

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HID GLOBAL CORP.,
Petitioner,

v.

MORPHOTRUST USA, LLC,
Patent Owner.

Case IPR2017-01938
Patent 7,207,494 B2

Before KARL D. EASTHOM, CHRISTA P. ZADO, and
STACY B. MARGOLIES, *Administrative Patent Judges*.

EASTHOM, *Administrative Patent Judge*.

DECISION

Final Written Decision

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

Denying Motion to Amend

35 U.S.C. § 316(d) and 37 C.F.R. § 42.121

I. INTRODUCTION

This *inter partes* review, instituted pursuant to 35 U.S.C. § 314, addresses the patentability of claims 1–6, 8–10, 12, 13, 15–17, 19, and 20 (the “challenged claims”) of U.S. Patent No. 7,207,494 B1 (Ex. 1001, the “’494 patent”). This review also addresses the patentability of substitute claims 21–26, 28–30, 32, 33, 35–37, 39, and 40 (the “substitute claims”), submitted by Patent Owner in a Contingent Motion to Amend. Paper 18.

We have jurisdiction under 35 U.S.C. § 6. For the reasons discussed herein, Petitioner has shown by a preponderance of the evidence that the challenged claims are unpatentable. In addition, we deny Patent Owner’s Motion to Amend.

A. Procedural History

Petitioner, HID Global Corp., filed a Petition (Paper 1, “Pet.”) requesting an *inter partes* review of claims 1–6, 8–10, 12, 13, 15–17, 19, and 20 of the ’494 patent. See Pet. 4. Patent Owner, MorphoTrust USA, LLC, filed a Preliminary Response. Paper 8 (“Prelim. Resp.”). Subsequent to the Institution Decision (Paper 8, “Inst. Dec.”), Patent Owner filed a Response (Paper 18, “PO Resp.”) and Petitioner filed a Reply (Paper 22, “Reply”). The parties appeared for an Oral Hearing on November 15, 2018, a transcription of which appears in the record. Paper 33 (“Tr.”).¹ As indicated above, Patent Owner also submitted a Contingent Motion to Amend,

¹ During the Oral Hearing, the parties argued three other related proceedings in addition to IPR2017-01938, all transcribed together in Paper 40, namely IPR2017-01939, IPR2017-01940, and IPR2017-01941. See *infra* Section I.C. (Related Cases).

followed by other papers by the parties, as discussed further below in Section IV.

B. The '494 Patent

The '494 patent, titled “Laser Etched Security Features for Identification Documents and Methods of Making Same” (Ex. 1001, [54]), describes etching patterns in identification cards, documents, and “many different articles that can be marked” (*id.* at 9:43) using a laser. *Id.* at [57], 9:36–57, Fig. 1. Examples of identification cards and documents include “driving licenses, national or government identification cards, bank cards, credit cards, controlled access cards and smart cards, carry[ing] thereon certain items of information which relate to the identity of the bearer. Examples of such information include name, address, birth date, signature and photographic image” *Id.* at 2:61–3:4. The ID cards and documents may include other variant (e.g., employee number) and invariant (e.g., employer name) information. *See id.*

Figure 1, reproduced below, “is an illustrative example of a prior art identification document” 10 (*id.* at 4:54–55):

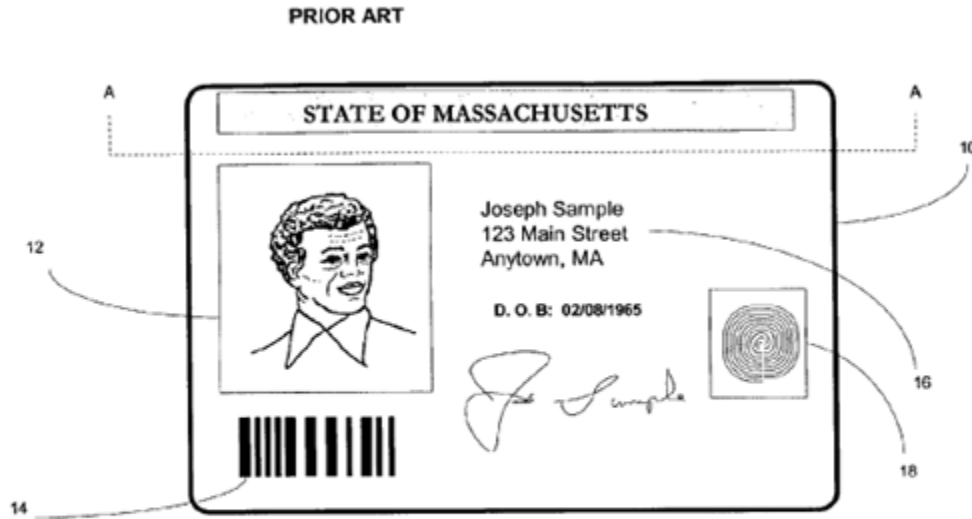


FIGURE 1

Prior art ID document 10, depicted above, includes “photographic image 12, a bar code 14 (which may contain information specific to the person whose image appears in photographic image 12 and/or information that is the same from ID document to ID document), variable personal information 16, such as an address, signature, and/or birthdate, and biometric information 18” such as a fingerprint. *Id.* at 3:10–17. The ID document may also include “a magnetic stripe . . . and various security features, such as a security pattern.” *Id.* at 3:19–21.

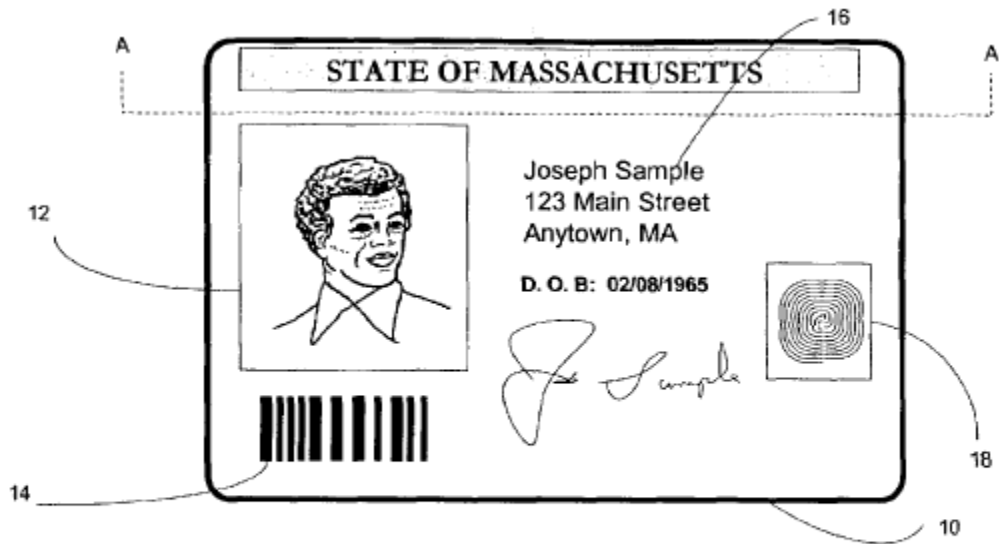
As further background, the ’494 patent states “printing techniques are not the only methods for printing information on . . . ID documents. Laser beams, for example can be used for marking, writing, bar coding, etching, and engraving many different types of materials, including plastics.” *Id.* at

3:58–62. The '494 patent states “[l]asers have been used, for example, to mark plastic materials to create indicia such as bar codes, date codes, part numbers, batch codes, and company logos. Lasers also have been used to engrave or etch very fine patterns into articles that are extremely difficult to replicate.” *Id.* at 3:62–67.

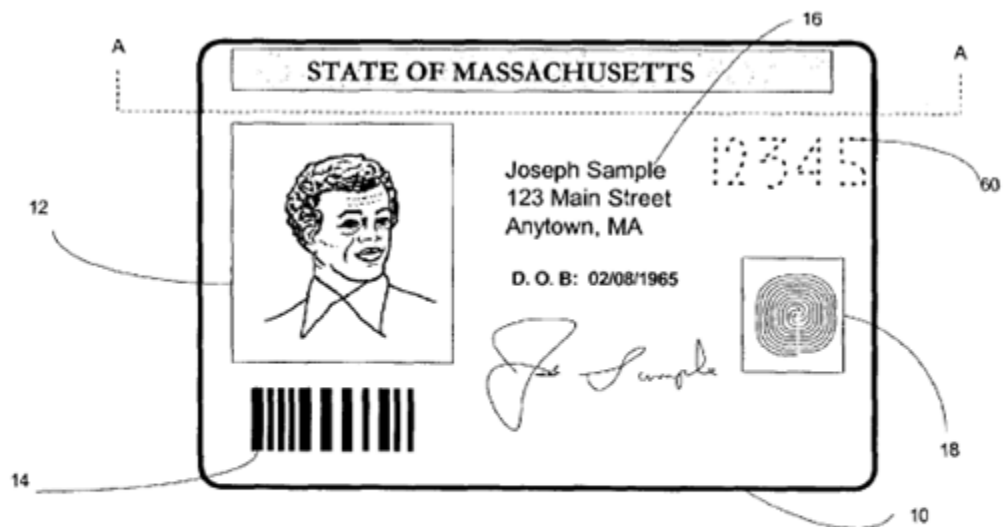
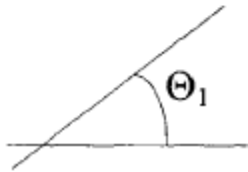
The '494 patent states that using lasers “to write or engrave information to ID cards presents a number of advantages over conventional printing.” *Id.* at 4:24–26. One advantage includes “provid[ing] an indicium having a tactile feel, which is a useful authenticator of a data carrier that also can be very difficult to counterfeit or alter.” *Id.* at 4:26–30. The '494 patent states “the foaming of the thermoplastic that can occur with some types of laser engraving can be adapted to provide . . . [the] tactile feel” noted. *Id.*

Another feature includes “a pattern that can be tactile or non-tactile, but is not readily visible when seen straight on (e.g., the pattern is visible only in low angle reflected light).” *Id.* at 8:42–45. The '494 patent refers to such a pattern as having “an optically variable (OV) quality.” *Id.* at 7:52–8:63; *cf. id.* at 8:48–50 (referring to a “non-OVD [optically variable device] pattern”).

With respect to the OV quality, Figures 3A and 3B, reproduced below, represent “one embodiment of the invention, viewed at first and second angles, respectively.” *Id.* at 4:59–61.



(A)



(B)



FIG. 3

A comparison of Figure 3A to Figure 3B above represents how security feature 60 (12345), created by laser etching, creates an OV pattern that cannot be seen easily when viewed “straight on,” but can be seen at angles tilted relative to the “straight on” angle. *See id.* at 7:59–8:25 (further explaining the viewing angle depends on the angle of the light with the OV quality arising due to laser surfaces created non-parallel to the surface of the card).

Figures 6A of the '494 patent follows:

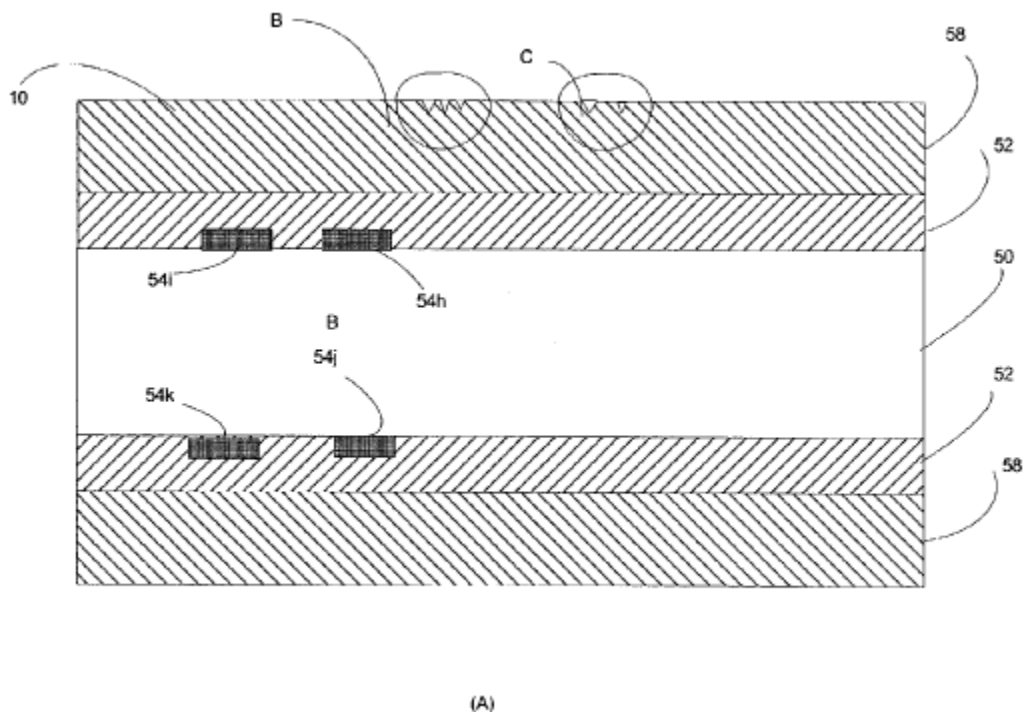


Figure 6A, reproduced above, represents the ID document such as that depicted in Figures 3A–3B having information 54h–l in layer 52 formed between core layer 50 and “overlamine” 58. *Id.* at 8:32–36. Information 54h–l may be formed by “many different types of conventional printing and also laser marking.” *Id.* at 8:37–39.

Figures 6B and 6C of the '494 patent follow:

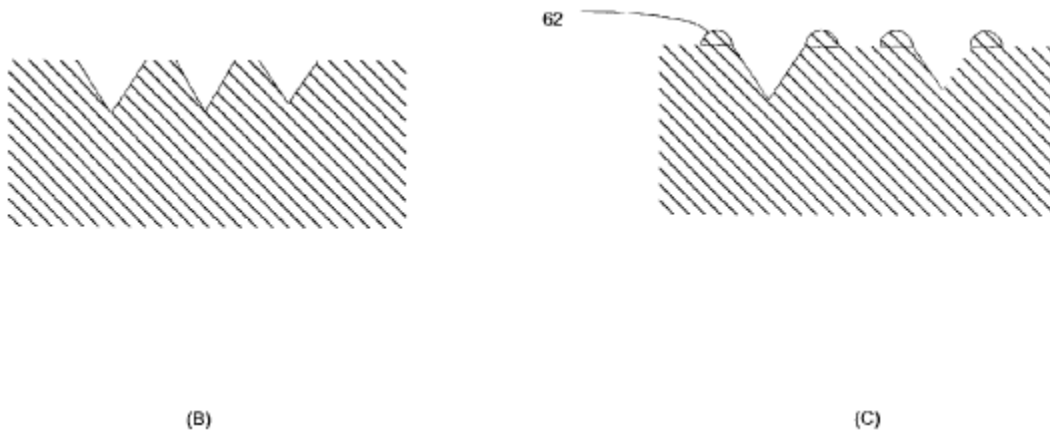


Figure 6B corresponds to “an enlarged view of section B in” Figure 6A, and represents a “non-tactile pattern” created by a laser, which “is not readily visible when seen straight on.” *See id.* at 8:42–47. Figure 6C corresponds to “an enlarged view of section C” in Figure 6A and represents “a tactile pattern with raised edges 62” created by a laser. *See id.* at 8:50–52. The '494 patent Specification describes a “tactile and/or non-OVD pattern” feature that “cannot be photocopied,” and appears to indicate Figure 6C represents such a feature. *See id.* at 8:48–53 (referring to the “alternative embodiment” with the “tactile and/or non-OVD pattern” and then describing “this alternative implementation” with respect to Figure 6C). Referring to Figure 6C, the '494 patent states “[e]ven in this alternative implementation, the feature cannot be photocopied.” *Id.* at 9:52–53.

C. Related Cases

Petitioner identifies the following proceedings involving the '494 patent: *MorphoTrust USA, LLC v. United States of America*, No. 1-16-cv-00227 (Fed. Cl.) (filed Feb. 16, 2016); *MorphoTrust USA, LLC v. CBN Secure Techs, Inc.*, No. 1-16-cv-00323 (E.D.Va.) (filed Mar. 23, 2016). Pet.

57. Petitioner also identifies the following related Patent Trial and Appeal Board (PTAB) Proceedings: *HID Global Corp. v. MorphoTrust USA, LLC*, Case IPR2017-01939 (PTAB Aug. 18, 2017) (challenging claims 1–20 of the '494 patent); *HID Global Corp. v. MorphoTrust USA, LLC*, Cases IPR2017-01940 & 41 (PTAB Aug. 18, 2017) (challenging claims in related patents). *Id.*; *supra* note 1.

D. Illustrative Claims

Challenged dependent claims 2, 3, 6, 8, 10, 12, 16, and 17 depend from one of challenged independent claims 1, 5, 9, 13, and 15. Illustrative independent claims 1, 4, 5, 9, 13, 15, 19, and 20, emphasized to highlight variants of the above-described OV and tactile features, follow:

1. A method of producing a security feature in an identification document comprising: providing a core including a top surface and a bottom surface; laminating a first laminate in contact with the top surface; and laminating a second laminate in contact with the bottom surface, the laminated core comprising the identification document, the identification document having a top side and a bottom side respectively corresponding to the core's top and bottom side, the top side having a top surface; and laser etching a pattern into the top surface of the identification document; wherein the pattern includes visual properties, and *wherein the visual properties comprise a characteristic of not being visible when viewed straight on.*

4. A method of producing a security feature in an identification document comprising: providing a core including a top surface and a bottom surface; laminating a first laminate in contact with the top surface; and laminating a second laminate in contact with the bottom surface, the laminated core comprising the identification document, the identification document having a top side and a bottom side respectively corresponding to the core's top and bottom side, the top side having a top surface; and

laser etching a pattern into the top surface of the identification document; *wherein the pattern comprises an Optically Variable Device (OVD).*

5. An identification document, including a core and at least one outer laminate layer, wherein a top surface of the outer laminate layer is laser-processed to form a pattern, *the pattern being essentially not visible when viewed straight-on.*

9. An identification document, including a core and at least one outer laminate layer, wherein a top surface of the outer laminate layer is laser-processed to remove material therefrom, a void defined by such removing *having a “V” cross section.*²

13. An identification document, including a core and at least one outer laminate layer, wherein a top surface of the outer laminate layer is laser-processed in a pattern to remove material therefrom, said laser-processing also forming a raised feature along at least part of said pattern, *said raised feature extending above a nominal top surface level of said outer laminate and providing a tactile effect.*

15. An identification document, including a core and at least one outer laminate layer, the document conveying a portrait image, text information, a signature, and a bar code, wherein *a top surface of the outer laminate layer is laser-processed to define an optically variable device.*

19. An identification document including a core and an output layer of a laminate material, the top surface of the laminate material including a void pattern creating an indicia, the document characterized by raised features along edges of said

² According to the written description, OV patterns and tactile features may arise from “laser etching [that] creates reflecting surfaces that are not parallel to the surface of the document.” Ex. 1001, 7:59–8:5.

void pattern, *said features comprising foamed laminate material, the raised features extending above a nominal top surface level of the document to provide a tactile effect that aids in verifying the authenticity of the document.*

20. A method of producing an identification document, the method including laminating an outer layer to a core layer, and laser-processing the outer layer to form a void pattern therein, *the method characterized by foaming said outer layer during said laser processing so as to form a tactile feature adjacent said void pattern, said tactile feature aiding in verifying the authenticity of the document.*³

Ex. 1001, 12:2–14:20.

E. Asserted Grounds of Unpatentability

Petitioner asserts the combination of Maurer⁴ (Ex. 1005) and Bernecker⁵ (Ex. 1006) would have rendered the subject matter of claims 1–6, 8–10, and 12 obvious. Pet. 4. Petitioner asserts the combination of Maurer, Bernecker, and Gunn⁶ (Ex. 1008) would have rendered the subject matter of claims 15–17 obvious. *Id.* Petitioner asserts the combination of

³ Claim 20 does not specifically recite a raised tactile feature. The '494 patent states “the foaming of the thermoplastic that can occur with some types of laser engraving can be adapted to provide an indicium having a tactile feel.” Ex. 1001, 4:26–28.

⁴ Maurer et al., U.S. Patent No. 4,544,181 (issued Oct. 1, 1985).

⁵ Bernecker, U.S. Patent No. 5,958,528 (issued Sept. 28, 1999).

⁶ Gunn et al., U.S. Patent No. 6,066,594 (issued May 23, 2000).

Maurer and Fry⁷ (Ex. 1007) would have rendered the subject matter of claims 13, 19, and 20 obvious. *Id.*

To support its showing, Petitioner relies on the Declaration of Emmanouil M. Tentzeris, Ph.D. (Ex. 1002), submitted with its Petition, and the Reply Declaration of Emmanouil M. Tentzeris Ph.D. (Ex. 1012) submitted with its Reply. To counter Petitioner's showing, Patent Owner cites prior art patents (Ex. 2002, Ex. 2003, Ex. 2004, Ex. 2006) and other documents and evidence (Ex. 2005, 2012), and relies on the Declaration of Darran R. Cairns, Ph.D., in Support of Patent Owner's Response (Ex. 2010), submitted with its Response.

II. ANALYSIS

A. Claim Construction

In an *inter partes* review based on a petition filed prior to November 13, 2018, the Board interprets claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b) (2017); *Cuozzo Speed Techs., LLC v. Lee*, 136 S.Ct. 2131, 2144–45 (2016). Under this standard, absent any special definitions, claim terms carry 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). Only terms in controversy must be construed and only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed.

⁷ Fry, U.S. Patent No. 3,626,143 (issued Dec. 7, 1971).

Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

Petitioner “interprets all claim terms for purposes of this review in accordance with their plain and ordinary meaning consistent with the specification.” Pet. 9 (omitted footnote cites Ex. 1002 ¶¶ 35–39, which includes proposed claim constructions in related district court litigation). Patent Owner provides claim constructions for “tactile feature” or “tactile effect,” and also a void having a “‘V’ cross section,” terms that some of the claims employ. PO Resp. 6–8. Petitioner submits none of Patent Owner’s proposed claim constructions create a dispositive issue. Reply 22–23. As Petitioner submits, no need exists to provide explicit claim constructions for tactile feature or tactile effect, because no dispute exists over whether the prior art discloses such a feature. *See Vivid Techs.*, 200 F.3d at 803.

Regarding the “V” cross section, which claims 6, 9, 10, and 17 recite, Patent Owner submits “[t]o be ‘V’ shaped, the void must consist of two generally flat sides that begin at the top surface of the card and meet at a single point below the top surface of the card.” PO Resp. 7. Patent Owner relies on Figure 6B of the ’494 patent for this construction. *See id.* at 6–7.

However, the ’494 patent specifically states

throughout this application, laser engraved indicia, information, identification documents data, etc., *may be shown as having a particular cross sectional shape* (e.g., rectangular) *but that is provided by way of example and illustration only and is not limiting*, nor is the shape intended necessarily to represent the actual resultant cross sectional shape that occurs during laser engraving or manufacturing of identification documents.

Ex. 1001, 5:9–17 (emphasis added). In other words, the figures do not provide a definition for a specific shape, “nor is the shape intended necessarily to represent the actual resultant cross sectional shape that occurs during laser engraving” (*id.*), contrary to the premise of Patent Owner’s claim construction argument. Claim 9 recites a “‘V’ cross section,” and claim 10 depends from claim 9 and further defines the “‘V’ cross section” as “defined by two intersecting surfaces, neither of which is parallel to the top surface of the outer laminate.” Claim 10 does not require the “V” shape to begin at two generally flat sides, but it does require an intersection.

Nothing in the ’494 patent requires a “V” shape to begin at two generally flat sides. Even if it does, the outcome would not change, because the prior art (i.e., Bernecker) discloses or at least suggests such a feature, as found and determined below. Therefore, no need exists to further define or construe the term. *See Vivid Techs.*, 200 F.3d at 803.

B. Level of Ordinary Skill in the Art

Petitioner, citing the testimony of its declarant, Dr. Tentzeris, asserts that a person having ordinary skill in the art of the alleged invention “would have held *at least* a bachelor’s degree in engineering or physics and at least one year of relevant work experience in either one of the fields of laser processing or security features for identity documents.” Pet. 9 (citing Ex. 1002 ¶¶ 31–34) (emphasis added). Petitioner also asserts that “[t]his is the level of ordinary skill offered by” Patent Owner’s expert (Henry Dreifus) in the Federal Court of Claims related matter. *Id.* (citing Ex. 1010, 7). In the cited exhibit, Mr. Dreifus states that a person of ordinary skill in the art “would have had a Bachelor’s degree in engineering or physics and at least

one year of relevant work experience in either one of the fields of laser processing or security features for identity documents.” Ex. 1010 ¶ 23.

With one minor exception, Patent Owner and Dr. Cairns essentially agree with Petitioner’s contention regarding the level of ordinary skill. PO Resp. 26. For example, Patent Owner’s declarant, Dr. Cairns, opines that a person of ordinary skill in the art “would have had a Bachelor’s degree in engineering or physics and at least one year of relevant work experience in either one of the fields of laser processing or security features for identity documents.” Ex. 2001 ¶ 19; Ex. 2010 ¶ 47.

Petitioner’s addition of “at least” to the educational background constitutes the only difference between Petitioner’s and Dr. Cairns’ proposals. As noted above, however, Petitioner also asserts that its proposal tracks Patent Owner’s proposal in the Federal Court of Claims litigation, which did not include the qualifier “at least” for the educational background. The parties do not argue that any issue in the case turns on such a difference. The challenged patent and the asserted prior art reveal a level of ordinary skill in the art that supports Patent Owner’s proposal, which we adopt.

C. Obviousness Grounds of Unpatentability

As indicated above, Petitioner asserts the combination of Maurer and Bernecker would have rendered obvious the subject matter of claims 1–6, 8–10, and 12, the combination of Maurer, Bernecker, and Gunn would have rendered obvious the subject matter of claims 15–17, and the combination of Maurer and Fry would have rendered obvious the subject matter of claims 13, 19, and 20. Pet. 4.

1. Overview of Maurer

Maurer discloses using a laser to create a “multi-layered identification card comprising a card core laminated between cover sheets with user information appearing in the card inlet.” Ex. 1005, [57]. Maurer describes “an underlying, basic need” to protect identification cards “as far as conceivably possible from being forged and/or counterfeited in entirety.” *Id.* at 1:13–16. Maurer explains that a “polylaminated identification card has proved to be valuable” in combating forgery (*id.* at 2:10–11), and that using a laser to mark a core of a laminated card “protect[s] it from manipulation or tampering to a far greater extent than with unlaminated card cores, should they fall into the wrong hands” (*id.* at 4:19–24).

Maurer discloses “inscrib[ing] individual features, in particular personal data, in the interior of [the] card after lamination of the card blank.” *Id.* at 4:5–7. Scoring the core also etches the outer lamination layer to create “a relief-type structure on the cover sheet”: “At the same time as the information is provided on the core of the card by means of the laser beam, it is possible to concurrently mark the cover sheet which is then accessible to manual inspection by virtue of the resultant, permanent relief-type structure *on the cover sheet.*” *Id.* at 4:25–30 (emphasis added). Maurer explains that by controlling the energy of the laser beam to engrave a security feature, it “can . . . be felt manually.” *Id.* at 6:14–23; *id.* at 9:8–11 (claim 3 reciting “[a] multilayer identification card according to claim 1 in which the information on said transparent cover sheet is in relief and can be sensed by touch”).

Figures 1 and 2 of Maurer appear below:

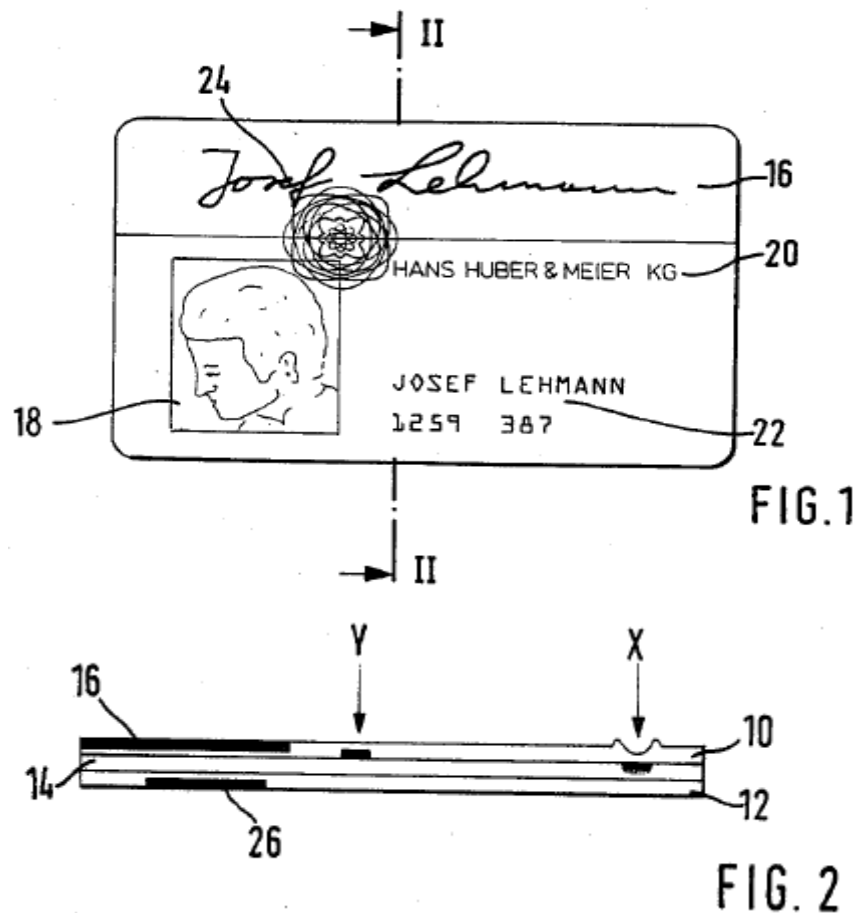


Figure 2 represents a cross-section of the security card depicted in Figure 1, and shows an example of a tactile security feature at area X on transparent cover 10. *See id.* at 6:18–23 (“Depending on the energy quantum of this laser beam, the upper cover sheet 10 can be melted concurrently in such a way that a relief is formed above the line of printed information, and in register therewith which can also be felt manually. An example is indicated by arrow X.”). The laser can cause the core to change colors (depending on the material coating the core) or to blacken/burn, thereby enhancing the ability to see the information and/or pattern (with some of the blackened

information/pattern being in register with the tactile relief created by the laser melting through upper cover sheet 10). *See id.* at 6:14–36 (describing burning “alphanumeric indicia are printed on the card core 14” such as data strips 20 and 22 in register at X, and describing background pattern 24 as a different color from that of “burned-in indicia in the data strips 20 and 22”). Maurer notes that “the extent to which the core is burned [is] adjustable in a simple manner.” *Id.* at 4:38–42.

Maurer explains “[i]t is known in principle (German patent specification No. 1,499,422) to use the energy of laser beams to evaporate or even burn materials which absorb this energy.” *Id.* at 3:57–59. Maurer discloses “employing a number of different techniques” in order to safeguard cards (*id.* at 1:23–29), noting that using the multiple known techniques enhances security in part because “the amount of time and energy expended in counterfeiting or forging the document exceeds by far the gains which can be expected” (*id.* at 1:42–49). Maurer also discloses “other features not shown here may also be provided by means of the laser beam without departing from the scope of the invention.” *Id.* at 7:1–3. On the other hand, Maurer discloses that “the identification card does not have to contain all of the information and features mentioned.” *Id.* at 8:47–49.

2. Overview of Fry

Fry teaches “[a] process for grooving thermoplastic sheet[s] with a laser beam.” Ex. 1007, 1:69–70. Fry states “[w]hen a groove or score is accomplished successfully, a bead is formed on both edges of the groove. The appearance of the groove is generally neat and regular, when accompanied by a bead.” *Id.* at 3:60–63.

Figure 2 of Fry follows:

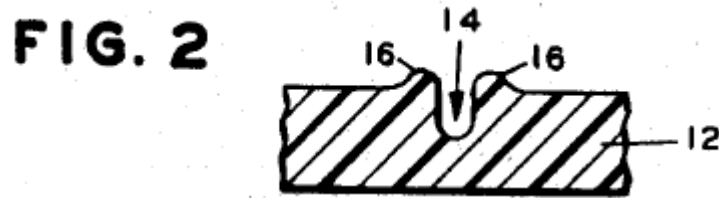


Figure 2 above shows bead 16 formed adjacent groove 14 produced by a laser in plastic substrate 12. *See id.* at 2:69–75. Fry explains “[f]airly large bubbles result in [the] process [of forming the groove], and microscopic examination reveals that the bubbles are formed only on the film side facing the [laser] beam.” *Id.* at 4:30–32. Fry generally explains “the energy density in the laser beam must be such that the plastic is evaporated or decomposed” (*id.* at 4:8–9), but the groove 14 “has a neat and clean surface, remaining unscorched after the scoring process has ended” (*id.* at 2:74–75). Fry also describes “the plastic material [a]s molten.” *Id.* at 4:24.

Bubbles released during the process form part of beads 16. *See id.* at 3:63–65. Fry explains “[i]n polyethylene, bubble formation occurs before the formation of the groove and not thereafter.” *Id.* at 4:52–53. Fry also explains “it is apparent that the groove is formed from the bubbles” (*id.* at 4:33–34), and states “[m]icroscopic examination of the grooves . . . reveals the presence of small bubbles in the beads formed on the sides of the grooves” (*id.* at 3:63–65).

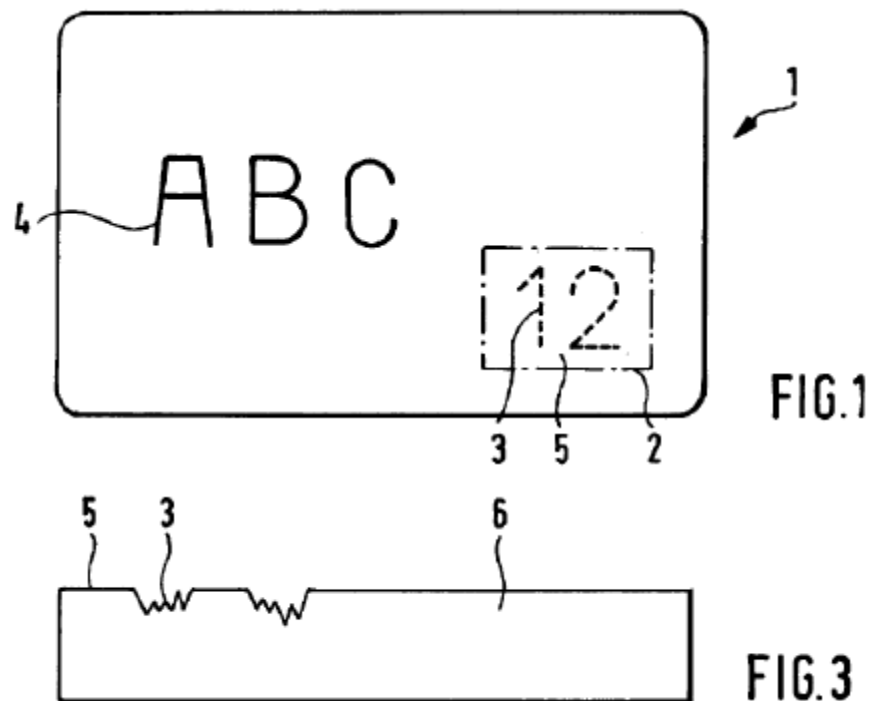
Fry discloses two possibilities for bubble formation: 1) “the release of entrained gases or water vapor from the plastics in the molten region, with

the bubbles forming due to pressure buildup or release of these gases,” or 2) “the internal temperature of the plastics may exceed the point at which the material degrades, and thereby result in the formation of small gaseous molecules.” *Id.* at 4:43–47.

3. Overview of Bernecker

Bernecker discloses providing laser-produced credit cards, ID cards, and other cards with “an authenticity feature that is neither manipulable nor copiable” and “stand[s] out clearly only when viewed at the glancing angle.” Ex. 1006, 2:9–22.

Bernecker’s Figures 1 and 3 follow:



Figures 1 and 3 represent card embodiments having information areas 3 “which show readable information or a pattern or the like” with “diffusely light-scattering properties which make it possible to recognize the

information clearly at a certain viewing angle.” *Id.* at 4:40–49. Figure 1 also represents a display of “usual information 4” in “color contrast” with its background. *See id.* at 4:41–42.

With respect to laser-notched information areas including areas 3, Bernecker generally states “the material in the radiation-exposed areas is melted and partly decomposed, giving rise to notches without color changes of the plastic.” *Id.* at 4:8–10. Bernecker refers to “evaporated” “plastic material” to create “depressions . . . in the form of readable information.” *Id.* at 3:15–17. Bernecker also explains that a notched area, viewable at glancing angles, “offers a simple possibility for designing data to be very inconspicuous” as a “protection against forgery,” and “in any case readily recognizable at the glancing angle.” *Id.* at 4:20–28. Bernecker also describes its invention as “a method for producing . . . an authenticity feature that is neither manipulable nor copiable and can be produced simply and cost effectively on the finished product.” *Id.* at 2:10–13. Bernecker explains the “optical scattering behavior” of the notches “cannot be recognized with the illuminating methods customarily used in reproduction devices.” *Id.* at 3:9–11.

Bernecker also indicates the laser-notched area can be colored or discolored. For example, Bernecker describes creating “notches without color changes of the plastic.” *Id.* at 4:9–10. Bernecker states this notched “information . . . without color contrast is added to” other data “already inscribed in color contrast by a laser.” *Id.* at 3:49–58. Color contrast information may include “photo, name, signature, etc.” *See id.* at 3:52–57. Bernecker notes “[u]sing a power-controllable laser it is therefore possible to

produce halftone images.” *Id.* at 4:3–4. By shifting the focus of the laser beam to the surface, this “give[s] rises to notches without color changes of the plastic.” *Id.* at 4:9–10. Bernecker indicates it can create surface notches with or without color changes: “Alternatively, the material can also be melted in the surface area without any discoloration of the material occurring.” *Id.* at 5:9–10 (describing Figure 3).

Bernecker further states “[i]t is known from the field of contrasting laser inscription that discoloration occur only as of a certain laser power, becomes stronger as the laser power increases further, and finally leads to complete burning of the material.” *Id.* at 3:66–4:3. Bernecker adds that controlled power and focus creates halftone images and focusing the laser on the “surface area of the material” produces colorless notches in the plastic. *Id.* at 3:66–4:10. Bernecker further notes its invention builds on prior art anti-forgery efforts “developed exclusively from the point of view of producing clearly readable information contrasting with its surroundings in the form of discolorations of the material.” *See id.* at 2:33–34. Bernecker states its cards “can of course also have further security features.” *Id.* at 4:50–51.

4. Overview of Gunn

Gunn generally discloses identification documents that include a core layer sandwiched between two transparent polymer layers. Ex. 1008, [57]. Similarly to the ’494 patent (*supra* Section I.A), Gunn explains that such identification documents, including driving licenses, credit cards, bank cards, and other cards, bear important information including “name, address, birth date, signature[,] and photographic image,” and also including other

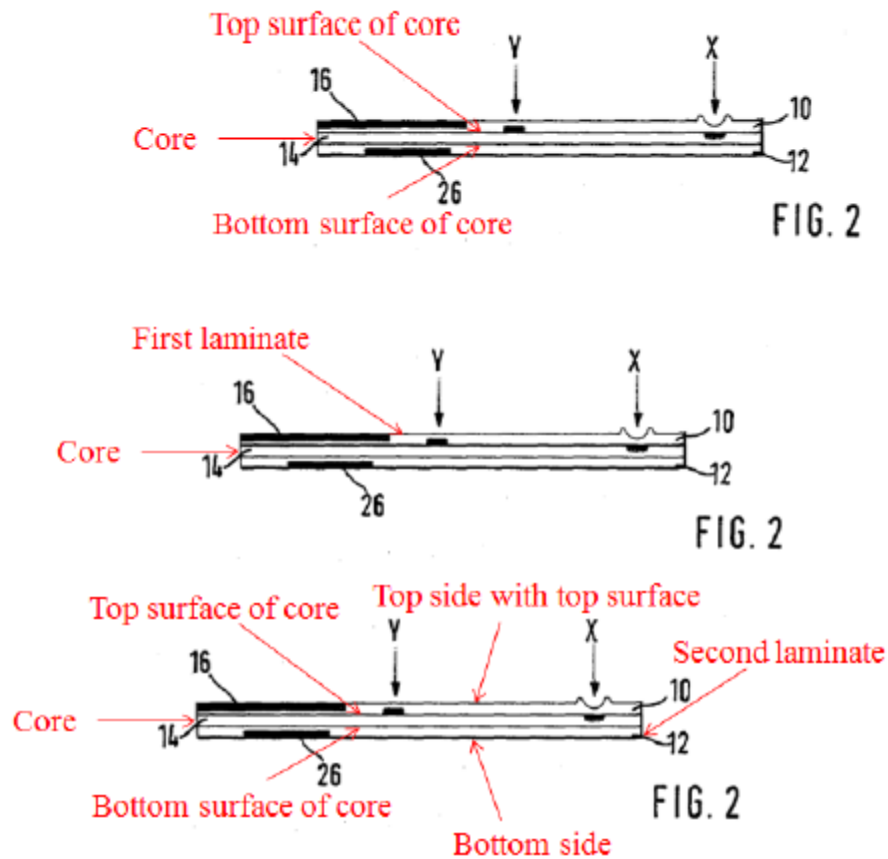
“variant” data (e.g., employee number) and “invariant” data with respect to a large number of cards (e.g., employer name). *Id.* at 1:10–22.⁸

Gunn discloses bar codes, explaining “the identification [data] of the bearer are often covertly repeated on the document in encrypted form for data verification in a magnetic stripe, bar code, radio frequency module[,] or integrated circuit chip.” *Id.* at 2:4–8. Gunn adds “it is often convenient to provide one or more first indicia intended for human reading of the core layer [front] surface . . . and one or more additional first indicia intended for machine reading (e.g., bar codes) on the opposed ‘back’ surface of the core layer.” *Id.* at 3:19–25.

5. Analysis of claims 1–6, 8–10, and 12

Petitioner contends the combination of Maurer and Bernecker would have rendered obvious the subject matter of claims 1–6, 8–10, and 12. Pet. 16–34. Petitioner persuasively reads most of the method steps of claim 1 primarily on the Maurer’s method of producing a security feature in a card comprised of a laminated core. *See id.* at 19–23. As an aid to demonstrating how Maurer teaches the core providing and laminating steps of claim 1, Petitioner annotates Maurer’s Figure 2 a number of times, as reproduced below:

⁸ The ’494 patent states the “present invention is also related to” several applications and Gunn, all of which the ’494 patent incorporates by reference. *See* Ex. 1001, 2:22–29. No dispute exists over whether Gunn, which issued May 23, 2000, constitutes prior art to the ’494 patent (which would have an earliest possible effective filing date of December 24, 2001, based on continuity to a provisional application). *See id.* at [60].



Id. at 21–23 (citing Ex. 1005, Abstract, 4:19–30, 5:38–41, Fig. 2; Ex. 1002 ¶¶ 67–70). Maurer’s Figure 2, as annotated by Petitioner and reproduced above, reveals card core 14 laminated by first 10 and second 12 laminates, etched with a tactile security feature at location X. *See id.* at 22–23.

Petitioner contends the combination of Maurer and Bernecker teaches or suggests the laser etching step and wherein clause of claim 1: “laser etching a pattern into the top surface of the identification document; wherein the pattern includes visual properties, and wherein the visual properties comprise a characteristic of not being visible when viewed straight on.” *Id.* at 23–25.

Petitioner relies on Bernecker's OV notched patterns, created by a laser, and contends it would have been obvious to include them on the top layer of Maurer's similar card, in order to provide additional security features not subject to tampering or manipulation. *See id.* (citing Ex. 1005, Abstract; Ex. 1006, 2:16–22, 2:57–65, 3:13–17, 4:40–49, 5:5–10; Ex. 1002 ¶¶ 70–74; Pet. Section VII.B.1). Further addressing motivation, Petitioner relies on reasons outlined in Section VII.B.1 of its Petition. *Id.* at 23.

Petitioner persuasively explains a person of ordinary skill in the art would have been motivated to include Bernecker's "security feature in place of or in addition to other security features [of Maurer] . . . to provide protection from photocopying as disclosed by *Bernecker*." *Id.* at 24 (citing Ex. 1002 ¶ 72). Petitioner further persuasively explains that employing Bernecker's OV feature over a colorless area would have been obvious, because Bernecker explicitly discloses a colorless feature "stand[s] out clearly only when viewed at the glancing angle," and the references teach Bernecker's OV feature and Maurer's laminated core and other security features prevent tampering, forgery, manipulation, and photocopying. *See id.* at 16–17 (quoting Ex. 1006, 2:19–22; citing *id.* at 3:9–12; Ex. 1005, Abstract; Ex. 1002 ¶¶ 55–61).

Claim 2 depends from claim 1 and recites "a characteristic of resisting image capture" and claim 3 depends from claim 2 and specifies "where in [sic] the image capture is one of photocopying and optical sensor capture." Petitioner relies persuasively on Bernecker's teaching that the OV pattern resists copying. *See* Pet. 25 (citing Ex. 1006, 1:16–20, 2:9–13).

Claim 4 recites limitations similar to those of claim 1, with differences in the “wherein” clause: i.e., claim 4 reciting “wherein the pattern comprises an Optically Variable Device (OVD)” (instead of reciting “wherein the pattern includes visual properties, and wherein the visual properties comprise a characteristic of not being visible when viewed straight on”). *See* Pet. 26–27 (noting similarities and differences between claims 1 and 4). Claim 5 tracks most of the features of claim 1, albeit in a product-by-process format: “An identification document, including a core and at least one outer laminate layer, wherein a top surface of the outer laminate layer is laser-processed to form a pattern, the pattern being essentially not visible when viewed straight-on.”

Petitioner’s showing with respect to claims 4 and 5 persuasively tracks its showing summarized above with respect to claim 1. *See id.* at 26–30. Petitioner adds that preserving Maurer’s laminating feature and other features as combined with Bernecker’s OV features would have resulted in a card having the security feature of being recognizable by virtue of providing differently viewed features at different viewing angles. *See id.* at 28–29 (quoting Ex. 1006, 2:21–22 (area on card “stands out clearly only when viewed at the glancing angle”); citing Ex. 1002 ¶¶ 81–83)). In other words, according to Petitioner’s persuasive showing, the combined card would have provided additional security features relative to a simpler card, thereby providing resistance to manipulation and forgery, including via photocopying. *See id.* The record shows that attempting to forge an ID card having the combination of Maurer’s features with Bernecker’s OV features would have required more effort than copying a simpler card with fewer

features, as Maurer explains. *See supra* Section II.C.1 (citing Ex. 1005 for its teaching of “employing a number of different techniques” in order to safeguard cards (*id.* at 1:26–27), noting that using multiple known techniques enhances security in part because “the amount of time and energy expended in counterfeiting or forging the document exceeds by far the gains which can be expected” (*id.* at 1:44–49)).

Claim 6 recites “[t]he document of claim 5, wherein said laser-processing removes material from the laminate and defines at least one void having a ‘V’ cross section.” Claim 8 depends from claim 5 and recites “wherein said laser processing also defines an optically variable device.” Claim 9 recites a similar “V” shaped limitation to that of claim 5: “[a]n identification document, including a core and at least one outer laminate layer, wherein a top surface of the outer laminate layer is laser-processed to remove material therefrom, a void defined by such removing having a ‘V’ cross section.”

Addressing claims 6, 8, and 9, Petitioner persuasively contends Maurer and Bernecker disclose similar laser processes for forming voids on the top layer of ID cards, noting that Bernecker discloses evaporating plastic to make OV voids, and Bernecker discloses making notches that appear as “V” shaped cross-sections. *See* Pet. 30–32 (citing Ex. 1002 ¶¶ 84–85; Ex. 1006, Fig. 3, 2:19–25, 2:63–65, 3:13–17, 3:35–37); Ex. 1006, 4:6–12 (describing notches). The term “notch” means “[a] V-shaped cut.” Ex. 3001 (cited in the Institution Decision 24 & n.8).⁹ Further addressing claim 6,

⁹ WEBSTER’S II NEW RIVERSIDE DICTIONARY 804 (1984).

Petitioner contends Figure 3 of Bernecker illustrates V-shaped notches, and Bernecker describes the pattern as providing a readable security feature. *See* Pet. 30. Bernecker discloses that the readable OV feature, implemented with, *inter alia*, V-shaped notches, “offers a simple possibility for designing data to be very inconspicuous” as a “protection against forgery,” and “in any case readily recognizable at the glancing angle.” Ex. 1006, 4:20–28, Fig. 3; *supra* Section II.C.3; *see* Pet. 28–32 (addressing the OV feature of claims 5, 6, and 8).

Claim 10 depends from claim 9 and recites “wherein said ‘V’ cross section is defined by two intersecting surfaces, neither of which is parallel to the top surface of the outer laminate.” This limitation describes a “V” shape. Petitioner’s persuasive showing for claim 10 tracks its persuasive showing with respect to claims 6 and 9, with Petitioner persuasively asserting that Figure 3 of Bernecker portrays a “cross section . . . defined by two intersecting surfaces, neither of which is parallel to the top surface of the outer laminate.” *See* Pet. 33 (citing Ex. 1002 ¶ 87).

Claim 12 depends from claim 9 and recites an “optically variable device.” Petitioner persuasively relies on its showing for claim 8, relying on Bernecker’s OV feature as obvious for the same reasons with respect to claims 1 and 4. *See* Pet. 26–27 (addressing claim 4), 31–32 (claims 8 and 9).

In summary, Petitioner shows persuasively that providing features having the dual benefits of Bernecker’s OV feature and Maurer’s security features, while retaining Maurer’s features, results in a more secure card. *See* Pet. 29 (citing Pet. Section VII.B.1; Ex. 1006, 2:16–20; Ex. 1002 ¶ 82); Pet. 16–19 (Section VII.B. 1, motivation); Pet. 28–30 (citing Section

VII.B.1); Ex. 1002 ¶¶ 55–61. Petitioner shows persuasively that adding Bernecker’s OV feature to colorless areas of Maurer’s card satisfies the limitations of challenged claims 1–6, 8–10, and 12. *See* Pet. 16–34.

As summarized above, Petitioner makes a detailed and persuasive showing supported by rational underpinning regarding challenged claims 1–6, 8–10, and 12. *See id.* Based on the foregoing discussion and review of the record, Petitioner shows by a preponderance of evidence that the combination of Maurer and Bernecker would have rendered obvious the subject matter of claims 1–6, 8–10, and 12. Patent Owner’s arguments, addressed next, do not undermine Petitioner’s persuasive showing.

Patent Owner contends Petitioner “fails to articulate any legitimate motivation to combine *Maurer* and *Bernecker*, much less provide a reason the combination would [be] beneficial.” PO Resp. 27. According to Patent Owner, “Petitioner’s entire obviousness case[] is fatally flawed because the proffered motivation to combine—the need for a security feature that protects against photocopying—is already explicitly taught in *Maurer*.” *Id.* at 28 (emphasis by Patent Owner) (internal footnote omitted). Patent Owner correctly points out that Maurer provides magnetic stripe data and tactile data for security, and succinctly explains “[a]n individual charged with authenticating the card of *Maurer* would be able to inspect the card with his or her finger and determine whether the card is authentic or a photocopied duplicate based on the existence or absence of the tactile feature.” *Id.* Patent Owner implies its arguments alleging a “flawed motivation to combine” apply to claims 1–6, 8–10, 12, and 15–17. *See id.* at 28 n.6.

Building on its allegation of a lack of motivation, Patent Owner alleges that Petitioner's showing "bears the hallmarks of improper hindsight." *Id.* at 31.

Patent Owner's arguments do not undermine Petitioner's showing that it would have been obvious to add to the features of Maurer's card, in order to add protection to the card, as discussed above. *See, e.g.*, Pet. 18, 24. The combined card of Maurer and Bernecker as proposed by Petitioner beneficially renders photocopying, forgery, and reproduction more difficult, and visual inspection easier, as compared to a simple card that does not include Bernecker's OV or notched V features. *See id.*

Maurer explicitly describes the benefits of employing a variety of different features, suggesting features like that of Bernecker. For example, Maurer discloses "employing a number of different techniques" in order to safeguard cards (Ex. 1005, 1:23–29), noting that multiple known techniques enhance security in part because "the amount of time and energy expended in counterfeiting or forging the document exceeds by far the gains which can be expected" (*id.* at 1:42–49). Petitioner shows persuasively that adding Bernecker's OV feature would have provided such an additional feature, causing a forger to expend more time and effort to duplicate a card having combined features of both references, including Bernecker's OV feature and Maurer's raised tactile features, core laminating feature, and other security features. *See* Pet. 18, 23–24; Ex. 1002 ¶¶ 59, 60, 72. In addition, Petitioner sufficiently shows that adding Bernecker's OV feature would have provided a card with the security feature of appearing to be different based on the viewing angle. *See id.* In other words, a card not having the expected OV feature readily could be recognized as a forgery. Contrary to Patent Owner's

related arguments, for similar reasons summarized above, Petitioner's rationale or motivation does not amount to impermissible hindsight. *See* PO Resp. 10–11.

Patent Owner also contends Bernecker and Maurer provide different processes, with Maurer providing blackening of the card “to burn information deep into the core of the card,” and Bernecker preventing blackening or discoloration, which shows, according to Patent Owner, that Petitioner employs impermissible hindsight. *See id.* at 30 & n.7. Again, Petitioner does not suggest omitting all (or any) of Maurer's blackened printing areas. Petitioner generally proposes keeping at least several of Maurer's features, and also adding to or replacing some of them, while keeping much of Maurer's “laminated card design.” *See* Pet. 18 (modifying a driver's license, preventing tampering, adding Bernecker's security feature), 22–24 (modifying Maurer's identification document). Similarly, contrary to Patent Owner's arguments, and similar to Maurer, Bernecker specifically envisions “providing further security features,” including keeping some coloring processes on portions of the card, including “[p]ersonalization data 4 . . . preferably incorporated with a laser in the form of discolorations of the plastic material.” Ex. 1006, 4:53–54. So nothing in the combination precludes employing the two features, even if the laser must focus on different parts of the card (i.e., in the core and on the surface). *See* PO Resp. 30 n.7.

Maurer also specifically states “[a]s already mentioned hereinbefore, the identification card *does not have to contain all of the information and features mentioned. . . . Changes involving the number, form and*

positioning of the information can be made as desired.” Ex. 1005, 8:47–52 (emphasis added). Maurer specifically contemplates not burning in features—even for printing information (including picture) areas. For example, Maurer states that information “‘burned’ into the paper core” may involve “many shades of gray” using “corresponding technology already known” (Ex. 1005, 8:23–26), and if the card designer desires color, “the laser does not have to cause a blackening or destruction of the core, but merely a change in color” using “a suitable substance capable of causing a thermochemical [color] reaction” (*id.* at 6:25–28). And Bernecker supplements Maurer, by teaching that “[i]t is known from the field of contrasting laser inscription that discoloration occurs only as of a certain laser power, becomes stronger as the laser power increases further, and finally leads to complete burning of the material. Using a power-controllable laser it is therefore possible to produce halftone images.” Ex. 1006, 3:66–44. Bernecker specifically teaches adding its OV features to existing cards as “without complication” as “a simple possibility.” *Id.* at 4:21–26.

In other words, Petitioner shows persuasively that the proposed combination suggests retaining Maurer’s blackened areas at certain information portions of the laminated card. *See* Pet. 24–25. Petitioner also shows persuasively that at or adjacent other patterns on the card, including colorless underlying information or other areas, it would have been obvious to add Bernecker’s OV feature to supplement Maurer’s features (including raised features) together as part of one pattern or with different patterns at colorless areas, thereby retaining Bernecker’s OV feature and Maurer’s

tactile feature (including raised tactile feature) at desired card portions.¹⁰ See Pet. 23–25 (contending providing multiple security features, including Maurer’s lamination features, and Bernecker’s OV feature, would have been obvious to protect Maurer’s card further from photocopying, tampering, or manipulation (citing Ex. 1002 ¶ 72)). Although Maurer’s card resists photocopying as Patent Owner argues (PO Resp. 28), the underlying printed (blackened) areas would not resist photocopying even if the raised or notched features would. So adding Bernecker’s OV feature in areas devoid of blackened printed information in register therewith renders photocopying and forgery more difficult.

Petitioner also points out persuasively that a person of ordinary skill in the art “would have recognized that including Bernecker’s security feature in the top-most, transparent layer as taught by Bernecker, would add protection from copying because the security feature is visible only at a glancing angle.” Pet. 18 (citing Ex. 1002 ¶ 59). Petitioner persuasively adds that implementing some personal information as part of an OV layer according to Bernecker’s teachings would have retained the benefits of Maurer’s lamination while keeping photocopying of such information difficult. *Id.* Accordingly, contrary to Patent Owner’s arguments (PO Resp. 28–33), Petitioner does not engage in impermissible hindsight and provides articulated reasons based on evidence in Maurer, Fry, and Bernecker, and

¹⁰ Claims 1–6, 8–10, and 12 do not require a raised feature. Addressing claims 13, 19, and 20, which do require a raised feature, Patent Owner contends that Maurer “attributed the tactile feature to the depression—not a raised feature.” PO Resp. 34. We discuss this argument below.

expert testimony, supporting the proposed combination of known security features into a security card.

Grouping claims 6, 9, 10, 12, and 17 together, Patent Owner contends “Petitioner’s cited references fail to teach the creation of voids having a ‘V’ cross section.”¹¹ PO Resp. 48. Patent Owner contends “Petitioner again improperly ascribes significant meaning to dimensionless prior-art figures.” *Id.* at 49.

To the contrary, as the panel initially found in the Institution Decision, Bernecker discloses the feature as “notches without color changes of the plastic.” Ex. 1006, 4:9–10; Inst. Dec. 24–25 n.8, 40–41. As noted above and in the Institution Decision (*supra* note 9) the term “notch” means “[a] V-shaped cut.” Ex. 3001; Inst. Dec. 24–25 n.8, 40–41. Patent Owner does not address this or counter this evidence. See PO Resp. 48–51. The panel maintains the finding.

In addition, Bernecker depicts the notches as generally V-shaped at Figure 3. The ’494 patent does not describe any special feature related to a V-shaped groove. To the contrary, the ’494 patent specifically states

throughout this application, laser engraved indicia, information, identification documents data, etc., *may be shown as having a particular cross sectional shape* (e.g., rectangular) *but that is provided by way of example and illustration only and is not limiting*, nor is the shape intended necessarily to represent the actual resultant cross sectional shape that occurs during laser engraving or manufacturing of identification documents.

Ex. 1001, 5:9–17 (emphasis added).

¹¹ We address Petitioner’s showing regarding claim 17 below.

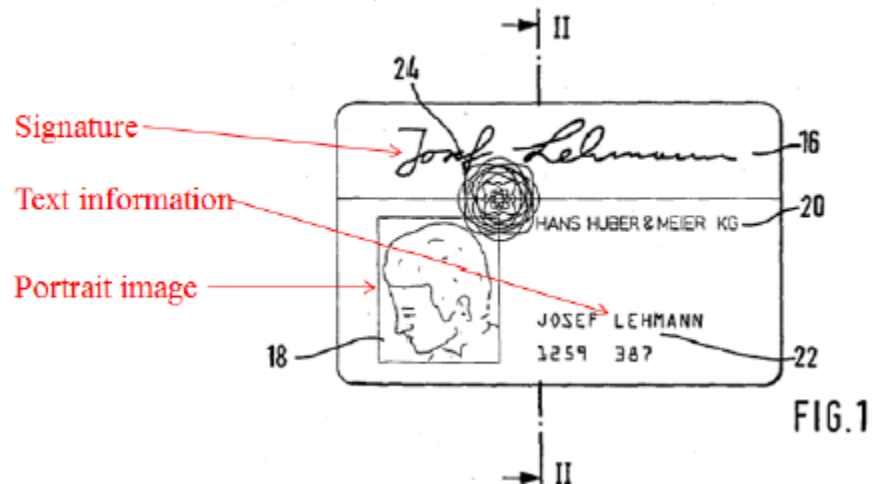
Even if we adopt Patent Owner’s claim construction so that the V-shape must generally begin at two flat sides (*see* discussion *supra* in Section II.A.), Bernecker suggests such a shape because Bernecker describes a notch and generally depicts a V-shape as found above. *See* Reply 21–22 (citing Ex. 1006, 4:9; annotating Figs. 2, 3). The ’494 patent reveals nothing special about the shape as requiring the “V” to begin at two flat sides either structurally or functionally.

In summary, Petitioner makes a detailed showing supported by rational underpinning regarding challenged claims 1–6, 8–10, and 12. *See* Pet. 19–34. Petitioner shows by a preponderance of evidence that the combination of Maurer and Bernecker would have rendered obvious the subject matter of claims 1–6, 8–10, and 12. Patent Owner’s arguments do not undermine Petitioner’s showing.

6. Analysis of claims 15–17

Petitioner contends the combination of Maurer, Bernecker, and Gunn would have rendered obvious the subject matter of claims 15–17. Pet. 34–43. Similarly to its showing for claim 1, Petitioner persuasively reads claim 15’s preamble, “[a]n identification document, including a core and at least one outer laminate layer,” onto Maurer’s “multi-layered identification card comprising a card core laminated between cover sheets with user information appearing on the card inlet.” Ex. 1005, [57]; Pet. 37 (citing Ex. 1005, [57], 5:38–41; Ex. 1002 ¶¶ 92–93). Claim 15 also requires “the document conveying a portrait image, text information, a signature, and a bar code, wherein a top surface of the outer laminate layer is laser-processed to define an optically variable device.” In addition to citing admitted prior

art Figure 1 of the '494 patent (Pet. 38), Petitioner persuasively cites and annotates Maurer's Figure 1, as follows:



As Petitioner's annotations show above, Maurer's Figure 1 depicts portrait image 18, text information at areas 20 and 22, and signature area 16. Pet. 38; Ex. 1005, 5:51–57. Petitioner points out that Bernecker and Gunn disclose similar card features. Pet. 39 (citing Ex. 1006, 1:10–15, 3:52–57; Ex. 1008, 1:14–17).

To address the OV feature, Petitioner relies persuasively on its rationale discussed above in connection with claim 5, contending it would have been obvious to employ Bernecker's security feature of rendering a card viewable only at angles, making the card easy to recognize and create, making the card difficult to forge, manipulate, and/or photocopy, and also keeping the benefits of Maurer's security features. See Pet. 40–41 (referring to its analysis of claims 5 and 8 (citing Ex. 1002 ¶ 98)).

Petitioner relies primarily on Gunn to address the recited bar code feature, but notes admitted prior art in the '494 patent (Ex. 1001, Fig. 1), Bernecker, and Maurer, each disclose providing machine readable

information on a document. *See* Pet. 34–35.¹² Petitioner persuasively contends it would have been obvious to use the known bar code feature in order to provide machine readable security features that include encryption, as Gunn suggests. *See* Pet. 35–36 (citing Ex. 1008, 2:4–8; Ex. 1002 ¶ 91), 39–40 (citing Ex. 1002 ¶ 97).

Petitioner notes Gunn explains information appearing in readable form on the card is “*often* covertly repeated on the document in encrypted form *for data verification* in a magnetic stripe, bar code, radio frequency module or integrated circuit chip.” Pet. 36 (quoting Ex. 1008, 2:4–8) (emphasis by Petitioner). According to Petitioner, given the cited teachings, a person of ordinary skill in the art

would have readily recognized the benefits of providing machine-readable information in the form of a bar code, in addition to human-readable information and would have been motivated to do so, as it would provide an alternative method of encoding identification information and provide an added layer of security by allowing the human-readable information on the card to be verified by the machine-readable information (i.e., through comparison/matching).

¹² Statements in the specification can be “probative on how one with ordinary skill in the art at the time of filing of the involved patent would have read and understood the disclosure of the prior art.” *Paice v. Ford Motor*, 881 F.3d 894, 901 (Fed. Cir. 2018) (citing *PharmaStem Therapeutics, Inc. v. ViaCell, Inc.*, 491 F.3d 1342, 1362 (Fed. Cir. 2007) (“Admissions in the specification regarding the prior art are binding on the patentee for purposes of a later inquiry into obviousness.”)); *see also In re Baxter Travenol Labs*, 952 F.2d 388, 390 (Fed. Cir. 1991) (holding extrinsic evidence, including *admissions*, may be used to explain what a reference discloses in a reexamination proceeding).

Pet. 35–36 (citing Ex. 1002 ¶ 91).

Claim 16 depends from claim 15, and recites “wherein said laser processing also defines a pattern that is essentially not visible when viewed straight-on.” Claim 17 depends from claim 15 and requires the laminate to include “a void having a ‘V’ cross section.” Petitioner persuasively relies on its showing with respect to the similar OV features recited in the claims noted above in the previous section. *See* Pet. 41–43.

Petitioner makes a detailed and persuasive showing supported by rational underpinning regarding challenged claims 15–17. *See* Pet. 34–43. Patent Owner’s arguments do not rebut Petitioner’s showing.

Patent Owner contends Bernecker does not disclose a V-shaped cross-section. PO Resp. 48–50. As set forth above in the previous section, Petitioner shows persuasively such a feature would have been an obvious and predictable variant as taught or suggested by Bernecker for the purpose of providing an OV feature. *See* Pet. 16–19, 30–32. Based on the foregoing discussion and review of the record, Petitioner shows by a preponderance of evidence that the combination of Maurer, Bernecker, and Gunn would have rendered obvious the subject matter of claims 15–17.

7. Analysis of claims 13, 19, and 20

Petitioner contends the combination of Maurer and Fry would have rendered obvious the subject matter of claims 13, 19, and 20. Pet. 43–56. Claims 13, 19, and 20 recite materially similar subject matter relating to a tactile or raised tactile feature on an identification document.

Claim 19, representative of the group, follows:

19. An identification document including a core and an outer layer of a laminate material, the top surface of the laminate material including a void pattern creating an indicia, the document characterized by raised features along edges of said void pattern, said features comprising foamed laminate material, the raised features extending above a nominal top surface level of the document to provide a tactile effect that aids in verifying the authenticity of the document.

Petitioner relies initially and persuasively on Maurer’s disclosure of “a multi-layer identification card comprising a card core laminated between cover sheets.” Pet. 44 (quoting Ex. 1005, [57]). Addressing the raised tactile feature, Petitioner quotes and persuasively relies on Maurer as follows:

[Maurer] disclosed that “[a]t the same time as the information is provided on the core of the card by means of the laser beam, it is possible to concurrently mark the cover sheet which is then accessible to manual inspection by virtue of the resultant, *permanent relief-type structure* on the cover sheet.” Ex. 1005, 4:25–30. *Maurer* went on to explain that the laser beam can melt the cover sheet “in such a way that a relief is formed above the line of the printed information and in register therewith which can also be *felt manually*.” *Id.* [at] 6:18–23.

Pet. 44–45 (emphasis by Petitioner).

Petitioner persuasively turns to Fry for its

particular implementation details for creating grooves in a variety of thermoplastics, which are commonly used for identification cards. Ex. 1007, Table II; Ex. 1002, ¶106. *Fry* explained that in its process, “the plastic is evaporated or decomposed” with a laser. *Id.* 4:6-12. The energy of the beam vaporizes the substrate “without affecting the regions adjacent [to] the area where the beam impinges.” *Id.* 1:41–44. *Fry* further

disclosed that the process of scoring or grooving results in raised features that include microscopic “bubbles.” *Id.* 3:63–65, 4:28–30. *Fry* further explained “that the groove is formed from the bubbles.” *Id.* 4:34–35.

Pet. 45 (emphasis by Petitioner).

Petitioner persuasively contends a person of ordinary skill in the art would have been motivated to turn to *Fry*’s “detailed teachings of how to score or groove plastic,” in light of Maurer’s teaching of using raised tactile features for providing a secure identification document. *See id.* According to Petitioner, *Fry*’s teachings of how to score and groove plastic would have been routine and straightforward to implement in Maurer, and the resultant security feature (e.g., raised tactile feature) would have provided expected functionality and yielded predictable results. *See id.* at 45–46 (citing Ex. 1002 ¶ 107). Moreover, according to Petitioner’s persuasive showing, a skilled artisan would have found it obvious that *Fry*’s grooving/scoring process would have included bubbling of thermoplastic material, which Petitioner equates with foaming. *Id.* at 46 (citing Ex. 1002 ¶ 107).

Claim 20 recites similar limitations in method form and does not specifically require the foaming to create a raised feature. *See supra* note 3. Claim 13 recites similar limitations with a product-by-process limitation of removing material: “wherein a top surface of the outer laminate layer is laser-processed in a pattern to remove material therefrom.”

Even if claim 20 requires a raised feature, Petitioner persuasively addresses the specific raised feature limitation (expressly recited in claims 13 and 19), relying on the above-discussed motivation for turning to *Fry*. *See* Pet. 46–56. The combination teaches providing a raised tactile and

foamed feature with Maurer at least suggesting a ready tactile indication provides ready authenticity for a document and prevents forgery and copying.

Fry teaches a laser plastic scoring method similar to Maurer's laser scoring plastic method, which ensures the formation of "neat and regular" (Ex. 1007, 3:62–63) raised tactile patterns:

When a groove or score is accomplished successfully, a bead is formed on both edges of the groove. The appearance of the groove is generally neat and regular, when accompanied by the bead. Microscopic examination of the grooves, furthermore, reveals the presence of small bubbles in the beads formed on the sides of the groove.

Id. at 3:60–65.

Credible testimony by Dr. Tentzeris shows "a person of ordinary skill in the art would have looked to known techniques for scoring and/or grooving thermoplastic, like those disclosed in *Fry*, in order to form the raised/tactile relief structure of *Maurer*." Ex. 1002 ¶¶ 111–115.

Based on the discussion above and Petitioner's showing, claims 13, 19, and 20 would have been obvious, because an artisan of ordinary skill would have recognized that the similar processes of Fry and Maurer employ melting with evaporation that foams the plastic and results in removal of some plastic material to create a neat and clean groove with adjacent raised edges (beads) in order to provide a neat and regular security feature of a tactile raised edge that provides a measure of authenticity. *See* Pet. 46–56.

In summary, Petitioner makes a detailed and persuasive showing supported by rational underpinning and the record regarding challenged claims 13, 19, and 20. *See* Pet. 33–56. Petitioner shows that the

combination of Maurer and Fry would have rendered obvious the subject matter of claims 13, 19, and 20. Patent Owner's arguments, addressed next, do not undermine Petitioner's showing.

Addressing claims 13, 19, and 20 as a group, Patent Owner presents a number of arguments to support its contention that neither Maurer nor Fry teaches a raised tactile feature. *See* PO Resp. 33–48. Patent Owner cites its expert, Dr. Cairns, in support of the contention. *See, e.g., id.* at 46 (arguing “[a]s explained by . . . Dr. Cairns, *Maurer* does not teach or disclose a raised feature that can be felt by touch” (citing Ex. 2010 ¶¶ 67–109)). Patent Owner's arguments fail to undermine Petitioner's showing because they rest on the premise that Maurer's Figure 2, which shows a raised tactile feature, represents a “cartoon” and cannot be relied upon. *See id.* at 40. To support that premise, Patent Owner contends Maurer's process does not include evaporation/ degradation of the plastic, a process that the parties agree results in a raised tactile feature. *See, e.g., id.* at 20; Reply 7; Ex. 2010 ¶ 90 & n.6 (testifying “creation of a feature like the one Petitioner argues is depicted in Figure 2 can only be made using the more aggressive vaporization” and stating “I understand that . . . Dr. Tentzeris[] agrees with me on this point.” (citing Ex. 2008 188:23–189:7)).

a. Divergent Field of Endeavor

Patent Owner asserts Fry involves “scoring plastics to form a weakened line, not for use in inscribing information” in a “divergent field of endeavor.” PO Resp. 42. This appears to be an attempt to raise an analogous art issue. Fundamentally, contrary to this implied argument, the '494 patent teaches scoring plastics with a laser just like Fry. *See* Ex. 1001,

Abstract; Ex. 1007, Abstract. According to Fry, “[a] score, by definition, is a groove into a material surface and penetrates only a portion of the total depth of the material being scored.” Ex. 1007, 2:32–33. As discussed at length above, Maurer also teaches marking or scoring a plastic layer. Ex. 1006, 4:24–36, 6:57–58; *supra* Sections II.C.1, 5, 6.

To determine if a prior art reference is analogous, one must consider “(1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor’s endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.” *In re Clay*, 966 F.2d 656, 658 (Fed. Cir. 1992). “A reference is reasonably pertinent if, even though it may be in a different field from that of the inventor’s endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor’s attention in considering his problem.” *Id.* at 659; *see Unwired Planet, LLC v. Google Inc.*, 841 F.3d 995, 1000–01 (Fed. Cir. 2016) (relying on *Clay*).

Here, the ’494 patent and Fry fall in the same field of endeavor of using a laser to form grooves (or score lines) in plastic substrates. The ’494 patent generally and broadly states it involves “marking a structure”: “[i]t is often desirable to mark a portion of a structure, such as a multi-layered structure (including after lamination), such as an ID document.” Ex. 1001, 7:43–45 (emphasis added). The ’494 patent embraces a wide field of products to mark:

Also, instead of ID documents, the inventive techniques can be employed with product tags, product packaging, business cards, bags, charts, maps, labels, etc., etc., particularly those

items including engraving of an over-laminate structure. The term ID document is broadly defined herein to include these tags, labels, packaging, cards, etc.

Id. at 11:22–29. The ’494 patent emphasizes marking “many different articles” without limiting marking to inscribing information:

Of course, it will be appreciated that embodiments of *the invention have applicability for the laser engraving and/or marking of plastic materials used to make many different articles formed by virtually any known method, including molding and extruding.*

Id. at 9:31–35; *accord id.* at 9:41–46 (methods apply to “virtually any product” and “the inventive laser etching methods . . . have applicability to the manufacture [of] many different articles that can be marked with . . . a tactile pattern,” including “packaging,” “containers,” “military products,” “consumer products,” and “toys”). The ’494 patent further notes “the technology disclosed herein can be used in combination with other technologies.” *Id.* at 11:18–19. So the technology includes simply marking any type of package or container, without necessarily providing textual information, just like Fry.

Dr. Tentzeris testifies that “Fry expressly discloses that it is applicable to the same types of plastic film or sheet material used in identification cards. . . . A person of ordinary skill in the art would not have ignored known techniques for processing the same materials used in identification cards.” Ex. 1012 ¶ 44 (disagreeing that Fry “is from a divergent field of endeavor”); *see also* Ex. 1002 ¶¶ 111–115 (testifying an artisan of ordinary skill would have turned to Fry for particular implementation details regarding scoring plastics).

Petitioner explains that Fry discloses forming beaded grooves in a plastic structure using lasers. *See* Pet. 16 (citing Ex. 1007, 2:69–75, 3:59–65, 4:30–40). The record also supports Dr. Tentzeris’s testimony that “a person of ordinary skill in the art would have looked to known techniques for scoring and/or grooving thermoplastic, like those disclosed in Fry, in order to form the raised/tactile relief structure of Maurer.” Ex. 1002 ¶¶ 111–115. Accordingly, Fry, like Maurer, constitutes analogous art to the ’494 patent, based on the same field of endeavor.

In addition, the ’494 patent particularly contemplates “using laser beams to write or engrave information to ID cards.” Ex. 1001, 4:24–26. It involves laser engraving to create “characters, text, tactile marks—including text, patterns designs, . . . photographs, etc.” *Id.* at 4:1–6. It also involves using a laser to create “slits” or “ridges” to form the desired text or design. *Id.* at 8:26–28. As such, Fry logically would have commended itself to an inventor’s attention in considering the problem of marking plastic with a beaded groove having a regular and neat appearance—in order to read the text. *See* Ex. 1007, 3:61–63 (noting “[t]he appearance of the groove is generally neat and regular, when accompanied by a bead”); Ex. 1002 ¶¶ 51, 54 (testifying Fry discloses “the particular implementation details for scoring thermoplastics” and a “neat and clean surface” for the grooves (quoting Ex. 1007, 2:69–75)).

For the foregoing reasons, Patent Owner’s argument that Fry is in a different field of endeavor is unavailing.

b. Scorching

Patent Owner also contends “one of ordinary skill in the art would understand that the process described in Fry results in a bead that would likely be scorched.” PO Resp. 26 (citing Ex. 2010 ¶ 115; 1007, 2:73–75). Patent Owner does not explain why this alleged bead scorching matters in the challenge to claims 13, 19, and 20. Indeed, none of the challenged claims precludes a raised scorched bead. *See supra* Section I.D. (listing illustrative claims); Ex. 1001, 12:1–14:20 (claims); Pet. 43–56 (addressing claims 13, 19, and 20). In any event, on balance, the record shows no scorching would occur in Fry. *See* Ex. 1012 ¶ 38 (testifying Fry does not disclose scorching, but even if Fry’s process results in scorching, the analysis does not change); Ex. 1002 ¶¶ 54, 135–137 (Fry does not teach discoloration or scorching); *infra* Section III.E (addressing Contingent Motion to Amend).¹³

c. Maurer’s Relief

Turning to Maurer’s Figure 2 and its description of a “relief,” Patent Owner contends Petitioner cannot rely on the raised tactile feature as depicted at area X of Maurer’s Figure 2, because “patent drawings do not define the precise proportions of the elements and *may not be relied on to show particular sizes if the specification is completely silent on the issue.*” PO Resp. 47 (quoting *Hockerson-Halberstadt, Inc. v. Avia Group Int’l*, 222 F.3d 951, 956 (Fed. Cir. 2000) (emphasis by Patent Owner)).

¹³ As indicated, we discuss this issue further below (*infra* Section III.E) and incorporate the findings and discussion to the extent it bears on the outcome with respect to the challenged claims.

Figure 2 of Maurer follows:

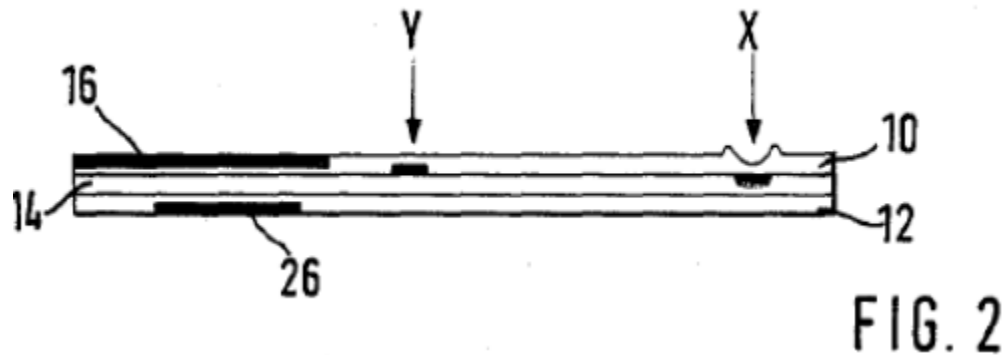


Figure 2 of Maurer shows area X, with a depression in, and ridges on, top laminate layer 10 above printed information (blackened area) in core layer 14. See Ex. 1005, 6:18–23. Maurer describes “arrow X” as follows: “[A] relief is formed above the line of printed information and in register therewith which can also be felt manually. An example is indicated by arrow X.” *Id.*

According to Patent Owner’s interpretation of Figure 2, the “relief depicted in Maurer is the depression . . . formed above the line of printed information [in core layer 14] . . . and *below* the nominal top surface of the cover sheet.” PO Resp. 17 (emphasis added). Contrary to this argument, Maurer’s description of a “manual inspection by virtue of a . . . permanent relief-type structure on the cover sheet” does not limit itself to a depression below the top surface of cover sheet 10. See Ex. 1005, 4:29–30. In describing Figure 2, Maurer refers to the “example is indicated by arrow X” and describes “a relief above the line of printed information” without limiting it to the depicted depression. *Id.* at 6:18–23.

Patent Owner argues that the ordinary meaning of “relief” as employed by Maurer supports Patent Owner. *See* PO Resp. 35 (citing Ex. 3002; Ex. 2010 ¶¶ 29–50, 85–90).¹⁴ As noted above, and as Patent Owner recognizes, Maurer describes a “relief” in conjunction with the depicted raised portion of Figure 2. *See id.* at 35–36 (reproducing Maurer’s Figure 2; citing Ex. 2010 ¶¶ 67–104). The applicable plain and ordinary meaning of “relief” is “[t]he projection of figures or forms from a flat background.”¹⁵ Ex. 3002; Inst. Dec. 40 & n.10 (citing Ex. 3002). Therefore, the plain and ordinary meaning of “relief,” which Maurer describes in reference to Figure 2, supports the finding that Maurer’s “relief,” as depicted in Figure 2, and which can be felt manually according to Maurer, includes a raised feature—i.e., “a projection . . . from a flat background.” *See* Ex. 3002; Ex. 1005, 4:28–30, 6:18–23.

Nevertheless, Patent Owner contends that the panels’ cited definition (Ex. 3002) in the Institution Decision also shows that “relief” means “variations in elevation,” which conforms to “the depression or valley identified by the ‘X’ in Maurer.” PO Resp. 36 (citing “definition 6” of Ex. 3002). Patent Owner also notes that Bernecker refers to a “microrelief” to describe “‘depressions’ formed when the plastic material is evaporated

¹⁴ Patent Owner’s citation to large ranges of paragraphs from Dr. Cairns’ Declaration, here and throughout its Response obfuscates Patent Owner’s evidentiary support.

¹⁵ The full sentence reads as follows: “The projection of figures or forms from a flat background, or such a projection that is apparent only, as in painting.” WEBSTER’S II NEW RIVERSIDE DICTIONARY 993 (1984).

during laser processing.” PO Resp. 37 (citing Ex. 1006, 3:13–17; Ex. 2010 ¶ 104).

The definition appearing in Exhibit 3002 that Patent Owner relies upon defines a relief as “[v]ariations in elevation of *a portion of the earth’s surface*.” Ex. 3002 (definition 6) (emphasis added). The definition relied upon by the panel more closely tracks Maurer’s flat card and raised bead at Figure 2 as a “projection of . . . forms from a flat background,” as Maurer’s card does not include the “earth’s surface.” See note 15. Even if Patent Owner’s definition also applies, “variations in elevation” still include the raised portions of Maurer’s Figure 2 (e.g., like mountains and valleys on the earth’s surface). Also, as Petitioner persuasively argues, even though Bernecker refers to a microrelief as a depression, another prior art reference entered into the record by Patent Owner supports Petitioner and shows that the typical meaning of “relief” in the art means (or at least includes) a raised feature. See Reply 8–9 n.4 (citing Ex. 2002, Abstract (“[T]he ‘natural foamability’ that laser action brings about in plastic materials . . . is exploited to obtain a relief height sufficient for clear impression of the characters.”)). Also, Maurer’s claims 1 and 3, and Maurer’s description (Ex. 1005, 4:28–30, 6:19–24, Fig. 2) support the finding that Maurer’s relief, which is “on” the cover sheet and can be felt manually, it includes a raised feature.

Moreover, Patent Owner’s arguments specifically contradict assertions it made in its Preliminary Response about Maurer’s disclosure of raised features: “[M]elting [as Maurer discloses only] can create localized distortions that may at some point, smoothly and unpredictably undulate

above the top surface.” Prelim. Resp. 17 (citing Ex. 2001 ¶¶ 56–59).¹⁶ Patent Owner similarly contended in its Preliminary Response that even melting creates “unpredictable undulations [that] are not discrete and do not provide any tactile effect, let alone one that would be reproducible.” *Id.* at 18. In other words, Patent Owner contended earlier in the proceeding that Maurer *does* create “localized distortions that may at some point . . . undulate above the top surface.” *Id.* at 17 (emphasis added).

Claims 13, 19, and 20 do not require, and no challenged claims require, predictable or discrete undulations. The arguments and evidence submitted by Patent Owner show that Maurer at least includes some raised unpredictable undulations that provide a tactile feel (albeit not “easily felt.” See Ex. 2001 ¶ 56 (testifying “the undulations that are potentially formed by the process taught in *Maurer* would not manifest themselves as discrete raised features” and “certainly not raised features *that can be easily felt*” (emphasis added))). Setting aside that Maurer produces at least “unpredictable undulations” as Patent Owner argued (Prelim. Resp. 18), Patent Owner now contends “Maurer attributed the tactile feature to the depression—not a raised feature.” PO Resp. 34. Patent Owner’s different arguments reveal an inconsistency, because a person can feel raised undulations in Maurer’s card if that person can feel depressions.

As noted above, Maurer explains that “[d]epending on the energy quantum of this laser beam, . . . a relief is formed above the line of printed

¹⁶ See *In re Baxter Travenol Labs*, 952 F.2d 388, 390 (Fed. Cir. 1991) (holding extrinsic evidence, including *admissions*, may be used to explain what a reference discloses in a reexamination proceeding).

information and in register therewith which can also be felt manually. An example is indicated by arrow X [in Figure 2].” Ex. 1005, Fig. 2; 6:18–23. As Petitioner persuasively argues, “nowhere does Maurer ‘attribute’ the tactility of the feature to any specific aspect of the feature, be it the depression or the raised portion [as depicted in Figure 2]. Maurer does not distinguish individual portions of the relief, simply stating that it can be ‘felt manually.’” Reply 15 (citing Ex. 1005, 6:18–23).

Given the description of a relief in Maurer corresponds with the plain meaning of that term and with what Figure 2 depicts, Figure 2 must be relied upon for what it teaches. *See In re Mraz*, 455 F.2d 1069, 1072 (CCPA 1972) (“[W]e did not mean that things patent drawings show clearly are to be *disregarded*.”); *In re Wagner*, 63 F.2d 987, 986–87 (CCPA 1933) (“While it is true that drawings may not always be relied upon for anticipation of a later application, it is also true that, if a drawing clearly suggests to one skilled in the art the way in which the result sought is accomplished by a later applicant, it is immaterial whether the prior patentee’s showing was accidental or intentional.”) (internal citations omitted); *In re Seid*, 161 F.2d 229, 231 (CCPA 1947) (Even “an accidental disclosure, if clearly made in a drawing, is available as a reference.”); *Jockmus v. Leviton*, 28 F.2d 812, 814 (2d Cir. 1928) (“We know of no rule that figures can never of themselves be an adequate anticipation of mechanical inventions, as of course they must be of designs, and we can see no reason for importing into the statute an arbitrary distinction, unrelated to its purposes.”) (L. Hand, J.); *see also Vas-Cath Inc. v. Mahurkar*, 935 F.2d

1555, 1563 (Fed. Cir. 1991) (earlier-filed design drawings support later-filed utility claims reciting certain dimensions).

Unlike the patentee in *Hockerson-Halberstadt*, Petitioner does not rely on Maurer for its “precise proportions,” “particular sizes,” or any “quantative relationship” between the groove and bead. *See Hockerson-Halberstadt*, 222 F.3d at 956 (“The ‘792 patent is devoid of any indication that the proportions of the groove and fins are drawn to scale. HHI’s argument thus hinges on an inference drawn from certain figures about the quantitative relationship between the respective widths of the groove and fins.”).¹⁷ Also, Maurer’s disclosure is not only not “completely silent on the issue,” *see id.*; it describes what Figure 2 clearly shows as a relief on a cover sheet that can be felt manually. Ex. 1005, 4:28–30, 6:19–24, 9:8–11.

In addition to the disclosure describing the “relief-type structure on . . . cover sheet” 10 (Ex. 1005, 4:29–30), Maurer’s Figure 2 shows a generally raised feature in cross section at area X on cover sheet 14, and Maurer explains that “a relief can . . . be . . . felt manually” (*id.* at 6:18–23)

¹⁷ In addition to distinguishing *Hockerson-Halberstadt* here because Petitioner does not rely on “precise proportions” or “particular sizes” of the raised ridges in the prior art patent to Maurer, *Hockerson-Halberstadt* involves another distinction—a prosecution history disclaimer wherein the court disallowed an accused infringer from relying on specification drawings lacking precise proportions to broaden claim scope that the patentee clearly disavowed during prosecution. *See id.* (“Thus, in the present case, a reasonable competitor, being aware that figures in a patent are not drawn to scale unless otherwise indicated, would understand the arguments in the prosecution history as clearly disclaiming a groove having a width greater than the combined width of the fins.”).

at area X. In addition, Figure 2's depiction of a raised portion at area X surrounding a groove looks much like the raised bead and groove depicted in Fry's Figures 1 and 2, and also somewhat similar to raised features 62 and grooves depicted in the '494 patent's Figure 6c, which involve the same technology of using a laser to score plastics, as discussed in the previous subsection.

Patent Owner argues that the X in Maurer indicates only the depression in the cover sheet—an argument in which Patent Owner relies on allegedly precise proportions of features of Figure 2 for support. *See* PO Resp. 15–17 (reproducing precise annotations of Figure 2 and arguing the “feature” X must exactly line up with outer contours of the printed information on core layer 14 (citing Ex. 2012 ¶ 82)). Patent Owner also argues “‘arrow X’ merely designates the [whole] depression” and “is not intended to be an accurate depiction of the features and dimensions of the final identification card” (PO Resp. 15), but then Patent Owner contends “Maurer . . . pointed the arrow [from X] directly at the center of this depressed area” (*id.* at 16). Patent Owner explains Maurer “used a slightly curved line connecting the reference number 10” “to generally identify the entire cover sheet 10.” *Id.* Patent Owner's arguments, taken to their logical extreme, contradict each other, because if the arrow from the X only points to the center of the depression, it must relate only to the center per Patent Owner's theory, yet Patent Owner also maintains the arrow from the X represents the whole depression. The record does not support these arguments, and related arguments about the nature of Maurer's Figure 2, and Dr. Cairns' related testimony. *See* PO Resp. 16–18 (citing Ex. 2010

¶¶ 81–83, 86); Ex. 2010 ¶¶ 81–86.

Dr. Cairns’ testimony tracks Patent Owner’s arguments and relies on the same annotations of Figure 2. *See* Ex. 2010 ¶¶ 79–86. Dr. Cairns also states “[m]y opinions in this regard are based on the important recognition that the melting process taught in Maurer cannot result in the creation of a raised tactile feature like that proposed by Petitioner.” Ex. 2010 ¶ 87. We address melting and evaporation below in Section II.C.7.d and conclude Maurer discloses a raised relief and involves some evaporation in addition to melting. *See* Ex. 1012 ¶ 26 (“Idemia’s assertion is based on the idea that the word ‘melting’ in *Maurer* means *idealized* melting, that is, purely bringing a material to a liquid state, and nothing else.”).

c. Fry’s Teachings

Patent Owner contends “the dimensions involved in the embodiment in Fry” “would have been useless to a skilled artisan implementing laser processing techniques to create identification documents, such as taught in Maurer.” PO Resp. 42 (creating a hypothetical plastic substrate 12 with a wide score 14 based on cited dimensions in Fry (citing Ex. 2010 ¶ 113)), 25 (arguing “the width of the groove is over 20 times greater than the thickness of the plastic”). Contrary to these arguments, as Petitioner points out, Fry does not limit its teachings to any score width or substrate width. Reply 16; *see* Section II.C.2 (Overview of Fry showing Fry discusses cutting grooves in plastic with a laser). As Petitioner also points out, Fry lists several “controlling variables” in scoring plastics. *Id.* (citing Ex. 1012 ¶¶ 35–36). Both experts agree that artisans of ordinary skill would have recognized that the score line depends on multiple factors, including laser power, speed, and

the type of plastic. *See* Ex. 2010 ¶¶ 31, 32, 35 (listing multiple factors); Ex. 1012 ¶¶ 32–33 (listing similar factors cited in Fry and Maurer). Moreover, Petitioner points out that the bubbles disclosed in Fry would be on the same order of thickness as the embodiment’s plastic substrate thickness relied upon by Patent Owner, thereby showing an artisan of ordinary skill would have recognized that Fry contemplates other plastic thicknesses and groove dimensions in addition to the embodiment relied upon by Patent Owner. *See* Reply 16 (discussing “bubbles . . . about 6 mils wide”—i.e., as wide as the thickness of the plastic being grooved in Patent Owner’s cited embodiment (quoting Ex. 1007, 4:32–33)).

d. Melting and Evaporation

Alleging several related supporting reasons, Patent Owner argues that Fry only discloses vaporizing, and Maurer does not disclose a raised feature, because Maurer only discloses melting. *See* PO Resp. 44–45. According to Patent Owner, “[t]he fundamental security features of Maurer—a blackened core and a melted laminate securely bonded to that core—would simply not exist because the laser process taught in Fry would simply vaporize the material on which the security features of Maurer are supposed to be deposited.” *Id.* at 45 (citing Ex. 2010 ¶¶ 111–115). According further to Patent Owner, melting in Maurer’s process focuses the laser beam on the core, which “stands in stark contrast to the process that would be required to form the ‘raised tactile’ features suggested by Petitioner.” PO Resp. 18–19. Patent Owner explains that “the process suggested by Petitioner [i.e., presumably Fry’s process of forming a beaded groove] would require instead focusing the laser just below the top surface of the laminate layer of

the card.” *See id.* at 19 (citing Ex. 2010 ¶¶ 86–97). Regarding the combined teachings of Fry and Maurer, Patent Owner contends, “[t]his flawed premise—that Maurer teaches a raised tactile feature—is Petitioner’s only motivation for combining Maurer and Fry.” *Id.* at 41. Patent Owner contends “it is literally impossible for Maurer to achieve its fundamental purpose of blackening the core while also forming [raised features].” *Id.* at 19. Patent Owner maintains that “the process taught in Fry teaches the application of far greater amounts of laser energy [than that of Maurer] with the express goal of removing all of the material exposed to the laser.” *Id.* at 44.

As Petitioner persuasively explains, however, Patent Owner’s arguments rely on an improper characterization of Maurer and the combined teachings of Maurer and Fry. *See* Reply 2–16, 19–21; Ex. 1012 ¶¶ 30–34. Patent Owner’s arguments also fail to recognize the knowledge of an artisan of ordinary skill reading Maurer and Fry. On one hand, Patent Owner’s arguments assume an artisan of ordinary skill reading the ’494 patent needs no explanation for how to form a raised tactile feature, and on the other hand, Patent Owner argues an artisan reading Maurer and Fry would be unable to combine the teachings to form a raised tactile feature. For example, Patent Owner maintains that the “process of forming micro-bubbles and then allowing the laminate to cool and re-harden, as described in the ’494 patent, can be used to create discrete, raised features or ridges that provide a tactile effect.” PO Resp. 39–40 (citing Ex. 2010 ¶¶ 29–50). To support this argument, Patent Owner quotes the ’494 patent as follows: “the foaming of the thermoplastic that can occur with some types of laser

engraving can be adapted to provide an indicium having a tactile feel, which is a useful authenticator of a data carrier that also can be very difficult to counterfeit or alter.” *Id.* at 39 (quoting Ex. 1001, 4:26–31). But this relied-upon passage in the ’494 patent says nothing about cooling, re-hardening, or a *raised* feature. The passage suffers from the same or similar allegation by Patent Owner of a shortcoming in Maurer—it does not *explicitly* describe foaming as creating a *raised* tactile feature. Nowhere (with the exception of *non-original* claim 19 (*see* Ex. 1004, 57 (adding new claim 29, which issued as claim 19)) does the ’494 patent explicitly describe foaming as creating a raised ridge.¹⁸ So at best, the ’494 patent implies an artisan of ordinary skill would have recognized that a raised ridge, such as what Maurer and Fry each describe and depict, requires some degree of plastic foaming (i.e., some evaporation/decomposition/bubbling) via a laser. *See* Ex. 1012 ¶ 25 (“For example, when applying laser energy to a plastic substrate, a certain subset of molecules on the plastic substrate exposed to the laser may experience ‘melting,’ while others may experience ‘evaporation,’ or some combination of the two over time.”).

The ’494 patent generally states an artisan of ordinary skill knew how to focus a laser to obtain different features: “As those skilled in the art will appreciate, the laser can be focused at a specific setting to produce holes of a

¹⁸ No original claim recites anything related to a raised feature. Ex. 1004, 6:11–12 (original claims 1–14). In submitting “[n]ew” claims 29 and 30 during prosecution of the ’494 patent, Patent Applicant failed to cite to any portion of the specification supporting them. *See id.* at 52–58 (Amendment Accompanying RCE).

predetermined diameter, depth and spacing.” Ex. 1001, 8:40–43. In the next sentence the ’494 patent states “[t]his etching process creates a pattern that can be tactile or non-tactile,” directing the reader to Figure 6B, which does not depict a raised edge. Then, in the same column, the ’494 patent refers to “an alternate embodiment” that generally involves “a tactile and/or non-OVD pattern by adjusting the hole depth and area location of the laser engraving,” and specifically points to Figure 6C, which involves “a tactile pattern with raised edges.” *See id.* at 8:48–52. But nothing in column 8 refers to foaming or evaporation, or otherwise describes how to create the raised tactile pattern in relation to Figure 6C. *See id.* at 8:26–54. (And the column does not indicate how raised feature 62 at Figure 6C becomes OV—rather, it refers to it as “tactile and/or non-OVD,” (*id.* at 8:48–52)). As indicated above, this lack of specific description in the ’494 patent indicates further that an artisan of ordinary skill at least knew how to use a laser to form different features at the time of the invention, including OV (*see, e.g.* Bernecker) and raised (*see, e.g.*, Maurer, Fry) features.

In any event, Petitioner persuasively shows that Maurer teaches a raised tactile beaded groove, and Fry teaches a similar raised tactile beaded groove formed via small bubbles released during a laser groove forming process, using a process that an artisan of ordinary skill would have recognized as the same or similar to the laser groove forming process in Maurer. *See* Pet. 43–55; Ex. 1002 ¶¶ 53–54 (citing Ex. 1007, Fig. 2, 1:72–2:3, 2:39–61, 69–75, 3:19–24, 4:7–12), ¶¶ 101–07; *supra* Section II.C.1–2; Ex. 1005, Fig. 2; Ex. 1007, Fig. 2. As Dr. Tentzeris credibly explains, Maurer does not limit its teachings to melting, or otherwise limit its

teachings to a process that occurs without at least some vaporization occurring based on the power of the laser. See Ex. 1012 ¶ 27 (“Maurer’s disclosure does not refer to this ‘idealized’ form of melting that would exclude bringing any of the material to a gaseous state (i.e., idealized vaporization).”), ¶ 25 (“For example, when applying laser energy to a plastic substrate, a certain subset of molecules on the plastic substrate exposed to the laser may experience ‘melting,’ while others may experience ‘evaporation,’ or some combination of the two over time.”). Dr. Tentzeris cites Dr. Cairns’ testimony to support the notion that melting need not be an idealized melting that excludes some vaporization: Dr. Cairns testifies “[t]his [raised feature] process involves *briefly heating the plastic substrate to just above its vaporization temperature*, and then allowing it too [sic] cool.” Ex. 1012 ¶ 29 (quoting Ex. 2010 ¶ 47) (emphasis added by Dr. Tentzeris).

Logically, as Dr. Tentzeris testifies, the laser melts some of the plastic and evaporates other portions, depending on the hot spot. Dr. Cairns’ testimony assumes an idealized case wherein the whole plastic region hit by the laser obtains the same uniform temperature throughout and the plastic in the laser beam either melts or vaporizes, but not both. Patent Owner cites to Kasai (Ex. 2003) to support “the important distinction” between melting and vaporization, but the quotation from Kasai supports Petitioner because it implies the two processes occur naturally together in laser applications: “There is known a process for recording an information by [focusing] a strongly modulated, scanned or deflected laser beam to a spot of a high energy density, irradiating a recording member and thereby selectively

removing and/or deforming a part of the recording member by *melting and/or vaporizing* to produce a record of the information.” See PO Resp. 40–41 (quoting Ex. 2003, 1:10–17) (emphasis added).

Maurer states “[i]t is known in principle (German patent specification No. 1,499,422) to use the energy of laser beams *to evaporate or even burn* materials which absorb this energy *to a greater or lesser degree.*” Ex. 1005, 3:57–60 (emphases added). In context, Maurer’s disclosed process builds on the German patent’s process by forming a relief above the printed line of information, and Maurer does not specify its process excludes the evaporation described in the German patent that Maurer improves upon. See Ex. 1005, 3:56–58, 6:14–23. Bernecker similarly discloses partial evaporation, but the evaporation does not result in raised ridges. See Ex. 1006, 3:15–17 (“the plastic material is evaporated” to create notches), 4:3–10 (disclosing partial decomposition to create notches without color changes in the plastic).

Fry specifically teaches using a laser “beam . . . sufficient to *degrade or melt the thermoplastic*” (Ex. 1007, 1:70–72 (emphasis added)) in order to “*form[] a groove or score in the thermoplastic having a bead* that has been formed during the operation bordering the groove” (*id.* at 2:1–3). See also, *e.g.*, Ex. 1007, 1:27–45 (describing “well known . . . different response mechanisms to temperature increase” of plastic, including “melting, evaporation and decomposition [that] shall be discussed as degradation-type reactions”). So for some short-hand purposes, Fry groups melting, evaporation, and decomposition together as “degradation-type reactions.” As Dr. Tentzeris testifies, melting and evaporation occur together in Fry’s

and Maurer’s processes—because melting by itself only occurs in an idealized world. *See, e.g.*, Ex. 1012 ¶ 27 (“I also made it clear that how a person of skill in the art would view the term melting in Maurer differs from how a 5th grade student first learning about melting would understand the term.” (citing Ex. 2008, 69:16–70:15)).

Furthermore, contrary to Patent Owner’s arguments restricting Fry to teaching laser ablation (vaporization/evaporation) by focusing a beam only on a surface of plastic, Fry explains that “heat is generated by absorption of the beam *within the material*. This means that the initial hot spot in plastics irradiated by the laser beam is *within the material and not on the surface*.” *Id.* at 1:51–53 (emphasis added); *see also* Ex. 1012 ¶ 34 (“A person of skill in the art would have understood that whether the laser applies any energy to the core depends, as explained in Maurer, Fry, and even the ’494 patent, on the absorptivity of the laminate and core material.”). And as Petitioner notes, Fry’s claim 1 specifically recites “generating a groove in a thermoplastic, substrate material” using a “beam of laser light . . . of such intensity that said beam *does not cause substantial vaporization*.” Ex. 1007, 5:7–13 (emphasis added); *see* Reply 12 n.6. Emphasizing the point about absorption of heat inside the plastic, Fry teaches that “plastics are not strong absorbers of laser light, because if they were, *most of the light would be absorbed at or near the surface and little light would penetrate into the substrate*.” *Id.* at 3:20–23 (emphasis added).

Patent Owner also contends

the process suggested by Petitioner would require instead *focusing the laser just below the top surface* of the laminate layer of the card. . . . Focusing the laser in this way is necessary to

create the microchannel—and possibly attendant raised edges—that Petitioner advocates would exist. *Id.*

PO Resp. 19 (citing Ex. 2010 ¶¶ 86–97) (emphasis added). Patent Owner does not quantify what “just below the top surface” means. In any event, Fry teaches “the initial hot spot in plastics irradiated by the laser beam is *within the material and not on the surface*” (Ex. 1007, 1:51–53 (emphasis added)), and Fry also teaches “plastics are not strong absorbers of laser light” so that most of the laser light *penetrates* into the plastic (*see* Ex. 1007, 3:20–23). Fry does not specify how deep the laser energy penetrates into the plastic relative to the laser’s focus. Fry suggests the energy could reach the white paper core layer of Maurer—especially because sufficient energy can cut all the way through the plastic in Fry—i.e., cutting through it by focusing the laser “on any given spot on the material 12, for too long at a time.” *See* Ex. 1007, 2:29–38; Ex. 1005, 4:37–42, 6:14–16, 6:59–60 (burning white paper core). Furthermore, Bernecker provides evidence that an artisan of ordinary skill knew how to adjust a laser focus to obtain optimal results, including halftone images and evaporation of plastic material. *See* Ex. 1007, 3:64–4:18.

Patent Owner also argues “unlike melting, vaporization converts the laminate to its gas form, which can form micro-bubbles in the laminate layer that expand and push the card material above the nominal top surface of the card.” PO Resp. 39. Dr. Tentzeris agrees, credibly testifying some molecules evaporate in a non-idealized application. *See, e.g.*, Ex. 1012 ¶ 25 (“[W]hen applying laser energy to a plastic substrate, a certain subset of molecules on the plastic substrate exposed to the laser may experience

‘melting, while others may experience ‘evaporation,’ or some combination of the two over time”).

Patent Owner cites Maurer ’754 to show grooves can be felt manually (see PO Resp. 21 (citing Ex. 2006, Fig. 2)), and Dr. Cairns cites it “as consistent” with his “opinions” (Ex. 2010 ¶ 100), but Maurer’s Figure 2 also shows that cutting some plastics creates microbubbles 14, 15 *prior to* forming channel 19, depending on the chemical make-up of the layer (e.g., a PVC layer from ALKOR) even at low energy doses. See Ex. 2006, 4:2–39 (ALKOR PVC layer description), 2:64–3:17 (“When the dosage of laser energy is small, microscopically fine gas bubbles and black, microscopically small points presumably consisting of elementary carbon, first arise locally in the dye. . . . When the laser energy is increased, the gas formation and blackening in the laser transformable film also increase until at a certain laser energy depending on the properties of the film, a blackened channel consisting of more or less cohesive gas bubbles that are clearly defined locally is formed in the film. When the laser energy is increased further, the channels break open so that a blackened groove which opens on the card surface is formed, on the edge and surface of which other color reactions are observed which may modify the overall color effect.”), 5:10–40 (describing the successive process of gas formation to groove formation to blackening), Fig. 2.

In any event, Fry and Maurer (and Bernecker) each teach cutting a groove into a top layer of plastic. See Ex. 1005, Fig. 2 (groove in top layer 10); Ex. 1007, Fig 2 (groove in layer 12), 3:69–74 (describing a metal backing plate for use in the grooving process that “is not especially

dependent upon the backup plate”); Ex. 1006, [57] (noting the “invention relates to a data carrier . . . with at least one plastic layer having first diffusely light-scattering properties”), 3:49–62 (integrating the invention with known data carriers “already inscribed in color contrast by a laser . . . such as photo, name, signature, etc.”), 3:64–67 (using “the same laser” for color and colorless processing), 5:14 (claim 1 reciting “at least one plastic layer”), Fig. 3 (etched OV features). Even though Maurer’s process provides laser energy to the paper core, like Fry (and Bernecker), Maurer’s process does not cut all the way through the top layer—rather, Maurer’s process darkens/blackens the “white paper” core without cutting through the top layer to the core. *See* Ex. 1005, 4:25–30, 6:14–23, 6:59–60. In other words, some of the energy from the laser in Maurer’s process burns indicia into the white paper core as part of the layer melts near the core. *See id.* In addition to melting, some evaporation occurs in hotter regions of the plastic to create the raised features, as both experts agree foaming/evaporation must occur to create raised features. *See* Ex. 1012 ¶¶ 25–29; Ex. 2010 ¶ 90 & n.6 (testifying “creation of a feature like the one Petitioner argues is depicted in Figure 2 can only be made using the more aggressive vaporization” and stating “I understand that . . . Dr. Tentzeris[] agrees with me on this point.” (citing Ex. 2008, 188:23–189:7)).

Dr. Cairns and Dr. Tentzeris agree that what occurs depends on several factors. For example, Dr. Cairns testifies that

[w]hether a specific area of a plastic substrate is heated, melted, or vaporized is dependent on calibration of the various laser- and substrate-processing variables identified above. The most important of these variables are the power of the laser, the speed

with which the laser is moving, and the depth within the substrate at which the laser is focused.

Ex. 2010 ¶ 35; *accord id.* ¶¶ 31–33 (citing other factors).

But the record does not support Dr. Cairns' conclusion that melting occurs to the exclusion of vaporization in Maurer's process. *See* Ex. 1012 ¶ 27 (“A person of skill in the art would not think that these processes are ‘mutually exclusive’ of each other, as Idemia and Dr. Cairns assert.”). As noted above, Bernecker verifies “melting” occurs with “part[] decompos[ition]” (i.e., evaporation) to create “notches without color changes.” *See* Ex. 1006, 4:7–10.

Similarly, Fry discusses two mechanisms for bubble creation (i.e., partial evaporation): 1) “the release of entrained gases or water vapor from the plastics in the molten region,” and 2) “the internal temperature of the plastics may exceed the point at which the material degrades, and thereby result in the formation of small gaseous molecules.” Ex. 1007, 4:42–48 (emphasis added). Dr. Cairns and Dr. Tentzeris focus on the second mechanism, agreeing that at least some evaporation must occur to create a raised ridge and foaming. Ex. 1012 ¶ 29; Ex. 2010 ¶ 47. (On the other hand, as noted above, even though evaporation may be necessary to form a groove, Bernecker discloses that evaporation does not necessarily create a raised ridge or discoloration, even if it decomposes material to create depressions. *See* Ex. 1006, 3:15–17).

Regarding the second mechanism, Fry states “[i]n polyethylene, bubble formation occurs *before the formation of the groove* and not thereafter.” Ex. 1007, 4:52–53 (emphasis added). Fry adds that, in other

plastics, “bubble formation occurs throughout the grooving or scoring process.” *Id.* at 4:62–63. (Above a certain laser power threshold, bubbling or gas formation also occurs in the Maurer ’754 process as noted above, although Maurer ’754 employs a specific layer—ALKOR PVC layer. *See* Ex. 2006, Abstract, 2:57–3:17, 4:39–44, 5:10–40.) In Fry’s process, gas bubbles occur after “the material is sufficiently hot” and some bubbles “collapse in the groove center because that region is hottest and *molten* for the longest period of time.” Ex. 1007, 4:58–62 (emphasis added). The word “molten” means “[m]ade liquid by heat: MELTED.”¹⁹ So Fry shows that some bubbles arise from the *molten* plastic during the process of groove formation. Fry and Maurer disclose similar plastics. Ex. 1005, 6:57–58 (“The cover sheets preferably consist of plastics, e.g., PVC”); Ex. 1007, 3:1–12 (Table I, listing polyvinyl chloride and other plastics).

Claim 1 of Fry corroborates the understanding that only some vaporization occurs. It recites using a “laser beam . . . of such intensity that said beam *does not cause substantial vaporization*,” with “such intensity causing bubbles to evolve from the degraded portion . . . to accumulate along the sides of the groove.” So Fry involves some vaporization arising from the molten material to create raised ridges—i.e., not substantial vaporization.

Supporting the testimony of both experts, Fry discloses that bead formation and the size of the bubbles largely results from different factors, including, for example, the velocity of the beam and the type of material,

¹⁹ WEBSTER’S II NEW RIVERSIDE DICTIONARY 763 (1984) (Ex. 3004).

which ultimately controls “the energy density in the laser beam” on the plastic, which in turn dictates the result of vaporization, melting, and bubble formation. *See* Ex. 1007, 4:15–17 (“Thus, if the relative velocity is too high, a bead results rather than a groove.”). Dr. Cairns refers to creating ridges via microbubbles as “routinely referred to in the art as foaming,” suggesting an artisan of ordinary skill readily knew how to foam plastics to create ridges. *See* Ex. 2010 ¶¶ 47–50.

According to Dr. Tentzeris,

Fry explained that the characteristics of its groove depend primarily on (1) the energy of the laser (Ex. 1007 at Table I, II), and (2) the absorptivity of the material (*id.* at Table I). *Id.* at 1:49–50 (“heat is generated by absorption of the beam within the material”). Fry also discusses other factors, including the thermal conductivity and diffusivity of the plastic (*id.* at 3:31–42), but it does not specify that the focal point of the laser must be on a specific point in the laminate.

Ex. 1012 ¶ 33 (noting Fry does set a focusing the laser “to a spot about 3/16 inches wide” on the surface of a plastic layer in one embodiment (citing Ex. 1007, 2:62–65)).

Petitioner and the evidence of record show that an artisan of ordinary skill would have been able to adjust laser power and focus in order to melt or evaporate plastic in a card such as that of Maurer as modified by Bernecker to ensure the desired result of printing, laminating, creating voids, raised features, and OV features. *See, e.g.*, Pet. 9–15 (discussing level of skill and background art); *supra* Sections II.C.1–3; Ex. 1005, 6:26–28 (A “laser does not have to cause a blackening or destruction of the core.”), 8:25–32 (The “technology is already known” for providing “inseparable” photographs on

the core with “many shades of gray” “‘burned’ into the paper core,” and “the density of the laser beam intensity must be reduced appropriately” for other color processes.); Ex. 1006, 2:60–63 (“The laser, its power, and the plastic material must be coordinated with one another.”), 4:50–60 (disclosing color 4 and non-color 3 personalization data features using the same or different laser); Ex. 1006, 3:60–65 (coordinating laser power with plastic), 3:13–17 (vaporization), 3:64–4:18 (varying laser power and focus creates variations including burning to halftone images to colorless notches in the plastic).

Nothing in Maurer supports Patent Owner’s assertion that Maurer’s process requires focusing the laser on the white paper core. *See* PO Resp. 20; Ex. 2010 ¶¶ 69–70; Ex. 1012 ¶¶ 32–33. Regardless, Maurer’s paper core must get hot enough to burn information into it. Ex. 1005, 6:14–16. Maurer’s process, even when modified by Fry, does not preclude, and requires, some evaporation of the molten plastic, in order to form the beads. Ex. 1012 ¶ 29; Ex. 2010 ¶ 47; Ex. 2008 188:22–89:7.

Dr. Cairns bases his assertion that Maurer must focus the laser beam on the card core as follows: “This internal and localized focus of the laser energy is described in Maurer at 4:37–42 (“Since the sites treated with the laser beam are located inside the card, so to speak, owing to the localized burning of the core . . .”). Ex. 2010 ¶ 69 n.2 (quoting Ex. 1005, 4:37–42). But this quoted passage does not state the laser focuses on the paper core. Rather, the passage refers generally to treating sites “inside the card,” suggesting localized burning of the core as the laser light passes through the plastic, even with a laser focus in the plastic, and the white paper core traps the laser energy (including conducted heat) as it must to burn the paper core.

See Ex. 1012 ¶ 34 (“A person of skill in the art would have further understood that a laser does not abruptly stop supplying energy past the focal point.”); Ex. 1005, 4:38–40 (“localized burning of the core”), 6:14–16 (white paper core must be hot enough to burn indicia into it).

Dr. Cairns contends when Maurer’s process focuses on the card core, “gravity forces the liquefied material to sink downwardly, filling any space between the laminate and card core as well as cavities and/or fibers in the card core itself that can accommodate additional material.” Ex. 2010 ¶ 74. Dr. Cairns also contends “[h]eat from the laser energy blackening the core would radiate outwardly from the site of laser focus and melt a radial area surrounding the now blackened core.” *Id.* ¶ 72. But as noted, Maurer does not state it focuses the laser on the card core, and Maurer’s process already provides “pressure and heat” to “hot-laminate[]” the paper core to the outer plastic layers, prior to applying the laser. See Ex. 1007, 6:60–63. Maurer describes further adhesion due to melting as Dr. Cairns testifies, but Maurer does not describe any groove or depression created as a result of “gravity” making the melted plastic sink into the paper pores and does not support Dr. Cairns on that point.

Expounding on his unsupported theory, Dr. Cairns explains “evaporation by focusing the laser at the core would fail because the increased laser energy required to form the microchannel (beyond the mere melting energy ordinarily required by Maurer) would result in the eradication of the entire laminate layer above the card core.” Ex. 2010 ¶ 98. Dr. Cairns does not cite anything to support this latter hypothesis. See *id.* ¶¶ 98–99. As indicated above, Dr. Cairns does state his “opinions regarding the

actual disclosure of Maurer are consistent with the disclosure in another of the same inventor's patents filed in the same period," namely Maurer '754. *Id.* ¶ 100 (citing Ex. 2004), Fig. 2). Dr. Cairns does not state unequivocally that Maurer '754 supports the latter hypothesis. *See id.* In any event, as discussed above, Maurer '754 discloses bubble formation (without forming beads) creates blackening using a different material (ALKOR PVC). *See* Ex. 2006, Abstract, 2:57–3:17, 4:39–44, 5:10–40.²⁰ If anything, Maurer '754 suggests focusing a laser above the core, because the process results in heating the plastic first to create bubbles before forming the groove.²¹ *See* Ex. 2006, 5:10–41, Fig. 2 (showing bubbles 15 and black points 14 “first form[ed]” before groove 19 and discolored areas 20).

Maurer shows that the card paper core can be inscribed (burned), for example, to create a gray scale mosaic photograph, without altering the plastic layer above it. *See* Ex. 1005, 4:38–42 (adjusting laser to adjust extent of burning), 6:18–23 (melting depends on energy of laser beam) 6:60–62 (hot lamination); 8:16–26 (making “inseparable” gray scale mosaic photograph from core based on prior art methods). Dr. Cairns acknowledges

²⁰ Maurer '754 specifically notes ALKOR PVC exhibits different properties than other conventional PVC materials employed for laminating cards. *See* Ex. 2006, 4:39–48 (noting ALKOR PVC has a “linear absorption coefficient $K \dots$ at a wavelength of 1064 nm is approx. 15 times greater than a hard PVC film conventionally used in laminating technology”).

²¹ Maurer '754 states “it is only essential that [laser transformable cover films] are absorb[er] in the wave range of the recording laser and are at least transparent enough in the visual spectral range so that information or patterns underneath the cover films remain recognizable through the latter.” Ex. 2006, 6:20–24.

that Maurer’s paper core can be inscribed (burned) concurrently with melting the plastic layer above it. See Ex. 2010 ¶¶ 79, 88, 98. But nothing in the record, and nothing cited by Dr. Cairns, suggests the whole laminate layer above the core must be eradicated above the paper core when blackening the core while melting the layer above as some of the layer also vaporizes. See Ex. 1012 ¶¶ 26–32. Dr. Cairns does not persuasively rebut or challenge Dr. Tentzeris’s credible testimony, which the record supports, that some plastic vaporization necessarily occurs during non-idealized melting, given sufficient energy within the localized molten plastic (as Fry and Maurer ’754 each show). See *id.* Dr. Cairns’ testimony supports Dr. Tentzeris to a certain extent, because Dr. Cairns refers to a process, “[in] addition to the two [melting and vaporizing] processes,”—“*briefly heating the plastic substrate to just above its vaporization temperature*, and then allowing it to cool. With such a process, microbubbles are allowed to form in the plastic substrate and are then trapped when the material cools.” Ex. 2010 ¶ 47 (emphasis added). Dr. Cairns refers to this as “routinely referred to in the art as foaming.”

Id. ¶ 50.

Dr. Cairns cites to an article that describes the “fabrication of microfluidic devices for chemical and biomedical analysis” (Ex. 2012, 1), and concludes “[l]ow-power CO2 laser direct-writing ablation was successfully used to micromachine a microchannel on the polycarbonate substrate in this work” (*id.* (“the 2009 Micromachining Article”) at 4).²²

²² Although this article forms a primary basis for Dr. Cairns’ testimony,

The 2009 Micromachining Article does not support Dr. Cairns, as the article shows a molten region existing underneath what Maurer refers to as a vaporization region. *See* Ex. 2010 ¶¶ 38–39 (discussing Ex. 2012 for a polycarbonate layer).²³ Also, Dr. Cairns states that in the 2009 Micromachining Article, “[t]he depth of the microchannel that is formed in the substrate depends on, among other things, the depth to which the laser is focused within the substrate.” *Id.* ¶ 41; *see also id.* ¶ 38 (“Due to the efficient absorption of laser energy by the polycarbonate material at the focal point, and the extreme temperature drop off at distances away from the focal point, decomposed material is quickly vaporized and ejected from the area of laser focus while the area immediately surrounding that area of focus remains solid—having *not even been heated to its melting point.*”).²⁴ But

Patent Owner does not cite it. *See* Ex. 2010 ¶¶ 37–40 (discussing Ex. 2012); PO Resp. 20 (citing Ex. 2010 ¶¶ 37–40).

²³ We assume without deciding that the 2009 Micromachining Article may shed some light on the laser process at issue here, even though no evidence shows that this article, published in 2009, indicates the knowledge of a skilled artisan at the time of the invention (i.e., 2001). Also, polycarbonate, the subject of the 2009 Micromachining Article, probably behaves somewhat differently than other plastics, as Maurer ’754 indicates with respect to another material (i.e., ALCOR PVC). *Accord* Ex. 2010 ¶ 32 (noting the “doping” of the material plays a role). For example, in Exhibit 2012, Figure 2 shows that the whole groove is scorched (and it does not show a prominent bead, if any), whereas Fry discloses a “generally neat and regular [groove], when accompanied by the bead.” Ex. 1007, 3:62–63.

²⁴ Dr. Cairns provides an equation relating thermal diffusivity, temperature, and time, as a function of distance from a laser focal point, but provides no quantifiable data to support his point that the temperature of plastic “drops quickly from the focal point.” *See* Ex. 2012 ¶¶ 36–37. The equation cited by Dr. Cairns also does not account for “thermal conductivity” and the fact

the 2009 Micromachining Article *directly contradicts* Dr. Cairns about the depth of the laser focal point. The laser described in the 2009 Micromachining Article focuses *on the surface of the material—and that laser ablates and melts some material under the surface under that focal point*. See Ex. 2012, 2 (“The Gaussian laser beam with diameter of 85 mm was focused on the surface of the sample using a reflecting mirror and a focusing lens with focal length of 65mm.” (emphasis added)), Fig. 2 (showing an ablation region and molten material thereunder); see also Ex. 2012 ¶ 38 (reproducing Figure 2 to show an ablated region with molten material thereunder). The 2009 Micromachining Article describes a similar relationship between power and laser velocity that Fry describes, with a higher power and slower velocity creating a wider channel “and the birth of a molten pool.” *Id.* at 3; Ex. 1007, 2:38–45, 4:6–51. So similar to Fry (albeit with a different material creating different results such as scorching), the 2009 Micromachining Article describes creating a molten pool as the laser ablate[s] some of the material and leaves some molten material (and other non-melted material). See Ex. 2012, 3, Fig. 2.

Regardless of the focal point, and contrary to Dr. Cairns’ testimony, Fry and the 2009 Micromachining Article each show laser energy propagating beyond the laser focal point. See, e.g., Ex. 2012, Fig. 2; Ex. 1007, 1:49–52 (“[H]eat is generated by absorption of the beam within the

that heat transfer occurs in a *molten* plastic substance in Maurer and Fry. See *id.*; Ex. 1007, 3:32–40 (describing “the thermal conductivity and the thermal diffusivity of the plastic” as important factors “pertinent in the scoring of plastics”).

material. This means that the initial hot spot in plastics irradiated by the laser beam is within the material and not on the surface.”). This implies, as found above, that the white paper core in Maurer traps the laser energy so that it accumulates sufficient energy to burn regardless of whether the plastic material above melts, or melts as some of it also vaporizes to form the raised ridges depicted at Figure 2 of Maurer.

Petitioner and Dr. Tentzeris show persuasively, given the similarities of creating a void with a tactile feel using a laser on plastics as disclosed in Fry and Maurer, that it would have been obvious in view of Fry to ensure the raised feature in Maurer provides a predictable tactile feel as suggested by specifics regarding Fry’s “neat and regular” groove and bead structure (Ex. 1006, 3:62–63). *See* Ex. 1002 ¶¶ 106–112, 126, 185–88; Pet. 55 (arguing foaming would have been obvious). Dr. Cairns refers to creating ridges via microbubbles as “routinely referred to in the art as foaming,” suggesting an artisan of ordinary skill readily knew how to foam plastics to create the ridges described in Fry and Maurer. *See* Ex. 2010 ¶¶ 47–50.

Fry explains that “heat is generated by absorption of the beam within the material. This means that the initial hot spot in plastics irradiated by the laser beam is within the material and not on the surface.” Ex. 1007, 1:49–53. In similar fashion, Maurer generally describes “the sites treated with the laser beam are located inside the card”—i.e., not necessarily focusing the laser on the card core. *See* Ex. 1005, 4:37–38. So given that Fry and Maurer disclose cutting grooves in the same type of plastic material (e.g., PVC), the hot spot in each would be the same or similar based on the plastic’s absorptivity, thermal conductivity, and diffusivity. *See* Ex. 1012

¶¶ 32–33 (testifying Maurer does not specify a focal point and listing other more controlling factors disclosed by Fry and Maurer including absorptivity of the plastic, card core coating, and laser power (citing Ex. 1007, 1:49–50, 2:62–65, 3:31–42)).

In summary, using Fry’s process in conjunction with Maurer’s similar process involves applying a laser, which the plastic absorbs at some point below the surface, so that some of the plastic material in the groove becomes molten and degrades to form a groove, releasing bubbles to form a bead during the grooving process as Fry teaches, and at the same time, blackens the core material for printing due to heat absorption to the core layer. Contrary to Patent Owner’s arguments, Fry and Maurer do not employ incompatible processes. Stated differently, contrary to Patent Owner’s arguments, Fry does not teach that the whole thickness of the region forming the groove and hit by the laser vaporizes; rather, Fry teaches it remains molten, similar to Maurer. *See* Ex. 1012 ¶ 22 (“the complex processes of melting and evaporation were not mutually exclusive” and “a person of skill in the art reviewing the prior art would have understood blackening the core while creating raised features was possible, at least because Maurer discloses such a process”), ¶ 25 (“melting is a complicated process with complex chemical characteristics that involves some form of evaporation” and “when applying laser energy to a plastic substrate, a certain subset of molecules on the plastic substrate exposed to the laser may experience ‘melting,’ while others may experience ‘evaporation,’ or some combination of the two over time”), ¶ 34 (“A person of skill in the art would have further understood that a laser does not abruptly stop supplying energy past the focal point,”

“Idemia’s assertion is also not consistent with physics,” and “[i]n order for the laser to apply no energy to the core, the intervening material (i.e., the material above the core, between the laser source and the core) must absorb all of the laser energy.”).

Petitioner persuasively shows that a person of ordinary skill would have considered Maurer’s and Fry’s similar teachings regarding using a laser to cut grooves in a top layer of plastic, where Maurer discloses (or at least suggests) creating a raised tactile feel, thereby making visual and manual inspection possible, and also making it more difficult to forge the card. *See* Pet. 16–25; Ex. 1005, 4:25–30, 5:10–20, 6:4–5, 7:1–3. Petitioner also sufficiently explains that Fry discloses beads formed from bubbles alongside grooves, which serve to mark a plastic structure. *See* Pet. 15 (citing Ex. 1007, 2:69–75, 3:59–65, 4:30–40). Credible testimony by Dr. Tentzeris on this record indicates “a person of ordinary skill in the art would have looked to known techniques for scoring and/or grooving thermoplastic, like those disclosed in *Fry*, in order to form the raised/tactile relief structure of *Maurer*.” Ex. 1002 ¶¶ 111–115. As noted above, Dr. Cairns refers to creating ridges via microbubbles as “routinely referred to in the art as foaming,” suggesting an artisan of ordinary skill readily knew how to foam plastics to create ridges. *See* Ex. 2010 ¶¶ 47–50.

As summarized above, Petitioner makes a detailed showing supported by facts with a rational underpinning regarding challenged claims 13, 19, and 20. *See* Pet. 33–56. Petitioner shows by a preponderance of evidence that the combination of Maurer and Fry would have rendered obvious the

subject matter of claims 13, 19, and 20. Patent Owner's arguments do not undermine Petitioner's showing.

8. Weight of Dr. Tentzeris's Testimony

Patent Owner contends "Dr. Tentzeris's testimony is not credible and provides no assistance to the Board's obviousness analysis." PO Resp. 51. First, Patent Owner contends Dr. Tentzeris "refused to admit that the figures in Maurer are cartoons or imprecise renderings drawn by an artist." *Id.* But Patent Owner's citations reveal that Dr. Tentzeris acknowledged that the "dimensions could be different, could be larger or smaller but the fundamental teachings [about elevated features and discoloration] . . . leads to formation of structures similar Fig. 2." *See id.* at 52 (quoting Ex. 2008, 161:24–162:24). Patent Owner's similar arguments about other figures that Patent Owner characterizes as "cartoons" fail to show a lack of credibility. The figures need not be dimensioned perfectly or represent "photographs or scanning electron microscope cross-sections" to lend insight, as discussed above. *See id.*; Section II.C.7.c

Second, Patent Owner alleges that Dr. Tentzeris demonstrated a complete lack of understanding of the technology. PO Resp. 51. Petitioner persuasively responds that Dr. Tentzeris demonstrated detailed understanding during his deposition. Reply 24 (citing Ex. 2008, 64:9–67:9 (detailed explanation of Fry), 71:12–73:3 (discussing glass temperature), 69:16–70:15 (refusing to adopt an elementary school understanding of melting and vaporization)). A review of the record shows Dr. Tentzeris understands the technology.

Third, Patent Owner contends Dr. Tentzeris “brush[ed] aside” dimensions in Fry and “refused to accept—much less deal with—the import of the plain language of Fry that contradicted his conclusions.” PO Resp. 52. As noted above, Fry’s teachings generally evince the mechanisms of laser grooving in plastics, and Dr. Tentzeris, like Dr. Cairns, relied upon those teachings. Dr. Tentzeris credibly supported his testimony by citing to Fry where applicable and aided the panel in understanding the technology, as discussed above. Contrary to Patent Owner’s related allegation (*id.* at 52–53), the dimensions of Fry’s substrate do not undermine Dr. Tentzeris’s testimony because those dimensions relate to a single embodiment, as discussed above. *Supra* Section II.C.7.c.

Fourth, Patent Owner contends Dr. Tentzeris refused to acknowledge that Bernecker “used the term ‘microrelief’ to reference features below the top surface of the card.” PO Resp. 53 (citing Ex. 2008, 121:24–123:4, 129:16–132:16). The cited deposition passages do not appear to show a direct question posed about a “microrelief.” *See* Ex. 2008, 121:24–123:4, 129:16–132:16. In any case, as Petitioner points out, Dr. Tentzeris stated that Bernecker discloses “a microrelief” and “notches or depressions on the surface.” Reply 25 (citing Ex. 2008, 122:25–123:4).

Finally, Patent Owner makes a number of other arguments, including that Dr. Tentzeris improperly analyzed the prior art and claims, did not identify the claim construction he employed, gave unresponsive testimony, and used notes during his deposition. *See* PO Resp. 54–56. As one specific example, Patent Owner faults Dr. Tentzeris for “forming no opinion about exact meanings” of “subjective” terms, and instead provided “examples” of

“foaming,” “tactile feature,” “tactile effect,” and “OVD.” *See id.* at 54 (citing Ex. 2008, 34:4–37:19, 86:25–88:2, 88:16–89:4, 95:15–23, 98:2–17, 135:11–138:8).

A fair reading of Dr. Tentzeris’s deposition testimony shows that he generally responded to Patent Owner’s questions, even though he used notes, and he also provided useful insight to the panel in his declaration testimony. As one example referenced by Patent Owner, during his deposition, Dr. Tentzeris stated as to a “foamed laminate material . . . Fry explained that the process of grooving or scoring thermoplastic results in small bubbles that can be seen during microscopic examination as written in Fry exhibit 24 column 3, lines 63 and 68.” Ex. 2008, 34:19–34. So Dr. Tentzeris informs that foaming includes “small bubbles” creating during a scoring process. This constitutes a reasonable example of foaming that Patent Owner does not challenge and it also serves to define the meaning of the term—i.e., foaming includes small bubbles. Dr. Tentzeris provided similar responses to shed light on the meaning of the other terms, at the same time, explaining where he found the terms in the prior art. *See, e.g., id.* at 94:15–96:16 (tactile feel), 123:16–25 (describing a notch by referring to Fry), 134–136 (describing methodology of using the prior art, and referring to the ’494 as an example patent for an optically variable device). Patent Owner does not contend the examples it cites show that Dr. Tentzeris incorrectly characterized any terms under discussion, let alone any terms at issue in the trial. In order to aid the panel’s understanding, Dr. Tentzeris need not provide an “exact meaning” to subjective or other terms, especially terms not in dispute.

Accordingly, we afford Dr. Tentzeris's testimony its due weight, and determine it to be credible, having considered it in light of Dr. Cairns' testimony and the prior art and arguments presented as set forth in the Final Written Decision.

9. Summary

For the foregoing reasons, Petitioner has shown, by a preponderance of the evidence, that the subject matter of (i) claims 1–6, 8–10, and 12 would have been obviousness over Maurer and Bernecker, (ii) claims 15–17 would have been obviousness over Maurer, Bernecker, and Gunn, and (iii) claims 13, 19, and 20 would have been obviousness over Maurer and Fry.

III. PATENT OWNER'S CONTINGENT MOTION TO AMEND

As discussed above, Petitioner has demonstrated by a preponderance of the evidence that claims 1–6, 8–10, 12, 13, 15–17, 19, and 20 are unpatentable. Accordingly, the contingency in Patent Owner's Contingent Motion to Amend manifests. Paper 18 ("Mot." or "Motion"). The Motion seeks to replace claims 1–6, 8–10, 12, 13, 15–17, 19, and 20 with substitute claims 21–26, 28–30, 32, 33, 35–37, 39, and 40. Mot. 4.

To support its Motion, Patent Owner relies on the Declaration of Darran R. Cairns, Ph.D., in Support of Patent Owner's Contingent Motion to Amend." Ex. 2011. Patent Owner also relies on the Cairns Declaration (Ex. 2010) it filed with its Patent Owner Response (addressed above and throughout this Final Written Decision).

Petitioner opposes the Motion in its Response in Opposition to Patent Owner's Contingent Motion to Amend. Paper 23 ("Opp." or "Opposition"). To support its Opposition, Petitioner provides the Declaration of Emmanouil

M. Tentzeris Ph.D. in Support of Patent Owner's Contingent Opposition to Motions to Amend U.S. Patent No. 7,207,494 (Ex. 1013).

Replying to the Opposition, Patent Owner filed a Reply in Support of its Contingent Motion to Amend. Paper 24 ("PO Reply" or "Patent Owner's Reply"). Responding to Patent Owner's Reply, Petitioner filed a Sur-Reply to Patent Owner's Motion-to-Amend. Paper 31 ("Pet. Sur-Reply" or "Petitioner's Sur-Reply"). For the reasons below, we deny the Motion.

A. The 37 C.F.R. § 42.121 and 35 U.S.C. § 316(d) Requirements

In an *inter partes* review, substitute claims must be proposed as a part of a motion to amend. 35 U.S.C. § 316(d). The Board must assess the patentability of proposed substitute claims "without placing the burden of persuasion on the patent owner." *Aqua Prods., Inc. v. Matal*, 872 F.3d 1290, 1328 (Fed. Cir. 2017) (en banc). Patent Owner's proposed substitute claims must meet the statutory requirements of 35 U.S.C. § 316(d) and the procedural requirements of 37 C.F.R. § 42.121. See "Guidance on Motions to Amend in view of Aqua Products" (Nov. 21, 2017) (https://www.uspto.gov/sites/default/files/documents/guidance_on_motions_to_amend_11_2017.pdf) ("Guidance").

Under the Guidance,

[i]n light of the *Aqua Products* decision, the Board will not place the burden of persuasion on a patent owner with respect to the patentability of substitute claims presented in a motion to amend. Rather, if a patent owner files a motion to amend (or has one pending) and that motion meets the requirements of 35 U.S.C. § 316(d) (i.e., proposes a reasonable number of substitute claims, and the substitute claims do not enlarge scope of the original claims of the patent or introduce new matter), the Board will proceed to determine whether the substitute claims are

unpatentable by a preponderance of the evidence based on the entirety of the record, including any opposition made by the petitioner. Thus, for example, if the entirety of the evidence of record before the Board is in equipoise as to the unpatentability of one or more substitute claims, the Board will grant the motion to amend with respect to such claims, and the Office will issue a certificate incorporating those claims into the patent at issue.

Guidance 2.

The Guidance also states “a patent owner . . . must meet the requirements for a motion to amend under 37 C.F.R. § 42.121 That is, a motion to amend must set forth written description support . . . in relation to each substitute claim, and respond to grounds of unpatentability involved in the trial.” *Id.*

The Motion meets certain threshold requirements of 37 C.F.R. § 42.121. Particularly, the Motion seeks to add a reasonable number of substitute claims (one-for-one), replacing claims 1–6, 8–10, 12, 13, 15–17, 19, and 20 with substitute claims 21–26, 28–30, 32, 33, 35–37, 39, and 40, with each substitute claim responding reasonably to Petitioner’s grounds of obviousness involved in the trial. *See* Mot. 4, 22–24.

*B. New Matter, 37 C.F.R. § 42.121, 35 U.S.C. § 316(d),
All Claims in General, Specifically Claims 23, 28, 36, and 40*

The Guidance indicates Patent Owner’s Motion must meet new matter/written description requirements. *See* Guidance 2.; 37 C.F.R. § 42.121(a)(2) (“A motion to amend may be denied where . . . (ii) The amendment seeks to enlarge the scope of the claims of the patent or introduce new subject matter.”); 35 U.S.C. § 316(d)(3) (“An amendment . . .

may not enlarge the scope of the claims of the patent or introduce new matter.”).

Petitioner generally argues Patent Owner’s “citation to its expert’s report” and “string citations” to the original patent application fail to provide written description report. *See* Opp. 5–6. Patent Owner’s citations appear reasonable and absent a specific shortcoming alleged by Petitioner, satisfy Patent Owner’s burden of production with respect to new matter/written description support for all of the claims.

Claims 23, 28, and 36, respectively depend from independent claims 21, 25 and 35, and require one or more raised features to have “a height above the nominal top surface level that is at least 30% of a thickness of the outer laminate layer before . . . laser processing.” Independent claim 40 recites a similar limitation. In claim 40, the “tactile raised feature” must be “adjacent said void pattern.”

In addition, with the exception of substitute claim 40, the substitute claims recite a “raised feature” with an OVD quality. Patent Owner agrees with this summary, asserting that “[i]n all the claims (except for claim 40), this raised feature must also have an optically variable quality (*e.g.*, not visible when viewed straight on, resists photocopying).” Mot. 23.

To address the new matter/written description requirement, Patent Owner asserts that the original ’494 patent application (Ex. 1004) incorporates by reference U.S. Patent No. 5,005,872 (Ex. 2009 (the ’872 patent)), which states the following relevant to the 30% limitation in the substitute claims:

In the present invention this increase in volume arising from gas bubbles is exploited selectively to produce characters which are distinct from their surroundings not only in terms of their color but also in terms of their relief height. As tests have shown, plastic material such as PVC can increase its volume by 30% and more due to the action of a laser beams even without additional foaming agents, and without substantial loss of strength in the film in these areas.

See Motion 9, 21–22 (quoting Ex. 2009, 2:66–3:6, citing Ex. 1004, 600).

Petitioner disagrees that this incorporation by reference of the '872 patent satisfies the new matter/written description requirement of substitute claims 23, 28, 36, and 40. Opp. 5–7. Claims 23, 28, 36, and 40 recite “the nominal top surface level that is at least 30% of a thickness of the outer laminate layer.” Therefore, the claims cover ranges from 30%–100% or even 30%–200% of the outer laminate thickness.

Petitioner contends the “'872 patent merely discloses that PVC *can be foamed* to increase volume/height by 30%. See Ex. 2009, 2:66–3:6, 6:14–16. It does not convey to a person of ordinary skill in the art that the *particular security feature* of the '494 patent had a specific height.” Opp. 6 (citing Ex. 2009, 2:66–3:6, 6:14–16; Ex. 1013 ¶ 22). Petitioner also points out the substitute claims “require *invisible raised features* when viewed straight on (e.g., substitute claim 23).” *Id.* at 7 (emphasis added). In contrast, Petitioner notes “[t]he '872 patent further specifies that its raised features include *color* changes that ‘are distinct from their surroundings.’” *Id.* at 6 (citing Ex. 2009, 2:67–3:1) (emphasis added).

In response, Patent Owner contends

[t]he '872 patent—which was specifically selected to be incorporated by reference—demonstrates that the inventors were

aware that laser processing of polycarbonate laminate layers, such as PVC, could result in raised features that extend above the top surface level by a height of at least 30% of the thickness of the laminate layer before laser processing. Ex. 2009 at 3:2–6, 6:14–16. The inventors expressly taught that the etched features should be both prominent and optically variable

PO Reply 5.

Initially, this response appears to intermingle PVC (polyvinyl chloride) with polycarbonate, a relatively harmless error with respect to the issue at hand. In any event, Patent Owner does not provide the requisite written description support for claims 23, 28, 36, and 40 in its Motion. As indicated above, the phrase “at least 30% of a thickness of the laminate layer,” as recited in the substitute claims at issue here, lacks an upper bound for thickness that the ’872 patent does not support. At the cited passage, the ’872 patent states “plastic material such as PVC can increase its volume by *30% and more* due to the action of a laser beam even without additional foaming agents, and without a substantial loss of strength in the film in those areas.” Ex. 2009, 2:66–3:6 (emphasis added). This passage does not quantify “and more.” However, elsewhere, the ’872 patent indicates the extent of the “more.” For example, the ’872 patent states a “transparent cover film with a total thickness of 250 to 350μ can be expanded by appropriate laser action to a thickness of 350 or 450μ. Due to the local limitation of the ‘foaming’ area, an increase in volume of about 30% is reflected more or less directly in a corresponding change in thickness.” *Id.* at 6:11–16. The ratio of 350/250 represents a thickness/volume increase of 40%, whereas the ratio of 450/350 represents a thickness/volume increase of 28%.

Accordingly, Patent Owner fails to show that the inventors were in possession of the full scope of claims 23, 28, 36, and 40—a ridge extending from a layer that exceeds 30% (e.g., 100%) of the original thickness of the layer after laser processing, which claims 23, 28, 36, and 40 cover. *See In re Wertheim*, 541 F.2d 257, 263–64 (CCPA 1976) (The PTO “satisfied its burden” of showing specification with disclosed range of 25%–60% and examples within that range does not provide descriptive support for new claim limitation of “at least 35%” “[b]y pointing to the fact that claim 1 reads on embodiments outside the scope of the description.”).

Per the discussion below in Section III.E., relying on Bernecker, the parties agree that the OV limitation (“not visible when viewed straight on”) requires a colorless and/or contrastless raised feature. *See* Ex. 1006, 2:53–65, 3:35–37, 3:57–58, 4:6–10, 5:9–10; PO Resp. 3 (alleging prior art “markings were made by discoloring the surface of the card stock” “[u]like . . . the invention described in the ’494 patent”). Patent Owner, however, also fails to show that the inventors were in possession of a colorless or contrastless raised feature that extends above the top surface level by a height of at least 30% of the thickness of the laminate layer before laser processing, as claims 23, 28, and 36 cover. *See id.*

With further respect to color of plastics as described in the ’872 patent (*see* Opp. 6–7), by “appropriately optimizing the material parameters and method parameters (plastic material, layer structure, layer thickness, laser intensity, beam control, etc.),” the disclosed process creates characters in plastic material “which are distinct . . . in terms of their color.” Ex. 2009, 2:68–3:17. Independent claim 21 recites “raised features extending above a

nominal top surface of the first laminate to form reflecting surfaces that are not parallel to the nominal to surface of the first laminate and are not visible when viewed straight on.” Dependent claim 23 recites “at least one of the raised features has a height above the nominal top surface of the first laminate that is at least 30% of a thickness of the first laminate before said laser etching.” Claims 28 and 36 recite a similar “not visible” requirement.

In contrast to the “not visible” requirement for claims 23, 28, and 36, the ’872 patent indicates the raised (plateau) feature will be plastic “characters which are distinct from their surroundings not only in terms of their color but also in terms of their relief height”—i.e., visible in contrast with its surroundings, as Petitioner argues. *See* Ex. 2009, 2:67–3:2; Opp. 6–7 (citing Ex. 2009, 2:67–3:1). Given these differences, Petitioner shows persuasively that the inventors of the ’494 patent were not in possession of the breadth of subject matter covered by claims 23, 28, and 36.

The inventors did not have possession of the “at least 30%” limitation through the ’872 patent for another reason. In incorporating five different patents in their entirety, including the ’872 patent, the specification states the five patents “describe various implementations for using a laser to print information.” Ex. 1004, 600. These “implementations for using a laser” point to no result thereof, such as a thickness limitation or range thereof. Nothing else in the ’494 patent describes a thickness limitation as important to obtaining a combined OV tactile ridge. So “the specification does not clearly disclose to the skilled artisan that the inventors . . . considered the [ridge range] to be part of their invention.” *See Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1328 (Fed. Cir. 2000). Without requiring

adequate guideposts somewhere in the specification describing the importance of a limitation incorporated by reference therein, the specification conceivably could incorporate by reference every prior art patent and then the patentee later could argue its invention includes all the subject matter therein.

Accordingly, for the reasons noted above, Petitioner shows by a preponderance of evidence that Patent Owner's Motion does not satisfy the regulatory and statutory written description requirements for substitute claims 23, 28, 34, 36, and 40, which consequently recite impermissible new matter.

*C. Broadening, 37 C.F.R. § 42.121, 35 U.S.C. § 316(d),
Claims 21, 25, 28, and 36*

Patent Owner's Motion must not introduce substitute claims that enlarge the scope of the claims of the patent. *See* Guidance 2; 37 C.F.R. § 42.121(a)(2) ("A motion to amend may be denied where . . . (ii) The amendment seeks to enlarge the scope of the claims of the patent or introduce new subject matter."); 35 U.S.C. § 316(d)(3) ("An amendment . . . may not enlarge the scope of the claims of the patent or introduce new matter."); *Lectrosonics, Inc. v Zaxcom, Inc.*, Case IPR2018-01129, 01130 (PTAB February 25, 2019) (Paper 15) (comparing substitute claims to issued claims for broadening analysis) (precedential). Patent Owner contends the substitute claims narrow the issued claims by adding limitations thereto. Motion 4–6. Petitioner argues that the Motion does not satisfy the burden of production of showing the proposed substitute claims 21, 25, 28, and 36 do not enlarge the scope of issued claims 1, 5, 8, and 16. *See* Opp. 3–5

(“Idemia neither addresses the removed language nor provides any evidence or reasoning to meet its burden of production.”).

By presenting facially narrowing limitations with respect to at least issued claims 1 and 5, which appear to be the broadest issued claims with respect to the narrowing limitations, the Motion meets the burden of production as to substitute claims 21, 25, 28, and 36. The record shows claims 25, 28 and 36 do not broaden claims of the patent.

Regarding substitute claim 21, Petitioner alleges that with respect to claim 1, claim 21 “removes ‘top surface of the identification document’ and ‘wherein the pattern includes visual properties, and wherein the visual properties comprise a characteristic of . . . being’ from the claim, broadening the scope of claim 1 in at least two respects.” Opp. 3. Regarding one alleged broadening aspect, Petitioner explains claim 21 does not prohibit additional layers, so that claim 21, which recites “[a] method of producing a security feature in an identification document comprising . . . providing a core . . . [and] laminating a first laminate,” does not require providing the pattern in a topmost layer of the identification document. *See id.*

In contrast, original claim 1 requires the “laser etching a pattern into the top surface of the identification document.” Accordingly, Petitioner shows that substitute claim 21 impermissibly broadens challenged claim 1, because it does not require a pattern in the top surface of the identification document.

Alleging a second broadening aspect, Petitioner also contends that claim 21 “no longer require the entire pattern to be invisible when viewed straight on.” With respect to claim 5, which appears, in most respects, to be

the broadest issued claim in relation to the substitute claims, Petitioner's argument has merit.

Claim 5 of the '494 patent follows: "An identification document, including a core and at least one outer laminate layer, wherein a top surface of the outer laminate layer is laser-processed to form a pattern, the pattern being essentially not visible when viewed straight-on."

So claim 5 requires the entire pattern to "be[] essentially not visible when viewed straight-on," And as Petitioner argues, claim 21 does not require the entire pattern to "be[] essentially not visible when viewed straight-on," Claim 21 recites "etching a pattern of raised features into the first laminate, said raised features extending above a nominal top surface of the first laminate to form reflecting surfaces that are not parallel to the nominal top surface of the first laminate and are not visible when viewed straight on." So the pattern of claim 21 may include reflecting surfaces that are visible when viewed straight on.

Patent Owner responds that challenged claim 1 "necessarily involved laser etching the first laminate in contact with the top surface." PO Reply 2. This argument lacks merit, because claim 1 does not necessarily involve laser etching the first laminate. Patent Owner's argument does not address the limitation in claim 1 that necessarily requires "laser etching a pattern into the top surface of the identification document"—a feature claim 21 does not require. See Pet. Reply 5.

Patent Owner also responds that "Petitioner points to no disclosure in the '494 patent in which a surface other than the laminate layer is laser etched." PO Reply 2. This argument only alleges that Petitioner did not

point to how the '494 patent supports the full scope of claim 1, an unnecessary showing given the plain language of claim 1. In any event, the '494 patent refers to marking “any layer . . . to virtually any product.” Ex. 1001, 9:37–39.

Regarding substitute claim 25, Petitioner alleges it “removes the language ‘wherein the top surface of the outer laminate layer is laser-processed to form a pattern, the pattern being.’ . . . As a result, claim 25 no longer requires the entire pattern resulting from the laser-processing to be essentially not visible when viewed straight on, instead merely requiring that for the *raised features*.” Opp. 4.

Petitioner’s argument is not persuasive. Claim 5 recites “the outer laminate layer is laser-processed to form a pattern, the pattern being essentially not visible when viewed straight-on.” Even though claim 25 does not explicitly require the whole “pattern” to be “essentially not visible when viewed straight-on” and challenged claim 5 does as Petitioner argues, substitute claim 25 narrows the “pattern” of claim 5 such that only “raised features form a pattern” and the “raised features [that form the pattern] are essentially not visible when viewed straight-on.” In addition, claim 25 requires “raised features of foamed laminate material.” So claim 25 at least implicitly requires a pattern of raised features of foamed laminate material to be essentially not visible when viewed straight-on.

Petitioner contends substitute claim 28 impermissibly broadens claim 8, because it removes the limitation that requires the laser processing to “define[] an optically variable device.” Opp. 5. Petitioner explains that although claim 25, from which claim 28 depends, “still requires features that

are essentially not visible when viewed straight-on, . . . claim [25] permits the features to be always non-visible.” *Id.* Nevertheless, having determined claim 25 does not impermissibly broaden original claim 5, as claim 28 depends from claim 25, claim 28 does not impermissibly broaden claim 5. Consequently, Petitioner does not provide a persuasive argument showing that substitute claim 28 constitutes improper broadening.

Finally, Petitioner contends substitute claim 36 impermissibly broadens claim 16. Opp. 5. Patent Owner contends Petitioner does not challenge claim 35, from which claim 36 depends. *See* PO Reply 3. Patent Owner also contends substitute claim 35 narrows challenged claim 15 and claim 36 depends from claim 35, so “[c]laim 36 does not broaden the scope of the ’494 patent.” *Id.* Patent Owner’s argument is persuasive.

Based on the foregoing discussion, the Motion includes improper broadening of substitute claim 21, but does not include improper broadening of substitute claims 25, 28, and 36.

*Indefiniteness, 35 U.S.C. § 112 ¶ 2,
Claims 21–23 and 35*

Petitioner contends substitute claims 21, 22, and 35 are indefinite under 35 U.S.C. § 112 ¶ 2. Opp. 10.

According to Petitioner,

[c]laim 21 recites “said raised features extending above a nominal top surface of the first laminate to form reflecting surfaces that are not parallel to the nominal top surface of the first laminate and are not visible when viewed straight on,” which is ambiguous as to whether invisibility applies to the raised features or merely the reflecting surfaces (permitting visibility of other portions of the raised features).

Id. (citing Ex. 1013 ¶¶ 24–25). According to Patent Owner, the phrase “starting with ‘that’” modifies “the reflecting surfaces,” so claim 21 is not indefinite. See PO Reply 7. Petitioner points out that in the same paper, Patent Owner contradicts itself, by arguing “[i]t is this pattern of ‘said raised features’ that must be ‘not visible when viewed straight on.’ No broadening resulted here.” Pet. Sur-Reply 6 (citing and quoting PO Reply 2). Petitioner contends “Indemia’s own inability to determine what portion of the claim is modified by ‘not visible when viewed straight on’ confirms claim 21 is indefinite.” *Id.*

Patent Owner’s unclear arguments do not help Patent Owner, but the record supports Patent Owner’s argument that the claim is not indefinite. Claim 21 limits “the reflecting surfaces” by reciting the “reflecting surfaces that are not parallel to the nominal top surface of the first laminate and are not visible when viewed straight on.” We agree with Patent Owner that “that” clearly modifies “the reflecting surfaces” and therefore “not visible when viewed straight on” refers to the reflecting surfaces. Accordingly, Petitioner does not show substitute claim 21 is indefinite.

Petitioner contends claim 22 is indefinite because the term “visual properties” lacks antecedent basis. Opp. 10. Petitioner’s showing is persuasive. Claim 22 depends from claim 21 and claim 22 does not indicate in sufficiently clear manner what constitutes the recited “visual properties.” The term “visual properties” does not appear in claim 21. It appeared in issued claim 1, but was removed in proposed substitute claim 21. Mot. App’x. Therefore, the “visual properties” could refer to visual properties inherent in the “pattern,” the “raised features,” the “reflecting surfaces,” or

the “identification document” of claim 21. These alternative readings render the claim indefinite because the scope of the claim cannot be ascertained. *See Ex parte McAward*, Appeal 2015-006416, 2017 WL 3669566, at *5 (PTAB Aug. 25, 2017) (precedential). Patent Owner submits claim 22 requires a “minor adjustment” to clarify it (PO Reply 7), but because the amended claim scope may have impacted Petitioner’s obviousness challenge and thereby would have required further briefing by both parties without a showing of good cause, the panel denied Patent Owner’s request to submit another substitute claim to replace substitute claim 22 at that late stage of the proceeding. *See* Paper 26; Ex. 3003 (Patent Owner argues claim 22 contains “a typographical error in the language . . . causing an antecedent basis issue.”). Claim 23 depends from claim 22 and is indefinite due to the dependency.

Claim 35 recites “wherein a top surface of the outer laminate layer is laser-processed . . . to define an optically variable device comprising reflecting surfaces that are not parallel to the nominal top surface level of the outer laminate layer and that is essentially not visible when viewed straight on.” Petitioner contends “[c]laim 35 is indefinite as to what must be ‘essentially not visible when viewed straight on.’ . . . While the ‘and that’ appears to indicate that invisibility applies to the reflecting surfaces, the use of the singular ‘that is’ appears to suggest that invisibility applies to the entire raised feature.” Opp. 10. Petitioner’s argument is not persuasive. Claim 35 employs the singular “is.” Patent Owner argues “the singular verb ‘is’ . . . modifies the singular noun ‘optically variable device.’” PO Reply 7. So claim 35 specifies that “an optically variable device . . . is essentially not

visible when viewed straight on.” Petitioner does not contend the term “optically variable device,” which several of the challenged claims recite, is indefinite.

Based on the foregoing discussion, Petitioner shows substitute claims 22 and 23 are indefinite by a preponderance of evidence. Petitioner does not show that substitute claims 21 and 35 are indefinite.

E. Analysis of the Alleged Obviousness of the Substitute Claims

Patent Owner does not bear the burden of showing the substitute claims would have been obvious. *See Aqua Prods.*, 872 F.3d at 1327; Guidance 2. For the reasons explained below, Petitioner has shown by a preponderance of the evidence that the subject matter of the proposed substitute claims, claims 21–26, 28–30, 32, 33, 35–37, and 39, would have been obvious.

With the exception of substitute claim 40, the substitute claims recite a “raised feature” with an OV quality. *See* Mot. App’x. As noted above, Patent Owner agrees with this characterization, asserting that “[i]n all the claims (except for claim 40), this raised feature must also have an optically variable quality (e.g., not visible when viewed straight on, resists photocopying).” *Id.* at 23.

Substitute claim 21 follows:

21. (Substitute for claim 1, if found unpatentable) A method of producing a security feature in an identification document comprising:

providing a core including a top surface and a bottom surface;

laminating a first laminate in contact with the top surface;

and

laminating a second laminate in contact with the bottom surface, the laminated core comprising the identification document, the identification document having a top side and a bottom side respectively corresponding to the core's top and bottom side, the top side having a top surface; and

laser etching a pattern of raised features into the [[top surface of the identification document]] first laminate, said raised features extending above a nominal top surface of the first laminate to form reflecting surfaces that are not parallel to the nominal top surface of the first laminate and are [[; wherein the pattern includes visual properties, and wherein the visual properties comprise a characteristic of]] not [[being]] visible when viewed straight on.

Id. at App'x i (underlining representing additions to claim 1, double brackets representing deletions).

In responding to Petitioner's grounds of obviousness set forth in the trial, *see* 37 C.F.R. § 42.121, Patent Owner contends "there is no 'clear tactile relief' taught in Maurer," so "a skilled artisan would not have been motivated to use such a feature." Mot. 23 (citing Ex. 2010 ¶ 120).²⁵ Patent Owner also contends "the tactile portion taught in Maurer does not extend above the top surface of the document, much less a raised feature having the combination of attributes required by the substitute claims." *Id.* at 24 (citing Ex. 2010 ¶¶ 84–86, 104). Finally, Patent Owner contends the combination lacks a "rational basis for concluding" an artisan of ordinary

²⁵ As noted, Patent Owner does not have the burden of showing the unobviousness of the substitute claims, but per 37 C.F.R. § 42.121(a)(2)(i), Patent Owner's Motion "must respond to a ground of unpatentability involved in the trial."

skill would have combined Bernecker and Maurer. *Id.* at 24. According to Patent Owner, “the claimed combination would not simply require adding an additional security feature to Maurer, but to destroy two of the security features touted in Maurer to replace them with a single other feature (from Bernecker).” *Id.* at 24 (citing Ex. 2010 ¶¶ 121–124).

Petitioner responds that “*Maurer*, *Bernecker*, and *Fry* collectively render obvious a combined security feature with both (1) a tactile/raised relief and (2) optical variability for the relief.” Opp. 9. As discussed further below, Petitioner persuasively shows several motivations for combining the features, including to enhance security by adding to Maurer’s features and providing a ready mechanism for quickly comparing two items of information on a card. *See id.* at 12 (citing Ex. 1006, 3:18–26) (arguing that providing raised tactile features with registration and OV, instead of just the former, enhances security). As Petitioner persuasively contends, Patent Owner’s arguments largely rely on materially the same evidence and arguments Patent Owner relies upon with respect to challenged claims 1–6, 8–10, 12, 13, 15–17, 19, and 20. *See id.* at 8.

As noted above, the parties agree, with the exception of substitute claim 40, the substitute claims recite a “raised feature” with an OV quality. *See id.* at App’x. (claim 21 (above); claim 24 (“wherein the pattern of ridges comprises an Optically Variable Device”); claim 25 (“the raised features are essentially not visible when viewed straight-on”); claim 29 (“wherein said ridges comprise an optically variable quality”); claim 33 (“wherein the raised feature comprises an optically variable quality”); claim 35 (“a raised tactile feature extending above a nominal top surface level of said outer

laminate layer, and to define an optically variable device comprising reflecting surfaces that are not parallel to the nominal top surface level of the outer laminate layer and that is essentially not visible when viewed straight on”)).

Claim 39 recites “wherein neither the void pattern nor the raised features can be photocopied.” Claim 35 additionally recites a bar code feature, in addition to a raised OV feature, and claims 36 and 37 depend therefrom. In addition to the raised OV feature, or raised feature, claims 23, 28, 36, and 40 also recite the “at least 30%” thickness limitation for the raised feature as discussed above in Section III.B. Mot. App’x.

Claim 22 depends from claim 21 and recites “wherein the visual properties comprise a characteristic of resisting image capture by photocopying.” Claims 26 and 37 respectively depend from claims 25 and 35 and recite a “void having a ‘V’ cross section.” Claim 30 depends from claim 29 and recites “said ‘V’ cross section is defined by two intersecting surfaces, neither of which is parallel to the top surface of the outer laminate.” Claim 32 depends from claim 29 and recites “wherein said laser processing also defines an optically variable device.” *Id.*

Petitioner persuasively addresses the particular limitations of each substitute claims. Opp. 16–25. As Petitioner summarizes, “Idemia rewrites claims 1, 2, 4–6, 9–10, 12, 13, 15, 17, and 19 to require a single security feature including *both* (1) a raised feature (tactile/raised relief) and (2) a visual feature tied to the raised feature. *Maurer, Bernecker, and Fry* (and optionally *Gunn*) render obvious such a combined security feature.” Opp. 11 (citing Ex. 1013 ¶¶ 27–48). Petitioner persuasively relies on Maurer’s

method of producing a laminated card to teach the claimed method of producing the identification document's core and the first and second laminates, as set forth in the substitute claims. *See, e.g.*, Opp. 16–17 (citing Ex. 1013 ¶¶ 49–52; Ex. 1002 ¶¶ 144–147; Ex. 1005, Abstract; Ex. 1006, Abstract, 4:37–52).

To address the added security features of the substitute claims, Petitioner relies on a “combined security feature” according to the combined teachings of Maurer, Bernecker, and Fry. As an example, with respect to claim 21, Petitioner persuasively states as follows:

As explained above in Section VII.A.1, the combined security feature is formed through laser-engraving a pattern and includes raised features. Ex. 1013, ¶¶53–56. Furthermore, the combined security feature would be implemented in a contrastless manner, as taught by *Bernecker*, to give rise to areas with “*different light scattering properties*” (Ex. 1006, 2:16–20, 53–56) resulting in a combined security feature that is not visible when viewed straight on. Ex. 1013, ¶56. Moreover, it would include reflecting surfaces that are not parallel to the top surface of the card. *Id.* ¶¶54–55. For example, the raised relief structure of *Maurer* includes reflecting surfaces, both above and below the top surface, that are not parallel to the top surface of the card. *Id.*; Ex. 1005, Fig. 2.

Opp. 17. Petitioner explains that Fry aids in rendering obvious the combined security feature, because Fry teaches “specifics about how to score thermoplastic without scorching or discoloration such that the resulting groove includes raised beads surrounding the groove.” *Id.* at 15 (citing Ex. 1007, 2:69–76). Petitioner adds that “using a laser to create a security feature that is both raised and lacks discoloration was well within the skill of a POSITA. . . . The ’494 patent assumes that creating such a feature was

within the skill of a POSITA, because it does not disclose any details about laser engraving.” *Id.* at 16 (citing Ex. 1013 ¶¶ 35–36, Ex. 1007, Table II).

Addressing the specific added features of each substitute claim, Petitioner persuasively contends that the raised OV feature of the substitute reads on the “combined security feature” (as supplemented by Gunn and the ’872 patent respectively to address a bar code limitation and the “at least 30%” thickness limitation as recited in some of the substitute claims). *See id.* at 11–25. For example, addressing claim 24, Petitioner persuasively explains that “*Maurer, Bernecker, and Fry* collectively render obvious a combined security feature that is invisible when viewed straight on, which would resist image capture by photocopying, as disclosed in *Bernecker*.” *Id.* at 18 (citing Ex. 1013 ¶ 57; Ex. 1006, 2:19–22, 2:53–56, 2:63–65). Petitioner persuasively explains that implementing the combined security feature would render Maurer’s pattern of ridges optically variable as suggested by Maurer, Bernecker, and Fry. *Id.* (citing Ex. 1005, Fig. 2, Ex. 1007, Fig. 1).

Addressing claim 25, Petitioner persuasively explains “the combined security feature would also include reflecting surfaces not parallel to the top surface of the outer laminate, owing to the existence of raised features and Bernecker’s teaching of implementing the laser processing in a colorless manner to give rise to areas with different light scattering properties.” *Id.* at 19 (citing Opp. Section VII.A.2). Addressing claim 39, Petitioner persuasively maintains Fry suggests foaming material to create raised edges, Maurer teaches raised features with a void pattern in a laminated card, and Bernecker suggests making void and raised features in a contrastless manner

(e.g., not in registration with underlying printed material), so that the combined security feature will be “neither manipulable nor copiable,” thereby aiding in verifying the authenticity. *See id.* at 23–24 (citing Ex. 1013 ¶¶ 105–112; Ex. 1006, 2:9–13; Ex. 1005, Fig. 2 (void pattern/raised features); Ex. 1007, Fig. 2 (same)).

Relying on Fry, Maurer, Bernecker, and the testimony of Dr. Tentzeris, Petitioner persuasively shows the subject matter of substitute claims 22 (resisting image capture by photocopying), claim 32 (OV feature), and claim 33 (OV feature), would have been obvious. *See* Opp. 18, 21–22 (citations omitted). As Petitioner persuasively explains in its Opposition, the recited tactile OV raised features resist image capture by virtue of being non-parallel, contrastless, and colorless with respect to the plastic laminate according to Bernecker’s teachings as combined with Maurer and Fry. *See, e.g., id.* at 12–16, 20–22.

Addressing the bar code feature of independent substitute claim 35 (and dependent claims 36–37), Petitioner persuasively tracks its showing in reliance on the combined security feature as suggested by the teachings of Maurer, Bernecker, and Fry, and further persuasively combines the teachings of Gunn to address the recited bar code limitation as a well-known ID feature in the art useful for aiding in authenticity. *See* Opp. 22–23 (citing Ex. 1013 ¶¶ 98–102; Opp. Section VII.A.2). Addressing the “V” cross section voids recited in claims 26, 29, 30, and 37, Petitioner persuasively relies on Bernecker’s Figure 3 and related teachings to address that feature as part of Bernecker’s OV teachings. *See id.* at 20 (citing Ex. 1013 ¶¶ 71–

74, 21 (citing Ex. 1013 ¶¶ 82, 74), 23 (citing Ex. 1013 ¶ 103; Opp. Section VII.A.6).

Addressing substitute claims 23, 28, 36, and 40, Petitioner persuasively explains that Patent Owner admits that the 30% height limitation was known in the art through the '872 patent. *Id.* at 25 (citing Ex. 2009, 2:66–3:6, 6:14–17). Petitioner also explains persuasively that it would have been obvious to increase the height of Maurer's tactile features as suggested by Bernecker's OV teachings and Fry's foaming process to ensure they could be felt easily, thereby enhancing the ability to determine authenticity readily. *See id.*

We adopt and incorporate by reference Petitioner's obviousness showing, summarized above, as persuasive. *See* Opp. 11–25. Patent Owner's arguments, addressed below, do not undermine that showing.

Regarding Patent Owner's argument (Mot. 23 (citing Ex. 2010 ¶¶ 102–103, 120)) that Maurer does not disclose a clear raised tactile feature, on balance, the record shows Maurer discloses a clear raised feature, as does Fry.²⁶ *See* Ex. 1012 ¶¶ 37–38 (citing Ex. 1002 ¶¶ 135–137); Ex. 1002 ¶¶ 54, 135–137. The cited testimony of Dr. Cairns that Patent Owner relies upon to support the argument follows:

Nothing in Maurer's disclosure suggests that the laser inscription process does not cause a blackening of the outer cover sheet laminate while it simultaneously burns the core of the card.

²⁶ Patent Owner does not argue in its Motion that Fry's ridges would be discolored or blackened, but as discussed below, raises the issue in its Reply to the Opposition.

Although the upper cover sheet is transparent when first laminated on the card core, nothing in Maurer supports a conclusion that the area of the upper cover sheet exposed to the laser in Maurer remains transparent after the laser inscription process. In fact, claim 1 of Maurer *requires* that the “visually perceptible information” be “formed in said cover sheet in register with and simultaneously with the information in the card core.” *Id.* at 8:58–9:2.

Ex. 2012 ¶ 102.

Dr. Cairns’ contention that “nothing in Maurer supports” a transparent cover sheet after laser treatment “misapprehends the law. Contrary to [Patent Owner’s] suggestion, a reference need not state a feature’s absence in order to disclose a negative limitation.” *See AC Techs. S.A. v. Amazon.com, Inc.*, 912 F.3d 1358, 1367 (Fed. Cir. 2019) (citing *Sud-Chemie, Inc. v. Multisorb Techs., Inc.*, 554 F.3d 1001, 1004–05 (Fed. Cir. 2009) (*AC Techs.* characterizing *Sud-Chemie* as “affirming finding that reference disclosed ‘uncoated’ film where it did not describe the film as coated and did not suggest necessity of coatings”)).

Moreover, contrary to Patent Owner’s arguments, Maurer specifically describes as the “invention,” a transparent cover sheet *through which* the card core information can be perceived:

The invention relates to an identification card, comprising two cover sheets of which at least one is transparent, and a card core or inner layer of an opaque material, in particular paper, which is provided with information which can be perceived visually through said transparent cover sheet.

Ex. 1005, 6–10. The “invention” arises *after* laser processing, which creates “information which can be perceived visually through said transparent cover sheet.” *Id.* at 4:25–43. Maurer’s claims 1–3 support this interpretation of a

transparent cover sheet after laser processing. *See id.* at 8:58–9:11 (independent claim 1 and dependent claims 2 and 3 respectively reciting “1. . . . visually perceptible information . . . in the form of . . . degraded core portions formed in said core by means of a laser beam traversing the transparent cover sheet . . . whereby the information is also formed in said cover sheet in register . . . with the information in the card core” (independent claim 1); “2. . . . the information is present in the form of dark markings caused by partial burning of the paper material” (dependent claim 2); and “3. . . . the information on said transparent cover sheet is in relief and can be sensed by touch” (dependent claim 3)).

Regarding the other paragraph of Dr. Cairns’ testimony that Patent Owner cites to support its argument that Maurer’s process results in a blackened top layer, Patent Owner does not explain its relevance, but the testimony relates to Bernecker’s description of Maurer’s German priority document. *See* Mot. 23 (citing Ex. 2010 ¶ 103); Ex. 2010 ¶ 103. Contrary to Dr. Cairns’ testimony (Ex. 2010 ¶ 103) that Bernecker’s description of Maurer’s German priority document shows Maurer’s process burns the top layer, Bernecker does not state clearly what “material” it references with respect to Maurer’s German priority document (or any of the three references cited as a group)—i.e., Bernecker does not state that the “discolorations” necessarily occur in both the plastic and in the paper core of Maurer’s German priority document. *See* Ex. 1006, 2:30–34.²⁷

²⁷ Also, Dr. Cairns’ testimony assumes, without requisite support, that Maurer’s German priority document and Maurer disclose the same thing. In addition, the relied-upon passage cites three German patents as showing the

Bernecker also states “[i]t is known from the field of contrasting laser inscription that discoloration occurs only as of a certain laser power, becomes stronger as the laser power increases further, and finally leads to complete burning of the material. Using a power-controllable laser it is therefore possible to produce halftone images.” *Id.* at 3:66–4:4 (emphasis added). By referring to halftone images and “burning,” Bernecker suggests it refers to burning the paper core as a “discoloration” of that material. But even if the vague reference to “material” includes the plastic top layer *and* the paper core of Maurer or some other reference, Bernecker recognizes that “it is known” that laser power controls discoloration. Bernecker also states “[i]n contrast, it is an essential feature of the invention that the material processing . . . takes place without discoloration of the of the substrate material *and* without providing color contrast with the surroundings.” *Id.* at 2:52–56 (emphasis added). So Bernecker stresses that its inventive *contribution* provides no color contrast—i.e., it provides OV colorless depressions in colorless areas—but Bernecker *also claims and discloses* a color contrast feature in combination with a colorless feature, for example, in combination with “usual information 4 shown in color contrast” (*id.* at 4:40–41). *See id.* at 6:34–36 (claim 17: “using said laser to apply further information in the form of discolorations or burnings of material”).

“common practice” instead of focusing on a single document such as Maurer’s German priority document. *See id.* at 2:26–2 (listing DE 2907004 C2, DE 3048736 A1, and DE 3151407 C1).

In addition to relying on Maurer and Bernecker as teaching colorless engraving and suggesting a combined security feature, Petitioner persuasively argues that

[i]mplementing the combined security feature would have been straightforward and well within the skill of a POSITA. [Ex. 1013] ¶34. *Fry* disclosed specifics about how to score thermoplastic without scorching or discoloration such that the resulting groove includes raised beads surrounding the groove. Ex. 1007, 2:69–76. And *Fry* disclosed particular details about how to create the grooves in a variety of thermoplastics commonly used for identification cards. See Ex. 1007, Table II; Ex. 1013, ¶35–36. Thus, using a laser to create a security feature that is both raised and lacks discoloration was well within the skill of a POSITA. *Id.* *The '494 patent assumes that creating such a feature was within the skill of a POSITA, because it does not disclose any details about laser engraving.*

Opp. 15–16 (emphasis added).

In its Reply, Patent Owner argues Fry teaches “a scorched bead.” PO Reply 10 (citing Ex. 2010 ¶¶ 115, 133). On balance, however, the record does not support Patent Owner’s allegation that Fry teaches a raised “scorched” (i.e., blackened or burned) feature. Ex. 1013 ¶¶ 34–36 (testifying Fry teaches colorless raised features, which “was well within the skill of a person of ordinary skill in the art); Ex. 1012 ¶ 38 (testifying Fry does not disclose scorching, but even if Fry’s process results in scorching, the analysis does not change); Ex. 1002 ¶ 54 (Fry does not teach discoloration or scorching).

At the cited paragraphs, Dr. Cairns relies on the following statement in Fry: “*Aside from this bead, the score 14 has a neat and clean surface, remaining unscorched after the scoring process has ended.*” See Ex. 1012

¶¶ 115 (quoting Ex. 1007, 2:73–75, 133 (no citation); Reply 10.²⁸ Dr. Cairns relies on the same language. Ex. 2010 ¶ 115. But Fry specifies “[a] score, by definition, is a groove into a material surface and penetrates only a portion of the total depth of the material being scored.” Ex. 1007, 2:32–33. So a score does not include the bead. In the relied upon sentence, Fry emphasizes that the groove does not include the bead in the first clause, compares the bead and groove in the second clause (i.e., the groove is neat and regular), and then further describes the groove in the last clause (i.e., without comparing it to the bead). See Ex. 1012 ¶ 38 (testifying Fry does not teach a scorched bead, noting the relied upon sentence only refers to the “structural irregularity (i.e., the raised feature) produced by the bead, which makes the surface less smooth”). In addition, Fry does not describe the bead and groove as blackened. “[A] reference need not state a feature’s absence in order to disclose a negative limitation.” See *AC Techs.*, 912 F.3d at 1367 (quoting *Sud-Chemie, Inc.*, 554 F.3d at 1004–05 (*AC Techs.* characterizing *Sud-Chemie* as “affirming finding that reference disclosed ‘uncoated’ film where it did not describe the film as coated and did not suggest necessity of coatings”)).

²⁸ As indicated above (Section II.C.7), Patent Owner advances this same argument in the Patent Owner Response (PO Resp. 26), but none of the challenged claims require unscorched beads, so we address the issue here. In its Response, Patent Owner refers to “this express language in Fry” as supporting its position that “the process described in Fry results in a bead that *would likely* be scorched.” *Id.* (citing Ex. 2010 ¶ 112 (emphasis added)).

Even if Fry somehow suggests blackened raised features, the '494 patent does not provide any insight as to how to create an unscorched raised bead. *See* Opp. 15–16. This suggests, and as Petitioner argues, that skilled artisans readily knew how to create a raised clear feature. *See id.*; Ex. 1013 ¶¶ 34–36; Ex. 1012 ¶ 38 (citing Ex. 1002 ¶¶ 135–137); Ex. 1002 ¶ 54; Ex. 1005, 1:5–10, 4:25–30; Ex. 1006, 4:1–18 (creating notches in “melted and partly decomposed” plastic areas without color changes by altering laser power); Ex. 1007, 3:60–63 (forming a beaded groove).

In addition, as Petitioner persuasively argues, “*Bernecker* recognized that laser engraving without discolorations or color contrast is useful by itself as a security feature because the colorless laser engraving ‘gives rise to areas with different light scattering properties’ that cannot be recognized when viewed directly ‘and stand out clearly only when viewed at the glancing angle.’” Opp. 13 (quoting Ex. 1006, 2:16–25; citing *id.* at 3:27–28)). Furthermore, *Bernecker* teaches that “[i]t is known . . . that discoloration occurs only as of a certain laser power, becomes stronger as the laser power increases further, and finally leads to complete burning of the material.” Ex. 1006, 4:1–3. As discussed above, the invention of *Bernecker* adds to prior art discolored cards with burned paper core markings by providing at other card places no “discoloration” in the form of notches “without producing color contrast with the surroundings.” *See id.* at 2:54–56; 4:19–29 (adding “inconspicuous” data to prior art cards “without complication”).

Patent Owner cites to Dr. Cairns’ testimony for the proposition that adding *Bernecker*’s security feature as a colorless feature would have

destroyed the principle of Maurer of providing blackened printed areas in register with depressions of the cover film. Mot. 24 (citing Ex. 2010 ¶¶ 121–124). According to Dr. Cairns, Bernecker’s additions would undermine a related fundamental purpose of Maurer—i.e., Maurer requires “personal data” “in the *interior* of said card after lamination of the card blank.” Ex. 2010 ¶ 122 (quoting Ex. 1005, 4:3–7 (emphasis by Patent Owner)). Dr. Cairns also contends Maurer’s teaching of concurrent marking of the laminated cover layer in register with the underlying blackened printed information on the card core would have been destroyed by adding Bernecker’s security feature. *See id.* ¶ 123.

In its Reply, Patent Owner emphasizes that “Maurer exclusively teaches the creation of blackened inscriptions whereas Bernecker teaches avoiding discoloration.” PO Reply 9 (citing Ex. 2010 ¶¶ 67–76, 101–103, 106). Patent Owner also contends “Maurer does not teach a colorless laser engraving technique or a colorless security feature.” *Id.* (citing Ex. 2010 ¶¶ 101–104, 118). Patent Owner adds “Bernecker does not teach forming colorless laser engraved features in register with contrasting features,” and “Bernecker teaches that the core should be left undisturbed and that laser processing should only affect the outer laminate layer of the card.” *Id.* (citing Ex. 2010 ¶¶ 109, 118). Patent Owner adds “the dimensions involved in Fry would have been useless to a skilled artisan designing laser processing techniques for identification documents.” *Id.* at 10 (citing Ex. 2010 ¶¶ 110–113, 132). Finally, Patent Owner contends motivation lacks to combine the references in light of Fry’s “divergent field of endeavor” and Fry “discusses a scorched bead, contrary to Petitioner’s suggestion that Fry’s

process would have created a raised feature that ‘lacks discoloration.’” *Id.* (citing Ex. 2010¶¶ 110–113, 115, 131–134).

Most, if not all, of these arguments repackage and restate arguments presented in Patent Owner’s Response and Preliminary Response, arguments the panel found unpersuasive. The arguments do not address Petitioner’s showing that it would have been obvious to create a combined security feature as suggested by Bernecker’s OVD teachings and Maurer’s colorless raised features in other areas of Maurer’s card, retaining Maurer’s registration and darkened areas, in order to provide a more secure card.

Also, the panel found Maurer does not exclusively contemplate blackening all card information with registration:

Maurer also specifically states “[a]s already mentioned hereinbefore, the identification card *does not have to contain all of the information and features mentioned. . . . Changes involving the number, form and positioning of the information can be made as desired.*” Ex. 1005, 8:47–52 (emphasis added). Maurer specifically contemplates not burning in features—even for printing information (including picture) areas. For example, Maurer states that information “‘burned’ into the paper core” may involve “many shades of gray” using “corresponding technology already known” (Ex. 1005, 8:23–26), and if the card designer desires color, “the laser does not have to cause a blackening or destruction of the core, but merely a change in color” using “a suitable substance capable of causing a thermochemical [color] reaction” (*id.* at 6:25–28).

Supra Section II.C.5. So Maurer specifically discloses adding information without any registration in the upper laminate and without burning the core. And Maurer generally contemplates “*other features not shown here . . . provided by means of the laser beam.*” Ex. 1005, 7:1–2 (emphasis added).

Bernecker provides such “other features” in the form of colorless OVD features, produced by a laser, as both parties recognize. In addition, similar to Maurer, Bernecker contemplates retaining many known card features (Ex. 1007, 3:49–60, 4:53–54), like those of Maurer, as the panel also found in the same section above:

Bernecker specifically envisions “providing further security features,” including keeping some coloring processes on portions of the card, including “[p]ersonalization data 4 . . . preferably incorporated with a laser in the form of discolorations of the plastic material.” Ex. 1006, 4:53–54. So nothing in the combination precludes employing the two features, even if the laser must focus on different parts of the card (i.e., in the core and on the surface).

Supra Section II.C. 4.

Patent Owner’s arguments also are not commensurate in scope with the substitute claims. With the exception of claim 39, the substitute claims generally only require a pattern of *raised features* not to be visible when viewed straight on. *See, e.g.*, claim 21 (above); claim 24 (“wherein the pattern of ridges comprises an Optically Variable Device”); claim 25 (“the raised features are essentially not visible when viewed straight-on”); claim 29 (“wherein said ridges comprise an optically variable quality”); claim 33 (“wherein the raised feature comprises an optically variable quality”); claim 35 (“a raised tactile feature extending above a nominal top surface level of said outer laminate layer, and to define an optically variable device comprising reflecting surfaces that are not parallel to the nominal top surface level of the outer laminate layer and that is essentially not visible when viewed straight on”); claim 39 (wherein neither the void pattern nor the

raised features can be photocopied). So even if Maurer's card as modified by Bernecker, Fry, (and/or Gunn) includes visible blackened printing on the core in register with raised features on the cover, this does not render the *colorless raised features* visible—these features do not contrast with the top laminate even if they contrast with inscriptions in the blackened core. Similarly, the “void pattern” of claim 39 could not be photocopied—only the underlying blackened information would be photocopied—not the colorless voids themselves.

Nevertheless, even if the contrast between the underlying blackened printed material and some of the colorless raised features in Maurer render those colorless raised features visible, Petitioner persuasively shows that Maurer and Bernecker each contemplate providing printed information without blackening it (e.g., photographs and other information) and without providing that information in register with the top laminate, as discussed above. See Opp. 12–14 (referring to laser engravings without color contrast); Ex. 1013 ¶ 30 (obvious to provide the combined features without color contrast), ¶ 32 (obvious to provide Maurer's raised feature with Bernecker's OV feature without registration with printed information), ¶¶ 37–38 (testifying the combined security feature would have been obvious based on the collective teachings of Maurer and Bernecker), ¶¶ 39–42 (testifying the collective teachings of Maurer, Bernecker, and Fry render the combined security feature obvious).

In other words, the substitute claims do not preclude Maurer's features of a raised tactile feature in register with blackened printed areas at some areas of the card, and in addition to that, at other card areas, a pattern

of raised colorless (OV) tactile features not in register with any printed information, as the combination of Maurer, Bernecker, and Fry suggests. *See* Ex. 1013 ¶ 37 (“The combined security feature would include raised features that extend above the nominal top surface of the card and be accessible to manual inspection, as disclosed by Maurer, while also being visible only at the glancing angle and resistant to copying, as disclosed by Bernecker because the contrastless laser engraving would be implemented without discoloration and by itself (rather than with printed information) as a security feature, as taught by Bernecker.”), ¶38 (obvious to implement the combined security feature in Maurer’s laminated card). In this way, contrary to Patent Owner’s arguments, Maurer would retain the features Patent Owner contends Maurer must retain—i.e., the blackened core, registration, and lamination teachings—while adding the colorless, raised, non-registered, tactile features at adjacent or other card areas, as suggested by Fry and Bernecker, as Petitioner proposes.

Patent Owner agrees that Maurer suggests tactile features (and Patent Owner’s Preliminary Response admits that Maurer teaches some raised features as noted above). *See supra* Section II.C.7.c. Maurer’s tactile features, in light of Bernecker, suggests colorless tactile features with limited visibility at least at some angles as Bernecker teaches, because the purpose of *tactile* features suggests providing authenticity in conditions of limited visibility. Providing raised OV features allows the features to be felt more readily and provide the benefit of added authenticity. Given that providing raised features simply allows the tactile features to be felt more readily (i.e., compared to mere notches that Patent Owner attributes to

Maurer's card as tactile), and given that Bernecker specifically teaches providing nonparallel notches as OVD features to provide further authenticity, Petitioner persuasively shows that providing unscorched raised beads without registration at colorless areas of Maurer's existing card would have been obvious in order to provide a card that would have been difficult to forge, would have provided an extra measure of authenticity, and would have been felt more easily than mere notches. *See* Opp. 12–16; Ex. 1013 ¶¶ 37–38, 40–41.

Petitioner provides a number of persuasive reasons to add raised colorless tactile features without registration with blackened printing to Maurer's card. *See* Opp. 15 (listing a “desire” for “multiple security features,” known benefits of tactile features for security, Bernecker's recognition that clear features provide useful security features, “recognition that visibility only at a glancing angle would benefit clear engravings with tactile features and vice versa,” and the “straightforward process of implementing such a feature”).

Quoting from Bernecker and citing the testimony of Dr. Tentzeris, Petitioner persuasively explains the benefits of combining Bernecker's OVD features as raised features based on Maurer's teachings:

In addition, Bernecker recognized that laser engraving without discolorations or color contrast is useful by itself as a security feature (Ex. 1006, 3:27–28) because the colorless laser engraving “gives rise to areas with different light scattering properties” that cannot be recognized when viewed directly “and stand out clearly only when viewed at the glancing angle.” Ex. 1006, 2:16–25. Bernecker explained that an “essential feature” of its security feature is that the laser processing takes place “without discoloration” and “without producing color contrast

with the surroundings.” *Id.* 2:53–56. As a result, the security feature, which is formed in the “externally accessible plastic film” (*Id.* 3:13–14) “cannot be recognized by reflected light and appears only at the glancing angle.” *Id.* 2:63–65.

A POSITA would have readily recognized that the benefits achieved by Bernecker’s colorless/contrastless laser engraving that only stands out clearly when viewed at a glancing angle would have applied equally to clear/colorless laser engravings that include raised tactile features, such as the transparent relief structure in Maurer. Ex. 1013, ¶30. A POSITA would also have recognized that the benefits of a raised relief structure that can be felt manually, as achieved in Maurer, would likewise improve colorless laser engraved security features that are only visible at a glancing angle, as disclosed in Bernecker. *Id.*

Opp. 13.

Petitioner explains persuasively that “Bernecker recognized that colorless laser engraving need not be disposed in register with printed information and is useful by itself as a security feature, separate from other security features.” *Id.* at 14 (citing Ex. 1013 ¶ 32). Quoting from Maurer and citing the testimony of Dr. Tentzeris, Petitioner adds persuasively that

[a] POSITA would have recognized that by implementing *Maurer’s* clear tactile relief *by itself*, rather than in conjunction/register with printed information below the relief, and in a colorless/contrastless manner, as taught by *Bernecker*, that the resulting combined security feature would remain tactile, with raised features that extend above the top surface of the laminate, providing the benefits of the tactile security feature (Ex. 1013, ¶32) and that the resulting combined security feature would be optically variable and visible only at a glancing angle such that the relief would beneficially be “neither manipulable nor copiable.” Ex. 1006, 2:9–13; Ex. 1013, ¶32.

Id. at 14–15. Petitioner persuasively adds that an artisan of ordinary skill would have turned to Fry, because Fry

disclosed specifics about how to score thermoplastic without scorching or discoloration such that the resulting groove includes raised beads surrounding the groove. Ex. 1007, 2:69–76. And *Fry* disclosed particular details about how to create the grooves in a variety of thermoplastics commonly used for identification cards. See Ex. 1007, Table II; Ex. 1013, ¶¶35–36. Thus, using a laser to create a security feature that is both raised and lacks discoloration was well within the skill of a POSITA. *Id.* The ’494 patent assumes that creating such a feature was within the skill of a POSITA, because it does not disclose any details about laser engraving.

Opp. 15–16 (emphasis added).

Patent Owner does not dispute that an artisan of ordinary skill knew how to create a raised tactile colorless OVD feature prior to the filing of the ’494 patent. See PO Reply 9–10 (repeating arguments from its Motion, for example, arguing Maurer does not disclose a raised feature, alleging Fry teaches a scorched bead).

With respect to claims 33 and 35–37, Patent Owner contends “Petitioner depends solely on Maurer for the raised tactile feature. But Maurer does not disclose such a feature.” PO Reply 10. Contrary to this argument, Maurer teaches a raised feature even without Fry’s added teachings, as found above. *Supra* Section II.C.7.c.

Also, Petitioner does not rely solely on Maurer, but generally contends “*Maurer, Bernecker, and Fry* render obvious such a combined security feature.” Opp. 11; see also *id.* at 15–16. As indicated above, Petitioner persuasively explains an artisan of ordinary skill would have

turned to Fry, because Fry discloses “specifics about how to score thermoplastic without scorching or discoloration such that the resulting groove includes raised beads” and “particular details about how to create the grooves in a variety of thermoplastics commonly used for identification cards.” See Opp. 15–16 (citing Ex. 1007, 2:69–76, Table II; Ex. 1013 ¶¶ 35–36). Petitioner also persuasively explains that the references, including Fry, show “[i]t would have been routine and straightforward for a POSITA to implement the combined security feature [i.e., including raised discolored features] and it would have been clear that such a feature would provide the expected functionality to yield predictable results.” *Id.* at 16 (citing Ex. 1013 ¶¶ 37–38). Petitioner also specifically cites Fry and refers to its earlier discussion of motivation in addressing the particulars of claims 33 and 35–37. See Opp. 21–24.

As Petitioner persuasively explains, the substitute claims merely combine well-known features of the prior art, including raised tactile colorless features produced typically by foaming and that provide an OVD quality with thickness limitations, and notches, which include a V-shape. See Opp. 10–25; Ex. 1013 ¶¶ 29–116. The ’494 patent does not provide a clear description of how to make any of these features, particularly the raised OV feature, indicating such features were well-known to artisans of ordinary skill at the time of the invention.

Based on the foregoing discussion, Petitioner shows by a preponderance of evidence that substitute claims 21–26, 28–30, 32, 33, 39, and 40 would have been obvious over the combination of Maurer,

Bernecker, and Fry, and claims 35–37 would have been obvious over that combination with Gunn. Opp. 10–25.

F. Summary, Contingent Motion to Amend

Substitute claims 23, 28, 36, and 40 constitute new matter and fail to satisfy the written description requirements of 37 C.F.R. § 42.121(a)(2) and 35 U.S.C. § 316(d)(3). Substitute claim 21 constitutes impermissible broadening under 37 C.F.R. § 42.121(a)(2) and 35 U.S.C. § 316(d)(3). Substitute claims 22 and 23 are indefinite under 35 U.S.C. § 112 ¶ 2. Substitute claims 21–26, 28–30, 32, 33, 39, and 40 would have been obvious over the combination of Maurer, Bernecker, and Fry, and claims 35–37 would have been obvious over that combination with Gunn.

Accordingly, we deny the Contingent Motion to Amend.

IV. CONCLUSION

Petitioner shows by a preponderance of evidence that 1–6, 8–10, 12, 13, 15–17, 19, and 20 of the '494 patent are unpatentable. Petitioner shows by a preponderance of evidence that substitute claims 21–26, 28–30, 32, 33, 35–37, 39, and 40 of the Contingent Motion to Amend are unpatentable.

V. ORDER

ORDERED that 1–6, 8–10, 12, 13, 15–17, 19, and 20 of the '494 patent are unpatentable;

FURTHER ORDERED that Patent Owner's Motion to Amend 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.

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