

IPR2024-00584
Patent No. 11,560,770

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

IPR2024-00584
Patent No. 11,560,770

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 11,560,770**

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Cases

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Exhibit 1003	U.S. Patent Publication 2022/0268141 A1 by Andrew Krupa et al. entitled “System and Method for an Automated and Intelligent Frac Pumping” (“ <i>Krupa</i> ”)
Exhibit 1004	U.S. Patent Publication No. 2019/0233275 (“Carr”)
Exhibit 1005	PCT International Patent Application Publication WO2020/145978 A1 by Beuterbaugh et al. entitled “Simulfrac Pulsed Treatment” (“ <i>Beuterbaugh</i> ”)
Exhibit 1006	U.S. Patent No. 8,490,685 (“Tolman”)
Exhibit 1007	U.S. Patent Publication 2007/0023184 A1 by Robert Jackson et al. entitled “Well Product Recovery Process” (“ <i>Jackson</i> ”)
Exhibit 1008	First Amended Complaint for Patent Infringement, Permanent Injunctive Relief Requested and Demand for Jury Trial, (ECF No. 29); <i>Downing Wellhead Equipment, LLC v. Intelligent Wellhead Systems, Inc., et al.</i> , No. 1:23-cv-01180 (D. Colo.) (“the Litigation”)
Exhibit 1009	Jacobs, Trent. “The Shale Evolution: Zipper Fracture Takes Hold,” <i>J Pet Technol</i> 66 (2014): 60–67. doi: https://doi.org/10.2118/1014-0060-JPT
Exhibit 1010	’770 Prosecution History
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Exhibit 1014	Downing’s Objections and Responses to IWS’s First Set of Interrogatories in the Litigation
Exhibit 1015	Michael Morton, “Unlocking the Earth: A Short History of Hydraulic Fracturing,” GEO ExPro, Vol. 10, No. 6, December 2013 (https://geoexpro.com/unlocking-the-earth-a-short-history-of-hydraulic-fracturing/) (last accessed November 30, 2023)
Exhibit 1016	B.A. Wells and K.L. Wells. “Shooters – A “Fracking” History.” American Oil & Gas Historical Society, (https://aoghs.org/technology/hydraulic-fracturing) (last accessed November 30, 2023)
Exhibit 1017	Carl T. Montgomery and Michael B. Smith, “Hydraulic Fracturing: History of an Enduring Technology,” <i>Journal of Petroleum Technology</i> , Vol. 62, Issue 12 (Dec. 2010).
Exhibit 1018	Bourgoyne, A. T., Jr., K. K. Millheim, M. E. Chenevert and F. S. Young, Jr. (1986). <u>Applied Drilling Engineering, Society of Petroleum Engineers.</u>
Exhibit 1019	Vassiliou, M. S. (2018), <u>Historical dictionary of the petroleum industry</u> , Rowman & Littlefield
Exhibit 1020	U.S. Patent Application Publication No. 2013/0306322 to Sanborn <i>et al.</i> entitled “System and Process for Extracting Oil and Gas by Hydraulic Fracturing” (“ <i>Sanborn</i> ”)
Exhibit 1021	U.S. Patent Publication No. 2012/0255734 to Coli <i>et al.</i> (“ <i>Coli</i> ”) entitled “Mobile, Modular, Electrically Powered System for Use in Fracturing Underground Formations”
Exhibit 1022	Waters, George, Dean, Barry, Downie, Robert, Kerrihard, Ken, Austbo, Lance, and Bruce McPherson. "Simultaneous Hydraulic Fracturing of Adjacent Horizontal Wells in the Woodford Shale." Paper presented at the SPE Hydraulic Fracturing Technology Conference, The Woodlands, Texas, January 2009. doi: https://doi.org/10.2118/119635-MS (“ <i>Waters</i> ”)
Exhibit 1023	Pearson, C.M., Bond, A.J., Eck, M.E., and J.H. Schmidt. "Results of Stress-Oriented and Aligned Perforating in Fracturing Deviated Wells." J Pet Technol 44 (1992): 10–18. doi: https://doi.org/10.2118/22836-PA

Exhibit 1024	Mutalik, P N, and Bob Gibson. "Case History of Sequential and Simultaneous Fracturing of the Barnett Shale in Parker County." Paper presented at the SPE Annual Technical Conference and Exhibition, Denver, Colorado, USA, September 2008. doi: https://doi.org/10.2118/116124-MS ("Mutalik")
Exhibit 1025	Mayerhofer, M. J., Lolon, E. P., Warpinski, N. R., Cipolla, C. L., Walser, D., and C. M. Rightmire. "What is Stimulated Reservoir Volume (SRV)?" Paper presented at the SPE Shale Gas Production Conference, Fort Worth, Texas, USA, November 2008. doi: https://doi.org/10.2118/119890-MS ("Mayerhofer")
Exhibit 1026	Roussel, Nicolas P., and Mukul M. Sharma. "Optimizing Fracture Spacing and Sequencing in Horizontal-Well Fracturing." SPE Prod & Oper 26 (2011): 173–184. doi: https://doi.org/10.2118/127986-PA ("Roussel")
Exhibit 1027	K. R. Webster, W. C. Goins, Jr., and S. C. Berry, "A Continuous Multistage Tracing Technique," <i>Journal of Petroleum Technology</i> , vol. 17, no. 06, pp. 619-625, 1965, doi: 10.2118/977-pa. ("Webster")
Exhibit 1028	A. Casero, G. Pace, B. Malone, F. Cantaloube, L. Tealdi, H. Malonga, and R. Seale, "Continuous Pumping, Multistage, Hydraulic Fracturing in Kitina Field, Offshore Congo, West Africa," in <i>SPE International Symposium and Exhibition on Formation Damage Control</i> , 2008, vol. All Days, SPE-112442-MS, doi: 10.2118/112442-ms. [Online]. Available: https://doi.org/10.2118/112442-MS ("Casero").
Exhibit 1029	S. Rassenfoss, "A Look Into What Fractures Really Look Like," <i>Journal of Petroleum Technology</i> , vol. 70, no. 11, pp. 28-36, 2018, doi: 10.2118/1118-0028-jpt. at 6 ("Rassenfoss").
Exhibit 1030	R. Oberhofer, "Application of Ball-Drop Technology to Improve Efficiency and Stimulation of Limited Entry Completion Systems," in <i>Abu Dhabi International Petroleum Exhibition & Conference</i> , 2016, vol. Day 2 Tue, November 08, 2016, D021S052R004, doi: 10.2118/183427-ms. [Online]. Available: https://doi.org/10.2118/183427-MS ("Oberhofer").

Exhibit 1031	Tolman, R. C., et al. (2009). <u>Method and Apparatus for Simultaneous Stimulation of Multi-Well Pads</u> . SPE Hydraulic Fracturing Technology Conference (“ <i>Tolman</i> ”).
Exhibit 1032	G. R. Holzhausen and R. P. Gooch, "Impedance of Hydraulic Fractures: Its Measurement and Use for Estimating Fracture Closure Pressure and Dimensions," in <i>SPE/DOE Low Permeability Gas Reservoirs Symposium</i> , 1985, vol. All Days, SPE-13892-MS, doi: 10.2118/13892-ms. [Online]. Available: https://doi.org/10.2118/13892-MS (“ <i>Holzhausen</i> ”).
Exhibit 1033	R. W. Paige, L. R. Murray, and J. D. M. Roberts, "Field Application of Hydraulic Impedance Testing for Fracture Measurement," <i>SPE Production & Facilities</i> , vol. 10, no. 01, pp. 7-12, 1995, doi: 10.2118/26525-pa (“ <i>Paige</i> ”).
Exhibit 1034	L. V. Massaras, A. Dragomir, and D. Chiriac, “Enhanced Fracture Entry Friction Analysis of the Rate Step-Down Test,” in <i>SPE Hydraulic Fracturing Technology Conference</i> , 2007, vol. All Days, SPE-106058-MS, doi: 10.2118/106058-ms. [Online]. Available: https://doi.org/10.2118/106058-MS (“ <i>Massaras</i> ”).
Exhibit 1035	S. Mondal, "Pressure transients in wellbores: Water hammer effects and implications for fracture diagnostics," 2010 (“ <i>Mondal</i> ”).
Exhibit 1036	PCT International Patent Application Publication WO2017/201526 A1 by Ciezobka et al. entitled “Hydraulic Fracturing System and Method” (“ <i>Ciezobka</i> ”)
Exhibit 1037	U.S. Patent Publication 2007/0125543 A1 by McNeel et al. entitled “Method and Apparatus for Centralized Well Treatment” (“ <i>McNeel</i> ”)
Exhibit 1038	Excerpts from Downing’s Response to IWS’s Initial Invalidity Contentions in the Litigation, dated January 19, 2024
Exhibit 1039	Downing’s Supplemental Objections and Responses to IWS’s First Set of Interrogatories in the Litigation

Exhibit 1040	Order on Motion to Stay in The Litigation, dated Feb. 14, 2023
Exhibit 1041	Declaration of Dr. Robert Durham
Exhibit 1042	<i>Intelligent Wellhead Systems, Inc. v. Downing Wellhead Equipment, LLC</i> , IPR2024-00256, Petition for <i>Inter Partes</i> Review of U.S. Patent No. 11,401,779 (Paper 1)
Exhibit 1043	<i>Intelligent Wellhead Systems, Inc. v. Downing Wellhead Equipment, LLC</i> , IPR2024-00300, Petition for <i>Inter Partes</i> Review of U.S. Patent No. 11,560,770 (Paper 1)
Exhibit 1044	API 6A 20th Edition, Specification for Wellhead and Christmas Tree Equipment, October 2010
Exhibit 1045	Downing Infringement Contentions from The Litigation, dated September 27, 2023

TABLE OF CLAIMS

CLAIM / LIMITATION	CLAIM LANGUAGE
CLAIM 1	
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.
CLAIM 2	
2.1	2. The method of claim 1, further comprising: communicating fluid to a third well via the manifold and a third valve, the third valve being associated with both the manifold and the third well; and
2.2	in response to determining that the fluid communicated via the manifold has satisfied the one or more conditions:
2.3	opening a fourth valve; communicating fluid to a fourth well via the fourth valve; and
2.4	closing the third valve after opening the fourth valve.
CLAIM 3	
3.1	3. The method of claim 2, wherein the first valve is closed after opening both the second valve and the fourth valve; and/or
3.2	the third valve is closed after opening both the second valve and the fourth valve.

CLAIM / LIMITATION	CLAIM LANGUAGE
CLAIM 4	
	4. The method of claim 1, wherein the one or more conditions include one or more flowrate conditions.
CLAIM 5	
	5. The method of claim 4, wherein the fluid communicated via the manifold has satisfied the one or more flowrate conditions when a flowrate of the fluid is below an upper threshold, above a lower threshold, or both.
CLAIM 6	
	6. The method of claim 4, wherein the fluid communicated via the manifold has not satisfied the one or more flowrate conditions when a flowrate of the fluid is above an upper threshold or below a lower threshold.
CLAIM 7	
	7. The method of claim 1, further comprising: pumping the fluid into the manifold.
CLAIM 8	
	8. The method of claim 1, further comprising: determining that the fluid communicated via the manifold has satisfied the one or more conditions.
CLAIM 9	
	9. The method of claim 8, wherein determining that the fluid communicated via the manifold has satisfied the one or more flowrate conditions comprises determining that a flowrate of the fluid is below an upper threshold, above a lower threshold, or both.
CLAIM 10	

CLAIM / LIMITATION	CLAIM LANGUAGE
	10. The method of claim 1, wherein the fluid communicated via the manifold is hydraulic fracturing fluid.
CLAIM 11	
	11. The method of claim 1, wherein: the first valve is a first zipper valve; and/or the second valve is a second zipper valve.
CLAIM 12	
12.1	12. The method of claim 1, wherein the second valve is associated with both the manifold and the second well; and
12.2	wherein communicating fluid to the second well via the second valve comprises communicating fluid to the second well via the manifold and the second valve.
CLAIM 13	
	13. The method of claim 12, wherein the fluid communicated via the manifold is hydraulic fracturing fluid.
CLAIM 14	
14.1	14. An apparatus, comprising: a non-transitory computer readable medium; and a plurality of instructions stored on the non-transitory computer readable medium and executable by one or more processors, wherein, when the instructions are executed by the one or more processors, the following steps are executed:
14.2	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
14.3	in response to determining that the fluid communicated via the manifold has satisfied one or more conditions:
14.4	opening a second valve;

CLAIM / LIMITATION	CLAIM LANGUAGE
	communicating fluid to a second well via the second valve; and
14.5	closing the first valve after opening the second valve.
CLAIM 15	
15.1	15. The apparatus of claim 14, wherein, when the instructions are executed by the one or more processors, the following steps are also executed: communicating fluid to a third well via the manifold and a third valve, the third valve being associated with both the manifold and the third well; and
15.2	in response to determining that the fluid communicated via the manifold has satisfied the one or more conditions:
15.3	opening a fourth valve;
15.4	communicating fluid to a fourth well via the fourth valve; and
15.5	closing the third valve after opening the fourth valve.
CLAIM 16	
16.1	16. The apparatus of claim 15, wherein: the first valve is closed after opening both the second valve and the fourth valve; and/or
16.2	the third valve is closed after opening both the second valve and the fourth valve.
CLAIM 17	
	17. The apparatus of claim 14, wherein the one or more conditions include one or more flowrate conditions.
CLAIM 18	
	18. The apparatus of claim 17, wherein the fluid communicated via the manifold has satisfied the one or more

CLAIM / LIMITATION	CLAIM LANGUAGE
	flowrate conditions when a flowrate of the fluid is below an upper threshold, above a lower threshold, or both.
CLAIM 19	
	19. The apparatus of claim 17, wherein the fluid communicated via the manifold has not satisfied the one or more flowrate conditions when a flowrate of the fluid is above an upper threshold or below a lower threshold.
CLAIM 20	
	20. The apparatus of claim 14, wherein, when the instructions are executed by the one or more processors, the following step is also executed: pumping the fluid into the manifold.
CLAIM 21	
	21. The apparatus of claim 14, wherein, when the instructions are executed by the one or more processors, the following step is also executed: determining that the fluid communicated via the manifold has satisfied the one or more conditions.
CLAIM 22	
	22. The apparatus of claim 21, wherein determining that the fluid communicated via the manifold has satisfied the one or more flowrate conditions comprises determining that a flowrate of the fluid is below an upper threshold, above a lower threshold, or both.
CLAIM 23	
	23. The apparatus of claim 14, wherein the fluid communicated via the manifold is hydraulic fracturing fluid.
CLAIM 24	
	24. The apparatus of claim 14, wherein:

CLAIM / LIMITATION	CLAIM LANGUAGE
	the first valve is a first zipper valve; and/or the second valve is a second zipper valve.
CLAIM 25	
25.1	25. The apparatus of claim 14, wherein the second valve is associated with both the manifold and the second well; and
25.2	wherein communicating fluid to the second well via the second valve comprises communicating fluid to the second well via the manifold and the second valve.
CLAIM 26	
	26. The apparatus of claim 25, wherein the fluid communicated via the manifold is hydraulic fracturing fluid.
CLAIM 27	
27.1	27. A system, comprising: a first valve via which fluid is communicated from a manifold to a first well;
27.2	a second valve via which fluid is adapted to be communicated to a second well; and
27.3	one or more controllers, configured to:
27.4	open the second valve to thereby communicate fluid to the second well via the second valve; and
27.5	close the first valve after opening the second valve,
27.6	in response to: determining that the fluid communicated via the manifold has satisfied one or more conditions.
CLAIM 28	
28.1	28. The system of claim 27, further comprising: a third valve via which fluid is communicated from the manifold to a third well;
28.2	a fourth valve via which the fluid is adapted to be communicated to a fourth well; and

CLAIM / LIMITATION	CLAIM LANGUAGE
28.3	the one or more controllers, configured to: open the fourth valve to thereby communicate fluid to the fourth well via the fourth valve; and
28.4	close the third valve after opening the fourth valve,
28.5	in response to: determining that the fluid communicated via the manifold has satisfied the one or more conditions.
CLAIM 29	
29.1	29. The system of claim 28, wherein the one or more controllers are further configured to: close the first valve after opening both the second valve and the fourth valve; and/or
29.2	close the third valve after opening both the second valve and the fourth valve.
CLAIM 30	
	30. The system of claim 27, wherein the one or more conditions include one or more flowrate conditions.
CLAIM 31	
	31. The system of claim 30, wherein the fluid communicated via the manifold has satisfied the one or more flowrate conditions when a flowrate of the fluid is below an upper threshold, above a lower threshold, or both.
CLAIM 32	
	32. The system of claim 30, wherein the fluid communicated via the manifold has not satisfied the one or more flowrate conditions when a flowrate of the fluid is above an upper threshold or below a lower threshold.
CLAIM 33	
	33. The system of claim 27, further comprising the manifold.

CLAIM / LIMITATION	CLAIM LANGUAGE
CLAIM 34	
	34. The system of claim 27, further comprising one or more pumps; wherein the one or more controllers are further configured to cause the one or more pumps to pump the fluid into the manifold.
CLAIM 35	
	35. The system of claim 27, wherein the fluid communicated via the manifold is hydraulic fracturing fluid.
CLAIM 36	
	36. The system of claim 27, wherein: the first valve is a first zipper valve; and/or the second valve is a second zipper valve.
CLAIM 37	
37.1	37. The system of claim 27, wherein the second valve is associated with both the manifold and the second well; and
37.2	wherein communicating fluid to the second well via the second valve comprises communicating fluid to the second well via the manifold and the second valve.
CLAIM 38	
	38. The system of claim 37, wherein the fluid communicated via the manifold is hydraulic fracturing fluid.

I. INTRODUCTION

Intelligent Wellhead Systems, Inc. (“IWS”/“Petitioner”) requests *inter partes* review (IPR) of claims 1-38 (“Challenged Claims”) of Downing Wellhead Equipment, LLC’s (“Downing’s”/“Patent Owner’s”) U.S. Patent No. 11,560,770 (“’770 Patent”/“’770”) (Ex. 1001).

The Challenged Claims are unpatentable and should be cancelled because they merely cover the well-known abstract idea of determining fluid conditions to decide when to open/close valves in multi-well operations, and certain prior art anticipates and/or renders them all obvious.

II. MANDATORY NOTICES

A. REAL PARTIES-IN-INTEREST

Intelligent Wellhead Systems, Corp., IWS USA Corp., and Pason Systems Corp. are real parties-in-interest.

B. RELATED MATTERS

1. Downing asserted the Challenged Claims against IWS, Intelligent Wellhead Systems, Corp. and IWS USA Corp., in *Downing Wellhead Equipment, LLC v. Intelligent Wellhead Systems, Inc., et al.*, No. 1:23-cv-01180-RMR-SP (D. Colo.) (“the Litigation”). Exs. 1008, 1045. The Litigation is in its early stages. Claim construction has not occurred, a claim construction hearing has not been set, and, as of February 14, 2024, all claim construction briefing deadlines have been

stayed. A trial date has not been set. On February 14, 2024, the Litigation was stayed pending institution decisions by the Patent Trial and Appeal Board (the “Board”) in related IPR2024-00256 and IPR2024-00300 (“related IPRs”). Ex. 1042, 1043, 1040. The stay affects all deadlines and litigation activities with the exception of allowing either side to conduct third-party discovery relating to *Krupa* (U.S. 2022/0268141, Ex. 1003) as prior art. *Id.* at 22. The parties shall submit a status report to the court within five business days of the Board’s institution decisions in the related IPRs, and either party may seek a further stay if either of the related IPRs is instituted. *Id.* IWS has not yet filed an answer in the Litigation as IWS’s Motion to Dismiss under 35 U.S.C. § 101 (ECF No. 34) was pending at the time the stay was granted.

2. *Intelligent Wellhead Systems, Inc. v. Downing Wellhead Equipment, LLC*, Case No. IPR2024-00256, before the Board, involving U.S. Patent No. 11,401,779 (“’779 Patent”), which is the parent to the ’770 Patent. This IPR is pending institution with Downing’s preliminary response due March 11, 2024. Ex. 1042.

3. *Intelligent Wellhead Systems, Inc. v. Downing Wellhead Equipment, LLC*, Case No. IPR2024-00300, before the Board, involving U.S. Patent No. 11,560,770, which is a continuation of the ’779 Patent. This IPR is pending

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institution with Downing's preliminary response due March 28, 2024. Exs. 1043, 1001-1035.

4. *Intelligent Wellhead Systems, Inc. v. Downing Wellhead Equipment, LLC*, Case No. IPR2024-00583, before the Board, involving the '779 Patent.

C. LEAD AND BACKUP COUNSEL

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D. SERVICE INFORMATION

Papers concerning this matter should be served on Lead and Back-up counsel.

Petitioner consents to service by email at OBWB-IWS-Downing@obwb.com.

III. PAYMENT OF FEES

Charge all IPR-associated fees to Deposit Account 50-0591.

IV. GROUNDS FOR STANDING

Petitioner certifies that '770 is available for IPR and Petitioner is not barred/estopped from requesting IPR on the identified grounds.

V. IDENTIFICATION OF CHALLENGE

The Claims should be cancelled as unpatentable under post-AIA¹ 35 U.S.C. §§ 102/103 on these grounds:

GROUND(S)	CHALLENGED CLAIMS (1-38)	35 U.S.C. §	REFERENCE(S)
1	1, 2, 4-13	102	<i>Ciezobka</i>
2	All	103	<i>Ciezobka</i>
3	2-3, 14-38	103	<i>Ciezobka and McNeel</i>

Grounds are explained below, including where prior art discloses/teaches/suggests each limitation.

Dr. Robert Durham's Declaration (Ex. 1041) provides additional explanation and support. 37 C.F.R. §§ 42.104(b)(1).

VI. TECHNOLOGY BACKGROUND AND PRIOR ART

Since oil and gas operations began, operators have been opening and closing valves on wells in response to conditions. Ex. 1041, ¶¶ 64-102; *see also*, Exs. 1002, 1009, 1015-1035. Monitoring and determining conditions and responsively

¹ The earliest effective filing date of '770 is after 2013.

sequencing valves, as the '770 Patent purportedly claims, was therefore well known long before the '770 Patent, and is disclosed/taught/suggested in at least the following prior art.

A. CIEZOBKA

WO2017/201526 (“*Ciezobka*,” Ex. 1036), published on November 23, 2017—before the '770's priority date (May 17, 2021)—is § 102(a)(1)-prior art.

Ciezobka discloses hydraulic fracturing systems/methods that include controlling the flowrate to multiple wells to deliver pressure pulses to improve well fracturing. *Ciezobka*, Abstract; 2:24-26. Flowrate may be varied by alternately opening and closing valves along flow lines to the wells to divert fluid flow from one well to another. *Id.*, 11:21-12:15.

Ciezobka also discloses fracturing evaluation methods “implemented in a software toolbox which incorporates all of the data...for real time application in the field during hydraulic fracturing operations” and, “using the data collected during field activities” ultimately “to decide on further rate fluctuations” in hydraulic fracturing operations. *Id.* 27:26-28:2. *See also*, Ex. 1041, ¶¶ 103-106. *MCNEEL*

U.S. 2007/0125543 (“*McNeel*,” Ex. 1037), published June 7, 2007—before '770's effective filing date—is § 102(a)(1) -prior art.

McNeel discloses stimulating multiple wells simultaneously or singly from a centralized location, including a manifold. *McNeel*, Abstract, ¶¶ [0021], [0024],

[0025]. *See also*, Ex. 1041, ¶¶ 107-111.

VII. PERSON OF ORDINARY SKILL IN THE ART

A POSITA as of '770's priority date would have had an engineering degree and two or more years' well-related operations experience, or equivalent education/experience. Ex. 1041, ¶ 61.

VIII. OVERVIEW OF THE '770 PATENT

A. SUMMARY

The '770's claims broadly purport to cover opening and closing valves to wells in response to "one or more conditions." Ex. 1001², 22:34-25:23. The valves can be to any two wells that may be anywhere relative to each other (including different sites), and the "one or more conditions" can be any condition of a fluid communicated via a manifold to a first well, at least according to the claims. *Id.* Meanwhile, the only "condition" '770's specification describes is flowrate (also referred to as frac or idle rate), including merely determining if there is/isn't fluid flow. *Id.*, 13:36-54; 18:25-29, 60-62; 19:12-14, 50-51; 20:11-21; 21:9-18; Fig. 12.

² Citations to '770/prior art are in [column]:[line] or [internal page #]:[line/paragraph] format.

B. '770 PROSECUTION SUMMARY

'770 issued January 24, 2023, from Application No. 17/878,493 ("’493 Application"), filed August 1, 2022, as a continuation application of Application No. 17/388,716 ("’716 Application," issued as the ’779 Patent). *See*, Exs. 1011, 1012. Only one office action issued during prosecution.

The ’770 claims issued without amendment, *i.e.*, in their original form as filed in the ’493 Application. These claims recited many of the same limitations as its parent ’716 Application’s claims, except the ’716 Application included “allowable” “flowrate” limitations, as shown below (differences between claims underlined):

'770's/'493 Application's Claim 1:	'779's/'716 Application's Claim 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. A method, comprising: (a) permitting performance of a first hydraulic fracturing operation on a first well, which first hydraulic fracturing operation comprises pumping fluid into the first well via a first valve associated with the first well, and
	<u>measuring a flowrate of the fluid being pumped into the first well;</u>
in response to determining that the fluid communicated via the manifold has satisfied one or more conditions:	(b) determining that the <u>flowrate</u> of the fluid being pumped into the first well is <u>below a flowrate threshold</u> and has been below the flowrate threshold <u>for a threshold amount of</u>

	<u>time</u> ;
opening a second valve;	(c) during pumping of the fluid into the first well via the first valve, opening a second valve associated with a second well;
communicating fluid to a second well via the second valve; and	(d) permitting performance of a second hydraulic fracturing operation on the second well, which second hydraulic fracturing operation comprises pumping fluid into the second well via the second valve; and
closing the first valve after opening the second valve.	(e) during pumping of the fluid into the second well via the second valve, closing the first valve associated with the first well;
	wherein, during each of steps (a), (b), (c), (d), and (e), fluid is continuously pumped to the first valve, the second valve, or both the first valve and the second valve.

During '779's prosecution, the Examiner allowed claims over US2017/0275980A1 ("*Kajaria*") only once they recited measuring flowrate and meeting/satisfying flowrate thresholds/conditions. Ex. 1013, p. 47, 53, 111-115. Meanwhile, a different Examiner allowed '770's claims (which did not recite such elements) over *Kajaria* without requiring such flowrate-based limitations. Thus, although the '779-Examiner found that *Kajaria* disclosed '779's broader claim

limitations, the '770-Examiner did not (allowing the same much broader limitations over *Kajaria*).

Contrary to the '779-Examiner's conclusions about *Kajaria*, the '770-Examiner concluded that *Kajaria* fails to disclose “the key features of ‘in response to determining that the fluid communicated via the manifold has satisfied one or more conditions: opening a second valve.’” Ex. 1010, p. 19.

'770's sole office action rejected the claims as unpatentable over '779's claims, finding the claims “not patentably distinct from each other because the claims of the present application merely remove limitations and/or have minor obvious changes in claim language....” *Id.*, p. 61-62. '770 issued after Downing filed a terminal disclaimer.

C. '770 PRIORITY

The parties do not dispute that '770 claims priority to Provisional Application No. 63/189,663, filed May 17, 2021, or that '770's earliest effective filing date is May 17, 2021. Downing initially refused to identify a priority date until after it had seen Petitioner's invalidity contentions in the Litigation. Ex. 1014. After receiving those contentions and the IPR2024-00256 petition, Downing acknowledged May 17, 2021 as the Challenged Claims' earliest effective filing date, but alleged having publicly disclosed the subject matter of the '770 on September 1, 2020, arguing that one or more exceptions under 35 U.S.C. § 102(b) applies to “remove” any prior art

with an effective filing date after September 1, 2020. Exs. 1038, 1039.

This Petition presents only prior art published prior to September 1, 2020, rendering disputes regarding alleged prior disclosure(s) irrelevant to this IPR.

D. CLAIM CONSTRUCTION

The Board only construes claims when necessary to resolve the underlying controversy. *Toyota Motor Corp. v. Cellport Sys., Inc.*, IPR2015-00633, Paper No. 11 at 16 (P.T.A.B. Aug. 14, 2015). Claim construction is not necessary in this IPR.³ If necessary, however, the *Phillips* standard applies. 37 C.F.R. § 42.100(b); *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-16 (Fed. Cir. 2005).

IX. DETAILED EXPLANATION OF THE GROUNDS

The '770 Claims are grouped by method (Claims 1-13), apparatus (Claims 14-26), and system claims (Claims 27-38). Independent Claim 1 and its dependent claims are methods that a person/computer may execute. Independent Claim 14 and its dependent claims recite an apparatus with standard computer language that executes Claim 1's and its progeny's steps. Claim 27 and its dependent claims recite a system that recites "one or more controllers" "configured to" perform Claim 1's method with Claim 1's wording slightly re-arranged. Because of the similarities

³ Claim construction may be necessary in the Litigation for invalidity, noninfringement, and/or unenforceability purposes.

across groupings (though grammatically different, functionally the same), claims are discussed together accordingly.

Further, as discussed in Section VIII.A, '770's independent claims are broader than '770's description. Although the independent claims do not require hydraulic fracturing, continuous pumping, or even that the second well/valve is associated with the same manifold as the first well/valve, prior art discussed herein nevertheless include such applications.

Each claim is considered as a whole, separated into discrete subparts for ease of discussion only. Dependent claim discussions incorporate their respective independent/intervening claim discussions.

A. GROUND 1- *CIEZOBKA* ANTICIPATES CLAIMS 1, 2, AND 4-13

'770's Claims relate to a method, apparatus, and system with overlapping valve sequences and communicating fluid to two or more wells onsite. This is exactly what *Ciezobka* discloses. For example, *Ciezobka*'s Figure 6 (below, annotated⁴) shows a system for hydraulically fracturing a first well and a second well, and Figure 7 (below, annotated) shows a corresponding flowrate schedule.

⁴ All annotated figures use pink lines for flowlines to first well and green lines for flowlines to second well.

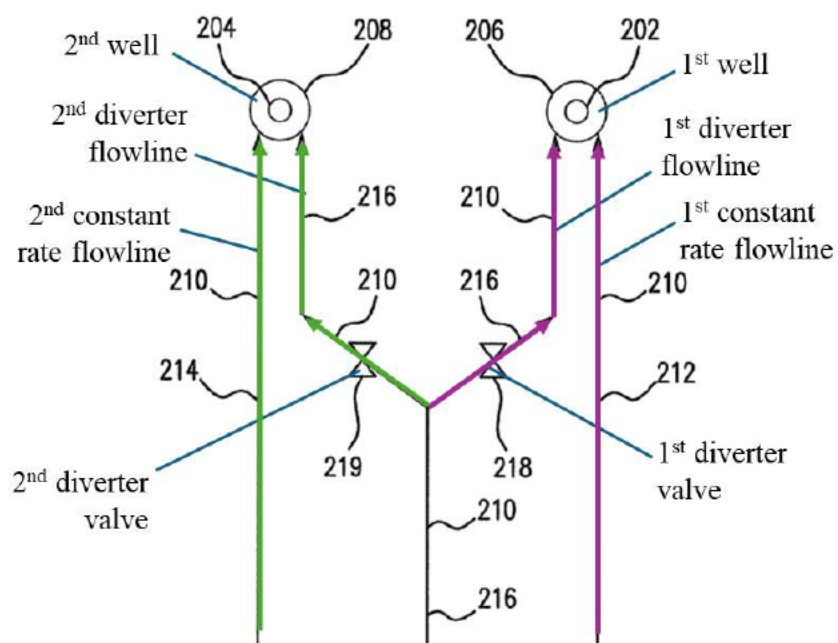


FIG. 6
(Annotated)

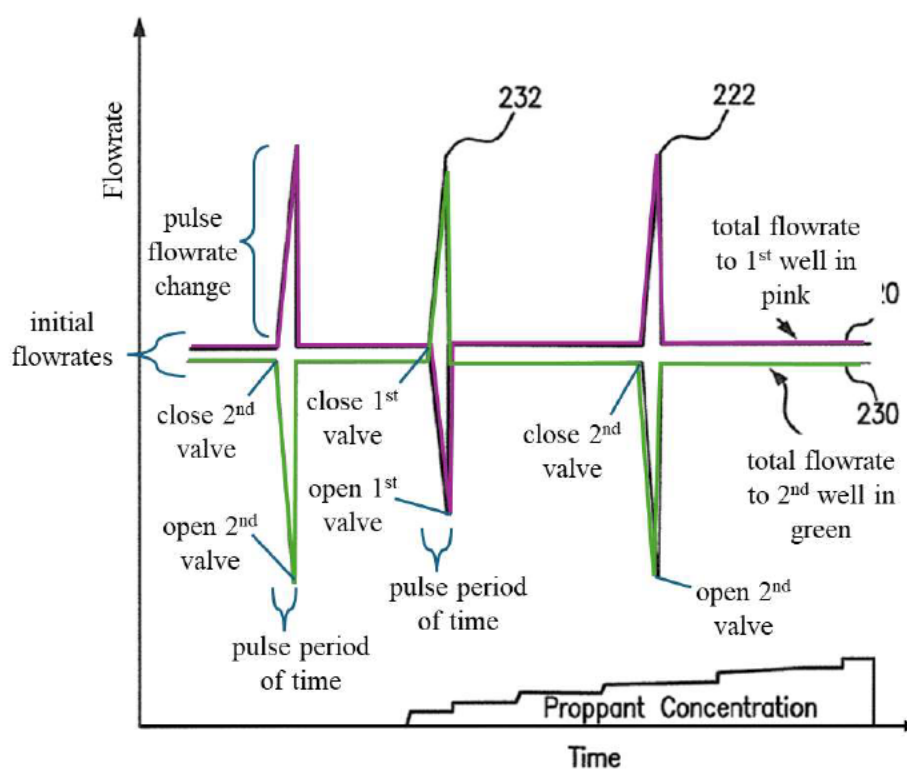


FIG. 7
(Annotated)

As shown, first and second wells are each connected by two flowlines to a fracturing system, *e.g.*, including high-pressure fracturing pumps and a manifold (not shown), to pump fracturing fluid into the wells. *Ciezobka*, 10:11-12; 11:28-12:2. The flowlines “include a valve...that can be opened and closed to restrict a flow of fluid to the wellbore.” *Id.*, 11:21-23. Diverter valves 218, 219 positioned along diverter flowlines to the first and second wells are opened and closed to divert fluid flow at increased and decreased flowrates, within pulse flowrate thresholds, to selected wells for selected pulse periods of time. *Id.*, 12:7-14; 15:18-21. *Ciezobka* discloses and therefore anticipates Claims 1, 2, and 4-13.⁵

1. Independent Claim 1 and Dependent Claim 2

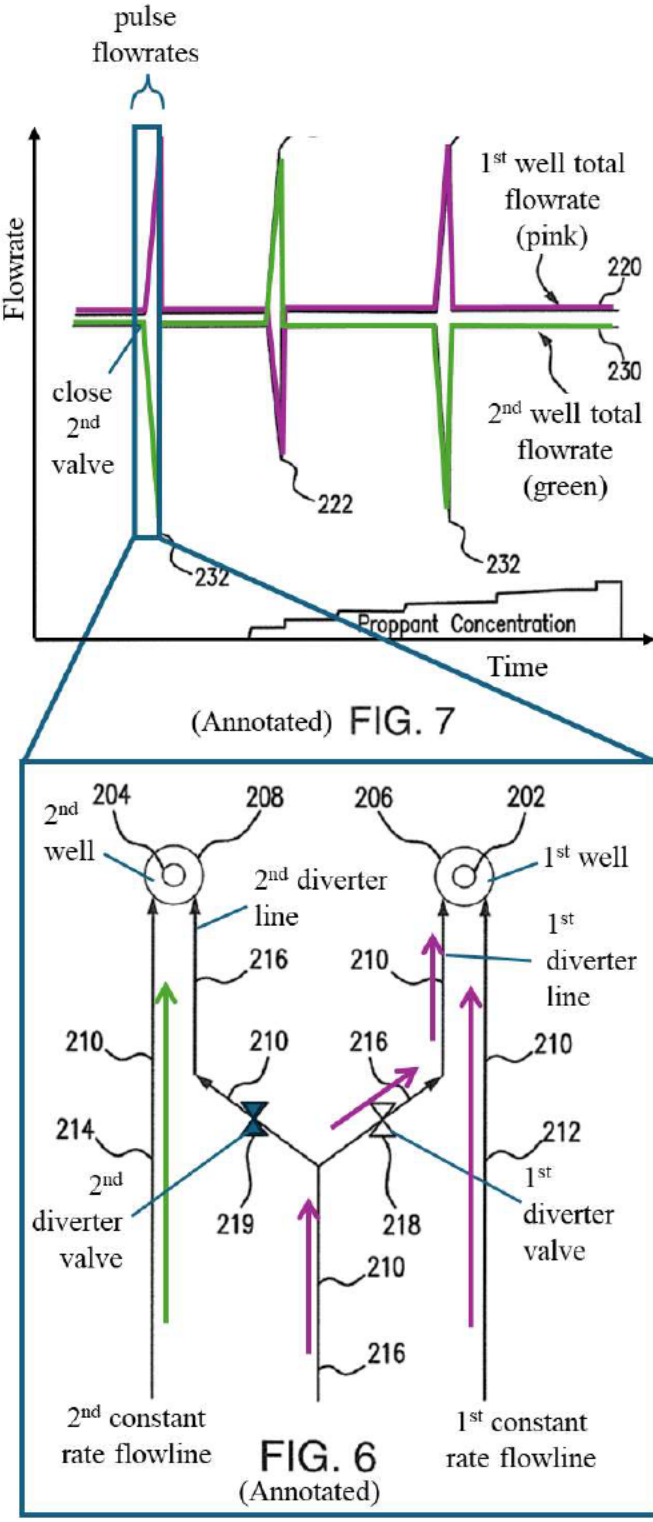
Claim	<i>Ciezobka</i>
[1.1] -“A method, comprising: communicating fluid to a first well via a manifold and a first valve, the first valve being associated with both the manifold and the first well; and” [2.1] - “the method of claim 1, further comprising: communicating fluid to a third well	<i>Ciezobka</i> discloses hydraulic fracturing systems/methods, including “pumping the fracturing fluid...at a pump rate and injecting the fracturing fluid under pressure into the wellhead at an initial flow rate and creating small fractures in deep rock formations.” 3:29-32. “As the system moves towards an equilibrium pressure with few or no new fractures being created,” the flowrate of fracturing fluid into the well is changed to introduce “a pressure pulse into the wellbore for a pulse period of time causing a temporary increase of pressure leading to opening new fractures.” 3:32-4:3. <i>Ciezobka</i> discloses high-pressure fracturing pumps pumping fracturing fluid to wells via flowlines through “a single or multiple common manifolds.” 3:17-18; 10:10-12;

⁵ *Ciezobka*-citations in claim charts refer to *Ciezobka*/Ex. 1036.

Claim	Ciezobka
via the manifold and a third valve, the third valve being associated with both the manifold and the third well; and”	11:28-30. The flowlines “may include a valve... that can be opened and closed” to allow or restrict fluid flow to the wellbore. 11:21-23. When a first valve associated with a first well (diverter valve 218 along first diverter flowline and/or a valve along the first constant rate flowline 212) is open, fracturing fluid is pumped through the first valve to the first well to permit a hydraulic fracturing operation on the first well. <i>See</i> 3:17-18; 10:10-12; 11:21-33; 12:4-10, Fig. 6. Thus, <i>Ciezobka</i> discloses communicating fluid to a first well via a manifold and a first valve (valve 218 along the first diverter flowline), the first valve being associated with both the manifold and the first well. Ex. 1041, ¶¶ 113-118. <i>Ciezobka</i> discloses the methods and apparatuses may include “[s]imilar variations...utiliz[ing] multiple wells.” 28:22-23. <i>Ciezobka</i>’s disclosure of applying its methods to “multiple wells” includes application to a third, fourth, or any number of wells, including pumping fluid from <i>Ciezobka</i>’s pumping systems (including a manifold) to a third well via an associated third valve. Ex. 1041, ¶ 141. Thus, <i>Ciezobka</i> discloses communicating fluid to a third well via a manifold and a third valve associated with both the manifold and the third well. Ex. 1041, ¶¶ 139-145.
<u>[1.2]/[2.2]</u> –“in response to determining that the fluid communicated via the manifold has satisfied one or more conditions”	“As the system moves towards an equilibrium pressure with few or no new fractures being created,” the flowrate of fracturing fluid into the well is changed to introduce “a pressure pulse into the wellbore for a pulse period of time causing a temporary increase of pressure leading to opening new fractures.” 3:32-4:3. <i>Ciezobka</i> discloses “variable rate fracturing” methods for fracturing multiple wells by varying flowrate “parameters” (conditions) into each well. 15:16-21. <i>Ciezobka</i> discloses

Claim	<i>Ciezobka</i>
	flowrate parameters/conditions include the “magnitude of change” in flowrate and the “duration” of the flowrate change. 15:19-20; Fig. 8. <i>Ciezobka’s</i> “variable rate fracturing” methods include injecting fracturing fluid from a fracturing system (including pumps and at least one common manifold) into wells, and when it’s determined that a certain flowrate range (e.g., a pulse flowrate greater than, less than, and/or within a range of an initial flowrate) has been directed into a well for a period of time, a subsequent valve sequence is performed to redirect flow between the two wells. Fig. 7; 12:13-15; 3:34-4:3, 11-13, 26-31. For example, <i>Ciezobka</i> discloses injecting fracturing fluid “into a well at an initial flow rate...changing the initial flow rate to a primary flow rate lower than the initial flow rate...for a period of time” and, after the flowrate conditions of the lower “primary flow rate” and “period of time” are performed, the methods include “modulating a valve to change between the primary flow rate and [a] secondary flow rate.” Claims 1, 9. <i>Ciezobka’s</i> Figures 6-7 show different wells’ associated diverter valves as open/closed to “increas[e] the total flow rate...to [a] first wellhead...and decreas[e] the total flow rate...to [a] second wellhead” relative to an initial flowrate “for a short period of time.” 12:7-11. Preferably, “the pulse [decreased] flow rate may range from 25% to 75% lower tha[n] the initial flow rate” with a corresponding increased flowrate to the other well. 4:5-7; 12:9-11. After flowrate conditions of directing the decreased flowrate to the second wellhead and increased flowrate to the first wellhead for the period of time are met, both diverter valves are open, at which point flow is directed to both first and second wells at a secondary flowrate. Fig. 7; 12:13-15; 4:2-3. “The process is then repeated” alternating between wells. 12:13-15.

Claim	<i>Ciezobka</i>
	In <i>Ciezobka</i>, after determining a flowrate (e.g., a pulse flowrate greater than, less than, and/or within a range of an initial flowrate) has been directed into a well for a period of time, a subsequent valve sequence is performed to redirect flow between the two wells. 4:11-13; 4:26-31; <i>see also</i>, Ex. 1041, ¶¶ 119-125. Applying <i>Ciezobka</i>’s teachings to third and fourth wells and associated third and fourth valves in <i>Ciezobka</i>’s multi-well systems would have involved performing the same variable-rate fracturing methods, including the same overlapping valve sequencing as described with <i>Ciezobka</i>’s examples using two wells and associated valves. <i>Id.</i>, ¶¶ 146-147. For example, <i>Ciezobka</i>’s teachings (determining that pulse flowrate conditions to a first well are met, and in response, opening a second valve to a second well and then closing a first valve to a first well) would equally be applied to third and fourth wells/valves, i.e., determining pulse flowrate conditions are met for the third well, and in response, opening a fourth valve to communicate fluid to the fourth well and then closing the third valve to the third well. Ex. 1041, ¶¶ 121-124; 146-147.
[1.3]-“opening a second valve; communicating fluid to a second well via the second valve; and” [2.3]-“opening a fourth valve; communicating fluid to a fourth well via the fourth valve; and”	Figures 6-7 show fracturing fluid pumped through a first diverter valve 218 to a first well, while a second diverter valve 219 to a second well is closed to prevent fluid flow through the second diverter line 216 to the second well (12:8-11), and, as fluid is continuously pumped (<i>i.e.</i> communicated) through valve 218 to the first well, the second valve 219 to the second well <i>is opened</i> to allow fluid flow to the second well (12:5-16). <i>See also</i> 11:32-12:14; Ex. 1041, ¶¶ 126-129. Annotated Figures 6 and 7 below show the sequence of the closed second valve being opened to communicate fluid to a second well.

Claim	Ciezboka
	 The figure consists of two parts: FIG. 6 (Annotated) and FIG. 7 (Annotated). FIG. 6 (Annotated): A schematic diagram of a well system. It shows two wells, labeled '2nd well' (204) and '1st well' (202). Each well has a 'diverter valve' (214 for the 2nd well, 212 for the 1st well) and a 'diverter line' (216 for the 2nd well, 210 for the 1st well). The wells are connected to a central manifold (218) which then splits into two 'constant rate flowlines' (210 for the 2nd well, 216 for the 1st well). The flowlines are shown with arrows indicating flow direction. The diverter valves are shown in a closed position. FIG. 7 (Annotated): A graph showing 'Flowrate' (Y-axis) versus 'Time' (X-axis). The graph displays three flowrate curves: 'pulse flowrates' (blue), '1st well total flowrate (pink)' (220), and '2nd well total flowrate (green)' (230). The pulse flowrates are shown as sharp, narrow peaks. The total flowrates are shown as broader, lower peaks. The graph also shows 'Proppant Concentration' (Y-axis) versus 'Time' (X-axis) at the bottom, with a step-like function. The flowrate curves are labeled with reference numerals 222 and 232.

Claim	Ciezboka
	FIG. 7 (Annotated) FIG. 6 (Annotated)

Claim	<i>Ciezobka</i>
	<i>Ciezobka</i>’s disclosure of applying its methods to “multiple wells” (28:22-23) includes application to third and fourth wells (Ex. 1041, ¶ 142), and applying <i>Ciezobka</i>’s teachings to third and fourth wells and associated third and fourth valves in <i>Ciezobka</i>’s multi-well systems would have involved performing the same variable-rate fracturing methods, including the same overlapping valve sequencing as described with <i>Ciezobka</i>’s examples using two wells and associated valves. <i>Id.</i>, ¶ 143. Accordingly, <i>Ciezobka</i> discloses opening a second (or fourth) valve to communicate fluid to a second (or fourth) well in response to determining the fluid has satisfied one or more conditions—that an increased flowrate (pulse flowrate) was provided to the first well (or third well) for a “short period of time.” Ex. 1041, ¶¶ 126-135; 148-149.
[1.4]–“closing the first valve after opening the second valve.” [2.4]–“closing the third valve after opening the fourth valve.”	After opening the second diverter valve to communicate fluid to the second well, “[t]he process is then repeated by closing the [first diverter] valve” to “increase[e] the total flow rate... to the second wellhead... and decreas[e] the total flow rate... to the first wellhead... for a short period of time.” 12:13-15. As discussed in Limitations 1.1/2.1 and 1.3/2.3, <i>Ciezobka</i> also discloses applying its methods to third and fourth wells. 28:22-23; Ex. 1041, ¶¶ 114-117; 141-144; 126-135; 148-149. Thus, <i>Ciezobka</i> discloses “closing the first valve after opening the second valve” (Ex. 1041, ¶ 136-138) and “closing the third valve after opening the fourth valve” (Ex. 1041, ¶¶ 145-149; <i>see also</i> ¶¶ 150-152).

Because *Ciezobka* discloses every limitation of Claims 1 and 2, as arranged in the claims, *Ciezobka* anticipates Claims 1 and 2.

2. Claim 4

Claims 4(1) recites “wherein the one or more conditions include one or more flow rate conditions.”

Ciezobka discloses using flowrate “parameters,” *i.e.*, conditions, to define a “variable rate fracturing” process for fracturing multiple wells. *Ciezobka*, 15:16-21. The flowrate “parameters” include the “magnitude of change” in flowrate and the “duration” of the flowrate change. *Id.*, 15:19-20; Fig. 8. For example, *Ciezobka*’s “variable rate fracturing” processes include “increasing and/or decreasing the pump rate” and/or “redirecting the flow” of fluid from a fracturing system (including pumps and at least one common manifold) to wells for a “short amount of time” “to impart a pressure pulse that can open unopened perforations,” *i.e.*, fracture the formation. *Id.*, 3:13-14; 8:9-12; 9:28-31; 11:5-7. “The pressure pulse comprises changing the initial flow rate to a pulse flow rate,” optionally including one or more pre-pulse rates, “and then to a secondary flow rate.” *Id.*, 4:2-3, 26-31. For example, a pulse may be introduced into a well “for a pulse period of time,” where the “pulse flow rate may range from 25% to 75% lower than the initial flow rate.” *Id.*, 4:1-7. Thus, flowrate thresholds and flowrate durations are used to outline different steps in *Ciezobka*’s variable rate fracturing processes. Ex. 1041, ¶¶ 167-169.

Thus, in addition to disclosing all limitations in Claim 1, *Ciezobka* discloses Claim 4.

Ciezobka anticipates Claim 4.

3. Claim 8

Claims 8(1) merely recites that the conditional determining limitation in Limitation 1.2 has occurred. Thus, for the same reasons provided with Independent Claim 1, *Ciezobka* discloses determining that the fluid communicated via the manifold has satisfied condition(s). Ex. 1041, ¶¶ 185-186.

Thus, in addition to the limitations disclosed by *Ciezobka* in Claim 1, *Ciezobka* discloses Claim 8. Ex. 1041, ¶¶ 184-186.

Ciezobka anticipates Claim 8.

4. Claims 5(1,4) and 9(1,8)

Claim 5(1,4) recites, “wherein the fluid communicated via the manifold has satisfied the one or more flow rate conditions when a flow rate of the fluid is below an upper threshold, above a lower threshold, or both.” Claim 9(1,8)⁶ recites that the conditional limitation in Claim 5 has occurred (*i.e.*, “determining that...”). Accordingly, these claims are discussed together.

⁶ Claim 9 lacks antecedent basis for “the...flow rate conditions,” but is addressed nonetheless.

Ciezobka discloses determining and updating, in real time, flowrate “parameters” (*i.e.*, conditions), including the “magnitude of change” in flowrate and the “duration” of the flowrate change, to define a “variable rate fracturing” process for fracturing multiple wells, where the fracturing process is moved to next steps by operating valves based on those parameters. *Ciezobka*, 15:16-21, 19:22-28; Fig. 8. Flowrate parameters/conditions for pulses within the variable rate fracturing processes include a change in flowrate from an initial flowrate within a pulse flowrate range for a “pulse period of time” “to impart a pressure pulse that can open unopened perforations,” *i.e.*, fracture the formation. *Id.*, 3:13-14; 4:2-15; 8:9-12; 9:28-31; 11:5-7.

Ciezobka discloses providing pulses to first and second wells according to pulse flowrate parameters/conditions by alternately opening and closing valves associated with the first and second wells, as shown in Fig. 7 below. *Id.*, 12:4-22. After determining a pulse flowrate (greater than, less than and/or within a range of an initial flowrate) has been directed into a well for a certain time, a subsequent valve sequence is performed in response to the determination based on a flowrate condition to redirect flow between the two wells, including opening a first valve to a first well before closing a second valve to a second well. *Id.*, 12:17-20; *see also* 4:11-13; 4:26-31.

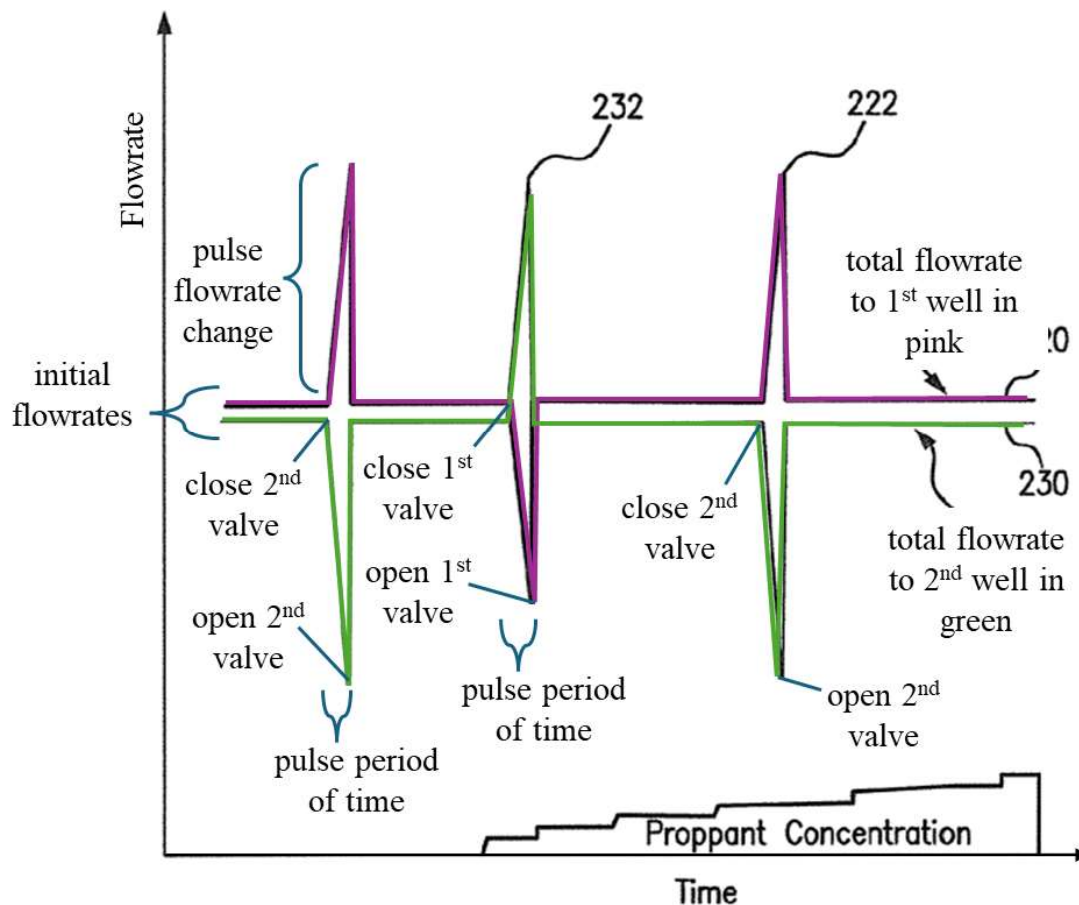
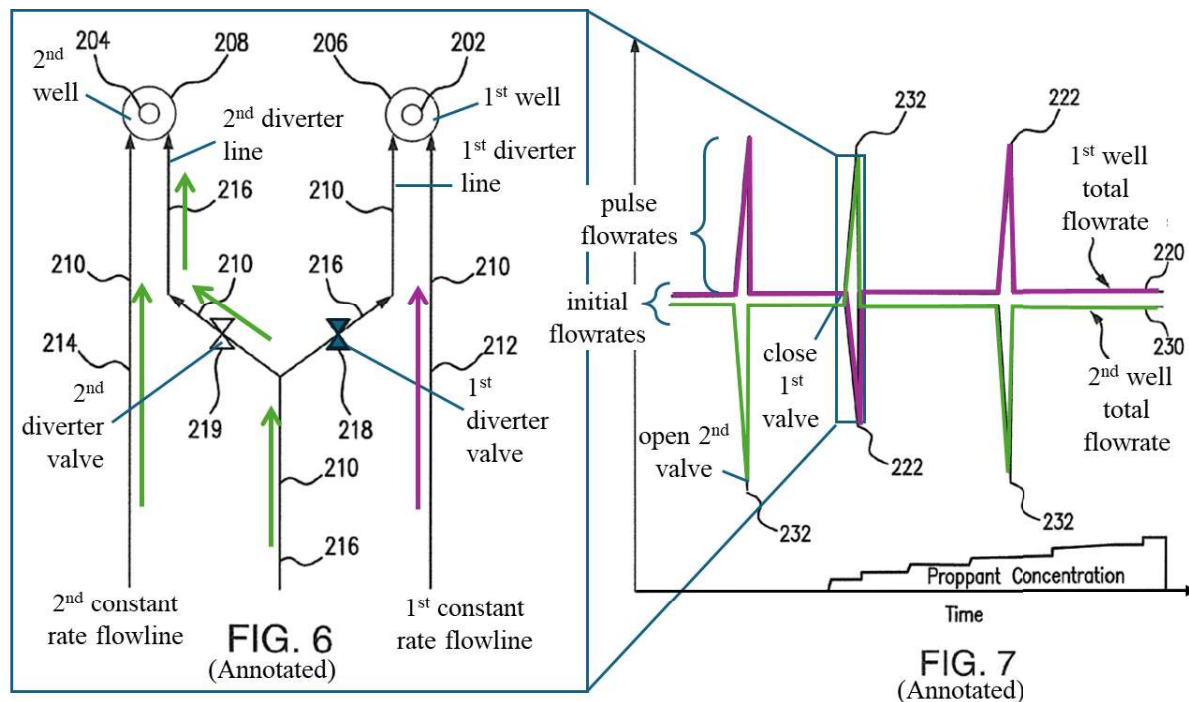


FIG. 7
(Annotated)

Ciezobka discloses diverting flow from the second well to the first well where the decreased total flowrate to the second well “ranges from 25% to 75% lower” than the initial total flowrate to the second well and is decreased for the “pulse period of time.” *Ciezobka*, 4:6-7; 12:19-20. Conversely, the diverting flow into the first well provides an inverse flowrate increase to the first well for the pulse period of time. *Ciezobka*, 12:4-10; Ex. 1041, ¶ 172. Accordingly, the pulse flowrate conditions for fluid pumped via the manifold to the first well are met when the

flowrate increase to the first well is within the thresholds of between 25% and 75% change in flowrate from the initial total flowrate to the first well for the pulse period of time. Ex. 1041, ¶ 174.

When the flowrate to the first well has been increased to within the pulse flowrate range for the pulse period of time (*i.e.*, when the pulse flowrate conditions are met), the second valve is opened to resume total flowrate to the wells to (or close to) the initial flowrates. *Ciezobka*, 4:2-5; 12:5-15; 15:8-13; Fig. 7. After the initial flowrates are held within the narrower flowrate range, the first valve to the first well is then closed to repeat the pulse process for the second well:



Thus, *Ciezobka* discloses that when the flowrate to a first well is within a flowrate range (*i.e.*, between an upper and lower threshold) for a period of time,

thereby satisfying flowrate conditions, a series of valve operations are performed, including opening a second valve and then closing the first valve after opening the second valve, and determining that the fluid communicated has satisfied one of these conditions.

Therefore, in addition to disclosing the limitations in Claims 1, 4, and 8, *Ciezobka* discloses Claims 5 and 9. Ex. 1041, ¶¶ 170-176; 187-189.

Claims 5 and 9 are anticipated by *Ciezobka*.

5. Claim 6

Claim 6(1,4) recites, “the fluid communicated via the manifold has not satisfied the one or more flow rate conditions when a flow rate of the fluid is above an upper threshold or below a lower threshold.”

As discussed with Claim 5, *Ciezobka* discloses that when the flowrate to a first well is within a flowrate range (i.e., between an upper and lower threshold) for a period of time, thereby satisfying flowrate conditions, a series of valve operations are performed, including opening a second valve and then closing the first valve after opening the second valve. *See, e.g., Ciezobka*, 4:2-13; 4:26-31; 12:5-20; 15:8-13. Conversely, when the flowrate to the first well is outside of the flowrate range, e.g., below a pulse flowrate, the flowrate does not satisfy pulse flowrate conditions. *Id.*

Therefore, in addition to disclosing the limitations in Claims 1 and 4, *Ciezobka* discloses Claim 6. Ex. 1041, ¶¶ 177-180.

Ciezobka anticipates Claim 6.

6. Claim 7

Ciezobka discloses “pumping the fluid into the manifold,” as recited in Claim 7(1).

Ciezobka discloses flowlines connect “high-pressure fracturing pumps, through a single or multiple common manifolds, to a wellhead.” *Ciezobka*, 3:16-18. *Ciezobka*’s Figure 4 shows high-pressure fracturing pumps pumping fracturing fluid to a manifold at a high-pressure and then through the flowlines to a wellhead connected to the wellbore. *Id.*, 10:10-13. *Ciezobka* discloses that the pump/manifold system may likewise be connected via flowlines to two wells, such as in Figure 6. *Id.*, 11:28-33.

Thus, in addition to the limitations disclosed by *Ciezobka* in Claim 1, *Ciezobka* discloses Claim 7. Ex. 1041, ¶¶ 181-183.

Claim 7 is therefore anticipated by *Ciezobka*.

7. Claim 12

Claim 12(1) recites, “the second valve is associated with both the manifold and the second well” (Limitation 12.1), “wherein communicating fluid to the second well via the second valve comprises communicating fluid to the second well via the manifold and the second valve” (Limitation 12.2).

In *Ciezobka's* Figure 6, first and second wells are connected to a fracturing system by diverter and constant rate flowlines. *Id.*, 11:26-29. In operation, the fracturing system (not shown in Fig. 6) supplies fracturing fluid to the wells via the flowlines (11:32-12:5):



Ciezobka's pumps pump fracturing fluid to the flowlines through "a single or multiple common manifolds." Ex., 1036, 3:17-18; 10:10-12; 11:28-30. The flowlines "may include a valve... that can be opened and closed" to allow or restrict fluid flow to the wellbore. *Id.*, 11:21-23. When the valve on the second diverter line is open, fracturing fluid is pumped (*i.e.*, communicated) through the second diverter line to the second well. *Id.*, 12:4-8.

Thus, *Ciezobka* discloses communicating fluid to a second well via a manifold and a second valve (second diverter valve along the second diverter flowline), the second valve being associated with both the manifold and the second well. Ex. 1041, ¶¶ 207-209.

Therefore, in addition to the limitations disclosed by *Ciezobka* in Claim 1, *Ciezobka* discloses Claim 12. Ex. 1041, ¶¶ 201-2011.

Claim 12 is anticipated by *Ciezobka*.

8. Claims 10 and 13

Claim 10(1) recites "the fluid communicated via the manifold is hydraulic fracturing fluid." Claim 13(1,12) recites the same limitation as Claim 10(1), except Claim 13 depends from base claims reciting the fluid is also communicated via the manifold and the second valve. Thus, these claims are discussed together.

Ciezobka discloses systems/methods of "hydraulic fracturing to create a number of additional open perforations in an earth formation." *Ciezobka*, 23:21-22.

The hydraulic systems/methods include pumping “fracturing fluid... at a pump rate ... through a single or multiple common manifolds, to a wellhead.” *Id.*, 3:15-18. The hydraulic fracturing fluid is “generally, water” and other materials injected “under pressure into the wellhead at an initial flow rate” to create “small fractures in” the formation. *Id.*, 1:20-22; 3:1-14.

Thus, in addition to the limitations disclosed by *Ciezobka* in Claims 1 and 12, *Ciezobka* discloses Claims 10 and 13. Ex. 1041, ¶¶ 190-192; 212-213.

Claims 10 and 13 are therefore anticipated by *Ciezobka*.

9. Claim 11

Claim 11(1) merely labels first/second valves differently without imparting any distinguishable functionality/structure over what the independent claims recite. *Ciezobka* discloses the limitations of Claim 11 for the same reasons *Ciezobka* discloses the first and second valves. See Section IX.A.1. The '770's specification does not define or describe “zipper” valves as having any distinguishable feature from any other valve capable of allowing fluid flow into a well. Ex. 1041, ¶ 194. Instead, '770 merely describes “zipper valves 170a-b (such as, for example, gate valves)” based on their function “[to] communicate fluid between” a zipper manifold and a well, and a “zipper manifold” is merely described as being a manifold “adapted to communicate” pressurized fracturing fluid from high-pressure pumps (via a

discharge manifold) to multiple wells. 'Ex. 1001, 5:59-64; 6:8-9; 7:60-8:4;, 13:20-29; 14:6-11; 14:23-35; 14:38-46, and associated figures.

Ciezobka discloses that “a single or multiple common manifolds” may connect the high-pressure fracturing pumps to a well via multiple flowlines, and the flowlines may each include a valve “that can be opened and closed to restrict a flow of fluid to the wellbore.” *Ciezobka*, 3:15-20; 11:21-22, 28-30. In embodiments where multiple wells are connected to fracturing pumps via “a single or multiple common manifolds,” a POSITA would have considered such manifold to include a manifold equivalent to or interchangeable with a “zipper manifold,” and any associated valves that “can be opened and closed to restrict a flow of fluid to the wellbore” to be effectively equivalent to “zipper valves,” as described in '770. Ex. 1041, ¶ 197; Ex. 1044.

Accordingly, *Ciezobka* discloses first and second “zipper valves” for the same reasons *Ciezobka* discloses the claimed first and second valves.

Thus, in addition to the limitations disclosed by *Ciezobka* in Claim 1, *Ciezobka* discloses Claim 11. Ex. 1041, ¶¶ 193-200.

Claim 11 is therefore anticipated by *Ciezobka*.

B. GROUND 2- CIEZOBKA RENDERS OBVIOUS CLAIMS 2-3, AND 14-38

As discussed above, Claims 1, 2, and 4-13 are anticipated by *Ciezobka*. Claims 2 and 3, which depend from Claim 1, are obvious over *Ciezobka*. Additionally, independent Claims 14 and 27 and their dependent claims are obvious over *Ciezobka*. Claims 14 and 27 are nearly identical to Claim 1, but a person/computer/controller may execute Claim 1, while only a computer executes Claim 14 and only a controller executes Claim 27. *See also*, Ex. 1041, ¶¶ 112; 355.

1. Claims 1 and 4-13

Ciezobka discloses all limitations of Claims 1 and 4-13, as discussed in Section IX.A. To the extent any differences may exist, a POSITA would have considered Claims 1 and 4-13 obvious over *Ciezobka*. Accordingly, *Ciezobka* also renders obvious Claims 1 and 4-13.

2. Independent Claim 14

Claim 14 merely adds standard computer language to Claim 1. *Ciezobka* discloses or renders obvious all limitations of Claim 14.

a. Limitation 14.1

Ciezobka discloses using a diagnostic approach for evaluating hydraulic fracturing methods, “implemented in a software toolbox which incorporates all of the data handling and data analysis elements for real time application in the field during hydraulic fracturing operations as well as post completion using the data

collected during field activities.” *Ciezobka*, 27:26-29. *Ciezobka* also discloses artificial intelligence (AI) tools “can be used to identify the efficacy of said rate pulses in the subject processing.” *Id.*, 27:14-15.

Ciezobka’s “(AI) tools” or “software toolbox” would necessarily include a typical computer system with processor(s) executing instructions stored on non-transitory computer readable medium. Ex. 1041, ¶ 215.

Ciezobka discloses that collected data diagnostics are further used to generate parameter optimization outputs, which “are then used to decide on further rate fluctuations as envisioned to be part of subject hydraulic fracturing method.” *Ciezobka*, 27:30-28:2. *Ciezobka*’s “rate fluctuations” include “increasing and decreasing the pump rate and/or” opening/closing valves to multiple wells to “redirect[] the flow of fracturing fluid” between the wells. *Id.*, 4:30-31; 9:28-31; 28:22-26. Thus, a POSITA would have understood that using the computer system’s generated optimized rate fluctuations “for real time application in the field during hydraulic fracturing operations” would have obviously included software instructions for opening/closing valves according to the determined optimized rate fluctuation schedules, which would have been executed in *Ciezobka*’s fracturing systems. *Id.*, 27:26-29; Ex. 1041, ¶¶ 215-217.

Ciezobka therefore discloses, or at least renders obvious, Limitation 14.1.

b. Limitations 14.2-14.6

Limitations 14.2-14.6 are identical to Limitations 1.1-1.5. Thus, *Ciezobka* discloses Limitations 14.2-14.6 for the same reasons discussed with Claim 1. Section IX.A.1. Ex. 1041, ¶¶ 218-222.

Ciezobka discloses, or at least renders obvious, every limitation of Claim 14, as arranged in the claims. Ex. 1041, ¶¶ 214-223.

3. Independent Claim 27

Claim 27 merely adds one or more controllers to Claim 1. *Ciezobka* discloses or renders obvious all limitations of Claim 27.

a. Limitations 27.1-27.2, 27.4-27.6

Limitations 27.1-27.2 and 27.4-27.6 are nearly identical to Limitations 1.1-1.5, except Claim 27 describes the system that performs Claim 1's steps. *Ciezobka* discloses the method and components that perform Claim 1's method, including, *e.g.*, first/second wells, first/second valves, manifold(s), and fluid. Thus, *Ciezobka* discloses Limitations 27.1-27.2 and 27.4-27.6 for the same reasons discussed with Claim 1. Section IX.A.1.; Ex. 1041, ¶¶ 258-261; 267-271.

b. Limitation 27.3

This limitation adds a controller(s) configured to perform the steps of 27.4-27.6 (which are nearly identical to Limitations 1.2-1.4). *Ciezobka* discloses “a software toolbox which incorporates all of the data handling and data analysis

elements for real time application in the field during hydraulic fracturing operations as well as post completion using the data collected during field activities.” *Ciezobka*, 27:26-29. *Ciezobka* discloses that the software toolbox further generates parameter optimization outputs, which “are then used to decide on further rate fluctuations as envisioned to be part of subject hydraulic fracturing method.” *Id.*, 27:30-28:2. *Ciezobka*’s “rate fluctuations” include “increasing and decreasing the pump rate and/or” opening/closing valves to multiple wells to “redirect[] the flow of fracturing fluid” between the wells. *Id.*, 4:30-31; 9:28-31; 28:22-26. Thus, a POSITA would have understood that using the computer system’s generated optimized rate fluctuations “for real time application in the field during hydraulic fracturing operations” would have obviously included software instructions for controlling the valves and pumps according to the determined optimized rate fluctuation schedules to perform Limitations 27.4-27.6, which would have been executed in *Ciezobka*’s fracturing systems. Ex. 1041, ¶¶ 215-216. Further, software instructions for controlling *Ciezobka*’s fracturing systems according to such rate fluctuation schedules would have been implemented by any suitable generic controller available at the time (circa 2017). *Id.* And, the ’770 Patent does not define or describe a “controller” as anything more than a generic controller. See Ex. 1001, generally.

Additionally, given *Ciezobka*’s examples with precise rate control, e.g., changing pump rates and/or opening/closing valves to change a flowrate such as by

25% for a short period of time ranging from 1 minute to 1 second, a POSITA would have readily recognized that such control would have been implemented with any controller that was well-known at the time. Ex. 1041, ¶ 263 .

Ciezobka therefore discloses, or at least renders obvious, Limitation 27.3. Ex. 1041, ¶¶ 262-266.

Ciezobka discloses, or at least renders obvious, every limitation of Claim 27, as arranged in the claims. Ex. 1041, ¶¶ 257-272.

4. Claims 2, 15, and 28

As discussed in Section IX.A.1., *Ciezobka*'s disclosure of applying its methods to "multiple wells" includes application to a third, fourth, or any number of wells and opening/closing valves in response to determining whether pulse flowrate conditions are met. Ex. 1041, ¶ 141, 143.

To the extent application of *Ciezobka*'s methods to third/fourth wells/valves is not explicitly or inherently disclosed, a POSITA would have found it obvious to apply *Ciezobka*'s teachings of opening/closing valves to first/second wells when pulse flowrate conditions are met to third and fourth wells/valves. Ex. 1041, ¶¶ 146-149. A POSITA would have expected the same results of *Ciezobka*'s variable rate fracturing when applying the methods for first/second wells/valves to third/fourth wells/valves. *Id.*, ¶ 143. Mere repetition of elements has no patentable significance unless a new and unexpected result is produced. *See, e.g., In re Harza*, 274 F.2d 669

(CCPA 1960); and *Perfect Web Techs., Inc. v. InfoUSA, Inc.*, 587 F.3d 1324, 1330 (Fed. Cir. 2009). Additionally, a POSITA would have found it obvious to apply *Ciezobka*'s teachings to third and fourth wells in the same manner as described with *Ciezobka*'s examples using first and second wells "to take advantage of increased hydrocarbon production, operating efficiencies, and reduced friction taught by *Ciezobka* at multiple well locations, not just one or two." Ex. 1041, ¶ 142.

Thus, in addition to disclosing, or at least rendering obvious, all limitations in Independent Claims 1, 14, and 27 (*See* Sections IX.A.1., IX.B.2-3.), *Ciezobka* renders obvious the limitations in Claims 2, 15, and 28. Ex. 1041, ¶¶ 139-152; 224-230; 273-279.

Claims 2, 15, and 28 are obvious over *Ciezobka*.

5. Claims 3, 16, and 29

Claims 3(1,2), 16(14,15), and 29(27,28) recite "the first valve is closed"/ "close the first valve" "after opening both the second valve and the fourth valve" (Limitations 3.1/16.1/29.1) "and/or" "the third valve is closed"/ "close the third valve" "after opening both the second valve and the fourth valve" (Limitations 3.2/16.2/29.2).

As discussed, *Ciezobka* discloses that its well-swapping fracturing systems/methods of opening/closing valves to alternately fracture associated first and second wells may include "[s]imilar variations... utiliz[ing] multiple wells."

Ciezobka, 3:29-4:2; 11:24-12:15; 28:22-23. *Ciezobka*'s disclosure of applying its methods to "multiple wells" includes application to a third, fourth, or any number of wells. Ex. 1041, ¶ 141.

Further, a POSITA would understand that application of *Ciezobka*'s variable rate fracturing methods for first/second wells using overlapping valve sequencing for associated first/second valves may obviously and equally be applied to third/fourth wells in the system using the overlapping valve sequencing for associated third/fourth valves to alternately deliver fracturing pulses to the wells. Ex. 1041, ¶ 159. Doing so would have included mere repetition of known processes in the same manner with predictable results of increasing production from more wells. *Id.* When running *Ciezobka*'s overlapping valve sequencing for first/second valves and third/fourth valves, a POSITA would have found it "nearly inevitable that, at some point in the 'simultaneous' fracturing operation... the first valve would be closed after the second valve is opened (as specifically disclosed by *Ciezobka*) and after the fourth valve is opened." *Id.*, ¶ 162. For the same reasons, a POSITA would have found it obvious when duplicating *Ciezobka*'s overlapping valve sequencing for the third/fourth valves, that the third valve would be closed after opening both the second and fourth valves. *Id.*, ¶ 165.

Claims 3, 16, and 29 are obvious over *Ciezobka*. Ex. 1041, ¶¶ 153-166; 231-234; 280-283.

6. Claim 21

Claim 21(14) is identical to Claim 8(1), but depends from a different independent claim, and merely recites that Independent Claim 14's condition-determining limitation has occurred. Thus, for the same reasons discussed regarding Claims 8 and 14, *Ciezobka* discloses determining that the fluid communicated via the manifold has satisfied condition(s). *See*, Sections IX.A.4 and IX.B.1; Ex. 1041, ¶¶ 243-244.

Thus, in addition to the limitations disclosed and/or rendered obvious by *Ciezobka* in Claim 14, *Ciezobka* discloses Claim 21's limitations. Ex. 1041, ¶¶ 243-244.

Ciezobka renders obvious Claim 21.

7. Claims 17 and 30

Claims 17(14) and 30(27) are identical to Claim 4(1), except Claims 17 and 30 depend from Independent Claims 14 and 27. In addition to disclosing, or at least rendering obvious, all limitations in Claims 14 and 27, *Ciezobka* discloses the limitations in Claims 17/30 for the same reasons discussed with Claim 4. *See*, Section IX.A.2; Ex. 1041, ¶¶ 235-236; 284-285.

Thus, Claims 17 and 30 are obvious over *Ciezobka*.

8. Claims 18, 22, and 31

Claims 18(14,17) and 31(27,28) are identical to Claim 5(1,4), and Claim 22(14,21) is identical to Claim 9(1,8), except Claims 18, 22, and 31 depend from different base claims. Claims 18 and 31 cover conditions being satisfied and Claim 22 covers “determining” that those same conditions have been satisfied. In addition to disclosing, or at least rendering obvious, all limitations in Claims 14 and 27, *Ciezobka* discloses the limitations in Claims 18, 22, and 31 for the same reasons discussed with Claims 5 and 9. *See*, Section IX.A.4; Ex. 1041, ¶¶ 237-238; 245-246; 286-287.

Thus, *Ciezobka* renders obvious Claims 18, 22, and 31.

9. Claims 19 and 32

Claims 19(14) and 32(27) are identical to Claim 6(1), except Claims 19 and 32 depend from different independent claims. In addition to disclosing, or at least rendering obvious, all limitations in Claims 14 and 27, *Ciezobka* discloses the limitations in Claims 19/32 for the same reasons discussed with Claim 6. *See*, Section IX.A.5; Ex. 1041, ¶¶ 239-240; 288-289.

Thus, *Ciezobka* renders obvious Claims 19 and 32.

10. Claim 20

Claim 20(14) is identical to Claim 7(1), except Claim 20 depends from a different independent claim. Thus, in addition to disclosing, or at least rendering obvious, all limitations in Claim 14, *Ciezobka* discloses the limitations in Claim 20 for the same reasons discussed with Claim 7. *See*, Section IX.A.6; Ex. 1041, ¶¶ 241-242.

Thus, *Ciezobka* renders obvious Claim 20.

11. Claims 23 and 35

Claims 23(14) and 35(27) are identical to Claim 10(1), except they depend from different independent claims. In addition to disclosing, or at least rendering obvious, all limitations in Claims 14 and 27, *Ciezobka* discloses the limitations in Claims 23/35 for the same reasons discussed with Claim 10. *See*, Section IX.A.8; Ex. 1041, ¶¶ 247-248; 298-299.

Thus, *Ciezobka* renders obvious Claims 23 and 35.

12. Claims 24 and 36

Claims 24(14) and 36(27) are identical to Claim 11, except they depend from different independent claims. In addition to disclosing, or at least rendering obvious, all limitations in Claims 14 and 27, *Ciezobka* discloses the limitations in Claims 24/36 for the same reasons discussed with Claim 11. *See*, Section IX.A.9; Ex. 1041, ¶¶ 249-250; 300-301.

Thus, *Ciezobka* renders obvious Claims 24 and 36.

13. Claims 25 and 37

Claims 25(14) and 37(27) are identical to Claim 12, except they depend from different independent claims. In addition to disclosing, or at least rendering obvious, all limitations in Claims 14 and 27, *Ciezobka* discloses the limitations in Claims 25/37 for the same reasons discussed with Claim 12. *See*, Section IX.A.7; Ex. 1041, ¶¶ 251-254; 302-305.

Thus, *Ciezobka* renders obvious Claims 25 and 37.

14. Claims 26 and 38

Claims 26(14) and 38(27) are identical to Claims 10 and 13, except they depend from different independent claims. In addition to disclosing, or at least rendering obvious, all limitations in Claims 14 and 27, *Ciezobka* discloses the limitations in Claims 26/38 for the same reasons discussed with Claims 10 and 13. *See*, Section IX.A.8; Ex. 1041, ¶¶ 255-256; 306-307.

Thus, *Ciezobka* renders obvious Claims 26 and 38.

15. Claim 33

Claim 33(27) superfluously recites the manifold recited in Claim 27 and is thus disclosed by *Ciezobka* for the same reasons discussed in Sections IX.B.2. *See also*, Ex. 1041, ¶¶ 290-292.

Thus, *Ciezobka* renders obvious Claim 33.

16. Claim 34

Claim 34(27) recites “one or more pumps; wherein the one or more controllers are further configured to cause the one or more pumps to pump the fluid into the manifold.”

Ciezobka discloses flowlines connect “high-pressure fracturing pumps, through a single or multiple common manifolds, to a wellhead.” *Ciezobka*, 3:16-18. *Ciezobka*’s Figure 4 shows high-pressure fracturing pumps pumping fracturing fluid to a manifold and then through the flowlines to a wellhead connected to the wellbore. *Id.*, 10:10-13. *Ciezobka* discloses that the pump/manifold system may likewise be connected via flowlines to two wells, such as in Figure 6. *Id.*, 11:28-33.

Further, *Ciezobka* discloses using “a software toolbox... for real time application” of *Ciezobka*’s variable rate fracturing parameters “in the field during hydraulic fracturing operations.” *Ciezobka*, 27:26-29. *Ciezobka*’s variable rate fracturing parameters include “increasing and decreasing the pump rate and/or” maintaining a “constant flow rate.” *Id.*, 4:30-31; 9:28-31; 11:32-33; 28:22-26. Thus, a POSITA would have understood that using the “software toolbox... for real time application in the field during hydraulic fracturing operations” would have obviously included software instructions for controlling the pumps according to *Ciezobka*’s variable rate fracturing parameters, which would have been executed in *Ciezobka*’s fracturing systems. Ex. 1041, ¶¶ 294-296. Further, software instructions for

controlling *Ciezobka*'s fracturing systems, including the pumps, would have been implemented by any suitable generic controller available at the time. *Id.*.

Thus, in addition to the limitations disclosed/rendered obvious by *Ciezobka* in Claim 27, *Ciezobka* discloses, or at least renders obvious, the limitations in Claim 34. Ex. 1041, ¶¶ 293-297.

Ciezobka renders obvious Claim 34.

C. GROUND 3- CIEZOBKA AND MCNEEL RENDER OBVIOUS CLAIMS 2-3 AND 14-38

As discussed in Sections IX.A-B, *Ciezobka* discloses or renders obvious all of '770's claims. To the extent it is argued that *Ciezobka* does not disclose/render obvious the limitations including third and fourth wells/valves, generic computer elements, and generic controller(s), *McNeel* discloses, or at least renders obvious, these limitations. A POSITA would have found it obvious to combine the teachings of *Ciezobka* and *McNeel*, as both are in the same field of well systems (as is the '770), and are directed to improving and controlling fracturing operations to multiple wells and the combination of their analogous and/or compatible systems would have been combined with predictable results. Ex. 1041, ¶¶ 308-315.

1. Independent Claim 14

a. Limitation 14.1

Limitation 14.1 recites that generic computer elements execute a method ("An apparatus, comprising: a non-transitory computer readable medium; and a plurality

of instructions stored on the non-transitory computer readable medium and executable by one or more processors, wherein, when the instructions are executed by the one or more processors, the following steps are executed),” which is disclosed and/or rendered obvious by *Ciezobka* and *McNeel*.

Ciezobka discloses fracturing evaluation methods “implemented in a software toolbox which incorporates all of the data ... for real time application in the field during hydraulic fracturing operations as well as post completion using the data collected during field activities” and “provides the ‘effectiveness’ and ‘confidence’ measures in the output,” which “are then used to decide on further rate fluctuations” in hydraulic fracturing operations. *Ciezobka*, 27:26-28:2. A POSITA would have understood that *Ciezobka*’s “software toolbox” would obviously include “a non-transitory computer readable medium; and a plurality of instructions stored on the non-transitory computer readable medium and executable by one or more processors,” as recited in Limitation 14.1. Ex. 1041, ¶ 339.

While *Ciezobka* teaches implementing analysis data related to hydraulic fracturing operations “for real time application in the field,” *McNeel* teaches methods of using well system data for controlling a fracturing operation via a “controller” and/or a “central control system.” It would have been obvious to a POSITA to use *McNeel*’s control system with the “software toolbox” of *Ciezobka* to implement the optimized rate fluctuation schedule determined from *Ciezobka*’s

fracturing evaluation methods in the fracturing system of *Ciezobka*, as doing so would merely involve applying a known technique/system (*McNeel*'s control system) to *Ciezobka*'s system to yield the predictable results of improved system control. Ex. 1041, ¶ 340.

Thus, Limitation 14.1 is disclosed, or at least rendered obvious, by *Ciezobka* and *McNeel*.

b. Limitations 14.2-14.6

Limitations 14.2-14.6 are identical to Limitations 1.1-1.5, which are disclosed by *Ciezobka*, as discussed in Section IX.A.1.

Thus, *Ciezobka* and *McNeel* disclose, or at least render obvious, every limitation of Claim 14, as arranged in the claims. Ex. 1041, ¶¶ 338-341.

Claim 14 is rendered obvious by *Ciezobka* in view of *McNeel*.

2. Independent Claim 27

a. Limitations 27.1-27.2, 27.4-27.6

Limitations 27.1-27.2 and 27.4-27.6 are nearly identical to Limitations 1.1-1.5 (which are disclosed by *Ciezobka*, as discussed in Section IX.A.1), except Claim 27 describes the system that performs Claim 1's steps. *Ciezobka* discloses the method and components that perform Claim 1's method, including, *e.g.*, first/second wells, first/second valves, manifold(s), and fluid. Thus, *Ciezobka* discloses

Limitations 27.1-27.2 and 27.4-27.6 for the same reasons discussed with Claim 1.

See, Section IX.A.1. Ex. 1041, ¶ 345.

b. Limitation 27.3

Limitation 27.3 recites generic controller(s) are configured to open/close valves, which is disclosed, or at least rendered obvious, by *Ciezobka* and *McNeel*.

McNeel discloses operations of a multi-well fracturing system “are controlled, coordinated, and monitored by a central control system.” *McNeel*, ¶ [0029]. “The central control system may use all of the sensor data” collected from the system to control system operations, including fracturing fluid rate. *Id.* For example, fracturing fluid delivery systems including fracturing fluid component tanks and valve-metering control systems, “can be monitored for level, material weight, and the rate,” where the collected “information can be transmitted to a controller or control area.” *Id.*, ¶¶ [0020]-[0021]. Manifold valves can also be “electronically monitored and controlled.” *Id.*, ¶¶ [0025]-[0026]. Thus, *McNeel* discloses using a “controller,” as recited in Limitation 27.3.

Further, *Ciezobka* discloses using “a software toolbox...for real time application” of *Ciezobka*’s variable rate fracturing parameters “in the field during hydraulic fracturing operations.” *Ciezobka*, 27:26-29. *Ciezobka* discloses that the software toolbox further generates parameter optimization outputs, which “are then

used to decide on further rate fluctuations as envisioned to be part of subject hydraulic fracturing method.” *Id.*, 27:30-28:2.

Ciezobka’s variable rate fracturing parameters include “increasing and decreasing the pump rate and/or” opening/closing valves to multiple wells to “redirect[] the flow of fracturing fluid” between the wells. *Id.*, 4:30-31; 9:28-31; 28:22-26. Thus, a POSITA would have understood that using the “software toolbox...for real time application in the field during hydraulic fracturing operations” would have obviously included software instructions for controlling *Ciezobka*’s fracturing systems according to *Ciezobka*’s variable rate fracturing parameters, which include opening/closing valves in response to determining parameters indicating moving to a next step in the fracturing process (*i.e.*, Limitations 27.4-27.6). Ex. 1041, ¶¶ 343-344. Further, a POSITA would have understood that instructions with the “software toolbox” for controlling *Ciezobka*’s fracturing systems would have been implemented by any suitable generic controller available at the time. *Id.*

It would have been obvious to a POSITA to use *McNeel*’s controller with the “software toolbox” of *Ciezobka* to implement *Ciezobka*’s variable rate fracturing processes in *Ciezobka*’s fracturing systems, as doing so would merely involve applying a known technique/system (*McNeel*’s controller) to *Ciezobka*’s system to yield the predictable results of improved system control. Ex. 1041, ¶ 344.

Thus, Limitation 27.3 is disclosed, or at least rendered obvious, by *Ciezobka* and *McNeel*.

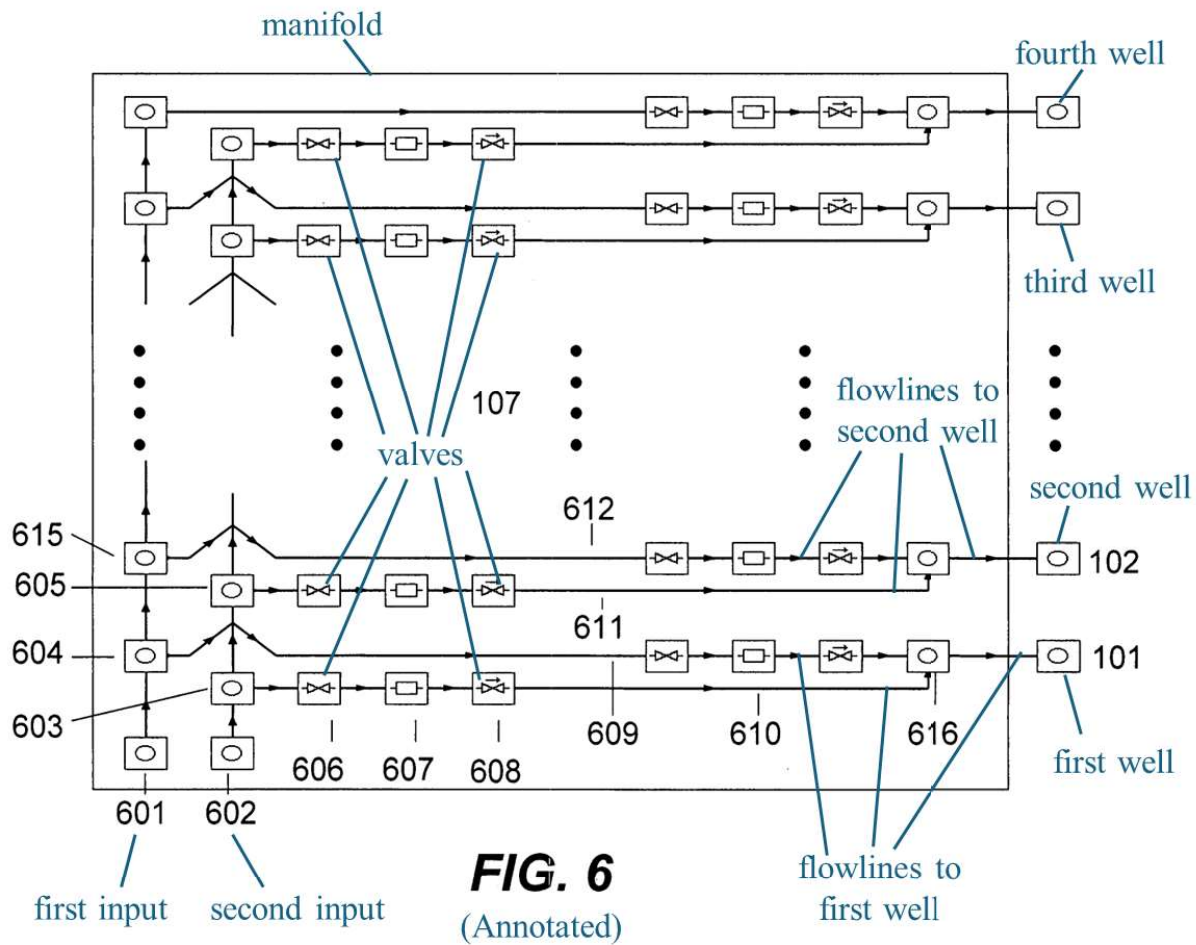
Claim 27 is rendered obvious by *Ciezobka* in view of *McNeel*. *See also*, Ex. 1041, ¶¶ 343-345.

3. Claims 2, 15, and 28

Claims 2(1), 15(14), and 28(27) recite already-analyzed limitations (Claim 1, 14, 27) that are applied to third and fourth valves/wells.

For the reasons discussed above in Section IX.B.3., *Ciezobka* discloses or renders obvious application of the claimed sequence to third and fourth wells/valves. *McNeel* also clearly shows such third and fourth wells/valves.

McNeel discloses pumping fracturing fluid from a manifold to multiple wells, including at least four wells, at higher and lower rates by opening/closing valves associated with the wells. *McNeel*, ¶¶ [0025]-[0026]. Additionally, in *McNeel*'s Figure 6 manifold, two flowlines are fluidly connected to each well, including first-fourth wells, where valves along each of the two flowlines may be opened/closed to allow/restrict fluid flow to each well. *Id.*, ¶ [0026].



Thus, *McNeel* clearly discloses communicating fluid to a third well via the manifold and an associated third valve (Limitations 2.1/15.1/28.1) and opening a fourth valve to communicate fluid to a fourth well (Limitations 2.3-2.4/15.3-15.4/28.2-28.3). Further, *McNeel* discloses opening and closing the valves to each well according to “[w]hen it is desired” to selectively deliver fluid to each well, including pumping fluid to wells “simultaneously or singly.” *Id.* ¶¶ [0025]-[0026].

Although *Ciezobka*’s examples use two wells, *Ciezobka* discloses the methods and apparatuses may include “[s]imilar variations ... utiliz[ing] multiple wells.”

Ciezobka, 28:22-23. Thus, it would have been obvious to a POSITA to use *McNeel*'s manifold to selectively deliver higher/lower rates of fluid flow to multiple wells, including a first, second, third, and fourth well, in *Ciezobka*'s systems according to the methods of *Ciezobka* for delivering pulses of fluid flow to multiple wells. Ex. 1041, ¶ 325. Application of *Ciezobka*'s teachings to third and fourth wells and associated third and fourth valves in a multi-well system using *McNeel*'s systems/methods for selectively delivering fluid to first-fourth wells would have involved performing the same function in the same manner with predictable results. Ex. 1041, ¶¶ 323-324.

Claims 2, 15, and 28 are therefore obvious over *Ciezobka* in view of *McNeel*. See also, Ex. 1041, ¶¶ 316-326; 342; 346-352.

4. Claims 3, 16, and 29

Claims 3(1,2), 16(14,15), and 29(27,28) recite “the first valve is closed” (or “close the first valve”) “after opening both the second valve and the fourth valve” (Limitations 3.1/16.1/29.1) “and/or” “the third valve is closed” (or “close the third valve”) “after opening both the second valve and the fourth valve” (Limitations 3.2/16.2/29.2).

As discussed, *Ciezobka* discloses that its well-swapping fracturing systems/methods of opening/closing valves to alternately fracture associated first and second wells may include “[s]imilar variations...utiliz[ing] multiple wells.”

Ciezobka, 3:29-4:2; 11:24-12:15; 28:22-23. *Ciezobka*'s disclosure of applying its methods to "multiple wells" includes application to third, fourth, or any number of wells. Ex. 1041, ¶ 158.

Further, *McNeel* explicitly discloses systems/methods that allow control of fracturing methods on first-fourth wells, or more. For example, in *McNeel*'s Figure 4, a "central manifold 107 can be connected to one or more additional manifolds 405" which "are operable to connect to multiple well locations," including first, second, third, and fourth wells. *McNeel*, ¶ [0024]. *McNeel* discloses using "a central control system" to open/close valves associated with each well to control fluid flow into the wells, as desired. *Id.*, ¶¶ [0024]-[0026], [0029].

Both *Ciezobka* and *McNeel* disclose varying the rate of fracturing fluid to multiple wells from "a single or multiple common manifolds" (*Ciezobka*, 3:16-18; *McNeel*, Fig. 4) by opening/closing valves to each well as the fracturing fluid is constantly pumped to the valves. *Ciezobka*, 11:25-12:15; *McNeel*, ¶¶ [0023], [0025]-[0026]. *McNeel* discloses that the valve sequencing is performed according to whenever "it is desired" to fracture the wells, either simultaneously or singly. *Id.*, ¶¶ [0021], [0025]-[0026]. *Ciezobka* discloses specific overlapping valve sequencing for improved fracturing of multiple wells that are arranged in a system analogous with the system disclosed by *McNeel*, where each well is connected to a fracturing system via multiple flowlines and valves operable to vary the flowrate into the well.

Ciezobka, 28:22-25; Figures 4, 6. Further, while *Ciezobka* discloses its example multi-well system with first/second wells/valves in Figure 6 may be connected to any pump/manifold system for providing a pressure flowrate to the wells, *McNeel* discloses specific manifold and control systems that are capable of selectively diverting fracturing fluid to multiple wells using a “central control system.” *Ciezobka*, 11:28-30, Fig. 4; *McNeel*, ¶¶ [0021], [0025]-[0026], [0029].

It would have been obvious to a POSITA to use *McNeel*'s manifold and control systems for connecting and controlling flow of fracturing fluid into first-fourth wells via associated valves in order to apply *Ciezobka*'s systems/methods on “multiple wells,” as doing so would be a simple combination of known elements (*Ciezobka*'s system/methods for variable rate fracturing of first/second wells) being combined in a known way (using *McNeel*'s central manifold/control systems to connect multiple of *Ciezobka*'s systems):

McNeel's disclosure:

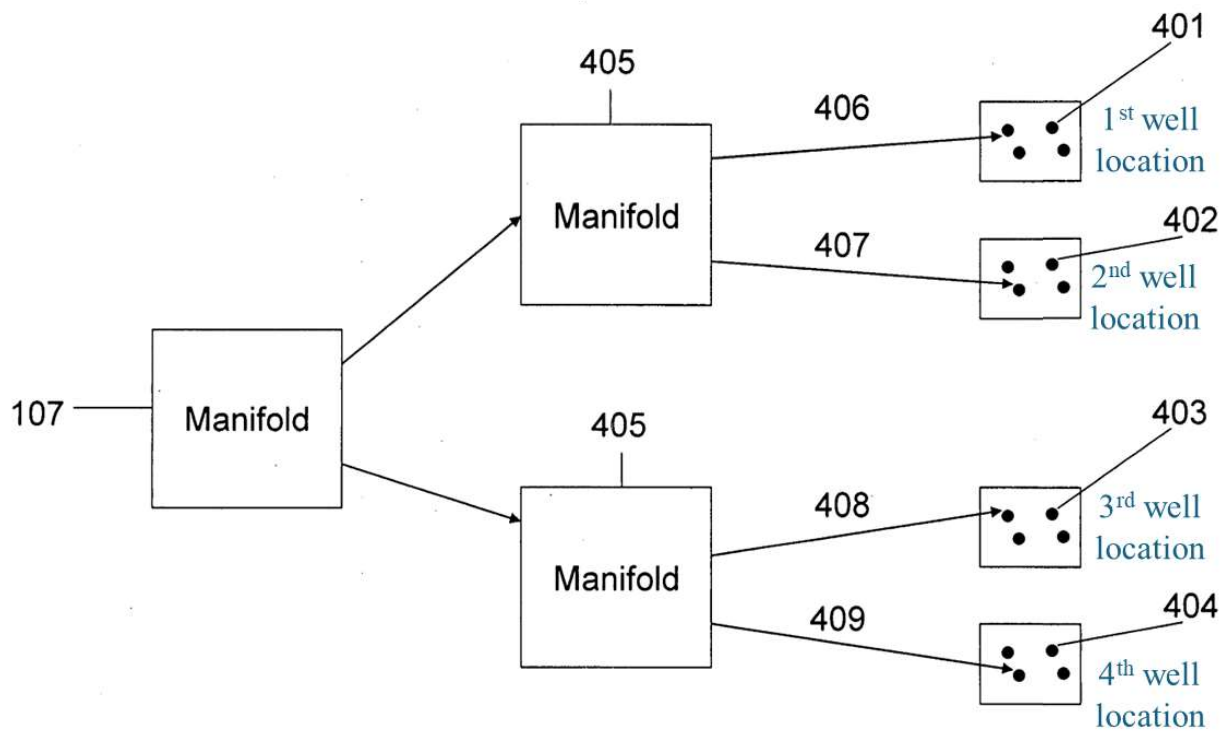
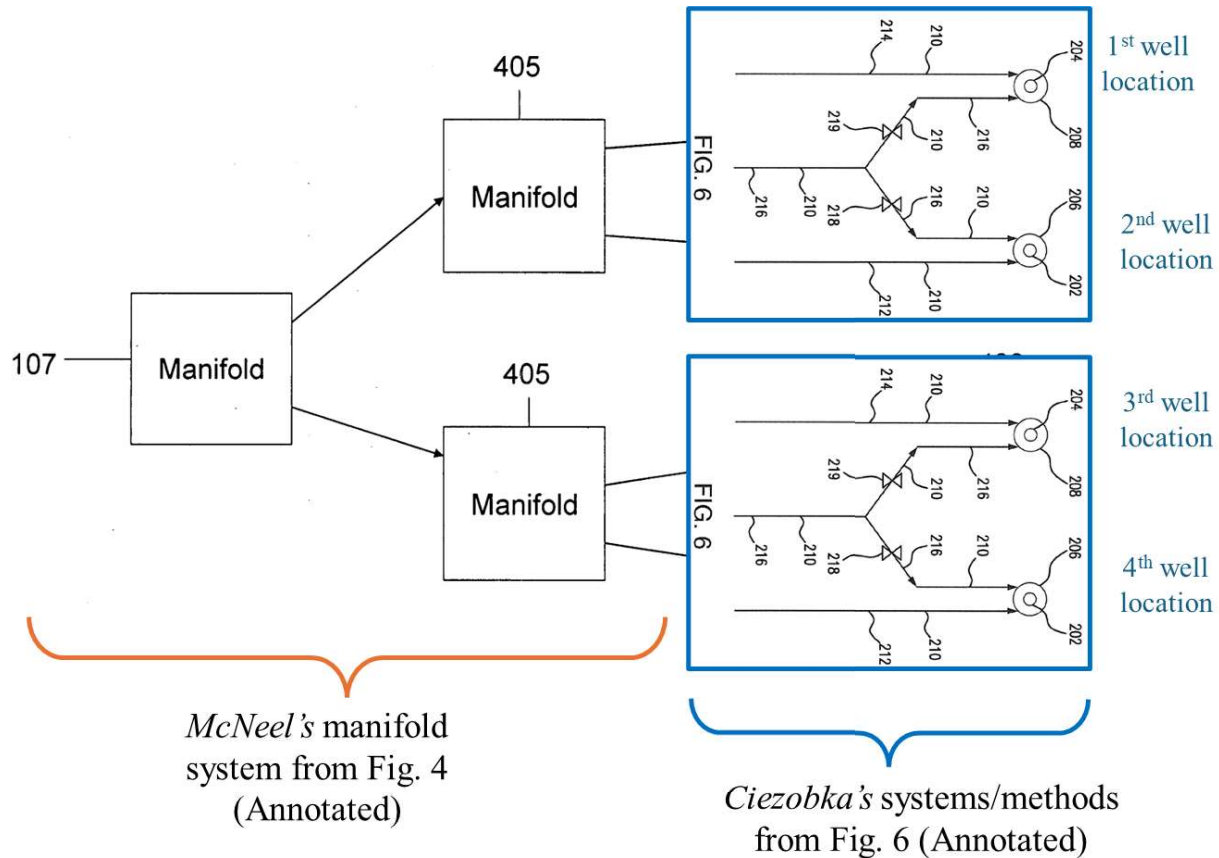


FIG. 4

(Annotated)

McNeel's and Ciezobka's disclosures combined:



Ex. 1041, ¶ 331.

Further, a POSITA would have understood that application of *Ciezobka's* variable rate fracturing methods for first/second wells using overlapping valve sequencing for associated first/second valves may obviously and equally be applied to third/fourth wells in the system using the overlapping valve sequencing for associated third/fourth valves to alternately deliver fracturing pulses to the wells. *Id.* Doing so would have included mere repetition of known processes in the same manner with the predictable results of increasing production from more wells. *Id.*

Furthermore, it would have been obvious to a POSITA to use *McNeel*'s manifolds and control system for application of *Ciezobka*'s variable rate fracturing methods for first/second and third/fourth wells, as *McNeel* specifically discloses manifold and control systems for delivering fracturing fluid at variable rates to first-fourth wells using overlapping valve sequencing. *Id.*, ¶ 344.

When running *Ciezobka*'s overlapping valve sequencing for first/second valves and third/fourth valves using *McNeel*'s manifold and control systems, a POSITA would have found it to be “nearly inevitable that, at some point in the ‘simultaneous’ fracturing operation...the first valve would be closed after the second valve is opened (as specifically disclosed by *Ciezobka*) and after the fourth valve is opened.” *Id.*, ¶ 331. Additionally, a POSITA would have found it obvious that when duplicating *Ciezobka*'s overlapping valve sequencing for the third/fourth valves using *McNeel*'s manifold and control systems, the third valve would be closed after opening both the second and fourth valves. *Id.*, ¶ 336.

Claims 3, 16, and 29 are therefore obvious over *Ciezobka* in view of *McNeel*. Ex. 1041, ¶¶ 327-337; 342; 353.

5. Claims 17-26, 30-38

Claims 17-26 and 30-38 each depend from either of Independent Claims 14 or 27, which are disclosed or rendered obvious by *Ciezobka* in view of *McNeel*, as discussed in Sections IX.C.1-2. The limitations in Claims 17-26 and 30-38 are

further disclosed, or at least rendered obvious by *Ciezobka* for the reasons described in Sections X.B.

Thus, Claims 17-26 and 30-38 are rendered obvious by *Ciezobka* in view of *McNeel* for the same reasons as provided above. Ex. 1041, ¶¶ 342; 353.

X. SECONDARY CONSIDERATIONS

There are none. *Id.*, ¶ 354.

XI. THE OFFICE HAS NOT PREVIOUSLY CONSIDERED THESE GROUNDS

The Office has not considered any ground in this Petition. Denial of institution under 35 U.S.C. § 325(d) is unwarranted.

XII. CONCLUSION

All Claims are unpatentable.

Dated: March 1, 2024

Respectfully submitted,

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CERTIFICATE OF COMPLIANCE

The undersigned hereby certifies that the foregoing Petition contains 9,600 words, excluding those portions identified in 37 C.F.R. § 42.24(a), as measured by the word-processing system used to prepare this Petition.

Dated: March 1, 2024

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(a), the undersigned hereby certifies that on March 1, 2024, a true and correct copy of the foregoing **Petition for *Inter Partes* Review of U.S. Patent No. 11,560,770** and copies of all supporting materials and exhibits was served by Federal Express on the following correspondence address of record as listed on USPTO's Patent Center (formerly PAIR):

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Pursuant to 37 C.F.R. § 42.105(a), the undersigned hereby certifies that on March 1, 2024, a true and correct copy of the foregoing **Petition for *Inter Partes* Review of U.S. Patent No. 11,560,770** and copies of all supporting exhibits was served by Federal Express on the Patent Owner at the following address known to the Petitioner as likely to effect service:

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