UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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WEATHERFORD U.S., L.P.
Petitioner

v.

HALLIBURTON ENERGY SERVICES, INC.,
Patent Owner

_____

Case No. IPR2024-00990
U.S. Patent 11,333,007

_____

PATENT OWNER'S REPLY TO PETITIONER'S OPPOSITION TO PATENT OWNER'S REVISED MOTION TO AMEND

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Patent Owner's Exhibits	
No.	**Exhibit Description**
2001	Deposition Transcript of Dr. Michael R. Chambers re: IPR2024-00990 (February 21, 2025)
2002	Declaration of Robert A. Durham
2003	Curriculum Vitae of Robert A. Durham
2004	Second Declaration of Dr. Robert Durham
2005	U.S. Provisional Application No. 62/688,813
2006	Bourgoyne, Adam T., Jr., Keith K. Millheim, Martin E. Chenevert, and F.S. Young, Jr., *Applied Drilling Engineering*, Society of Petroleum Engineers (1986).
2007	Staff of Royal Dutch / Shell Group of Companies, *The Petroleum Handbook*, (1983).
2008	Rahman, S. S. and G. V. Chilingarian, *Casing design-theory and practice* (1995).
2009	IEEE RP 1017, "IEEE Recommended Practice for Field Testing Electric Submersible Pump Cable" (2004).
2010	Conaway, Charles F, *The Petroleum Industry: A Nontechnical Guide. Pennwell Books* (1999).
2011	Braek, A. M., R. A. Almehaideb, and R. Hughes, A*pplication of Eos to Optimize the Design of an Early Production Scheme of an Onshore Oil Field in Abu Dhabi*, Abu Dhabi International Petroleum Exhibition and Conference (1998).
2012	Omitted
2013	Deposition Transcript of Michael R. Chambers re: IPR2024-00990 (July 2, 2025)

2014	Third Declaration of Dr. Robert A. Durham
2015	Deposition Transcript of Michael R. Chambers re: IPR2024-00990 (September 5, 2025)
2016	"Consolidated" & "Unconsolidated" Definition. Norman J. Hyne, *Dictionary of Petroleum, Exploration, Drilling, and Production* (1991).

I. INTRODUCTION

The Board should grant the Revised Motion to Amend ("RMTA"). Petitioner's Opposition ("Opp.") ignores express, elementary teachings in the prior art, misconstrues the claims, and contradicts Petitioner's earlier admissions.

II. THE RMTA IS PROPER, BUT THE OPPOSITION IS NOT

The Opp. argues many RMTA claims do not respond to a ground of unpatentability, claiming PO offered them "without expla[nation]." Opp., 1. But PO explained that these RMTA claims add elements not in the prior art raised in the original Opposition. Paper 21, p.3. For example, claimed combinations of eccentric screens (RMTA claims 28-29, 31, 38) are not in the *Yeh*, *Yeh2*, or *Bonner* references Petitioner relied on in all grounds, nor are additional claim elements (*e.g.*, relating to base pipe flow areas, packing tube flow areas, and packing tubes interconnected to junction blocks, in RMTA claims 26-27, 30, 33-34, 37, 39-40). *See Lectrosonics, v. Zaxcom,* IPR2018-01129, Paper 33, 46, 73 (P.T.A.B. Feb. 25, 2019) (finding "amended language" that overcomes "references at issue" "responsive to grounds of unpatentability"). This Reply further clarifies these RMTA claims respond to and are patentable over the prior art. *See infra* § III. The RMTA claims are proper.

The Opp., however, improperly incorporates by reference the Opposition to PO's original Motion to Amend. *See generally* Opp. (incorporating 20 pages); *see Intellectual Ventures Mgmt., LLC v. Xilinx, Inc.*, IPR2012-00023, Paper 35, 41

(PTAB Feb. 11, 2014). The Board should disregard the material improperly incorporated. *See also* 37 C.F.R. § 42.121(f)(3).

III. THE RMTA CLAIMS ARE NOT OBVIOUS

A. Claims 28-40: There is no motivation to combine *Bonner*'s eccentric screen with *Yeh*'s system

The Opp. to the RMTA relies on *Bonner* for Claims 28-40, which recite an upstream eccentric screen, and argues that *Bonner*'s allegedly "high-pressure eccentric sand screen" could be substituted upstream for *Yeh*'s high-pressure concentric screen. Opp., 1-2, 7-9, 10-11, 12, 21; EX2015, 48:5-9.

As an initial matter, substituting *Bonner*'s eccentric screen into *Yeh* fundamentally alters *Yeh*'s principle of operation and renders *Yeh* inoperable for its intended purpose. *Yeh's* invention is a "crossover joint for connecting eccentric flow paths to concentric flow paths." EX1005, Title; *see also id.*, 1:3-32, 4:12-21, 32:30-33. The Opp. argues that combining *Bonner* and *Yeh* achieves the benefit of "removal of Yeh's crossover tool," leaving only eccentric flow paths. Opp., 9, 11. In removing *Yeh*'s crossover joint and concentric flow paths, the combination removes *Yeh*'s invention and fundamentally alters *Yeh*'s principle of operation. Such a combination fails to establish obviousness. *See Plas-Pak Indus., Inc. v. Sulzer Mixpac AG*, 600 Fed. App'x 755, 759 (Fed. Cir. 2015); *Medtronic, Inc. v. Teleflex Innovations S.a.r.l.*, 69 F.4th 1341, 1350 (Fed. Cir. 2023) ("[D]estruction of [primary reference's] 'entire premise' 'counsel[ed] strongly against obviousness'").

Bonner also does not teach a "high-pressure" eccentric screen. EX2014, §VIII.A. *Bonner*'s eccentric screen is "functionally the same" as "existing industry-proven designs" and "very similar to currently available shunt systems on the market." EX1016, 2, 4. *Bonner* lists "multiple design changes" and "improvements" without mentioning improved shunt tube pressure rating. EX1016, 2-5; *see* EX2015, 36:8-37:22 (describing "real focus of [Bonner's] design" as "the connection" between assemblies). Petitioner initially introduced *Bonner* in this proceeding as a conventional 2x2 eccentric screen. Pet., 27-28, 37; EX1003, ¶¶154-55.

The Opp. now claims *Bonner*'s eccentric screen is "high-pressure"—and could be substituted for *Yeh*'s high-pressure concentric screen—because *Bonner* tested transport tube burst pressure to 5,000 psi, purportedly higher than 3,000-psi ratings in conventional eccentric screens. Opp., 8. As an initial matter, *Bonner*'s pressure tests established a 5,000-psi burst pressure (EX1016, 11-12), while *Yeh* requires at least 6,500 psi (EX1005, 28:18-20). To fill this 1,500-psi gap, the Opp. rehashes Petitioner's arguments against the original claims, claiming a POSITA could have thickened shunt tube walls to obtain higher pressure ratings. Opp., 10. Petitioner's arguments for thicker shunt tube walls are classic hindsight: neither *Yeh* nor *Yeh2* teaches thickening walls and both instead teach away from it. The transport tubes in *Yeh*'s 6x3 concentric screens had thinner walls than in 2x2 eccentric screens, and *Yeh2* achieves higher pressure ratings for 6x3 concentric screens by changing

design parameters other than tube wall thickness. EX2002, §XI.A; *see also* Paper 10, 17-21, 30-32. And *Bonner* is silent on shunt tube wall thickness. EX1016.

The Opp. also claims a POSITA would have modified tubing material to fill the 1,500-psi gap. Opp., 24. But neither *Yeh* nor *Bonner* teaches achieving pressure rating based on shunt tube material. EX1005; EX1016. And the *Jones* reference merely teaches making tubing of "pressure-resistant material," not changing material between upstream and downstream screens. EX1007, 4:11-13.

Moreover, the gap Petitioner must fill is far greater than 1,500 psi. *Bonner* explains that its "5000 psi burst pressure" should be reduced by a "1.33 safety factor" to obtain a "working burst pressure" that "allow[s] for variations" in tube manufacturing. EX1016, 12. *Bonner*'s pressure tests thus established a 5,000-psi "***burst pressure***." EX1016, 11-12. But *Yeh* requires a 6,500-psi "***working pressure***." EX1005; 28:18-20, 30:15-20; EX1015, 3 ("[W]orking pressure of the shunt system increases … to 6,500 psi"); EX2014, ¶¶57-60. Dividing 5,000 psi by a 1.33 safety factor yields 3,760-psi working pressure. EX2014, ¶¶58-59; EX2015, 42:2-7. *Yeh*'s concentric screens applied a safety factor around 1.5. EX1010, 24:62-25:6; EX1027, 4. Applying a 1.5 safety factor to *Bonner*'s 5,000-psi burst pressure yields 3,333-psi working pressure. EX2014, ¶62. Petitioner's expert admitted that including a "safety factor" between a "test pressure" and a "working pressure" was "Petroleum Engineering 101" (EX2015, 32:18-33:13), yet failed to consider *Bonner*'s clear

teaching on safety factor in his analysis (EX1052; EX2015, 43:17-20).

Bonner's working pressure of at most 3,333-3,760 psi is nowhere near the 6,500 psi *Yeh* requires. EX2014, ¶¶57-64. If Petitioner argues *Bonner*'s screen could pack some interval below 3,760 psi, this is no "substitute" for *Yeh*'s concentric screen. Opp., 7-9. It would require keeping *Yeh*'s concentric screen and crossover tool, contradicting the Opp.'s main reason for combining *Bonner* and *Yeh*. Opp., 9.

It is also unclear that *Bonner*'s screen could pack even that short interval. In *Hurst*, the "burst pressure limit" "of the shunt tubes" in 2x2 screens is "5,000 psi." EX1013, 2, 9. *Hurst*'s 2x2 screens are the same 2x2 screens the art unanimously limits to about 3,000-psi working pressure, or 3,000 feet. *E.g.*, EX1005, 30:15-20; EX1015, 1 ("[C]urrent eccentric 2x2 APT screens … may include [m]aximum shunt system working pressure of 3,000 psi which limits the packable length to ~3,200 ft"), 3. Thus, according to the art, *Bonner*'s 5,000-psi burst pressure rating confirms that ***Bonner's screen is a conventional eccentric screen***—rated to 3,000-psi working-pressure. *Yeh* uses this screen at the toe, not the heel. EX1005, 30:15-25.

And concentric screens had already achieved quicker install times, the Opp.'s second reason to combine *Yeh* and *Bonner*. EX1015, 4 (noting concentrics installed at "10 joints per hour" "improved rig sit efficiency" versus "five joints per hour" for "eccentric 2x2 design"); Opp., 9. In view of safety factor and concentric screens' improved installation times, there is no motivation to combine *Yeh* and *Bonner*.

Bonner does not teach a "high-pressure" screen[1] able to replace *Yeh*'s 6,500-psi screen. The Opposition to Claims 28-40 fails "Petroleum Engineering 101."

B. The prior art does not teach Claim 24

The Opp. argues *Hurst* motivates varying packing tube nozzle size and spacing. Opp., 2. *Hurst* actually states "friction and thus the pressure applied to each zone can be controlled through … nozzle diameter and frequency," i.e., that nozzle size and spacing affect friction pressure. EX1013, 3-4. But *Hurst* does not teach ***to vary*** nozzle size or spacing along or across packing tubes. EX2014, ¶¶65-66, 70.

The Opp. then claims declining flow would motivate varying nozzle size and spacing (Opp., 2), but *Yeh2* solves that problem with closed-ended tubes (EX1006, 4, Fig. 6, 13; EX2002, ¶65). The Opp. also ignores that increasing nozzle size or decreasing spacing would negatively impact other performance metrics by increasing friction pressure and leakoff from the gravel slurry. EX1013, 2; EX1006, 2-3 ("[L]arge portholes allow excessive fluid leakoff…"); EX2014, ¶¶67-73.

In fact, *Yeh2* expressly teaches to use the same nozzle spacing and size. EX1006, 4 (using uniform "6 ft porthole spacing"), Figs. 6a-6b, 9. So does *Hurst*.

[1] Even were *Bonner*'s eccentric screen "high-pressure" (it is not), *Bonner* does not teach thicker transport tube walls upstream, as in claim 28. EX1016; EX2015, 37:17-22 (agreeing "*Bonner* does not mention changing shunt tube wall thickness").

EX1013, 2-3, Table 1. Moreover, had *Yeh2* varied nozzle size or spacing throughout the interval, the friction pressure drop (i.e., the slope of the "pressure profile") would change over the gravel pack length. EX2014, ¶70. It does not. EX1006, Fig. 15.

For Claim 24, the Opp. manufactures a motivation for changing nozzle size and spacing that *Hurst* does not teach, discounts *Yeh2*'s use of closed-ended tubes, and fails to address *Yeh2*'s and *Hurst*'s use of equally spaced and sized nozzles.

C. Claims 27, 33, 40: The prior art does not teach an upstream packing tube interconnected to a downstream junction block

RMTA claims 27, 33, and 40 recite an upstream "packing tube" "interconnected" to a downstream "junction block." Petitioner first argues (for claim 27) that Yeh's "crossover tool" interconnects an upstream, *concentric* packing tube to a downstream, eccentric junction block. Opp., 7. But *Yeh*'s crossover tool does not even have a packing tube or junction block. EX2014, ¶¶74-77. The "**wall 1010**" (in blue) in *Yeh*'s crossover tool shows no gravel packed in the crossover tool, as "**secondary flow path 1020**" (in red) is not exposed to the formation:

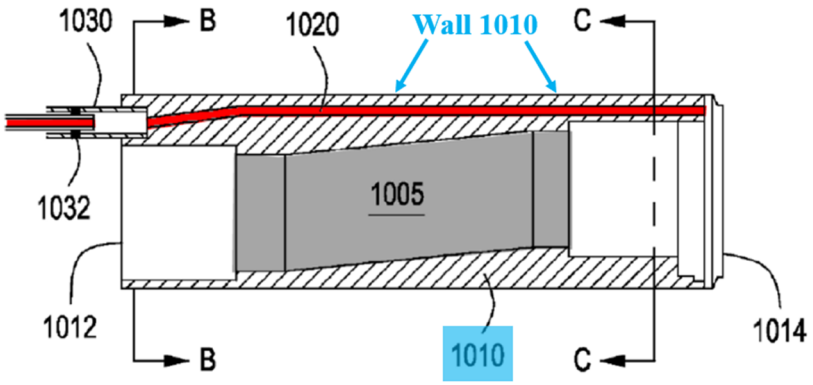
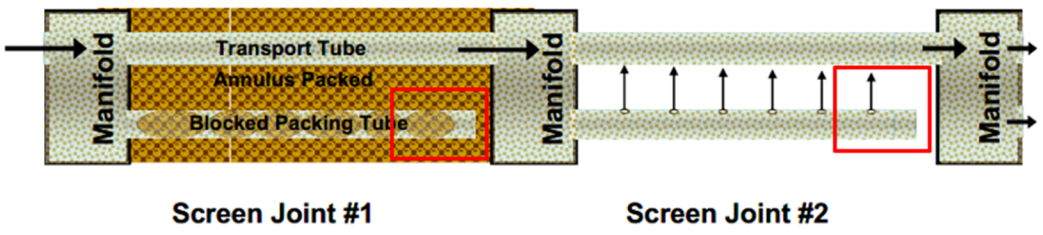


FIG. 10A

EX1005, Fig. 10A (annotated), 25:44-55; EX2014, ¶¶74-77.

And the Petition admitted *Yeh*'s crossover tool connected transport tubes, not packing tubes, stating that the crossover's "[s]econdary flow path 1020 would fluidly connect ***the transport tubes of the concentric screen and the manifold of the downstream eccentric screen*** …." Pet., p.55; *see id.*, 39-40; EX1003, ¶¶287, 289. The Board should see through Petitioner's attempts to change its position.

Petitioner also argues (for claims 33, 40) that *Bonner*'s "box crossover" interconnects an upstream, *eccentric* packing tube to a downstream, eccentric junction block. Opp., 17, 25. The Opp. misconstrues the amended claims. In the '007 Patent, packing tubes are "interconnected using jump tubes" that "establish fluid communication" to the downstream junction block. EX1001, 10:61-67; *see also id.*, 7:13-29. Accordingly, it is not enough for the art to teach any "continuous" path between any part of a packing tube and a downstream junction block (as Petitioner states, Opp., 25). It is clear from the '007 Patent that interconnection establishes fluid flow from the packing tube to the downstream junction block. EX2014, ¶¶82-83. *Yeh2* and *Bonner* teach just the opposite. In *Yeh2*'s screens, packing tubes **"do not connect"** (in red below) to the downstream manifold (i.e., junction block):



EX1006, Fig. 6b (annotated); EX2014, ¶¶78-81; EX2015, 12:19-22 (agreeing that *Yeh2* "shows closed-ended packing tubes that do not connect to the downstream manifold"). *Bonner* similarly illustrates a packing tube **"not connected"** (in red below) to the "pin crossover" that would establish fluid communication:

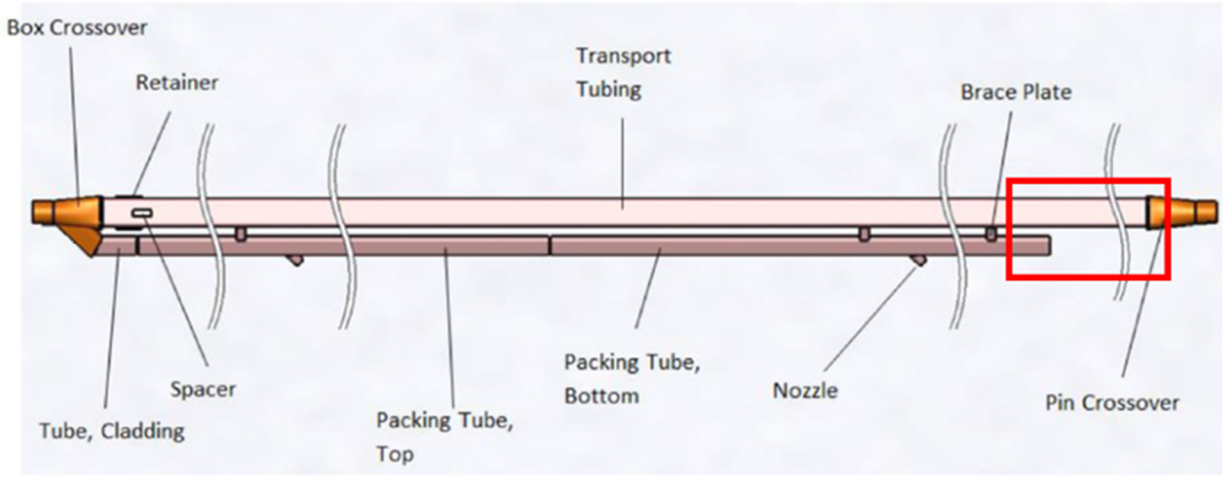


Figure 8—Shunt system tubing weldment with its components

EX1016, Fig. 8 (annotated); EX2014, ¶¶84-88; EX2015, 14:7-14 (agreeing that in *Bonner* Figure 8, "the downstream end of the packing tube is not connected to the downstream junction").

D. Claim 36: Petitioner misconstrues "volume of fluid"

Claim 36 recites that "the low pressure shunt tube system is disposed to allow a larger volume of fluid to flow therethrough than the high pressure shunt tube system …." Paper 21, Claim 36. The Opp. argues Claim 36 violates the law of conservation of mass because the claimed "volume" includes volume in transport tubes. Opp., 19-20. Petitioner simply misconstrues Claim 36. The '007 Patent

describes a "larger volume of fluid" flow only once, and this "volume" is determined by "cross-sectional flow areas, location and number ***of nozzles***." EX1001, 9:36-41. The claimed "volume of fluid" is thus the volume of fluid through packing tube nozzles. Claim 36 is enabled under this construction, as the '007 Patent teaches numerous nozzle configurations for achieving the claimed features. EX1001, 3:23-38, 7:67-8:6, 8:25-9:2, 16:13-28; EX2014, ¶¶89-93. As the broad construction Petitioner proposes is clearly untenable (a POSITA would have known conservation of mass could not be violated), the Board should adopt this narrower construction. *See Athletic Alternatives, Inc. v. Prince Mfg., Inc.*, 73 F.3d 1573, 1581 (Fed. Cir. 1996). Moreover, Petitioner's expert admits the art had not achieved a larger volume of fluid flow through the downstream nozzles than through the upstream nozzles. EX2015, 17:16-18:5. Claim 36, properly construed, is patentable.

E. Claims 26, 37: Petitioner admits eccentric screens had larger base pipes and smaller outer diameters than concentric screens

Claims 26 and 37 both recite an upstream screen and downstream screen having the same outer diameters and base pipes with a same cross sectional flow area. Claim 26 requires a *concentric* upstream screen, and Claim 37 requires an *eccentric* upstream screen. Paper 21, Claims 26, 37; EX1001, Claim 1.

For the same outer diameter limitation, the Opp. identifies one example of a "7.76-in OD" concentric screen and a "7.65-in OD" eccentric screen (EX1027, 3), and equates these diameters based on manufacturing tolerances (Opp., 5). This

example compares concentric 6x3 screens and eccentric 2x2 screens. EX1027, Figs. 1-2; EX2015, 29:22-30:11. For Claim 26's "base pipe" limitation, the Opp. again relies on this single example, with a concentric 6x3 screen and eccentric 2x2 screen each using 5.5" base pipe. Opp., 5-6 (citing EX1027). Concentric 6x3 screens actually had thinner transport tube walls than 2x2 eccentric screens, and therefore do not teach Claim 26, which depends from Claim 1 requiring thicker transport tube walls upstream. EX2002, ¶¶105-06; EX1001, Claim 1; *see also* Paper 10, 17-19. Figures 1-2 of the *Barry* reference confirm that 2x2 eccentric screens had thicker transport tube walls (red boxes) and 6x3 concentric screens had thinner transport tube walls (blue boxes):

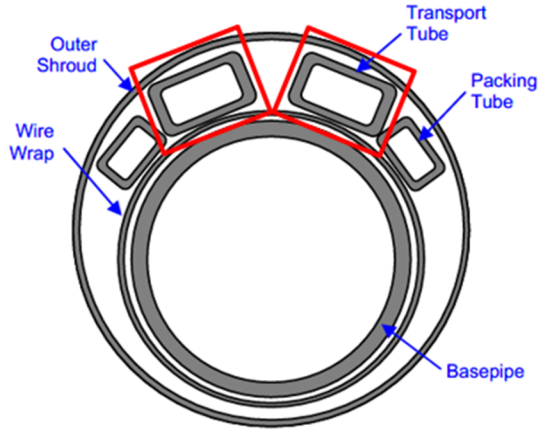


Fig. 1. Alternate Path "Two-by-Two" Screen Cross-Section

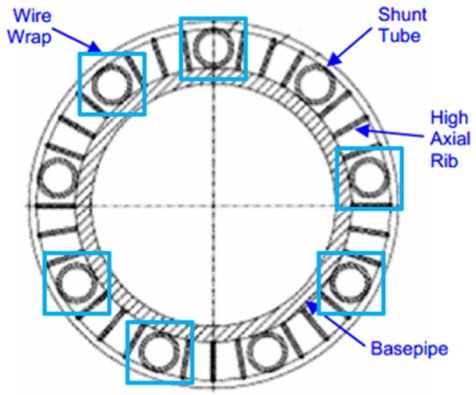


Fig. 2. Internal Shunt Alternate Path Screen Cross-Section

EX1027, Figs. 1-2 (annotated); EX2015, 31:1-7 (Petitioner's expert admitting that transport-tube walls in Figure 1 above are "shown as thicker" than transport-tube walls in Figure 2 above).

In addition, the Opp. addresses the claimed "outer diameter" and "base pipe" "cross-sectional flow area" in isolation, without explaining how concentric screens would obtain *both* the same outer diameter and same base pipe diameter as eccentric screens. Opp., 5-6. Concentric screens could not achieve both these features together: Petitioner has admitted that eccentric screens permitted larger base pipes, larger shunt tubes, and smaller outer diameters than concentric screens. Paper 17, 9 (stating "eccentric screens provide for a larger primary flow path," i.e., base pipe); EX1003, ¶128; EX1044, ¶45 ("[T]he eccentric orientation … allow[ed] for larger shunt tubes … while still providing for a larger base pipe for the primary flow path."); EX2013, 57:15-19, 58:6-11, 65:5-14.

For claim 37, Petitioner merely cites back to its arguments for Claim 26. Paper 26, 20-21. But as Claim 26 requires a *concentric* upstream screen, it is irrelevant to Claim 37 requiring an *eccentric* upstream screen.[2] *See* Paper 21, Claim 37. And as discussed in Section III.A above, *Bonner*'s conventional eccentric screen could not be substituted for *Yeh*'s high-pressure concentric screen.



Date: September 12, 2025 Chad C. Walters (Reg. No. 48,022)
Counsel for Patent Owner

[2] And Petitioner cannot properly incorporate Dr. Chambers' analysis into the Opp., where it is wholly absent. *See* 37 C.F.R. §42.6(a)(3).

CERTIFICATE OF SERVICE

In accordance with 37 C.F.R. § 42.6(e), the undersigned certifies that on the 12th day of September, 2025, a complete and entire copy of PATENT OWNER'S REPLY TO PETITIONER'S OPPOSITION TO PATENT OWNER'S REVISED MOTION TO AMEND and supporting exhibits therein were served on Petitioner via electronic mail at the following addresses:

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