

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

KERR MACHINE COMPANY,
Petitioner,

v.

S.P.M. OIL & GAS, INC.,
Patent Owner.

IPR2022-00365
Patent 10,663,071 B2

Before MEREDITH C. PETRAVICK, MITCHELL G. WEATHERLY, and
AMANDA F. WIEKER, *Administrative Patent Judges*.

PETRAVICK, *Administrative Patent Judge*.

DECISION
Granting Institution of *Inter Partes* Review
35 U.S.C. § 314

I. INTRODUCTION

A. *Background and Summary*

Petitioner Kerr Machine Company filed a Petition (Paper 1, “Pet.”) requesting *inter partes* review of claims 1–18 of U.S. Patent No. 10,663,071 B2 (Ex. 1001, “the ’071 patent”). Patent Owner S.P.M. Oil & Gas, Inc. filed a Preliminary Response (Paper 6, “Prelim. Resp.”).

With our authorization (Paper 7), Petitioner filed a Preliminary Reply to Patent Owner’s Preliminary Response (Paper 8, “Prelim. Reply”) and Patent Owner filed a Preliminary Sur-reply (Paper 9, “Prelim. Sur-reply”).

Under 35 U.S.C. § 314(a), an *inter partes* review may not be instituted unless the information presented in the Petition and any response thereto shows “there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.”

For the reasons discussed below, we determine that Petitioner shows a reasonable likelihood that at least one of the challenged claims is unpatentable. Accordingly, we institute *inter partes* review of U.S. Patent No. 10,663,071 B2.

B. *Real Parties-in-Interest*

Petitioner identifies itself as real party-in-interest. Pet. ix. Patent Owner identifies SPM Oil & Gas Inc.¹ and Caterpillar, Inc. as real parties-in-interest. Paper 4, 1.

¹ Petitioner lists S.P.M. Flow Control, Inc. as a real-party-in-interest for Patent Owner. Pet. ix. Patent Owner informs us that it used the name S.P.M. Flow Control, Inc. from December 16, 1997 to February 11, 2021. Paper 4, 1 n. 1. “S.P.M. Flow Control, Inc. and SPM Oil & Gas Inc. are the same entity, with SPM Oil & Gas Inc. being the current name of the entity.” *Id.*

C. Related Matters

The parties indicate that the '071 patent is the subject of litigation between the parties, *Kerr Machine Co. v. SPM Oil & Gas Inc., et al.*, C.A. No. 4:21-cv-1191 (N.D. Tex.). Pet. ix; Paper 4, 1.

Petitioner also filed IPR2022-00881, IPR2022-00882, and PGR2022-00033 challenging Patent Owner's U.S. Patent No. 10,520,037 B2, U.S. Patent No. 9,879,659 B2, and U.S. Patent No. 10,429,657 B2, respectively.

D. The '071 Patent

The '071 patent is titled “Valve Seats for use in Fracturing Pumps” and issued on May 26, 2020. Ex. 1001, codes (54), (45). The '071 patent “relates to reciprocating pumps, and, in particular, to valve seats used in reciprocating pumps.” *Id.* at 1:19–20. The '071 patent describes that solid particles in fracturing fluid will erode the interacting surfaces of a valve body and a valve seat, but replacing the valve seat is difficult and risks damage to the pump. *Id.* at 1:56–65. To address this problem, the '071 patent proposes a valve seat having an insert of ceramic material. *Id.* at 2:35–38. Figure 3 of the '071 patent is reproduced below, with coloring added by Petitioner. Pet. 10.

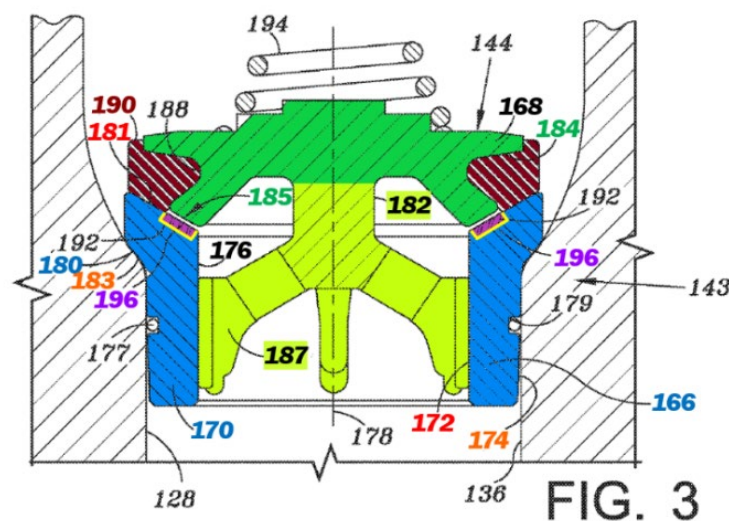


Figure 3 depicts inlet valve assembly 144 having valve seat 166 (blue) and valve body 168 (dark and light green). *Id.* at 6:11–12. Valve seat 166 includes cylindrical body 170 with inner surface 172 forming bore 176 along valve seat axis 178, which is coaxial with axis 132 of fluid inlet passage 128. *Id.* at 6:13–18. Valve seat 166 also includes inner surface 181 for engaging seal 190 (dark purple brown of valve body 168. *Id.* at 6:63–67. Insert 196 (purple), which is formed of ceramic material (e.g., tungsten carbide), is fixed to valve seat 166, for example, by press-fit. *Id.* at 6:43–48, 54–57. According to the '071 patent, insert 196 reduces damage from corrosion, erosion, or pitting during operation and, thus, extends the life span of valve seat 166. *Id.* at 5:32–36, 6:60–62, 8:49–52.

E. Challenged Claims

Petitioner challenges claims 1–18. Pet. 3. Claims 1, 11, 16, and 18 are independent claims. Ex. 1001, 10:26–12:53. Claims 2–10 depend from claim 1, claims 12–15 depend from claim 11, and claim 17 depends from claim 16. *Id.*

Claim 1 is illustrative and is reproduced below with Petitioner's numbering of the elements added in brackets.²

[1.0] 1. A valve assembly for use in a fracturing pump, the valve assembly comprising:

[1.1] a valve member reciprocatably movable into and out of engagement with a valve seat body the valve member having a head portion and a tail portion, [1.2] the valve seat body having an inner surface forming a fluid bore extending between a first end and a second end of the valve seat body, the fluid bore engaging at least a portion of the tail portion for

² Petitioner references the elements of claim 1 with the bracketed numbering. Pet. 26–52. We refer to the elements of claim 1 using Petitioner's numbering in our analysis below.

supporting therein, and an outer surface for supporting the valve seat body in a fluid passageway of the fracturing pump;

[1.3] a seating surface extending radially from the inner surface and facing the valve member, [1.4] the seating surface having a recessed area, the recessed area having an outer diameter length;

[1.5] an insert, the insert having an outer diameter length greater than the outer diameter length of recessed area prior to insertion into the recessed area such that when the insert is disposed in the recessed area, the insert is frictionally secured inside the recessed area and forming at least a portion of the inner surface and at least a portion of the seating surface contacting the valve member when the valve assembly is in a closed position; and

[1.6] wherein the valve seat body first end has a diameter D1 and the valve seat body second end has a diameter D2 such that that the difference between D2 and D1 allows the valve seat body outer surface to be longitudinally supported by the fluid passageway.

Ex. 1001, 10:26–54.

F. Asserted Grounds of Unpatentability

Petitioner asserts the following ground(s) of unpatentability:

No.	Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
1	1, 3–8, 11, 14, 16–18	103(a)	Deakins ³
2	1–8, 11, 14, 16–18	103(a)	Yuanbai ⁴ , Deakins
3	1–18	103(a)	Pratelli ⁵ , Yuanbai
4	8–10, 12, 13, 15	103(a)	Deakins, Vadasz ⁶

³ U.S. Patent No. 1,687,008, issued Oct. 9, 1929 (Ex. 1007) (“Deakins”).

⁴ The People’s Republic of China Patent No. CN 2898364 Y, issued May 9, 2007 (Ex. 1010) (“Yuanbai”). In our analysis, we cited to an English language translation, dated November 11, 2021, which appears in the record as Exhibit 1009.

⁵ Int’l Pub. No. WO 2015/077001 A1, published May 28, 2015 (Ex. 1008) (“Pratelli”).

⁶ U.S. Patent No. 4,662,392, issued May 5, 1987 (Ex. 1006) (“Vadasz”).

No.	Claim(s) Challenged	35 U.S.C. §	Reference(s)/Basis
5	8–10, 12, 13, 15	103(a)	Yuanbai, Deakins, Vadasz

Pet. 2. Petitioner provides a Declaration of Steven M. Tipton, Ph.D., P.E. (Ex. 1002).

Patent Owner provides a Declaration of Timothy L. Morse, Ph.D. (Ex. 2001).

II. DISCRETIONARY DENIAL

Patent Owner requests that we discretionarily deny institution under 35 U.S.C. § 314(a) in light of *Kerr Machine Co. v. SPM Oil & Gas Inc., et al.*, C.A. No. 4:21-cv-1191 (N.D. Tex). Prelim. Resp. 6–13; *see generally* Prelim. Sur-Reply.

We will not discretionarily deny institution in view of parallel district court litigation where a petitioner stipulates not to pursue in a parallel district court proceeding the same grounds as in the petition or any grounds that could have reasonably been raised in the petition. *See* Interim Procedure for Discretionary Denials in AIA Post-Grant Proceedings with Parallel District Court Litigation, 3, 7–8.⁷ Here, Petitioner offers such a stipulation. Prelim. Reply 1, 6 (citing Ex. 1047). Petitioner states:

With respect to U.S. Patent No. 10,663,071, Kerr Machine Co. stipulates that if the Patent Trial and Appeal Board institutes a trial in IPR2022-00365, Kerr will not pursue in the N.D. Texas district court litigation (C.A. No. 4:21-cv-01191-O) any of the grounds raised in its IPR Petition (i.e., Grounds 1–5 as summarized on pages 2–3 of the Petition) against any of the challenged claims as originally issued, or on any other ground

⁷ available at https://www.uspto.gov/sites/default/files/documents/interim_proc_discretionary_denials_aia_parallel_district_court_litigation_memo_20220621_.pdf

that Kerr reasonably could have raised during the IPR under 35 U.S.C. § 311(b) (i.e., a ground raised under §§ 102 or 103 only on the basis of prior art consisting of patents or printed publications).

Ex. 1047. We, thus, decline to exercise discretion to deny institution under 35 U.S.C. § 314(a).

III. ANALYSIS

A. Principles of Law

A petition must show how the construed claims are unpatentable under the statutory grounds it identifies. 37 C.F.R. § 42.104(b)(4). Petitioner bears the burden of demonstrating a reasonable likelihood that it would prevail with respect to at least one challenged claim for a petition to be granted. 35 U.S.C. § 314(a).

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) when in evidence, objective indicia of non-obviousness (i.e., secondary considerations). *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

The record at this stage of the proceeding does not include any argument or evidence directed to secondary considerations of nonobviousness.

B. Level of Ordinary Skill in the Art

Petitioner contends that a person of ordinary skill in the art (“POSITA”) at the time of the invention of the ’071 patent would have had the following education and experience: “a bachelor’s degree in mechanical engineering, and approximately 3–5 years of work experience in the design or manufacture of reciprocating pumps or their components.” Pet. 11 (citing Ex. 1002 ¶ 64). Petitioner adds that “a POSITA with additional relevant education might have fewer years of work experience, e.g., someone with advanced mechanical engineering degrees would also qualify as a POSITA.” *Id.*

At this stage of the proceeding, Patent Owner does not contest Petitioner’s definition of the level of skill or offer its own definition. *See generally* Prelim. Resp.

For purposes of this decision, we adopt Petitioner’s proposal as reasonable and consistent with the prior art. *Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art may reflect an appropriate level of skill in the art).

C. Claim Construction

In an *inter partes* review, claims are construed using the same claim construction standard that would be used to construe the claims in a civil action under 35 U.S.C. § 282(b), including construing the claims in accordance with the ordinary and customary meaning of such claims as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b). Thus, we apply the claim

construction standard as set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc).

1. “*seating surface*,” “*inner surface*,” “*tungsten carbide*,” “*tungsten carbide nickel*,” and “*tungsten carbide cobalt*”

Petitioner proposes explicit constructions for the following terms: “seating surface,” “inner surface,” “tungsten carbide,” “tungsten carbide nickel,” and “tungsten carbide cobalt.” Pet. 12–21.

Patent Owner responds that we need not explicitly construe any claim term and that these terms should be given their “ordinary and customary meaning in light of the claims, specification, and file history of the ’071 Patent as would have been read by a person of ordinary skill in the art (‘POSITA’) for the purpose of this proceeding.” Prelim. Resp. 13–14.

We need not explicitly construe any of these term in order to decide whether to institute *inter partes* review. *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999) (only terms that are in controversy need to be construed, and then only to the extent necessary to resolve the controversy).

2. *Preamble*

The parties disagree as to whether the preambles of the independent claims are limiting. Petitioner asserts that, for example, claim 1’s preamble is not limiting because the body of the claim defines a structurally complete invention. Pet. 26. Petitioner argues that the “fracturing pump” recited in the preamble is an intended use element. *Id.* at 26. Patent Owner argues that the preamble is limiting because it serves as antecedent basis for elements in the body of the claim and fracturing is described in the ’071 patent. Prelim. Resp. 31–36.

Petitioner, however, asserts that “[n]evertheless, the asserted grounds disclose or suggest the preamble.” Pet. 26. Because we find that Petitioner establishes a reasonable likelihood of prevailing with respect to at least one of the challenged claims even if the preamble is limiting, we determine that it is not necessary to construe explicitly the preambles of the independent claims at this stage of the proceeding.

D. Overview of the Asserted Prior Art

1. Deakins

Deakins is a U.S. patent titled “Pump Valve” that issued on October 9, 1928. Ex. 1007, 1. Deakins relates to valves for pumps that circulate solid-laden fluids during oil well drilling. *Id.* at 1:1–8, 15–21. Deakins explains that such pumps operate at, for instance, 400 psi to maintain circulation, which causes considerable wear on valve surfaces. *Id.* at 1:22–32, 75–87.

Deakins addresses the wear issue using a replaceable ring of wear-resistant material secured to the valve seat. *Id.* at 1:88–95.

Figure 3 of Deakins is reproduced below with coloring added by Petitioner. Pet. 47.

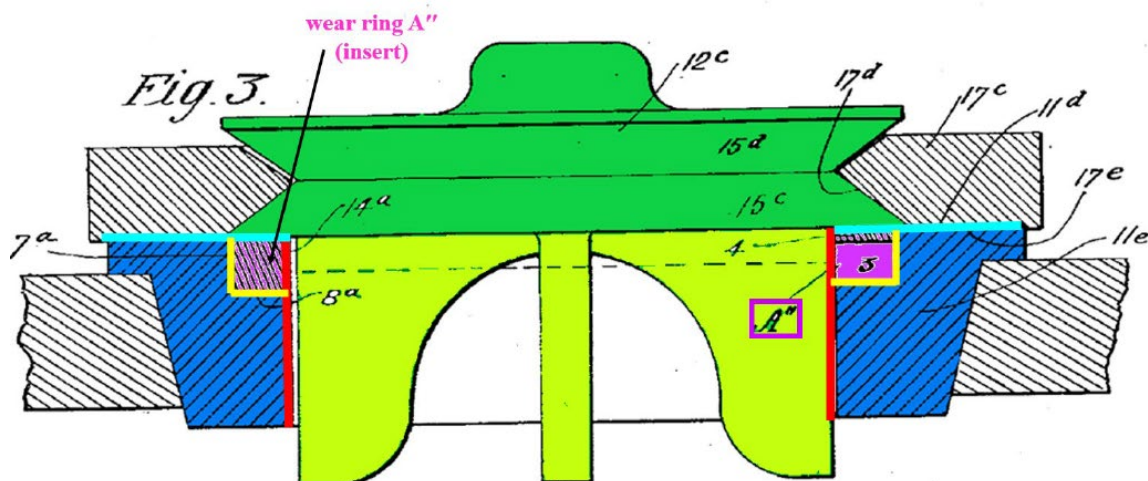


Figure 3 depicts valve body 12^c (dark and light green) with sealing ring 17^c and flat downwardly-facing sealing face 17^e (light blue line), which seats upon upwardly-facing flat sealing face 11^d of valve seat 11^e (blue). *Id.* at 3:24–35. Downwardly-facing peripheral surface 14^a of valve body 12^c presses down on upper face 11^d of valve seat 11^e and wear ring A'' (purple), which is pressed into groove 7^a and against annular shoulder 8^a of valve seat 11^e. *Id.* at 3:36–42. Wear ring A'' is made of wear resistant material and may be held in place via force fit. *Id.* at 2:71–79.

2. Yuanbai

Yuanbai is a Chinese patent titled “Drilling Pump Valve Having Constant-Strength Structure” that issued May 9, 2007. Ex. 1009, codes (54), (45). Yuanbai describes a drilling pump valve with a valve seat having a wear-resistant bushing for increasing service life. *Id.* ¶ 4.

Figure 2 of Yuanbai is reproduced below, with coloring added by Petitioner. Pet. 48.

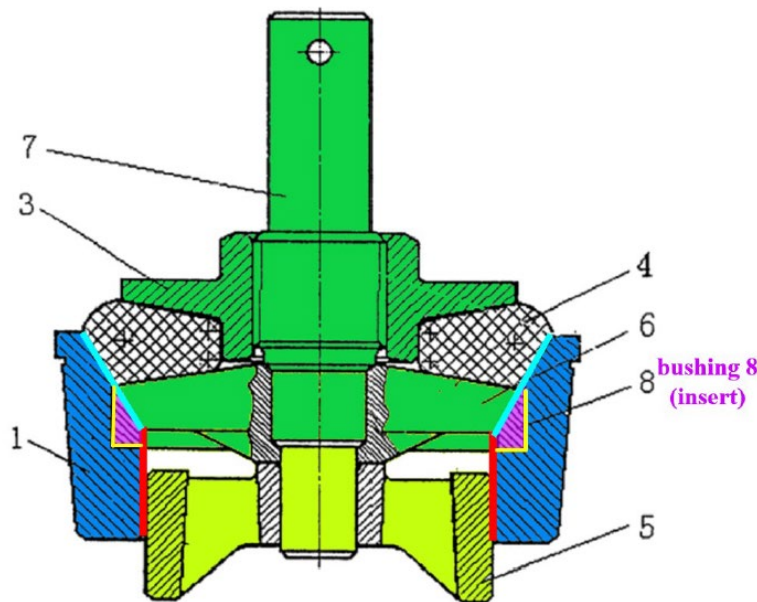


FIG. 2

Figure 2 depicts valve seat 1 (blue) and valve disk 6 (green) with matching conical surfaces. *Id.* ¶ 19. The conical surfaces seal and bear impact caused by closing the valve. *Id.* ¶ 2. Bushing 8 (purple) is provided on the inner conical surface of valve seat 1 for contacting the valve disk. *Id.* ¶ 19. Yuanbai discloses that bushing 8 may be made of a wear-resistant material to improve strength of the valve seat. *Id.* ¶ 7.

3. *Pratelli*

Pratelli is a published Patent Cooperation Treaty application titled “Valve for Hydraulic Fracturing Pumps With Synthetic Diamond Inserts” that published May 28, 2015. Ex. 1008, codes (54), (45). Pratelli describes inserts used to resist impact between mating surfaces of a valve body and a valve seat and, thereby, increase the valve’s service life. *Id.* ¶ 5.

Figure 2 of Pratelli is reproduced below, with coloring added by Petitioner. Pet. 38.

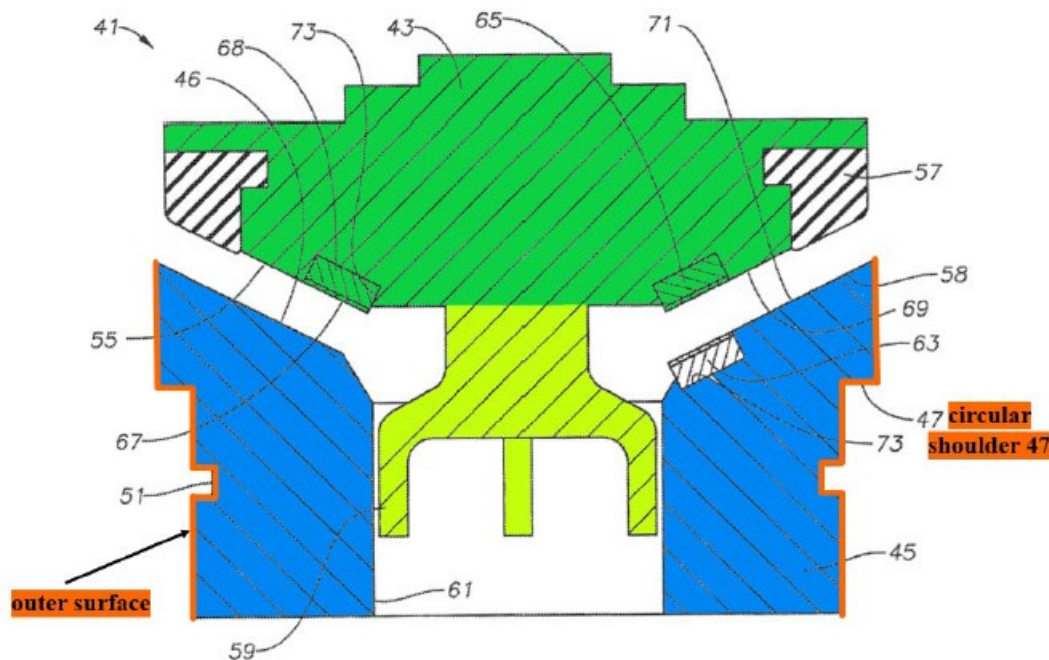


Figure 2 depicts valve 41 including valve body 43 (dark and light green) and valve seat 45 (blue). *Id.* ¶ 25. Stop surface 55 of valve body 43 mates with seat rim 46 of valve seat 45. *Id.* ¶ 26. Valve seat insert 63 is mounted on stop surface 55 and valve body insert 65 is mounted seat rim 46. *Id.* ¶ 27. Inserts 63, 65 (not colored) are positioned such that they mate with each other when the valve is closed. *Id.* The inserts, which may be press fit into mounting holes 73, are formed of wear-resistant material (e.g., tungsten carbide) for withstanding repeated impacts. *Id.* ¶ 29. Figures 3 and 4 of Pratelli are reproduced side-by-side below.

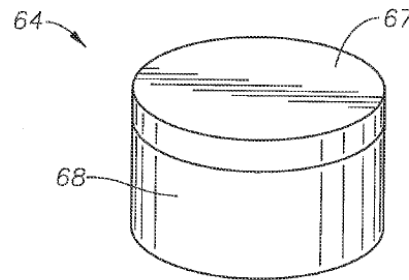
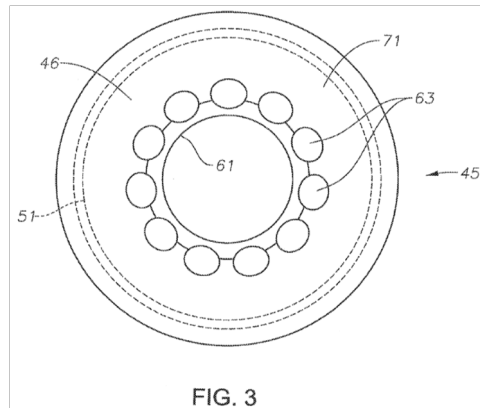


Figure 3 depicts a top view of the valve seat showing inserts 63, and Figure 4 depicts an insert. *Id.* ¶¶ 17–18. Pratelli suggests an alternative embodiment having a single ring-shaped insert mounted on seat rim 46 instead of individual inserts 63. *Id.* ¶ 29.

4. Vadasz

Vadasz is a U.S. patent titled “Check Valve” that issued on May 5, 1987. Ex. 1006, codes (54), (45). Vadasz describes a ball check valve for use in positive displacement subsurface pumps used in the petroleum industry. *Id.* at 2:15–19. The check valve includes an insert formed of

ceramic material, including tungsten carbide. *Id.* at 3:24–27. The insert functions as a valve seat. *Id.* at 3:6–15.

E. Ground 1: Obviousness of Claims 1, 3–8, 11, 14, and 16–18 over Deakins

1. Independent Claims 1, 11, 16, and 18

a) Claim 1

As can be seen from of the summary of Deakins above, Deakins discloses a pump valve having a valve member, a valve seat body, a seating surface, and an insert arranged as required by claim 1. Deakins, however, does not explicitly disclose that the valve is for use in a fracturing pump, as recited by element 1.0 (claim 1’s preamble). *See generally* Ex. 1007.

Petitioner argues that Deakins’ pump “may be used as a mud or fracturing pumps because both are reciprocating positive displacement pumps having the same components (including valves).” *Id.* at 26.

Petitioner contends:

A POSITA recognized that the conditions described in Deakins (relatively high pressure pumping and abrasive, solid-laden fluids) were the same or very similar to hydraulic fracturing operations. Ex-1002 ¶ 118. Deakins’ pressures (400 psi) are around the same pressures used in fracturing operations. *Id.*; *see* Ex-1039 at 5. But even if this were not the case, a POSITA considered Deakins’ teachings applicable to fracturing pumps, because the use of a valve seat having a wear resistant ring (i.e., an insert) addresses the well-known issue of valve seat erosion seen in fracturing pumps due to abrasive fracturing fluid. Ex-1002 ¶ 118; Deakins, 1:22–32, 1:72–95; *see also, e.g.*, Ex-1005, 1:36–63; Ex-1006, 1:30–35; Section V.C. above. A POSITA was therefore motivated to use Deakins’ wear-resistant ring in a fracturing pump to extend the life of the valve seat to save expenses associated with more frequent shutdown and maintenance. Ex-1002 ¶ 118; *see, e.g.*, Ex-1008 [0003]–

[0004]. A POSITA had a reasonable expectation of success in using Deakins' design in a fracturing pump because Deakins was intended for a reciprocating mud pump, which are the same as or very similar to reciprocating fracturing pumps. Ex-1002 ¶ 116; *see, e.g.*, Ex-1013, 1:24–33.

Id. at 26–27.

In response, Patent Owner argues that Deakins does not explicitly disclose the claimed fracturing pump as allegedly required by multiple elements of the claims (Prelim. Resp. 14–20) nor would it have been obvious to a POSITA to use Deakins' valve design in a fracturing pump (*id.* at 20–30). In particular, Patent Owner argues that Deakins discloses a mud pump, which “is entirely different because it is used for fracturing the subterranean formation, normally long after the wellbore has been drilled.” *Id.* at 17. Patent Owner, contends that it would not have been obvious to a POSITA to use Deakins' valve in a fracturing pump because fracturing pumps operate at pressures of 10,000 psi and upwards to 25,000 psi, at rates of 1,000 strokes per minute or higher during fracturing operations and Deakins' mud pump operates at 400 psi. *Id.* at 21–25. Patent Owner further contends that that it would not have been obvious to a POSITA to use Deakins' valve in a fracturing pump because it is more difficult to remove the valve seat in a fracturing pump and thus, a POSITA would not look to a solution that requires frequently removing the valve seat. *Id.* at 26–30. Patent Owner further argues that Deakins' seal is not designed to withstand a high-pressure fracturing environment. *Id.*

Based on the record at this stage of the proceeding, we are persuaded by Petitioner's evidence and argument that a POSITA would have found it obvious to use Deakins' valve with a wear-resistant ring in a fracturing

pump, to extend the life of the valve seat to save expenses associated with more frequent shutdown and maintenance. Ex. 1002 ¶ 118.

Although Deakins suggests in one passage that its valve could be used in a mud pump (i.e., a pump for circulating drilling mud) (Ex. 1007, 1:15–22), Deakins does not limit its valves to only being used in mud pumps. Deakins states:

This invention relates generally to valves, and although the specific and illustrative embodiment of the invention herein set out has been particularly designed for use in connection with pumps operating at considerable pressure, it will be readily understood that the invention is not at all limited to such uses.

Ex. 1007, 1:1–8; *see also id.* at 3:106–112 (explaining that the drawings and descriptions are not limiting). Deakins, thus, suggests that there are other uses for its valves.

Petitioner’s evidence suggests that a POSITA would have known that mud pumps can be used for fracturing. *See* Pet. 26 (citing Ex. 1013, 1:24–32, Ex. 1002 ¶ 116); Prelim. Reply (citing Ex. 1019 1:14–25 (describing pumps used for drilling mud and for fluids used to stimulate the producing formation)). Dr. Tipton testifies that: “A POSITA knew that both mud and fracturing pumps were reciprocating positive displacement pumps having the same design, including the design of internal components such as the suction and discharge valves.” Ex. 1002 ¶ 116. For example, U.S. Patent No. 5,616,009, titled “Mud Pump,” discloses that its pump can be used to drill oil wells or “in conditioning oil wells such as fracturing with extremely high pressure or abrasive fluid.” Ex. 1013, 1:24–32.

Deakins discloses that mud pumps are operated “at comparatively high pressures, for instance at 400 pound per square inch” and this causes the valve to abrade so that the valve has a short life and needs often to be

renewed. *Id.* at 1:22–32. We note that Deakins does not explicitly disclose the range of pressures at which its valve may operate and only discloses that 400 psi is “a for instance.” *See also* Ex. 1012 ¶ 3 (“Mud pumps are positive displacement pumps that can pump the drilling mud at pressures in the range of 2500 to 7500 psi.”).

Petitioner asserts that that 400 psi is around the same pressure used in fracturing operations, which is about 500 to over 20,000 psi. Pet. 26–27 (citing Ex. 1011, 1:23–53 (disclosing a range of 10,000 to 15,000 psi for fracturing), Ex. 1039, 5 (disclosing a range of 500 psi to 20,000 psi depending on well depth)); *see also* Prelim. Reply 6 (citing Ex. 2007 ¶ 5 (disclosing as low as 5,000 psi)). Exhibit 1039 states:

While early fracking treatments made do with existing acid- or cement pumping equipment, specialized instruments were rapidly created to produce the necessary pressures and flow rates that fracking requires. Modern fracking equipment uses around 1500 horsepower to pump 800 gallons of fluid per minute at pressures of around 500 *psi*. Some of the largest equipment for the deepest wells can utilize in excess of 10,000 horsepower to pump more than 4200 gallons of fluid per minute at pressures that can exceed 20,000 psi (Fjaer, 2008).

Ex. 1039, 5 (emphasis added).

Patent Owner argues that the 500 psi of Exhibit 1039 is an error⁸ and inconsistent with other evidence, including the ’071 patent and Petitioner’s

⁸ Relying on its declarant’s testimony, Patent Owner attempts to show that Exhibit 1039’s disclosure of 500 psi is an error by calculating the power of the pump using variables disclosed by Exhibit 1039. Prelim. Resp. 23–25 (citing Ex. 2001 ¶¶ 52, 60). At this stage of the proceeding, Petitioner has not had the opportunity to cross-examine Patent Owner’s declarant or present meaningful argument or evidence to the contrary. We determine that the accuracy of Exhibit 1039’s disclosure is an issue best considered during trial.

own patent application (U.S. Patent Application No. 2021/0148349). Prelim. Resp. 21–23. According to Patent Owner, fracturing operations occur at much higher pressures. *See id.* The '071 patent states that “Reciprocating pumps are oftentimes operated at pressures of 10,000 pounds per square inch (psi) and upward to 25,000 psi.” Ex. 1001, 1:33–35. U.S. Patent Application No. 2021/0148349 states that “[f]luid used in hydraulic fracturing operations is typically pumped through the fluid end at a pressure of at least 8,000 psi, and more typically between 10,000 and 15,000 psi.” Ex. 2007 ¶ 5.

Patent Owner argues “a POSITA would have known that Deakins’ mud pump cannot survive in a hydraulic fracturing environment, where the flow rate and pressure of fluid are much higher than the flow rate and pressure of fluid in drilling operation in order to fracture the rock formation.” Prelim. Resp. 27–30. For example, Patent Owner argues that Deakins’ seal ring may be dislocated in a fracturing environment and that Deakin’s flat surfaced valve seat would suffer from more impact stress. *Id.* at 27–30.

The evidence of record concerning fracturing pressure at this stage of the proceeding shows that fracturing pumps operate at a variety of pressures depending of a variety of circumstances, such as well depth. That some fracturing pumps operate at 5,000 psi, 8,000 psi, 10,000 psi, or upwards of 25,000 psi does not negate that some fracturing pumps may operate at a lower operating pressure, such as 500 psi.

Deakins teaches that because of the operating pressure, the valve seat is subject to wear and, thus, has a shortened life and must be replaced often.

Ex. 1:22–32, 1:72–95. Deakins solves this problem by providing a ring of wear resistant material. Ex. 1001, 1:88–91.

Patent Owner asserts that

in a fracturing environment, “it is more difficult and cumbersome to replace the valve seat than the valve body. For example, a valve seat is oftentimes fixed inside the fluid passageway . . . removing the valve seat from the fluid passageway oftentimes increases the risk of damage to the pump fluid end.” [Ex. 1001,] 1:60–66. Therefore, a POSITA would not have been motivated to look at any solution that requires frequently removing the valve seat of a fracturing pump from the fluid passageway to fix or replace its parts (e.g., insert, or ring) when it is corroded. *See* Ex-2001, ¶ 65.

Prelim. Resp. 26. According to Patent Owner, Deakins teaches removing wear ring A” without damaging or unduly mutilating the seat and, thus, “a POSITA would not have considered Deakins because its anti-corrosion solution is to provide a ring that is designed to be removable with ease for an operator. *Id.* at 26–27 (citing Ex. 1007, 3:84–95).

Deakins’ teaching that its wear ring may be replaced when worn does not negate Deakins teaching of extending the life of the valve by providing the wear ring in the first place. Ex. 1:22–32, 1:72–95. That a POSITA would have been motivated to use Deakins’ valve with a wear ring in a fracturing pump is supported by other evidence of record. For example, Pratelli discloses inserts in a valve seat of a fracturing pump and teaches that it is advantageous to provide wear resistant inserts in the valve seat. *See* Ex. 1008 ¶¶ 3–4, 9, 27, Figs. 2–3 (disclosing the use of inserts in a valve seat for a fracturing pump); *see also* Ex. 1005, 1:36–63 (describing accelerated wear of valve sealing surfaces in oil drilling and fracturing). Pratelli states:

Because of the high pressure environment, the harsh nature of the fracturing fluid and the continuous opening and

closing of the valves, they experience extensive wear. With the current valve designs, operators must change valves frequently, sometimes on a daily basis. Replacing the valves is expensive and time consuming.

Ex. 1008 ¶ 4.

On this record and at this stage of the proceeding, Petitioner's evidence sufficiently shows for the purposes of institution that it would have been obvious to a POSITA to use Deakins' valve having a wear-resistant ring in a fracturing pump to extend the life of the valve seat to save expenses associated with more frequent shutdown and maintenance. Ex. 1002 ¶ 118.

Accordingly, on the record before us at this stage of the proceeding, we determine that Petitioner has shown a reasonable likelihood that claim 1 is unpatentable over Deakins.

b) Claims 1, 11, 16, and 18

Petitioner relies upon the same analysis to show that independent claims 11, 16, and 18 are unpatentable over Deakins. Pet. 78–79, 84–89. Likewise, Patent Owner relies on its argument for claim 1. *See generally* Prelim. Resp.

On this record, and for the same reasons discussed above with respect to claim 1, we determine that Petitioner shows a reasonable likelihood that claims 11, 16, and 18 are unpatentable over Deakins.

2. Dependent claims 3–6, 8, 14, and 17

Petitioner contends that Deakins discloses the limitations of dependent claims 3–8, 14, and 17. Pet. 57–75, 81–84, 86. At this stage of the proceeding, Patent Owner does not provide additional arguments directed to the patentability of these dependent claims. *See generally* Prelim. Resp. 14–36. We have reviewed Petitioner's contentions and evidence cited for these dependent claims and find them to be sufficient for institution.

3. *Dependent claim 7*

Dependent claim 7 recites that the “insert is positioned to contact at least a portion of a valve member to create a seal between the insert and the portion of the valve member.” Ex. 1001, 11:1–4.

Petitioner argues the Deakins’ “wear ring A” is positioned to contact the surface 14a and to create a seal between the wear ring and the inner part of 14a” because Deakins discloses that wear ring A” is positioned to contact surface 14a of valve member 12c. Pet. 70.

Patent Owner responds that Deakins’ sealing ring 17, not wear ring A”, creates the seal. Prelim. Resp. 48 (citing Ex. 1007, 3:75–81, Ex. 2001 ¶ 105 (supporting testimony of Dr. Morse)).

On this record, we are concerned about whether the contact between the wear ring A” and surface 14a in Deakins creates a seal as required by claim 7. Petitioner relies upon the testimony of Dr. Tipton to assert that the contact creates a seal. Pet 70 (citing Ex. 1002 ¶¶ 189–190 (supporting testimony of Dr. Tipton)). Dr. Tipton testifies:

In Deakins, the downwardly facing peripheral surface 14a of valve member 12c seats on both the “inner part of upper face 11d of seat 11e and upon wear ring A” which is pressed to seat in groove 7a.” [EX. 1007], 3:36–42. Thus, a POSITA understood wear ring A” to be positioned to contact the surface 14a to create a seal between the wear ring and the inner part of 14a.

Ex. 1002 ¶ 189. On this record, we are concerned that Dr. Tipton’s testimony does not sufficiently explain whether a seal is created between wear ring A” and surface 14a in Deakins. We note that Dr. Tipton also testifies that particles may lodge between the surfaces and prevent a seal from forming and this is why valves have elastomeric inserts in the valve

bodies. Ex. 1002 ¶ 190. We note these factual issues may be further developed during trial.

F. Ground 2: Obviousness of Claims 1–8, 11, 14, and 16–18 over Yuanbai and Deakins

1. Independent Claims 1, 11, 16, and 18

a) Independent Claim 1

Claim 1 recites a “valve seat body having an inner surface forming a fluid bore extending between a first end and a second end of the valve seat body” (element 1.2) and “a seating surface extending radially from the inner surface” (element 1.3). Ex. 1001, 10:30–37. Claim 1 also recites “the insert . . . forming at least a portion of the inner surface.” *Id.* at 10:44–47.

Petitioner relies upon Yuanbai alone to teach these limitations. Pet. 34–35, 39–40. Petitioner asserts that Yuanbai discloses an inner surface as indicted in annotated Figure 2 of Yuanbai, reproduced below. Pet. 40.

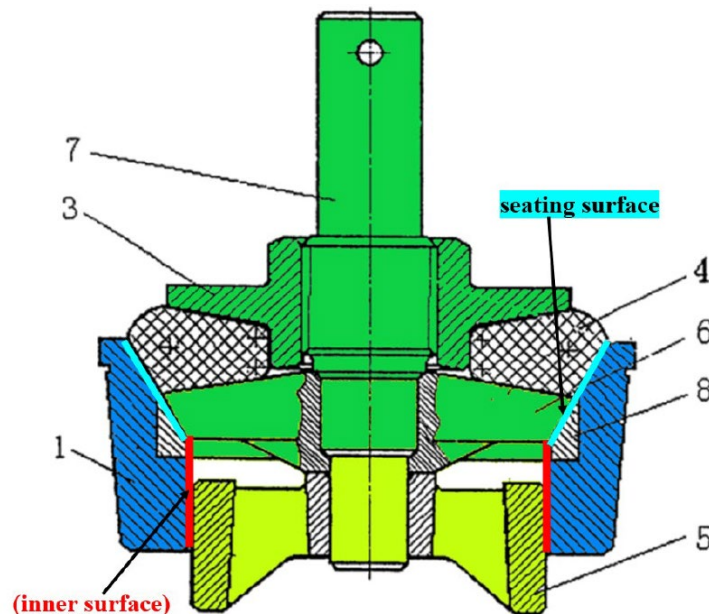


Figure 2 depicts a drilling pump valve. Ex. 1009 ¶ 11. Petitioner annotated Figure 2 to show the valve seat body in blue, the inner surface with a red line, and a seating surface with a blue line. Pet. 40. Petitioner argues that Yuanbai's bushing 8 forms part of the inner surface. Pet. 34–35; *see also id.* at 15–20 (arguing that “inner surface” refers to the inside surface of the entire valve seat, including the insert).

On the record before us at this stage of the proceeding, we are concerned about whether Yuanbai discloses the insert forming at least a portion of the inner surface and the seating surface extending radially from the inner surface because, as Patent Owner contends, Figure 2 of Yuanbai depicts a step between bushing 8 and the inner surface of the valve body.

Patent Owner argues that Yuanbai's bushing 8 (the alleged insert) does not form part of the inner surface because there is a step between the bushing and the inner surface. Prelim. Resp. 45–47. Figure 2 of Yuanbai is reproduced below with annotations provided by Patent Owner. Prelim. Resp. 47.

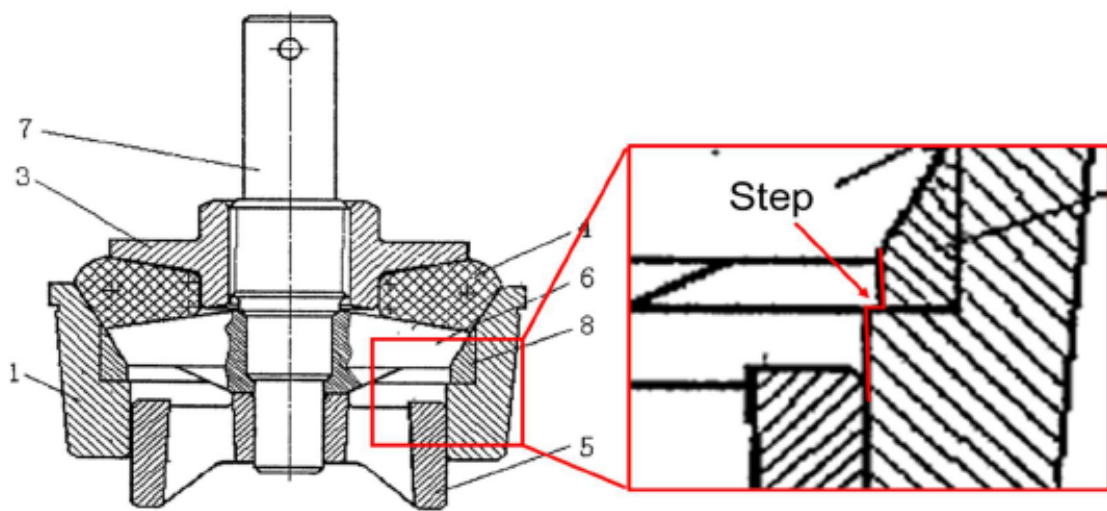


FIG. 2

Annotated Figure 2 depicts the drilling pump valve with a box showing a magnifying view of the step. Patent Owner, thus, argues that the step

precludes the seating surface from extending radially from the inner surface. Since the upper surface of the bushing in Yuanbai forms a part of the seating surface, and since the bushing itself forms no part of the inner surface, the seating surface does not in any way intersect the inner surface.

Id. at 48. Dr. Morse testifies that “[t]his step essentially places the surface of the bushing in a different plane than that of the inner surface.” Ex. 2001

¶ 96. Patent Owner, thus, argues that Yuanbai’s seating surface does extending radially from the inner surface, because the seating surface does not intersect part of the inner surface. Prelim. Resp. 48.

The Petition does not mention Yuanbai’s step or provide any sufficient explanation as to whether the step does or does not form part of the inner surface. *See generally* Pet. 34–35, 39–40. Petitioner does not account for the step in its annotation of Yuanbai’s Figure 2, reproduced above, with the red line to show the inner surface.

In its Preliminary Reply, Petitioner argues that the “‘inner surface’ includes the entire inside surface, including all inside surfaces of the insert and the valve seat.” Prelim. Reply 7 (citing Pet. 15–20). At pages 15–20 of the Petition, Petitioner discusses whether the claim term “inner surface” should be construed to be the inner surface of the entire valve seat, which includes both the valve body and the insert. *See, e.g.*, Pet. 19 (proposing that “inner surface” should be construed “to refer to the inside surface of the entire valve seat, including the insert”). Petitioner, however, does not discuss whether the claimed “inner surface” may include a step between multiple surfaces in different planes.

Patent Owner further argues that a POSITA would not have been motivated to use Deakins or Yuanbai's valve in a fracturing pump. Prelim. Resp. 39–40. Patent Owner's argument is similar to its argument made with respect to ground 1 and Deakins and discussed above. *See id.* For similar reasons, we find Patent Owner's arguments unpersuasive. We note that Yuanbai discloses pressures of 30 MPa or approximately 4,350 psi. Ex. 1009 ¶ 2; Ex. 1002 ¶ 120.

Patent Owner additionally argues that there is no motivation that would lead a POSITA to apply the “force fit” attachment method of Deakins to Yuanbai's bushing. Prelim. Resp. 42–44.

Element 1.5 recites that “the insert is frictionally secured inside the recessed area.” Ex. 1001, 10:44–45. Petitioner argues that a POSITA would have been motivated to attach Yuanbai's bushing 8 using a force or press fit “in order to allow replacement of the bushing without damaging the seat, which would be more likely when welding or otherwise bonding the bushing in place.” Pet. 48–49.

On the record before us at this stage of the proceeding, we are persuaded by Petitioner's evidence and analysis that, given Deakins teaching, it would have been obvious to a POSITA to use a force or press fit to attach Yuanbai's bushing to the valve seat. Yuanbai is silent as to how bushing 8 is attached to valve seat 1. *See generally* 1009. Deakins teaches using a press or force fit to attach an insert to a valve body so that the wear-ring may be removed without damaging the seat. Ex. 1007, 2: 15–17, 2:73–79, 3:82–83. Dr. Tipton testifies that that press fitting the bushing allows for replacement of the bushing while sparing the valve seat and that avoids problems with using welding. Ex. 1002 ¶ 153.

b) Independent claims 11, 16, and 18

Claims 11, 16, and 18 recite similar limitations requiring an inner surface and a seating surface extending radially from the inner surface. Ex. 1001, 11:17–37, 11:53–12:5, 12:29–35. Petitioner relies upon the same analysis to show that independent claims 11, 16, and 18 are unpatentable over Yuanbai and Deakins. Pet. 78–79, 84–89. For the same reasons discussed above with respect to claim 1, we are concerned about whether Yuanbai discloses the claimed inner step, which is also recited by these claims.

2. Dependent claims 2–6, 8, 14, and 17

Petitioner contends that the combination of Yuanbai and Deakins renders obvious the limitations of dependent claims 2–6, 8, 14, and 17. Pet. 55–75, 81–84, 86. These claims depend upon claims 1, 11, and 16 and, thus, for the same reasons discussed above with respect to claim 1, we have similar concerns with respect to Petitioner’s analysis with respect to these claims. *See In re Fritch*, 972 F.2d 1260, 1266 (Fed. Cir. 1992) (“Dependent claims are nonobvious if the independent claims from which they depend are nonobvious.”).

3. Dependent claim 7

Dependent claim 7 recites that the “insert is positioned to contact at least a portion of a valve member to create a seal between the insert and the portion of the valve member.” Ex. 1001, 11:1–4.

Petitioner argues that because Yuanbai’s bushing 8 is positioned to contact the valve disk it, thus, creates a seal. Pet. 71 (citing Ex. 1009 ¶ 19, Fig. 2).

Patent Owner responds that Deakins' sealing ring 17, not wear ring A'', creates the seal. Prelim. Resp. 48 (citing Ex. 1007, 3:75–81, Ex. 2001 ¶ 105 (supporting testimony of Dr. Morse)).

On the record before us at this stage of the proceeding, we do not agree with Patent Owner’s argument. Yuanbai refers to this surface as a “sealing conical surface.” *See* Ex. 1009 ¶ 19; *see also* Ex. 1002 ¶ 191 (supporting testimony of Dr. Tipton).

However, claim 7 depends from claim 1 and, thus, for the same reasons as discussed above with respect to claim 1, we are concerned with respect to Petitioner's analysis with respect to claim 7.

G. Ground 3: Obviousness of Claims 1–18 over Pratelli and Yuanbai

1. Independent Claims 1, 11, 16, and 18

a) *Independent Claim 1*

Petitioner contends that claims 1–18 are unpatentable over the combination of Pratelli and Yuanbai. Pet. 29–89. Figure 2 of Pratelli is reproduced below, with coloring added by Petitioner. Pet. 38.

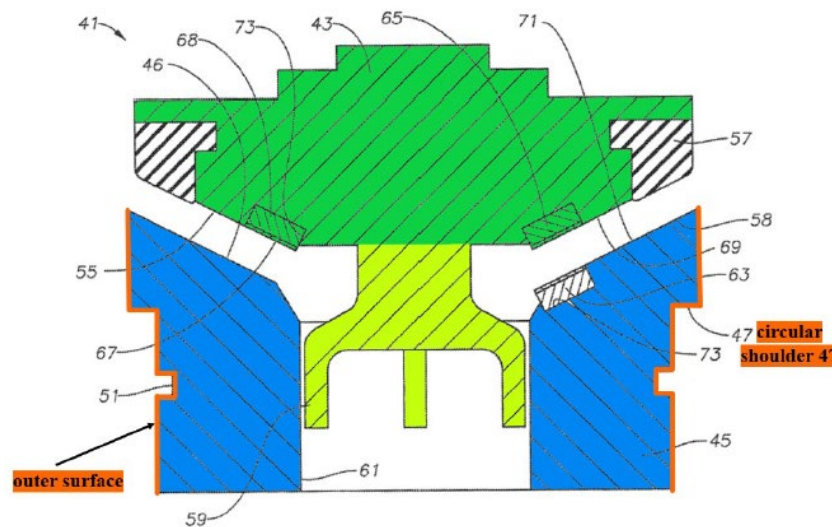
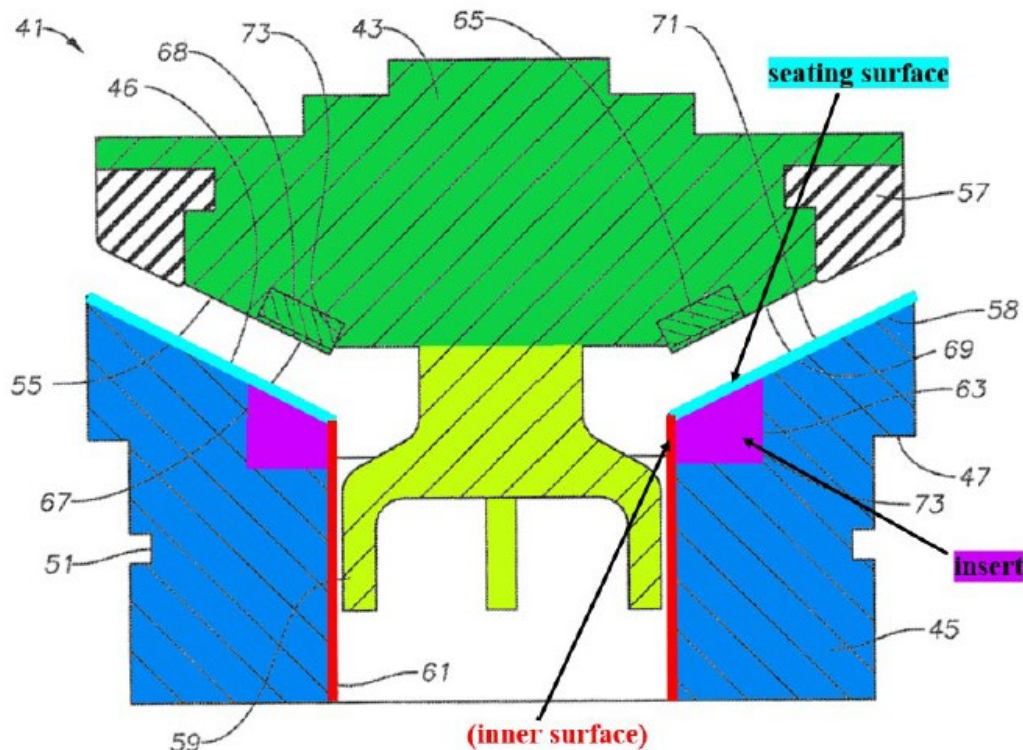


FIG. 2

Figure 2 depicts valve 41 including valve body 43 (dark and light green) and valve seat 45 (blue). *Id.* ¶ 25. Valve body 43 has multiple inserts 63 recessed into seating rim 46. *Id.* ¶ 6, Figs. 3–4.

Petitioner argues that a POSITA would have been motivated to use Yuanbai’s “bushing design as Pratelli’s ring-shaped insert based on Pratelli’s suggestion that its inserts could be provided as a single ring-shape.” *Id.* at 44. Petitioner further argues that a ring-shaped insert “necessarily require[s] a matching recess in the valve seat rim” as its reasoning to modify Pratelli’s insert recess to have a single outer sidewall. *Id.* at 43, 45. Given Pratelli’s “suggestion to use a press fit,” Petitioner argues that an inner sidewall is not needed with a ring-shaped insert because a ring-shaped insert would have radial forces around the entire circumference to secure it in place. *Id.* at 50–51. According to Petitioner, “Yuanbai’s design is easier (and therefore cheaper) to manufacture, as it does not require as precise a tolerance in machining the inner diameter of the insert, which is open to the inner bore.” *Id.* at 51.

Reproduced below is Figure 2 of Pratelli altered by Petitioner to show the replacement of Pratelli’s valve seat insert with Yuanbai’s ring-shaped insert and recess design. Pet. 51–52.



Altered Figure 2 shows the valve seat body in blue, Yuanbai's ring-shaped insert in purple, the inner surface with a red line, and a seating surface with a blue line. Pet. 40. Notably, Petitioner's altered Figure 2 depicts the inner surface of Yuanbai's bushing aligned with the inner surface of the valve body.

Petitioner asserts that the combination of Pratelli and Yuanbai teaches all of the elements of claim 1, including element 1.2 ("valve seat body having an inner surface forming a fluid bore extending between a first end and a second end of the valve seat body"), element 1.3 ("a seating surface extending radially from the inner surface"), and element 1.5 ("the insert . . . forming at least a portion of the inner surface") (Ex. 1001, 10:30–37, 10:44–47). *See id.* Patent Owner disagrees and first argues that the combination fails to disclose element 1.2 ("valve seat body having an inner surface

forming a fluid bore extending between a first end and a second end of the valve seat body”), element 1.3 (“a seating surface extending radially from the inner surface”), and element 1.5 (“the insert . . . forming at least a portion of the inner surface”). Ex. 1001, 10:30–37, 10:44–47.

Patent Owner contends that the combination of Pratelli and Yuanbai “would naturally include the step that is present in Yuanbai between the inner surface and the insert.” Prelim. Resp. 54–55. As for Ground 2, Patent Owner argues that this step prevents the insert from forming a portion of the inner surface and the seating surface extending from the inner surface. *Id.*

On the record before us at this stage of the proceeding, we are concerned about whether Petitioner’s proposed combination of Pratelli and Yuanbai discloses the insert forming at least a portion of the inner surface and the seating surface extending radially from the inner surface. As proposed in the Petition, the combination requires modifying Pratelli to include not only Yuanbai’s ring-shaped insert but also its recess design. Pet. 43, 45, 50–52. As discussed above, Yuanbai recess design includes a step between bushing 8 and the inner surface of the valve body. Ex. 1009, Fig. 2.

The Petition does not mention Yuanbai’s step or provide any sufficient explanation as to why the step would not be incorporated in the proposed combination. *See generally* Pet. 43, 45, 50–52. Petitioner does not account for the step in its alteration of Yuanbai’s Figure 2, reproduced above. Altered Figure 2 does not depict Yuanbai’s step and instead depicts the inner surface of the insert aligned with the inner surface of the valve body.

Patent Owner further argues that a POSITA would not have been motivated to press fit the ring-shaped bushing of Yuanbai into Pratelli's valve seat because Pratelli's teachings regarding press-fitting relate to a plurality of individual inserts, not a single ring-shaped insert (Prelim. Resp. 56–57), and Pratelli is configured such that press-fitting would not be possible “without modifying the cross sectional shape of the ring.” *Id.* at 58. Patent Owner argues that because Pratelli's recess has two walls angled relative to the inner bore, “if an attempt were made to press fit a single ring-shaped insert into the valve seat of Pratelli, the insert would impinge on the valve seat in a way that would not allow the insert to be received by the recess.” *Id.*

Patent Owner's argument is unpersuasive because it does not account for Petitioner's proposed modification of Pratelli to include Yuanbai's single walled recess design, which matches the shape of the ring. *See* Pet. 43, 45, 50–52.

2. Dependent claims 2–6, 8–10, 12–15, and 17

Petitioner contends that the combination of Pratelli and Yuanbai discloses the limitations of dependent claims 2–6, 8–10, 12–15, and 17. Pet. 57–75, 81–84, 86. At this stage of the proceeding, Patent Owner does not provide additional arguments directed to the patentability of these dependent claims. *See generally* Prelim. Resp. 14–36. However, these claims depend from claim 1 and, thus, for the same reasons as discussed above with respect to claim 1, we have a concern with respect to Petitioner's analysis with respect to claims 2–6, 8–10, 12–15, and 17.

3. *Dependent claim 7*

Petitioner argues that Pratelli as modified by Yuanbai discloses the claimed insert “positioned to contact at least a portion of a valve member to create a seal between the insert and the portion of the valve member” because “[t]he top surface 67 of valve seat insert 63 . . . impacts valve body 43 at inserts 65, which are part of the valve member.” Pet. 72.

Patent Owner argues that claim 7 would not have been obvious over Pratelli and Yuanbai for the additional reason that Pratelli’s sealing member 57, not the alleged insert, creates the seal. Prelim. Resp. 60–61.

On the record before us at this stage of the proceeding, Patent Owner’s argument is unpersuasive. Yuanbai refers to this surface as a “sealing conical surface.” See Ex. 1009 ¶ 19; see also Ex. 1002 ¶ 191 (supporting testimony of Dr. Tipton).

However, claim 7 depends from claim 1 and, thus, for the same reasons as discussed above with respect to claim 1, we have a concern with respect to Petitioner’s analysis with respect to claim 7.

H. Grounds 4 & 5: Obviousness of Claims 8–10, 12, 13, and 15 over Deakins and Vadasz and Obviousness of Claims 8–10, 12, 13, and 15 over Yuanbai, Deakins, and Vadasz

Petitioner argues that dependent claims 8–10, 12, 13, and 15 are unpatentable based on the combination of Deakins and Vadasz, and the combination of Yuanbai, Deakins, and Vadasz. Pet. 74–80, 84.

These dependent claims recite elements directed to the material of the insert. Ex. 1001, 11:5–11, 1:39–43, 1:46–47. For example, claim 9 recites “wherein the insert is formed of a ceramic” and claim 10 recites “wherein the insert is formed of tungsten carbide. *Id.* at 11:8–11.

Petitioner also asserts that a POSITA would be motivated to make Deakins' wear ring A" from tungsten carbide because Deakins' suggest to make wear ring A" from a wear-resistant material. Pet. 76–77 (citing Ex. 1007, 1:72–92, Ex. 1002 ¶ 210). Similarly, Petitioner also asserts that a POSITA would be motivated to make Yuanbai's ring-shaped insert from tungsten carbide because Yuanbai suggests that it be made from a wear-resistant material. Pet. 77 (citing Ex. 1009 ¶ 7).

Patent Owner contends that these claims are patentable over the combination of Deakins and Vadasz because “the differences between the valves disclosed by Deakins and Vadasz are significant enough that a POSITA would not have made the proposed combination.” Prelim. Resp. 61–66. Patent Owner contends that these claims are patentable over the combination of Yuanbai, Deakins, and Vadasz for similar reasons. *Id.* at 65–66.

Although there are some differences between the type of valve body and valve seat in Deakins and Yuanbai and Vadasz (*see* Prelim. Resp. 61–66), we do not agree that those differences would affect a POSITA's choice of wear-resistant material for an insert. On the record before us at this stage of the proceeding, we are persuaded by Petitioner's evidence and analysis that, given Vadasz, it would have been obvious to a POSITA to make Deakins' wear ring A" and Yuanbai's insert from tungsten carbide. *See* Ex. 1002 ¶¶ 210–213. Both Deakins and Yuanbai suggest using a wear-resistant material. Ex. 1007, 1:72–92; Ex. 1009 ¶ 7. Vadasz discloses press-fitting an insert into a valve seat assembly and making the insert from ceramic materials and tungsten carbide. Ex. 1006, 1:30–36, 3:1–12, 3:16–28.

Accordingly, on this record, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing in demonstrating that claims 8–10, 12, 13, and 15 are obvious over Deakins and Vadasz.

Claims 8–10, 12, 13, and 15 depend from claims 1 and 11 and, thus, for the same reasons as discussed above with respect to claim 1, we have a concern with respect to Petitioner’s analysis with respect the patentability of claims 8–10, 12, 13, and 15 over Yuanbai, Deakins, and Vadasz.

IV. CONCLUSION

After considering the evidence and arguments presented in the Petition, the Preliminary Response, Preliminary Reply, and Preliminary Sur-Reply, we determine that Petitioner has demonstrated a reasonable likelihood of prevailing with respect to at least one of the challenged claims, and thus, we institute an *inter partes* review of all challenged claims on all presented challenges. *SAS*, 138 S. Ct. at 1359–60; *PGS Geophysical AS v. Iancu*, 891 F.3d 1354, 1360 (Fed. Cir. 2018) (interpreting the statute to require “a simple yes-or-no institution choice respecting a petition, embracing all challenges included in the petition”).

At this stage of the proceeding, the Board has not made a final determination as to the patentability of any challenged claim or any underlying factual and legal issues.

V. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that, pursuant to 35 U.S.C. § 314(a), an *inter partes* review of claims 1–18 of the '071 patent is instituted with respect to all grounds set forth in the Petition;

FURTHER ORDERED that, pursuant to 35 U.S.C. § 314(c) and 37 C.F.R. § 42.4(b), *inter partes* review of the '071 patent shall commence on the entry date of this Order, and notice is hereby given of the institution of a trial.

IPR2022-00365
Patent 10,663,071 B2

FOR PETITIONER:

James H. Hall
Stephen D. Zinda
J. David Cabello
CABELLO HALL ZINDA, PLLC
James@CHZFirm.com
Stephen@CHZFirm.com
David@CHZFirm.com

FOR PATENT OWNER:

Robert C. Hilton
Kuan-Chieh Tu
MCGUIREWOODS LLP
SPM-Kerr@mcguirewoods.com
rhilton@mcguirewoods.com
gtu@mcguirewoods.com