

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 IPR2017-00152
Patent 7,780,890 B2

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

TORNQUIST, *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”) filed a Petition (Paper 2, “Pet.”) requesting an *inter partes* review of claims 11–13, 15, 17–19, and 21 of U.S. Patent No. 7,780,890 B2 (Ex. 1001, “the ’890 patent”). Aspen Aerogels, Inc. (“Patent Owner”) filed a Preliminary Response to the Petition (Paper 7, “Prelim. Resp.”).

We have authority to determine whether to institute an *inter partes* review. 35 U.S.C. § 314; 37 C.F.R. § 42.4(a). The standard for instituting an *inter partes* review is set forth in 35 U.S.C. § 314(a), which provides that an *inter partes* review may not be instituted “unless the Director determines . . . there is a reasonable likelihood that the petitioner would prevail with respect to at least 1 of the claims challenged in the petition.”

After considering the Petition and the Preliminary Response, we determine that Petitioner has not demonstrated a reasonable likelihood that it would prevail with respect to any of the challenged claims of the ’890 patent. Accordingly, we do not institute *inter partes* review.

A. *Related Proceeding*

The parties note that the ’890 patent is at issue in *Certain Composite Aerogel Insulation Materials and Methods for Manufacturing the Same*, USITC Inv. No. 337-TA-1003 (June 2, 2016). Pet. 2; Paper 4, 2.

B. *The ’890 Patent*

The ’890 patent discloses “the preparation of solvent filled gel sheets in a continuous fashion” using sol-gel casting methods. Ex. 1001, 1:18–19, 2:29–33. The ’890 patent explains that “[c]onventional methods for gel sheet and/or fiber-reinforced composite gel sheet production formed via sol-gel chemistry” invariably involved “batch casting,” or “catalyzing one entire

volume of sol to induce gelation simultaneously through that volume.” *Id.* at 2:4–9.

In contrast to this batch casting method, the ’890 patent discloses a method of continuously dispensing a catalyzed sol solution onto a moving element to form a gel sheet. *Id.* at 2:34–41, 3:37–40, 4:46–52, 6:32–39 (noting that the first phase of the casting method involves “blending all constituent components (solid precursor, dopants, additives) into a low-viscosity sol that can be dispensed in a continuous fashion”). These gel sheets may then be cut and rolled into a plurality of layers. *Id.* at 4:46–52, Fig. 1.

The ’890 patent notes that fibrous materials may be added to the sol prior to the point of polymer gelation to reinforce the matrix materials. *Id.* at 5:2–7. The ’890 patent further notes that the disclosed process permits “control of the growth and aggregation of the matrix species throughout the transition from the ‘sol’ state to the ‘gel’ state.” *Id.* at 8:10–12.

C. Illustrative Claim

Independent claim 11 is illustrative of the challenged claims and is reproduced below:

11. A method for preparing gel sheets, comprising the steps of:
dispensing a sol onto a moving element as a continuous sheet;
rolling the dispensed sheet into a plurality of layers; and
drying the layers

Ex. 1001, 13:64–14:2.

D. The Asserted Grounds of Unpatentability¹

References	Basis	Claim(s) Challenged
Nakanishi ² and Ramamurthi ³	§ 103	11–13, 15, 17, and 21
Nakanishi and Roberts ⁴	§ 103	11, 13, 17, and 21
Nakanishi and Andersen ⁵	§ 103	11, 13, 17, and 21
Ramamurthi and Nakanishi	§ 103	11–13, 15, 17, and 21
Ramamurthi and Champagne ⁶	§ 103	11–13, 15, 17, and 21
Sonoda ⁷ and Uchida ⁸	§ 103	11–13, 15, 17, and 21
Nakanishi, Ramamurthi, and Chew ⁹	§ 103	18 and 19
Nakanishi, Ramamurthi, and Leeke ¹⁰	§ 103	18 and 19
Ramamurthi, Champagne, and Chew	§ 103	18 and 19
Ramamurthi, Champagne, and Leeke	§ 103	18 and 19
Sonoda, Uchida, and Chew	§ 103	18 and 19
Sonoda, Uchida, and Leeke	§ 103	18 and 19

¹ In support of the asserted grounds of unpatentability, Petitioner relies upon the testimony of Dr. George W. Scherer. Ex. 1018.

² U.S. Patent No. 4,950,148, issued Aug. 21, 1990 (Ex. 1005).

³ U.S. Patent No. 5,306,555, issued Apr. 26, 1994 (Ex. 1006).

⁴ U.S. Patent No. 3,042,573, issued July 3, 1962 (Ex. 1011).

⁵ U.S. Patent No. 5,665,442, issued Sept. 9, 1997 (Ex. 1008).

⁶ U.S. Patent No. 6,187,250 B1, issued Feb. 13, 2001 (Ex. 1007).

⁷ Japanese Patent Publication H08-34678 (translation), published Feb. 6, 1996 (Ex. 1021).

⁸ U.S. Patent No. 6,123,882, issued Sept. 26, 2000 (Ex. 1022).

⁹ U.S. Patent No. 6,106,722, issued Aug. 22, 2000 (Ex. 1009).

¹⁰ U.S. Patent No. 4,496,461, issued Jan. 29, 1985 (Ex. 1010).

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, “[a] claim in an unexpired patent shall be given its broadest reasonable construction in light of the specification of the patent in which it appears.” 37 C.F.R. § 42.100(b); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2142 (2016) (upholding the use of the broadest reasonable interpretation standard). In determining the broadest reasonable construction, we presume that claim terms carry their ordinary and customary meaning. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). A patentee may define a claim term in a manner that differs from its ordinary meaning; however, any special definitions must be set forth in the specification with reasonable clarity, deliberateness, and precision. *See In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

Petitioner proposes constructions for the terms “a moving element” and “fibrous batting material.” Pet. 13–14. Patent Owner proposes constructions for the terms “gel sheets,” “continuous sheet,” “sol,” “rolling the dispensed sheet into a plurality of layers,” and “the layers.” Prelim. Resp. 12–17. Upon review of Petitioner’s and Patent Owner’s arguments and supporting evidence, we determine that only the term “sol” requires construction 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.”).

Sol

The claims of the ’890 patent do not define the term “sol,” nor does Petitioner provide a proposed construction for the 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. 23–24; Ex. 1018 ¶¶ 86–89; Ex. 1005, 4:41–43, 4:64–68. 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 understood the gel of Nakanishi to be made from a catalyzed sol.” Pet. 23 (citing Ex. 1018 ¶ 86).

Patent Owner contends the term sol should be construed as “a low-viscosity colloidal suspension before it has formed into a gel.” Prelim. Resp. 15. In support of this construction, Patent Owner cites to a book co-authored by Dr. Scherer that defines a “sol” as “a colloidal suspension of solid particles in a liquid.” *Id.* at 16, 21–22 (quoting Ex. 2008, 3). Patent Owner also directs our attention to various portions of the ’890 patent written description that distinguish between a catalyzed sol dispensed on a conveyor and the resulting gel sheet. *Id.* at 15–16 (citing Ex. 1001, 2:34–41 (explaining that the catalyst is added to the sol to “induce[] gel formation”), 4:42, 9:28–39 (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”)), 23; *see also* Ex. 1001, 4:46–52 (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).

Consistent with the textbook definition of “sol” provided by Patent Owner, the various sols of the ’890 patent are described as liquid solutions,

not gels. Ex. 2008, 3; Ex. 1001, 2:9–12 (noting that the pH and/or temperature of “a dilute metal oxide sol” may be adjusted to induce gelation), 7:19–22 (noting that “[p]articularly preferred are gels formed primarily from alcohol solutions of hydrolyzed silicate esters”), 8:12–16 (noting that the “properties of the resulting aerogels are strongly affected by the pH of the precursor solution”), 8:45–46 (“The preparation of aerogel-forming solutions is well known in the art.”). And, as noted by Patent Owner, the ’890 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.”), 6:4–5 (“Gels are a class of materials formed by entraining a mobile interstitial solvent phase within the pores of a solid structure.”), 8:10–12 (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 ’890 patent referring to a gel as a sol, or otherwise equating these two terms. Thus, we find persuasive Patent Owner’s argument that the term “sol,” as used in the ’890 patent, means a colloidal suspension of solid particles in a liquid, before it has transitioned into a gel.

We are not persuaded, however, that the ordinary meaning of “sol,” or the descriptions of the various sols in the ’890 patent, clearly require that a sol must be of “low-viscosity,” as asserted by Patent Owner. Ex. 1001, 8:29–33 (noting that “other sol preparation and gel induction methods” may be used with the processing methods of the invention); see *In re 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 “sol” to mean “a colloidal suspension of solid particles in a liquid, before it has transitioned into a gel.”

B. Claims 11–13, 15, 17, and 21 over Nakanishi and Ramamurthi and Claims 11–13, 17, and 21 over Nakanishi and Roberts or Andersen

Petitioner contends the subject matter of claims 11–13, 15, 17, and 21 would have been obvious over Nakanishi and Ramamurthi, and the subject matter of claims 11–13, 17, and 21 would have been obvious over Nakanishi and Roberts or Andersen. Pet. 22–42.

1. Nakanishi

Nakanishi discloses “an apparatus capable of automatically processing silicone gel material with high viscosity without manual operation.”

Ex. 1005, 1:37–41. Figure 1 of Nakanishi, reproduced below, depicts one embodiment of the disclosed apparatus:

FIG. 1

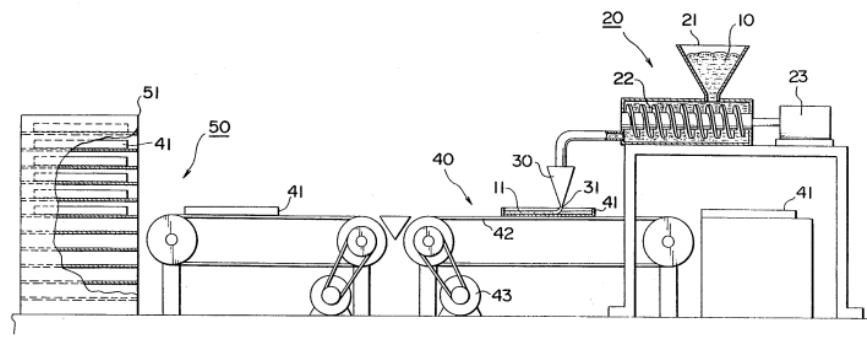


Figure 1 is a partly cutaway view of the apparatus of Nakanishi

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. This material is then extruded from nozzle 30 onto movable receiving means 41 as thin sheet-formed strip 11. *Id.* at 2:65–2:68, 3:15–19. Moveable receiving means 41 is then 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 this 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 4:64–66. This 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. 1006, 1:10–15, 2:3–8. This 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. *Roberts*

Roberts discloses “a process and apparatus for manufacturing impregnated woven or non-woven fibrous sheet materials.” Ex. 1011, 1:11–13. In this 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.

4. *Andersen*

Andersen discloses methods “for manufacturing sheets having a highly inorganically filled matrix.” Ex. 1008, Abstract. A preferred method for manufacturing the sheets of Andersen 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 12:14–26. Andersen notes that the sheets produced in this manner may be “rolled on to large spools or cut into sheets and stacked on a pallet much like paper or paperboard and stored until needed.” *Id.* at 7:3–5.

5. *Claims 11–13, 15, 17, and 21 over Nakanishi and Ramamurthi*

Petitioner contends the combination of Nakanishi and Ramamurthi discloses every limitation of independent claim 11. In particular, Petitioner contends that Nakanishi discloses dispensing a sol directly onto a moving element and Ramamurthi discloses both rolling a gel sheet into a plurality of layers and drying these layers. Pet. 25 (“Nakanishi teaches the element of dispensing a sol onto a moving element as a continuous sheet.”), 37 (noting that in at least one embodiment of Ramamurthi the “silica fiber mat/sheet was rolled up in a cylindrical shape” and dried).

Patent Owner contends the Petition fails to demonstrate that claim 11 would have been obvious over Nakanishi and Ramamurthi because, *inter alia*, Petitioner has not demonstrated that “the **gelled** silicone gel material” dispensed on the movable means in Nakanishi is a sol. Prelim. Resp. 24. We agree.

Nakanishi consistently describes the material dispensed onto the movable receiving means as a “gel material.” See Ex. 1005, 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 assert that this gel material is “a colloidal suspension of solid particles in a liquid.” See Ex. 2008, 3. Nor does Petitioner explain persuasively why one of ordinary skill in the art would have considered the gel material of Nakanishi to be a “sol,” as opposed to a gel made from a sol or catalyzed sol. Indeed, although the Petition asserts that the mixture of liquids A and B in Nakanishi is a catalyzed sol, it concludes “a [person of ordinary skill in the art] would have understood the *gel* of Nakanishi to be *made from a*

catalyzed sol.” Pet. 23–24 (emphases added); *see also* Ex. 1005, 4:21–27 (disclosing commercial “silicone gel” products that can be used as the silicone gel material in Nakanishi’s apparatus); Ex. 2003, 3:63–66 (discussing the “conversion” of a sol into a gel). Accordingly, on this record we are not persuaded that Petitioner has demonstrated sufficiently that Nakanishi discloses “dispensing a sol,” as required by claim 11.

As Petitioner has not demonstrated that Nakanishi and Ramamurthi disclose or suggest every limitation of claim 11, we are not persuaded that Petitioner has demonstrated a reasonable likelihood that the subject matter of claim 11 would have been obvious over Nakanishi and Ramamurthi. And, because claims 12, 13, 15, 17 and 21 each depend from claim 11, we are likewise not persuaded that Petitioner has demonstrated a reasonable likelihood that the subject matter of these claims would have been obvious over Nakanishi and Ramamurthi.¹¹

6. Claims 11–13, 17, and 21 over Nakanishi and Roberts or Andersen

Petitioner also asserts that claim 11, as well as dependent claims 12, 13, 17, and 21, would have been obvious over Nakanishi and Roberts or Andersen. Pet. 37–42. In each of these grounds, however, Petitioner relies upon Nakanishi as disclosing the “dispensing a sol” limitation of claim 11. Pet. 28–30, 37–39. Thus, for the reasons set forth above, we are not persuaded that Petitioner has demonstrated a reasonable likelihood that the

¹¹ Petitioner also presents a ground in which Ramamurthi is relied upon “as the base reference.” Pet. 42–43. In this ground, Petitioner continues to rely upon Nakanishi as “dispensing a sol.” *Id.* at 43. Accordingly, we are not persuaded that the challenged claims would have been obvious over this modified combination of Nakanishi and Ramamurthi.

subject matter of claim 11–13, 17, and 21 would have been obvious over Nakanishi and Roberts or Andersen.

C. Claims 18 and 19 over Nakanishi, Ramamurthi, and Chew or Leeke

Petitioner asserts that claims 18 and 19, which depend directly or indirectly from claim 11, would have been obvious over Nakanishi, Ramamurthi, and Chew or Leeke. Pet. 59–64. Petitioner does not assert that Chew or Leeke disclose “dispensing a sol.” Thus, for the reasons set forth above, we are not persuaded that the subject matter of claims 18 and 19 would have been obvious over Nakanishi, Ramamurthi, and Chew or Leeke.

D. Claims 11–13, 15, 17, and 21 over Ramamurthi and Champagne

Petitioner contends the subject matter of claims 11–13, 15, 17, and 21 would have been obvious over Ramamurthi and Champagne. Pet. 43–49.

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 “introduce[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 of Champagne and is reproduced below:

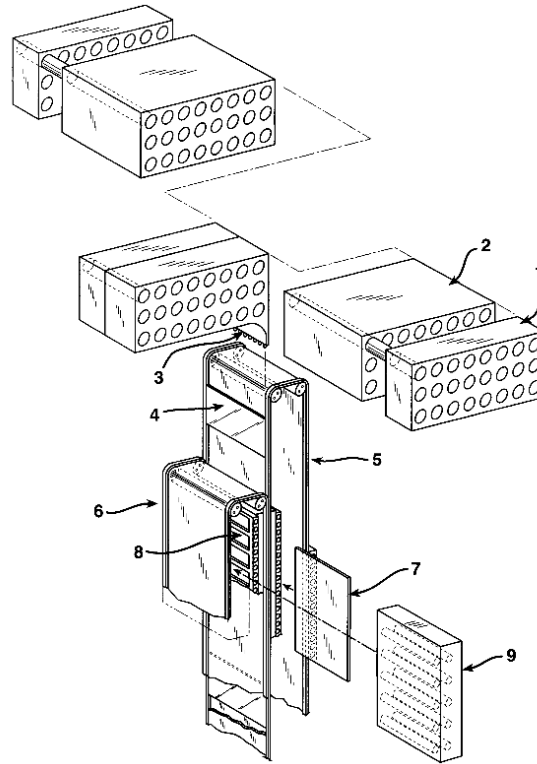


Figure 1 shows a plan view and elevation and partial cross-sectional view of a schematic of the entire continuous gel casting apparatus and method

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 contends Champagne discloses continuously dispensing a sol onto a moving element and Ramamurthi discloses forming a flexible AMC mat or sheet from a silicate sol-gel solution, rolling the resulting gel sheet into a plurality of layers, and then drying the layers, as recited in independent claim 11. Pet. 43–44, 46–48. Petitioner further contends that a person of ordinary skill in the art would have sought to utilize the moving element of Champagne in Ramamurthi in order “to scale up Ramamurthi’s process for mass production.” *Id.* at 46.

To establish that a particular combination of references would have been obvious, Petitioner must explain both *how* and *why* one of ordinary skill in the art would have combined the references to produce the claimed invention. *See Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1066 (Fed. Cir. 2016). Here, Dr. Scherer testifies that “[i]t would have been a simple design choice and a trivial matter for [a person of ordinary skill in the art] to have included the moving element and continuous feeding process described by Champagne to scale up Ramamurthi’s process for mass production.”

Ex. 1018 ¶ 170. Ramamurthi’s process, however, relies upon fiber reinforcement to provide the flexibility necessary for rolling the gel mats or sheets. Ex. 1006, Fig. 1 (noting that convention aerogels lack fiber reinforcement and are “fragile” and “susceptible to cracking”); *see also* Ex. 2007, 1:43–45 (noting that conventional aerogels are “brittle, non-flexible,” and will fracture when compressed). Petitioner directs our attention to no disclosure in Champagne of dispensing fibers within a sol,

nor does Dr. Scherer explain how one of ordinary skill in the art would have modified Champagne's apparatus and/or process to continuously dispense such a sol-fiber solution through the cylinder block and nozzle. *See* Ex. 1007, 4:35–45, 5:61–6:1. Thus, Petitioner has not demonstrated sufficiently *how* one of ordinary skill in the art would have modified Champagne to continuously dispense the fiber/sol solution of Ramamurthi on a moving element.

With respect to the “rolling” limitation of claim 11, Champagne utilizes a glass or plastic laminate backing to support the dispensed gels. *Id.* at 6:37–40 (noting that a glass or plastic laminate backing is inserted into the molding space to act as a secondary support), 6:43–45 (noting that the gel is adhered to the backing). Petitioner does not address these supports or explain how the aerogels of Ramamurthi could be dispensed onto Champagne's glass or plastic laminate supports and still be rolled. Accordingly, Petitioner has not demonstrated sufficiently how Champagne and Ramamurthi could be combined to achieve the limitations of claim 11.

In view of the foregoing, Petitioner has not demonstrated that the subject matter of claim 11 would have been obvious over Ramamurthi and Champagne. And, because challenged claims 12, 13, 15, 17, and 21 depend from claim 11, Petitioner likewise has not demonstrated that the subject matter of these claims would have been obvious over Ramamurthi and Champagne.

E. Claims 18 and 19 over Ramamurthi, Champagne, and Chew or Leeke

Petitioner contends the subject matter of claims 18 and 19 would have been obvious over Ramamurthi, Champagne, and Chew or Leeke. Pet. 64–

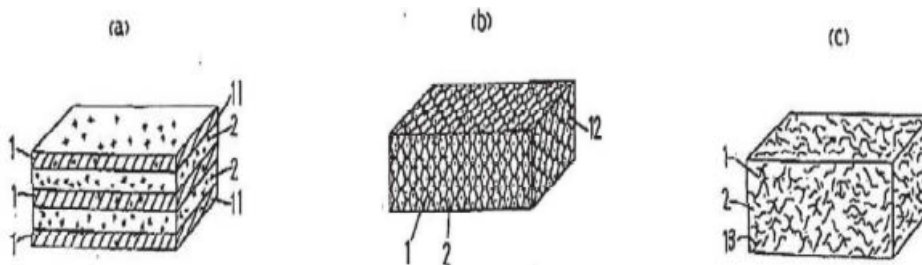
65. Petitioner does not contend, however, that Chew or Leeke resolve the deficiencies noted above with respect to Petitioner's ground based on Ramamurthi and Champagne. Accordingly, we are not persuaded that Petitioner has demonstrated a reasonable likelihood that claims 18 and 19 would have been obvious over Ramamurthi, Champagne, and Chew or Leeke.

F. Claims 11–13, 15, 17, and 21 over Sonoda and Uchida

Petitioner asserts the subject matter of claims 11–13, 15, 17, and 21 would have been obvious over Sonoda and Uchida. Pet. 49–59.

1. Sonoda

Sonoda discloses the production of aerogels. Ex. 1021 ¶¶ 3, 10. Figures 1(a)–(c) of Sonoda are reproduced below:



Figures 1(a)–(c) are perspective views of different aerogel embodiments in Sonoda

In Figure 1(a), cloth 11 and aerogel 2 (formed from a sol-form reaction solution) are alternately layered to form a laminate structure. *Id.* ¶ 27. To form the embodiment depicted in Figure 1(b), a sol-form reaction solution is poured over “glass wool-like block-form fiber aggregate 12” and gelled. *Id.* ¶ 29. To form the embodiment depicted in Figure 1(c), a sol-form reaction solution is mixed with fibers 13 and gelled to form an aerogel panel “in which fibers 13 are used as the fiber body.” *Id.* ¶ 30. In each of these

embodiments, gelling of the sol-form reaction mixture is followed by supercritical drying. *Id.* ¶¶ 27, 29, 30.

2. Uchida

Uchida discloses an apparatus for manufacturing fiber reinforced thermoplastic resin sheets. Ex. 1022, 1:7–9. Figure 1, reproduced below, depicts one embodiment of the Uchida apparatus:

FIG. 1

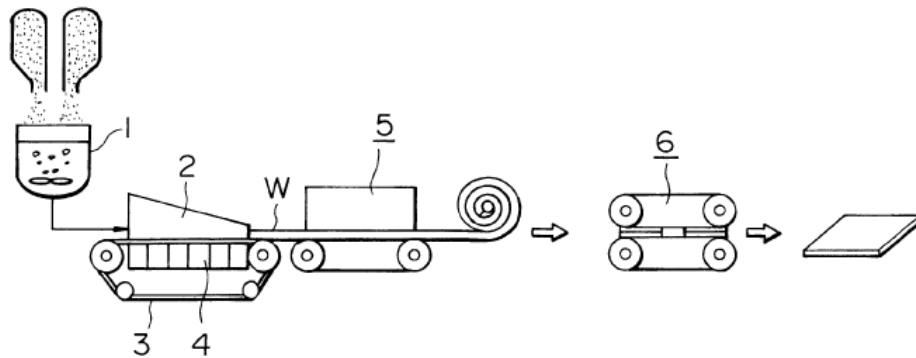


Figure 1 is a diagrammatic view illustrating equipment for wet manufacturing a fiber reinforced thermoplastic resin sheet

In Figure 1, thermoplastic resin and reinforcing fibers are mixed in dispersion tank 1. *Id.* at 2:15–26. The resulting aqueous dispersion is then transferred onto mesh belt 3 having “small pores penetrating to its reverse surface.” *Id.* at 2:32–37. The aqueous medium is then “sucked” through the small pores of the belt into suction box 4, thereby separating the thermoplastic resin and reinforcing fibers from the aqueous medium. *Id.* at 2:33–41.

The web material remaining on mesh belt 3 is transferred to drying section 5, where residual water is removed, “the thermoplastic resin is melted by heating to a temperature above the melting point of the resin,” and the resulting web “is wound into a roll by a take-up reel.” *Id.* at 2:56–65.

The web is subsequently transferred to consolidating section 6, where the web is cut and heat-pressed so that the thermoplastic resin is thoroughly impregnated into the reinforcing fibers. *Id.* at 2:66–3:2.

3. Analysis

Petitioner contends that Sonoda and Uchida disclose every limitation of independent claim 11. In particular, Petitioner contends Sonoda discloses producing an aerogel panel from a sol and Uchida discloses dispensing material onto a continuously moving element and rolling the resulting sheet into a plurality of layers. Pet. 49–52, 55–56. Petitioner further contends that one of ordinary skill in the art would have sought to implement Uchida’s moving element in Sonoda in order “to scale up Sonoda’s process for mass production” and that, in so doing, this ordinary artisan would have understood that “rolling the resultant gelled material before supercritical drying” was the “most logical choice” in order to save space and allow for more efficient drying. *Id.* at 50–52.

Patent Owner contends one of ordinary skill in the art would not have sought to dispense Sonoda’s sol-form reaction solution onto Uchida’s “porous mesh belt,” because the suction mechanism of Uchida “would suck any low-viscosity sol placed on the mesh belt through the belt, leaving no material on the belt to form a gel sheet.” Prelim. Resp. 54–55 (citing Ex. 1022, 2:33–41).

As noted by Patent Owner, the mesh belt of Uchida is designed to remove the aqueous medium from the dispensed dispersion. Ex. 1022, 2:29–41. Petitioner does not address the porous nature of Uchida’s belt or detail how any of the aerogel panel embodiments disclosed in Sonoda—which are formed from a sol-form reaction solution—could be formed

successfully on Uchida's porous belt. Pet. 55 (Petitioner relying upon Uchida's endless mesh belt and suction box in the combination of Sonoda and Uchida); Ex. 1021 ¶¶ 27, 29–30. Thus, we are not persuaded that Petitioner has explained sufficiently why one of ordinary skill in the art would have sought to combine Sonoda and Uchida, or why an ordinary artisan would have perceived a reasonable expectation of success in so doing. *See Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1165 (Fed. Cir. 2006) (noting that an obviousness determination requires that “a skilled artisan would have perceived a reasonable expectation of success in making the invention via” the proposed combination).

In view of the foregoing, we are not persuaded that Petitioner has demonstrated a reasonable likelihood that claim 11 would have been obvious over Sonoda and Uchida. And, because claims 12, 13, 15, 17, and 21 each depend from claim 11, we are likewise not persuaded that Petitioner has demonstrated a reasonable likelihood that these claims would have been obvious over Sonoda and Uchida.

G. Claims 18 and 19 over Sonoda, Uchida, and Chew or Leeke

Petitioner contends that claims 18 and 19 would have been obvious over Sonoda, Uchida, and Chew or Leeke. Pet. 64–65. Petitioner does not contend, however, that Chew or Leeke disclose dispensing a sol onto a moving element, or that these references would otherwise resolve the issues discussed above with respect to Uchida's porous belt. *Id.* Accordingly, for the reasons set forth above, Petitioner has not demonstrated a reasonable likelihood that claims 18 and 19 would have been obvious over Sonoda, Uchida, and Chew or Leeke.

III. CONCLUSION

Upon consideration of the Petition and the Preliminary Response, we conclude that Petitioner has not demonstrated a reasonable likelihood that claims 11–13, 15, 17–19, and 21 of the '890 patent would have been obvious over the recited prior art. Accordingly, we do not institute *inter partes* review with respect to any claims of the '890 patent.

IV. ORDER

It is hereby

ORDERED that the Petition is *denied* as to all challenged claims, and no trial is instituted.

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PETITIONER:

Joseph A. Mahoney
Bryan Nese
Mayer Brown LLP
jmahoney@mayerbrown.com
bnese@mayerbrown.com
alisoniprs@mayerbrown.com

PATENT OWNER:

John C. Phillips
Kevin Su
IPR41577-00031p1@fr.com
PTABInbound@fr.com