

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

FORMLABS INC.,
Petitioner,

v.

ENVISIONTEC, INC.,
Patent Owner.

Case IPR2017-01258
Patent 7,195,472 B2

Before CHRISTOPHER L. CRUMBLEY, CHRISTOPHER M. KAISER,
and MICHELLE N. ANKENBRAND, *Administrative Patent Judges*.

KAISER, *Administrative Patent Judge*.

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

INTRODUCTION

A. Background

Formlabs Inc. (“Petitioner”) filed a Petition (Paper 2, “Pet.”) requesting an *inter partes* review of claims 9–15 of U.S. Patent No. 7,195,472 B2 (Ex. 1001, “the ’472 patent”). EnvisionTEC, Inc. (“Patent Owner”) filed a Preliminary Response (Paper 6, “Prelim. Resp.”). On October 30, 2017, we instituted trial to review the patentability of claims 9–15 on nine of the 18 grounds Petitioner asserted in its Petition. Paper 12 (“Inst. Dec.”). After the decision in *SAS Inst., Inc. v. Iancu*, 138 S. Ct. 1348 (2018), we also instituted trial on the remaining nine grounds presented in the Petition (“the additional grounds”). Paper 20. The parties filed, and we granted, a joint motion to remove the additional grounds from this proceeding. Paper 22; Paper 23.

During the trial, Patent Owner filed a Response (Paper 17, “PO Resp.”), and Petitioner filed a Reply (Paper 19). Patent Owner filed Observations on the Cross-Examination of Petitioner’s reply witnesses Richard Hague and Don Elliott. Paper 27. Petitioner responded to these observations. Paper 31. In addition, Patent Owner filed a Motion to Exclude Evidence. Paper 26, (“POMot.”). Petitioner responded to the motion, and Patent Owner replied. Paper 32; Paper 38.¹ We held a hearing, the transcript of which has been entered into the record. Paper 40 (“Tr.”).

¹ Petitioner objected to Patent Owner’s Reply in Support of its Motion to Exclude (Paper 35) as exceeding the applicable page limits, and we allowed Patent Owner to file a Corrected Reply in compliance with those page limits. Paper 37; Paper 38; Ex. 3001; Ex. 3002. We consider here only Patent Owner’s shorter Corrected Reply. Our decision on Patent Owner’s Motion to Exclude would not change even if we were to consider Patent Owner’s original, over-length Reply.

We have jurisdiction under 35 U.S.C. § 6, and we issue this Final Written Decision pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. We conclude that Petitioner has established by a preponderance of the evidence that each of claims 9–15 of the '472 patent is unpatentable.

B. Related Matters

The parties note that the '472 patent is asserted in *EnvisionTEC, Inc. v. Formlabs, Inc.*, No. 2:16-cv-06812-RSWL-RAO (C.D. Cal.). Pet. v; Paper 4, 1.

C. The Asserted Grounds of Unpatentability

Petitioner contends that claims 9–15 of the '472 patent are unpatentable based on the following grounds (Pet. 13–70):²

Statutory Ground	Basis	Challenged Claim(s)
§ 102	Akamine ³	9–12 and 15
§ 103	Akamine	10 and 13–15
§ 103	Akamine, Mizukami, ⁴ and McDonald ⁵	10

² Petitioner also relies on a declaration from Richard Hague, Ph.D. Ex. 1002.

³ Akamine et al., Japanese Unexamined Patent Application Publication No. H11-348135, published Dec. 21, 1999 (certified translation provided) (Ex. 1005, “Akamine”).

⁴ Yoshiaki Mizukami, Daniel Rajniak & Masatoshi Nishimura, *An Integrated Micro-Electrophoretic Chip Fabricated Using a New Stereolithographic Process*, in THE THIRTEENTH ANN. INT’L CONF. ON MICRO ELECTRO MECHANICAL SYSTEMS 751–56 (2000) (Ex. 1007, “Mizukami”).

⁵ J. Cooper McDonald, David C. Duffy, Janelle R. Anderson, Daniel T. Chiu, Hongkai Wu, Olivier J.A. Schueller & George M. Whitesides, *Fabrication of Microfluidic Systems in Poly(dimethylsiloxane)*, 21 *Electrophoresis: An Int’l J.* 27–40 (Jan. 2000) (Ex. 1008, “McDonald”).

Statutory Ground	Basis	Challenged Claim(s)
§ 103	Akamine and Vorgitch ⁶	14
§ 103	Akamine and Hull ⁷	14
§ 102	Gotoh ⁸	9–12 and 15
§ 103	Gotoh	10 and 14
§ 103	Gotoh and Vorgitch	14
§ 103	Gotoh and Hull	14
§ 102	Mizukami	9–12 and 15
§ 103	Mizukami	10, 14, and 15
§ 103	Mizukami and McDonald	10
§ 103	Mizukami and Vorgitch	14
§ 103	Mizukami and Hull	14
§ 103	Mizukami and Akamine	9–12, 14, and 15
§ 103	Mizukami, Akamine, and McDonald	10
§ 103	Mizukami, Akamine, and Vorgitch	14
§ 103	Mizukami, Akamine, and Hull	14

Following the parties’ joint motion to remove the final nine grounds listed above, only the first nine listed grounds remain in the proceeding. Paper 22; Paper 23.

D. The ’472 Patent

The ’472 patent, titled “Apparatus and Method for the Non-Destructive Separation of Hardened Material Layers from a Flat

⁶ Vorgitch et al., U.S. Patent No. 5,182,715, issued Jan. 26, 1993 (Ex. 1009, “Vorgitch”).

⁷ Hull, U.S. Patent No. 4,575,330, issued Mar. 11, 1986 (Ex. 1010, “Hull”).

⁸ Gotoh, Japanese Patent Application Publication No. 1994-81727, published Nov. 22, 1994 (certified translation provided) (Ex. 1006, “Gotoh”).

Construction Plane,” issued on March 27, 2007. Ex. 1001, at [45], [54]. It relates to “building up three-dimensional objects in layers from ‘light-hardening’ photopolymers.” *Id.* at 1:9–10. In this construction method, the ’472 patent notes that “the layer to be produced is selectively exposed on a transparent reference plane . . . through the [reference plane], and polymeri[z]ed [or] hardened.” *Id.* at 1:15–17. After each layer is polymerized or hardened, the newly formed layer must be separated “from the transparent reference plane in such a way that it remains stuck to the previously produced layers, and both the [new] layer and the already produced part of the object is not deformed or even destroyed or torn off by the separating force.” *Id.* at 1:33–44.

The ’472 patent describes a structure that “allows easy separation of the hardened layer from the transparent reference plane.” *Id.* at 2:11–12. It purports to achieve this objective “independently of . . . the hardened surface area, . . . the formation of the surface structure of the hardened layer, [or] the hardening material used.” *Id.* at 2:3–9. One embodiment of this structure comprises “the application of an optically transparent silicone layer to the [reference plane] oriented towards the photopolymer.” *Id.* at 4:40–42.

When the hardened layers are separated, “in the whole silicone layer elastic deformation takes place and the internal stresses in the silicone layer lead to the regions of the silicone layer which adhere to the hardened material layer being peeled off.” *Id.* at 4:42–48. This requires “good adhesion of the silicone layer to the bottom plate,” or that “the adhesion between silicone layer and bottom plate is greater by a multiple than the adhesion between silicone layer and hardened material.” *Id.* at 4:49–53.

E. Illustrative Claim

Claims 9–15 of the '472 patent are challenged. Claim 9 is independent and illustrative; it recites:

9. An apparatus for the separation of a material layer that is hardened on a flat plane, which serves as a reference, the apparatus comprising a flexible, elastic separating layer arranged between plane and material layer, the elastic separating layer comprising a gel-like elastic material that is applied directly to the plane.

Ex. 1001, 5:51–56. In addition, although Patent Owner does not concede the unpatentability of any claim, it does not affirmatively dispute Petitioner's evidence or argument as to the unpatentability of any claim except claim 10. PO Resp. 2; Tr. 29:11–19. That claim recites:

10. The apparatus according to claim 9, wherein the gel-like layer has an adhesion to the plane that is greater by a multiple than adhesion of the gel-like layer to the hardened material layer.

Ex. 1001, 6:1–4.

ANALYSIS

A. Claim Construction

In an *inter partes* review, we construe claim terms in an unexpired patent according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); see *Cuozzo Speed Techs. LLC v. Lee*, 136 S. Ct. 2131, 2144 (2016) (upholding the use of the broadest reasonable interpretation standard). Claim terms generally are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

Petitioner proposes construing both “gel-like elastic material” and “greater by a multiple.” Pet. 9–11; Reply 3–4. Patent Owner proposes construing both of these terms, as well as “adhesion.” PO Resp. 23–30.

1. “*Gel-Like Elastic Material*”

The term “gel-like elastic material” appears in claim 9. Ex. 1001, 5:51–56. Petitioner proposes construing this term “broadly enough to cover at least . . . a material that has the required elasticity for being deformable, yet [sic] the elasticity for recovering its original state after deformation.” Pet. 10; see Reply 4 (arguing that the actual construction may be broader than this but that no precise construction is required beyond this). Petitioner argues that this construction gives the term the definition given to it by the applicant during prosecution of the ’472 patent. *Id.* (quoting Ex. 1004, 15). We note that Petitioner does not argue that the construction of “gel-like elastic material” should be limited to precisely the given definition. Instead, Petitioner argues merely that the broadest reasonable interpretation should be at least broad enough to encompass a material according to that definition. Pet. 10; Reply 4.

Patent Owner, on the other hand, argues that the prosecution history limits the meaning of “gel-like elastic material” to precisely the scope stated therein: “a material that has the required elasticity for being deformable, yet [sic] has the elasticity for recovering its original state after deformation.” PO Resp. 23–25 (quoting Ex. 1004, 15). Accordingly, Patent Owner asks us to construe the term “gel-like elastic material” in this limited way. *Id.*

On the record developed during this proceeding, we agree with Patent Owner. During prosecution, the applicant argued that “the general understanding of the term ‘gel-like elastic material[]’ to one of ordinary skill

in the art . . . is a material that has the required elasticity for being deformable, yet [sic] the elasticity for recovering its original state after deformation.” Ex. 1004, 15. An inventor may define specific terms used to describe an invention, but must do so “with reasonable clarity, deliberateness, and precision” and must “‘set out his uncommon definition in some manner within the patent disclosure’ so as to give one of ordinary skill in the art notice of the change” in meaning. *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (quoting *Intellicall, Inc. v. Phonometrics, Inc.*, 952 F.2d 1384, 1387–88 (Fed. Cir. 1992)). This definition may appear in either the patent specification or the prosecution history. *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002); *see also Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 789 F.3d 1335, 1343 (Fed. Cir. 2015) (“Applicants can define . . . claim scope during prosecution,” just as they can in a patent specification.). In our view, the statement in the prosecution history that “the general understanding of . . . ‘gel-like elastic material[]’ . . . **is** a material that has the required elasticity for being deformable, yet the elasticity for recovering its original state after deformation” is a reasonably clear, deliberate, and precise definition of the term. Ex. 1004, 15 (emphasis added). Accordingly, at least on this record, this is the proper interpretation of “gel-like elastic material.”

Thus, we construe “gel-like elastic material” as “a material that has the required elasticity for being deformable, yet the elasticity for recovering its original state after deformation.”

2. “Adhesion”

Patent Owner proposes construing the term “adhesion” as “separation force per unit area.” PO Resp. 26–27. Petitioner argues that no construction

of “adhesion” is necessary but does not otherwise object to Patent Owner’s proposed construction. Reply 4. The evidence of record supports Patent Owner’s proposed construction. Pet. 28 (arguing that “the adhesion of the silicone coating to the hardened resin is approximately $1.85 \times 10^4 \text{ N/m}^2$ ”); Ex. 1001, 1:65–2:7 (suggesting that adhesion is “independent[] of [the] hardened surface area”); Ex. 1007, Fig. 5 (reporting “Adhesion strength” in units of “N/m²”); Ex. 2001 ¶ 46 (“Adhesion is a well-known evaluation of the force *per unit area* required to separate two surfaces.”); Ex. 2002, 147:13–149:9 (“The adhesion strength is an overall number that is agnostic of the actual cross-section[al] area that is being produced.”). Accordingly, on the record developed during this proceeding, we conclude that the proper construction of “adhesion” is “separation force per unit area.”

3. “*Greater by a Multiple*”

Claim 10 recites “the gel-like layer has an adhesion to the plane that is greater by a multiple than adhesion of the gel-like layer to the hardened material layer.” Ex. 1001, 6:1–4. Both parties agree that this phrase should be interpreted as requiring that the adhesion of the gel-like layer to the plane is equal to the adhesion of the gel-like layer to the hardened material layer multiplied by some number. Pet. 11; PO Resp. 27–30. The parties disagree, however, as to what values this multiplier may take. Petitioner argues that the number by which the adhesion of the gel-like layer to the hardened material layer is multiplied should be “any integer or non-integer multiplier large enough to ensure that the gel-like layer remains adhered to the plane while separating from the hardened material layer.” Pet. 11. Patent Owner argues that the multiplier must be “two or more.” PO Resp. 27–30.

Petitioner adverts to the “two or more” construction in its Petition. Pet. 23. Petitioner states that “no justification . . . exists” for adopting this construction. *Id.* In particular, Petitioner argues that this alternate construction would be narrower than Petitioner’s proposed construction. *Id.* (“If the claim were interpreted more narrowly . . . it would also have been obvious to a POSA . . . to have an adhesion to the transparent plate . . . that is at least twice as great as its adhesion to the hardened resin layer.”); Reply 5 (citing Ex. 1002 ¶¶ 81–84; Ex. 2001 ¶¶ 54–58).

The parties both agree that Petitioner’s proposed functional construction is broader than the “at least twice” alternate construction. Patent Owner argues that the functional construction is broader when it says that Petitioner’s proposed functional construction is “unreasonably broad” but that the “at least twice” construction “is correct.” PO Resp. 28. Petitioner agrees that its proposed construction is broader. Reply 5. At the oral hearing, Petitioner argued that Patent Owner “is alleging” that “greater by a multiple” “means greater by at least a factor of 2,” while, under Petitioner’s construction, “the claim can be met by some smaller multiples less than 2.” Tr. 11:13–15. There is evidence to support this agreement between the parties. Dr. Hague testifies that the “at least twice” construction is narrower. Ex. 1002 ¶¶ 81–84. Dr. Gall testifies that the functional construction “is unreasonably broad,” but adopts the “at least twice” construction. Ex. 2001 ¶¶ 54–58. Thus, we are persuaded that, on the record developed during trial, Petitioner’s proposed functional construction is broader in scope than the alternative “at least twice” construction.

Because Petitioner’s proposed construction is broader than the alternative, if it is reasonable, it is the broadest reasonable construction we

have been offered. The parties dispute whether this construction is reasonable. There is, however, no need for us to resolve this dispute. As discussed below, Petitioner has shown by a preponderance of the evidence that the challenged claims are unpatentable even under the narrower “at least twice” construction. Because the claims are unpatentable under the narrower construction, they also would be unpatentable under the broader construction, and we need not decide whether the broader construction is reasonable.

Accordingly, for purposes of this decision, we base our analysis on Patent Owner’s construction of “greater by a multiple” as “at least twice.”

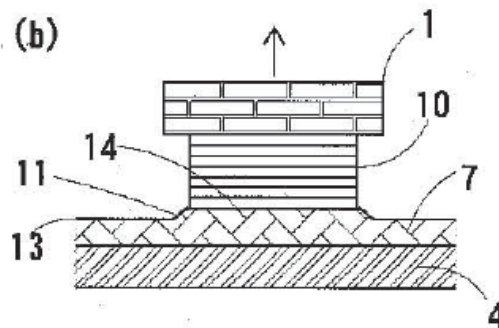
B. Asserted Grounds Based on Akamine

Petitioner argues that Akamine anticipates claims 9–12 and 15. Pet. 13–22. Petitioner also argues that the subject matter of claims 10 and 13–15 would have been obvious to a person of ordinary skill in the art given the teachings of Akamine. *Id.* at 23–27. In addition, Petitioner argues that the subject matter of claim 10 would have been obvious to a person of ordinary skill in the art given the teachings of Akamine, Mizukami, and McDonald; that the subject matter of claim 14 would have been obvious to a person of ordinary skill in the art given the teachings of Akamine and Vorgitch; and that the subject matter of claim 14 would have been obvious to a person of ordinary skill in the art given the teachings of Akamine and Hull. *Id.* at 27–34. Patent Owner does not contest any of these unpatentability assertions, with the following exceptions. Patent Owner argues that claim 10 is not anticipated by Akamine and would not have been obvious to a person of ordinary skill in the art given the teachings of Akamine or the combined teachings of Akamine, Mizukami, and McDonald.

PO Resp. 2 (“Envisiontec provides this Response only for claim 10 of the ‘472 Patent. Envisiontec respectfully requests that the Board deny the Petition on Grounds 1-3 and 6-7 with respect to claim 10.”); Tr. 29:11–19 (“... we are only challenging claim 10 affirmatively.”).

1. *Akamine*

Akamine relates to “a photofabrication device which allows a layered fabricated material to be readily peeled from a light energy irradiation face, thereby resolving accidents involving breakage of the fabricated article layer.” Ex. 1005, 2. Akamine teaches that “[t]he peeling operation for the next layering and fabrication is . . . difficult, and if stress on the layered fabricated article **10** is too great, then the layered fabricated article will break.” *Id.* ¶ 23. A solution to this problem is shown in Akamine Figure 4(b), which is reproduced below:



Akamine Figure 4(b) depicts an apparatus for manufacturing a layered article. Light energy irradiation face 13 includes “elastically deformable high polymer material 7.” *Id.* ¶ 26. When “layered fabricated article **10** is moved in the direction of separation from the light energy irradiation face **13** in preparation for molding of the next layer, an elastically deformable portion **11** . . . is generated due to the elastic characteristics thereof.” *Id.* Because of this, “separation can occur without leading to breakage of the

layered fabricated article.” *Id.* The sequence of separating the cured layer from the irradiation face, curing the next layer, then separating the newly cured layer from the irradiation face again is carried out repeatedly to manufacture layered fabricated article 10. *Id.* ¶ 27.

2. Mizukami

Mizukami relates to “fabricat[ing] three-dimensional microstructures by solidifying a photopolymerizable resin layer-by-layer via the scanning of a laser beam.” Ex. 1007, 752. The process disclosed in Mizukami is illustrated in Figure 2(a) of Mizukami, which is reproduced below:

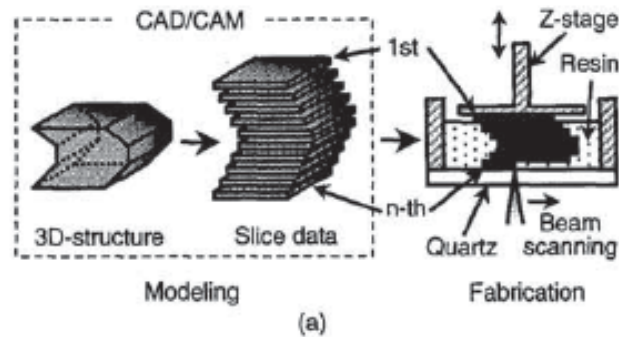


Figure 2(a) of Mizukami depicts a fabrication process. “First, a three-dimensional structure is designed and an arbitrary number (n) of two-dimensional sliced shapes of the final structure, the so-called ‘slice data,’ are created using a CAD/CAM system.” *Id.* Next, “a first layer is fabricated by solidifying the liquid resin via the scanning of the laser beam according to the coordinate information in the slice data.” *Id.* This occurs in a resin reservoir with a quartz glass bottom. *Id.* Then the Z-stage is lifted up one layer, allowing the fabrication of a second layer, and “[t]he final structure is completed by repeating the same operation until the final n -th layer is created.” *Id.* In one embodiment of Mizukami, a silicone coating is applied

to the quartz glass of the reservoir bottom in order to reduce the strength of adhesion between the hardened resin layers and the quartz glass bottom. *Id.* at 753.

3. *McDonald*

McDonald relates to rapid prototyping of three-dimensional objects using printing and lithography techniques. Ex. 1008, 28–29. McDonald describes fabricating a layer of poly(dimethylsiloxane) (PDMS), then irreversibly sealing a surface of the PDMS to a glass plate. *Id.* at 27, 31. McDonald teaches that the seal between PDMS and glass can “withstand[] pressures of 30–50 psi.” *Id.* at 31.

4. *Vorgitch*

Vorgitch “relates generally to improvements in a stereolithography method and apparatus for the production of three-dimensional objects.” Ex. 1009, 1:9–11. As in Akamine and Mizukami, the stereolithography system of Vorgitch includes a vat containing the resin that can be hardened into the layers of the object being fabricated. *Id.* at 7:65–66, 8:61–67. In Vorgitch, the vat is “removable” and can “be easily replaced.” *Id.*

5. *Hull*

Hull “relates generally to improvements in apparatus for forming three-dimensional objects from a fluid medium and, more particularly, to stereolithography involving the application of lithographic techniques to production of three-dimensional objects.” Ex. 1010, 1:7–14. As in Akamine, Mizukami, and Vorgitch, Hull discloses a “container” that “is filled with a UV curable liquid.” *Id.* at 6:28. In Hull, “there may be several containers . . . each container having a different type of curable material that

can be automatically selected by the stereolithographic system.” *Id.* at 9:32–39.

6. *Analysis: Anticipation by Akamine*

Petitioner argues that all limitations of claims 9–12 and 15 are disclosed by Akamine. Pet. 13–22. We conclude that Petitioner has shown by a preponderance of the evidence that Akamine discloses all the limitations of claims 9, 11, 12, and 15. We do not reach the issue of the unpatentability of claim 10 on this ground. This issue is moot because we conclude that claim 10 is unpatentable on the ground of obviousness over the combination of Akamine, Mizukami, and McDonald, as discussed below.

a. Claim 9

As Petitioner argues, claim 9 recites three limitations: “[a]n apparatus for the separation of a material layer that is hardened on a flat plane” and “a flexible, elastic separating layer arranged between plane and material layer,” wherein “the elastic separating layer compris[es] a gel-like elastic material that is applied directly to the plane.” Pet. 12. Akamine discloses cured layers 3 of resin in fabricated article 10. Ex. 1005 ¶¶ 19, 23, Fig. 4. It also discloses transparent plate 4, on which the resin layers are cured using irradiation by light energy. *Id.* ¶¶ 19–20, Fig. 2, Fig. 4. Patent Owner does not contest this evidence or Petitioner’s assertion that Akamine anticipates claim 9. We find that Petitioner has shown by a preponderance of the evidence that Akamine discloses the “apparatus for the separation of a material layer that is hardened on a flat plane” limitation of claim 9.

Akamine also discloses layer 7 located between transparent plate 4 and cured layers 3. *Id.* ¶ 26, Fig. 4. Akamine discloses that layer 7 is an

“elastically deformable high polymer material.” *Id.* ¶ 26. When fabricated article 10 “is moved in the direction of separation from the light energy irradiation face,” “an elastically deformable portion” of layer 7 “is generated,” “and separation can occur without leading to breakage of the layered fabricated article.” *Id.* Patent Owner does not contest this evidence or Petitioner’s assertion that Akamine anticipates claim 9. We find that Petitioner has shown by a preponderance of the evidence that Akamine discloses the “flexible, elastic separating layer arranged between plane and material layer” limitation of claim 9.

As noted above, “gel-like elastic material” is “a material that has the required elasticity for being deformable, yet the elasticity for recovering its original state after deformation.” Akamine discloses that layer 7 is “elastically deformable” and that layer 7 elastically deforms when fabricated article 10 is separated from transparent plate 4. *Id.* Akamine also discloses that the sequence of preparing a gap between the cured layers and the irradiation face, then curing a new layer, then peeling the fabricated article off the irradiation face is repeated to create a series of layers making up the fabricated article. *Id.* ¶ 27. Based on these disclosures, Petitioner directs us to evidence suggesting that a person of ordinary skill in the art would have understood that layer 7 returns to its original shape after deforming upon separation of fabricated article 10 from transparent plate 4. Pet. 18 (citing Ex. 1002 ¶ 59). In addition, Akamine discloses that layer 7 is part of “an irradiation face” that “is a composite molded body formed with a transparent glass or plastic plate.” Ex. 1005 ¶ 26. Patent Owner does not contest this evidence or Petitioner’s assertion that Akamine anticipates claim 9. We find that Petitioner has shown by a preponderance of the evidence that Akamine

discloses the “gel-like elastic material that is applied directly to the plane” limitation of claim 9.

b. Claim 10

Claim 10 depends from claim 9 and adds a limitation requiring that the “gel-like layer ha[ve] an adhesion to the plane that is greater by a multiple than adhesion of the gel-like layer to the hardened material layer.” Ex. 1001, 6:1–4. As discussed below, we determine that Petitioner has shown by a preponderance of the evidence that claim 10 is unpatentable as obvious over the combination of Akamine, Mizukami, and McDonald. See *infra* § B.8. Accordingly, we do not reach the unpatentability of claim 10 as anticipated by Akamine. *Beloit Corp. v. Valmet Oy*, 742 F.2d 1421, 1423 (Fed. Cir. 1984) (once a dispositive issue is decided, there is no need to decide other issues).

c. Claim 11

Claim 11 depends from claim 9 and adds a limitation requiring that the “gel-like separating layer [be] structured and arranged to elastically deform during a separation of the separating layers from the hardened material layer and to return to its original state after complete detachment from the hardened material layer.” Ex. 1001, 6:5–10. As discussed above, we find that Petitioner has made a sufficient showing that layer 7 of Akamine is a “gel-like elastic material,” in that layer 7 is “a material that has the required elasticity for being deformable, yet the elasticity for recovering its original state after deformation.” In addition, as discussed above, Akamine discloses that layer 7 actually does deform upon separation of fabricated article 10, and we find that Petitioner has shown sufficiently that layer 7 returns to its original shape after separation of article 10. Patent

Owner does not contest this evidence or Petitioner's assertion that Akamine anticipates claim 11. We find that Petitioner has shown by a preponderance of the evidence that Akamine discloses the "structured and arranged to elastically deform" limitation of claim 11.

d. Claim 12

Claim 12 depends from claim 9 and requires that the apparatus "further compris[e] a lateral frame that, in combination with the plane, forms a kind of holding basin for nonhardened material on a side of the gel-like separating layer." Ex. 1001, 6:11–14. The apparatus of Akamine includes resin fabrication tank 2 with transparent plate 4 as its bottom face. Ex. 1005 ¶ 12, Fig. 1. Patent Owner does not contest this evidence or Petitioner's assertion that Akamine anticipates claim 12. We find that Petitioner has shown by a preponderance of the evidence that Akamine discloses the "lateral frame" limitation of claim 12.

e. Claim 15

Claim 15 depends from claim 9 and requires both that "the reference plane comprise[] a transparent plate" and that "the separating layer also [be] transparent." Ex. 1001, 6:22–24. Akamine's plate 4 is disclosed as transparent. Ex. 1005 ¶ 26, Fig. 4. Petitioner argues that a person of ordinary skill in the art would have understood that Akamine's layer 7 also is transparent, because "it coats the transparent plate 4 and is between the light source 6 and the liquid resin 3." Pet. 22 (citing Ex. 1002 ¶ 78; Ex. 1005, Fig. 1). Patent Owner does not contest this evidence or Petitioner's assertion that Akamine anticipates claim 15. We find that Petitioner has shown by a preponderance of the evidence that Akamine

discloses the “transparent plate” and transparent separating layer limitations of claim 15.

Thus, we find that Petitioner has shown by a preponderance of the evidence that Akamine discloses the limitations of claims 9, 11, 12, and 15 and, therefore, anticipates those claims.

7. *Analysis: Obviousness over Akamine*

Petitioner argues that the subject matter of claims 10 and 13–15 would have been obvious to a person of ordinary skill in the art given the teachings of Akamine. Pet. 23–27. We find that Petitioner has shown by a preponderance of the evidence that Akamine would have taught or suggested all the limitations of claims 13–15. We do not reach the issue of the obviousness of claim 10 over Akamine alone, because this issue is moot in light of our conclusion that claim 10 is obvious over the combination of Akamine, Mizukami, and McDonald.

Each of claims 10 and 13–15 depends from claim 9. Ex. 1001, 6:1–25. Accordingly, each of these claims incorporates all the limitations of claim 9. 37 C.F.R. § 1.75(c). As discussed above, Petitioner has shown by a preponderance of the evidence that Akamine discloses every limitation of claim 9.

a. Claim 10

As discussed below, we determine that Petitioner has shown by a preponderance of the evidence that claim 10 is unpatentable as obvious over the combination of Akamine, Mizukami, and McDonald. *See infra* § B.8. Accordingly, we do not reach the unpatentability of claim 10 as obvious over Akamine. *Beloit Corp.*, 742 F.2d at 1423 (once a dispositive issue is decided, there is no need to decide other issues).

b. Claim 13

Claim 13 depends from claim 12 and adds a limitation requiring that “the lateral frame [be] formed from the same gel-like material as the separating layer.” Ex. 1001, 6:15–17. As discussed above, Petitioner has shown by a preponderance of the evidence that Akamine discloses every limitation of claim 12. With respect to claim 13, Petitioner admits that “Akamine is silent regarding what material forms the lateral walls . . . of the resin fabrication tank.” Pet. 24. Petitioner argues, however, that “it would have been an obvious design alternative for a [person of ordinary skill in the art] to construct the lateral walls from the same . . . material as the separating layer.” *Id.* (citing Ex. 1002 ¶¶ 67–68). Petitioner directs us to evidence suggesting that the ordinarily skilled artisan would have understood this construction method as “easier and/or less costly” or “more efficient.” *Id.* at 24–25 (citing Ex. 1002 ¶ 68). Additionally, Petitioner directs us to evidence suggesting that using the same material “for all of the tank surfaces that come in contact with the resin” would be advantageous in that “only that single material . . . would then need to be tested or otherwise confirmed for compatibility . . . with the resin.” *Id.* at 25 (citing Ex. 1002 ¶ 68). Patent Owner does not contest this evidence or Petitioner’s assertion that claim 13 would have been obvious over Akamine. We find that Petitioner has shown by a preponderance of the evidence that a person of ordinary skill in the art would have found it obvious to modify the disclosure of Akamine to meet the lateral frame material limitation of claim 13.

c. Claim 14

Claim 14 depends from claim 12 and adds a limitation requiring that “the holding basin comprise[] a frame and a bottom plate and together the

holding basin and the gel-like separating layer [be] an exchangeable unit.” Ex. 1001, 6:18–21. As discussed above, Petitioner has shown by a preponderance of the evidence that Akamine discloses every limitation of claim 12. With respect to claim 14, as discussed above, Akamine’s resin fabrication tank 2 includes both side walls and transparent bottom plate 4, and Akamine’s layer 7 is attached to the bottom plate of Akamine’s resin fabrication tank 2. Ex. 1005, Fig. 1, Fig. 4. Patent Owner does not contest this evidence or Petitioner’s assertion that claim 14 would have been obvious over Akamine. We find that Petitioner has shown by a preponderance of the evidence that Akamine teaches or suggests the holding basin limitation of claim 14.

Petitioner argues that a person of ordinary skill in the art “would have been motivated to make [the holding basin of Akamine] ‘exchangeable’” in order “to enable the photopolymer material in the tank to be exchanged, allowing for fabrication of different objects and/or different layers out of different materials” or “for ease of emptying and/or cleaning the tank, and/or for expedient repair or replacement of the tank as a unit.” Pet. 26 (citing Ex. 1002 ¶¶ 71, 72, 74–75). Additionally, Petitioner argues that a person of ordinary skill in the art “would also have understood that configuring the tank as a removable unit would have provided beneficial access (e.g., for inspection and/or repair) to the light source and/or other components located beneath the tank.” *Id.* (citing Ex. 1002 ¶ 73). Patent Owner does not contest this evidence or Petitioner’s assertion that claim 14 would have been obvious over Akamine. We find that Petitioner has shown by a preponderance of the evidence that a person of ordinary skill in the art would

have found it obvious to modify the disclosure of Akamine to meet the exchangeability limitation of claim 14.

d. Claim 15

As discussed above, we find that Petitioner has shown by a preponderance of the evidence that Akamine discloses the “transparent plate” and transparent separating layer limitations of claim 15. In addition, Petitioner directs us to evidence suggesting that a person of ordinary skill in the art would have understood that making Akamine’s layer 7 transparent would “allow unimpeded transfer of light energy through the plate and the separating layer for the most efficient and precise curing of the resin” and would “be desirable for efficiency and quality of photofabrication.” Pet. 27 (citing Ex. 1002 ¶ 80). Patent Owner does not contest this evidence or Petitioner’s assertion that claim 15 would have been obvious over Akamine. We find that Petitioner has shown by a preponderance of the evidence that Akamine teaches or suggests the limitations of claim 15.

Thus, we find that Petitioner has shown by a preponderance of the evidence that Akamine teaches or suggests the limitations of claims 13–15. Further, we find that Petitioner has shown by a preponderance of the evidence that there would have been an adequate reason to modify Akamine in the manner proposed. Pet. 23–27. We are not persuaded that Petitioner has shown by a preponderance of the evidence that Akamine teaches or suggests the limitations of claim 10.

8. *Analysis: Obviousness over Akamine, Mizukami, and McDonald*

a. Limitations of Claim 10

Petitioner argues that the combination of Akamine, Mizukami, and McDonald would have taught or suggested every limitation of claim 10 of the '472 patent and that a person of ordinary skill in the art would have had a reason to combine these references. Pet. 27–33. According to Petitioner, Akamine teaches or suggests the limitations of claim 9, including the “gel-like elastic layer that is applied directly to the plane,” and Mizukami and McDonald teach the strength of adhesion between Akamine’s silicone gel-like layer and both the glass plane and the hardened resin layer. *Id.* Specifically, according to Petitioner, Mizukami teaches that silicone and hardened resin adhere with a strength of “approximately 1.85×10^4 N/m²,” and McDonald teaches that poly (dimethylsiloxane) and glass adhere with a strength of “ 20.6×10^4 to 34.5×10^4 N/m².” *Id.* at 28, 31 (citing Ex. 1002 ¶¶ 88, 93; Ex. 1007, Fig. 5; Ex. 1008, 31). Petitioner argues that these values differ by a factor of between 11.1 and 18.6, which is large enough to satisfy either proposed construction of “greater by a multiple.” *Id.* at 31.

We note first that, as discussed above, Petitioner has shown by a preponderance of the evidence that Akamine discloses the limitations of claim 9, including the “gel-like elastic layer that is applied directly to the plane.” This leaves only the questions of whether the prior art teaches the appropriate adhesion values and whether the person of ordinary skill in the art would have had reason to combine the teachings of Akamine with those of Mizukami and McDonald.

On the first question, Petitioner is correct that Mizukami reports an adhesion value between a silicone coating and hardened “acrylic resin” of

“approximately $1.85 \times 10^4 \text{ N/m}^2$.” Ex. 1007, 753, Fig. 5. Patent Owner argues that this value is irrelevant to Akamine’s apparatus, because Akamine’s silicone layer is flexible and elastic, and there is insufficient evidence to suggest that Mizukami’s silicone coating possesses these same properties. PO Resp. 51. We disagree. First, although Mizukami’s silicone is described as a “coating” rather than a layer, Ex. 1007, 753, Akamine’s silicone, which is flexible and elastic, also is described as a “coating.” Ex. 2001 ¶ 59. Second, the silicone layers in Akamine and Mizukami have the same purpose: promoting the separation of the hardened resin layers from the glass tank bottom. Ex. 1005 ¶¶ 6–7; Ex. 1007, 753. The evidence of record establishes that flexibility and elasticity are necessary for a layer to carry out this purpose. Ex. 1024, 81:7–82:10, 84:18–85:17, 138:6–139:9. Thus, the evidence suggests that Mizukami’s silicone layer, like Akamine’s, is gel-like, flexible, and elastic.

Even if Mizukami’s silicone layer is rigid rather than gel-like, the silicone-resin adhesion value reported there still is relevant. Less force is required to peel an object off a gel-like layer than to peel the same object off a rigid layer. Ex. 1024, 84:18–85:17, 107:19–110:6. Accordingly, if the adhesion value reported in Mizukami is for a rigid silicone layer, the value for a gel-like but otherwise similar layer must be even lower. That is, Mizukami’s adhesion value places an upper bound on the adhesion obtained in Akamine, meaning that the adhesion obtained in Akamine must be equal to or lower than Mizukami’s reported value. Because the silicone-resin adhesion is in the denominator of the ratio recited in claim 10, lower values than those reported in Mizukami would lead to even higher ratios than those Petitioner argues are present. Thus, either Mizukami’s silicone layer is gel-

like, in which case Akamine's adhesion value is the same as Mizukami's adhesion value, or Mizukami's silicone layer is rigid, in which case Akamine's adhesion value is lower than Mizukami's adhesion value. In either case, the ratio of adhesion values in Akamine's apparatus would be equal to or higher than the value for which Petitioner argues.

An adhesion ratio for Akamine cannot be calculated without also knowing the strength of the adhesion between Akamine's silicone and the glass bottom of the tank. Petitioner directs us to McDonald for this value, arguing that McDonald teaches an adhesion value of between 20.6×10^4 and 34.5×10^4 N/m². Pet. 28, 31 (citing Ex. 1002 ¶¶ 88, 93; Ex. 1007, Fig. 5; Ex. 1008, 31). This is based on McDonald's statement that an irreversible sealing of silicone to glass "withstands pressures of 30–50 psi." Ex. 1008, 31. Patent Owner responds with several arguments.

First, Patent Owner argues that McDonald is not analogous art to the challenged claims because it "does not concern any type of additive manufacturing." PO Resp. 48, 50–51. A reference is analogous art if either of two conditions is met: it is "in the field of the [challenged patent]," or it "is reasonably pertinent to the problem with which the inventor was concerned." *In re Kahn*, 441 F.3d 977, 986–87 (Fed. Cir. 2006) (citing *In re Oetiker*, 977 F.2d 1443, 1447 (Fed. Cir. 1992)). Even if Patent Owner is correct that McDonald's field is separate from the additive manufacturing of the challenged patent, this does not answer the question of whether McDonald is reasonably pertinent to a problem solved by the '472 patent. We find that it is. "It is the object of [the '472 patent] to provide a solution for a separating layer . . . which . . . allows easy separation of the hardened layer from the transparent reference plane." Ex. 1001, 2:3–12. This requires

sealing the separating layer, which can be made of silicone, to a glass plate in such a way that there is “good adhesion” between them. *Id.* at 4:49–53. McDonald, meanwhile, relates to sealing a silicone object to a glass plate in such a way as to avoid the silicone separating from the plate during operation. Ex. 1008, 31. In both cases, the object is to avoid the silicone separating from the glass. Accordingly, we find that McDonald “is reasonably pertinent to the problem with which the inventor [of the ’472 patent] was concerned.” *Kahn*, 441 F.3d at 986–87.

Second, Patent Owner argues that McDonald “does not disclose use of a ‘gel-like’ separating layer” because its silicone layer is not used “as a separating layer.” PO Resp. 50 (citing Ex. 2002, 81). But this argument ignores the argument made by Petitioner: that Akamine teaches the use of a gel-like separating layer made of silicone on top of a glass plate, and that McDonald simply teaches the strength of the adhesion between the silicone and the glass. Pet. 30–31. Because, as discussed above, Akamine teaches the use of a gel-like separating layer, it is irrelevant that McDonald does not also teach this limitation. The references used in an obviousness combination under 35 U.S.C. § 103 do not need to amount individually to references capable of proving anticipation under § 102.

Finally, Patent Owner argues that McDonald’s “30–50 psi” teaching is not an adhesion value but instead “the capillary pressure that unseats the [silicone layer].” PO Resp. 49–50. Patent Owner is correct that McDonald’s reference to a pressure of between 30 and 50 psi is describing the pressure of fluid within a small capillary tube formed between the silicone layer and the glass plate, rather than a pressure that might be applied over the entire surface of the silicone-glass interface. Ex. 1008, 31. But the

evidence of record shows that this measurement is a reasonable estimate of the adhesion between the silicone and the glass. When McDonald's device fails at pressures above 30 or 50 psi, it does not fail in a way that involves the silicone peeling away from the glass at all. Instead, McDonald teaches that "attempting to break the seal results in failure in the bulk [silicone]." Ex. 1008, 31. Dr. Hague testifies that this means that the silicone "itself would tear somewhere in the body of the [silicone], not at the interface of the [silicone] and the glass." Ex. 1025 ¶ 77. Thus, breaking the adhesion requires applying a pressure greater than 30–50 psi, with the pressure reported in McDonald simply representing the pressure at which the device as a whole, rather than the silicone-glass interface, fails.

Even assuming that the silicone-glass adhesion fails at the pressure reported in McDonald, Dr. Hague testifies that the "30–50 psi" of McDonald is the upper limit of the pressure that will avoid "causing the [silicone] to separate at all from the glass," or to begin peeling off the glass, as opposed to the pressure necessary to remove the entire silicone object completely from the glass. Ex. 1025 ¶ 77. According to Dr. Hague, the only force resisting this peeling "is the adhesive strength of the covalent bond between the [silicone] and glass at the very edge of the capillary," as opposed to the force produced by the covalent bonds across the entire surface of the glass-silicone contact area. *Id.* Thus, although the 30–50 psi pressure is applied only over a small portion of the total area of the silicone-glass contact area, it is not resisted by a pressure applied over a much larger area, meaning that it is a reasonable estimate of the force of adhesion between the silicone layer and the glass layer divided by the area over which that force acts to resist

separation. The McDonald-reported pressure of 30–50 psi converts to “ 20.6×10^4 to 34.5×10^4 N/m².” Ex. 1002 ¶ 93.

We find that Petitioner has shown by a preponderance of the evidence that Akamine teaches or suggests all the limitations of claim 9, including a “flexible, elastic separating layer” made from silicone, that Mizukami teaches that the adhesion between Akamine’s silicone layer and hardened acrylic resin is at most 1.85×10^4 N/m² (and may be lower), and that McDonald teaches that the adhesion between Akamine’s silicone layer and glass is approximately 20.6×10^4 to 34.5×10^4 N/m². Dividing McDonald’s approximate value for the glass-silicone adhesion by Mizukami’s value for the maximum resin-silicone adhesion gives a ratio of between 11.1 and 18.6. Ex. 1002 ¶ 93. This is significantly greater than two. Under the claim construction we adopt in this case, the glass-silicone adhesion need be only twice as great as the resin-silicone adhesion, so the Akamine/Mizukami/McDonald combination satisfies the construction of “greater by a multiple” by a wide margin.⁹ Accordingly, we find that Petitioner has shown by a preponderance of the evidence that the Akamine/Mizukami/McDonald combination teaches or suggests a glass-silicone adhesion that is greater by a multiple than the resin-silicone adhesion.

⁹ As discussed above, Patent Owner’s construction of “at least 2” is the narrower construction, so if the ratio of adhesions in Mizukami and McDonald satisfies this construction, it by definition also satisfies Petitioner’s broader, functional construction.

b. Reason to Combine

Petitioner argues that a person of ordinary skill in the art would have had reason to combine the teachings of Akamine, Mizukami, and McDonald. Pet. 31–33. Specifically, Petitioner argues that a person of ordinary skill in the art would have used McDonald’s poly(dimethylsiloxane) as the separating layer 7 of Akamine in order to obtain a high adhesion to Akamine’s glass plate 4. *Id.* At the same time, Petitioner argues that a person of ordinary skill in the art would have understood from Mizukami that silicone (such as McDonald’s poly(dimethylsiloxane)) had a weak adhesion to acrylic resin, providing additional reason to use that material to make separating layer 7 of Akamine. *Id.*

Patent Owner counters that it is hindsight reconstruction to assume that a person of ordinary skill in the art would have wanted to maximize the glass-silicone adhesion and to minimize the resin-silicone adhesion, because, before the invention of the ’472 patent, there was no known reason to do so. PO Resp. 52. In particular, Patent Owner argues that a person of ordinary skill in the art would have known that “Akamine’s separating layer functions properly [even] when [the glass-silicone adhesion] is less than [the resin-silicone adhesion].” *Id.*

We find that Petitioner has shown a reason to combine Akamine, Mizukami, and McDonald by a preponderance of the evidence. First, Dr. Hague testifies that a person of ordinary skill in the art would have recognized that fabrication devices built according to Akamine’s teachings would have needed to provide for many repeated separations of hardened resin layers from the flexible, elastic separating layer, that ensuring a lack of separation between the separating layer and the glass was important to this

operation, and that high glass-silicone adhesion and low resin-silicone adhesion were necessary to allow a comfortable safety margin in operating the resulting photofabrication device. Ex. 1002 ¶¶ 82–83.

Second, there is independent evidence of record that a person of ordinary skill in the art would have known that ensuring adhesion of a silicone release coating to its substrate was important and that one means of ensuring this was to measure the relative adhesion of the coating to the substrate and to an aggressive material that is pressed onto the coating and then removed. A patent issued in 1981, nearly 20 years before the asserted foreign priority application that led to the '472 patent, describes testing “silicone release coatings” using the “Scotch (trademark) cellophane tape test” to ensure that they “adhere[] to the substrate with an adhesive force much greater than the adhesive force between the cured [silicone] composition and the released aggressive Scotch tape.” Ex. 1013, 10:44–56. The preponderance of the evidence thus demonstrates that a person of ordinary skill in the art would have known that it was important to ensure that the glass-silicone adhesion in Akamine was “much greater than the” resin-silicone adhesion in Akamine. Accordingly, we find that a person of ordinary skill in the art would have had reason to use the disclosures of Mizukami and McDonald regarding adhesion in the construction of Akamine’s silicone layer.

9. *Analysis: Obviousness over Akamine and Either Vorgitch or Hull*

Petitioner argues that the combination of Akamine and Vorgitch would have taught or suggested every limitation of claim 14 of the '472 patent and that a person of ordinary skill in the art would have had a reason

to combine these references. Pet. 33–34. Petitioner also argues that the same is true for the combination of Akamine and Hull. *Id.* at 34.

Specifically, Petitioner argues that both Vorgitch and Hull teach or suggest the limitation of claim 14 requiring that “the holding basin and the gel-like separating layer [be] an exchangeable unit.” *Id.* at 33–34. Patent Owner does not contest this evidence or the obviousness of claim 14 over Akamine and either Vorgitch or Hull.

Vorgitch discloses a “removable vat” that can “be easily replaced throughout part building with vats containing resins with different characteristics, including color, conductivity, etc.” Ex. 1009, 7:65–66, 8:61–67. Hull discloses a “container” that “is filled with a UV curable liquid.” Ex. 1010, 6:28. In Hull, “there may be several containers . . . each container having a different type of curable material that can be automatically selected by the stereolithographic system.” *Id.* at 9:32–39. On the present record, we find that the combination of Akamine and either Vorgitch or Hull teaches or suggests the limitations of claim 14.

Petitioner argues that a person of ordinary skill in the art would have had a reason to combine the teachings of Vorgitch or Hull with the teachings of Akamine to produce an apparatus having the advantages taught by Vorgitch or Hull. Pet. 33–34. Specifically, Petitioner argues that using the “easily replaced” “removable vat” of Vorgitch would “enabl[e] the tank to be swapped out for one containing a different resin, allowing for an object to be fabricated with different materials for different layers.” *Id.* (citing Ex. 1002 ¶¶ 106–07; Ex. 1009, 8:61–67). In addition, Petitioner argues that using the “several containers” of Hull would “allow[] the stereolithographic system to automatically select among various exchangeable resin tanks

holding different types of curable resins, such that different layers of three-dimensional objects can be fabricated from different materials of different colors, different electrical characteristics, etc.” *Id.* at 34 (citing Ex. 1002 ¶ 101; Ex. 1010, 9:32–39). Patent Owner does not contest the obviousness of claim 14 over Akamine and either Vorgitch or Hull. We conclude that Petitioner has shown by a preponderance of the evidence that claim 14 of the ’472 patent would have been obvious over the combination of Akamine and either Vorgitch or Hull.

C. Asserted Grounds Based on Gotoh

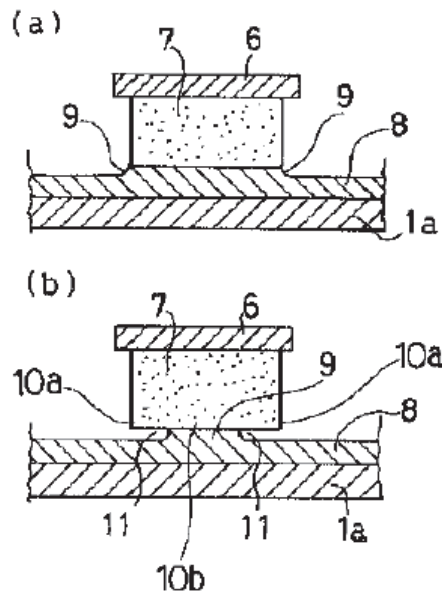
Petitioner argues that Gotoh anticipates claims 9–12 and 15. Pet. 35–43. Petitioner also argues that the subject matter of claims 10 and 14 would have been obvious to a person of ordinary skill in the art given the teachings of Gotoh. *Id.* at 43–46. In addition, Petitioner argues that the subject matter of claim 14 would have been obvious to a person of ordinary skill in the art given the teachings of Gotoh and either Vorgitch or Hull. *Id.* at 46–48.

1. Gotoh

Gotoh relates to “a resin molding device wherein a thin film member used to promote separation of the cured product layer formed and the tank bottom surface is disposed inside a tank on the bottom surface of a molding tank.” Ex. 1006, Abstract. Gotoh teaches that, using its thin film member, “when the cured product layer is pulled up, the cured product layer can be easily separated from the tank bottom surface and resin used to form[] the next cured product layer can be supplied smoothly.” *Id.* In Gotoh, a “well-known method of optical molding” is used in which light irradiates “the bottom of [a] resin molding tank with a clear bottom surface, forming a cured product layer between the molding stage disposed inside the tank and

the bottom surface of the tank,” resulting in “successively laminating a cured product layer between the cured product layer and the bottom surface of the tank.” *Id.* ¶ 3. A “significant problem[] with” this method is that “when the cured product layer formed by gradually pulling up the molding stage was separated from the bottom surface, the cured product layer did not smoothly separate from the bottom surface of the resin molding tank and was broken.” *Id.* ¶ 6. A solution to this problem is shown in Gotoh Figure 3, which is reproduced below:

[Fig.3]



Gotoh Figure 3 depicts thin film member 8, which is pasted onto the bottom of tank 1a. *Id.* ¶ 11. Figure 3 depicts cured product layer 7 being “pulled up by molding stage 6” from thin film member 8, causing “elastic deformation part 9” to be “formed on the surface of thin film member 8.” *Id.* ¶¶ 16–17. As the molding stage and the cured product layer are pulled up away from the bottom of the tank, elastic deformation part 9 detaches

from outer edges 10a of cured product layer 7, causing gaps 11 to form. *Id.* ¶ 17.

2. *Analysis: Anticipation by Gotoh*

Petitioner argues that all limitations of claims 9–12 and 15 are disclosed by Gotoh. Pet. 35–43. We find that Petitioner has shown by a preponderance of the evidence that Gotoh discloses all the limitations of claims 9, 11, 12, and 15. We do not reach the issue of the anticipation of claim 10 by Gotoh, because this issue is moot in light of our conclusion that claim 10 is obvious over the combination of Akamine, Mizukami, and McDonald.

a. Claim 9

As discussed above, claim 9 recites three limitations: “[a]n apparatus for the separation of a material layer that is hardened on a flat plane” and “a flexible, elastic separating layer arranged between plane and material layer,” wherein “the elastic separating layer compris[es] a gel-like elastic material that is applied directly to the plane.” Pet. 12. Gotoh discloses cured product layers 7. Ex. 1006 ¶¶ 16–17, Fig. 3. It also discloses clear bottom surface 1a of resin molding tank 1, on which the resin layers are cured using irradiation by light energy. *Id.* ¶¶ 3, 10, Fig. 1, Fig. 4. Patent Owner does not contest this evidence or the anticipation of claim 9 by Gotoh. We find that Petitioner has shown by a preponderance of the evidence that Gotoh discloses the “apparatus for the separation of a material layer that is hardened on a flat plane” limitation of claim 9.

Gotoh also discloses thin film member 8 located between clear bottom surface 1a and cured product layers 7 and pasted to clear bottom surface 1a. *Id.* ¶¶ 11, 16–17, Fig. 4. Gotoh discloses that thin film member 8 deforms

elastically to produce “elastic deformation part 9” when cured product layer 7 “is pulled up.” *Id.* ¶ 16, Fig. 4. This “creates a state wherein it is easy to separate cured product layer 7.” *Id.* Patent Owner does not contest this evidence or the anticipation of claim 9 by Gotoh. We find that Petitioner has shown by a preponderance of the evidence that Gotoh discloses the “flexible, elastic separating layer arranged between plane and material layer” limitation of claim 9.

As noted above, “gel-like elastic material” is “a material that has the required elasticity for being deformable, yet the elasticity for recovering its original state after deformation.” Gotoh discloses that thin film member 8 elastically deforms when cured product layer 7 is separated from clear tank bottom 1a. *Id.* ¶¶ 16–17. Gotoh also discloses that the sequence of preparing a gap between the cured layers and the irradiation face, then curing a new layer, then lifting the fabricated article off the irradiation face is repeated to “successively laminat[e]” a series of layers making up the fabricated article. *Id.* ¶ 3. Based on these disclosures, Petitioner directs us to evidence suggesting that a person of ordinary skill in the art would have understood that thin film member 8 returns to its original shape after deforming upon separation of cured product layer 7 from clear tank bottom 1a. Pet. 39–40 (citing Ex. 1002 ¶¶ 119–21; Ex. 1006 ¶¶ 9, 16–17, 23, Fig. 3). In addition, Gotoh discloses that thin film member 8 “is pasted so that it forms a single piece” with clear tank bottom 1a. Ex. 1006 ¶ 11. Patent Owner does not contest this evidence or the anticipation of claim 9 by Gotoh. We find that Petitioner has shown by a preponderance of the evidence that Gotoh discloses the “gel-like elastic material that is applied directly to the plane” limitation of claim 9.

b. Claim 10

Claim 10 depends from claim 9 and adds a limitation requiring that the “gel-like layer ha[ve] an adhesion to the plane that is greater by a multiple than adhesion of the gel-like layer to the hardened material layer.” Ex. 1001, 6:1–4. As discussed above, we determine that Petitioner has shown by a preponderance of the evidence that claim 10 is unpatentable as obvious over the combination of Akamine, Mizukami, and McDonald. Accordingly, we do not reach the unpatentability of claim 10 as anticipated by Gotoh. *Beloit Corp.*, 742 F.2d at 1423 (once a dispositive issue is decided, there is no need to decide other issues).

c. Claims 11, 12, and 15

With respect to claim 11, for essentially the same reasons discussed above with respect to Akamine, we find that Petitioner has shown by a preponderance of the evidence that Gotoh discloses the “structured and arranged to elastically deform” limitation of claim 11. Ex. 1002 ¶¶ 119–21; Ex. 1006 ¶¶ 3, 9, 11, 16–17, 23, Fig. 3.

With respect to claim 12, for essentially the same reasons discussed above with respect to Akamine, we find that Petitioner has shown by a preponderance of the evidence that Gotoh discloses the “lateral frame” limitation of claim 12. Ex. 1002 ¶ 126; Ex. 1006 ¶ 10, Fig. 1.

With respect to claim 15, for essentially the same reasons discussed above with respect to Akamine, we find that Petitioner has shown by a preponderance of the evidence that Gotoh discloses the “transparent plate” and transparent separating layer limitations of claim 15. Ex. 1002 ¶ 134; Ex. 1006 ¶¶ 8, 10, 12, Fig. 1.

Thus, we find that Petitioner has shown by a preponderance of the evidence that Gotoh discloses the limitations of claims 9, 11, 12, and 15.

3. *Analysis: Obviousness over Gotoh*

Petitioner argues that all limitations of claims 10 and 14 would have been taught or suggested by Gotoh. Pet. 43–46. We find that Petitioner has shown sufficiently, on the present record, that Gotoh would have taught or suggested all the limitations of claim 14. We do not reach the issue of the obviousness of claim 10 over Gotoh alone, because this issue is moot in light of our conclusion that claim 10 is obvious over the combination of Akamine, Mizukami, and McDonald.

a. Claim 10

As discussed above, we determine that Petitioner has shown by a preponderance of the evidence that claim 10 is unpatentable as obvious over the combination of Akamine, Mizukami, and McDonald. Accordingly, we do not reach the unpatentability of claim 10 as obvious over Gotoh. *Beloit Corp.*, 742 F.2d at 1423 (once a dispositive issue is decided, there is no need to decide other issues).

b. Claim 14

Claim 14 depends from claim 12 and adds a limitation requiring that “the holding basin comprise[] a frame and a bottom plate and together the holding basin and the gel-like separating layer [be] an exchangeable unit.” Ex. 1001, 6:18–21. As discussed above, Petitioner has shown by a preponderance of the evidence that Gotoh discloses every limitation of claim 12. With respect to claim 14, Gotoh’s resin molding tank 1 includes both side walls and clear bottom plate 1a, and Gotoh’s thin film member 8 is attached to the bottom plate of Gotoh’s resin molding tank. Ex. 1006 ¶ 10,

Fig. 1, Fig. 3. Patent Owner does not contest this evidence or the obviousness of claim 14 over Gotoh. We find that Petitioner has shown by a preponderance of the evidence that Gotoh teaches or suggests the holding basin limitation of claim 14.

Petitioner argues that a person of ordinary skill in the art “would have been motivated to make [the holding basin of Gotoh] ‘exchangeable’” in order “to enable the light-curing material in the tank to be exchanged, allowing for fabrication of different objects and/or different layers out of different materials” or “for ease of emptying and/or cleaning the tank, and/or for expedient repair or replacement of the tank as a unit.” Pet. 45–46 (citing Ex. 1002 ¶¶ 128, 129, 131–32). Additionally, Petitioner argues that a person of ordinary skill in the art “would also have understood that configuring the tank as a removable unit would have provided beneficial access (e.g., for inspection and/or repair) to the light source and/or other components located beneath the tank.” *Id.* at 46 (citing Ex. 1002 ¶ 130). Patent Owner does not contest this evidence or the obviousness of claim 14 over Gotoh. We find that Petitioner has shown by a preponderance of the evidence that a person of ordinary skill in the art would have found it obvious to modify the disclosure of Gotoh to meet the exchangeability limitation of claim 14.

Thus, we find that Petitioner has shown by a preponderance of the evidence that Gotoh teaches or suggests the limitations of claim 14, but not those of claim 10. Further, we find that Petitioner has shown by a preponderance of the evidence that there would have been an adequate reason to modify Gotoh in the manner proposed. Pet. 43–46.

4. *Analysis: Obviousness over Gotoh and Either Vorgitch or Hull*

Petitioner argues that the combination of Gotoh and Vorgitch would have taught or suggested every limitation of claim 14 of the '472 patent and that a person of ordinary skill in the art would have had a reason to combine these references. Pet. 46–47. Petitioner also argues that the same is true for the combination of Gotoh and Hull. *Id.* at 47–48. Petitioner's argument for these grounds is substantively identical to Petitioner's argument for the asserted grounds of obviousness over Akamine and either Vorgitch or Hull discussed above. Patent Owner does not contest the obviousness of claim 14 over Gotoh and either Vorgitch or Hull. For the reasons discussed above with respect to the ground of obviousness over Akamine and either Vorgitch or Hull, we conclude that Petitioner has shown by a preponderance of the evidence that claim 14 of the '472 patent would have been obvious over the combination of Gotoh and either Vorgitch or Hull.

D. Patent Owner's Motion to Exclude

Patent Owner moves to exclude certain evidence from this proceeding. PO Mot. 1–6. The precise scope of the evidence Patent Owner wishes to exclude is unclear from Patent Owner's Motion. It is clear that Patent Owner wishes to exclude a portion of Exhibit 1006. *Id.* at 4–6. Beyond this, however, Patent Owner moves to exclude “all evidence submitted for the first time [with Petitioner's] Reply.” *Id.* at 1. This would include all exhibits from Exhibit 1014 through Exhibit 1028, but Patent Owner then specifically asks for exclusion only of “Exhibits 1025 and 1028.” *Id.* at 4. Accordingly, we analyze Patent Owner's arguments with respect to Exhibits 1006, 1025, and 1028 only. Our analysis would apply equally well to the remainder of Petitioner's Reply exhibits.

1. *Reply Evidence: Exhibit 1025 and Exhibit 1028*

Patent Owner argues that Exhibits 1025 and 1028 should be excluded from this proceeding because “new reply evidence is not permitted nor contemplated by statute.” POMot. 2–4. Specifically, Patent Owner argues that the Leahy-Smith America Invents Act, which created *inter partes* reviews, permits petitioners to submit post-institution material only in two specific forms: supplemental information and written comments. *Id.* at 2 (quoting 35 U.S.C. §§ 316(a)(3), 316(a)(13)). Because “[n]either of these provisions provide[s] for submitting new evidence,” Patent Owner argues that reply evidence cannot be submitted at any time in any *inter partes* review.

We disagree. “The purpose of the trial in an *inter partes* review proceeding is to give the parties an opportunity to build a record by introducing evidence—not simply to weigh evidence of which the Board is already aware.” *Genzyme Therapeutic Prods. L.P. v. Biomarin Pharma. Inc.*, 825 F.3d 1360, 1367 (Fed. Cir. 2016). In fact, under some circumstances, we are required to consider evidence offered by a petitioner in reply. *Ariosa Diagnostics v. Verinata Health, Inc.*, 805 F.3d 1359, 1365 (Fed. Cir. 2015) (vacating decision “because it appeared that the Board had declined to consider a reference simply because the reference ‘had not been identified at the petition stage’”); *see also Anacor Pharma., Inc. v. Iancu*, 889 F.3d 1372, 1380–81 (Fed. Cir. 2018) (“the petitioner in an *inter partes* review proceeding may introduce new evidence after the petition stage” under some circumstances). Thus, we are not persuaded by Patent Owner’s argument that, merely because no statute expressly provides in so many

words for the submission of reply evidence in an *inter partes* review, no reply evidence ever may be admitted in *inter partes* review proceedings.

2. *Elliott Declarations: Exhibit 1006 and Exhibit 1028*

Don Elliott, an employee of Linguistic Systems, Inc., filed two declarations in the case. First, he filed a declaration as a portion of Exhibit 1006, testifying that he “completed the attached translation into English of” Gotoh. Ex. 1006, 1. Second, he filed a declaration accompanying Petitioner’s Reply testifying as to the meaning of two words in his original translation of Gotoh. Ex. 1028. Patent Owner argues that both of these declarations should be excluded because “Mr. Elliott’s [deposition] testimony shows that the declarations were created by and/or altered by unknown people (presumably the Petitioner) contrary to the presentation of Mr. Elliott as an impartial translator.” PO Mot. 4.

Petitioner opposes Patent Owner’s Motion, arguing both that Patent Owner did not identify any violations of the Federal Rules of Evidence, and that Patent Owner failed to file the objections on which its Motion to Exclude relies. We agree with Petitioner that each of these defects is an independent basis to deny Patent Owner’s Motion to Exclude as to Exhibits 1006 and 1028.

The party moving to exclude evidence bears the burden of proving that it is entitled to the relief requested—namely, that the material sought to be excluded is inadmissible under the Federal Rules of Evidence. See 37 C.F.R. §§ 42.20(c), 42.62(a). Here, neither Patent Owner’s objections to Exhibits 1006 and 1028¹⁰ nor Patent Owner’s Motion to Exclude identifies

¹⁰ As discussed below, Patent Owner did not timely file any objections to Exhibits 1006 and 1028. In response to Petitioner’s noting this failure in its

any provision of the Federal Rules of Evidence that those exhibits violate. Paper 34, 2; PO Mot. 3–6. This failure to identify a Federal Rule of Evidence that would be violated by the admission of an exhibit means that Patent Owner has not carried its burden on the Motion to Exclude.

In addition, Patent Owner failed to timely file the objections on which its Motion to Exclude rests. “Any objection to evidence submitted during a preliminary proceeding must be filed within ten business days of the institution of the trial.” 37 C.F.R. § 42.64(b)(1). Thus, Patent Owner was required to file any objection to Exhibit 1006 no later than November 14, 2017, which was ten business days after our Institution Decision was issued. Paper 12 (showing an issue date for the Institution Decision of October 30, 2017). Any objection to Exhibit 1028 was due by May 7, 2018. Despite these deadlines, Patent Owner did not file the objections to Exhibits 1006 and 1028 until July 11, 2018. Paper 34. Patent Owner argues that this failure should be excused for several reasons, each of which we consider below. First, however, we must resolve a separate issue that has a bearing on how we resolve this Motion to Exclude.

Patent Owner has repeatedly violated the rules governing *inter partes* reviews, and we have excused its actions every time. Patent Owner filed its Preliminary Response late, unaccompanied by a request to excuse the late action. Paper 6, 11 (showing date of filing as August 2, 2017); Paper 7 (order requiring Patent Owner to show cause why late Preliminary Response should be considered); Paper 11 (order allowing late filing of Preliminary Response). This not only was an instance of action contrary to our rules, it

opposition to Patent Owner’s Motion to Exclude, Patent Owner has now filed its objections to those exhibits. Paper 34.

also constituted an attempt to hide the offending action by not bringing it to our attention. At that time, we informed Patent Owner that “we do not expect to treat such violations so leniently in the future.” Paper 11, 4. Despite that admonition, Patent Owner filed an over-length Reply in support of its Motion to Exclude. Paper 35 (including six pages of argument); 37 C.F.R. § 42.24(c)(2) (setting page limit at five pages). Once again, we permitted Patent Owner to correct its error by filing a shortened Reply. Paper 37 (permitting corrected Reply). Now, not only does Patent Owner ask us to waive our timeliness rule with regard to its evidentiary objections, but it does so late, in a reply in support of a motion, rather than in a motion, which is itself yet another violation of our rules. Paper 38, 1–2 (reply asking for relief from Rule 42.64(c) under Rule 42.5(b)); 37 C.F.R. § 42.20(a) (“Relief . . . must be requested in the form of a motion.”). This litany of repeated violations of our rules establishes that leniency in favor of Patent Owner is not in the interest of justice. Accordingly, we decline the invitation to ignore the proverbial third strike and excuse Patent Owner’s refusal to follow the rules that govern *inter partes* reviews.

We begin with Patent Owner’s request to waive Rule 42.64(c) and permit it to file its evidentiary objections after its Motion to Exclude. Paper 38, 1–2. Patent Owner’s request for relief comes in its Reply in support of its Motion to Exclude. *Id.* But every request for relief “must be requested in the form of a motion.” 37 C.F.R. § 42.20(a). Because the request to waive the timeliness rule comes in a reply rather than a motion, it violates Rule 42.20(a), so we deny the request.

Next, we consider the question of whether Patent Owner’s refusal to file its objections in a timely fashion should affect the outcome of its Motion

to Exclude. Rule 42.64(b)(1) requires every objection to be timely filed in the record of the proceeding, and Rule 42.65(c) requires the Motion to Exclude to “identify the objections *in the record*.” 37 C.F.R. § 42.64 (emphasis added). Patent Owner did not satisfy either of these rules. Its objections were untimely even under the most lenient interpretation of the timeliness rule. Assuming Patent Owner is correct that it could not have learned of the alleged problems with Exhibits 1006 and 1028 until Mr. Elliott’s deposition on June 13, 2018, the objections stemming from that deposition would have been due no later than June 20, 2018, but they were not filed until July 11, 2018. As it is, we interpret the rule strictly, making the objection to Exhibit 1006 due on November 14, 2017, and the objection to Exhibit 1028 due on May 7, 2018. The actual filing date of July 11, 2018, is far later than either of these dates, so the objections were untimely.

At the time of Patent Owner’s Motion to Exclude, there were no objections in the record for Patent Owner to identify. Paper 26 (Motion to Exclude, filed June 20, 2018); Paper 34 (Patent Owner’s objections, filed July 11, 2018). Accordingly, it is unsurprising that the Motion to Exclude does not “identify the objections in the record,” as unambiguously required by Rule 42.64(c). Because the Motion to Exclude fails to comply with Rule 42.64(c), we deny it.

Even if we were to continue down the path of leniency and consider Patent Owner’s arguments for excusing its refusal to follow our rules with respect to these objections and this Motion to Exclude, we would not be persuaded by those arguments.

First, Patent Owner argues that it was impossible to learn of the problems with Exhibits 1006 and 1028 until the deposition of Mr. Elliott,

which occurred on June 13, 2018. Paper 38, 4; Exhibit 2006 (showing date of Elliott deposition). This may be true. But Patent Owner did not approach us after the Elliott deposition asking for relief from Rule 42.64(b)(1), nor did Patent Owner even include in its Motion to Exclude a request that we waive the timeliness requirement. Instead, Patent Owner waited until its lack of timeliness was discovered by Petitioner to ask for relief from its obligations under our rules. Paper 32, 1–2, 6–7 (Petitioner’s opposition, noting that no objections were filed); Paper 38, 1–2 (Patent Owner, in reply, asking us “to waive any timing requirements under 37 CFR 42.5(b)”). At no step in the process did Patent Owner do what was required under our rules, making it difficult for us to excuse its untimeliness.

Patent Owner also asks us to excuse its late filing of the objections, arguing that doing so would be in the interest of justice. Paper 38, 1–2. We disagree. It may be true that Patent Owner’s timely service of some objections on Petitioner means that Patent Owner’s refusal to file the objections in accordance with our rules did not prejudice Petitioner. Even assuming that is the case, however, this is merely one factor weighing in favor of allowing the late filing. And our conclusion that acting leniently toward Patent Owner is no longer in the interest of justice is a substantial countervailing factor. In light of this conclusion, we would not grant Patent Owner’s request for relief.

Finally, Patent Owner argues that Rule 42.64(b)(1),¹¹ which requires that the objections be filed in the record of the proceeding, does not mean

¹¹ Patent Owner misidentifies the applicable rule as “37 CFR 42.64(c),” which is the rule governing motions to exclude evidence, not the rule

what it says. Paper 38, 1. Specifically, Patent Owner argues that, when Rule 42.64(b)(1) was amended to require “filing” rather than merely “service” of objections, the “amendment did not affect substantive rights and was made ‘for consistency with the Office Patent Trial Practice Guide.’” *Id.* (quoting Amendments to the Rules of Practice for Trials Before the Patent Trial and Appeal Board, 80 Fed. Reg. 28,561, 28,563 (May 19, 2015)). The amendments in question do say that they “do not change the substantive criteria of patentability” and that they “are procedural and/or interpretive rules.” 80 Fed. Reg. at 28,563. But the requirement to carry out the trial in a particular way—here, by filing, rather than merely serving, objections to evidence—is a procedural requirement, not a substantive right. *Hanna v. Plumer*, 380 U.S. 460, 464 (1965) (test for distinguishing procedural from substantive rules is “whether a rule really regulates procedure,—the judicial process for enforcing rights and duties recognized by substantive law”) (quoting *Sibbach v. Wilson & Co.*, 312 U.S. 1, 14 (1941)). The “substantive right” here is the right to some degree of due process in deciding whether a challenged patent claim is unpatentable, which may include the right to make objections to evidence in some form. The form in which the objections must be made, and the time at which they must be made, is a matter of procedure, not a change to the substantive right to make them. Accordingly, the fact that the amendment to Rule 42.64(b)(1) claimed to be procedural only, rather than substantive, does not affect the ability of that amendment to affect the form or timing of objections to evidence. Thus, the

governing objections. We apply Patent Owner’s argument to the correct rule rather than the rule Patent Owner identifies.

text accompanying the amended rule is not an indication that the rule itself fails to mean what it says.

We deny Patent Owner's Motion to Exclude for several reasons, each discussed above. First, we are not persuaded that the failure of the America Invents Act expressly to permit reply evidence means that all reply evidence is prohibited in all *inter partes* reviews. Second, Patent Owner fails to carry its burden because it fails to identify any provision of the Federal Rules of Evidence that would be violated by admitting the evidence Patent Owner challenges. Third, Patent Owner's Motion does not comply with our rules regarding motions to exclude, and it rests on objections to evidence that do not comply with our rules governing objections. Fourth, even ignoring the violations of our rules, we are not persuaded by any of Patent Owner's arguments that we should excuse its failure to file its objections in a timely fashion.

CONCLUSION

Upon consideration of the Petition, the Response, the Reply, the Observations and responses thereto, and the evidence before us, we determine that Petitioner has shown by a preponderance of the evidence that claims 9, 11, 12, and 15 of the '472 patent are unpatentable as anticipated by Akamine or by Gotoh. We also determine that Petitioner has shown by a preponderance of the evidence that claims 13–15 are unpatentable as obvious over Akamine, and that claim 14 is unpatentable as obvious over Gotoh. We further determine that Petitioner has shown by a preponderance of the evidence that claim 10 is unpatentable as obvious over the combination of Akamine, Mizukami, and McDonald. We determine that Petitioner has shown by a preponderance of the evidence that claim 14 is

unpatentable as obvious over the combination of Akamine and either Vorgitch or Hull, as well as over the combination of Gotoh and either Vorgitch or Hull.

We do not reach the issue of whether Petitioner has shown by a preponderance of the evidence that claim 10 is unpatentable as anticipated by Akamine or Gotoh or as obvious over Akamine or Gotoh.

Finally, we deny Patent Owner's Motion to Exclude Evidence.

ORDER

It is hereby

ORDERED that Petitioner has proven by a preponderance of the evidence that claims 9–15 of U.S. Patent No. 7,195,472 B2 are unpatentable;

FURTHER ORDERED that, pursuant to 35 U.S.C. § 318(b), upon expiration of the time for appeal of this decision, or the termination of any such appeal, a certificate shall issue canceling claims 9–15 of U.S. Patent No. 7,195,472 B2;

FURTHER ORDERED that Patent Owner's Motion to Exclude is denied; and

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

IPR2017-01258
Patent 7,195,472 B2

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