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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

EPSON AMERICA, INC.,
Epson,

v.

CASCADES PROJECTION LLC,
Cascades.

Case IPR2015-01206
U.S. Patent No. 7,688,347

PETITIONER EPSON'S REPLY TO PATENT OWNER CASCADES' RESPONSE TO PETITION

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I. CLAIMS 29, 30 AND 32 WOULD HAVE BEEN OBVIOUS OVER BRANDT IN VIEW OF UCHIYAMA

A. "Means For Focusing" (Claim 29)

The following specifically addresses the "means for focusing" because that is the principal focus of Cascades' arguments, but it applies equally to the "means for enhancing brightness" of claims 48 and 69 and the "means for bringing light" of claim 30.

1. The function of the "means for focusing" is to focus light onto the image forming element and its pixels, not to make the light uniform or to eliminate all light waste

The function of the "means for focusing" is "focusing different segments of a light beam emanating from said light source onto said element at proper angles such that light is focused onto the pixels of said element." Epson 1001 at 63:34-37. Cascades' expert Mr. Bohannon agrees that a person of ordinary skill in the art in 1994 would not have understood claim 29, or any of the challenged claims, to require any particular degree of uniformity or light waste. Epson 1017 (Bohannon Deposition) at 70:9-71:3, 90:14-93:10, 155:5-156:3 (uniformity); *id.* at 72:9-73:8, 158:3-17 (light waste).

Moreover, while the function of focusing light "onto the pixels" reduces waste, Brandt disclosed this: "Since the aspect ratio of the lenses of the first lens plate is equal to that of the object, and because these lenses are imaged

onto the object, the shape of the cross-section of the illuminating beam at the object is adapted to the shape of the object, such that substantially all radiation incident on the first lens plate reaches the object." Epson 1003 at 3:11-17.

2. Brandt increases uniformity and does not teach away

Cascades argues that the Figure 65 embodiment superimposes different images while Brandt superimposes the same image, with the result that the Figure 65 embodiment achieves uniform illumination while Brandt does not. Not only is this irrelevant, for the reasons explained above, but it is also wrong.

Cascades' superposition arguments are contrary to the evidence.

First, the system of Brandt's Figure 2 in fact improves uniformity. Brandt discloses that his superpositioning "results in the illumination intensity distribution in this plane having the desired uniformity, the degree of uniformity being determined by the number of lenses of the plates 25 and 28." Epson 1003 at 12:67-13:2. This results from averaging the beams, with more averaging and therefore more uniformity as the number of lenses increases. Cascades 2007 at 129:14-131:7, 221:8-20. Even Mr. Bohannon agreed Brandt's superpositioning "probably" improved uniformity. Epson 1017 at 196:4-20.

Second, the Figure 65 embodiment does not in fact achieve perfectly uniform illumination. It has greater brightness at the center than along the edges or

in the corners. Cascades 2007 at 113:17-24, 115:5-19, 130:23-24.

Third, Cascades is not even correct that the Figure 65 embodiment superimposes different images while Brandt superimposes the same image.

- Brandt discloses superimposing different images. For example, the embodiment in Brandt's Figure 20 includes images, shown in Figure 21, that are different because they are rotated from each other. *See* Epson 1003 at 18:46-51; Epson 1017 at 212:8-213:9, 214:6-13.
- Conversely, adding an initial collector to the Figure 65 embodiment results in superimposing different segments of the light beam which each have the same image. According to Mr. Bohannon, it is condensor 22, placed before lens plate 25 in Brandt's Figure 2, that results in each lenslet capturing an image of the entire source. Epson 1017 at 207:21-25. But he also testified that including such a condensor would not take an apparatus outside the scope of any of the claims. *Id.* at 206:19-207:20. It follows that Figure 65 would still embody a "means for focusing" even with a condensor between the source 6510 and lens array 6570, even if it results in each lenslet capturing the same image.

See id. at 208:2-12 (whether the lenslets image the entire source is "going to depend on how [source] 6510 is built," but "none of it matters, I don't think, to figure 65 or the claims").

Brandt does not teach away. Dr. Kahn explained: "I think [Brandt's] number one objective is uniformity, and number two is that maybe he wants to taper the uniformity to satisfy his understanding that he would have to be careful what you wish for until – uniformity may not be what you should wish for." Cascades 2007 at 138:19-139:4. Brandt repeatedly discloses that his invention provides beneficial uniformity. Epson 1003 at 2:50-58, 3:17-22, 12:67-13:2. And what Brandt actually says in the passage cited by Cascades is that "[t]he illumination intensity at the edges of a display panel **need not be exactly equal** to that in the center of the panel"; that such exactly equal uniformity "would look unnatural, notably when displaying video images"; and "[i]t is then preferable that the illumination intensity **slightly** decreases from the center towards the edges." *Id.* at 5:18-25 (emphasis added). Thus, Brandt's message is not "don't do it"; rather, he teaches "be careful not to overdo it." This cannot be considered teaching away, especially since the challenged claims do not require uniformity.

Cascades also asserts that Uchiyama teaches away. Epson respectfully disagrees – Uchiyama actually includes an embodiment with two

prisms to reduce non-uniformity, Epson 1005 at [0005] (Second Embodiment, page 10) – but this is a red herring. If Cascades is correct that the "input lens array" of claim 29 is not required to get light into pixel holes, then Uchiyama is unnecessary to demonstrate obviousness and its teachings are irrelevant. *See* Petition at 25; Epson 1011 ¶¶ 38, 141.

3. Cascades is also mistaken about Brandt's purported "rectangle in circle" light waste

Cascades argues that using a "rectangle within circle" configuration to collect light "may cause up to 40% light waste." Response at 30. But this would require a very crude system with a single 4:3 rectangle within a circle. Epson 1017 at 186:22-187:16. A system like Brandt's with many elements (48 are shown, in a 6 x 8 array, in Figure 4) has far lower losses. Cascades 2007 at 143:2-11. As the number of elements increases, the losses decrease. Epson 1017 at 188:17-189:4, 190:20-24. Notably, Cascades does not argue that a "rectangle within circle" structure cannot be equivalent to the Figure 65 "circle within rectangle" structure and thus satisfy the "means for focusing" requirement.

4. Both sides' experts confirm that Figure 65 and the prior art use prisms or other optical elements to change beam size

Cascades trains its biggest rhetorical guns on what it calls the "junk science" idea that prisms can change the size of a light beam. But Mr. Bohannon

testified on cross-examination:

- In Figure 65, "the reason the collimating beam on 6520 is small is because the prisms have steered it down to that area." Epson 1017 at 122:24-123:16.
- Without the prisms in Figure 65, the light beams emanating out of lens array 6570 "would generally not converge and superimpose upon the image-forming element." *Id.* at 120:6-12.
- In Figure 65 "those beams are superimposed. They're steered by the prisms onto that lens and that image-forming element." *Id.* at 125:2-16.

Dr. Kahn testified that prisms "by themselves" do not change beam size, and agreed that "you would need an optical element that does converging and diverging of a beam in order to change the beam size to join with the prism." Cascades 2007 at 55:18-23, 57:16-22. But that is true both in Figure 65 and in the prior art, modified to add prisms or other optical elements to change beam size, that Dr. Kahn discussed in his declaration. *See*, *e.g.*, Epson 1011 ¶¶136-152. Thus, it is the operation of the prisms (or other optical elements, *see* Epson 1001 at 38:53) in the Figure 65 embodiment that results in the cross-sectional area of the superimposed beams projected onto image-forming element 6530 being smaller

than the aggregate cross-sectional area of the beams emitted from lens array 6570.

Moreover, changing the beam size is a purpose of the Figure 65 embodiment. "[T]he distances needed for light to spread out sufficiently and for separate beams to be sent to the image-forming element and overlapped at the proper angles" tend to increase projector size. Epson 1001 at 38:37-40. Thus, the specification provides examples, including Figure 65, of methods "to reduce these dimension requirements." *See id.* at 38:41-42 ("various methods can be utilized"), 38:43-57 (Figures 61 and 62), 38:58-39:4 (Figure 65, which is a "preferred variation" of Figure 62).

The specification also discusses the need to change beam size in connection with the "Keplerian" telescope shown in Figure 40. "To reduce the size of the resulting collimated beam, which will probably be necessary in most applications, various optical methods may be used, such as the Keplerian telescope made of two lenses, as depicted in Fig. 40." Epson 1001 at 33:18-21. Figure 40 also appears in EP '630 with the almost verbatim identical description, with the immaterial difference that EP '630 refers to the Figure 40 structure as a "Galilean" telescope. Epson 1007 at 41:19-23 & Fig. 40. Thus, the prior art also includes the teaching that (a) it is desirable to change the beam size and (b) "various optical methods may be used" to do it. *Id.*

5. Cascades ignores evidence of record that persons of ordinary skill would have modified Brandt and Uchiyama to achieve an improved system with reduced beam size

Cascades asserts that "Epson's petition never explains ***how*** specific teachings in Brandt and Uchiyama should be modified to include prisms or how any such specific combination would operate." Response at 46. This misunderstands the law and Epson's arguments and disregards the teachings of the prior art. First, the test "is what the combined teachings of [the] references would have suggested to those of ordinary skill in the art," and "it is not necessary that the inventions of the references be physically combinable." Institution Decision (Paper 15) at 20 n. 3 (citing cases). Second, Epson provided several examples of prior art recognizing that changing the beam size is desirable and providing examples of how to do that. *See* Petition at 37-41; Epson 1011 ¶¶ 144-152.

In particular, Brandt's Figure 9 shows how to use mirrors to reduce beam size. Petition at 39-40; Epson 1011 ¶ 148. Not only that, in Figure 9 the mirrors are incorporated into a complete system including both sets of lens plates that superimpose light beams onto the display panel. *See* Epson 1003 at 15:19-31.

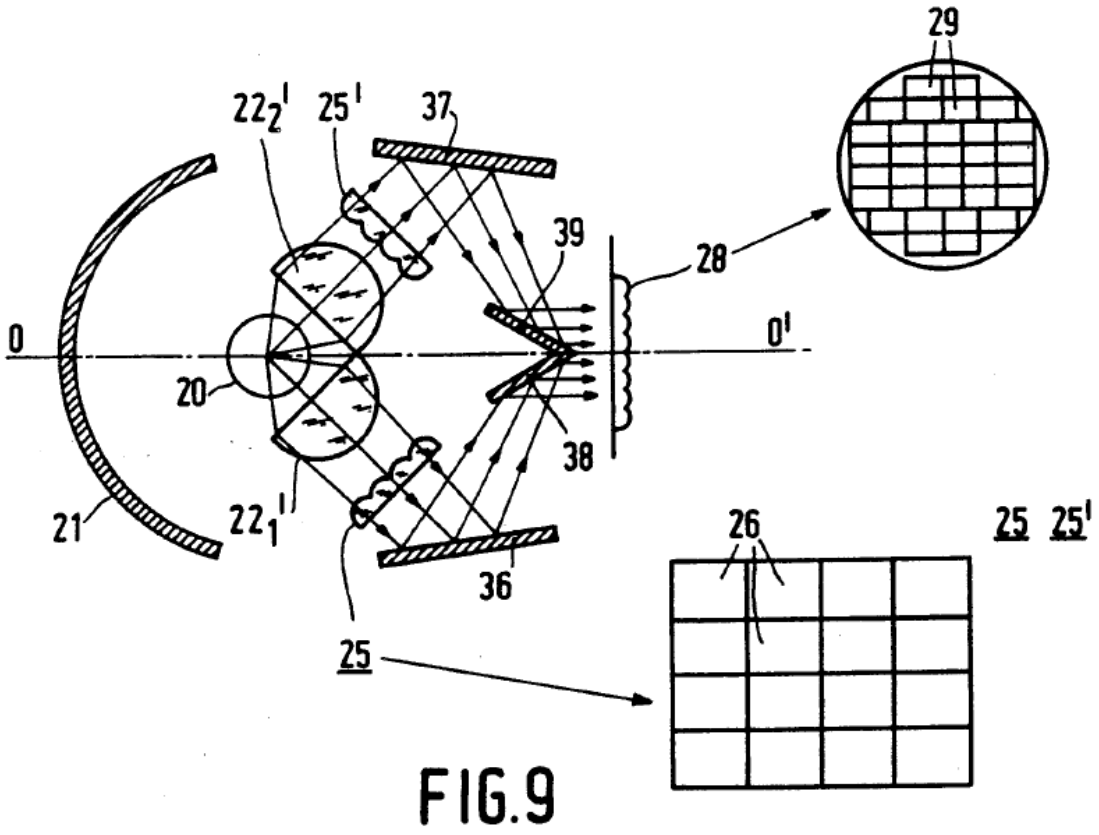

FIG.9

Dr. Kahn explained: "Note that the beam-reducing mirrors of Figure 9 are located between collimating lens arrays (25, 25') and focusing lens array 28, just as the beam-reducing prisms in Figure 65 of the '347 patent are located between lens array 6570 and focusing lens array 6560." Epson 1011 ¶ 148. And the '347 specification expressly provides that the Figure 65 embodiment can use mirrors, not prisms. Epson 1001 at 38:53 ("mirrors, prisms, etc.").

Mr. Bohannon testified that he did not use Figure 9, Epson 1017 at 239:16-240:6, suggesting that Cascades did not ask him to consider it. Similarly,

Mr. Bohannon did not consider Figure 40 of EP '630 discussed above. *See id.* at 37:23-38:5, 240:12-25. More generally, Mr. Bohannon stated "I didn't think that it was my job as analyzing to go beyond Brandt and Uchiyama" for claims 29, 30 and 32. Epson 1017 at 39:11-40:8. The Response hews to the same line.

If Cascades argues that the Board cannot make a full inquiry into the prior art of record, that would be legal error. *Randall Mfg. v. Rea*, 733 F.3d 1355, 1362 (Fed. Cir. 2013), held that "narrowly focusing on the four prior-art references cited by the Examiner and ignoring the additional record evidence Randall cited to demonstrate the knowledge and perspective of one of ordinary skill in the art" ran afoul of *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398 (2007), because it "failed to account for critical background information that could easily explain why an ordinarily skilled artisan would have been motivated to combine or modify the cited references to arrive at the claimed inventions." The same holds true here. This is not a matter of changing the grounds on which the Board instituted: "The significance of those and other references did not depend on any attempt to change the combination that formed the basis of the Examiner's rejections; rather, the references constitute important evidence of the state of the art and the context in which the Examiner-cited combination should be evaluated." *Id.* at 1363.

6. Cascades's nonequivalence argument relies on unclaimed features and ignores the evidence of equivalence

The prior art performs the function of the "means for focusing" in substantially the same way. Cascades argues: "Mr. Dolgoff's undisputed 'way' to achieve the 'proper angle' of light incidence involves [1] placing beam-segment steering prisms into the corresponding structure [2] to superimpose multiple light-balancing beam segments." Response at 1-2 (emphasis in original and numbering added). This is wrong on both counts.

As to [1], the discussion of Figure 65 in the '347 specification itself shows that prisms are not required elements. The specification discloses that the elements are "mirrors, prisms, etc." Epson 1001 at 38:53. Moreover, there is nothing unusual about the prisms shown in Figure 65; all that is required is that they steer light. *See* Epson 1017 at 117:25-118:11.

Part [2] of Cascades' formulation, "to superimpose multiple light-balancing beam segments," is also incorrect. Neither light balancing or any other way to increase uniformity should be considered in evaluating equivalence for the "means for focusing." "A court errs when it improperly imports unclaimed functions into a means-plus-function claim limitation." *Applied Med. Res. Corp. v. United States Surgical Corp.*, 448 F.3d 1324, 1339 (Fed. Cir. 2006). "[T]he inquiry should be restricted to the way in which the structure performs the

properly-defined function and should not be influenced by the manner in which the structure performs other, extraneous functions." *Id*. (emphasis in original).

The prior art achieves substantially the same result. Cascades identifies the "result" as uniformity and eliminating light waste. *See* Response at 1. Again, this is legal error because it "imports unclaimed functions." *Applied Med. Res.*, 448 F.3d at 1339. The result achieved by the "means for focusing" is to increase the light incident onto and into the pixels and thereby increase light throughput. Epson 1011 ¶ 43. The prior art does this. Petition at 28-29; Epson 1011 ¶ 143.

B. "Same Size" (Claim 32)

Cascades repeats its argument that Brandt does not disclose the "same size" limitation in claim 32. In the decision on Cascades' request for rehearing, the Board stated: "Although we did not find counsel's arguments in the Preliminary Response (Paper 6) persuasive, Patent Owner is free to provide **evidence** in support of the position in its Patent Owner Response …." Paper 19 at 2 (emphasis added). Cascades now cites to paragraphs 74-76 in Mr. Bohannon's declaration, but they merely repeat its assertion that Epson has not provided evidence on "size."

This is incorrect for the reasons explained on page 32 of the Petition. Moreover, during cross-examination, Mr. Bohannon agreed:

- The outermost beam from Brandt's lens 31 passes through lens 34 and then passes to the active edge of display panel 1. Epson 1017 at 243:6-12. Mr. Bohannon called Brandt's Figure 2 a "cartoon," *id.*, but he also said he thought that was true for all patents, *id.* at 233:8-13, and recognized patent figures are intended to be instructive, *id.* at 243:21-25.
- Brandt includes description of how to compute "the desired size of the diagonal of the beam cross-section at the area of display panel 1." Epson 1003 at 13:38-58. Asked if this provides for calculating the lens size "so that I can get a beam size to match that diagonal at the element 1," Mr. Bohannon said: "It appears to be as you describe. I haven't had a chance to study it in detail." Epson 1017 at 246:23-248:12. Cascades attempted to rehabilitate on re-direct, *id.* at 293:8-295:4, by pointing to Brandt's mistaken use of the word "diameter" instead of "diagonal" (*see* Epson 1003 at 13:55), but this was in an example where the mistake is evident upon performing the calculation, and Brandt's formula (*see* Epson 1003 at 13:38-53) uses "diagonal."

II. CLAIM 33 WOULD HAVE BEEN OBVIOUS OVER BRANDT IN VIEW OF EP '630

Cascades' only arguments with respect to claim 33 are to repeat that claim 29 is allegedly nonobvious and to assert that the combination of Brandt and EP '630 does not disclose prisms. Again, this ignores the knowledge of persons skilled in the art, including the disclosures of prisms and other optical elements that can be added to Brandt's system to change the beam size; and ignores that prisms are not required in the Figure 65 embodiment, *see* Epson 1001 at 38:53.

III. CLAIMS 48 AND 69 WOULD HAVE BEEN OBVIOUS OVER BRANDT IN VIEW OF SATO

A. A "Fresnel Polarizer" Does Not Require Optical Coatings Or Polarization Conversion

Cascades now agrees that a "Fresnel polarizer" is a polarizer constructed with stepped, sawtooth-like elements so as to have the optical properties of a much thicker polarizer. However, Cascades proposes to add requirements of "an optical coating layer where two sawtooth-like elements touch" and "polarization conversion of reflected incident light through a wave plate in a manner to cause nearly all incident light to exit with primarily one polarization." Both proposals are contrary to law and lack the requisite support in the specification. If Cascades wanted to add these requirements to the claims, Cascades should have moved to amend the claim language.

Claim construction standards. Claim construction in this proceeding is governed by *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (*en banc*). Cascades argues for a purported "coined terms" doctrine, Response at 26, but "coined" merely refers to a term "without a meaning apart from the patent," and *Phillips* applies. *MyMail, Ltd. v . America Online, Inc.*, 476 F.3d 1372, 1377 (Fed. Cir. 2007). Likewise, while the cases Cascades cites are pre-*Phillips*, both are consistent with *Phillips*. In *Irdeto Access, Inc. v. Echostar Satellite Corp.*, 383 F.3d 1295, 1298 (Fed. Cir. 2004), the applicant had stated, to overcome an indefiniteness rejection, that the term "group" was "very adequately described in the specification and therefore there is a complete foundation for the use of [this term] in the claims." *Goldenberg v. Cytogen, Inc.*, 373 F.3d 1158, 1164 (Fed. Cir. 2004), involved a term ("marker substance") that the parties agreed had "no accepted meaning to one of ordinary skill in the art," so the Court construed it "only as broadly as is provided for by the patent itself." These holdings do not (and cannot) trump the *Phillips* requirement that claims be construed as they would be understood by a person of ordinary skill in the art in view of the specification. *See Phillips*, 415 F.3d at 1313.

The specification does not require optical coatings. It states that holograms can be used instead of optical coatings in a Fresnel polarizer:

> **All previously described** MacNeille polarizers and **Fresnel polarizers have utilized multi-layer dielectric coatings** which must be applied with vacuum deposition. This is somewhat expensive and time consuming. **A hologram**, which can be recorded with a single exposure, **provides an alternative to such a multi-layer coating** at a lower cost in much less time.

Epson 1001 at 46:34-39 (emphasis added). Thus, the specification does not limit the term as Cascades proposes.

Cascades attempts to rely on Dr. Kahn's cross-examination testimony that a person of ordinary skill would perceive that "Fresnel polarizer" implies coatings. Response at 18, 27. However, that testimony came after Cascades walked Dr. Kahn through the specification passages describing Fresnel polarizer configurations with coatings and the first sentence block-quoted above. *See* Cascades 2007 at 68:5-74:10. Cascades did not ask about the rest of the quoted passage disclosing that holograms can be used instead. In any event, it is the disclosure in the specification that matters.

The specification does not require polarization conversion. It describes an embodiment containing a "Fresnel polarizer" that does not have polarization conversion, and instead has reflection back to the light source similar to Sato:

> With the use of a light valve that utilizes polarized light, a polarizer is used after the light valve to act as an

> analyzer. … **By using a** MacNeille polarization beam splitter or a **Fresnel polarizer (as described herein)** instead of the final polarizer/analyzer, **several advantages are realized**. Since there is no absorption, no heating occurs. **[1]** Because nearly 50% of the light appears in each beam, **nearly 100% of the light** that should go to the screen **passes through the analyzer to the screen**. **[2]** **A plane mirror in the path of the beam exiting the MacNeille analyzer that normally would have been absorbed** by a sheet polarizer **can reflect that normally wasted beam back to the light source** for reprojection through the system to the extent the beam is collimated. The beam will retrace its path through the system ending up being focussed [sic] into the center of the light source to be gathered by the collecting mirrors for reprojection through the system. **[3]** **Although a large portion of this light will not make it to the screen** due to non-parallelism, and consequent inability to retrace its path through the entire system, and **due to loss of improperly polarized light exiting the first** MacNeille polarization beam splitter or **Fresnel polarizer** on its way back to the bulb, **some brightness will be added to the image that would not have been available if this technique were not used**.

Epson 1001 at 53:65-66, 54:6-26 (numbering and emphasis added). Sentence [1] states that "nearly 100%" of the light passes through, which might in isolation appear consistent with polarization conversion; but sentence [2] then states that one of the beams is reflected back to the light source, which means that it is not converted and passed through. Sentence [3] refers to "this technique" as being used with a "Fresnel polarizer," reinforcing that a "Fresnel polarizer" in this embodiment does not perform polarization conversion.

Moreover, "Fresnel" and "polarizer" are well-understood by persons of ordinary skill in the art. *See* Epson 1011 ¶ 46. And the specification uses "Fresnel" not just for Fresnel polarizers, but also for Fresnel prisms and Fresnel mirrors, each time to refer to stepped sawtooth-like structures. *Id.* ¶ 63. "Fresnel" and "polarizer" are not "without a meaning apart from the patent." *MyMail*, 476 F.3d at 1377.

Finally, while Cascades asserts that "Figures 79-82 and 85 depict embodiments of a Fresnel polarizer," Response at 17, the specification describes these figures as depicting "Fresnel MacNeille polarizers" and "Fresnel polarizer configurations," without saying that a Fresnel polarizer is the entire assembly that performs polarization conversion instead of the structure that performs polarization. *See* Epson 1001 at 10:11-18, 25-26, 45:5-8. Other references in the specification also support that just the polarizer can be a "Fresnel polarizer." The specification refers to the polarizer alone as a "Fresnel polarizer plate," *id.* at 45:1-2, and it refers to a "polarizer plate or Fresnel polarizer" in the alternative, *id.* at 47:1-2. These passages are not the clear limiting statements required for Cascades' caselaw regarding purported "coined terms" to apply. *Cf. Irdeto*, 383 F.3d at 1303 (specification "repeatedly, consistently, and exclusively" used term the limiting way); *Goldenberg*, 373 F.3d at 1164 (construing term "only as broadly

as is provided for by the patent itself").

The specification also contradicts Cascades' argument that it would not make sense to use a Fresnel polarizer without using polarization conversion. The specification discloses that using a Fresnel polarizer, without conversion, is better than using a sheet polarizer. First, the specification states that sheet polarizers are inefficient because they absorb light, heat up, and "waste[ ] more than two-thirds of the light." Epson 1001 at 42:53-57. Using "a MacNeille prism for polarization" improves on this because, "properly constructed," it transmits approximately 50% and reflects approximately the other 50% of the light. *Id.* at 42:65-66, 43:8-11. These benefits do not require polarization conversion: "just utilizing one of the beams from this cube will increase the amount of light available for the light valve and will greatly diminish the light valve heating problem caused by sheet polarizer heating due to absorption." *Id.* at 43:13-16.

Second, the specification discloses that a polarizer with a Fresnel structure is even better than a MacNeille prism, again even without polarization conversion. Not only does the stepped sawtooth-like construction of Figure 78 eliminate "the loss of light due to absorption and the heating of standard sheet polarizers," but it also "eliminates the cost and weight of the prisms in a MacNeille polarizer." Epson 1001 at 44:25-30.

B. Cascades' Attacks Fail To Show That Sato Is Non-Enabling

Cascades accuses Sato of not knowing how to construct a polarizer using optical coatings or perform effective polarization conversion – in effect, of being non-enabling. None of this matters because the claims do not require optical coatings or polarization conversion. But even if they did, Cascades has failed to establish non-enablement. *See Liberty Mut. Ins. Co. v. Progressive Cas. Ins. Co.*, Case CBM2013-00009, 2014 WL 651402, at *22 (PTAB Feb. 11, 2014) (Paper 68) (rejecting argument when patent owner did not demonstrate non-enablement).

1. Persons of ordinary skill knew how to construct polarizers using optical coatings

Mr. Bohannon agreed on cross-examination that persons of ordinary skill in 1994 knew how to use coatings to polarize light. Epson 1017 at 171:9-17, 270:5-14, 275:4-9. The 1946 MacNeille patent discloses polarizers "including layers of alternately high and low index." Epson 1010 at 1:25-30; Epson 1011 ¶ 49. MacNeille also provides detailed formulas that can be used to design the layers. *See id.* at cols. 3-8. EP '630 discloses using "a MacNeill (sic) prism for polarization." Epson 1007 at 45:3-8. EP '630 states that "this effect can be maximized by applying several layers of dielectric coatings, with alternating indices of refraction." *Id.* at 45:8-11; *see* Epson 1011 ¶¶ 49-50.

A person of ordinary skill would have known how to apply such

techniques to construct polarizer 108 in Sato's Figure 7, *see* Cascades 2007 at 187:4-22, 258:9-259:7, and that would result in a polarizer that includes, in the words of Cascades' proposed construction, "an optical coating layer where two sawtooth-like elements touch." Cascades does not allege or offer evidence that implementing these teachings would require undue experimentation. *See Liberty Mut. Ins.*, 2014 WL 651402 at *21 (summarizing relevant law, including undue experimentation test). To the contrary, when the '347 patent itself describes constructing such a polarizer 7950/7960/7970 in Figure 79, the patent states that dielectric coating 7960 is "deposited in alternating layers, **as is known in the art**, to make a MacNeille polarizer." Epson 1001 at 45:17-25 (emphasis added); *see* Epson 1011 ¶ 58.

2. Sato discloses how to construct polarization converters

Sato discloses several embodiments of polarization conversion configurations, each of which includes, in the words of Cascades' proposed construction, "polarization conversion of reflected incident light through a wave plate in a manner to cause nearly all incident light to exit with primarily one polarization." Cascades asserts that "Sato loses much of the original light, more than 50%," Response at 39, and cites paragraph 80 of Mr. Bohannon's declaration. *Id.* But even assuming any particular degree of light waste reduction were claimed

(it is not), paragraph 80 does not in fact support Cascades' assertion, because it is itself based on an unsupported assumption.

First, Mr. Bohannon's paragraph 80 does not discuss the light that makes it through the polarizer 108 on its initial pass. It is discussing losses to recycled light. Persons of skill in the art would have known from EP '630 that "approximately 50%" of the light would make it through on the initial pass with a well-constructed polarizer. Epson 1007 at 45:2-18.

Second, as to the recycled light, Mr. Bohannon bases his testimony on an unsupported assumption "that <u>each</u> surface the light passes through or is reflected from as it is recycled back to the lamp again is about 95% efficient" or has a 5% loss. Cascades 2008 ¶ 80 (emphasis in original). But the '347 patent teaches that the surface loss is 4%, not 5%, and moreover that throughput can be "significantly" increased using anti-reflection coatings. Epson 1001 at 32:30-32. Persons of ordinary skill knew from EP '630 that "[a]nti-reflection (AR) coatings can, of course, be used on all optical surfaces to reduce light leases (sic, losses) due to reflection at those surfaces." Epson 1007 at 17:38-40. The same prior art Handbook of Optics that Epson cited in its Petition gives an example of an AR coating with only 1% loss over the visible spectrum. Epson 1018 at 9, 11 (coating 4.1). Using such a coating, the loss through the six surface interactions Mr.

Bohannon assumed would be only about 6% ($(0.99)^6 = 0.94$).

C. The Combination Of Brandt And Sato Renders Claims 48 And 69 Obvious

1. A person of ordinary skill would have been motivated to replace Brandt's polarizer 10 with Sato's polarizer 108

Dr. Kahn testified regarding design steps a person of ordinary skill would have performed to insert polarizer 108 before display panel 1 and adjust Brandt's other components accordingly. Cascades 2007 at 203:11-204:11. Here again, Cascades does not argue or provide evidence that this would require undue experimentation, and Cascades ignores the knowledge in the prior art providing motivation to do this.

EP '630 teaches that a MacNeille-type polarizer is superior to a typical sheet polarizer. "Since most sheet polarizers absorb between 65% and 75% of the light that hits them, just utilizing one of the beams from this cube [the MacNeille prism described at 45:2-13] will increase the amount of light available for the light valve and will greatly diminish the light valve heating problem caused by sheet polarizer heating due to absorption." Epson 1007 at 45:18-24. Thus, a polarizer 108 constructed using MacNeille techniques together with Sato's teaching of a stepped sawtooth-like construction, as persons of ordinary skill knew how to do, Cascades 2007 at 187:4-22, 258:9-259:17, would be more efficient and

reduce the heating problem.

2. The claims would still be obvious even if polarization conversion were required

The same system described above, with Sato's polarizer 108 replacing Brandt's polarizer 10 and this time with Sato's quarter wave plate 109 inserted just before it, would perform polarization conversion. Mr. Bohannon asserts that this combined system would do a poor job and not be worth the trouble, but his analysis here is based on the same unsupported assumptions about 5% surface loss/95% efficiency addressed above. *See* Cascades 2008 ¶ 88. Moreover, as noted above, the '347 specification itself teaches enhancing the performance of an "analyzer" containing a "Fresnel polarizer" – placed after the light valve and thus even farther away from the light source – using reflections all the way back to the light source. Epson 1001 at 53:65-54:26. The specification's disclosure that using reflections back to the source is worth doing even with a post-light valve Fresnel polarizer, contradicts the ridicule that Cascades attempts to heap on Sato.

Moreover, even Mr. Bohannon grudgingly recognized the motivation that a person of ordinary skill would have had to add polarization conversion to Brandt to improve its performance. Epson 1017 at 284:25-285:10 ("So I'm just speculating perhaps they would have explored it."). Again, Cascades does not argue or offer evidence that this would require undue experimentation.

Finally, in arguing that Sato's polarizer cannot be used to provide Brandt with effective polarization conversion, Cascades avoids discussion of U.S. Patent No. 5,566,367 to Mitsutake, which is of record in *Sony Corp. v. Cascades Projection LLC*, Case IPR2015-01846 (instituted Feb. 26, 2016). *See* Epson 1019 (copy of Sony Exhibit 1005). *Masterimage 3D, Inc. v. Reald Inc.*, Case IPR2015-00040, slip op. at 2 (PTAB July 15, 2015) (Paper 42) held that the prior art of record that a Patent Owner moving to amend the claims must address in showing patentable distinction includes "any material art of record in any other proceeding before the Office involving the patent." Epson respectfully submits that such prior art of record in another Office proceeding should likewise be available to consider in arguing patentability of the original claims. The Patent Owner does not bear the burden of proof with respect to the original claims, but the Patent Owner should not be given incentive to pretend that prior art of record in another Office proceeding does not exist.

If the Board determines to consider Mitsutake, Figure 2 discloses a single element that includes a polarizer with a stepped sawtooth-like structure, a multi-layer optical coating, and polarization conversion, and thus is a "Fresnel polarizer" under either side's proposed construction. Cascades 2007 at 263:25-264:13, 265:1-5 (discussing same Figure 2 in corresponding European

Patent Application Publication No. 0,508,413 A2 to Mitsutake). This element, like Sato's polarizer 108, can be placed in Brandt's system just before light valve 1. *Id.* at 265:6-22.

IV. CONCLUSION

Cascades has not presented any argument or evidence that overcomes Epson's showing of why claims 29, 30, 32, 33, 48 and 69 of the '347 patent are invalid as obvious.

Respectfully submitted,

Dated: June 8, 2016 By: */s/ David J. Ball*

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APPENDIX OF EXHIBITS

Epson 1001 – U.S. Patent No. 7,688,347 to Dolgoff

Epson 1002 – Prosecution History for Patent Application No. 10/115,279, which issued as U.S. Patent No. 7,688,347

Epson 1003 – U.S. Patent No. 5,098,184 to Brandt

Epson 1004 – Japanese Published Patent Application No. A-5-45724 to Uchiyama

Epson 1005 – Certified English translation of Japanese Published Patent Application No. A-5-45724 to Uchiyama

Epson 1006 – U.S. Patent No. 5,042,921 to Sato

Epson 1007 – European Patent Application Publication No. 0,509,630 A2 to Dolgoff

Epson 1008 – Excerpts from McGraw-Hill Dictionary of Scientific and Technical Terms (4th ed. 1989)

Epson 1009 – Excerpts from Walter G. Driscoll and William Vaughan, Handbook of Optics (1978)

Epson 1010 – U.S. Patent No. 2,403,731 to MacNeille

Epson 1011 – Declaration of Frederic J. Kahn, Ph.D.

Epson 1012 – Curriculum Vitae of Frederic J. Kahn, Ph.D.

Epson 1013 – Cascades' Brief Setting Forth Expected Expiration Date of U.S. Patent No. 7,688,342 (*Christie Dig. Systs. U.S.A., Inc. v. Cascades Projection LLC*, Case IPR 2015-01342, Paper 14)

Epson 1014 – Petitioner's Brief Regarding Expected Expiration Date of U.S. Patent No. 7,688,342 (*Christie Dig. Systs. U.S.A., Inc. v. Cascades Projection LLC*, Case IPR 2015-01342, Paper 16)

Epson 1015 – European Patent Application Publication No. 0,508,413 A2 to Mitsutake (exhibit to Kahn Deposition, Cascades Exhibit 2007)

Epson 1016 – Annotated Copy of Figure 65 of U.S. Patent No. 7,688,347 (exhibit to Bohannon Deposition, Epson Exhibit 1017)

Epson 1017 – Deposition of William Bohannon

Epson 1018 – Further Excerpts from Walter G. Driscoll and William Vaughan, Handbook of Optics (1978)

Epson 1019 – U.S. Patent No. 5,566,367 to Mitsutake

CERTIFICATE OF COMPLIANCE

This PETITIONER EPSON'S REPLY TO PATENT OWNER CASCADES' RESPONSE TO PETITION complies with the word count limit of 37 C.F.R. § 42.24(c) because it contains 5,586 words, excluding the parts of the response exempted by 37 C.F.R. § 42.24(c), as determined by Microsoft's automated Word Count program.

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CERTIFICATE OF SERVICE

I hereby certify that on June 8, 2016, the foregoing PETITIONER EPSON'S REPLY TO PATENT OWNER CASCADES' RESPONSE TO PETITION and Epson Exhibits 1015-1019 were served electronically on the following counsel of record for Patent Owner at the below-listed email addresses:

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