

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GUANGDONG ALISON HI-TECH CO., LTD.,
Petitioner,

v.

ASPEN AEROGELS, INC.,
Patent Owner.

Case IPR2016-01820
Patent 6,989,123 B2

Before JON B. TORNQUIST, CHRISTOPHER M. KAISER, and
MICHELLE N. ANKENBRAND, *Administrative Patent Judges*.

ANKENBRAND, *Administrative Patent Judge*.

DECISION
Denying Institution of *Inter Partes* Review
37 C.F.R. § 42.108

I. INTRODUCTION

Guangdong Alison Hi-Tech Co., Ltd. (“Petitioner”) requests *inter partes* review of claims 15–17 and 19 of U.S. Patent No. 6,989,123 B2 (Ex. 1001, “the ’123 patent”). Paper 2 (“Pet.”). Aspen Aerogels, Inc. (“Patent Owner”) filed a Preliminary Response. Paper 12 (“Prelim. Resp.”).

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314(b); 37 C.F.R. § 42.4(a). We may not institute an *inter partes* review “unless . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.” 35 U.S.C. § 314(a). Applying that standard, and upon consideration of the information presented in the Petition and the Preliminary Response, we deny the Petition and do not institute an *inter partes* review.

A. Related Proceeding

The parties identify the following investigation before the United States International Trade Commission involving the ’123 patent: In the Matter of *Certain Composite Aerogel Insulation Materials and Methods for Manufacturing the Same*, USITC Inv. No. 337-TA-1003 (June 2, 2016). Pet. 6; Paper 9, 2.

B. The ’123 Patent

The ’123 patent, titled “Methods to Produce Gel Sheets,” issued on January 24, 2006. The ’123 patent relates to “preparation of solvent filled gel sheets in a continuous fashion.” Ex. 1001, 1:17–18. More specifically, the specification describes methods for continuously combining a sol “and an agent (heat catalyst or chemical catalyst) that induces gel formation and forming a gel sheet on a moving element such as a conveyor belt . . . by

dispensing the catalyzed sol at a predetermined rate effective to allow gelation to [occur] on the moving element.” *Id.* at 2:34–41. After gelation, the resulting gel sheets “are rolled into a plurality of layers.” *Id.* at 3:41–44. The specification describes the process as “a novel and effective way of producing gel sheets for efficient drying operations.” *Id.* at 3:44–46.

By contrast, “[c]onventional methods for gel sheet . . . production formed via sol-gel chemistry . . . involve batch casting,” which entails “catalyzing one entire volume of sol to induce gelation simultaneously throughout that volume.” *Id.* at 2:3–8. According to the specification, the continuous casting methods “are greatly improved over conventional batch sol-gel casting methods for gel sheets” because, *inter alia*, “large volumes of material can be fashioned in a smaller production area than with traditional batch casting.” *Id.* at 2:29–31, 3:63–64.

The continuous casting method comprises three phases. In the first phase, all constituent components (solid precursor, dopants, and additives) are blended into a sol that can be dispensed in a continuous manner. *Id.* at 6:42–45. The sol includes inorganic materials, organic materials, or a combination of inorganic and organic hybrid materials. *Id.* at 2:41–42. The sol “can be catalyzed to induce gelation by methods known to those trained in the art.” *Id.* at 7:19–20. “The second phase involves dispensing the blended sol onto a moving conveyor mold,” and “may also include introduction of heat or radiation to the ungelled sol . . . to either induce gelation or modify the properties of the gel.” *Id.* at 6:45–51. Control of the variables in gel formation, such as solution pH, “can permit control of the growth and aggregation of the matrix species [organic, inorganic, or mixture of both] throughout the transition from the ‘sol’ state to the ‘gel’ state.” *Id.*

at 8:19–24. In the third phase, gels are cut and conveyed to a post-processing area, or the gel sheets are rolled into a plurality of layers. *Id.* at 3:41–44, 6:52–57, 9:39–41 (“Gel composite sheets can be produced in rolled form if mechanically wound at the end of the belt.”), 10:62–63 (gel sheets are rolled onto a mandrel), Figs. 1, 8. When rolled, the gel sheets can be co-rolled with a permeable or impermeable spacer material to provide “a favorable flow pattern in a subsequent drying,” as well as “flow paths for subsequent silation (aging) fluids to easily pass through.” *Id.* at 3:46–54, 10:63–11:5.

C. Illustrative Claim

Petitioner challenges claims 15–17 and 19 of the ’123 patent. Independent claim 15 is illustrative of the challenged claims and recites:

15. A process for preparing gel sheets, comprising the steps of:
dispensing a catalyzed sol onto a moving element as a continuous sheet;
rolling the dispensed sheet into a plurality of layers.

Ex. 1001, 14:48–52.

D. The Prior Art

The Petition advances the following references as prior art:

1. U.S. Patent No. 4,950,148, issued August 21, 1990 (“Nakanishi,” Ex. 1004);
2. U.S. Patent No. 5,306,555, issued April 26, 1994 (“Ramamurthi,” Ex. 1005);
3. U.S. Patent No. 6,187,250 B1, issued February 13, 2001 (“Champagne,” Ex. 1006);
4. U.S. Patent No. 5,665,442, issued September 9, 1997 (“Andersen,” Ex. 1007);

5. U.S. Patent No. 6,106,722, issued August 22, 2000 (“Chew,” Ex. 1008);
6. U.S. Patent No. 4,496,461, issued January 29, 1985 (“Leeke,” Ex. 1009);
7. U.S. Patent No. 4,452,892, issued June 5, 1984 (“Rosevear,” Ex. 1010);
8. U.S. Patent No. 3,042,573, issued July 3, 1962 (“Roberts,” Ex. 1011);

E. The Asserted Grounds of Unpatentability

Petitioner asserts 24 grounds of unpatentability, based primarily on Nakanishi or Champagne, and divides the remaining asserted prior art references into two groups: (1) Ramamurthi, Andersen, and Roberts (collectively, “the Rolling Prior Art”), and (2) Chew, Leeke, and Rosevear (collectively, “the Spacer Prior Art”). See Pet. 7–8. For the purpose of this decision, we group Petitioner’s 24 grounds as set forth in the table below.

References	Statutory Basis	Claim(s) Challenged
Nakanishi and any of the Rolling Prior Art	§103	15
Nakanishi, any of the Rolling Prior Art, and any of the Spacer Prior Art	§103	16, 17, 19
Champagne and any of the Rolling Prior Art	§103	15
Champagne, any of the Rolling Prior Art, and any of the Spacer Prior Art	§103	16, 17, 19

The Petition is supported by the Declaration of George W. Scherer, Ph.D. (Ex. 1018).

II. ANALYSIS

We address below whether the Petition meets the threshold showing for institution of an *inter partes* review under 35 U.S.C. § 314(a). We consider each ground of unpatentability in view of the understanding of a

person of ordinary skill in the art. For the purpose of this decision, we find that the prior art itself is sufficient to demonstrate the level of ordinary skill in the art at the time of the invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (the prior art, itself, can reflect appropriate level of ordinary skill in art). Further, based on the information presented at this stage of the proceeding, we consider Petitioner’s declarant, Dr. Scherer, qualified to opine from the perspective of an ordinary artisan at the time of the invention. *See Ex. 1019* (curriculum vitae of Dr. Scherer).

A. Claim Construction

The Board interprets claims in an unexpired patent using the “broadest reasonable construction in light of the specification of the patent.” 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016). Under that standard, claim terms are given their ordinary and customary meaning in view of the specification, as would be understood by one of ordinary skill in the art at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Any special definitions for claim terms must be set forth with reasonable clarity, deliberateness, and precision. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

Petitioner does not propose any claim terms for express construction. *See Pet. 15–16*. Patent Owner proposes that we construe four terms: “gel sheets,” “continuous sheet,” “catalyzed sol,” and “rolling the dispensed sheet into a plurality of layers.” *Prelim Resp. 12–17*. For the purpose of this decision, we determine that only the term “catalyzed sol” requires express construction. *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”).

1. Catalyzed sol

The claims of the '123 patent do not define the term “catalyzed sol,” nor does Petitioner provide a proposed construction for that term. *See* 37 C.F.R. § 42.104(b)(3) (noting that the Petition must identify how the challenged claim is to be construed). In its substantive arguments, however, Petitioner asserts that Nakanishi mixes liquid A (identified by Dr. Scherer as a silicone base) and liquid B (identified by Dr. Scherer as a catalyst) to form a silicone gel material. Pet. 17–19; Ex. 1018 ¶¶ 65–67; Ex. 1004, 4:41–43, 4:64–68, 8:13–21. And, because the manufacture of gel sheets from such a two-part silicone mixture “was well-known in the art,” Petitioner contends a person of ordinary skill in the art “would have recognized the mixture of the two parts to be a catalyzed sol.” Pet. 18–19 (citing Ex. 1018 ¶¶ 65, 67).

Patent Owner contends the term “catalyzed sol” should be construed as “a low-viscosity mixture of a sol and gel-inducing agent before it has formed into a gel.” Prelim. Resp. 15. In support of that construction, Patent Owner cites to various portions of the '123 patent specification that distinguish between a catalyzed sol dispensed on a conveyor and the resulting gel sheet. *Id.* at 15–16 (citing Ex. 1001, 2:34–42 (explaining that the catalyst is added to the sol to “induce[] gel formation”), 4:47–48, 9:43–54 (explaining that a stable sol precursor is mixed with a catalyst using a fluid mixing system and that “gelation” of this catalyzed sol “occurs prior to the rolling assembly”)), 25; *see also* Ex. 1001, 4:52–55 (noting that the disclosed system delivers “a catalyzed sol mixture of low viscosity at one end” and provides a “system to cut and convey solvent-filled, fiber-reinforced gel composite sheets” at the other).

As Patent Owner points out, the '123 patent distinguishes between a catalyzed sol and the resulting gel. See Ex. 1001, 2:34–37 (“[T]he invention describes methods for continuously combining a low viscosity solution of a sol and an agent (heat catalyst or chemical catalyst) that induces gel formation and forming a gel sheet on a moving element.”), 6:12–14 (“Gels are a class of materials formed by entraining a mobile interstitial solvent phase within the pores of a solid structure.”), 8:22–24 (noting that the growth and aggregation of the matrix species may be controlled throughout “the transition from the ‘sol’ to the ‘gel’ state”). Indeed, we are directed to no discussion in the '123 patent referring to a gel as a catalyzed sol, or otherwise equating those two terms. Thus, we find persuasive Patent Owner’s argument that the term “catalyzed sol,” as used in the '123 patent, means a mixture of sol and gel-inducing agent, before it has formed into a gel.

We are not persuaded, however, that the ordinary meaning of “catalyzed sol,” or the descriptions of the various sols in the '123 patent, clearly require that a catalyzed sol must be “low-viscosity,” as asserted by Patent Owner. Ex. 1001, 8:41–43 (noting that “other sol preparation and gel induction methods” may be used with the processing methods of the invention); see *Paulsen*, 30 F.3d at 1480; *Thorner v. Sony Computer Entm’t Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (noting that “[i]t is not enough for a patentee to simply disclose a single embodiment or use a word in the same manner in all embodiments, the patentee must ‘clearly express an intent’ to redefine the term”). Accordingly, we decline to adopt that portion of Patent Owner’s construction.

In view of the foregoing, we construe the term “catalyzed sol” to mean “a mixture of sol and gel-inducing agent, before it has formed into a gel.”

B. Asserted Obviousness over Nakanishi and the Rolling Prior Art

Petitioner asserts that claim 15 is unpatentable under 35 U.S.C. § 103(a) because the subject matter of that claim would have been obvious over the combination of Nakanishi and any of the Rolling Prior Art (i.e., Ramamurthi, Andersen, or Roberts). Pet. 29–35.

1. Nakanishi

Nakanishi discloses “an apparatus capable of automatically processing silicone gel material with high viscosity without manual operation.” Ex. 1004, 1:37–41. Figure 1 of Nakanishi, reproduced below, depicts one embodiment of the disclosed apparatus:

FIG. 1

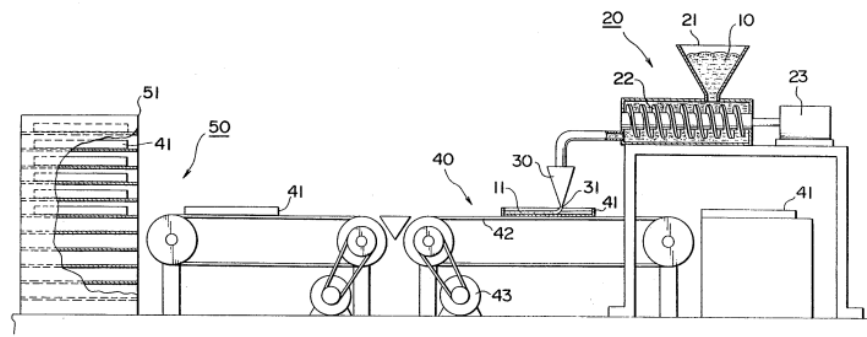


Figure 1 is a partly cutaway view of the apparatus of Nakanishi

As shown in Figure 1, silicone gel material 10 is provided from hopper 21 to nozzle 30 by screw conveyor 22. *Id.* at 2:59–68. That material is then extruded from nozzle 30 onto moveable receiving means 41 as thin sheet-formed strip 11. *Id.* at 2:65–2:68, 3:15–19. Moveable receiving means 41 is

delivered by belt conveyor 42 to heating section 50, where it is heated in multi-staged heating furnace 51. *Id.* at 3:20–22, 3:40–51.

Nakanishi does not describe expressly the materials used to manufacture silicone gel material 10 in the first embodiment. In the description of a second embodiment of the disclosed apparatus, however, a method for forming the silicone gel material is described. *Id.* at 4:41–43, 4:64–68. In that method, liquids A and B—which have been mixed with fine hollow particles—are delivered to a feeder and kneaded “into a gelled solidifiable state of material.” *Id.* at 4:18–28, 4:64–66. The gelled material is then debubbled and delivered to a hopper for further processing. *Id.* at 4:66–68, 5:24–25.

2. Ramamurthi

Ramamurthi discloses a batch method for preparing aerogel matrix composites (AMCs). Ex. 1005, 1:10–15, 2:3–8. The method generally comprises: “preparing an aerogel precursor; mixing fibers with the aerogel precursor; aging the aerogel precursor containing the fibers to obtain a gelled composition; completely submerging the gelled composition in a liquid suitable for supercritical drying;” and then drying the gelled composition. *Id.* at 2:15–21.

Ramamurthi explains that, in contrast to monolithic aerogels known in the art which are “extremely fragile and have low elasticities,” the disclosed fiber reinforced AMCs can have a range of flexibilities, and possess “enhanced strength, decreased sensitivity to moisture,” and good thermal insulation values. *Id.* at 2:3–8, 3:57–59, Fig. 1 (comparing the properties of fiber reinforced AMCs with “conventional aerogels”).

3. *Andersen*

Andersen “relates to compositions, methods for manufacturing sheets, and articles of manufacture having a highly inorganically filled organic polymer matrix” that “can vary greatly in thickness, stiffness, flexibility, toughness, and strength and can be used in a dry or moist state to form a variety of objects, including printed sheets, containers, and other packaging materials.” Ex. 1007, 1:40–47. Andersen teaches that a preferred method for manufacturing the sheets includes the steps of:

- (1) preparing a moldable mixture by mixing together water, inorganic aggregates, a water-dispersable [sic] organic binder, and fibers; (2) placing the moldable mixture into an extruder, such as an auger or piston extruder; (3) extruding the mixture through an appropriate die to preferably form a flat sheet of a desired thickness, or a pipe that can be unfolded into a sheet; (4) reducing the thickness of the sheet by passing it between at least one pair of rollers; and (5) drying the sheet to create a substantially hardened matrix comprising aggregate particles and fibers held together by an organic polymer binder.

Id. at 12:16–26. Andersen explains that “fibers are a preferred additive which increases the tensile strength, flexibility, ductility, and bendability of the highly inorganically filled sheets.” *Id.* at 14:6–8; *see also id.* at 30:16–26 (fibers may be added to the mixture to increase flexural and tensile strength). The manufactured sheets can be stored by “rolling the sheet onto a spool.” *Id.* at 7:3–5, 13:46.

4. *Roberts*

Roberts discloses “a process and apparatus for manufacturing impregnated woven or non-woven fibrous sheet materials.” Ex. 1011, 1:11–13. In that process, a foam “impregnant” is applied on “one surface of a fibrous sheet material” and suction is then applied “to the opposite surface of

the fibrous sheet material to suck the impregnant into said fibrous sheet material.” *Id.* at 1:19–25. The impregnated web of material is then passed through a drying machine and “wound on a roll.” *Id.* at 6:61–63.

5. Analysis

Petitioner argues that the combination of Nakanishi and any of Ramamurthi, Roberts, or Andersen teaches or suggests each of the limitations of claim 15. Pet. 29–30, 34–36. Having considered the arguments and evidence before us, for the reasons set forth below, we find that the record does not establish a reasonable likelihood that Petitioner will prevail on its asserted ground.

Petitioner contends that Nakanishi discloses dispensing a catalyzed sol directly onto a moving element. Pet. 29. In particular, Petitioner points to Nakanishi’s teaching “of making a sheet by mixing two liquids that react to form a gel,” “dispensing the silicone gel material, which [an ordinary artisan] would have recognized to be a catalyzed sol . . . ‘onto a movable receiving means,’ including a conveyor belt,” and “forming a thin sheet-formed strip with the dispensed silicone gel material.” *Id.* (citing Ex. 1004, 3:16–17, 3:20–25, 8:15–19; Ex. 1018 ¶¶ 65–78).

Patent Owner contends Petitioner has not demonstrated that “the **gelled** silicone gel material” dispensed on the movable means in Nakanishi is a catalyzed sol. Prelim. Resp. 25–26. We agree.

Nakanishi consistently describes the material dispensed onto its movable receiving as a “gel material.” *See* Ex. 1004, 1:37–41 (noting that the disclosed apparatus processes “silicone gel material with high viscosity”), 2:65–68 (noting that silicone gel material 10 is “extruded” from nozzle 30 by the pressure provided by screw conveyor 22). Petitioner does

not explain persuasively why one of ordinary skill in the art would have considered the gel material of Nakanishi to be a “catalyzed sol,” as opposed to a gel made from a sol or catalyzed sol. Indeed, although Petitioner asserts that the mixture of liquids A and B in Nakanishi is a catalyzed sol, that assertion is not supported by sufficient evidence. Pet. 18–19 (citing Ex. 1018 ¶¶ 65–67); *see* Ex. 1013, 1–2 (describing Toray Silicone CY52, on which Dr. Scherer relies to support the conclusion that Nakanishi discloses a catalyzed sol, as a “gel”); Ex. 1004, 4:21–27 (Toray Silicone CY52 is a known “silicone gel”); *see also* Ex. 2003, 3:63–66 (discussing the “conversion” of a sol into a gel).

On this record, we are not persuaded Petitioner demonstrates sufficiently that Nakanishi discloses “dispensing a catalyzed sol,” as required by claim 15. Accordingly, Petitioner does not establish a reasonable likelihood that the subject matter of claim 15 would have been obvious over Nakanishi and any of the Rolling Prior Art.

C. Remaining Nakanishi-based Grounds

Petitioner contends that claims 16, 17, and 19 would have been obvious over Nakanishi, the Rolling Prior Art, and the Spacer Prior Art, specifically: Nakanishi, any of the Rolling Prior Art, and Chew or Leeke; and Nakanishi, any of the Rolling Prior Art, and Rosevear. Pet. 8, 38–43, 44–48. Claims 16, 17, and 19 ultimately depend, directly or indirectly, from claim 15 and also require “dispensing a catalyzed sol.” Ex. 1001, 14:52–62. Petitioner, however, does not assert that any of the Rolling Prior Art or any of the Spacer Prior Art cures the deficiency in Nakanishi (i.e., discloses “dispensing a catalyzed sol”). Accordingly, for the reasons set forth above, we are not persuaded that Petitioner establishes a reasonable likelihood that

the subject matter of claims 16, 17, and 19 would have been obvious over the remaining Nakanishi-based grounds set forth in the Petition.

D. Asserted Obviousness over Champagne and the Rolling Prior Art

Petitioner argues that claim 15 is unpatentable under 35 U.S.C. § 103(a) because the subject matter of that claim would have been obvious over the combination of Champagne and any of the Rolling Prior Art (i.e., Ramamurthi, Andersen, or Roberts). Pet. 33–34, 36–37.

1. Champagne

Champagne “relates to the production of acrylamide or other gels for use in separations of proteins, nucleic acids or other biological materials,” and, in particular, to “a continuous gel casting method and apparatus.” Ex. 1006, 1:6–9. According to Champagne, although methods for batch producing gels were known, “[w]hat is needed presently, is an apparatus which could allow one skilled in the art to make either gradient or non-gradient slab gels continuously so that the gels produced are uniformly formed, polymerized and cut to a specific size as needed, in a mass-produced, assembly line manner.” *Id.* at 2:36–41. To fulfill that need, Champagne provides an apparatus that “introduc[es] the gel reaction mixture into a molding space [in a controlled manner] and a casting manifold which encloses the molding space and provides a continuously moving, sealed molding space for holding the reaction mixture during gelation.” *Id.* at 2:46–54. Figure 1 depicts the apparatus and is reproduced below.

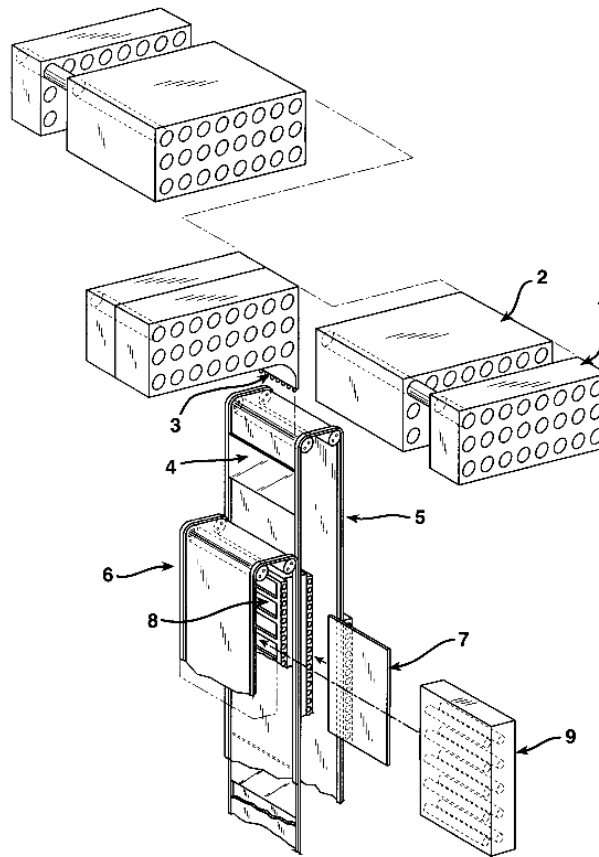


Figure 1 shows a plan view and elevation and partial cross-sectional view of a schematic of the entire continuous gel casting apparatus and method

In Figure 1, two halves of the reservoir cylinder block are located at the head of the apparatus. *Id.* at 4:13–14. Each half includes top section 1 and bottom section 2. *Id.* at 4:14–15. When placed together, the reservoir cylinders empty into nozzles 3 that deliver the premixed gel solution onto backing 4, which rides between support belt 5 and gel-side belt 6. *Id.* at 4:15–18; *see id.* at Fig. 2, 4:52–56 (explaining that Figure 2 shows how “[t]he multi-chamber reservoir cylinder block provides a means of supplying multiple separately or individually formulated streams of reaction mixture to the casting manifold through a series of nozzles (3) at one end of the molding space.”).

An alternate embodiment for introducing the gel solution to the molding space utilizes free radicals to initiate polymerization of the gel. *Id.* at 10:26–29, Fig. 10. In that embodiment, the monomer solution and gel initiators initially are separated from one another in different compartments of the cylinder block. *Id.* at 10:30–33, 11:25–27. “As the solution in each compartment is delivered to the horizontal delivery channel it follows a path to mix with the solution in the other compartment prior to entering the mold[ing] space.” *Id.* at 10:34–37, 11:17–24. The combined and mixed reaction solution with the polymerization reaction initiated then flows to nozzle 3 “in the usual manner and into the mold cavity.” *Id.* at 11:28–30.

After entering the molding space, the gel solution is sealed between the belts 5 and 6, and travels in a horizontal orientation. *Id.* at 4:19–21. Pressure plates or platens 7 keep the belts sealed. *Id.* at 4:21–22. The gel solution is “held for a time sufficient to initiate polymerization and allow shrinkage of the gel.” *Id.* at 6:28–30.

Champagne explains that backing 4 is comprised of a glass plate or plastic laminate and acts as a secondary support means “to provide support to the polymerizing gel.” *Id.* at 6:37–42, 7:6–8. Belts 5 and 6 “are affixed to a roller means for rotating, which allows the gel polymerized between the two belts to be moved through the apparatus for subsequent cutting and stacking on a continuous basis.” *Id.* at 6:45–48. By unsealing belts 5 and 6 as they move over exit rollers at the downstream end of the continuous casting line, “the completed gels, which are connected to one another as a consequence of continuous casting, move into a means for cutting and stacking the produced gels on a continuous basis, providing a major advantage . . . over batch casting methods.” *Id.* at 15:38–45.

2. Analysis

Petitioner argues that the combination of Champagne and any of the Rolling Prior Art teaches or suggests each of the limitations of claim 15. Pet. 34–35, 36–37. Petitioner also argues that a person of ordinary skill in the art would have been led to combine the teachings of those references. *Id.* at 34. Having considered the arguments and evidence before us, for the reasons set forth below, we find the record does not establish a reasonable likelihood that Petitioner would prevail on its asserted ground. In particular, we find Petitioner does not show sufficiently a reason that one of ordinary skill in the art would have combined the teachings of Champagne and any of the Rolling Prior Art.

Relying on the reasons presented for the grounds based on Nakanishi, Petitioner argues the ordinary artisan would have recognized that Champagne’s sheets “would inevitably reach the end of the conveyor and need to be processed further” to avoid falling onto the factory floor. Pet. 31; *see id.* at 34 (“The analysis above in Section VI.A.1 [directed at the combination of Nakanishi and the Rolling Prior Art] is incorporated herein.”); Ex. 1018 ¶ 104 (Dr. Scherer testifying that the analysis regarding Nakanishi “appl[ies] equally . . . with respect to Champagne.”). Petitioner contends that there would have been four logical, well-known, and predictable choices for further processing Champagne’s gel sheets: rolling, cutting into sections and stacking, folding, or placing onto another conveyor. Pet. 31 (citing Ex. 1018 ¶ 75). Petitioner explains that rolling “is particularly advantageous because of its use of simple equipment, ease of use, efficient use of space, and the ease of transport of the resulting rolls.” *Id.* (citing Ex. 1018 ¶ 75). In that regard, Petitioner contends that the

ordinary artisan “manufacturing continuous gel sheets on a mass scale would have looked to references such as Ramamurthi, Roberts and Andersen to solve the problem of transporting and storing long, continuous sheets.” *Id.* at 31.

Patent Owner contests Petitioner’s proffered reasons to combine the teachings of Champagne with Ramamurthi, Andersen, or Roberts, arguing that Petitioner’s rationale for combining the teachings of the references rests on “two conclusory sentences.” Prelim. Resp. 43–44.

As the Supreme Court explained in *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 (2007), an invention “composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art.” 550 U.S. at 418. Rather, “there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *Id.* (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). Accordingly, the U.S. Court of Appeals for the Federal Circuit has made clear that a petitioner in an *inter partes* review proceeding cannot “satisfy its burden of proving obviousness” by “employ[ing] mere conclusory statements” and “must instead articulate specific reasoning, based on evidence of record” to support an obviousness determination. *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1380–81 (Fed. Cir. 2016).

The “factual inquiry” into the reasons for “combin[ing] references must be thorough and searching, and the need for specificity pervades” *In re Nuvasive, Inc.*, 842 F.3d 1376, 1381–82 (Fed. Cir. 2016) (internal quotations and citations omitted). A determination of obviousness cannot be reached where the record lacks “explanation as to *how* or *why* the references

would be combined to produce the claimed invention.” *Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1066 (Fed. Cir. 2016); *see Nuvasive*, 842 F.3d at 1382–85; *Magnum Oil*, 829 F.3d at 1380–81.

We agree with Patent Owner that Petitioner does not explain sufficiently how the ordinary artisan would have been led from the disclosures of the Rolling Prior Art, which teach rolling fibrous sheets or sheets containing fibers, to roll Champagne’s polyacrylamide gel sheet, which lacks fibers and is backed by a glass plate or plastic laminate. Petitioner contends, and Dr. Scherer testifies, that a gel sheet formed on a conveyor, such as Champagne’s gel sheet, “is generally flat and flexible.” Pet. 12; Ex. 1018 ¶ 19. Yet, neither Petitioner nor Dr. Scherer directs us to sufficient evidence that one of ordinary skill in the art would have understood the gel sheet produced by Champagne’s process to be “generally flexible” such that it could be rolled into a plurality of layers, as recited in claim 15.

On that point, at least some of the record evidence appears to contradict Petitioner’s contention and Dr. Scherer’s testimony. Indeed, Ramamurthi indicates that added fibers are critical to flexibility of the gel. For example, Figure 1 of Ramamurthi compares the features of, and differences between, Ramamurthi’s composite gel processing route, which includes the step of adding re-enforced fibers to the gel matrix, and the processing route for preparing conventional aerogels, i.e., gels that do not include fibers. Ex. 1005, 3:24–28, 5:46–50. Figure 1 provides that conventional aerogels are delicate, inflexible, and susceptible to cracking, whereas Ramamurthi’s fiber-gel composite aerogels are mechanically strong and flexible. *Id.* at Fig. 1; *compare id.* at 3:57–59 (“monolithic aerogels are

extremely fragile and have low elasticities), *with id.* at 3:63–67 (explaining that to overcome the drawbacks associated with prior art gels, “aerogel matrix composites (AMCs) with a variety of unique characteristics have been prepared. The AMCs consist of a bulk or monolith aerogel matrix prepared . . . with a fiber-type reinforcement.”), 5:66–67 (“compared with conventional monolithic aerogels, the AMCs had a range of flexibility”). Thus, contrary to Petitioner’s argument and Dr. Scherer’s testimony, Ramamurthi suggests that fiber reinforcement provides the flexibility necessary for rolling its gel sheets. *See, e.g., id.* at 4:10–14, Fig. 1; *see also* Ex. 2007, 1:43–45 (noting that conventional aerogels are “brittle, non-flexible,” fracture when compressed, and, as a result, “can’t be flexed during use”).¹

In any event, Petitioner does not contend that an ordinary artisan would have modified Champagne’s process to disperse fibers throughout the gel solution. *See generally* Pet. Even if Petitioner did, however, Petitioner does not explain sufficiently *how* the ordinary artisan would have modified Champagne’s apparatus and/or process to mix and disperse fibers in the gel solution, as described in Ramamurthi. *See* Ex. 1005, 5:21–30, 7:27–49. Likewise, Petitioner fails to explain adequately why an ordinary artisan would have a reasonable expectation of achieving a gel sheet with fibers

¹ Andersen teaches that adding fibers to a matrix comprising inorganic aggregate particles and other additives, including gels, adds flexibility to the sheet material that subsequently is rolled. Ex. 1007, 14:6–8 (“fibers are a preferred additive which increases the tensile strength, flexibility, ductility, and bendability of the highly inorganically filled sheets”), 30:16–26 (fibers may be added to the mixture to increase flexural and tensile strength). Thus, like Ramamurthi, Andersen suggests that added fibers impart flexibility to its sheet.

dispersed therein in a continuous casting process, such as Champagne's, where Ramamurthi discloses a batch casting process. *Compare* Ex. 1005, 7:27–49, 12:14–16 (disclosing batch casting process for forming both rigid and flexible gel samples), *with* Ex. 1006, 15:38–45 (explaining that the disclosed continuous casting process “provid[es] a major advantage . . . over batch casting methods.”). As explained above, in Champagne's process, the gel solution is cast into the molding space through nozzles in the cylinder block, Ex. 1006, 4:15–18, 11:28–30, and Petitioner fails to explain how a gel solution including fibers could be cast through such nozzles, or direct us to any evidence supporting such a modification of Champagne's process.

Petitioner's contention that the ordinary artisan would have combined the teachings of Champagne and the Rolling Prior Art suffers from an additional shortcoming; namely, Champagne's gel forming solutions are applied to a backing support comprising glass or plastic laminate, and Petitioner fails to explain how the resulting gel could be rolled into a plurality of layers. Specifically, Champagne discloses that “[a] gel backing or cassette acting as a secondary support means . . . comprised of a glass or plastic laminate is inserted . . . into the molding space” to “provide support to the polymerizing gel which is applied onto the gel backing in the molding space.” Ex. 1006, 6:36–42, Figs. 1, 4, 5; *see also id.* at 6:43–45 (explaining that the gel is adhered to the backing), 6:66–7:8 (describing the casting apparatus in further detail and explaining that “the gel backing is a glass plate; it may also be plastic or some other laminate or composite”). Petitioner and Dr. Scherer do not address that backing support, much less explain *how* the resulting gel sheet could have been rolled into a plurality of layers, or *why* the ordinary artisan would have done so. *See, e.g.*, Pet. 20–

21, 33–34, 36; Ex. 1018 ¶¶ 41–42, 100–102. Indeed, as both Petitioner and Dr. Scherer acknowledge, Champagne provides that its resulting gels are cut and stacked, not rolled. Ex. 1006, 6:45–48, 15:42–43; see Pet. 20, 34; Ex. 1018 ¶ 102 (citing Ex. 1006, 6:45–48).

Given the foregoing, we find that Petitioner does not provide adequate “articulated reasoning” with respect to combining the teachings of Champagne and any of the Rolling Prior Art references. Accordingly, Petitioner does not establish a reasonable likelihood of prevailing in showing that the subject matter of claim 15 would have been obvious over the combination of Champagne and any of the Rolling Prior Art.

E. Remaining Champagne-Based Grounds

Petitioner contends that the subject matter of claims 16, 17, and 19 would have been obvious over Champagne, the Rolling Prior Art, and the Spacer Prior Art, specifically: Champagne, any of the Rolling Prior Art, and Chew or Leeke; and Champagne, any of the Rolling Prior Art, and Rosevear. Pet. 8, 43–48. In each of those grounds, Petitioner argues that an ordinary artisan would have combined the teachings of Champagne and any of the Rolling Prior Art. Petitioner, however, does not elaborate on the reasoning or evidence that we find unpersuasive with respect to claim 15. As such, we are not persuaded that Petitioner establishes a reasonable likelihood that the subject matter of claims 16, 17, and 19 would have been obvious over the remaining Champagne-based grounds set forth in the Petition.

III. CONCLUSION

Taking account of the information presented in the Petition and the Preliminary Response, and the evidence of record, we determine that Petitioner fails to demonstrate a reasonable likelihood of prevailing at trial as

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to any challenged claim. Accordingly, the Petition is *denied* and no trial is instituted.

IV. ORDER

It is hereby

ORDERED that the Petition is *denied* and no trial is instituted.

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