

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

INTELLIGENT WELLHEAD SYSTEMS, INC.,
Petitioner,

v.

DOWNING WELLHEAD EQUIPMENT, LLC,
Patent Owner.

IPR2024-00300
Patent 11,560,770 B2

Before BENJAMIN D. M. WOOD, CARL M. DEFRANCO, and
FREDERICK C. LANEY, *Administrative Patent Judges*.

LANEY, *Administrative Patent Judge*.

JUDGEMENT
Final Written Decision
Determining No Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

Intelligent Wellhead Systems, Inc. (“Petitioner”) filed a Petition (Paper 1, “Pet.”) requesting *inter partes* review of claims 1–38 (“Challenged Claims”) of U.S. Patent No. 11,560,770 B2 (Ex. 1001, “the ’770 patent”). Pet. 1. Downing Wellhead Equipment, LLC (“Patent Owner”) filed a Preliminary Response (Paper 8). We instituted review with respect to all grounds and claims set forth in the Petition. Paper 10. After institution, Patent Owner filed a Response (Paper 20, “PO Resp.”), to which Petitioner filed a Reply (Paper 25, “Pet. Reply”), and Patent Owner filed a Sur-reply (Paper 31, “PO Sur-reply”). An oral hearing was held on February 21, 2025, and the transcript is of record. Paper 41 (“Tr.”).

We have jurisdiction pursuant to 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of the Challenged Claims. Petitioner bears the burden of proving unpatentability of the Challenged Claims. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015). To prevail, Petitioner must prove unpatentability by a preponderance of the evidence. *See* 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d) (2021). After studying the arguments and the supporting evidence, we determine that Petitioner has not shown, by a preponderance of the evidence, that claims 1–38 of the ’770 patent are unpatentable.

II. BACKGROUND

A. *Real Parties-in-Interest*

Petitioner identifies itself, IWS USA Corp., and Pason Systems Corp. as real parties-in-interest. Paper 7, 2. Patent Owner identifies itself and SEF Energy, LLC as real parties-in-interest. Paper 5, 2.

B. Related Matters

The parties identify the following lawsuit in which the '770 patent is asserted: *Downing Wellhead Equipment, LLC v. Intelligent Wellhead Systems, Inc.*, 1:23-cv-01180-RMR-SP (D. Colo.). Paper 7, 2; Paper 5, 2. Additionally, the parties identify IPR2024-00256 wherein Petitioner challenged claims of U.S. Patent No. 11,401,779 (“the '779 patent”), which is a parent to the '770 patent. Paper 7, 4; Paper 5, 2. The Board denied institution of review of the '779 patent based on this Petition. *See Intelligent Wellhead Systems, Inc. v. Downing Wellhead Equipment, LLC*, IPR2024-00256, Paper 11 (PTAB June 5, 2024).

C. The '770 Patent

The '770 patent is titled “Hydraulic Fracturing Plan and Execution of Same,” and relates to “a hydraulic fracturing plan executable by a hydraulic fracturing system to hydraulically fracture a plurality of oil and gas wells.” Ex. 1001, code (54), 2:12–14. Figure 1A of the '770 patent depicts a hydraulic fracturing system for performing the patent’s fracturing methods, and is reproduced below:

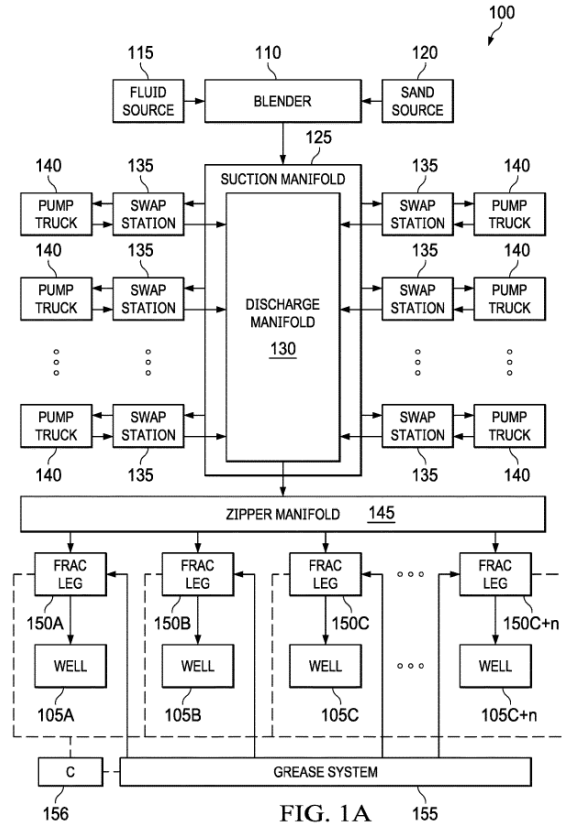


Figure 1A depicts hydraulic fracturing system 100, which is used to deliver fracturing fluid to wells 105A through 105C+n. Ex. 1001, 5:45–48. Pump trucks 140 draw the fracturing fluid from suction manifold 125 and discharge it to zipper manifold 145 via discharge manifold 130. *Id.* at 5:49–59. The zipper manifold delivers the fluid to “frac legs” 150A through 150C+n, each leg adapted to deliver the fluid to a corresponding well 105A through 105C+n. *Id.* at 5:59–65. Each frac leg is equipped with one or more zipper valves 170 capable of allowing or preventing fluid flow to the respective well. *Id.* at 7:49–8:1, Figs. 2A–2G.

According to the ’770 patent, when a fracturing stage has ended at one well and fracturing another well is contemplated, a determination is made whether to perform a “regular swap” or a “continuous pumping swap” (“CP swap”) to another well. *Id.* at 7:5–9. This determination may be based on,

e.g., determining that the fluid flow rate into the first well is below an upper threshold for a threshold amount of time. *Id.* at 13:30–54.

The steps of executing the CP swap from an “ n_1 well” to an “ n_1+1 well” are depicted in Figure 15, reproduced below.

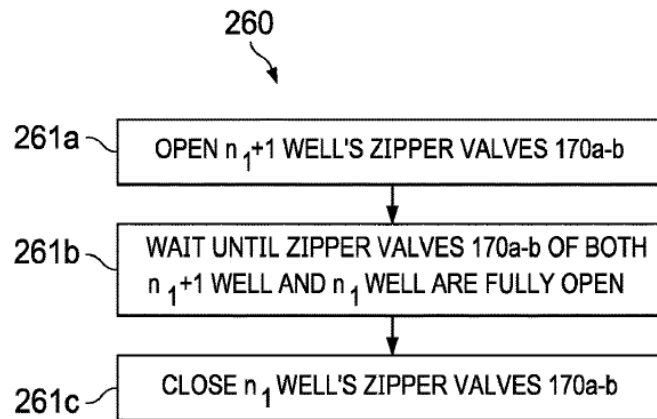


FIG. 15

Figure 15 is a flow diagram illustrating various sub-steps of a CP swap, in which hydraulic fracturing is moved from n_1 well to n_1+1 well. *Id.* at 4:39–43, 14:16–40. At sub-step 261a, the n_1+1 well’s zipper valves 170a-b are opened and hydraulic fracturing fluid is communicated from the zipper manifold 145 to the n_1+1 well. *Id.* at 14:22–25. At the sub-step 261b, both the n_1+1 well’s and the n_1 well’s zipper valves 170a-b are allowed to fully open, so that hydraulic fracturing fluid is communicated from the zipper manifold 145 to the n_1 well and the n_1+1 well. *Id.* at 14:29–35. Finally, at the sub-step 261c, the n_1 well’s zipper valves 170a-b are closed. *Id.* at 14:38–40.

The ’770 patent explains that “executing the CP swap from hydraulically fracturing . . . the n_1 well . . . to hydraulically fracturing . . . the n_1+1 well . . . transitions the zipper valves from one well to the other, opening the second well and subsequently shutting-in the first well, all while

pumping.” Ex. 1001, 14:43–48. “The transition is instantaneous and the total time between stages measured at treatment pressure is less than 20 seconds (as fast as 19 seconds in some instances).” *Id.* at 14:49–51.

D. The Challenged Claims and Their Construction

Of the 38 claims challenged in this Petition, claims 1, 14, and 27 are independent; claims 2–13 depend from claim 1; claims 15–26 depend from claim 14; and claims 28–38 from claim 27. Illustrative claim 1 reads:

1. [1.1] A method, comprising: communicating fluid to a first well via a manifold and a first valve, the first valve being associated with both the manifold and the first well; and
[1.2] in response to determining that the fluid communicated via the manifold has satisfied one or more conditions:
[1.3] opening a second valve; communicating fluid to a second well via the second valve; and
[1.4] closing the first valve after opening the second valve.

Ex. 1001, 22:34–43 (revised for formatting and to include brackets for the claim limitations in the manner addressed by Petitioner; Pet. x). Claims 14 and 27 recite similar limitations to claim 1, except claim 14 recites an apparatus (including, e.g., memory, processor, and software), and claim 27 recites a system (including, e.g., valves, manifold, and controllers), that perform the steps claim 1 recites. Ex. 1001, 23:25–41, 24:30–42; Pet. xii–xiii, xv. Most notably for this Decision, limitation 1.2 is the same as, and therefore representative of, limitations 14.3 and 27.6. *See id.*

E. Prior Art and Asserted Grounds

Petitioner asserts that claims 1–38 are unpatentable based on the following grounds:

Grounds	Claims Challenged	35 U.S.C. § ¹	Reference(s)/Basis
1	1–38	102	Krupa ²
2	1–38	103	Krupa
3	1–38	102	Carr ³
4	1–38	103	Carr
5	1–38	103	Carr, Beuterbaugh ⁴
6	5, 6, 9, 18, 19, 22, 31, 32	103	Carr, Beuterbaugh, Jackson ⁵
7	1–38	102	Tolman ⁶
8	1–38	103	Tolman

Petitioner additionally relies on testimony from Dr. Robert Durham in support of its challenges. Ex. 1002; Ex. 1044. Patent Owner counters with testimony from John Hughett in support of its positions. Ex. 2006.

¹ The Leahy-Smith America Invents Act (“AIA”), Pub. L. No. 112–29, 125 Stat. 284, 285–88 (2011), revised 35 U.S.C. §§ 102, 103 effective March 16, 2013. We apply the AIA versions of §§ 102 and 103 because the presumed earliest possible priority date evidenced by the ’770 patent is after that effective date. *See* Ex. 1001, codes (22), (63), (60).

² Krupa et al., US 2022/0268141 A1, publ. Aug. 25, 2022 (Ex. 1003 (“Krupa”)).

³ Carr et al., US 2019/0233275 A1, publ. Aug. 1, 2019 (Ex. 1004 (“Carr”)).

⁴ Beuterbaugh et al., WO 2020/145978 A1, publ. July 16, 2020 (Ex. 1005 (“Beuterbaugh”)).

⁵ Jackson et al., US 2007/0023184 A1, publ. Feb. 1, 2007 (Ex. 1007 (“Jackson”)).

⁶ Tolman et al., US 8,490,685, iss. July 23, 2013 (Ex. 1006 (“Tolman”)).

III. ANALYSIS

A. *Legal Standards*

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

“Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim.” *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1458 (Fed. Cir. 1984).

A claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the relevant art. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) secondary considerations (i.e., objective indicia) of nonobviousness when presented. *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966). “An obviousness determination [also] requires finding both that a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, and that the skilled artisan

would have had a reasonable expectation of success in doing so.” *CRFD Rsch., Inc. v. Matal*, 876 F.3d 1330, 1340 (Fed. Cir. 2017) (internal quotation marks and citation omitted).

B. Level of Ordinary Skill in the Art

In determining the level of skill in the art, we consider the problems encountered in the art, the art’s solutions to those problems, the rapidity with which innovations are made, the sophistication of the technology, and the educational level of active workers in the field. *Custom Accessories, Inc. v. Jeffrey-Allan Indus., Inc.*, 807 F.2d 955, 962 (Fed. Cir. 1986).

Petitioner proposes that the person of ordinary skill in the art (“skilled artisan”) as of May 17, 2021, “would have had an engineering degree and two or more years’ well-related operations experience, or equivalent education/experience.” Pet. 8 (citing Ex. 1003 ¶¶ 8–9). And Patent Owner neither disputes nor proposes an alternate definition of the skilled artisan’s background qualifications. *See generally* PO Resp.

For this Decision, we apply Petitioner’s proposed background for the lens through which a skilled artisan would view the references considered in this proceeding, which appears to be consistent with the level of skill shown in the prior art of record. *See Daiichi Sankyo Co. v. Apotex, Inc.*, 501 F.3d 1254, 1256 (Fed. Cir. 2007).

C. Claim Construction

In this *inter partes* review, claims are construed using the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b). *See* 37 C.F.R. § 42.100(b) (2020). The claim construction standard includes construing claims in accordance with the ordinary and customary meaning of such claims as understood by one of ordinary skill in the art at the time of the invention. *See id.*; *Phillips v. AWH*

Corp., 415 F.3d 1303, 1312–14 (Fed. Cir. 2005) (en banc). In construing claims in accordance with their ordinary and customary meaning, we take into account the specification and prosecution history. *Phillips*, 415 F.3d at 1315–17.

If the specification “reveal[s] a special definition given to a claim term by the patentee that differs from the meaning it would otherwise possess[,] . . . the inventor’s lexicography governs.” *Phillips*, 415 F.3d at 1316 (citing *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002)). Another exception to the general rule that claims are given their ordinary and customary meaning is “when the patentee disavows the full scope of a claim term either in the specification or during prosecution.” *Uship Intellectual Props., LLC v. United States*, 714 F.3d 1311, 1313 (Fed. Cir. 2013) (quoting *Thorner v. Sony Computer Entm’t Am., LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012)).

Additionally, only terms that are in controversy need to be construed and, even then, only to the extent necessary to resolve the controversy. *See Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1375 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’”) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g. Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner suggests that “[c]laim construction is not necessary in this IPR.” Pet. 12. Patent Owner likewise asserts that “claim construction is not necessary and that every claim term should be afforded its plain and ordinary meaning.” PO Resp. 10. And the experts for both parties’ state that they are relying on the plain and ordinary meaning of the Challenged Claims. Ex. 1002 ¶ 57 (“I have sought to provide the ordinary and customary meaning of claim terms”); Ex. 2012 ¶ 125 (“I have analyzed the

claim terms according to the ordinary and customary meaning”). Therefore, the parties do not identify with particularity any specific dispute regarding claim construction for us to decide.

Nevertheless, Petitioner makes a representation in its Reply about limitation 1.2— “in response to determining that the fluid communicated via the manifold has satisfied one or more conditions”—that we must address.

Petitioner states,

Notably, the independent claims do not require the second valve to be associated with the manifold or the first well The claims recite “communicating *fluid to a first well via a manifold and a first valve*,” and opening a second valve “in response to determining that *the fluid communicated via the manifold has satisfied one or more conditions*,” without requiring the fluid used for “determining” to have been communicated to the first well or first valve.

Pet. Reply 3. That last statement—limitation 1.2 does not “requir[e] the fluid used for ‘determining’ to have been communicated to the first well or first valve”—is inconsistent with the limitation’s plain and ordinary meaning, however.

When questioned during oral argument about whether “the fluid” in limitation 1.2 is the same fluid that is passing to the first well (*see* Tr. 8:25–12:14), Petitioner explained

So you have fluid that’s being communicated to the first well via the manifold and via a first valve. And then when you're saying in response to determining that the fluid communicated via the manifold, that's identifying where that fluid is communicated . . . the distinction is, if we're doing a determining step, there has to be where are we determining that. And nowhere in the patent and nowhere has patent owner said that the determining is occurring at the -- the well, I guess is the point.

Tr. 10:27–11:7. Petitioner admits that the plain meaning of “in response to determining that the fluid communicated via the manifold” is a determination about the fluid being communicated to the first well. *Id.* at 12:3–8.

Although we agree with Petitioner that the plain meaning of limitation 1.2 does not require the recited determination to *occur at the first well*, it does require the determination to be about the condition(s) of the fluid communicated to the first well by the manifold, regardless of where or how the information is gathered to make that determination. Limitation 1.2 recites plainly that the “determining” step is specifically about whether “***the fluid communicated via the manifold*** has satisfied one or more conditions.” Ex. 1001, 22:38–39 (emphasis added). Considering the antecedents for “the fluid” and “the manifold”—i.e., “communicating fluid to a first well via a manifold” (*id.* at 22:35, limitation 1.1)—limitation 1.2 expressly identifies the fluid which “the manifold” has “communicated” to the first well to be exactly the fluid used for “determining” whether “one or more conditions” are “satisfied” to trigger the recited responses. *Id.* This is because “the fluid” refers to a fluid passing to a first well by way of a manifold and the past tense of “communicated via the manifold” indicates, more specifically, that it is the fluid passed by the manifold which must satisfy a condition(s). The Specification of ’770 patent illustrates this by checking the “frac rate” of the fluid discharged by a manifold to a first well to make the determination about whether to permit a regular swap or a continuous pumping swap (“CP swap”). Ex. 1001, 13:30–54, Fig. 12. Therefore, contrary to Petitioner’s representation that limitation 1.2 does not “requir[e] the fluid used for ‘determining’ to have been communicated to the first well” (Pet. Reply 3), the plain meaning of limitation 1.2 does require the fluid used

for “determining” to have been communicated to the first well by the manifold.

Patent Owner correctly characterizes limitation 1.2 as creating an interdependency between communicating fluid to a first well and communicating fluid to a second well. PO Resp. 17–18 ((limitation 1.2 “requires operating the valves of *both* the first and second wells in a *specific ordered sequence* in response to a condition of the fluid communicated to the *first* well”); PO Sur-reply 2–3 (limitation 1.2 “require[s] opening a *second* valve in response to conditions of fluid communicated to the *first* well and performing the entire recited sequence in response to such conditions”). Limitation 1.2 does so by making the opening of a second valve and communicating therethrough fluid to the second well (limitation 1.3) *contingent upon* a condition being satisfied by fluid communicated to the first well a manifold. Ex. 1001, 22:38–43 (“opening a second valve; communicating fluid to a second well via the second valve”— “*in response to* determining that the fluid communicated via the manifold has satisfied one or more conditions”). Additionally, limitation 1.2 makes closing a first valve communicating fluid to the first well (limitation 1.4) *contingent upon* both the same condition being satisfied and the second valve opening to communicate fluid to the second well. *Id.* (“closing the first valve *after* opening the second valve”— “*in response to* determining that the fluid communicated via the manifold has satisfied one or more conditions”).

Put another way, limitation 1.2 makes each of the recited responses— “opening a second valve; communicating fluid to a second well via the second valve; *and* closing the first valve *after* opening the second valve” (limitations 1.3 and 1.4)—dependent upon the same triggering determination “that the fluid communicated via the manifold [to a first well] has satisfied

one or more conditions.” *Id.* As Patent Owner correctly notes, the colon at the end of limitation 1.2 “clearly indicates that ***all three steps*** [of the recited response] must be performed” as a “response to” the recited triggering determination. PO Sur-reply 21 (citing *Securus Techs., Inc. v. Global Tel*Link Corp.*, 701 F. App’x 971, 975 (Fed. Cir. 2017) (concluding that a colon following a limitation “is indicative that a list of particulars is to follow” and that “the most natural reading of the limitation is one that incorporates all the steps” that follow). This natural reading of limitation 1.2 is consistent with the ’770 patent’s Specification, which illustrates this by checking the “frac rate” of the fluid discharged by a manifold to a first well to make the determination about whether to permit a regular swap or a continuous pumping swap (“CP swap”) and, when the conditions warrant a CP swap, opening a second well to communicate fluid to a second well, waiting until the second valve is fully open, and, after that valve is fully open, closing the first valve. Ex. 1001, 13:30–54, 14:16–51, Figs. 12, 15. Therefore, limitation 1.2 establishes a cause/effect relationship between the condition(s) of the fluid communicated to a first well and the entire process of opening a second valve, communicating fluid to a second well via the second well, and closing, after the second well has opened, a first valve communicating fluid to the first well.

Beyond this clarification/interpretation of limitation 1.2, we do not find any other limitation needs to be expressly construed. *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (“[W]e need only construe terms ‘that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs.*, 200 F.3d at 803).

D. The Krupa Grounds (Grounds 1 & 2)

In Grounds 1 and 2, Petitioner argues that claims 1–38 of the ’770 patent are unpatentable because they are either anticipated, or rendered obvious, by Krupa. Pet. 17–47. Krupa is U.S. Application 17/651,716, which was published on August 25, 2022 and was filed on February 18, 2022. Ex. 1003, codes (21), (22). In this proceeding, however, Petitioner concedes that “the challenged claims’ priority date is May 17, 2021.” Pet. 12–16. Noting that Krupa “claims priority to U.S. Provisional App. No. 63/153,607), [which was] filed February 25, 2021” (*see id.* at code (60)) (“Krupa Provisional”), Petitioner states that “[b]ecause *Krupa*’s effective filing date is February 25, 2021—before ’770’s priority date (May 17, 2021)—*Krupa* is 35 U.S.C. § 102(a)(2)-prior art.” Pet. 4.

Patent Owner asserts Grounds 1 and 2 are defective because the Petition does not establish a *prima facie* case Krupa is prior art to the ’770 patent. PO Resp. 10–12. Specifically, Patent Owner argues that “[t]he Petition does not show (or even allege) that the subject matter relied upon in Krupa is supported by the Krupa Provisional” and that, to establish a *prima facie* case in the Petition, “Petitioner was required to show in the Petition that the Krupa Provisional ‘describes the subject matter’ relied upon in Krupa.” *Id.* at 10–11 (citing 35 U.S.C. § 102(d)(2); *Penumbra, Inc. v. RapidPulse, Inc.*, IPR2021-01466, Paper 34 at 32-34 (Mar. 10, 2023) (precedential as to § II.E.3); *Forescout Techs., Inc. v. Fortinet, Inc.*, IPR2021-01328, Paper 12, at 9-10 (Jan. 27, 2022)). Patent Owner states that “Petitioner failed to make that showing in the Petition—nor could it have, the Krupa Provisional was not filed as an exhibit.” *Id.* at 11–12.

In its Reply, Petitioner does not refute Patent Owner’s argument that a *prima facie* showing was not made in the Petition that Krupa qualifies as

prior art. *See* Pet. Reply 27. Instead, Petitioner simply states, “Petitioner maintains that Krupa is § 102(a)(2)-prior art with an effective filing date of February 25, 2021.” *Id.* Without citing any evidence or reasoning included in the Petition to support that contention, Petitioner offers, for the first time, a reason Krupa is prior art—“because it . . . is fully supported by its identical U.S. Provisional App. No. 63/153,607, filed February 25, 2021, and no exceptions apply.” *Id.* (citing Ex. 1037).

Petitioner’s burden to show with particularity why the ’770 patent is anticipated by, or would have been obvious over, Krupa necessarily requires Krupa to be first qualified as prior art. *See Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1327 (Fed. Cir. 2008) (party’s burden to prove anticipation of a patent includes initial burden of going forward with evidence that there is anticipating prior art). Under 35 U.S.C. § 102(a)(2)—the subsection under which Petitioner contends Krupa qualifies as prior art—when the reference patent document’s actual filing date is *before* the challenged patent’s filing date, a petitioner need only refer to the filing dates appearing on the challenged patent and reference patent document to make *prima facie* showing that the reference is prior art. 35 U.S.C. § 102(d)(1) (“For purposes of determining whether a patent or application for patent is prior art to a claimed invention under subsection (a)(2), such patent or application shall be considered to have been effectively filed, with respect to any subject matter described in the patent or application—(1) if paragraph (2) does not apply, as of the actual filing date of the patent or the application for patent.”).

Here, however, the February 18, 2022 filing date of Krupa (Ex. 1003, code (22)) is indisputably *after* the priority date for the Challenged Claims of the ’770 patent, which Petitioner concedes is at least May 17, 2021 (Pet.

4, 12–16). Petitioner must therefore seek the benefit of the February 25, 2021 filing date of the Krupa Provisional so that Krupa can qualify as prior art. *See* Pet. 4; 35 U.S.C. § 102(d)(2). To qualify as prior art, under subsection 102(d)(2), a reference patent or published patent application is considered effectively filed as of the filing date of its provisional application only to the extent that the provisional “describes the subject matter” relied on in the reference patent document. 35 U.S.C. § 102(d)(2). We cannot presume that the Krupa Provisional describes the subject matter that the Petition relies on from Krupa, however. *See Dynamic Drinkware*, 800 F.3d at 1380 (“[B]ecause the PTO does not examine priority claims unless necessary, the Board has no basis to presume that a reference patent is necessarily entitled to the filing date of its provisional application.”). The burden to make this showing in the Petition falls squarely on Petitioner.

The statutes and regulations applicable to *inter partes* review establish filing-content rules that (1) “generally require a petitioner to provide in the petition itself an understandable explanation of the element-by-element specifics of its unpatentability contentions, identifying supporting parts of the relied-on prior art” and (2) “reinforcing that requirement for what must be in the petition is a regulatory limit on permissible reply material.” *AMC Multi-Cinema, Inc. v. Fall Line Patents, LLC*, No. 2021-1051, 2021 WL 4470062, at *5 (Fed. Cir. September 30, 2021). When deciding whether subject matter included in a reply is within the limits of what is permissible, we must use our judgment “to distinguish impermissible new argument or evidence from permissible reinforcement (in responding to a patent owner's response) of a point already made with the required support in the petition.” *Id.* at *6. The Federal Circuit has “made clear that if the petition asserts that

a claim requirement is met, provides a reason that the assertion is true, and cites evidentiary support for that reason, then reply material that fairly adds confirmation that the initially presented material does in fact support the assertion is not prohibited new material, but a proper part of the record.” *Id.*

In the Petition, Petitioner does not explain how the Krupa Provisional discloses the cited subject matter from Krupa, nor does Petitioner provide evidence of what subject matter that the Krupa Provisional does disclose.

Pet. 4. Without any reasoning or evidence, the Petition can only be characterized as including an unsupported conclusory statement that Krupa is prior art. *See id.* Petitioner therefore did not make adequately, in the Petition, a showing necessary to establish a prima facie case that Krupa is within the scope of prior art available to challenge the ’770 patent.

In the Reply, Petitioner argues for the first time that Krupa is “fully supported by its identical” Krupa Provisional and submits, for the first time, the Krupa Provisional into the record.⁷ Pet. Reply 27. We determine, however, that this information cannot be considered because it is being used

⁷ Petitioner tried to submit previously this information after Patent Owner’s Preliminary Response was filed. Paper 9. Petitioner had argued that it had good cause to submit a reply under 37 C.F.R. § 42.108(c) because it could not have reasonably foreseen that Patent Owner would challenge Krupa’s status as prior art in the Preliminary Response. *Id.* at 3. We disagreed. We found that “Krupa’s status as prior art was a foreseeable issue from the outset” and “[i]t [was] therefore equally foreseeable that Patent Owner would challenge . . . whether Petitioner made the necessary showing to qualify Krupa as being properly within the scope of available prior art against the claims challenged.” *See id.* at 4. Petitioner asked for permission, in the alternative, to file a corrected petition, but we declined authorization because “[w]e [did] not consider the omission of any analysis in the Petitions of the ’607 provisional, or the failure to enter the ’607 provisional into the record of these proceedings, to be a “clerical or typographical mistake” under 37 C.F.R. § 42.104(c). *Id.* at 5.

to improperly “gap-fill” by presenting an argument and evidence intended to establish Krupa qualifies as prior art under 35 U.S.C. § 102(a)(2). *See* Board's Consolidated Trial Practice Guide (“Trial Guide”), 84 Fed. Reg. 64,280, (Nov. 2019), 74–75.⁸ The Trial Guide makes clear that “*Petitioner may not submit new evidence or argument in reply that it could have presented earlier, e.g. to make out a prima facie case of unpatentability.*” *Id.* at 73 (emphasis added). “Examples of *indications that a new issue has been raised in a reply include new evidence necessary to make out a prima facie case for the patentability or unpatentability of an original or proposed substitute claim.*” *Id.* at 74 (emphasis added). “While replies . . . can help crystalize issues for decision, *a reply . . . that raises a new issue or belatedly presents evidence may not be considered.*” *Id.* (emphasis added). And, here, there is no question Petitioner could have, and should have, provided the newly presented argument (i.e., the Krupa Provisional is “identical” to Krupa) and evidence (i.e., Ex. 1037 (the Krupa Provisional)) with the Petition to make out a prima facie case that the subject matter relied upon in Krupa is supported by the Krupa Provisional.

Therefore, because Petitioner failed to make a prima facie case that Krupa is prior art in the Petition, we find that Petitioner has also failed to demonstrate by a preponderance of the evidence that Krupa either anticipates or renders obvious the Challenged Claims, as contended in Grounds 1 and 2.

E. The Carr Grounds (Grounds 3–6)

In Grounds 3–6, Petitioner relies primarily on Carr to establish claims 1–38 of the ’770 patent are unpatentable. Pet. 47–70. Grounds 3 and 4

⁸ Available at www.uspto.gov/TrialPracticeGuideConsolidated.

contend that Carr alone discloses, or renders obvious, claims 1–38 (*id.* at 47–61); Ground 5 contends “*Carr* also renders obvious Claims 1–38 in view of *Beuterbaugh*” (*id.* at 62–69); and, addressing only dependent claims 5, 6, 9, 18, 19, 22, 31, and 32, Ground 6 contends that “[i]f the Board determines that *Carr*, with or without *Beuterbaugh*, lacks sufficient disclosure/teaching of flowrate thresholds as a fluid condition, *Jackson* explicitly discloses flowrate thresholds as a condition monitored in controlling valves for injecting fluid into a wellbore and associated formation” (*id.* at 69–70).

Patent Owner asserts Grounds 3–6 (“the Carr Grounds”) do not demonstrate that the Challenged Claims are unpatentable. PO Resp. 12–42. According to Patent Owner, the Carr Grounds are all deficient because Carr fails to disclose or suggest limitations 1.2, 14.3, and 27.6, which require each of the recited responses (i.e., opening a second valve, communicating fluid to a second well, and closing the first valve (limitations 1.3–1.4, 14.4–14.5, and 27.4–27.5)) to be triggered by determining that the fluid communicated to a first well by a manifold has satisfied a particular condition(s). *Id.* And to put a finer point on Patent Owner’s alleged deficiency, even assuming each of the triggered responses were individually known at the time of the invention, Petitioner failed to show that Carr, with or without *Beuterbaugh*, discloses or suggests performing each of those responses because the fluid passed by the manifold to the first well has been determined to satisfy a particular condition(s). *See id.* 16–23, 39.

The deficiency Patent Owner raises with Grounds 3–6 is dispositive of those grounds. Because limitation 1.2 is representative of the same limitations 14.3 and 27.6 (*see* Ex. 1001, 22:39–38, 23:35–37, 24:40–42) and because Carr is the only reference Petitioner relies upon to disclose or suggest the subject matter recited in those limitations (*see* Pet. 51; Tr. 30),

our analysis begins with a brief description of Carr. We next explain the parties' positions for what Carr disclose regarding the subject matter that limitation 1.2 recites. We explain afterwards why we find Petitioner's evidence and reasoning is unpersuasive to show Carr discloses or suggests that subject matter, which is fatal to the Carr Grounds.

1. Description of Carr

Carr, titled "Method and Apparatus for Metering Flow During Centralized Well Treatment," discloses a system for providing a well stimulation fluid for "simultaneously treating multiple wells from a centralized location," the system including a manifold, a first flow meter, and a second flow meter. Ex. 1004, codes (54), (57), ¶ 1. The manifold can define a first isolated manifold path in fluid communication with a first wellhead and a second isolated manifold path in fluid communication with a second wellhead. *Id.* As shown in annotated Fig. 5 of Carr, reproduced below, a first valve 470 is disposed along the first isolated manifold path 122 and a second valve 472 is disposed along the second isolated manifold path 124.⁹ *Id.* ¶ 33, Fig. 5.

⁹ Carr also discloses a proportioning valve located upstream the first and second valves, but in Figure 5 the proportioning valve is mistakenly identified by the number 470, which is the same number used for the first valve. Carr makes clear, however, that the number 474 was the intended identifier for the proportioning valve. Ex. 1004 ¶34. Therefore, the identifier 470 is used exclusively to refer to the first valve.

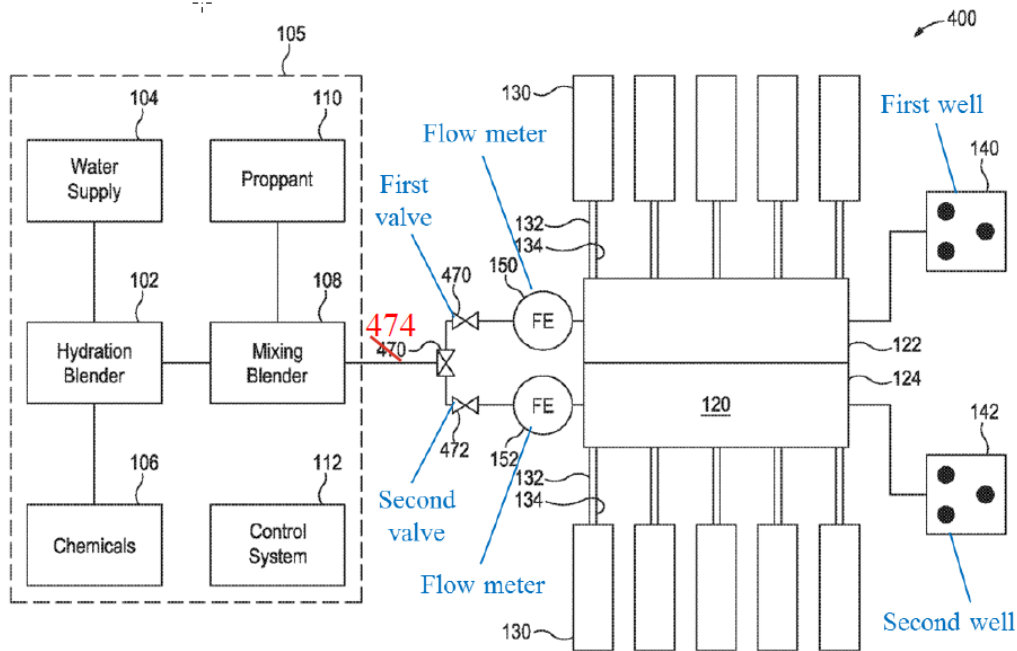


FIG. 5
(annotated)

Figure 5 is an exemplary “flow diagram of a centralized well treatment facility.” *Id.* ¶ 9. “The first valve 470 and the second valve 472 can allow for the first well 140 and the second well 142 to each be stimulated individually by opening the respective first valve 470 or the second valve 472 and closing the other valve.” *Id.* ¶ 33. According to Carr, “the first valve 470 and the second valve 472 can be used to control the flow rate to the first well 140, the second well 142, or to both the first well 140 and the second well 142 simultaneously.” *Id.* And “the control system 112 can be utilized to control the position of the first valve 470 [and] second valve 472 . . . by utilizing flow data from the first flow meter 150 and the second flow meter 152 in light of fluid flow targets for the first well 140 and/or the second well 142.” *Id.* ¶ 35.

2. *The Parties' Contentions*

a) *Petitioner Contends Carr Discloses or Suggests
Limitation 1.2*

Pointing to Carr's Figure 5 (reproduced above), Petitioner contends that Carr's description of the illustrated system discloses an "overlapping valve sequences for two or more wells in response to determining condition(s) of fluid communicated to a well." Pet. 47–48 (citing Ex. 1004, code (57), ¶¶ 33, 36, Fig. 5). Carr describes a fluid path from centralized location 105 to first well 140, through valve 470 and manifold 120, which Petitioner contends demonstrates the communicating of fluid to a first well 140. *Id.* Petitioner contends that valve 470 is the recited first valve and manifold 120 is the recited manifold. *Id.* at 49–50 (citing Ex. 1004 ¶ 33, Fig. 5). Additionally, Carr describes a fluid path from centralized location 105 to second well 142, through valve 472 and manifold 120, which Petitioner contends shows the communicating of fluid to a second well 142. *Id.* 47–48 (citing Ex. 1004, code (57), ¶¶ 33, 36, Fig. 5). Petitioner contends similarly that valve 472 is the recited second valve and that Carr discloses communicating fluid to the second well 142 by opening second valve 472. *Id.* at 51 (citing Ex. 1004 ¶¶ 23, 33).

Because Carr "discloses pumping fluid alternately and/or simultaneously to a first and second well via associated first and second valves" (*id.* at 52 (citing Ex. 1004 ¶ 33), Petitioner contends that a skilled artisan "would understand that operating the first and second valves to direct fluid into the associated first and second wells 'individually' and/or 'simultaneously' . . . includes closing the valve to one well (e.g., to the first well) after opening the valve to the other well (e.g., to the second well)" (*id.* (citing Ex. 1002 ¶¶ 331–332)). Petitioner contends also that a skilled artisan

“would find it necessary and at least obvious to close a first valve to a first well after opening a second valve to a second well based on the fluid flow targets to stimulate the first and second wells ‘individually’ and ‘simultaneously.’” *Id.* at 52–53 (citing Ex. 1004 ¶¶ 33, 35; Ex. 1002 ¶¶ 331–332).

Petitioner contends Carr discloses performing both steps of (1) opening second valve 472 to communicate fluid to the second well 142 and (2) closing first valve 470 after opening second valve 472 “in response to determining that the fluid communicated [to first well 140] via the manifold has satisfied one or more conditions,” as limitation 1.2 recites. Pet. 51 (citing Ex. 1004 ¶¶ 23–25, 35). Petitioner supports this contention by identifying that Carr’s control system 112 collects flow measurements for the first well 140 and the second well 142 “to control the production of fluid and the output of fluid to the first well 140 and the second well 142,” which “‘allow[s] for enhanced control of treatment or fracturing’ of the wells from a centralized well treatment facility.” *Id.* (citing Ex. 1004 ¶¶ 23–25). Additionally, Petitioner identifies that Carr’s control system 112 “can control fluid to the wells by controlling the position of the valves to the wells ‘utilizing flow data from the first flow meter 150 and the second flow meter 152 in light of fluid flow targets for the first well 140 and/or the second well 142.’” *Id.* (citing Ex. 1004 ¶ 35).

b) Patent Owner’s Response

Patent Owner asserts that “Carr’s system simply has no need to perform the ’770 Patent’s claimed well swapping technique, which only applies to wells sharing a common pressurized fluid flow.” PO Resp. 16 (citing Ex. 2012 ¶¶ 134–137). According to Patent Owner, “[b]oth experts agree that Carr’s manifold [120] is properly understood as a ‘missile’—it

intakes low-pressure fluid, feeds the fluid to pumps, and outputs highly pressurized fluid” and “Carr does not have a zipper manifold downstream from its missile for ‘redirection’ of common fluid flow between the wells 140 and 142,” but instead has two “‘isolated manifold path[s]’ output[] fluid directly to [their] respective well[s].” *Id.* at 15 (citing Ex.2009; Ex.2012 ¶133; Ex.2013, 154:1–5, 154:17–22, 146:9–148:11; Ex. 2008; Ex. 1004, Fig. 5). Patent Owner asserts that “because each isolated manifold path is independently pressurized by ‘separate’ pumps and directs fluid to wells with different geologic characteristics, the fluid conditions in each manifold path will be different” and “[e]ach manifold path’s flow meter separately and independently measures the different fluid conditions to control the respective valves 470 and 472 in light of the wells’ different fluid flow targets.” *Id.* (citing Ex.1004 ¶¶ 22, 33–35, 58, 60, Fig. 5; Ex.2012 ¶¶ 134–135; Ex.2013, 94:24–95:10, 151:21–152:3, 153:5–17).

Patent Owner argues that limitation 1.2 requires “operating the valves of *both* the first and second wells in a *specific ordered sequence* in response to a condition of the fluid communicated to the *first* well,” but “Carr necessarily fails to teach or suggest this claimed interdependency between wells because Carr’s wells are stimulated via ‘isolated manifold paths’ with independent fluid conditions.” PO Resp. 17–18.

In order to satisfy limitation 1.2, Patent Owner argues that “Carr must teach determining that fluid in the *first* isolated manifold path 122 satisfies a condition and opening the *second* valve 472 in response,” but “Carr does not teach or suggest such a sequence—nor would a [skilled artisan] find it obvious.” PO Resp. 19–20. Patent Owner states that:

Carr’s flow meter 150 provides flow rate information for first isolated manifold path 122, which is used to “control the

position of the first valve 470” in light of the “fluid flow targets for the first well 140.” Separately and independently, flow meter 152 provides flow rate information for second isolated manifold path 124, which is used to control the position of the second valve 472 in light of the fluid flow targets for the second well 142. Moreover, even though the isolated manifold paths receive fluid from the same centralized source 105, the fluid, once split, is still “isolated” within each manifold path and thus must be monitored “separately and independently.”

Id. at 20–21 (citing Ex.1004 ¶¶ 23, 33–35, 58, 60, Fig. 5; Ex.2012 ¶¶ 134–135; Ex.2013, 153:5–17, 94:24–95:10, 151:21–152:3). In view of this operation, Patent Owner argues that “[a]t no point does Petitioner . . . show[] that Carr opens its **second** valve 472 in response to determining that the fluid communicated to the **first** well 140 satisfies a condition” and “[n]or could it—Carr’s system simply does not operate in that manner.” *Id.* at 21 (citing Ex.2012 ¶¶ 136–137, 141–142). In Patent Owner’s words, “[i]t would make no sense in Carr to control the second valve 472 on the second isolated manifold path 124 based on the separate and independent fluid conditions within the first isolated manifold path 122.” *Id.*

Patent Owner notes that Petitioner’s statement that a skilled artisan “would find it necessary and at least obvious to close a first valve to a first well after opening a second valve to a second well based on the fluid flow targets” (Pet. 52–53) does not address the identified deficiency “because it does not allege that a [skilled artisan] would have found it inherent or obvious that Carr opens its second valve 472 in response to determining that the fluid communicated to the first well 140 satisfies a condition.”

PO Resp. 22. And even if Petitioner had made such a statement, Patent Owner argues that Petitioner cannot “show that Carr ‘necessarily’ opens second valve 472 in response to a condition of the fluid in first well 140, as

required for inherency,” because “Carr expressly teaches ‘adjusting the *first* valve in response to the *first* flow rate.’” *Id.* (citing Ex.1004 ¶ 58).

Furthermore, Patent Owner argues that “even if Carr’s system were ‘capable of’ opening the second valve 472 in response to a condition of the fluid in the first well 140, Petitioner does not make the required showing that a [skilled artisan] would have been motivated to do so.” *Id.* at 22–23 (citing *ParkerVision, Inc. v. Qualcomm Inc.*, 903 F.3d 1354, 1363 (Fed. Cir. 2018)). Patent Owner asserts again that a skilled artisan “would have found it nonsensical to operate a valve in Carr’s second isolated manifold path 124 based on a separate and independent fluid condition in the first isolated manifold path 122.” *Id.* at 23 (citing Ex.2012 ¶¶ 136–137, 142; Ex.2013, 153:5–17). And even if Carr could be understood to operate the second valve based on the condition(s) of the fluid passed by the manifold to the first well, Patent Owner asserts that a skilled artisan would have understood Carr’s disclosure to describe a “valve sequence conventionally utilized in fracturing industry when sequentially fracturing two wells: closing the valve of the first well and *then* opening the valve of the second well.” *Id.* at 25 (citing Ex. 2012 ¶ 148); *see id.* at 24–26.

c) Petitioner’s Reply

Petitioner states that Patent Owner “must face the problem of its own making” and criticizes Patent Owner’s “entire analysis” as relying “on improperly importing unclaimed features/limitations into the claims.” Pet. Reply 2. Petitioner states that Patent Owner’s “dependence between the valves” arguments are “red herrings and fail because none of the claims . . . require the second valve to be associated with the manifold or the first well,” nor do the claims require “the fluid used for ‘determining’ to have been communicated to the first well or first valve.” *Id.* at 3 (citing PO Resp. 18–

25). Petitioner states that “the claims only require the second valve [to be] opened ‘in response to determining that the fluid communicated via the manifold has satisfied one or more conditions’ and ‘Carr discloses this limitation.’” *Id.* at 4 (citing Pet. 51).

Petitioner argues,

Carr, as a whole, discloses or teaches that the valves are operated “in light of fluid flow targets for the first well 140 **and/or** the second well 142” to stimulate the wells individually or simultaneously. Thus, *Carr* plainly discloses an operator would open a second valve to a second well based on (*i.e.*, in response to) flow meter readings from the first well.

Pet. Reply 5 (citing Ex. 1002 ¶¶ 109–110, 320, 326, 331–332; Ex. 1044 ¶ 12). According to Petitioner, Patent Owner is wrong to insist that Carr’s isolated flow paths are operated independently because Carr’s disclosure of a “centralized location” for monitoring and controlling fluid flow, and an optional proportioning valve, demonstrates “Carr’s isolated flow paths are not operated independently.” *Id.* (citing PO Resp. 22; Ex. 1004 ¶¶ 15, 34; 1002 ¶¶ 107–110, 393). Petitioner asserts that Patent Owner’s expert “admits it was conventional for operators to consider data across the entire wellsite, and that it was well-known to control fluid flow to wells according to a pumping plan/schedule and move to a next step/stage in response to that plan and data gathered.” *Id.* (citing Ex. 1043, 19:18–24, 22:18–24:11, 25:9–15, 29:2–13, 32:11–15). And because Patent Owner’s expert “admits that splitting flow **does impact** flowrate,” Petitioner asserts he also “concedes that operating *Carr*’s first/second valves *would impact* fluid flow, contradicting [Patent Owner’s] basis for its *Carr* ‘in-response-to’ arguments.” *Id.* at 6 (citing Ex. 1043, 40:17–42:11; Ex. 1044 ¶¶ 10–12).

Petitioner accuses Patent Owner of “misread[ing] Carr’s simultaneous stimulation to require simultaneously opening and closing valves.” Pet. Reply 6 (citing PO Resp. 25). Because “Carr teaches treating wells ‘individually’ and ‘simultaneously,’ and during treatment, adjusting the position (*i.e.*, opening or closing) of the first and/or second valve ‘in light of fluid flow targets for the first well 140 and/or the second well,’” Petitioner contends that, “when treating Carr’s first well (with its valve open), Carr discloses opening the second well’s valve according to fluid flow targets for the first and/or second well.” *Id.* (citing Pet. 49; Ex. 1002 ¶¶ 323–324, 326–328, 359–360).

Petitioner’s last criticism is of Patent Owner’s “argument that it would be ‘nonsensical’ to ‘completely clos[e]’ Carr’s first valve while simultaneously treating the wells because ‘doing so would cut off fluid flow to the well and potentially deadhead the pumps.’” Pet. Reply 6 (citing PO Resp. 26). That argument, from Petitioner’s perspective, “incorrectly assumes that ‘opening’ requires adjusting valves from fully-closed to fully-open and ‘closing’ requires adjusting from fully-open to fully-closed,” which “is neither true nor in the claims.” *Id.* Petitioner states that the recited “opening” and “closing” of the valves “includes partially opening/closing” the valves and a skilled artisan “would understand [Carr] includes partially opening/closing [a] valve” because “Carr states that the ‘position’ of a valve may be controlled to ‘control the flow rate’ to the well.” *Id.* at 6–7.

d) Patent Owner’s Sur-Reply

Patent Owner states that it is Petitioner who is “ignor[ing] the claims’ plain-language requirement of performing the recited valve sequence ‘in response to’ a condition of ‘the fluid’ communicated to the *first well*.” PO

Sur-reply 1 (citing Pet. Reply 2). Patent Owner asserts that, by “refus[ing] to acknowledge the basic requirements of the claims,” Petitioner “moots its arguments that Carr either anticipates or renders obvious the Challenged Claims.” *Id.* at 1–2. “[C]ontrary to Petitioner’s assertions,” Patent Owner states that “the Challenged Claims require opening a **second valve** in response to conditions of fluid communicated to a **first well**” and that “Carr neither anticipates nor renders obvious this interdependency.” *Id.* at 2–3. Patent Owner asserts that neither the individual nor simultaneous stimulation operations in Carr’s “discloses or suggests performing the claimed valve sequence or doing so in response to conditions across two ‘isolated’ manifold paths,” and Petitioner “gives no reason for combining the different operations.” *Id.* at 2.

Carr’s general statement “that its control system can control the system’s valves ‘in light of fluid flow targets for the first well 140 and/or the second well 142’” is insufficient to disclose limitation 1.2, Patent Owner argues. PO Sur-reply 3 (citing Pet. Reply 5; Pet. 51; Ex. 1004 ¶ 35). This is because “the Challenged Claims do not merely require controlling the positions of the valves based on flow-meter data from one or both wells;” “[t]hey require opening a second valve in response to conditions of fluid communicated to the first well and performing the entire recited sequence in response to such conditions.” *Id.*

That general statement by Carr “also cannot render obvious the claimed interdependency (opening a **second** valve in response to conditions of fluid communicated to a **first** well) because it must be read together with Carr’s explicit statement that the “**first** valve” controls flow to the “**first** well” and the “**second** valve” controls flow to the “**second** well.” *Id.* (citing Ex. 1004 ¶ 33). Carr’s use of the alternative “and/or” language “does not

mean what Petitioner thinks it means,” Patent Owner states, because that alternative language in Carr “is meant to cover both of Carr’s alternative operations: stimulating its two wells ‘individually’ or stimulating its two wells ‘simultaneously.’” *Id.* at 4 (citing Ex. 1004 ¶ 33; Ex. 2033, 40:16–24; Pet. 52). And given Carr’s simultaneous and individual treatments are “**different operations**,” Patent Owner asserts that “Petitioner’s cited ‘and/or’ statement means that the control system would use only one of the fluid-flow targets when stimulating individually (‘or’) or would use both fluid-flow targets with stimulating simultaneously (‘and’).” *Id.* at 4–5 (citing Ex. 2033, 40:16–24). “[E]ven in the simultaneous case,” Patent Owner asserts that “each valve only controls the flow to its respective well.” *Id.* at 5 (citing Ex.1004 ¶ 33).

Additionally, Patent Owner argues that Petitioner’s mapping of Carr to show it anticipates limitation 1.2 improperly combines the two different operations Carr discloses because “[o]perating both valves to hit flow targets of both wells refers to **simultaneous** stimulation—yet Petitioner’s mapping to the claimed valve sequence (“closing the first valve after opening the second valve”) refers to Carr’s **individual** stimulation, which is a “different operation.” PO Sur-reply 6 (citing Pet. 52; Ex.1004 ¶ 33; Ex. 2033, 40:16–24; *Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1371 (Fed.Cir.2008)). Still further, Patent Owner argues that Petitioner failed to explain “why a [skilled artisan] would have been motivated to perform (or even could have performed) a valve sequence tailored for individual stimulation in combination with a dual-valve control scheme tailored for simultaneous stimulation” and a “mapping that pieces together disparate operations without any explanation fails as a matter of law.” *Id.* at 6–7 (citing *In re Stepan Co.*, 868 F.3d 1342, 1346 n.1 (Fed. Cir. 2017)).

Finally, although Petitioner contends that “Carr’s plain language discloses or teaches that a second well 142 can be stimulated individually by opening the second valve 472, *then* closing the first valve 470 to the first well 140,” Patent Owner argues that there is no supporting evidence from Carr “that the operations are performed in that specific order” or explanation “why a [skilled artisan] would understand Carr to imply that they are.” PO Sur-reply 7 (citing Pet. Reply 3). Patent Owner notes that “Petitioner does not dispute [] operators conventionally used the opposite valve sequencing to swap between wells—first closing the valve of the first well and then opening the valve of the second well” and asserts that “[n]othing in Carr suggests deviating from that convention.” *Id.* (citing Pet. Reply 3; Ex. 2012 ¶ 148).

3. *Petitioner’s Carr Grounds Are Deficient*

After studying the parties’ evidence and arguments, we find Petitioner’s contention that Carr discloses or suggests limitation 1.2 to be unpersuasive. Limitation 1.2, as discussed above (*see supra* § III.C), makes each of the recited responses—“opening a second valve; communicating fluid to a second well via the second valve; *and* closing the first valve *after* opening the second valve” (limitations 1.3 and 1.4)—dependent upon the same triggering determination “that the fluid communicated via the manifold [to a first well] has satisfied one or more conditions”; it establishes a cause/effect relationship between the condition(s) of the fluid communicated to a first well by a manifold (“the trigger”) and the process of opening a second valve, and communicating therethrough fluid to a second well, before closing a first valve that communicates fluid to the first well (“the triggered responses”). For the reasons discussed more fully below,

Petitioner's contention Carr discloses or suggests limitation 1.2 is not sufficiently credible to satisfy its burden of proof.

Carr discloses communicating fluid to first well 140 through first valve 470 and manifold 120, which may be referred to as a “missile.” Ex. 1004 ¶¶ 21, 33, Fig. 5; *see* Ex. 2009 (showing skilled artisans would have recognized that the reference to a “missile” indicates Carr's manifold uses high pressure pumping to convert the low pressure fluid entering the manifold to high pressure fluid exiting the manifold); Ex. 2013, 64:3–17. The first valve is associated with both manifold 120 and first well 140 because it is disposed along the first isolated manifold path 122 to first well 140 and because it can be utilized to control fluid communicating therethrough from mixing blender 108 to first well 140. *Id.* ¶ 33. Similarly, Carr discloses communicating fluid to second well 142 through second valve 472 and manifold 120. *Id.* The second valve is associated with both manifold 120 and second well 472 because it is disposed along a second isolated manifold path 124 to second well 142 and because it can be utilized to control fluid communicating therethrough from mixing blender 108 to second well 142. *Id.* Carr discloses that “fluid flow to the first well 140 and/or the second well 142 can be exclusively controlled by adjusting the output of the pumps 130” associated with each of the respective isolated manifold path. *Id.* ¶ 25. Carr discloses that “[t]he first valve 470 and the second valve 472 can allow for the first well 140 and the second well 142 to each be stimulated individually by opening the respective first valve 470 or the second valve 472 and closing the other valve.” *Id.* ¶ 33. Additionally, Carr discloses a control system 112 that “can be utilized to control the position of the first valve 470, second valve 472, and/or [a] proportioning valve 474 by utilizing flow data from [a] first flow meter 150 and [a] second

flow meter 152 in light of fluid flow targets for the first well 140 and/or the second well 142.” *Id.* ¶ 35. In view of these teachings, we find Carr discloses (1) a controllable first valve positioned along a first isolated manifold path to a first well for communicating high pressure fluid to the first well; and (2) a controllable second valve positioned along a second isolated manifold path to a second well for communicating high pressure fluid to the second well. Additionally, we find Carr discloses that the opening and closing of the respective first and second valves may be controlled using flow data collected at various locations along the fluid’s path to a particular well.

However, Carr does not disclose or suggest: *relying on* the condition(s) of the fluid communicated by first isolated manifold path 122 to first well 140 to be *the determinative factor for causing* first and second valves 470 and 472 to perform a sequenced response that includes— (1) opening second valve 472, (2) communicating fluid to second well 142 through second valve 472, and (3) after opening second valve 472, closing first valve 150 from communicating fluid to first well 140. At the time of the invention, when a first well is being operated individually using high pressure pumping, we find that skilled artisans would have considered concurrent operation of the second well’s valves to be hazardous and activities that can not occur. *See* Ex. 1031, 4 (“specifically identified activities that were restricted from occurring at the same time (i.e., CAN NOT OCCUR activities). As an example, if the operations on a well involved high pressure pumping . . . then manipulating manifold well valves and wellhead trees valves on another well were not allowed to be performed concurrently”); Ex. 2012 ¶ 148.

And Petitioner provides no persuasive evidence that a skilled artisan would have had a reasonable expectation of being able to successfully avoid the unacceptable hazards known to be associated with opening second valve 472 and communicating fluid to second well 142, while individually operating on first well 140 using high pressure pumping.¹⁰ Furthermore, Petitioner provides no persuasive evidence that a skilled artisan would have known that those unacceptable hazards could be avoided (or acceptably minimized) by using a condition(s) of the fluid communicated by first isolated manifold path 122 to first well 140 as a trigger for opening second valve 472 and communicating fluid to second well 142, while first well 140 is being individually operated.

Rather than using a condition(s) of the fluid communicated by first isolated manifold path 122 to first well 140 as a trigger for operating second valve 472, we find Carr teaches that the a condition(s) of the fluid passing to first well 140, or the fluid passing to *both* the first and second wells, may be used to trigger operations of the first valve 470; similarly, that the a condition(s) of the fluid passing to second well 142, or the fluid passing to *both* the first and second wells, may be used to trigger operations of the second valve 470. Ex. 1004 ¶¶ 35, 58, 60; *see* Ex.1004 ¶¶ 22, 33–34; Ex.2012, ¶¶ 134–135; Ex.2013, 94:24–95:10, 151:21–152:3, 153:5–17. Carr characterizes its own disclosure to describe “adjusting the first valve in response to the first flow rate” and “adjusting the second valve in response to the second flow rate.” *Id.* ¶¶ 42, 58, 60. And Carr describes control

¹⁰ Carr describes each isolated manifold path as a “missile,” which a skilled artisan would understand involves high pressure pumping when operating a well. Ex. 1004 ¶ 21; Ex. 2009; Ex. 2012 ¶ 133; Ex.2013, 154:1–5, 154:17–22, 146:9–148:11; Ex. 2008.

system 112 as being able to control the position of first valve 470 and/or second valve 472 “by utilizing flow data from the first flow meter 150 *and* the second flow meter 152 in light of fluid flow targets for the first well 140 and/or the second well 142.” *Id.* ¶ 35 (emphasis added).

Additionally, rather than evaluating the condition of the fluid *communicated by* (i.e., *exiting*) first isolated manifold path 122 to first well 140, Carr suggests evaluating the condition of the fluid *directed into* first isolated manifold path 122. Ex. 1004 ¶¶ 23, 27, 32. Carr teaches the first flow meter 150 and the second flow meter 152 can provide flow information about each flow *to the first well 140 and the second well 142* for precise measurement and regulation. *Id.* ¶ 23. And Carr provides examples in which a flow meter is “disposed downstream of the mixing blender 108 to measure the flow from the mixing blender 108 *before the flow is separated and directed into* the first isolated manifold path 122 and the second isolated manifold path 124 of the manifold 120” and “[a]s fluid flow *is directed into* the first isolated manifold path 122, the first flow meter 150 can measure flow rate therethrough.” *Id.* ¶¶ 27, 32 (emphasis added). Notably, Petitioner never explains persuasively why a skilled artisan would have chosen specifically the fluid conditions existing at the exit of the manifold to control when the valves are closing and opening, when Carr discloses using the fluid conditions of fluid flowing into the manifold.

In general, we agree with Patent Owner that “because each isolated manifold path is independently pressurized by ‘separate’ pumps and directs fluid to wells with different geologic characteristics, the fluid conditions in each manifold path will be different” and “[e]ach manifold path’s flow meter separately and independently measures the different fluid conditions to control the respective valves 470 and 472 in light of the wells’ different fluid

flow targets.” PO Resp. 15 (citing Ex. 1004 ¶¶ 22, 33–35, 58, 60, Fig. 5; Ex. 2012, ¶¶ 134–135; Ex. 2013, 94:24–95:10, 151:21–152:3, 153:5–17). And as Patent Owner argues, “even if Carr’s system were ‘capable of’ opening the second valve 472 in response to a condition of the fluid in the first well 140, Petitioner does not make the required showing that a [skilled artisan] would have been motivated to do so.” *Id.* at 22–23 (citing *ParkerVision*, 903 F.3d at 1363). We are persuaded that a skilled artisan, based on what was known at the time of the invention, “would have found it nonsensical to operate a valve in Carr’s second isolated manifold path 124 based on a separate and independent fluid condition in the first isolated manifold path 122.” *Id.* at 23 (citing Ex. 2012 ¶¶ 136–137, 142; Ex. 2013, 153:5–17).

When Carr is considered as a whole, we agree with Patent Owner that Carr neither discloses nor suggests an interdependency between the conditions of the fluid communicated via a manifold to the first well and the operations of a valve that communicates fluid to a second well. PO Sur-reply 2–3. Carr describes the first and second manifold paths communicating fluid to a respective first and second well as being *isolated*, and suggests each of the first and second fluid paths are intended to be completely separated from the influence of the other path. *See* Ex. 1004 ¶¶ 21–23, 25–27, 30–35. Carr further describes the conditions of the fluid communicated by each isolated manifold path as being separately controlled by an array of pumps that are separately operated using the flow meter information from their respective fluid path. *See id.* ¶¶ 22, 25, 30. We find Carr’s use of “isolated” manifold paths to independently control the conditions of the fluid communicated therethrough significantly diminishes

the persuasive weight afforded Petitioner's contention that Carr discloses or suggests the interdependence that limitation 1.2 requires.

Finally, we must address Carr's statement that "[t]he first valve 470 and the second valve 472 can allow for the first well 140 and the second well 142 to each be stimulated individually by opening the respective first valve 470 or the second valve 472 and closing the other valve." Ex. 1004 ¶ 33. Petitioner relies heavily on that statement to show Carr's system discloses closing first valve 470 *after* opening the second valve. Pet. 52–53. However, we do not give much persuasive weight to that statement as support for Petitioner's contention. We find Carr's statement to be describing *how* its system can be configured to stimulate a well individually, rather than describing *when, or in what sequence*, the operations would occur to stimulate a well individually. Although some weight must be given because there are a finite number of variations for sequencing the first and second valves in Carr's system to stimulate a well individually, that weight is diminished by the fact that a skilled artisan would have considered Petitioner's proposed variation to be "hazardous" and to be an operation that should not occur. *See* Ex. 1031, 4; Ex. 2012 ¶ 148. Still, even if we were to find Carr's statement sufficiently persuasive to disclose or suggest the recited sequence, as discussed above, we are not persuaded that a skilled artisan would have initiated that sequence in response to a condition of the fluid communicated to first well 140 for all the reasons discussed above.

Therefore, for all of the above reasons, Petitioner's contention regarding limitation 1.2 lacks evidence that is sufficiently credible to show persuasively that Carr discloses or suggests performing each of the recited responses—"opening a second valve; communicating fluid to a second well via the second valve; *and* closing the first valve *after* opening the second

valve” (limitations 1.3 and 1.4)—“in response to determining that the fluid communicated via the manifold [to a first well] has satisfied one or more conditions.”

4. *Conclusion Regarding Grounds 3–6*

Petitioner has not demonstrated that Carr discloses the subject matter of limitation 1.2, which is subject matter recited by each of the independent claims challenged. Petitioner does not rely on Beuterbaugh or Jackson to cure that deficiency. Therefore, we determine that Petitioner has not established by a preponderance of the evidence that Carr, Carr and Beuterbaugh, or Carr, Beuterbaugh, and Jackson render the Challenged Claims unpatentable.

F. *The Tolman Grounds (Grounds 7 & 8)*

In Grounds 7 and 8, Petitioner contends that claims 1–38 of the ’770 patent are unpatentable because Tolman render them either anticipated or obvious. Pet. 70–89. Patent Owner asserts Grounds 7–8 (“the Tolman Grounds”) do not demonstrate that the Challenged Claims are unpatentable. PO Resp. 42–60. According to Patent Owner, the Tolman Grounds are all deficient because Tolman fails to disclose or suggest the recited “first valve” and limitations 1.2, 14.3, and 27.6, which the recited procedure (i.e., opening a second valve, communicating fluid to a second well, and closing the first valve (limitations 1.3–1.4, 14.4–14.5, and 27.4–27.5)) to be in response to determining that the fluid communicated to a first well by a manifold has satisfied a particular condition(s). *Id.* More specifically, Patent Owner contends a deficiency exists with the evidence and arguments that Petitioner offers to show Tolman discloses or suggests a first valve that is communicating fluid to a first well, and the first valve responds to a condition(s) of the fluid communicating through a manifold to the first well

by closing, but only after opening first a second well that communicates fluid to a second well. *See id.* 44–60.

The deficiency Patent Owner raises for the Tolman Grounds is dispositive of those grounds. Because limitation 1.2 is representative of the same limitations 14.3 and 27.6 (*see* Ex. 1001, 22:39–38, 23:35–37, 24:40–42) and because Tolman is the only reference Petitioner relies upon to disclose or suggest the subject matter recited in those limitations, our analysis begins with a brief description of Tolman. We next explain the parties’ positions about why Tolman does, or does not, disclose the subject matter that limitation 1.2 recites. We explain afterwards why we find Petitioner’s evidence and reasoning is unpersuasive to show Tolman discloses or suggests that subject matter, which is fatal to the Tolman Grounds.

1. Description of Tolman

Tolman, titled “Method and Apparatus Associated with Stimulation Treatments for Wells,” was filed July 24, 2006 and therefore qualifies as prior art to the ’770 patent. Ex. 1006 codes (54), (22).

Tolman describes a method and apparatus for “connecting multiple wells to a stimulation fluid pumping system via a pumping system manifold.” Ex. 1006, Abstract. Tolman’s pumping system provides a system such that a first stimulation treatment may be pumped into the first well concurrently with the preparation of the second well. *Id.* Figure 3, reproduced below, shows a flow chart of operations performed on a multi-well site, where “pumping,” “preparing,” and conducting “other operations” on different wells may be performed “in a concurrent or substantially simultaneous manner.” *Id.* at 7:48–56, Fig. 3.

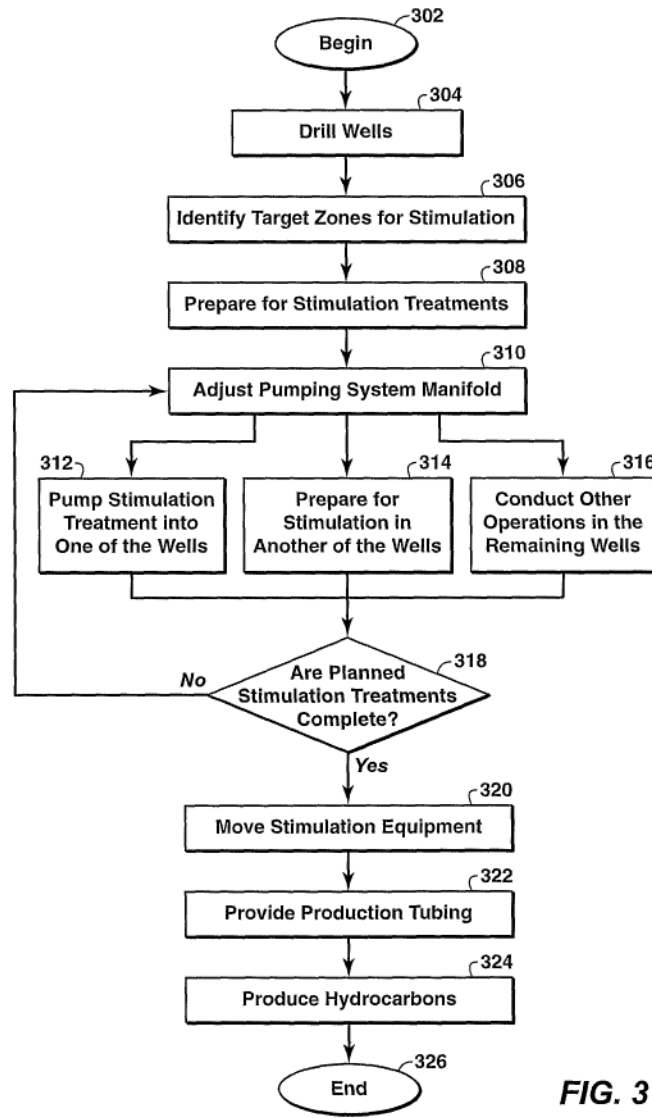


FIG. 3

Figure 3 shows that “pumping operations may include . . . pumping [and] manipulating pumping manifold valves, wellhead tree valves and/or flowback manifold valves,” and “other operations may include . . . injecting fluid in another well [and] manipulating valves.” *Id.* at 8:10–14, 8:31–38.

Figure 2, reproduced below, shows an example of Tolman’s systems, which includes a “pumping system manifold 206” that includes various components used to manage fluid flow from a stimulation fluid pumping system 202 to multiple well trees 106a–106c, such as valves and

measurement devices (e.g., flow meter 226). Ex. 1006, 6:48–55, 7:10–14, Fig. 2.

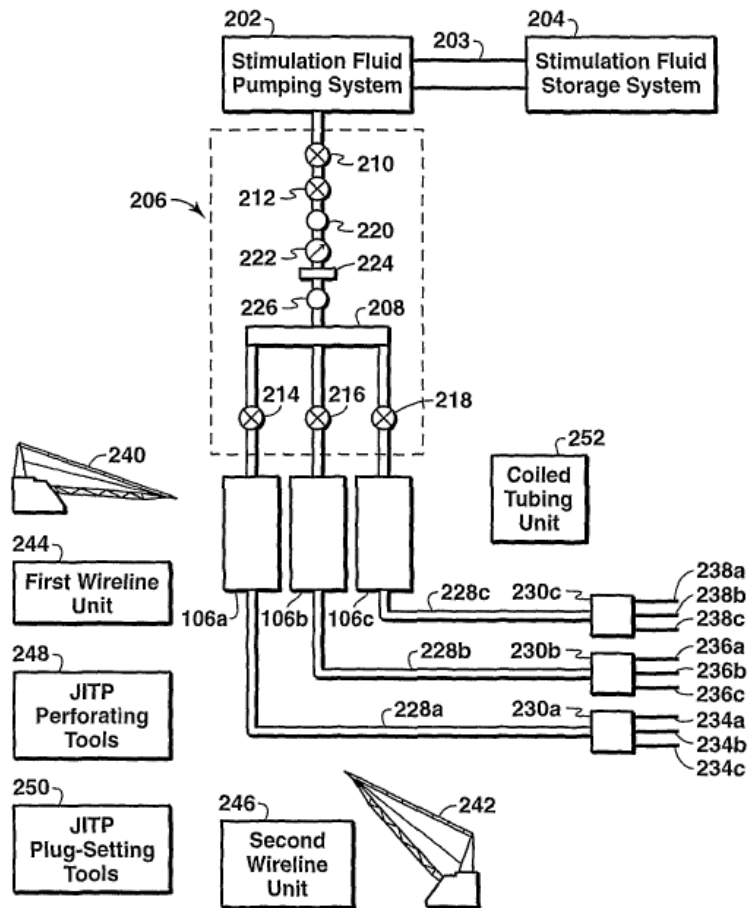


FIG. 2

Figure 2 shows that the manifold 206 may be used to “manage the flow paths” from the pumping system 202 to different wells via “a main manifold valve 210” and manifold well valves 214, 216, 218 associated with each well. *Id.* at 6:55–65. “These valves 210, 214, 216 and 218 may be actuated or positioned to a full-open or full-closed position to provide [a flow path or] hydraulic isolation between individual wells 104a-104c and the stimulation fluid pumping system 202.” *Id.* at 7:3–7, 7:23–27.

2. *The Parties' Contentions*

a) *Petitioner Contends Tolman Discloses or Suggests the Recited "First Valve" and Limitation 1.2*

Petitioner notes that limitation 1.2 does "not recite any particular fluid condition to be satisfied to conduct the claimed valve sequencing and could include merely determining if there is/isn't fluid flow to a well." Pet. 77.

With that clarification, Petitioner contends Tolman "discloses valve sequencing that is conducted upon determining a condition of fluid to a first well" because, in Tolman, after the delivery of stimulation fluid through a manifold and first valve to a first well is completed, and fluid is allowed to flow back through the first well's valve tree to a flowback system, second valves to a second well are opened to pump stimulation fluid to the second well and, after the second valves are opened and flowback to the first well has completed, the first well is "shut-in" by closing the first well's valves. *Id.* (citing Ex. 1006, 11:15–30, 11:48-49; Ex. 1002 ¶ 559).

To accomplish that procedure, Petitioner refers to the illustration and description of the system illustrated in Figure 2, reproduced below.

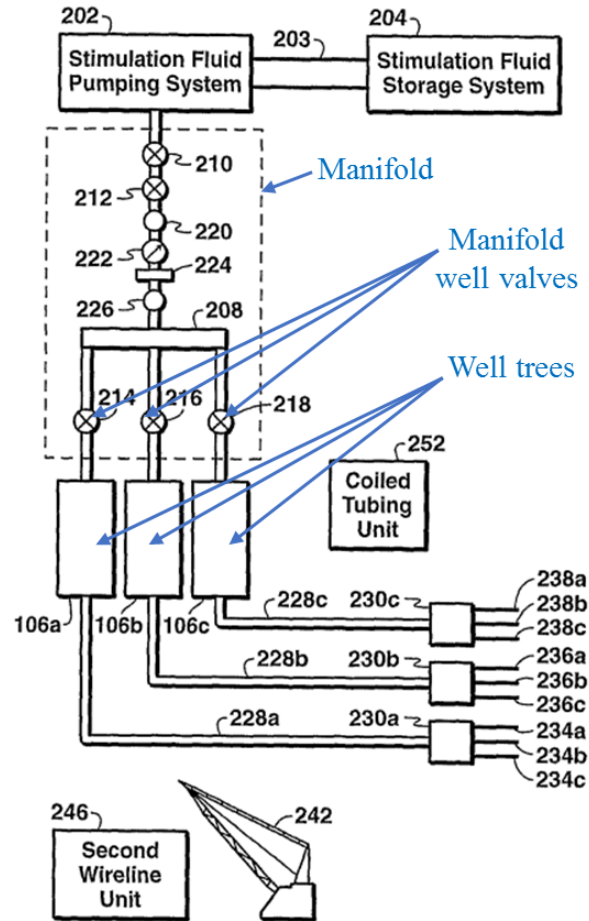


FIG. 2
 (annotated)

Figure 2 illustrates an exemplary surface pad configuration with equipment and wells, which Petitioner has annotated to identify a manifold, manifold well valves, and well trees. Pet. 72; Ex. 1006, 3:26–27, Fig. 2. Petitioner contends Figure 2 “discloses a multi-well system including a manifold ‘configured to provide a flow path from the stimulation fluid pumping system into at least one selected well.’” Pet. 71 (citing Ex. 1006, 2:46–50). Petitioner contends “[t]he flow paths are selected/managed by operating valves, such as manifold well valves 214, 216, 218 associated with each well’s tree 106a-106c” and “[a] first manifold well valve 214 and a tree valve (not shown) installed on the first well’s tree 106a may be opened to

inject fluid into the first well.” *Id.* at 71–72 (citing Ex. 1006, 6:19–33). Additionally, pointing to the portion of Figure 2 identified as “Manifold,” Petitioner contends Tolman discloses a “‘manifold [that] contains multiple valves to enable stimulation fluid to be pumped into any selected well,’ including a second manifold well valve 216 that may be set to an open position to allow fluid injected into the second well 106b.” *Id.* at 72 (citing Ex. 1006, 4:8–10, 7:21–25).

Petitioner highlights the following operations taught by Tolman. Pet. 75–77. Tolman teaches “preparing a second well while pumping stimulation fluid down the first well, so the second well is ready for fracturing when fracturing is completed in the first well.” *Id.* at 75 (citing Ex. 1006, 9:9–11, 10:41–45). After fracturing the first well is completed, “fluid is ‘flowed back’ through the first well’s tree to a flowback system.” *Id.* (citing Ex. 1006, 6:23–26, 11:8–10). During flowback of the first well, “the second well’s valves are opened and stimulation fluid is pumped down the second well to fracture the second well.” *Id.* (citing Ex. 1006, 11:15–30). Additionally, “during flowback from the first well, while a first well tree valve is open, a second well valve is opened to allow stimulation fluid to be pumped into the second well.” *Id.* at 76; *see id.* at 75 (citing Ex. 1006, 7:27–33; Ex. 1002, ¶¶ 554, 631, 669). Lastly, “[w]hen fracturing operations are completed in the second well and fluids are flowed back through the second well, the first well is shut-in, which necessarily includes closing first well’s valves. *Id.* at 77 (citing Ex. 1006, 11:63–67, 11:46–49; Ex. 1002, ¶¶ 559, 631, 669).

Addressing limitation 1.2 specifically, Petitioner contends that Tolman discloses “various operations may be performed on [multiple] wells...in a concurrent or substantially simultaneous manner to

reduce...time associated with stimulating wells.” Pet. 74 (citing Ex. 1006, 7:53–55, 8:52–59). Petitioner notes that “[w]hile the stimulation treatment is pumped into the well (block 312 in Figure 3),” Tolman teaches “‘another well may be prepared for stimulation treatments’ (block 314), and ‘other operations may be conducted in the remaining wells’ (block 316), such as injecting fluids.’” *Id.* at 74–75 (citing Ex. 1006, 8:64–9:6). And “[a]fter pumping stimulation fluid into a first well, ‘a determination is made whether the planned stimulation treatments...are completed,’” which a skilled artisan would have understood, according to Petitioner, “necessarily include[s] determining a fluid condition of the treatment fluid to the well.” *Id.* at 75 (citing Ex. 1006, 9:17–19; Ex. 1002 ¶¶ 546–549, 631, 670).

Petitioner contends that because Tolman teaches that “if ‘operations on the first well involve high pressure pumping . . . manipulating the manifold well valves and wellhead tree valves should not be concurrently performed,’” a skilled artisan “would have found it obvious to determine if high pressure fluid was flowing to the first well prior to operating well valves” by “using flow measurement devices (e.g., flow meters), which Tolman discloses as being associated with the wells’ valves.” Pet. 78 (citing Ex. 1006, 2:59–62, 7:10–14, 13:36–40; Ex. 1002 ¶¶ 546, 549). Further, because Tolman “discloses that during stimulation of a first well (where the first well’s valves are open and stimulation fluid is pumped down the first well), preparation operations on the second well may include ‘injecting fluids,’” Petitioner contends that a skilled artisan “would have found it obvious, if not necessary, to open the second well’s valve to ‘inject[] fluids’ into the second well.” *Id.* (citing Ex. 1006, 8:63–65, 9:2–6; Ex. 1002, ¶ 557). As a result, Petitioner concludes: Tolman “discloses or suggests a valve sequencing including opening the first well’s valves to allow

stimulation fluid pumped down the first well; then opening a second well's valve during the first well's stimulation to allow fluid injected into the second well; and then closing the first well's valve after its stimulation.” *Id.* at 78–79 (citing Ex. 1006, 8:63–9:6, 11:15–21).

b) Patent Owner's Response

Patent Owner asserts that “[n]otwithstanding Tolman’s improvements on then-existing methods, Tolman still suffers from the same disadvantage of traditional fracturing systems—its pumps must be shut down when transitioning between stimulating wells, creating non-productive time (NPT).” PO Resp. 43 (citing *id.* at 3–7; Ex.2012 ¶ 194). Patent Owner notes that Tolman repeatedly emphasizes that only one well is treated at a time, while other wells are “**hydraulically isolated** from the pressure and energy created by the stimulation fluid pumping system,” which “requires the common pumping system 202 to be shut down during a well transition.” *Id.* at 43–44 (citing Ex.1006, 4:8–15, 9:8–15; Ex.2012 ¶¶ 151, 194).

Turning to Petitioner’s contentions, Patent Owner’s initial argument is that, because Petitioner “fail[ed] to map Tolman to the claimed ‘first valve’ with the “particularity” required under [35 U.S.C. §312(a)(3) and 37 C.F.R. § 42.104(b)(4)], the Tolman Grounds fail as a matter of law.” PO Resp. 49. Patent Owner asserts that “Petitioner initially identifies **both** ‘manifold well valve 214’ and an unspecified ‘tree valve’ on the wellhead tree 106a,” but there is no indication from Petitioner whether “it maps these two valves to the claimed ‘*first valve*’ together or in the alternative.” *Id.* at 45 (citing Pet. 71–72 (elements 1.1, 4.2, 27.1)). Adding to the confusion, Patent Owner asserts that Petitioner’s “subsequent mapping never again references first manifold valve 214 and instead variously identifies: (i) an unspecified ‘well tree valve,’ (ii) plural ‘well tree valves,’ (iii) ‘a first well tree valve,’ and

(iv) even more generically, ‘first well’s valves.’” *Id.* (citing Pet. 75–77 (elements 1.3, 1.4, 14.4, 14.5, 27.4, 27.5)). The confusion, in Patent Owner’s words, comes from the “undisputed” fact that “Tolman’s wellhead trees have multiple tree valves” and those valves operate differently depending on whether they are associated with either communicating fluid *to the well* (during treatment operations), communicating fluid *from the well* (during flowback operations), or both communications. *Id.* at 45–49 (citing Ex. 1006, 7:27–33, 8:13, 13:39, Fig. 2; Ex.2012 ¶¶ 195, 197; Ex. ¶¶ 544, 548). Patent Owner argues that “asserting that wellhead trees have multiple tree valves, but refusing to identify which specific “tree valve” is the claimed ‘first valve,’ fails the requirements of 35 U.S.C. §312(a)(3).” *Id.* at 47.

Turning to the merits of Petitioner’s contentions, Patent Owner asserts that, “[e]ven ignoring the legal deficiency of Petitioner’s mapping, none of Tolman’s identified valves individually meet *every* requirement of the claimed ‘first valve.’” PO Resp. 49. First, Patent Owner asserts that manifold valve 214 cannot be the recited first valve “because it is closed when manifold valve 216 (the alleged ‘second valve’) is opened—in direct contradiction to elements 1.4, 14.5, 27.5, which require ‘*closing the first valve after opening the second valve*’ and ‘*close the first valve after opening the second valve.*’” *Id.* at 50 (citing Ex. 2012 ¶¶ 199–202; Ex. 1006, 4:5–16, 7:4–7, 7:21–30, 8:56–62, 10:30–35; 11:15–21 13:35–40). Second, Patent Owner asserts that the well tree valves associated with flowback cannot be the recited first valve because they “communicate fluid *out of a well*—not *to* a well.” *Id.* at 51 (citing Ex.1006, 6:23–26, 6:33–35, 8:21–23, 10:65–11:3, 11:15–30, 13:51–56; Ex. 2012 ¶¶ 203–204, 206; Ex. 2013, 191:18–23). Third, Patent Owner asserts that, regardless of which of the potential first

valves Petitioner may intend, none of Tolman’s valves “perform the entire claimed valve sequence ‘*in response to*’ determining that that a single fluid condition or set of conditions has been satisfied.” *Id.* at 54–55. Fourth, Patent Owner asserts that “if the ‘first well is shut-in’ during the second well’s flowback[, as Petitioner contends], the first well’s flowback tree valve (the alleged ‘*first valve*’) is closed after the manifold well valve 216 (the alleged ‘*second valve*’) has already been closed,” which “fails to establish ‘*closing the first valve after opening the second valve.*’” *Id.* at 55–56 (citing Pet. 77; Ex. 1006, 11:63–12:3; Ex. 2012 ¶¶ 215–216). Patent Owner concludes that, [b]ecause the Challenged Claims require performing the entire ‘valve opening/closing’ sequence in response to a single fluid condition or set of conditions, Grounds 7 and 8 fail.” *Id.* at 55 (citing Ex.2012 ¶¶ 212–214).

c) Petitioner’s Reply

Petitioner characterizes Patent Owner as “admit[ing] that Tolman discloses all limitations of the independent claims,” except regarding limitation 1.2. Pet. Reply 17. Petitioner states that Patent Owner’s “response hinges on red herrings and features found nowhere in the claims.” *Id.* at 18. Because there are no recitations in the claims to stimulate the two wells at the same time, to eliminate/reduce the “non-pumping time,” or to “perform[] any operation ‘without requiring pumps to be shut down,’” Petitioner argues that “[t]he claims merely require ‘communicating fluid’ and ‘opening’ and ‘closing’ valves.” *Id.*

Petitioner argues that, rather than failing to satisfy the particularity requirement, the Petition “specifically identified multiple valves that meet the limitations of the claimed ‘first valve.’” Pet. Reply 18 (citing Pet. 72, 75–77). Petitioner argues that Patent Owner’s “willful ignorance of the

evidence is not a lack of particularity by Petitioner” and “[o]n this record, the Board can easily discern where the claimed elements are in Tolman.” *Id.* at 19–20.

This is so, Petitioner states, because “each Tolman [well] tree has multiple tree valves that meet all the limitations of the claimed ‘first valve.’” Pet. Reply 18 (citing Pet. 78; Ex. 1002 ¶¶ 544, 556–557; Ex. 1044 ¶¶ 39–42). Petitioner identifies, in particular, that it was well-known that a well tree includes “master and other valves” and it was “conventionally understood that a master valve ‘is the ultimate valve for allowing or preventing flow into or out of the well.’” *Id.* (citing Ex. 1043, 48:2–54:9; Ex. 1042 ¶ 98; Ex. 2006, ¶ 98; Ex. 1038; Ex. 1043, 46:18–47:19; 51:6–12; Ex. 1044 ¶¶ 33–34, 38). According to Petitioner, a skilled artisan “would have understood Tolman’s tree valves as including at least a ‘master valve’ that is open during fracturing (treatment) and flowback and closed at shut-in.” *Id.* at 19 (citing Ex. 1043, 46:9–17; 51:6–12; 53:21–54:9; Ex. 1044 ¶¶ 34, 37–39). Therefore, Petitioner concludes that “[a]t least one of Tolman’s ‘tree valves,’ the master valve, is . . . the claimed ‘first valve,’ as explained in the Petition.” *Id.* (citing Pet. 75–76; Ex. 1002 ¶¶ 544, 556–557; Ex. 1044 ¶ 39). And “[t]hat tree valve is associated with the manifold, allows communication from the manifold to the first well, and is closed (*i.e.*, shut-in) after opening the second valve (*e.g.*, a tree valve on tree 106b or manifold well valve 216) to communicate fluid for treating the second well.” *Id.* (citing Pet. 72, 75–76; Ex. 1006, 9:17–38; Ex. 1002 ¶¶ 552–553).

Petitioner argues that Patent Owner’s “argument that Tolman’s tree valve does ‘not communicate fluid *to* the first well’ defies logic and contradicts [its] own expert.” Pet. Reply 20 (citing PO Resp. 51–53). Petitioner contends that “the first well’s tree valve (*e.g.*, the master valve) is

open during fracturing *and* flowback and, therefore, communicates fluid to the first well.” *Id.* (citing Ex. 1043, 46:1–54:9). Petitioner characterizes Patent Owner as “essentially argu[ing] that fluid must be communicated *to the first well while* fluid is communicated *to the second well*,” which Petitioner contends “is *not* required by the claims” because “[t]he claims merely require closing the first valve at any time after opening the second valve, which Tolman explicitly discloses.” *Id.* Petitioner argues, “that certain Tolman valves are closed to isolate one well from another is irrelevant” because, “[a]s was well-known to a [skilled artisan] (and as [Patent Owner’s] expert admits), at least Tolman’s master tree valve must be open to allow fluid communication during treatment and flowback of the first well and must be closed to shut-in the well.” *Id.* (citing Ex. 1043, 46:1–54:9; Ex. 1044, ¶¶ 33–34, 37–42).

Petitioner argues that Patent Owner’s arguments regarding limitation 1.2 fail because “Tolman teaches that the valve ‘sequence’ occurs ‘in response to determining that the fluid communicated via the manifold has satisfied one or more conditions.’” Pet. Reply 22 (citing Pet. 74–75; Ex. 1002 ¶¶ 547–551). Petitioner accuses Patent Owner of “again ignor[ing] the claim language to distinguish prior art” by asserting “the Challenged Claims require performing the ‘entire valve sequence’ in response to a ‘single condition or set of conditions.’” *Id.* (citing PO Resp. 54–55). Petitioner states, emphatically, that “[t]his is **not claimed**” because “[t]he claim language states that the sequence begins once the fluid ‘has satisfied one or more conditions,’ which may include but is not the same as ‘fluid conditions.’” *Id.* Petitioner disagrees with Patent Owner’s “notion that there is ‘a single fluid condition or set of conditions’ or that the condition for closing the first valve must be the same as the condition for opening the

second valve.” *Id.* (citing PO Resp. 55). That notion, Petitioner argues, “contradicts the claims’ plain language,” which it contends only requires the closing of the first valve to occur “after opening the second valve, which opening happens in response to fluid satisfying one or more undefined conditions.” *Id.*

Petitioner argues that Patent Owner’s expert “admits it was conventional for operators to determine the status of and make decisions for a frac job based on (*i.e.*, in response to) monitored parameters (*i.e.*, conditions).” Pet. Reply 22 (citing Ex. 1043, 21:19–25:20). Petitioner contends that it was conventional for operators to “monitor flowrate and/or other parameters to determine if the goals of a pumping plan for the frac job were being met” and “[m]onitored parameters (*e.g.*, flowrate) indicate the end of the frac stage if they match the pumping plan’s indicated end-of-stage parameters.” *Id.* at 23 (citing Ex. 1043, 21:19–25:20; 29:2–16). Petitioner contends that “[i]t was also known to move to a next stage in a frac job when the current frac stage is ending.” *Id.* (citing PO Resp. 41; Ex. 2012 ¶¶ 185–190; Ex. 1043, 18:11–13, 23:17–21).

Petitioner argues also that Patent Owner’s “arguments that Tolman’s first valve isn’t closed after opening a second valve are baseless.” Pet. Reply 23 (citing PO Resp. 55–56; Ex. 1044 ¶¶ 37–42). Petitioner explains the reason for this is

Tolman discloses stimulating the first well when valves 210, 214, and tree valves 106a are open to communicate fluid to first well. After stimulation, the first well is flowed back, and concurrently the second well receives fracture treatment via valves 210, 216, and well tree valves 106b. The first well is shut-in (tree valve closed) after opening the second well’s manifold valve and tree valves for communicating fluid (fracture treatment) to the second well. Whether or not

flowback has started on the second well, the first well's valve is closed (shut-in) *after opening* the second well's valve and communicating fluid to the second well via the second valve (e.g., 216, 106b), as the claims require.

Pet. Reply 23–24 (citing Pet. 71–72, 75–77; Ex. 1006, 10:29–35, 11:4–21, 11:46–49; Ex. 1043, 56:17–57:7, 57:8–58:21; Ex. 1044, ¶¶ 38–42).

d) Patent Owner's Sur-Reply

Patent Owner argues first that, in the Reply, Petitioner attempts to “improperly introduce[e] ***entirely new arguments*** centered around an alleged ‘master valve’ in Tolman’s frac trees that neither the Petition nor Tolman itself even mentions.” PO Sur-reply 14–17. Because the Petition “variably refers to Tolman’s manifold well valve 214 and/or an unspecified ‘tree valve’ on the wellhead tree 106a at different points in its claim mapping,” in the Reply, “Petitioner attempts to cure its lack of specificity and evidence by arguing ***for the first time*** that a [skilled artisan] ‘would have understood Tolman’s tree valves as including at least a ‘master valve’ that is open during fracturing (treatment) and flowback and closed at shut-in’ and that ‘the master valve, is thus the claimed ‘first valve.’” PO Sur-reply 14–15 (citing Pet. 71–75; Pet. Reply 19). However, Patent Owner observes, “[t]his alleged ‘master valve’ appears nowhere in the Petition, the supporting expert declaration, or Tolman itself.” *Id.* at 15.

Patent Owner characterizes Petitioner’s Reply as improperly “attempt[ing] to backfill its mapping by belatedly identifying a ‘master valve’—and doing so with evidence not submitted with the Petition.” PO Sur-reply 16. “[N]either the Petition nor Tolman itself even mentions a ‘master valve’ [and] Petitioner did not simply identify another portion of Tolman—it instead pointed to evidence ***not submitted with the Petition.***” *Id.* (citing Pet. Reply 18–19; Ex. 1043, 48:2–54:9). Patent Owner argues that

“[e]ven if a [skilled artisan] would understand a master valve to be inherent in Tolman’s disclosure of a frac tree, the Petition and supporting evidence gave no indication that Petitioner intended to rely on the ‘master valve’ as the claimed ‘*first valve*.’” *Id.* Patent Owner notes that it is undisputed “frac trees can vary in configuration and can include at least eight different valves” and that “[t]he Petition provides no guidance on which ‘tree valve’ in Tolman’s frac tree allegedly constitutes the claimed ‘*first valve*’ beyond vaguely suggesting that it is one used for flowback.” *Id.* at 16–17 (citing Pet. 75–76; Ex. 2033, 22:24–24:13). Moreover, “Tolman itself provides no details on the configuration of its particular frac tree.” *Id.* at 17. As a result, Patent Owner asserts that it “could not have anticipated Petitioner’s new argument and has had no opportunity to develop rebuttal evidence,” which “fundamentally prejudice[s] [Patent Owner] and violate[s] both the IPR statute and the APA.” *Id.* (citing *Corephotonics, Ltd. v. Apple Inc.*, 84 F.4th 990, 1001-02 (Fed. Cir. 2023); *Henny Penny Corp. v. Frymaster LLC*, 938 F.3d 1324, 1331 (Fed. Cir. 2019)).

Even if Petitioner were permitted to raise its new Reply theory, Patent Owner argues that the theory would fail because Tolman’s failure to disclose or suggest the recited “first valve” and limitations 1.2 still leaves a deficiency with the evidence and arguments to show a first valve that is communicating fluid to a first well and that the first valve responds to a condition(s) of the fluid communicating through a manifold to the first well by closing, but only after opening a second well that communicates fluid to a second well. PO Sur-reply 17–21.

3. *Petitioner’s Tolman Grounds Are Deficient*

After studying the parties’ evidence and arguments, we find Petitioner’s contention that Tolman discloses or suggests the recited first

valve and limitation 1.2 to be unpersuasive. We begin our analysis by first addressing Patent Owner’s argument that Petitioner introduces improperly new arguments and evidence in the Reply. Next, we address the merits of Petitioner’s contention that Tolman discloses or suggests the recited first valve and limitation 1.2. For the reasons discussed more fully below, although we determine Petitioner’s Reply does introduce improperly new arguments and evidence that may not be considered, we find Petitioner’s contention Tolman discloses or suggests the recited first valve and limitation 1.2 to lack sufficient credibility to satisfy its burden of proof, even if we were to allow all of the arguments and evidence advanced in the Reply.

(a) New Arguments and Evidence in the Reply

For limitations 1.1, 14.2, and 27.1, where the “first valve” is first identified in the independent claims, Petitioner associates the first well with Tolman’s disclosure of “[a] first manifold well valve 214 and a tree valve (not shown) installed on the first well’s tree 106a may be opened to inject fluid into the first well.” Pet. 72 (citing Ex. 1006, 6:19–33, Fig. 2). Notably, Petitioner appears to be identifying *both* manifold well valve 214 *and* a non-specific valve installed on the well tree communicating fluid with the first well. And for limitations 1.4, 14.5, and 27.5, which is the other instance that the independent claims identify the first valve, Petitioner states,

When fracturing operations are completed in the second well and fluids are flowed back through the second well, the first well is shut-in. A POSITA would understand that “shutting in” the first well necessarily includes closing first well’s valves.

Id. at 77 (citing Ex. 1006, 11:63–67, 11:46–49; Ex. 1002 ¶¶ 559, 631, 669). Here, Petitioner’s identification of “first well’s valves,” plural, appears to be referring to the earlier identification of *both* the manifold well valve 214 *and* a non-specific valve installed on the first well tree. Similarly, Petitioner’s

description of Tolman’s operation refers to “first well’s valves” and “the manifold well valves and wellhead tree valves.” *See id.* at 77–78. At the very end of that description, however, Petitioner does include a reference to a singular well valve—“closing the first well’s valve after its stimulation”—but that reference only identifies a valve generally associated with the first well, rather specifically the first manifold or first tree. *Id.* at 79. After searching the Petition, Tolman, and the declaration Petitioner’s expert submitted with the Petition, we were unable to locate even a single instance Petitioner identified any specific valve on the well tree to be the claimed first valve, nor were we able to find even a single instance where “master valve” was referenced. *See generally*, Pet.; Ex. 1002; Ex. 1006.

We determine that the Petition did not adequately present Petitioner’s contention that Tolman discloses or suggests a “master valve” that a skilled artisan would understand to be the claimed “first valve,” which is first introduced in the Reply. The issue is whether Petitioner’s identification of Tolman’s “tree valve” for the claimed first valve was particular enough to allow Petitioner to rely specifically on the “master valve” in the well tree to show Tolman discloses the first valve. We find that it is not. It is undisputed that a well tree include several different valves: (1) valves for communicating fluid to a well (e.g., for treatment or stimulation); (2) valves for communicating fluid from a well (e.g., for flowback); and (3) valves for communicating fluid both to and from a well (e.g., master valve). *See* Reply 19–20; Ex. 1002 ¶¶ 542–545; Ex. 1044 ¶¶ 33–34, 38–42; Tr. 33:12–18, 34:3–12, 36:8–37:18, 39:4–17; Ex. 2013, 85:4–86:19, 87:1–12, 89:2–11. And the opening/closing of these different valves are controlled independently of the other valves based on different parameters. *Id.*

Given the variability of the valves in a well tree, we find simply identifying a tree valve, generally, does not provide the particularity necessary to provide notice that the master valve is the particular valve being relied upon. Further compounding this problem is the fact that the Petition repeatedly refers to a plurality of valves, rather than a singular “master valve.” The variability of possible valves suggested by simply referring to a tree valve fails to provide a level of particularity that clearly identifies which specific structure is being relied upon to perform which part of the recited procedure. Ultimately, we agree with Patent Owner that because the Petition does not specifically identify the master valve in the Petition, which the Petitioner’s Reply suggest was the intention all along, Patent Owner was put at a disadvantage because its ability to fully develop a response was impeded. Therefore, Petitioner’s reliance particularly on the “master valve” of the well tree, and the newly introduced evidence associated therewith, was improper and may not be considered.

Nevertheless, as discussed below, even if Petitioner were allowed to rely on the master valve, we still find the Tolman Grounds to be deficient.

(b) Analysis of the Merits

Petitioner contends that Tolman’s manifold well valve 214 and tree valve associated with well tree 106a, or only the “master valve” in well tree 106a (as argued in the Reply), corresponds to a first valve that is “communicating fluid to a first well” (limitation 1.1) and closes *after* opening a second valve that communicates fluid to a second well (limitations 1.3 and 1.4), “in response to determining” the fluid communicated via a manifold to the first well has satisfied a condition(s) (limitation 1.2). Pet. 72; Reply 17–20. We are not persuaded, however. For the reasons explained next, Petitioner’s evidence lacks sufficient persuasive weight to

support finding that Tolman discloses or suggests a valve communicating fluid to a first well, which responds to a determination that the fluid communicated to the first well has satisfied a condition(s) by closing after a second well opens and communicates fluid to a second well.

First, Tolman discloses the following configuration. For a point of reference, Tolman's Figure 2 is reproduced below.

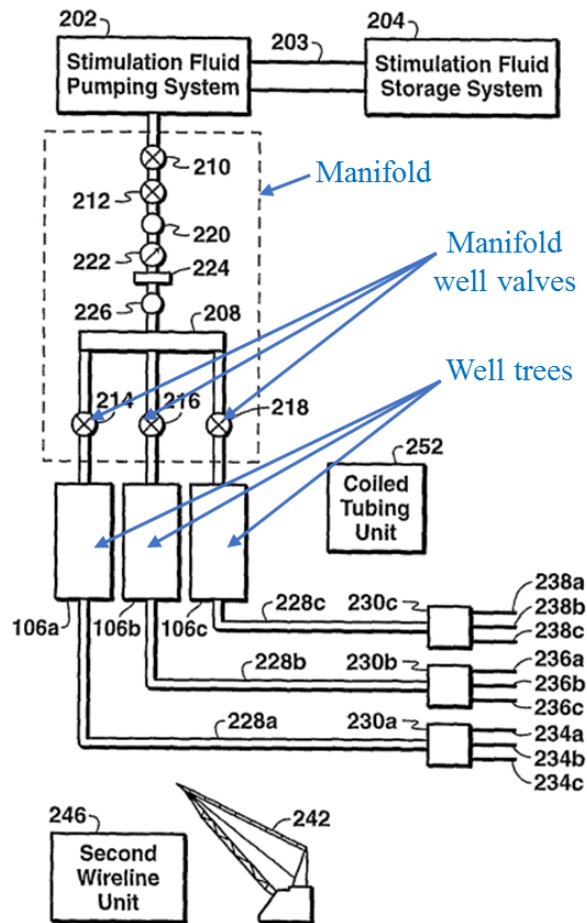


FIG. 2
(annotated)

Figure 2 illustrates an exemplary surface pad configuration with equipment and wells, which Petitioner has annotated to identify a manifold, manifold well valves, and well trees. Pet. 72; Ex. 1006, 3:26–27, Fig. 2. Figure 2 shows equipment for communicating fluid to a first well through manifold

valve 214 and well tree 106a. It also shows equipment for communicating fluid to a second well through manifold valve 216 and well tree 106b.

Petitioner alleges that well trees 106a and 106b each includes several different valves: (1) valves for communicating fluid to a well (e.g., for treatment or stimulation); (2) valves for communicating fluid from a well (e.g., for flowback); and (3) valves for communicating fluid both to and from a well (e.g., master valve). *See* Reply 19–20; Ex. 1002 ¶¶ 542–545; Ex. 1044 ¶¶ 33–34, 38–42; Tr. 33:12–18, 34:3–12, 36:8–37:18, 39:4–17; Ex. 2013, 85:4–86:19, 87:1–12, 89:2–11.

Petitioner further alleges that when the first well is being stimulated through manifold valve 214 and well tree 106a, manifold valve 214 is open, the well-tree stimulation valves are open, the flowback valves are closed, and the master valves are open. *Id.* When the stimulation of the first well is complete, manifold valve 214 is closed, the well-tree stimulation valves are closed, the flowback valves are open, and the master valves are open; in this configuration, the master valves and flowback valves allow fluid to flow back away from the well. *Id.* According to Petitioner, when the flow back is complete, manifold valve 214 remains closed, the stimulation valves remain closed, the flowback valves are closed, and the master valves are closed. *Id.* The same operation is true for the second well, except using manifold valve 216 and well tree 106b. *Id.* Tolman teaches that the second well does not open manifold valve 216 to begin stimulation operations until stimulation operations of the first well are complete and manifold valve 214 is closed. Ex. 1006, 11:8–21.

To the extent that Petitioner is arguing that Tolman’s manifold well valve 214 corresponds to the claimed first valve that closes *after* the second valve opens in response to determining the fluid communicated to the first

well satisfies a condition(s), we are not persuaded. This is because Tolman teaches that manifold well valve 214 is closed *before* manifold valve 216 (the alleged “second valve”) is opened to communicate fluid to the second well. Ex. 2012 ¶¶ 199–202; Ex. 1006, 4:5–16, 7:4–7, 7:21–30, 8:56–62, 10:30–35; 11:15–21 13:35–40.

Assuming *arguendo* that Petitioner’s assertions regarding the operation of a master valve in well tree 106a are correct, we again are not persuaded that Tolman teaches or suggests that the master valve corresponds to the recited first valve. As discussed above (*see supra* § III.C), limitation 1.2 establishes a cause/effect relationship between the condition(s) of the fluid communicated to a first well and the entire process of opening a second valve, communicating fluid to a second well via the second well, and closing, after the second well has opened, a first valve communicating fluid to the first well. Petitioner’s evidence is not sufficiently persuasive to demonstrate that the master valve operates as recited for the first valve.

Petitioner alleges that the master valve in well tree 106a will remain open when manifold valve 214 is closed during flowback of the first well. Reply 20; Tr. 33:21–34:12, 38:9–39:1; Ex. 1043, 56:17–57:7, 57:8–58:21; Ex. 1044, ¶¶ 38–42. At this point, the master valve starts communicating fluid flowing back away from the first well. *Id.* Petitioner asserts that the master valve is only closed when a determination is made that the first well has completed flowing back and the well is shut in. Tr. 39:15–17. Thus, it is that determination about fluid flowing away from the well which causes the master valve to close. *Id.*

Even based on this alleged operation, we are also not persuaded that the master valve in Tolman closes in response to determining the fluid *being communicated* to the first well has satisfied a condition(s). Instead, the

master valve closes in response to a determination about the fluid being communicated away from the well toward the manifold, which is the exact opposite of what limitation 1.2 recites. Furthermore, because (1) manifold valve 216 (the alleged “second valve”) opens only after fluid has stopped being communicated through manifold valve 214 to the first well and (2) the master valve remains open even after manifold valve 216 has completed opening to communicated fluid to a second well, we are not persuaded that the master valve closes because manifold valve 216 has opened in response to a determination the fluid communicated to the first well has satisfied a condition(s).

Therefore, for all of the above reasons, Petitioner’s contention regarding limitation 1.2, and the recited first valve, lacks evidence that is sufficiently credible to show persuasively that Tolman discloses or suggests the first valve or that Tolman discloses or suggests the recited procedure—“opening a second valve; communicating fluid to a second well via the second valve; *and* closing the first valve *after* opening the second valve” (limitations 1.3 and 1.4)—“in response to determining that the fluid communicated via the manifold [to a first well] has satisfied one or more conditions.”

4. Conclusion Regarding Grounds 7–8

Petitioner has not demonstrated that Tolman discloses or suggests the subject matter of limitation 1.2 and the first valve, which is subject matter recited by each of the independent claims challenged. Petitioner’s reliance particularly on the “master valve” of the well tree in its Reply, and the newly introduced evidence associated therewith, was improper and may not be considered. But even accepting that new theory and evidence, we find deficiencies to still exist with Petitioner’s showing that Tolman discloses or

suggests the subject matter of limitation 1.2 and the first valve. Therefore, we determine that Petitioner has not established by a preponderance of the evidence that Tolman renders the Challenged Claims unpatentable.

IV. CONCLUSION

After considering the evidence and arguments, we conclude that Petitioner has not established, by a preponderance of the evidence, that challenged claims 1–38 of the '770 patent are unpatentable. In particular, we resolve the asserted grounds as follows:

Claims Challenged	35 U.S.C. §	Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1–38	102, 103	Krupa		1–38
1–38	102, 103	Carr		1–38
1–38	102, 103	Carr, Beuterbaugh		1–38
5, 6, 9, 18, 19, 22, 31, 32	103	Carr, Beuterbaugh, Jackson		1–38
1–38	102, 103	Tolman		1–38
Overall Outcome				1–38

V. ORDER

Accordingly, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 318(a), claims 1–38 of the '770 patent have *not* been shown to be unpatentable; and

FURTHER ORDERED that a party seeking judicial review of this decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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