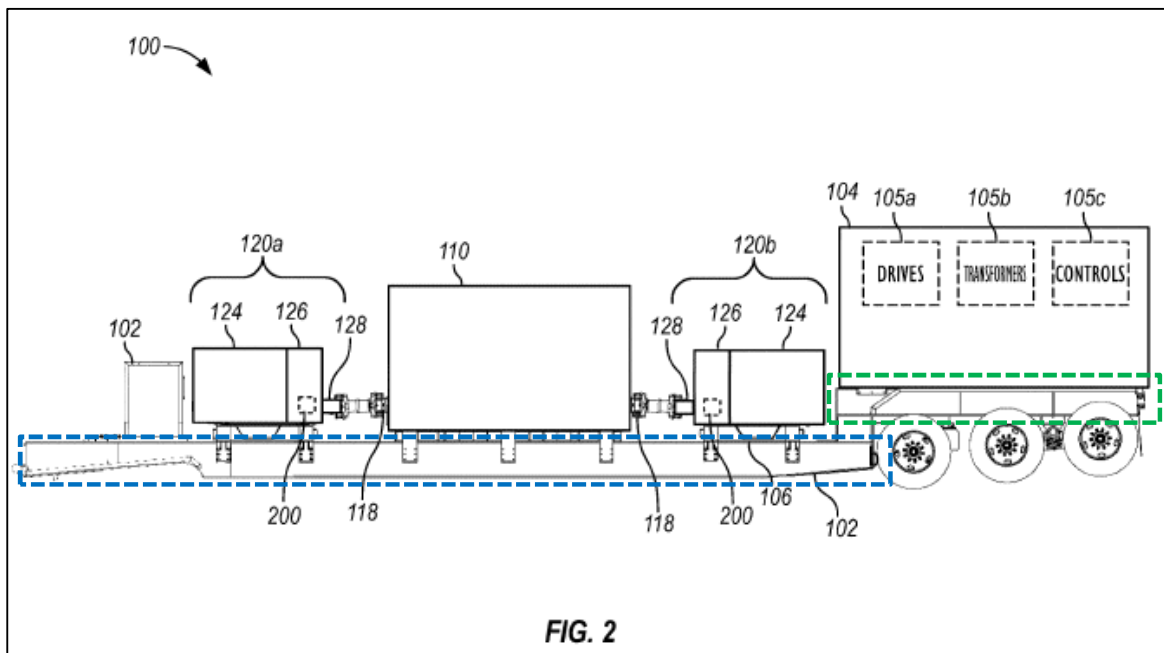
To the extent the preamble is limiting, *Morris* discloses the preamble. *Morris* discloses a “system and method for producing fracturing fluid.” EX1010, Abstract. In particular, *Morris* discloses a “fracturing transport” that comprises “a prime mover, a first pump, a first gear box, a first gear shaft, and a first coupling. The prime mover has a motor shaft and is operable to transmit drive to the motor shaft. The first pump is disposed adjacent the prime mover, and the first gear box (connected to the first pump) and the first gear shaft (disposed on the first gear box) are used to transmit the drive from the prime mover to the pump.” EX1010, [0017]. *Morris* further describes a method “for pumping fracture fluid with a pump,” wherein “the

pump has a fluid end assembly powered by a power end assembly driven by a prime mover.” *Id.*, [0031].

Accordingly, *Morris* discloses Limitation 1[p].

b) 1[a]

Morris discloses Limitation 1[a] at least through its disclosure of a lay-down trailer. The lay-down trailer “positions the pumps 120a-b lower to the ground as the main trailer beams are resting on the ground in operational mode,” and it also includes “an upper section above the trailer axles that may hold or have mounted the power and control systems 104.” EX1010, [0047]. Figure 2 of *Morris*, annotated below, depicts this configuration:



EX1010, Fig. 2 (annotated).

As shown, *Morris*'s lay-down trailer comprises two adjacent areas, where a first area (annotated in blue) is lower than a second area (annotated in green).

Accordingly, *Morris* discloses Limitation 1[a].

c) 1[b]

As discussed above with reference to Limitation 1[a], *Morris*'s lay-down trailer includes two pumps 120 and a prime mover 110 in the “*first area*” of the trailer. *See supra*, VIII.K.1.(b).

The prime mover 110 “may be a dual shaft electric motor that has a motor shaft 118 that protrudes on opposite sides of the electric motor,” and it “converts electric power to mechanical power for driving one or more pumps” (e.g., pumps 120). EX1010, [0038], [0049]. Each of *Morris*'s pumps 120 “may be a quintuplex pump” or any other type of “plunger style pumps 120a-b, such as triplex pumps.” *Id.*, [0050]. A POSITA would have understood that a “quintuplex” plunger pump has five plungers, as was well-known in the art. EX1003, ¶272 (citing EX1013, 3.11 (Table 7, identifying “Quintuplex” as the industry term for a five-plunger pump)). Further, because *Morris*'s pumps are driven by prime mover 110, which may be an electric motor, *Morris* discloses an “*electric-powered, multi-plunger pump with an odd number-of plungers, arranged in the first area . . . and powered by at least one electric motor, also arranged in the first area.*”

Morris's pumps "pump the fracturing fluid to a hydraulic fracturing manifold at the wellhead 12. The pressurized fracturing fluid can be delivered using piping and manifolds to the wellhead 12 in any suitable arrangement known in the art." EX1010, [0038]. Accordingly, the pumps are also "*coupled to a well, via outlet piping.*"

Accordingly, *Morris* discloses Limitation 1[b].

d) 1[c]

As discussed above with reference to Limitation 1[a], *Morris*'s lay-down trailer includes "an upper section" ("*second area*") "above the trailer axles that may hold or have mounted the power and control systems 104." *See supra*, VIII.E.1.(b). The "power and control system 104 may include one or more electric drives 105a (e.g., variable frequency drives (VFD)), which may "provide control, monitoring, and reliability functionality, such as preventing damage to a grounded or shorted prime mover 110." EX1010, [0048]. Further, "prime mover 110 may be driven by at least one variable frequency drive 105a." *Id.*, [0050]. A POSITA would have understood that because *Morris*'s VFD "drive[s]" prime mover 110 (which, as discussed above with reference to Limitation 1[b], may be an electric motor, *supra*, VIII.E.1.(c)), VFD is "*connected to*" and "*configured to control at least a speed of*" the prime mover (electric motor), consistent with the well-known functionality of VFDs. EX1003, ¶275 (citing EX1023-1026).

In the alternative, it would have been obvious to a POSITA that *Morris*'s VFD controls the speed of the prime mover (electric motor). VFDs are well-known components that control the speed of electric motors by varying the frequency of the power delivered to the motors. EX1003, ¶276 (citing EX1023-1026). Further, the use of VFDs to control electric motors in hydraulic fracturing operations was well-known in the art before the '863 Patent's priority date. *Id.*

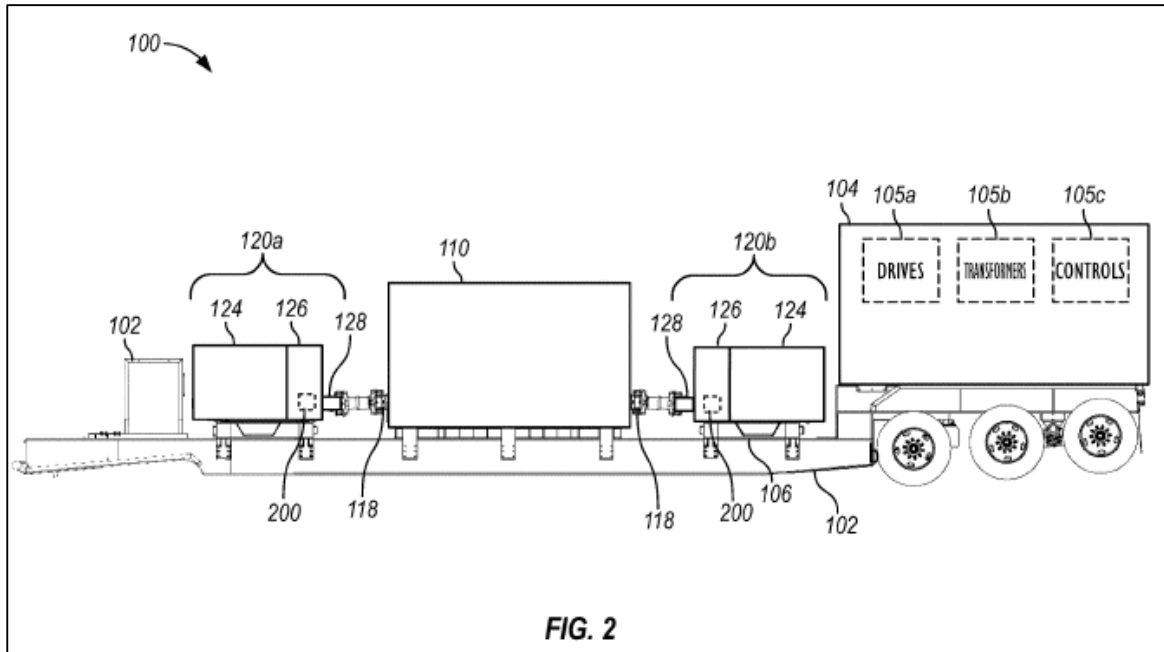
Accordingly, *Morris* discloses, or at least renders obvious, Limitation 1[c].

e) 1[d]

As discussed above with reference to Limitations 1[a] and 1[c], *Morris*'s lay-down trailer includes "an upper section" ("*second area*") "above the trailer axles that may hold or have mounted the power and control systems 104." *See supra*, VIII.K.1.(b), VIII.K.1.(d). "The power and control system 104 may include one or more . . . transformers 105b," which "can step one or more input voltages (e.g., 13.8 kilovolts (kV)) to one or more lower voltages (e.g., 4.2 kV, 2.1 kV, 600 and 480 volts (V))." EX1010, [0048]. Stepping down the input voltage in this manner produces an output voltage at "levels that equipment (e.g., electric prime movers) mounted on the transports 40, 50" (i.e., lay-down trailer 102) "my utilize." *Id.*, [0036]. A POSITA would have understood that because *Morris*'s transformer converts power from a higher, initial voltage level of, for example, 13.8 kV to power at a lower voltage that is usable by prime movers (e.g., electric motors) which, in

turn, power *Morris*'s pumps (see *supra*, VIII.K.1.(c)), the transformer is “configured to distribute power for operation of the electric pump.” EX1003, ¶¶279-281 .

Further, a POSITA would have understood that *Morris*'s transformer is “positioned within an enclosure with the VFD.” As shown in Figure 2 of *Morris* copied below, the “second area” of the disclosed lay-down trailer is depicted as an enclosed room wherein drives 105a (e.g., VFD) and transformers 105b are located.



EX1010, Fig. 2; EX1003, ¶279.

Thus, *Morris* discloses Limitation 1[d].

L. Ground 12: The combination of Morris and Oehring-I renders obvious Claim 2

1. Motivation to Combine

a) *Morris with Oehring-I*

For the same reasons discussed above in Ground 2 regarding the combination of *Fischer* with *Oehring-I*, a POSITA would have been motivated to combine *Morris* with *Oehring-I* and would have reasonably expected success in doing so (*i.e.*, design incentives would have motivated a POSITA to incorporate *Oehring-I*'s platform assembly into *Morris*'s lay-down trailer, and combining *Oehring-I*'s platform assembly to *Morris*'s lay-down trailer is merely applying a known technique to improve similar devices in the same way). *See supra*, VIII.B.1; EX1003, ¶¶282-287.

2. Claim 2

As discussed above with reference to Ground 2, *Oehring-I*'s platform assembly discloses Claim 2. The platform assembly is a “*slide out platform being driven between a retracted position and a deployed position*” because the support rails with which it is coupled is “slidingly engaged” with mount assemblies on the trailer such that the platform can be is “selectively moveable between deployed and stowed configurations.” *Supra*, VIII.B.2; EX1003, ¶186. Because the platform assembly “provides work surface so that operations personnel can readily access the pump on the trailer” when in the deployed position, *Oehring-I*'s platform assembly discloses that “*the deployed position provides a work area proximate the electric powered, multi-plunger pump.*” *Supra*, VIII.B.2; EX1003, ¶186. This

understanding is confirmed by Figure 1, which shows deployed platform assembly 30₂ proximate to pump 12₂. *Supra*, VIII.B.2; EX1003, ¶186; EX1012, Fig. 1.

A POSITA would have understood that in the combined *Morris-Oehring-I* system, *Oehring-I*'s platform assembly would have been incorporated into *Morris*'s pump trailer to provide a “selectively movable” platform that gives operations personnel access to *Morris*'s pump, as taught by *Oehring-I*. *See supra*, VIII.L.1.(a). And because *Morris*'s pump is located in the “*first area*” of *Morris*'s lay-down trailer, a POSITA would have understood that *Oehring-I*'s platform assembly, which is proximate to and provides access to the pump, would be “*integrated into the first area*.” EX1003, ¶288.

Accordingly, the *Fischer-Oehring-I* combination renders obvious Claim 2.

M. Ground 13: The combination of Morris and Oehring-II renders obvious Claims 3

1. Motivation to Combine

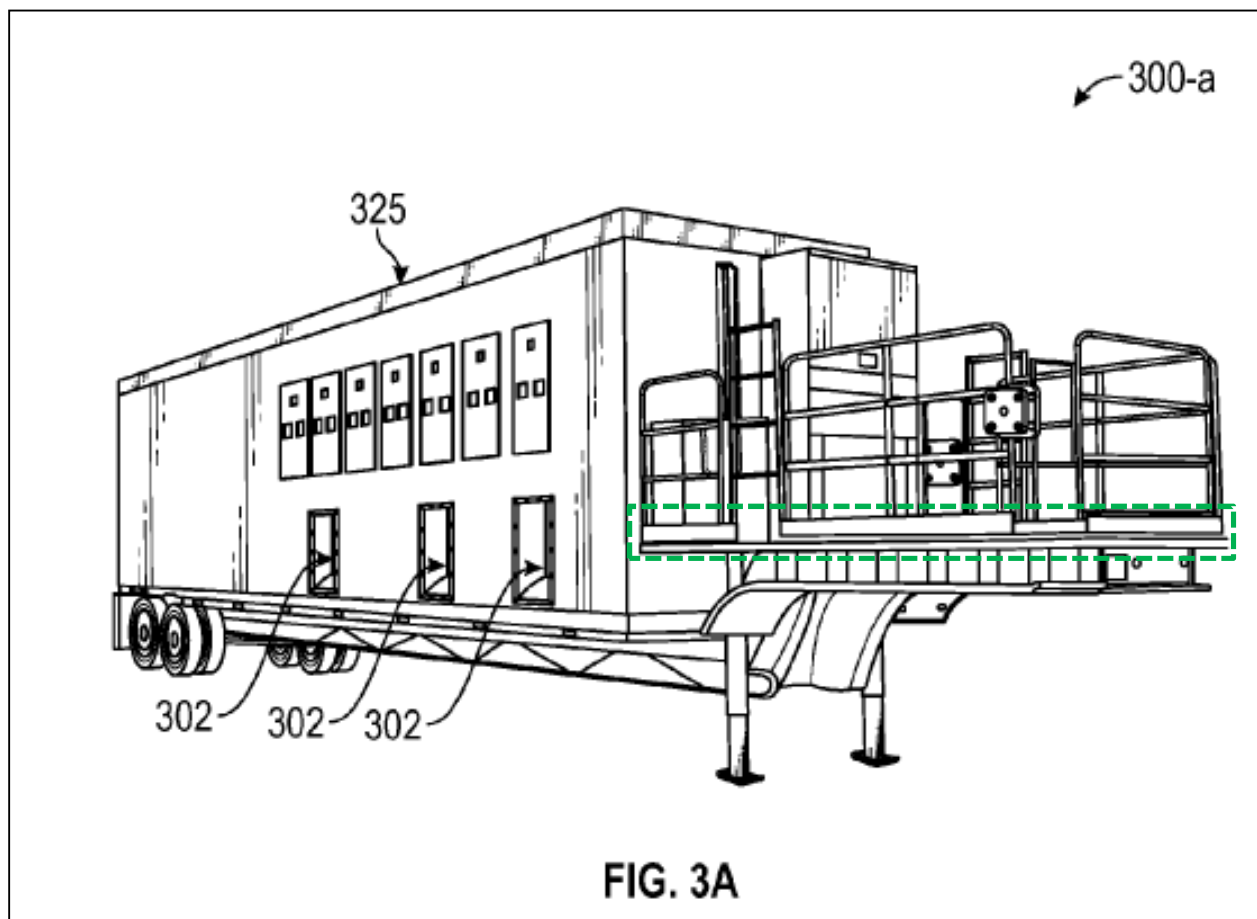
a) *Morris* with *Oehring-II*

For the same reasons discussed above in Ground 3 regarding the combination of *Fischer* with *Oehring-II*, a POSITA would have been motivated to combine *Morris* with *Oehring-II* and would have reasonably expected success in doing so (*i.e.*, design incentives would have motivated a POSITA to incorporate *Oehring-II*'s platform into *Morris*'s lay-down trailer, and combining *Oehring-II*'s platform to

Morris's lay-down trailer is merely applying a known technique to improve similar devices in the same way). *See supra* VIII.C.1; EX1003, ¶¶289-292.

2. Claim 3

Oehring-II describes a “switchgear trailer” that provides electric connections for various components of a fracturing system. EX1016, 7:21-28. Annotated Figure 3A of *Oehring-II*, provided below, depicts the switchgear trailer:

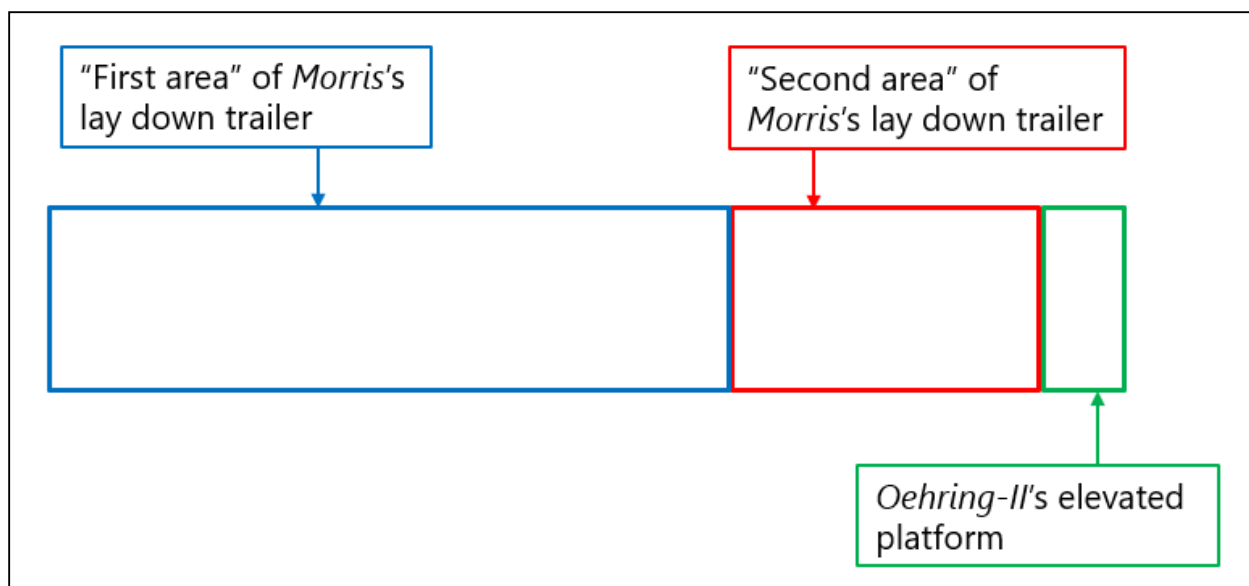


EX1016, Fig. 3A.

As depicted, the switchgear trailer further comprises an elevated platform (annotated in green) that is located along the trailer's longitudinal axis and provides access to the switchgear trailer as well as an enclosure adjacent to the trailer.

And as discussed above with reference to Ground 11, *Morris* describes a pump trailer that includes a second, elevated area that features an enclosure wherein a VFD is housed. *See supra*, VIII.K.1.(b), (d)-(e).

A POSITA would have understood that in the combined *Morris-Oehring-II* system, *Oehring-II*'s elevated platform would be incorporated into *Morris*'s lay-down trailer to provide operators access to the second area of *Morris*'s lay-down trailer. EX1003, ¶298. That is, a POSITA would have understood that *Oehring-II*'s elevated platform would be placed along the trailer's longitudinal axis (as taught by *Oehring-II*) at the rear of *Morris*'s lay-down trailer at the floor height of the second, elevated area of *Morris*'s lay-down trailer to provide access to this area. *Id.*; *see supra*, VIII.K.1.(b) (highlighting the “*second area*” of *Morris*'s lay-down trailer). The annotation below is provided to depicts a top-down view of the combined *Morris-Oehring-II* system.



A POSITA would have understood that in this combined system, *Oehring-II's* elevated platform (annotated in green above) would be “*proximate the enclosure in the second area, the work platform providing access to the enclosure,*” because Morris’s “*enclosure*” is located in the second area of the pump trailer, as discussed above with reference to Limitations 1[c] and 1[d]. EX1003, ¶299; *supra*, VIII.K.1.(d)-(e). Further, elevated platform being configured in this manner is also “*arranged such that the enclosure is between the work platform and the first area,*” as depicted in the annotation above. EX1003, ¶298.

Accordingly, the *Morris-Oehring-II* combination renders obvious Claim 3.

N. Ground 14: The Combination of Morris and Orban Renders Obvious Claims 4 and 5

1. Motivation to combine

a) *Morris with Orban*

For the same reasons discussed above in Ground 4 regarding the combination of *Fischer* with *Orban*, a POSITA would have been motivated to combine *Morris* with *Orban* and would have reasonably expected success in doing so (*i.e.*, design incentives would have motivated a POSITA to incorporate *Orban*'s water-based VFD cooling system into *Morris*'s VFD, and combining *Orban*'s cooling system to *Morris*'s lay-down trailer is merely applying a known technique to improve similar devices in the same way). *See supra*, VIII.D.1; EX1003, ¶¶301-304.

2. Claim 4

Under the combined *Morris-Orban* system, a POSITA would have understood that *Orban*'s water-based VFD cooling system would have been incorporated into *Morris*'s VFD to cool the VFD and the “*enclosure*” in which the VFD is located (as discussed above with reference to Limitation 1[d], *supra* VIII.K.1.(e)) for at least the same reasons provided in Ground 4 regarding Claim 4. *See supra*, VIII.D.2; EX1003, ¶305. Thus, the *Morris-Orban* combination renders obvious Claim 4.

3. Claim 5

As discussed above with reference to Claim 4, *Orban*'s water-based radiator (“*the liquid cooling system*”) uses water as the cooling liquid. *Supra*, VIII.N.2. Thus, the *Morris-Orban* combination renders obvious Claim 5. *See* EX1003, ¶306.

O. Ground 15: The combination of Morris and Karassik renders obvious Claims 6-8

1. Motivation to Combine

a) *Morris with Karassik*

For the same reasons discussed above in Ground 5 regarding the combination of *Fischer* with *Karassik*, a POSITA would have been motivated to combine *Morris* with *Karassik* and would have reasonably expected success in doing so (*i.e.*, because *Karassik*'s description of the ideal flowrate produced by plunger pumps and description of discharge flow pulsations produced by plunger pumps would aid a POSITA's selection of characteristics associated with *Fischer*'s pump and because combining *Karassik*'s seven- and nine-plunger pumps to the *Fischer* pumping system is a simple substitution of elements to known methods to yield predictable results). *See supra* VIII.E.1; EX1003, ¶¶307-311.

2. Claim 6

As discussed above with reference to Limitation 1[b], *Morris* discloses a quintuplex (*i.e.*, five-plunger) pump. *See supra*, Section VIII.K.1.(c).

In addition to “quintuplex” pumps, *Karassik* discloses “septuplex” (seven-plunger) pumps. *See, e.g.*, EX1013, 3.11 (Table 7, identifying “Septuplex” as the industry term for a seven-plunger pump). A POSITA would have understood that *Morris*'s quintuplex pump could be substituted for a septuplex pump, as these types were well-known alternatives for each other, as indicated by *Karassik*. EX1003,

¶312. Accordingly, Claim 6 is rendered obvious by the *Morris-Karassik* combination.

3. Claim 7

As discussed above with reference to Limitation 1[b], *Morris* discloses a quintuplex (*i.e.*, five-plunger) pump. *See supra*, Section VIII.K.1.(c).

In addition to “quintuplex” pumps, *Karassik* discloses “nonuplex” (nine-plunger) pumps. *See, e.g.*, EX1013, 3.11 (Table 7, identifying “Nonuplex” as the industry term for a nine-plunger pump). A POSITA would have understood that *Morris*’s quintuplex pump could be substituted for a nonuplex pump, as these types were well-known alternatives for each other, as indicated by *Karassik*. EX1003,

¶313. Accordingly, Claim 7 is rendered obvious by the *Morris-Karassik* combination.

4. Claim 8

As discussed above with reference to Claims 6 and 7, a POSITA would have understood that *Morris*’s quintuplex pump could be substituted for a nonuplex pump, as these types were well-known alternatives for each other, as indicated by *Karassik*. *Supra*, VIII.O.2, VIII.O.3; EX1003, ¶314. Accordingly, Claim 8 is rendered obvious by the *Morris-Karassik* combination.

P. Ground 16: Morris Renders Obvious Claims 10, 11, 19, and 20 in view of the knowledge of a POSITA and, in the alternative, Karassik

1. Motivation to combine

a) Fischer with Karassik

See supra, VIII.O.1; EX1003, ¶315.

2. Claim 10

Under *Morris*, it would have been obvious to a POSITA that a first output of *Morris*'s pump would have produced a first flowrate (“*first pump output*”) that is equal to a second flowrate (“*meets . . . a second pump output*”) achieved by two quintuplex (five-plunger) pumps in view of the knowledge of a POSITA and, in the alternative, *Karassik* for the same reasons discussed above in Ground 6 regarding Claim 10. *See supra*, VIII.F.2; EX1003, ¶¶316-318.

3. Claim 11

a) 11[p]

See supra, VIII.K.1.(a); EX1003, ¶320.

b) 11[a]

As discussed above with reference to Limitations 1[a] and 1[b], *Morris*'s lay-down trailer (“*support structure*”) includes a quintuplex (five-plunger) pump (“*multi-plunger pump*”) powered by an electric motor. *Supra*, VIII.K.1.(b), VIII.K.1.(c). For at least the same reasons, *Morris* teaches Limitation 11[a]. EX1003, ¶321.

c) 11[b]

As discussed above with reference to Limitations 1[a], 1[c], and 1[d], *Morris*'s lay-down trailer (“*support structure*”) includes a VFD that is connected to

the electric motor to control the speed of the electric motor and is located within an enclosure that is separate from *Morris's* pump (“*the electric-powered multi-plunger pump*”). *Supra*, VIII.K.1.(b), VIII.K.1.(d), VIII.K.1.(e). For at least the same reasons, *Morris* teaches Limitation 11[b]. EX1003, ¶322.

d) 11[c]

As discussed above with reference to Limitations 1[a] and 1[d], *Morris's* lay-down trailer (“*support structure*”) includes a transformer that steps down “one or more input voltages (e.g., 13.8 kilovolts (kV)) to one or more lower voltages(e.g., 4.2 kV, 2.1 kV, 600 and 480 volts (V)),” which are levels usable by the prime mover (electric motor) which, in turn, powers the pumps (“*the electric powered pump*”). *Supra*, VIII.K.1.(b), VIII.K.1.(e).

Further, the power generated at the input voltage level is generated by “one or more power sources of electricity,” which may include “one or more turbine-electric generator transports 22 that compress and mix combustion air with hydrocarbon fuel to spin and generate mechanical energy and then converts the mechanical energy to electricity.” EX1010, [0035]. A POSITA would have understood that the “turbine-electric generator transports 22” comprise, and are configured to carry, one or turbine-electric generators that actually generate the disclosed input power. EX1003, ¶324. Accordingly, *Morris* discloses that its transformer receives power “*from at least one generator.*”

Morris therefore discloses Limitation 1[c].

e) 11[d]

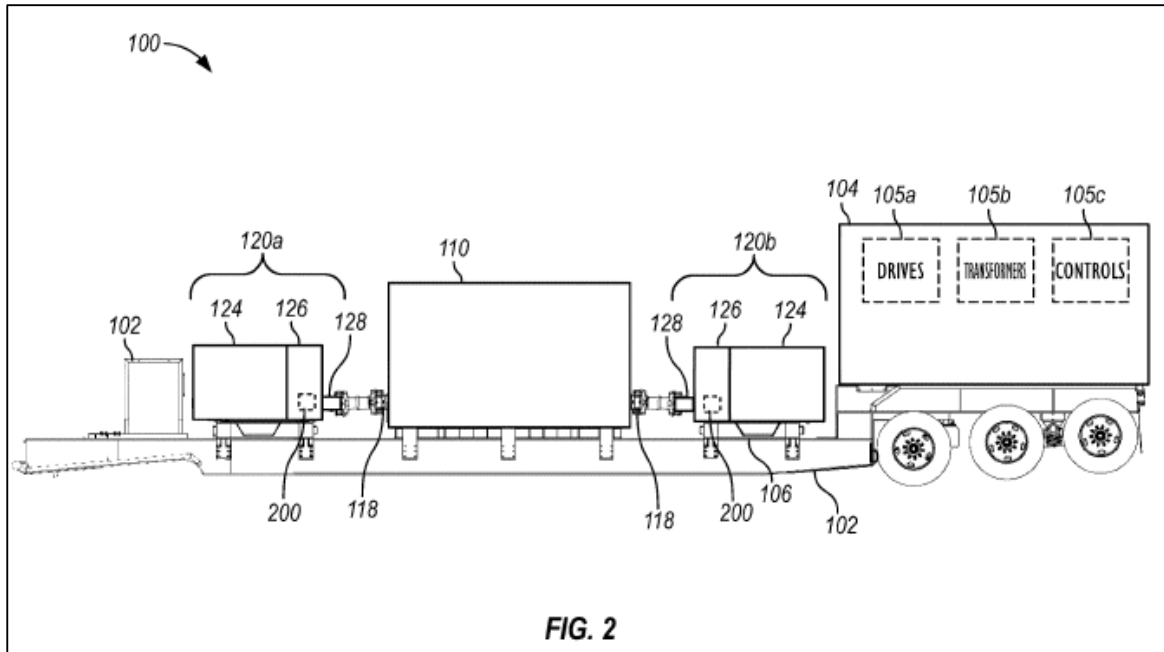
As discussed above with reference to Limitation 1[b], *Morris* teaches an electric-powered pump with five plungers. *Supra*, VIII.K.1.(c). It would have been obvious to a POSITA that *Morris*'s pump is “*configured to reduce kinematic flow ripple*” in view of the knowledge of a POSITA and, in the alternative, *Karassik* for the same reasons discussed above in Ground 6 regarding Limitation 11[d]. See *supra*, VIII.F.3.(e); EX1003, ¶¶326-331.

4. Claim 19

As discussed above with reference to Limitation 11[c], *Morris*'s electric prime mover (electric motor) is powered by one or more turbine-electric generators. *Supra*, VIII.P.3.(d); EX1010, [0035]. *Morris* therefore discloses Claim 19.

5. Claim 20

As discussed above with reference to Limitation 11[a], *Morris* discloses a lay-down trailer that includes a prime mover 110 and two pumps 120. *Supra*, VIII.P.3.(b). Figure 2 of *Morris* is copied below and shows the lay-down trailer (“*the support structure*”) having a “*first length*.”



EX1010, Fig. 2.

As discussed above with reference to Ground 2, Claim 20 appears to compare the “*first length*” of “*the support structure*” (i.e., *Morris*’s lay-down trailer) to the length of a different “*second*” support structure that is “*associated with two quintuplex pumps.*” A POSITA would have understood that such a “*second support structure*” would have been, for example, a second lay-down trailer as described by *Morris* (i.e., comprising a prime mover 110 and two pumps 120). EX1003, ¶338. In this configuration, the first and second lay-down trailers are identical, and therefore would have equal lengths. *Id.* Accordingly, *Morris* discloses Claim 20.

Q. Ground 17: Morris renders obvious Claim 12 in view of Oehring-I, the knowledge of a POSITA and, in the alternative, Karassik

1. Motivation to combine

a) *Morris* with *Oehring-I*

See supra, VIII.L.1; EX1003, ¶340.

b) *Morris with Karassik*

See supra, VIII.O.1; EX1003, ¶340.

2. Claim 12

As discussed above with reference to Claim 2, the *Morris-Oehring-I* combination renders obvious “a slide out platform integrated into the first area, the slide out platform being driven between a retracted position and a deployed position, wherein the deployed position provides a work area proximate the electric powered, multi-plunger pump.” *Supra*, VIII.L.2. A POSITA would have further understood that because *Oehring-I*’s platform assembly “provides access to the pump” (and “provides a work area proximate the electric powered, multi-plunger pump” as recited in Claim 2) the platform assembly (“slide out platform”) itself would be “proximate the electric powered, multi-plunger pump” when incorporated in *Morris*’s lay-down trailer. *Id.*; EX1003, ¶341.

For at least these reasons and the reasons provided in the Claim 2 analysis above, the *Morris-Oehring-I* combination renders obvious Claim 12. EX1003, ¶341.

R. Ground 18: *Morris* renders obvious Claim 13 in view of *Oehring-II*, the knowledge of a POSITA and, in the alternative, *Karassik*

1. Motivation to Combine

a) *Morris with Oehring-II*

See supra, VIII.M.1; EX1003, ¶342.

b) *Morris with Karassik*

See supra, VIII.O.1; EX1003, ¶342.

2. Claim 13

As discussed above with reference to Claim 3, the *Morris-Oehring-II* combination renders obvious incorporating *Oehring-II*'s elevated platform such that the platform is located “*proximate and external to the enclosure, the work platform providing access to the enclosure.*” *Supra*, VIII.M.2. And as discussed above with reference to Claim 3, the elevated platform of the combined *Morris-Oehring-II* system would be placed at the floor level of *Morris*'s VFD enclosure to provide operators access to the enclosure. *Id.* Because the VFD enclosure, which is located in the “*second area*” of *Morris*'s lay-down trailer, is located at an elevation greater than the elevation of the first area on which *Morris*'s “*electric powered, multi-plunger pump*” is mounted, a POSITA would have understood that *Oehring-II*'s elevated platform is also “*positioned at an elevation greater than the electric powered, multi-plunger pump.*” EX1003, ¶343. Accordingly, the *Morris-Oehring-II* combination renders obvious Claim 13.

S. Ground 19: Morris renders obvious Claims 14 and 15 in view of Orban, the Knowledge of a POSITA and, in the alternative, Karassik

1. Motivation to combine

a) *Morris with Orban*

See supra, VIII.N.1; EX1003, ¶344.

b) *Morris with Karassik*

See supra, VIII.O.1; EX1003, ¶344.

2. Claim 14

Claim 14 is rendered obvious by the *Morris-Orban* combination in view of the knowledge of a POSITA and, in the alternative, *Karassik* for the same reasons provided in Ground 14 regarding Claim 4. *See supra*, VIII.N.2; EX1003, ¶345.

3. Claim 15

Claim 15 is rendered obvious by the *Morris-Orban* combination in view of the knowledge of a POSITA and, in the alternative, *Karassik* for the same reasons provided in Ground 14 regarding Claim 5. *See supra*, VIII.N.3; EX1003, ¶346.

T. Ground 20: Morris renders obvious Claims 16-18 in view of Karassik, the knowledge of a POSITA and, in the alternative, Karassik

As discussed below, *Karassik* renders obvious the subject matter of Claims 16-18. Because Claim 11, from which Claims 16-18 depend, is challenged based on *Morris* in view of the knowledge of a POSITA and, in the alternative, *Karassik*, Ground 10 is based on *Morris* in view of *Karassik*, the knowledge of a POSITA and, in the alternative, *Karassik*.

1. Motivation to combine

a) *Morris with Karassik*

See supra, VIII.O.1; EX1003, ¶348.

2. Claim 16

Claim 16 is rendered obvious by the *Morris-Karassik* combination in view of the knowledge of a POSITA and, in the alternative, *Karassik* for the same reasons provided in Ground 15 regarding Claim 6. *See supra*, VIII.O.2; EX1003, ¶349.

3. Claim 17

Claim 17 is rendered obvious by the *Morris-Karassik* combination in view of the knowledge of a POSITA and, in the alternative, *Karassik* for the same reasons provided in Ground 15 regarding Claim 7. *See supra*, VIII.O.3; EX1003, ¶350.

4. Claim 18

As discussed above with reference to Claims 16 and 17, a POSITA would have understood that *Morris*'s quintuplex pump could be substituted for a septuplex or nonuplex pump, as these types were well-known alternatives for each other, as indicated by *Karassik*. *Supra*, VIII.T.2-3; EX1003, ¶351. Accordingly, Claim 18 is rendered obvious by the *Morris-Karassik* combination in view of the knowledge of a POSITA and, in the alternative, *Karassik*.

IX. OBJECTIVE INDICIA DO NOT SUPPORT PATENTABILITY

Petitioners are unaware of any evidence of secondary considerations of non-obviousness tied to the claimed invention of the '863 Patent identified by PO.

X. CONCLUSION

Petitioners respectfully request that *inter partes* review of the '863 Patent be instituted and that the challenged claims be cancelled as unpatentable under 35 U.S.C. §318(b).

Respectfully submitted,

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CERTIFICATE OF SERVICE

The undersigned hereby certifies on this 5th day of March 2025, that true and correct copies of the foregoing PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO. 11,459,863, Exhibits 1001-1036, and Petitioners' power of attorney were served in their entirety to Patent Owner via FedEx Express® or Express Mail:

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**CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME
LIMITATION, TYPEFACE REQUIREMENTS, AND TYPE STYLE
REQUIREMENTS**

1. This Petition complies with the type-volume limitation of 14,000 words, comprising 13,957 words, excluding the parts exempted by 37 C.F.R. § 42.24(a).
2. This Petition complies with the general format requirements of 37 C.F.R. § 42.6(a) and has been prepared using Microsoft® Word in 14-point Times New Roman.

Respectfully submitted,

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