

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

PACKERS PLUS ENERGY SERVICES INC.,
Petitioner,

v.

BAKER HUGHES OILFIELD OPERATIONS, LLC,
Patent Owner.

Case IPR2016-01099
Patent 6,006,838

Before MITCHELL G. WEATHERLY, BEVERLY M. BUNTING, and
ROBERT L. KINDER, *Administrative Patent Judges*.

BUNTING, *Administrative Patent Judge*.

FINAL WRITTEN DECISION

35 U.S.C. § 318(A); 37 C.F.R. § 42.73

I. INTRODUCTION

Packers Plus Energy Services Inc., (“Petitioner”), filed a Petition pursuant to 35 U.S.C. §§ 311–319 requesting *inter partes* review of claims 1–29 (the “challenged claims”) of U.S. Patent No. 6,006,838

(Ex. 1001, “the ’838 patent”). Paper 2 (“Pet.”). Patent Owner, Baker Hughes Oilfield Operations, LLC. (“Patent Owner”), did not file a Preliminary Response to the Petition. Applying the standard set forth in 35 U.S.C. § 314(a), we instituted an *inter partes* review of all challenged claims. Paper 10 (“Dec.”).

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 14, “PO Resp.”), and Petitioner filed a Reply to the Patent Owner Response (Paper 17, “Pet. Reply”). An oral hearing was held on August 10, 2017, and a copy of the transcript has been made part of the record. Paper 27 (“Tr.”). We denied Patent Owner’s request (Ex. 3001) for authorization to file a motion to dismiss for lack of jurisdiction under 37 C.F.R. § 42.20(b). Paper 29.

This Final Written Decision is entered pursuant to 35 U.S.C. § 318(a) as to the patentability of the claims for which we instituted trial. For the reasons that follow, we conclude that Petitioner has not demonstrated, by a preponderance of the evidence, that claims 1–29 of the ’838 patent are unpatentable.

II. BACKGROUND

A. Real Party in Interest

Petitioner names Packers Plus Energy Services Inc. as the real party in interest. Pet. 3. Patent Owner asserts that “[t]he real parties-in-interest in this proceeding are Baker Hughes Oilfield Operations, LLC; Baker Hughes, a GE Company, LLC; and Baker Hughes, a GE Company.” Paper 28, 1.

B. Related Proceedings

The parties indicate that the '838 patent has been asserted in: *Baker Hughes Oilfield Operations, Inc. v. Packers Plus Energy Services Inc.*, Case No. 4:16-cv-00019, (S.D. Tex.). Pet. 3; Paper 5, 1.

C. The '838 Patent (Ex. 1001)

The '838 patent issued December 28, 1999, from U.S. Patent Application No. 09/169,910 filed on October 12, 1998. Ex. 1001, (45), (21), (22).

The '838 patent is directed to an assembly for selectively stimulating multiple production zones of an open hole wellbore in oil or gas wells in a single trip.¹ Ex. 1001, Abst., 1:6–10. As depicted in Figure 1, the assembly 1 includes a plurality of modules 5, 10, 15, and 20 attached to tailpipe 4, and tailpipe 4 is suspended from service packer 3, which is inside casing 6. *Id.* at 3:1–6. The modules are spaced in the tailpipe string, so that an individual module is adjacent to the producing zone to be stimulated. *Id.* at 3:12–15. Figure 2, reproduced below, is illustrative of the module.

¹ Petitioner's expert, Mr. Medley, testifies that a "trip" involves moving or repositioning the stimulation tool from one producing zone to another within the well bore. Ex. 1003 ¶ 27.

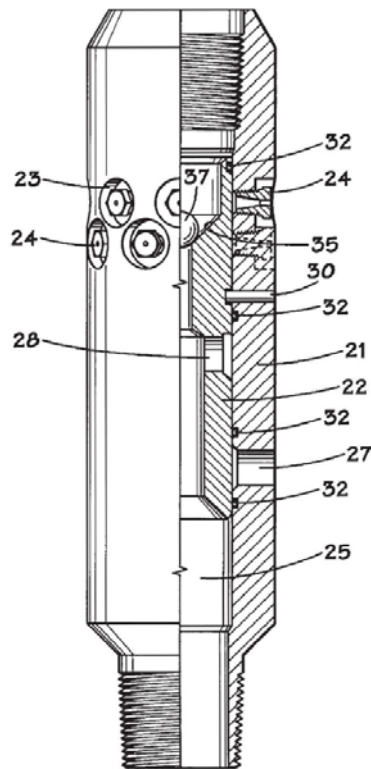


FIG. 2

Figure 2 is a partial cutaway view of the module.

The module includes tubular housing 21 having threaded upper and lower ends, and central passageway 25 extending longitudinally there through. *Id.* at 3:26–30. Shifting sleeve 22 is disposed in the module for longitudinal movement along the inner wall of housing 21, and includes radially extending ports 28 spaced circumferentially about the shifting sleeve. *Id.* at 3:30–34. Housing 21 also includes one or more radially extending ports 27 spaced circumferentially about housing 21, such that housing ports 27 correspond to shifting sleeve ports 28. *Id.* at 3:32–38. Shifting sleeve 22 includes ball seat 35, the size of which differs between modules, “with the lowermost module 20 having the smallest ball seat and the uppermost module 5 having the largest ball seat.” *Id.* at 3:40–42 (referring to Fig. 1). Housing 21 further includes a plurality of nozzle

holes 23 extending radially through the wall of housing 21, and that receive jet nozzles 24. *Id.* at 3:43–45.

In operation, ball 37 is dropped down into the assembly and is captured by seat 35 in the lowermost module. *Id.* at 4:31–33. The pressure in the assembly increases “until the force acting across the actuating ball and ball seat exceeds the shear value for sheer screw 30,” sheer screw 30 is sheared, and the shifting sleeve travels in a downward direction to the treating position. *Id.* at 4:35–38. In the open or treating position, jet nozzles 24 are in communication with central passageway 25 and acid is pumped through jet nozzles 24 to acidize and erode the adjacent portion of the wellbore. *Id.* at 4:39–47.

D. Illustrative Claim

Challenged claims 1, 8, 16, and 21 are independent. Claims 1 and 8 are directed to a method for selectively stimulating a plurality of producing zones in an oil and gas well, and claims 16 and 21 are directed to a method of stimulating a plurality of target zones within an oil and gas well in a single trip. Ex. 1001, 6:49–50, 7:21–22, 7:56–58, and 8:28–29. Claim 1, reproduced below, is illustrative of the challenged claims:

1. An assembly for selectively stimulating a plurality of producing zones in an oil and gas well comprising:
 - a tailpipe string;
 - a plurality of modules spaced in the tailpipe string at predetermined locations, wherein each module comprises a housing having a central passageway therethrough,
 - a plurality of jetting passageways extending radially through each housing, and
 - a shifting sleeve slidably mounted within each housing,

wherein the shifting sleeve is moveable from a closed position over the jetting passageways to an open position whereby the jetting passageways are in communication with the central passageway of each housing, and wherein the shifting sleeve includes a ball seat for receiving an actuating ball for shifting the shifting sleeve from the closed position to the open position.

Id. at 6:48–65.

E. Prior Art of Record

Petitioner relies on the following prior art references and the Admitted Prior Art (“APA”) (Pet. 6–7):

Reference	Reference	Date	Exhibit
Hutchison	U.S. 4,099,563	July 11, 1978	1005
Surjaatmadja	U.S. 5,765,642	June 16, 1998	1006
Baker	U.S. 3,054,415	Sept. 28, 1962	1007
Coon	R. Coon et al., <i>Single-Trip Completion Concept Replaces Multiple Packers and Sliding Sleeves in Selective Multi-Zone Production and Stimulation Operations</i> , SPE (Society of Petroleum Engineers) 29539 (1995).	1995	1008
Gazda	U.S. 4,043,392	Aug. 23, 1977	1009

Additionally, Petitioner relies on the Declaration of George H. Medley, P.E. (Ex. 1003), and Patent Owner relies on the Declaration of Blake R. Cox (Ex. 2001). The parties rely on other exhibits as discussed below.

F. Instituted Grounds

As explained in Section I. above, we instituted the instant trial based on the following asserted grounds of unpatentability (Dec. 17):

References	Basis	Claim(s) Challenged
Hutchison, Surjaatmadja	§ 103 ²	1–6, 8–14, 16, 19, 20–23, 27–29
Hutchison, Surjaatmadja, Coon	§ 103	15, 17, 18, 24, 25
Hutchison, Surjaatmadja, Coon, APA	§ 103	26
Hutchison, Surjaatmadja, Gazda	§ 103	13
Hutchison, Surjaatmadja, Baker	§ 103	7

III. ANALYSIS

Petitioner, in this proceeding, bears the burden of persuasion to prove unpatentability of the challenged claims, and that burden never shifts to Patent Owner. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015); *see also* 35 U.S.C. § 316(e) (“[T]he petitioner shall have the burden of proving a proposition of unpatentability by a preponderance of the evidence.”). To prevail, Petitioner must establish the facts supporting its challenge by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). Below, we explain why Petitioner has not met its burden with respect to the challenged claims.

² Because the claims at issue have a filing date prior to March 16, 2013, the effective date of the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) (“AIA”), we apply the pre-AIA version of 35 U.S.C. § 103 in this Decision.

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are given their broadest reasonable interpretation in light of the specification of the patent in which they appear. See 37 C.F.R. § 42.100(b); *In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1278 (Fed. Cir. 2015) (“We conclude that Congress implicitly approved the broadest reasonable interpretation standard in enacting the AIA”), *aff’d*, *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131 (2016); Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012). Under the broadest reasonable interpretation standard, and absent any special definitions, claims terms generally are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech. Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definitions for claim terms or phrases must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). In the absence of such a definition, limitations are not to be read from the specification into the claims. See *In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993).

Petitioner proposed a construction for the claim terms “nozzle body,” “sub,” and “actuating means.” Pet. 7–9. Further, Petitioner asserts that the “actuating means” limitation recited in claims 8–10, 13, and 21–23 is to be construed as a means-plus-function limitation in accordance with 35 U.S.C. § 112, ¶ 6, and proposes a construction for this term: “ball, dart, bar, or plug.” Pet. 9. In support thereof, Petitioner points to corresponding structure disclosed in the ’838 patent for performing the function of displacing the shiftable sleeve from a closed to an open position, namely

“balls, darts, bars, plugs or similar devices.” *Id.* (citing Ex. 1001, 2:27–29). In turn, Patent Owner proposed a construction for the terms “tailpipe string,” “over the jetting passageway,” “nozzle body,” and “flow port.” PO Resp. 18–26.

In view of the evidence of record developed during trial, we discern no reason to deviate, for purposes of this Final Written Decision, from our determination that the corresponding function is properly identified within the Specification of the ’838 patent, as well as sufficient structure for performing the identified function. Dec. 7.

As to the other challenged claim terms, we determine that only express construction of the term “over the jetting passageway” is necessary for purposes of this decision. *See Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (“only those terms need be construed that are in controversy, and only to the extent necessary to resolve the controversy”).

“over the jetting passageway”

Independent claim 1 recites, in relevant part, that the shifting sleeve “is moveable from a closed position over the jetting passageways to an open position whereby the jetting passageways are in communication with the central passageway of each housing.” Ex. 1001, 6:59–63. Independent claims 8 and 16 are similar. *Id.* at 7:28–32, 8:2–7. Claim 21 differs in that it recites that “the jetting passageways are sealed from the central passageways by the shiftable sleeve in the closed position.” *Id.* at 8:40–43.

Patent Owner argues that the broadest reasonable interpretation of the claim term “over the jetting passageways” is “covering the jetting passageways.” PO Resp. 20 (citing Ex. 2001 ¶ 50). Patent Owner

recognizes “a physical relationship between the sleeve and jet passageways.” *Id.* Relying on the testimony of Mr. Cox, Patent Owner asserts that “a POSITA would understand the plain meaning of ‘over the jetting passageways’ to mean that the sleeve covers the inner ends of the jetting passageways—i.e., is located between inner ends of the jetting passageways and the central passageway.” *Id.* at 21 (citing Ex. 2001 ¶51). To support this position, Patent Owner relies on annotated Figure 2 of the ’838 patent, reproduced below, and quotes passages from the Specification that purportedly demonstrate how

the [red] shiftable sleeve 22 is “adapted for longitudinal movement along the inner wall of housing 21” (Ex. 1001 at 3:30–32) and “in the closed position . . . **straddles** jet holes 23.” *Id.* at 3:56– 59 (emphasis added). Likewise, shifting sleeve 46 of a second embodiment (Figure 4) “is adapted for longitudinal movement along the inner wall of housing 51” (*id.* at 5:51–52) and begins in a “closed position **straddling** nozzle ports 58.” *Id.* at 5:56–59 (emphasis added). Ex. 2001 at ¶¶52–53.

Id.

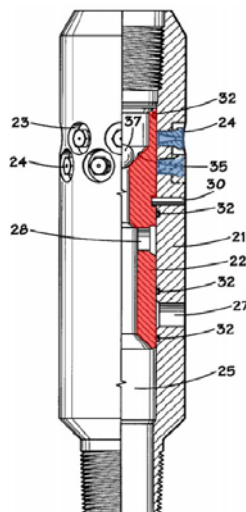


FIG. 2

Figure 2 of the ’838 patent is annotated by Patent Owner to illustrate movement of shiftable sleeve 22 with respect to housing 21 and jet holes 23.

Additionally, Patent Owner relies on an extrinsic, general purpose dictionary definition of “over,” namely—“to cover, conceal, or affect the whole surface or expanse.” *Id.* at 21–22 (citing Ex. 2008, 3–4).

Petitioner disputes the necessity of construing the term “over the jetting passageways,” arguing that the claim language is clear. Pet. Reply 5–6. Petitioner contends that the illustrated embodiments from the Specification of the ’838 patent showing the shiftable sleeve “straddling” jet holes 23 is not “an express disclaimer and requirement that the claim language ‘over the jetting passageways’ must mean physically covering the jetting passageways.” *Id.* at 6. In Petitioner’s view, “[t]he precise physical relationship between the shiftable sleeve’s open and closed position is already included in the claims: the shiftable sleeve’s closed position over the jetting passageways *blocks communication with the central passageway of the housing*, whereas the open positions *allows such communication*.” *Id.* (emphasis added).

In construing the claims, our analysis begins with, and remains centered on, the language of the claims themselves. *See Interactive Gift Express, Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1331 (Fed. Cir. 2001). “The claims, of course, do not stand alone.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005) (en banc). “Rather, they are part of a fully integrated written instrument, consisting principally of a specification that concludes with the claims.” *Id.* (internal quotation marks and citation omitted). “For that reason, claims must be read in view of the specification, of which they are a part.” *Id.* (internal quotations marks and citation omitted). Indeed, apart from the claims, the Specification is “the single best guide to the meaning of a disputed term.” *Id.* At the same time, there is a

presumption that a claim term carries its ordinary and customary meaning. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002). To overcome this presumption, the patentee must “clearly set forth” and “clearly redefine” a claim term away from its ordinary meaning. *Bell Atlantic Network Servs., Inc. v. Covad Commc’ns Grp., Inc.*, 262 F.3d 1258, 1268 (Fed. Cir. 2001). The disavowal must be “unmistakable” and “unambiguous.” *Dealertrack, Inc. v. Huber*, 674 F.3d 1315, 1322 (Fed. Cir. 2012).

Here, the entire claim phrase requires

a shifting sleeve slidably mounted within each housing, wherein the shifting sleeve is moveable from a closed position over the jetting passageways to an open position whereby the jetting passageways are in communication with the central passageway of each housing, and wherein the shifting sleeve includes a ball seat for receiving an actuating ball for shifting the shifting sleeve from the closed position to the open position.

Ex. 1001, 6:58–65. We view the first wherein clause, “wherein the shifting sleeve is moveable from a closed position over the jetting passageways to an open position” as defining the physical position of the sliding sleeve with respect to the jetting passageways in the “closed” position. Similarly, we view the whereby clause, “whereby the jetting passageways are in communication with the central passageway of each housing” as clarifying that the jetting passageways are in communication with the central passageway in the “open” position. Taking these two phrases together, the claim language informs us that in the closed position, the position of the shifting sleeve precludes communication between the jetting passageways and central passageway.

The Specification confirms our understanding, in describing how “shifting sleeve 22 is initially attached to housing 21 in the closed position by one or more shear screws 30 so that the shifting sleeve *straddles* jet holes 23, jet nozzles 24 and fluid flow ports 27.” Ex. 1001, 3:56–59 (emphasis added). The Specification also explains how dropping a ball onto seat 35 of shifting sleeve 22 increases pressure within the assembly, causing shearing of shear screw 30, resulting in downward movement of shifting sleeve 22 to the open or treating position, with jet nozzles 24 in communication with central passageway 25. *Id.* at 4:31–41.

We also consider Patent Owner’s Exhibit 2008, which reveals multiple definitions of the word “over.” See Ex. 2008. As noted by our reviewing court, the fact that a term “has multiple dictionary meanings does not mean that all of these meanings are reasonable interpretations in light of [the] specification.” *PPC Broadband, Inc. v. Corning Optical Commc’ns RF, LLC*, 815 F.3d 747, 752 (Fed. Circ. 2016). For example, we observe that additional definitions of “over” are “from one point to another across an intervening space,” another is “so as to pass down or forward and down,” and still another is “above.” Ex. 2008, 3. Nonetheless, we conclude Patent Owner is relying on the ordinary and customary meaning of “over.”

Next, we consider whether Patent Owner’s proposed definition of “over” is reasonable in light of the Specification of the ’038 patent. As acknowledged by the parties, the Specification uses the term “straddle” to describe the physical relationship between the shifting sleeve and jetting passageways, i.e., jet holes 23, jet nozzles 24 and fluid ports 27 in the closed position. According to a general purpose dictionary, straddle means “to stand, sit, or be astride of;” or “to belong in part to (each of several

categories).” Ex. 3001 (MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/straddle> (last visited November 28, 2017)).³ Based on the definition of “straddle,” Patent Owner’s proposed construction of “over” as “cover” is reasonable, and supported by the Specification.

In consideration of the foregoing, we construe the term “over the jetting passageways,” broadly, but reasonably, to mean “covering the jetting passageways.”

B. Principles of Law

A claim is unpatentable under § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966).

C. Level of Ordinary Skill in the Art

In determining the level of ordinary skill in the art, various factors may be considered, including the “type of problems encountered in the art;

³ “Astride” means “with one leg on each side.” Ex. 3002 (MERRIAM-WEBSTER, <https://www.merriam-webster.com/dictionary/astride> (last visited November 28, 2017)).

prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field.” *In re GPAC, Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (citation omitted). In that regard, Petitioner’s expert, Mr. George H. Medley, testifies

a person of ordinary skill in the art in this field (“POSITA”) at the relevant time frame would have had a combination of experience and education in the oil and gas industry. This typically would consist of a minimum of a bachelor of science in civil, mechanical, electrical, or petroleum engineering and three to five years of professional experience in hydrocarbon recovery.

Ex. 1003 ¶ 15.

Patent Owner’s expert, Mr. Cox, disagrees with Mr. Medley’s assessment of a person of ordinary skill in the art. Ex. 2001 ¶¶ 39–42. Specifically, Mr. Cox argues that Mr. Medley’s view of the pertinent art as the “oil and gas industry” “is too broad” (*id.* ¶ 41–42) and that “hands-on technical experience” could be equivalent to a Bachelor of Science degree in engineering (*id.* ¶42). Instead, Mr. Cox opines

a person of ordinary skill in the art would have had a combination of technical education and experience that would have given such a person a first-hand understanding of the types of tools, particularly jetting tools, used in the drilling, completion, stimulation, and remediation of wellbores to extract oil and gas.

Ex. 2001 ¶ 34. Mr. Cox further opines that

[s]uch a person with a bachelor of science degree in mechanical engineering or petroleum engineering, would have had 3–5 years of technical experience in the drilling, completion, stimulation, and remediation of well bores to extract oil and gas. Without a technical degree, such a person would have had 6–8 years of technical experience concerning the application of devices and methods directly associated with the drilling, completion, stimulation, and remediation of wellbores to extract oil and gas.

Id. ¶35.

Based on the evidence before us, we do not observe meaningful differences between the parties' overall assessments of a person with ordinary skill in the art. The parties' disagreement centers on whether narrow work experience may be equivalent to a technical degree and more general work experience. We recognize, however, that specialized work experiences or skills may be equivalent to more general education or training. Nonetheless, this purported difference does not impact our analysis. Thus, for purposes of this decision, we determine that the POSITA would have either (1) a bachelor of science in civil, mechanical, electrical or petroleum engineering and three to five years of experience in hydrocarbon recovery; or (2) 6–8 years of technical experience concerning the application of devices and methods directly associated with the drilling, completion, stimulation, and remediation of wellbores to extract oil and gas.

We also find that the prior art references themselves represent the level of ordinary skill in the art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the level of ordinary skill in the art may be evidenced by the references themselves); *GPAC*, 57 F.3d at 1579 (finding that the Board did not err in concluding that the level of ordinary skill in the art was best determined by the references of record).

D. Obviousness based on Hutchison and Surjaatmadja

Petitioner asserts that claims 1–6, 8–14, 16, 19, 20–23, and 27–29 of the '838 patent are unpatentable under 35 U.S.C. § 103 as obvious based on Hutchison and Surjaatmadja. Pet. 21–59. In support thereof, Petitioner identifies the disclosures in Hutchison and Surjaatmadja alleged to describe

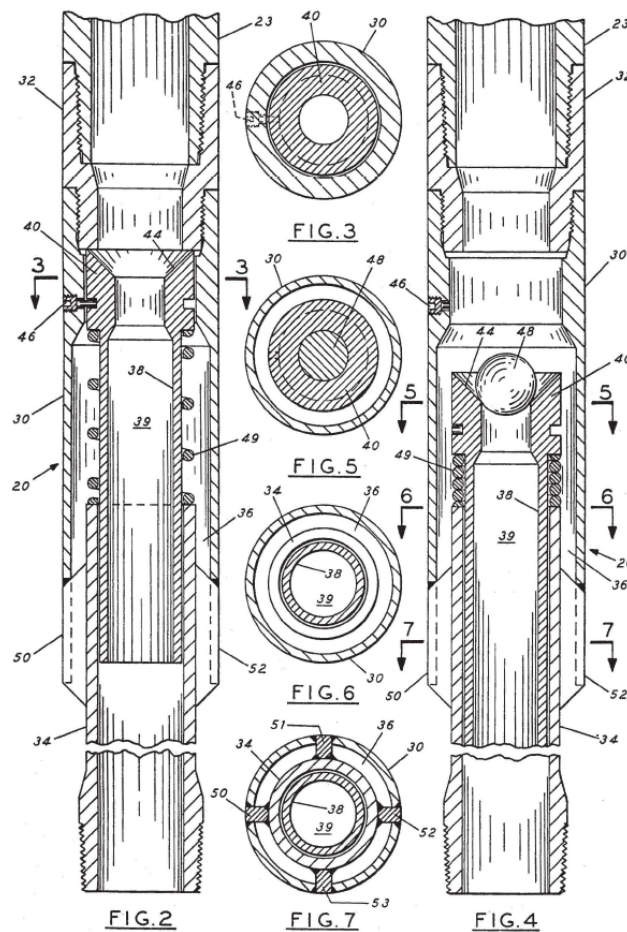
the subject matter in the challenged claims and reasons to combine the teachings of Hutchison and Surjaatmadja. *Id.* Additionally, Petitioner cites the Declaration of Mr. George H. Medley in support of the analysis advocated in the Petition. Ex. 1003.

Relying on Mr. Cox's Declaration (Ex. 2001), Patent Owner disagrees, arguing that the combination of Hutchison and Surjaatmadja fails to disclose certain claim limitations, and that Petitioner has not shown that one with ordinary skill in the art would have combined Hutchison and Surjaatmadja. PO Resp. 31–62.

We have reviewed the parties' contentions and supporting evidence. For the reasons given below, we conclude that Petitioner has not demonstrated by a preponderance of the evidence that challenged claims 1–6, 8–14, 16, 19, 20–23, and 27–29 of the '838 patent are obvious based on Hutchison and Surjaatmadja. We begin with an overview of Hutchison and Surjaatmadja, followed by a discussion of the parties' contentions in turn.

1. Overview of Hutchison (Ex. 1005)

Hutchison is directed to a steam injection system connectable to a tubing string located in a well that selectively passes steam through the tubing string or diverts steam from the interior of the tubing string into the well liner-tubing annulus. Ex. 1005, 1:15–23. The flow of steam is controlled by steam deflector 20, shown in Figures 2–7 reproduced below.



Figures 2–7 are sectional views of steam deflector 20.

Steam deflector 20 includes inner tubular section 34 disposed within outer tubular skirt 30, and annular chamber 36 is formed between outer tubular skirt 30 and inner tubular section 34, and is concentric with and parallel to the longitudinal axis of tubing string 19. *Id.* at 3:64–4:7. Sliding sleeve section 38 has a central opening 39 through its length, and is “slidably engaged inside the inner tubular section for coaxial travel between an up position (FIG. 2) and a down position (FIG. 4) in the inner tubular section 34.” *Id.* at 4:13–15. Ball seat 44 is formed in collar portion 40 of the sliding sleeve section and is positioned adjacent to the central opening. *Id.* at 4:28–30. The sliding sleeve is retained in the up or closed position by

shear pin 46, as depicted in Figure 2, such that annular chamber 36 is blocked to flow from the inside of the tubular skirt section. *Id.* at 4:30–34. Ball 48 is engaged within ball seat 44, and the corresponding rise in steam pressure

causes shear pin 46 to shear and disconnect the sliding sleeve section from the skirt section and depresses the sleeve section to the down position (FIG. 4) to open the annular chamber 36 to flow from the skirt section whereby steam is directed out of the annular chamber into the tubing-well liner annulus in a direction substantially concentric with and parallel to the longitudinal axis of the tubing string.

Id. at 4:52–59.

2. Overview of Surjaatmadja (Ex. 1006)

Surjaatmadja discloses a method of fracturing a subterranean formation using hydrajetting tool assembly 10. Ex. 1006, 3:5–6. The assembly includes, tubular hydrajetting tool 14 having axial fluid flow passageway 18 extending therethrough and communicating with lateral ports 20 disposed in the side of the tool. Within each port is fluid jet forming nozzle 22. *Id.* at 3:11–16.

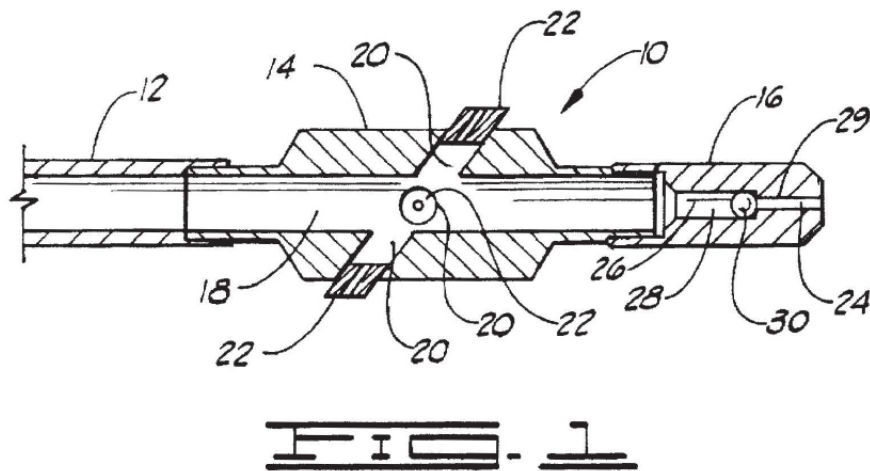


Figure 1 is a side elevational view of the hydrajetting tool assembly.

3. Discussion

a. Claims 1, 8, 16, and 21

Petitioner relies on the proposed combination of Hutchison and Surjaatmadja to describe each of the limitations recited in challenged claims 1, 8, 16, and 21. Pet. 21–59. Patent Owner challenges the sufficiency of Petitioner’s proofs with respect to the limitations that we discuss *infra*. PO Resp. 8–12. We note, however, that most of the claim elements of claims 1, 8, 16, and 21 are undisputed. As to the undisputed limitations, we find that, based on the evidence cited in the Petition, Petitioner presents sufficient evidence to support a finding that those limitations are disclosed by Hutchison, arranged as recited in the claims. *See In re Nuvasive, Inc.*, 842 F.3d 1376, 1383 (Fed. Cir. 2016) (Although the Board did not make findings as to whether any of the other claim limitations . . . are disclosed in the prior art, it did not have to: NuVasive did not present arguments about those limitations to the Board.).

Independent claims 1, 8, 16, and 21 each require the claim elements of a tailpipe string, a plurality of modules having a housing and spaced in the tailpipe string, a plurality of jetting passageways extending radially through the housing, and a shifting sleeve that is actuated by a ball to move the sleeve from a closed position “over the jetting passageways” to an open position with the jetting passageways in communication with a center passageway of each housing. Ex. 1001, 6:49–65, 7:21–35, 7:56–8:15, 8:29–59. Because the issues in dispute are essentially the same, we address the independent claims together.

Petitioner asserts that Hutchison teaches most of the limitations of claims 1, 8, 16, and 21, and relies on Surjaatmadja for the missing

limitations. Pet. 21. To demonstrate which teachings in Hutchison and Surjaatmadja satisfy the limitations of the claims, Petitioner also includes a claim chart identifying quotations from the cited reference that allegedly corresponds with the particular claim element. *Id.* at 21–38, 43–44, 55–56. For example, Petitioner contends that like the '838 patent, Hutchison involves the injection of a fluid into a well bore to improve hydrocarbon recovery from a well. *Id.* at 21 (citing Ex. 1005, 1:14–31). Specifically, that Hutchison describes “a ball and seat approach in which balls of increasingly larger diameter would be inserted into the string to engage seats of corresponding size in order to selectively stimulate one zone at a time, starting from the bottommost and moving upwards towards the surface.” *Id.* (citing Ex. 1005, 4:67–5:5). Further, Petitioner directs our attention to the disclosure in Hutchison regarding a slidable sleeve “that moves from a closed to open position in response to an actuating ball being received by a ball seat.” *Id.* (citing Ex. 1005, 4:49–59).

As to the closed position, Mr. Medley annotated Figure 2 of Hutchison, reproduced below, to demonstrate how shear pin 46 and the urging force of spring 49 retain ball seat 44 against a lower portion of the collar to form a seal, contain steam pressure within central opening 39 of sliding sleeve 38, and prevent steam from entering the annular chamber. *Id.* at 23 (citing 1003 ¶ 40; Ex. 1005, 4:30–35, 4:8–15).

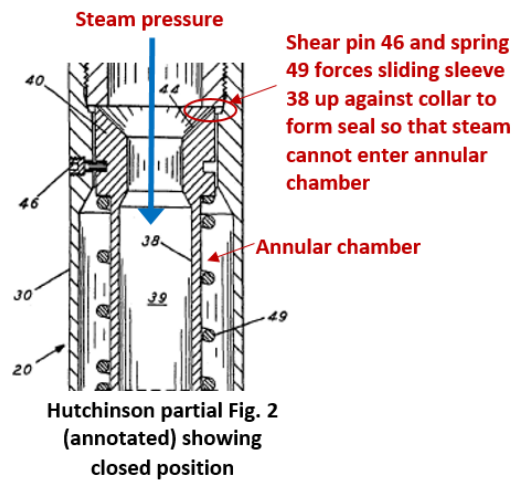


Figure 2 of Hutchison is annotated by Petitioner to illustrate seal between sliding sleeve and collar.

Petitioner further relies on Mr. Medley’s testimony regarding movement of the sliding sleeve in a downwardly direction to an open position, permitting the flow of steam into annular chamber 36 and out into the well bore. *Id.* at 24–26 (citing Ex. 1003 ¶¶ 41–42; Ex. 1005, 4:49–51, 4:28–59). Noting that Hutchison describes the release of steam into the well bore via a concentric annulus instead of jet nozzles as required by the claims, Petitioner turns to Surjaatmadja. *Id.* at 21 (citing Ex. 1005, 1:47–68). Namely, the disclosure in Surjaatmadja regarding the use of jet nozzles to spray acid into the well bore. *Id.* (citing Ex. 4:20–28); *see also id.* at 26–27 (citing Ex. 1006, 1:50–65, 3:3–52, 4:28–32, 32–41, Abstract; Ex. 1003 ¶¶ 43–44). Petitioner further relies on the testimony of Mr. George Medley, who opines that one of skill in the art would recognize that Surjaatmadja’s jet nozzles could be used in place of Hutchison’s steam injection. *Id.* at 21–22 (citing Ex. 1003 ¶ 38). Specifically, that one of skill in the art “would have been motivated to use Hutchison’s multi-zone stimulation system in an open-hole well by making the minor modification of closing the openings in Hutchison’s steam deflectors and instead using nozzles in a radial pattern as

mentioned by Hutchison and as explicitly taught by Surjaatmadja.” *Id.* at 29–30 (citing Ex. 1003 ¶ 48).

Petitioner enumerates various reasons why one of skill in the art would have been motivated to modify Hutchison’s annular chamber using the jetting passageways and nozzles of Surjaatmadja. *Id.* at 27–30. For example, because both Hutchison and Surjaatmadja relate generally to the oil and gas industry, and in particular, to equipment used to recover hydrocarbons from subterranean formations. *Id.* at 27 (citing Ex. 1005, 1:30–45; Ex. 1006, 1:6–35; Ex. 1003 ¶ 45). According to Petitioner, the fluid passageways of Hutchison and Surjaatmadja are utilized for a similar purpose, that is, the application of “one of several well-known stimulation techniques in which a subterranean formation is exposed to a fluid (steam in Hutchison, acid in Surjaatmadja) in order to improve hydrocarbon extraction from the formation.” *Id.* at 28 (citing Ex. 1005, 1:30–59; Ex. 1006, 1:47–63; Ex. 1003 ¶ 46). Again relying on the testimony of Mr. Medley, Petitioner asserts that one of skill in the art “would have been motivated by market forces and design incentives to implement the predicable variation of replacing Hutchison’s annular steam chamber with Surjaatmadja’s nozzles.” *Id.* (citing Ex. 1003 ¶ 47).

Noting problems associated with horizontal well drilling during the relevant time frame (*Id.* at 28–29 (citing Ex. 1003 ¶ 47; Ex. 1013, 2–3)), Petitioner further supports its rationale for the proposed combination of Hutchison and Surjaatmadja by arguing that Hutchison’s use of progressively larger combinations of a ball, seat, and sliding sleeve (1) allows for the treatment of all zones of interest in the well in one trip (*id.* at 29 (citing Ex. 1003 ¶ 48)); and (2) “avoids having to trip in a string,

wireline or other device to individually actuate the sliding sleeves” (*id.* (citing Ex. 1003 ¶ 48)). Petitioner maintains that one of skill in the art reading Hutchison would

agree with Hutchison’s observation that existing jet nozzle systems were not ideal for steam treatments of a lined wellbore due to potential damage to the liner. But the POSITA would also realize that, in an open-hole completion, the action created by a jet on the wellbore is exactly the desired result.

Id. (citing Ex. 1003 ¶ 48 (internal citations omitted)).

Patent Owner first argues that the Petition is defective because it fails to address the first *Graham* factor, i.e., the level of skill in the art. PO Resp. 27–30. We note, however, that Petitioner’s expert does testify as to the level of skill in the art, as discussed above in Section III.C. Given that we consider all four *Graham* factors together in an obviousness analysis, the Petition’s omission in this regard is accorded the appropriate weight in our obviousness analysis.

Next, Patent Owner argues that one of skill in the art would not have combined Hutchison with Surjaatmadja because the proposed modification would not include (1) a tailpipe string, or (2) a shiftable sleeve having a closed position over the jetting passageways. *Id.* at 33. According to Patent Owner, the proposed modification appears to be limited to open hole wellbores and one of skill in the art would not add Surjaatmadja’s nozzles to Hutchison multi-zone stimulation system for use in an open hole. *Id.* at 33–37. Patent Owner supports this position by arguing that Hutchison “states that jetting is undesirable in cased holes” (*id.* at 34 (citing Ex. 1005, 1:34–40)) and that Mr. Medley acknowledged during cross-examination that he “would just use [the modified tool with Surjaatmadja’s nozzles] in the **open hole**” (*Id.* (citing Ex. 2003, 106:11–20)). According to Patent Owner,

Petitioner's proposed modification retains Hutchison's cup-packers 22–25, and cup-type packers are not effective to seal in open wellbores and could damage the wellbore wall during insertion and removal of the tool string from an open hole segment of a wellbore. *Id.* at 34–37 (citing Ex. 2001 ¶¶ 65–66; Ex. 2003, 54:17–25; Ex. 2006, 5:2–5; Ex. 1001, 2:51–58; Ex. 2007, 4:7–8).

Petitioner counters that Patent Owner's argument concerning the placement of a cup-packer in an open wellbore is unavailing because it is premised “on an overly restrictive physical combination of Hutchison and Surjaatmadja.” Pet. Reply 11. We are not persuaded by Patent Owner's argument because obviousness does not require that all of the features of the secondary reference be bodily incorporated into the primary reference. *Keller*, 642 F.2d 413, 425. As Petitioner points out, the claims do not require the use of a packer, rather a plurality of modules for stimulating the wellbore. Moreover, Petitioner proposes modifying Hutchison's annular chamber using the jetting passageways and nozzles of Surjaatmadja, and does not rely on use of a packer. Pet. Reply 12.

Next, Patent Owner argues that in addition to Hutchison considering jetting a drawback, the proposed modification of Hutchison using Surjaatmadja's jet nozzles would render it unsuitable for its intended purpose. PO Resp. 37–38. That purpose, according to Patent Owner, is

to selectively . . . divert[] the steam . . . out into the well liner-tubing annulus in **a direction concentric with and substantially parallel to** the longitudinal axis of the tubing string . . . and **at a velocity which does not substantially exceed the velocity of the steam formerly flowing inside of the deflector** to prevent damage to the well liner and packer cup means packing off the tubing-liner annulus.

Id. at 37 (citing Ex. 1005, 1:47–60). Petitioner’s proposed modification, in Patent Owner’s view, would (1) preclude the even distribution of steam “along the length of isolated zones in a wellbore” (*id.* at 39 (citing Ex. 2001 ¶ 68)); (2) “its cup-type packers would be unable to isolate zones in an open hole wellbore” (*id.* (citing Ex. 2001 ¶65)); and (3) “in a cased wellbore, the modified system would disproportionately deliver steam to the localized positions of the jetting nozzles and not evenly heat heavy oils in the manner contemplated (and rejected) by Hutchison” (*id.* (citing Ex. 1005, 1:31–37, 1:47–60; Ex. 2001 ¶ 68)).

Patent Owner’s argument is not persuasive because it does not address specifically Petitioner’s proposed modification. Namely, the use of Hutchison’s device, as modified by the teachings of Surjaatmadja regarding jetting nozzles, in an open-hole application without a slotted liner that could be damaged by jetting nozzles. *Id.* at 13–14.

Patent Owner also argues that the proposed combination of Hutchison and Surjaatmadja does not include a tailpipe string. PO Resp. 40–41. Relying on its definition of tailpipe string as “the tubulars and completion components run in a well below a production packer or liner hanger packer,” Patent Owner disputes that a person of ordinary skill in the art would consider tubing string 19 of Hutchison to be a tailpipe string. *Id.* at 40. Patent Owner, however, does not present sufficient arguments or credible evidence demonstrating why one of skill in the art would not consider tubing string 19 of Hutchison to be a tailpipe string. More persuasive is the cross-examination testimony of Patent Owner’s expert Mr. Cox “that it was well known prior to the ’838 patent to run tubulars and completion components

below a production packer or liner hanger packer. Pet. Reply 16 (citing Ex. 1016, 17:5–19:1, 48:9–49:24, 60:23–62:2, 65:6–22, 116:16–117:4).

Next, Patent Owner argues that that the proposed Hutchison-Surjaatmadja combination does not “include a shiftable sleeve having a closed position over the jetting passageways.” PO Resp. 42–43 (emphasis omitted). Patent Owner understands Petitioner’s proposed modification as

closing the [blue] openings at the bottom of each of Hutchison’s steam deflectors, and substituting Surjaatmadja’s [red] jetting passageways and [green] nozzles for Hutchison’s “annular chamber.” Petition at 27–28. The [yellow] annular chamber 36 is defined by the inner tubular section 34 and the inner diameter of the skirt section 30. See Ex. 1005 at 3:67–4:5 (“The inner tubular section 34 of substantially smaller outer diameter than the inner diameter of the skirt section 30 is arranged with its upper portion extending coaxially interiorly of the lower portion of the skirt section 30 to form an annular chamber 36 **between the skirt section 30 and the inner tubular section 34.**”

Id. at 31. Patent Owner’s expert, Mr. Cox, modified Figure 2 based on this understanding, as reproduced below.

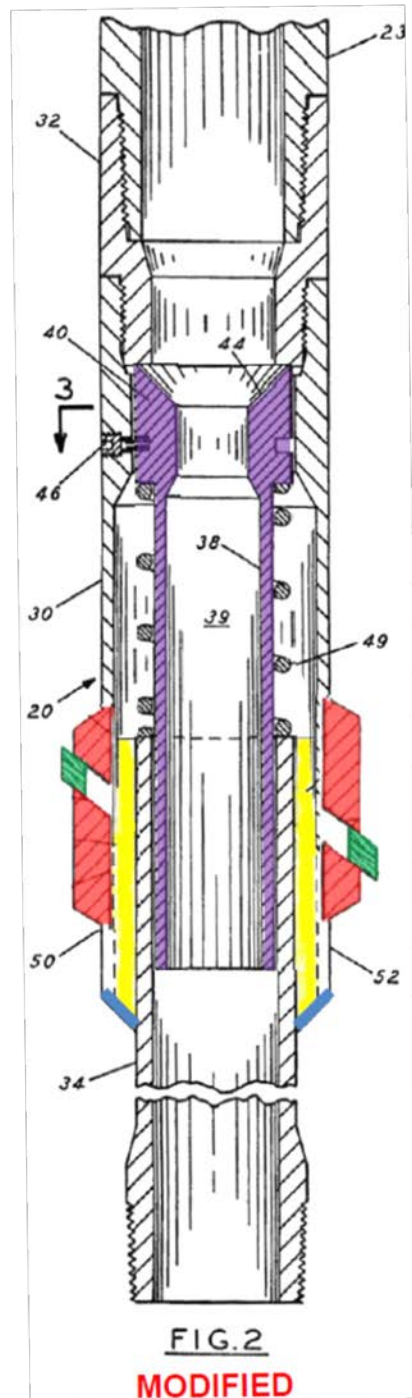


Figure 2 of Hutchison is modified by Patent Owner to show Petitioner's proposed modification.
Id. at 42. Indeed Mr. Cox confirmed during cross-examination that he modified Figure 2 of Hutchison to show Surjaatmadja's jetting nozzles

based on his “‘interpretation’ of Petitioner’s arguments.” Pet. Reply 10 (citing Ex. 1016, 71:10–73:2).

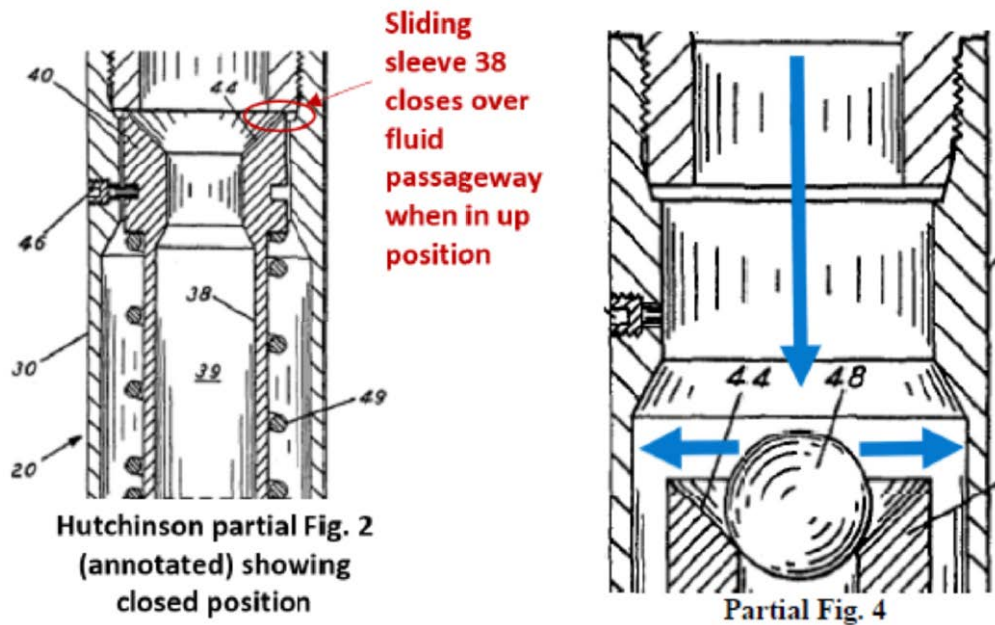
Patent Owner explains that

[i]n the closed position of Hutchison’s [purple] sleeve 38, the upper collar portion 40 closes off the annular chamber from the central passageway 39. See Ex. 1001 at 4:16–27. But this is not “over” the jetting passageways in which Surjaatmadja’s [green] nozzles are disposed. As shown, the [white] inner tubular section 34 *and* [yellow] annular chamber (open space) are *both* between the [purple] sliding sleeve and the passageways in which the [green] nozzles are disposed.

Id. at 42. According to Patent Owner, one of skill in the art would understand Hutchison’s sliding sleeve to be blocking an upper end of the annular chamber and not “‘over the jetting passageways,’ or even ‘closed’ with respect to the jetting passageways, because the passageways are open to Hutchison’s [yellow] annular chamber. *Id.*; see also Ex. 1001 at 6:58–60 (‘**closed** position over the jetting passageways’ (emphasis added)), 7:29–30 (same), 8:4–5 (same).” *Id.* at 43.

Petitioner characterizes Patent Owner’s interpretation of its proposed modification of Hutchison using Surjaatmadja’s nozzles as “misplaced.” Pet. Reply 10. According to Petitioner, Surjaatmadja’s jetting nozzles could be located “at any desired location or desired radial pattern—in Hutchison’s multi-zone stimulation tool.” *Id.* at 11. Based on its interpretation of “over the jetting passageways” which we declined to adopt, Petitioner first argues that the claims require “that the shiftable sleeve’s closed position ‘over the jetting passageways’ *blocks communication with the central passageway* when closed, which is disclosed by Hutchison’s sliding sleeve 38 when in the up position before shifting downward to the open position.” *Id.* at 17 (citing Ex. 1005, 4:10–15, 6:9–17, Figs. 2, 4) (emphasis added).

Additionally, Petitioner challenges Patent Owner's incorporation of Surjaatmadja's jetting nozzles at the lower portion of Hutchison's shiftable sleeve, asserting that one of skill in the art would have placed the jetting nozzles "in any reasonable location in Hutchison's housing." *Id.* To support its argument, Petitioner annotated Figures 2 and 4 of Hutchison, reproduced below.



Figures 2 and 4 of Hutchison as annotated by Petitioner.

Id. at 18. These annotated figures illustrate positioning of Surjaatmadja's jetting nozzles within Hutchison's housing "at the exact location where the shiftable sleeve 38 closes the fluid passageway." *Id.* Petitioner maintains that "the Petition grounds still demonstrate obviousness of the '838 patent claims" even under Patent Owner's proposed construction. *Id.*

As discussed above in Section III.A., we construe the claim term "over the jetting passageways" as "covering the jetting passageways." We recognize that although the claims require that the plurality of jetting

passageways “extend[] radially through each housing,” the claims do not specify the location of the jetting passageways with respect to the housing.

Petitioner confirms that it did not identify in the Petition the location of the jetting nozzles with respect to the housing. *See* Pet. Reply 10 (“Patent Owner’s ‘modified’ drawing of Hutchison’s [F]igure 2 . . . appears nowhere in the Petition and such a physical substitution is never argued by Petitioner or Mr. Medley.”). Based on the description of the proposed combination in the Petition, Patent Owner reasonably located the jetting nozzles in the lower portion of the housing. *See* Pet. 29–30 (“Thus, a POSITA would have been motivated to use Hutchison’s multi-zone stimulation system in an open-hole well by making the minor modification of closing the openings in Hutchison’s steam deflectors and instead using nozzles in a radial pattern as mentioned by Hutchison and as explicitly taught by Surjaatmadja.”) Having considered the evidence of record, Patent Owner presents persuasive arguments and credible evidence to support a finding that, when positioned in the lower portion of the housing, the shiftable sleeve does not cover “the jetting passageways in which Surjaatmadja’s [green] nozzles are disposed.” PO Resp. 42. We are persuaded by Patent Owner’s explanation that “the [white] inner tubular section 34 *and* [yellow] annular chamber (open space) are *both* between the [purple] sliding sleeve and the passageways in which the [green] nozzles are disposed.” *Id.* We are also persuaded by Patent Owner’s contention that one of skill in the art would not understand the sliding sleeve to be “‘over the jetting passageways’ or even ‘closed’ with respect to the jetting passageways, because the passageways are open to Hutchison’s [yellow] annular chamber.” *Id.* at 43 (citing Ex. 2001 ¶ 71). As discussed above in Section III. A., we are not persuaded by Petitioner’s

arguments and evidence that “the claims require only that the shiftable sleeve’s closed position ‘over the jetting passageways’ blocks communication with the central passageway when closed, which is disclosed by Hutchison’s sliding sleeve 38 when in the up position before shifting downward to the open position.” Pet. Reply 17 (citing Ex. 1005, 4:10–15, 6:9–17, Figs. 2, 4).

In light of the arguments and evidence cited above, we find that Patent Owner presents sufficient arguments and credible evidence demonstrating that the proposed modification of Hutchison’s housing by incorporating Surjaatmadja’s jetting nozzles does not satisfy the “over the jetting passageways” limitation of claims 1, 8, 16, and 21.

We also consider the alternative location for the jetting passageways offered by Petitioner in rebuttal to Patent Owner’s arguments. Pet. Reply 17–18. Specifically, Petitioner argues that “one entirely reasonable and obvious place to incorporate Surjaatmadja’s jetting nozzle’s into Hutchison’s housing would have been at the exact location where the shiftable sleeve 38 closes the fluid passageway, thereby physically covering the jetting passageways when closed.” *Id.* at 18. Petitioner’s unsupported attorney argument in this regard is not convincing. Petitioner does not provide sufficient explanation or offer credible evidence to support its contention that a person of skill in the art would consider it “reasonable and obvious” to place Surjaatmadja’s jetting nozzles at the same location that sliding sleeve 38 forms a seal with the fluid passageway.

For these reasons, Petitioner fails to persuade us that its proposed modification of Hutchison using the jetting nozzles of Surjaatmadja meets

the claim limitation of “a shiftable sleeve having a closed position over the jetting passageways” as required by claims 1, 8, 16, and 21.

b. Dependent Claims 2–6, 9–14, 19, 20, 22, 23, and 27–29

Each of dependent claims 2–6, 9–14, 19, 20, 22, 23, and 27–29 depend directly or indirectly from claims 1, 8, 16, and 21 respectively, and recite additional limitations. Petitioner’s arguments and evidence regarding claims 2–6, 9–14, 19, 20, 22, 23, and 27–29, however, do not remedy the deficiencies discussed above with respect to claims 1, 8, 16, and 21.

4. Summary

In view of the foregoing, we conclude that Petitioner has not established by a preponderance of the evidence that claims 1–6, 8–14, 16, 19, 20–23, and 27–29 of the ’838 patent are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Hutchison and Surjaatmadja.

E. Grounds Based Partially on Hutchison and Surjaatmadja

Petitioner also challenged the patentability of claims 7, 13, 15, 17, 18, and 24–26, which depend from independent claims 1, 8, 16, and 21, as obvious under 35 U.S.C. § 103, based in part on the proposed combination of Hutchison and Surjaatmadja. Specifically, Petitioner challenges:

- (1) claims 15, 17, 18, 24, and 25 based on Hutchison, Surjaatmadja, and Coon (Pet. 59–65)⁴;

⁴ In the Decision on Institution, we observed that Petitioner included independent claim 16 in the heading for this section, *e.g.*, “Hutchison, Surjaatmadja, and Coon render claims 15–18” obvious” but did not otherwise discuss claim 16 with respect to Ground 2. Pet. 59. We, therefore, instituted this ground based on Hutchison, Surjaatmadja, and Coon for claims 15, 17, 18, 24, and 25. Dec. 16.

- (2) claim 26 based on Hutchison, Surjaatmadja, Coon, and the APA (*id.* at 65);
- (3) claim 13 based on Hutchison, Surjaatmadja, and Gazda (*id.* at 65–70); and
- (4) claim 7 based on Hutchison, Surjaatmadja, and Baker (*id.* at 70–73).

Each of these dependent claims includes limitations in addition to the “shiftable sleeve having a closed position over the jetting passageways” limitation required by independent claims 1, 8, 16, and 21. In support of these challenges, Petitioner identifies the disclosures in each of these references alleged to describe the specific subject matter added in the respective challenged claims. Pet. 59–73. Petitioner, however, does not rely on Coon, the APA, Gazda, or Baker as teaching the “shiftable sleeve having a closed position over the jetting passageways” limitation discussed above. *Id.* Patent Owner counters that these grounds, based at least in part on Hutchison and Surjaatmadja, are patentable over the Hutchison-Surjaatmadja combination for the same reasons as discussed above with respect to claims 1, 8, 16, and 21. PO Resp. 43–64.

We agree. Having concluded above that Petitioner has not established by a preponderance of the evidence that underlying independent claims 1, 8, 16, and 21 of the ’838 patent are unpatentable based on the proposed combination of Hutchison and Surjaatmadja, for the same reasons, we likewise conclude that Petitioner has not established by a preponderance of the evidence that (1) claims 15, 17, 18, 24, and 25 are unpatentable as obvious based on Hutchison, Surjaatmadja, and Coon; claim 26 is unpatentable as obvious based on Hutchison, Surjaatmadja, Coon, and the APA; (3) claim 13 is unpatentable as obvious based on Hutchison,

Surjaatmadja, and Gazda; and (4) claim 7 is unpatentable as obvious based on Hutchison, Surjaatmadja, and Baker.

IV. CONCLUSION

Thus, based on our further review of the record, and for the reasons discussed above, Petitioner has not demonstrated, by a preponderance of the evidence, that claims 1–29 of the '838 patent are unpatentable.

V. ORDER

For the foregoing reasons, it is hereby:

ORDERED that claims 1–29 of the '838 patent are held not to be unpatentable; and

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

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Patent 6,006,838

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