

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CRAYOLA LLC,
Petitioner,

v.

UNIVERSITY OF CINCINNATI,
Patent Owner.

Case IPR2015-00393
Patent 7,430,355 B2

Before DAVID C. McKONE, JEREMY M. PLENZLER, and
JENNIFER MEYER CHAGNON, *Administrative Patent Judges*.

CHAGNON, *Administrative Patent Judge*.

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

I. INTRODUCTION

We have jurisdiction to hear this *inter partes* review under 35 U.S.C. § 6(c). This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed herein, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1, 8, 11, 12, 23, 24, 26, 27, 30, 32, 33, 42, 48, and 49 of U.S. Patent No. 7,430,355 B2 (Ex. 1001, “the ’355 patent”) are unpatentable.

A. Procedural History

Crayola LLC (“Petitioner”) filed a Petition (Paper 1, “Pet.”) for *inter partes* review of claims 1, 8, 11, 12, 23, 24, 26, 27, 30, 32, 33, 42, 48, and 49 (“the challenged claims”) of the ’355 patent. Petitioner included a Declaration of Steven M. Blair, Ph.D. (Ex. 1008) to support its positions. University of Cincinnati (“Patent Owner”) timely filed a Preliminary Response (Paper 5, “Prelim. Resp.”).

Pursuant to 35 U.S.C. § 314(a), on June 25, 2015, we instituted an *inter partes* review of the challenged claims to determine if claims 42, 48, and 49 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Chapin;¹ if claims 1, 8, 11, 12, 23, 24, 26, 27, 30, 32, and 33 are unpatentable under 35 U.S.C. § 103(a) as obvious in view of Chapin; if claims 1, 8, 11, 12, 23, 24, 26, 27, 30, 32, and 33 are unpatentable under 35 U.S.C. § 103(a) as obvious in view of Chapin and Snider;² and if claims 42, 48, and 49 are

¹ U.S. Patent No. 4,703,572, issued Nov. 3, 1987 (Ex. 1003).

² U.S. Application Pub. No. 2002/0120916 A1, published Aug. 29, 2002 (Ex. 1004).

unpatentable under 35 U.S.C. § 103(a) as obvious in view of Chapin and Schropp.³ Paper 6 (“Inst. Dec.”).

Subsequent to institution, Patent Owner filed a Patent Owner Response (Paper 9, “PO Resp.”), along with Declarations of Jason C. Heikenfeld, Ph.D. (Ex. 2007) and James F. Brennan, III, Ph.D. (Ex. 2008) to support its positions. Petitioner filed a Reply (Paper 16, “Reply”) to the Patent Owner Response. An oral hearing was held on March 9, 2016. A transcript of the hearing is included in the record. Paper 21 (“Tr.”).

B. Related Proceedings

The parties indicate that the ’355 patent has been asserted against Petitioner in *University of Cincinnati v. Crayola LLC*, No. 2:13-cv-1215 (S.D. Ohio). Pet. 1; Paper 3, 1.

C. The ’355 Patent

The ’355 patent, titled “Light Emissive Signage Devices Based on Lightwave Coupling,” relates to signage devices, which include, in one example embodiment, “a waveguide . . . adapted to receive light of a first wavelength and . . . photoluminescent features [coupled to the waveguide] adapted to emit light of a second wavelength in response to receiving light of the first wavelength.” Ex. 1001, at [54], Abstract.

³ U.S. Patent No. 3,131,496, issued May 5, 1964 (Ex. 1007).

Figures 16 and 20 of the '355 patent are reproduced below.

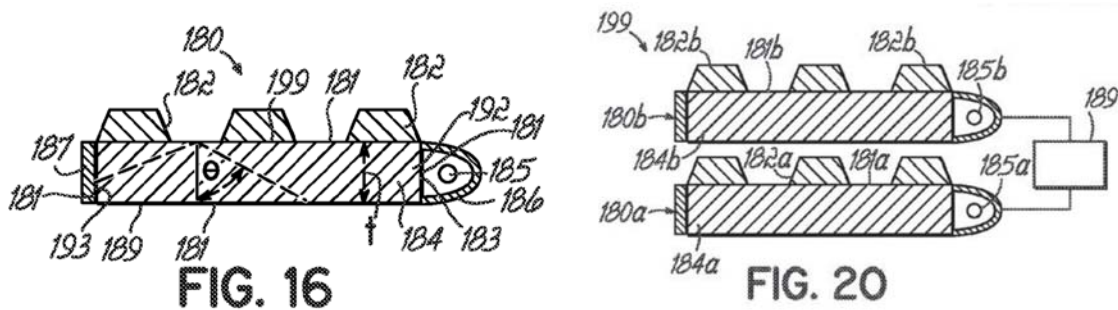


Figure 16 is a cross-sectional view of a “signage device in accordance with the principles of the invention, showing the basic mechanical structure of the full color luminescent ink signage device with a single light source, waveguide, . . . and luminescent inks,” and Figure 20 is a cross-sectional view of an embodiment “having multiple light sources and multiple waveguides patterned with luminescent ink.” Ex. 1001, 3:63–67, 4:17–20. Signage device 180, 199 (Fig. 20) includes waveguide(s) 184(a, b) and a pattern of photoluminescent features 182(a, b) coupled to waveguide(s) 184(a, b). *Id.* at 25:57–60, 29:37–40. The luminescent inks used to form photoluminescent features 182 may “have transparency levels of at least 50% or greater.” *Id.* at 33:17–20.

Light source(s) 185(a, b) may emit “short wavelength light in a range of about 350 nm to about 450 nm.” Ex. 1001, 11:3–4; *accord id.* at 27:39–40. Light emitted from light source 185 is injected into waveguide 184, through edge 183 at end 192 of waveguide 184. *Id.* at 27:39–44. Reflector assembly 186 “reflect[s] light not originally directed at an edge 183 . . . , thus reducing the loss of light.” *Id.* at 27:51–56. The short wavelength light propagates through waveguide 184 and is absorbed by photoluminescent features 182(a, b), causing them to emit “light of a wavelength in the range of about 420 nm to about 650 nm.” *Id.* at 26:10–16. The device of

Figure 20 additionally includes control device 189, which “may control the sequencing and powering of light sources 185a, 185b to produce the desired visual image.” *Id.* at 29:48–52. Control device 189 can power individual light sources in such a way to “create a captivating visual display of alternative images and multi-image collages.” *Id.* at 29:57–62.

D. Illustrative Claims

Of the challenged claims, claims 1 and 42 are independent. Claims 8, 11, 12, 23, 24, 26, 27, 30, 32, and 33 depend, directly or indirectly, from claim 1; claims 48 and 49 depend, directly or indirectly, from claim 42. Claims 1 and 42 of the '355 patent, reproduced below, are illustrative of the challenged claims:

1. A signage device comprising:

a waveguide adapted to propagate light of a first wavelength shorter than about 450 nm; and

at least one photoluminescent feature coupled with the waveguide for receiving the light of the first wavelength, the at least one photoluminescent feature adapted to emit light of a second wavelength between about 420 nm and about 650 nm in response to receiving the light of the first wavelength, wherein the at least one photoluminescent feature further comprises a primary color luminescent ink having an optical transparency of about 50% or greater.

Ex. 1001, 38:62–39:6.

42. A signage device comprising:

a plurality of waveguides each adapted to propagate light of a first wavelength shorter than about 450 nm, the waveguides arranged with an overlapping relationship; and

at least one photo luminescent feature coupled with each of the waveguides for receiving the light of the first wavelength, the at least one photoluminescent feature adapted to emit light of a second wavelength between about 420 nm and

about 650 nm in response to receiving the light of the first wavelength, and the light of the second wavelength emitted from the at least one photoluminescent feature of at least one of the waveguides being transmitted to a viewer through at least another of the waveguides.

Ex. 1001, 41:33–42:8.

II. ANALYSIS

A. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are given their broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b); *In re Cuozzo Speed Techs., LLC*, 793 F.3d 1268, 1275–79 (Fed. Cir. 2015), *cert. granted sub nom. Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 890 (mem.) (2016).

Under the broadest reasonable construction standard, claim terms generally are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *See In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). The claims, however, “‘should always be read in light of the specification and teachings in the underlying patent,’” and “[e]ven under the broadest reasonable interpretation, the Board’s construction ‘cannot be divorced from the specification and the record evidence.’” *Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015) (citations omitted). Further, any special definition for a claim term must be set forth in the specification with reasonable clarity, deliberateness, and precision. *See In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994).

The parties’ dispute requires construction of the terms “waveguide” and “ink having an optical transparency of about 50% or greater.”

Accordingly, we address each of these terms. No issue in this Decision, however, requires express construction of any other claim terms. *See, e.g., Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) (“[C]laim terms need only be construed ‘to the extent necessary to resolve the controversy.’”) (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

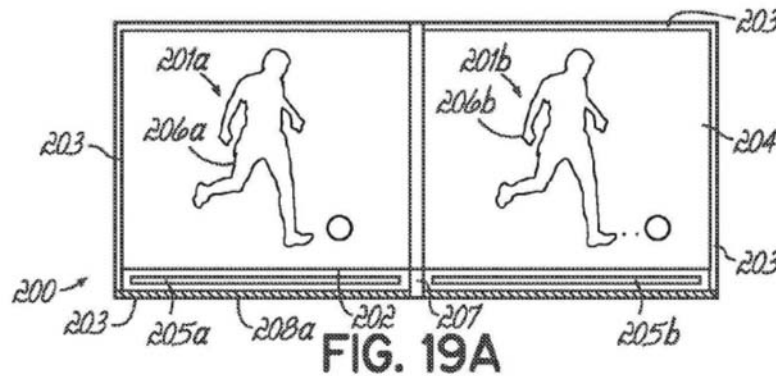
1. waveguide

Petitioner proposes that “waveguide” should be construed to mean “one piece or multiple separate pieces of optically transparent material capable of propagating ultra-violet, violet, or blue light and having a refractive index higher than the surrounding environment.” Pet. 9. Patent Owner does not propose an alternative construction, but disagrees with Petitioner’s proposal, asserting that Petitioner’s proposal to interpret “waveguide” to include multiple separate pieces of material is incorrect. PO Resp. 6–9.

The ’355 patent describes a waveguide as “propagating relatively short wavelength ultraviolet, violet, or blue light.” Ex. 1001, 2:27–28. It is further described that the light is “confined to the waveguide via internal reflection.” *Id.* at 2:55–57. The waveguide of the ’355 patent may be fabricated of “any optically transparent material capable of propagating ultra-violet, violet, or blue light and having a refractive index higher than the refractive index of [the surrounding] environment.” *Id.* at 5:8–11. The parties do not dispute that this description in the ’355 patent represents the ordinary and customary meaning of the term “waveguide.” The parties dispute, however, centers on whether the term “waveguide” should be construed, in view of the specification of the ’355 patent, to mean “one piece

or multiple separate pieces . . .” of waveguide material, or should be limited to a “single ‘segment[ed]’ waveguide.” Pet. 8–9; PO Resp. 6–9; Reply 1–5.

Petitioner points to Figure 19A of the ’355 patent, arguing that, in view of the embodiment described with respect thereto, “waveguide” should be construed to mean “one piece or multiple separate pieces” of waveguide material. Pet. 8–9. Figure 19A of the ’355 patent is reproduced below.



According to the ’355 patent, Figure 19A is “a top view of a signage device depicting the use of multiple light sources that, through electric light control, can create spatial and temporal sequencing of images *on a single waveguide*.” Ex. 1001, 4:9–12 (emphasis added). Referring to Figure 19A, the ’355 patent describes that “signage device 200 includes multiple light sources 205a, b configured along one edge 202 of *a waveguide* 204 which may be *divided into two segments* by a barrier or partition 207 which may be, for example, a light barrier or air gap.” Ex. 1001, 28:60–63 (emphases added).

Claim 12 of the ’355 patent recites that the signage device of claim 11 (which in turn depends from claim 1) further includes a “plurality of photoluminescent features, wherein the light sources [coupled with *the waveguide*] may be operated to temporally sequence the light of the first

wavelength for coupling with different photoluminescent features to create multiple images.” Ex. 1001, 39:43–47. Petitioner argues that to limit waveguide to a single piece of material would exclude all embodiments covered by claim 12. Pet. 9; Reply 3–5; Tr. 66:5–11. Patent Owner argues that the “functionality [of claim 12] could be achieved without separating the waveguide into segments by using light sources, such as lasers and LEDs that can be configured to have very little divergence in the direction parallel with the edge of the waveguide.” PO Resp. 8 (citing Ex. 2008 ¶ 26). However, as noted by Petitioner, not a single embodiment of this nature is described in the ’355 patent. Reply 4. Construing “waveguide” to be limited to a single piece of waveguide material would result in a construction that, for claim 12, not only leaves out the embodiment of Figure 19A, but also every other disclosed embodiment of the ’355 patent. *See Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1583 (Fed. Cir. 1996) (holding that a claim construction that excludes the preferred embodiment is “rarely, if ever, correct”).

As noted above, the disclosure of the ’355 patent *expressly* states that the embodiment of Figure 19A is *a single waveguide*. See Ex. 1001, 4:9–12. The claims must be construed in the context of the entire disclosure. *See Translogic*, 504 F.3d at 1257. In the context of the disclosure of the ’355 patent, “a waveguide” must cover the embodiment of Figure 19A, and, thus, at least includes a waveguide having multiple segments.

Patent Owner argues that “a single ‘segment[ed]’ waveguide” (as in Fig. 19A) and “multiple separate pieces” of waveguide material (as in Petitioner’s proposed construction) are not the same. PO Resp. 7 (citing Ex. 2008 ¶ 23). Patent Owner asserts that the discussion of the embodiment

of Figure 19A “does not redefine the term ‘waveguide,’ but rather it describes that for this embodiment, reference material may be inserted into or removed from a waveguide to change its light confinement properties.” *Id.* (citing Ex. 2008 ¶ 23).

As noted by Petitioner (*see* Reply 2), the ’355 patent does not define or discuss “reference material,” but instead only describes that the segments of the waveguide of Figure 19A may be “divided into two segments by a barrier or partition 207 which may be, for example, a light barrier or air gap.” Ex. 1001, 28:62–63. A segment is defined as “a separate piece of something.” *Segment Definition*, MERRIAM-WEBSTER.COM, <http://www.merriam-webster.com/dictionary/segment> (last visited May 10, 2016). Nothing in the description of the ’355 patent further defines what is meant by “segments,” or changes the common meaning of this word.

At the oral hearing, Patent Owner’s counsel argued, “[i]f you look at Fig. 19A . . . , clearly those edges [203] extend around the entire perimeter of the device that is shown in Fig. 19A. It’s one single frame all the way around the perimeter 203 as identified on all four sides of that figure. And, so, that is a single waveguide.” Tr. 27:1–6; *see id.* at 31:7–15, 39:15–16. We do not find this argument persuasive. The specification does not describe “with reasonable clarity, deliberateness, and precision” that there must be a frame or some other structural element such that the segments of the “single waveguide” of Figure 19A somehow are connected. *See Paulsen*, 30 F.3d at 1480. In fact, the specification is silent on this issue, and states only that the segments are divided by a barrier or partition, and that this barrier/partition may be a light barrier or air gap. Ex. 1001, 28:62–63. In other words, as disclosed in the specification of the ’355 patent, the

two segments may be separated by nothing more than air. *See* Ex. 1001, 28:57–63 (The waveguide “may be divided into two segments by a barrier or partition 207 which may *be* ... [an] air gap.”). There is no discussion in the specification of the ’355 patent of a barrier or partition including any sort of structure that defines such an air gap.

Other than the alleged frame of Figure 19A, Patent Owner’s counsel could not identify any discussion in the ’355 patent that requires the segments of waveguide 204 to be structurally connected in any way:

JUDGE PLENZLER: Right. I’m just trying to understand if there’s any other reason to infer from the specification and the discussion of air gap that would say . . . this [waveguide of Figure 19A] is really one piece instead of having two pieces with a gap.

MR. AHRENS: Other than the specific discussion of the frame 203 which circumnavigates both the panels in 19A and holds it together as one composite frame unit, I think that’s probably the strongest evidence of it being a single waveguide.

Tr. 40:19–41:3. However, as noted, we do not discern any “specific discussion” of such a frame in the ’355 patent. We decline to incorporate any such structural limitation from Figure 19A into the claims. *See Playtex Prods., Inc. v. Proctor & Gamble, Co.*, 400 F.3d 901, 907–08 (Fed. Cir. 2005) (determining trial court’s reliance on the drawings to limit the claim term was erroneous); *TI Grp. Auto. Sys. (N. Am.), Inc. v. VDO N. Am., L.L.C.*, 375 F.3d 1126, 1136 (Fed. Cir. 2004) (“[T]he mere fact that the patent drawings depict a particular embodiment of the patent does not operate to limit the claims to that specific configuration.” (quoting *Anchor Wall Sys. v. Rockwood Retaining Walls, Inc.*, 340 F.3d 1298, 1306–07) (Fed. Cir. 2003))).

Accordingly, for the reasons discussed, we interpret the term waveguide, in view of the specification of the '355 patent, to mean “one piece or multiple separate pieces of optically transparent material capable of propagating short wavelength light (e.g., ultra-violet, violet, or blue light), where the light is confined to the waveguide via internal reflection.”

2. ink having an optical transparency of about 50% or greater

Petitioner proposes that “ink having an optical transparency of about 50% or greater” should be construed to mean “ink which transmits 50% or more visible light without significant reflection, scattering, or absorption.” Pet. 9–10. Patent Owner does not propose an express construction of the phrase, but argues that we should reject Petitioner’s proposed construction. PO Resp. 9–10. Specifically, Patent Owner argues that the “without significant reflection, scattering, or absorption” portion of Petitioner’s proposed construction “makes for an incoherent, nonsensical and ambiguous construction,” because it incorrectly incorporates Dr. Blair’s definition of transparency, when referring to transmission probability. *Id.*

As correctly noted by Petitioner (*see* Pet. 10), the '355 patent does not define what is meant by “ink having an optical transparency of about 50% or greater.” We, thus, construe the phrase in accordance with its ordinary and customary meaning, taking into account the specification of the '355 patent. We determine that the ordinary meaning of “ink having an optical

transparency of about 50% or greater” is “ink which transmits 50% or more of light in the visible range of frequencies.”⁴

B. Whether the Cited References Are Analogous Art

Patent Owner argues that the asserted references are not analogous art to the claimed invention. PO Resp. 10–23. We have considered Patent Owner’s arguments, but do not find them persuasive.⁵

“To be considered within the prior art for purposes of [an] obviousness analysis, a reference must be . . . from the same field of endeavor or . . . reasonably pertinent to the particular problem the inventor is trying to solve.” *Circuit Check Inc. v. QXQ Inc.*, 795 F.3d 1331, 1335 (Fed. Cir. 2015) (citing *Wyers v. Master Lock Co.*, 616 F.3d 1231, 1237 (Fed. Cir. 2010); *Wang Labs., Inc. v. Toshiba Corp.*, 993 F.2d 858, 864 (Fed. Cir. 1993)). Patent Owner argues that the asserted references are neither from the same field of endeavor nor reasonably pertinent to the particular problem

⁴ See *Optical Definition*, MERRIAM-WEBSTER.COM, <http://www.merriam-webster.com/dictionary/optical> (last visited May 8, 2016) (2c: “of, relating to, or being objects that emit light in the visible range of frequencies”); *Transparency Definition*, MERRIAM-WEBSTER.COM, <http://www.merriam-webster.com/dictionary/transparency> (last visited May 10, 2016) (2: “the quality or state of being transparent”); *Transparent Definition*, MERRIAM-WEBSTER.COM, <http://www.merriam-webster.com/dictionary/transparent> (last visited May 10, 2016) (1(a)(1): “having the property of transmitting light without appreciable scattering so that bodies lying beyond are seen clearly”; 1(a)(2): “allowing the passage of a specified form of radiation (as X-rays or ultraviolet light)”).

⁵ We note that for purposes of the ground alleging anticipation by Chapin, the question of whether Chapin is analogous art is irrelevant. See *In re Schreiber*, 128 F.3d 1473, 1478 (Fed. Cir. 1997) (“A reference may be . . . directed to an entirely different problem from the one addressed by the inventor, yet the reference will still anticipate if it explicitly or inherently discloses every limitation recited in the claims.”).

the inventor was trying to solve. PO Resp. 11–16 (discussing Chapin), 17–20 (discussing Snider), 21–23 (discussing Schropp).

Patent Owner argues that the field of endeavor of the '355 patent is “light emissive displays, and more specifically, to light emissive signage displays based upon lightwave coupling.” PO Resp. 10 (quoting Ex. 1001, 1:13–15; citing Ex. 2007 ¶ 3). Patent Owner further asserts that “[m]ore specifically, the '355 Patent is directed to signage displays that included a greatly improved gamut of possible colors, brightness, greater levels of transparency, and commercial viability enabled by a combination of optical efficiency, simple usability, and manufacturability.” *Id.* at 10–11 (citing Ex. 2007 ¶ 3).

Patent Owner asserts that Chapin is not within the field of endeavor of the '355 patent because “Chapin discloses use of fluorescent pigments and paints, which for those commercially available at the time of Chapin, did not provide adequate levels of color, brightness, and optical transparency needed for operation as taught in the '355 Patent.” PO Resp. 11 (citing Ex. 2007 ¶ 5). Patent Owner asserts that Snider is not within the field of endeavor of the '355 patent, because the '355 patent “was not directed ‘to image and/or information display systems and’ ‘to an improved display system utilizing fluorescent material(s) which is particularly useful in a vehicle head-up display system,’” and because Snider does not use a waveguide. PO Resp. 17 (citing Ex. 1004 ¶ 3; Ex. 2007 ¶ 15). Patent Owner asserts that Schropp is not within the field of endeavor of the '355 patent, because the '355 patent “was not directed ‘to display boards, and more particularly to luminous display boards in which information is conveyed by differences in luminosity and/or color between adjacent portions of a board,’” and because

Schropp does not include photoluminescent features. PO Resp. 21–22 (citing Ex. 1007, 1:10–13; Ex. 2007 ¶¶ 19–20; Ex. 1001, 41:33–42:8, 42:29–38).

As informed by *KSR International Co. v. Teleflex Inc.*, 550 U.S. 398 (2007), the scope of analogous art must be construed broadly. See *Wyers*, 616 F.3d at 1238. We are not persuaded that the field of endeavor of the '355 patent, and each of Chapin, Snider, and Schropp, should be defined as narrowly as suggested by Patent Owner. Instead, we are persuaded that each of the '355 patent, Chapin, Snider, and Schropp are related to illuminated displays or signage. See Ex. 1001, 1:13 (“The invention relates to *light emissive displays*.” (emphasis added)); Ex. 1003, 1:10–14 (“The present invention relates to animated *signs and displays* . . . in which an animation effect is produced by sequential *illumination of the various views of a scene* comprising the complete display scene.” (emphasis added)); Ex. 1004 ¶ 59 (“[T]he invention could be used in non-vehicular applications [including] *displays* of advertisements, entertainment (*such as light displays*), or decorative patterns.” (emphasis added)); Ex. 1007, 1:10–11 (“This invention relates to . . . *luminous display boards*.” (emphasis added)); Reply 5–9. More specifically, the '355 patent and Chapin each relate to signs based on ultraviolet edge-lit waveguides containing visible fluorescent features. Reply 6 (citing Ex. 1001, 25:56–26:19, Fig. 16; Ex. 1003, 14:6–49, Fig. 24). The '355 patent and Snider each relate to forming photoluminescent features on a transparent material, such as PMMA or glass, and both disclose use in signage generally and windshield displays. *Id.* at 7 (citing Ex. 1001, 5:20–24, 38:22–38; Ex. 1004 ¶¶ 19–20, 59). The '355 patent and Schropp each relate to signage formed of transparent

carrier plates coupled to multiple light sources to allow the appearance of animation by sequential illumination of the lights. *Id.* at 7–8 (citing Ex. 1001, 5:20–24, 29:19–34; Ex. 1007, 2:60–61, 4:18–20; Ex. 1019, 87:21–88:7).

Because we find that each of Chapin, Snider, and Schropp is within the same field of endeavor as the claimed invention, we need not consider Patent Owner’s arguments regarding whether these references are reasonably pertinent to the particular problem with which the inventors are involved. For the reasons discussed, we determine that each of Chapin, Snider, and Schropp is analogous art to the ’355 patent and, thus, available as prior art for purposes of our obviousness analysis.

C. Principles of Law – Anticipation and Obviousness

To establish anticipation, each and every element in a claim, arranged as recited in the claim, must be found in a single prior art reference. *See Net MoneyIN, Inc. v. VeriSign, Inc.*, 545 F.3d 1359, 1369 (Fed. Cir. 2008); *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1383 (Fed. Cir. 2001). Although the elements must be arranged or combined in the same way as in the claim, “the reference need not satisfy an *ipsissimis verbis* test,” i.e., identity of terminology is not required. *In re Gleave*, 560 F.3d 1331, 1334 (Fed. Cir. 2009); *accord In re Bond*, 910 F.2d 831, 832 (Fed. Cir. 1990).

A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. *See KSR*, 550 U.S. at 406. The question of

obviousness is resolved on the basis of underlying factual determinations including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of ordinary skill in the art; and (4) objective evidence of nonobviousness. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

In that regard, an obviousness analysis “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ.” *KSR*, 550 U.S. at 418; *accord Translogic*, 504 F.3d at 1259. A prima facie case of obviousness is established when the prior art, itself, would appear to have suggested the claimed subject matter to a person of ordinary skill in the art. *See In re Rinehart*, 531 F.2d 1048, 1051 (CCPA 1976). The level of ordinary skill in the art may be reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978).

We analyze the asserted grounds of unpatentability in accordance with those principles.

*D. Claims 1, 8, 11, 12, 23, 24, 26, 27, 30, 32, and 33 —
Obviousness in View of Chapin, Alone or in Combination
With Snider*

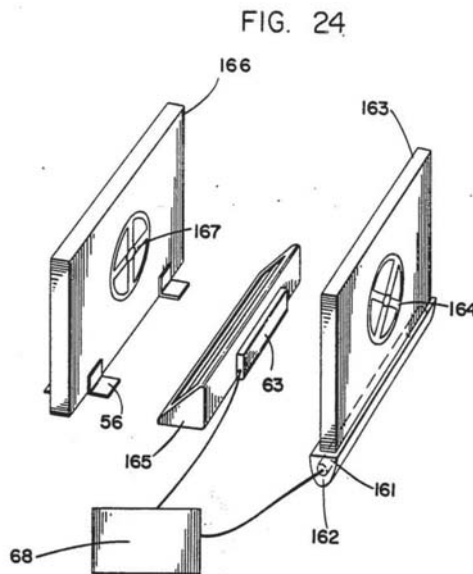
Petitioner asserts that independent claim 1, as well as claims 8, 11, 12, 23, 24, 26, 27, 30, 32, and 33 which depend therefrom, would have been obvious in view of Chapin. Pet. 48–53; *see also* Pet. 13–23 (Petitioner’s arguments and evidence that these claims are anticipated by Chapin, upon which Petitioner relies in its obviousness discussion). Petitioner also asserts that claims 1, 8, 11, 12, 23, 24, 26, 27, 30, 32, and 33, would have been

obvious in view of the combination of Chapin and Snider. *Id.* at 33–38. Patent Owner argues that the references do not teach or suggest the limitations of the claims. PO Resp. 25–51. Patent Owner also argues that one of skill in the art would not have combined Chapin and Snider. *Id.* at 37–38, 43. We have reviewed the entire record before us, including the parties’ contentions and supporting evidence presented during this trial. For the reasons explained below, we determine that Petitioner has demonstrated, by a preponderance of the evidence, that claims 1, 8, 11, 12, 23, 24, 26, 27, 30, 32, and 33 are unpatentable.

1. *Obviousness in View of Chapin*

a. Overview of Chapin

Chapin relates to “illuminated signs and displays.” Ex. 1003, Abstract. Figure 24 of Chapin is reproduced below.



As seen in Figure 24, a signage device includes panels 163, 166, which include scene-views 164, 167, respectively, formed thereon. Ex. 1003, 14:19–21, 14:44–47. “[U]ltraviolet transmitting panel 163 . . . may be made

of ultraviolet transmitting acrylic, or ordinary glass.” *Id.* at 14:9–11. Scene-view 164 may be “painted on the panel surface using fluorescent paint.” *Id.* at 14:26. Scene-views of the invention may also be applied “with inks containing fluorescent dyes rather than with paints.” *Id.* at 8:29–34; see also *id.* at 2:26–29 (“Various colored . . . fluorescent inks responsive to long-wave ultraviolet illumination are readily available for this application.”). These inks are “substantially transparent to the induced fluorescence.” *Id.* at 8:34.

Lamp 161 injects ultraviolet light into the edge of ultraviolet transmitting panel 163. Ex. 1003, 14:7–9. “[I]lluminating the edge of the panel with ultraviolet light will cause the scene to fluoresce brightly.” *Id.* at 14:27–28. During operation, scene-view 167 may be “flood illuminat[ed]” by “a second ultraviolet illuminator 165.” *Id.* at 14:43–44. Sequencing operation of lamp 161 and illuminator 165, causes “scene-views 164 and 167 alternatively [to] appear.” *Id.* at 14:45–46.

The sign illustrated in Figure 28 of Chapin, reproduced below, is a variation of Figure 24.

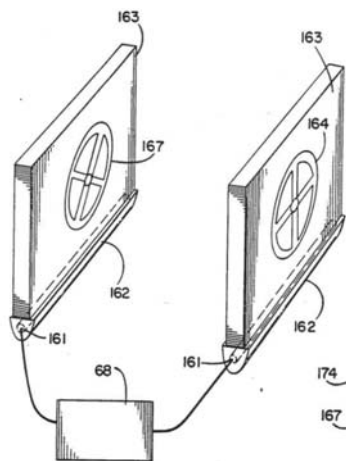
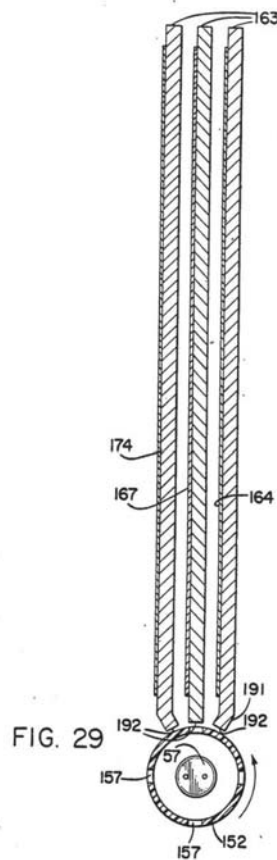


FIG. 28

As seen in Figure 28, panel 166 and illuminator 165 of Figure 24 are replaced with second ultraviolet transmitting panel 163 having second fluorescent scene-view 167 disposed thereon. Ex. 1003, 14:63–68. Second panel 163 is edge-lit by second lamp 161. *Id.* at 14:63–67. Scene-views 164, 167 may be painted “on either or both sides of the panel.” *Id.* at 14:67–68. “Lamp control circuit 68 controls the successive illumination of the respective panels and scenes.” *Id.* at 14:68–15:2.

Another embodiment of Chapin is disclosed in Figure 29, reproduced below.



As seen in Figure 29, ultraviolet lamp 57, housed within rotating shutter tube 152 including longitudinal slots 157, is driven by a motor to “sequentially illuminate the lower edge surfaces 192 of a plurality of

ultraviolet-transmissive panels 163.” Ex. 1003, 15:4–12. Ultraviolet radiation propagates upwards through each panel 163, successively causing scene-views 164, 167, 174 “to fluoresce brightly.” *Id.* at 15:25–33. The successive lighting of each transmissive panel 163 may produce animation-like effects, such as “the visual sensation of an arrow initially pointing upward, rotating 90 degrees clockwise to a horizontal position, rotating 90 degrees clockwise to a downward pointing position, and 180 degrees clockwise to its original upright pointing position to complete the cycle.” *Id.* at 15:33–41, Fig. 26.

b. Claim 1

We first discuss Petitioner’s contentions as to how Chapin teaches each element of independent claim 1. We then turn to Patent Owner’s opposition presented in its Response.

Petitioner’s Contentions

Claim 1 recites a “signage device.” As noted above, Chapin discloses “illuminated signs and displays.” Ex. 1003, Abstract. Petitioner relies on ultraviolet transmitting panels 163 of Chapin as disclosing the claimed waveguide. Pet. 16. The ultraviolet transmitting panels of Chapin are adapted to propagate light in the ultraviolet spectrum, which has a wavelength shorter than 450 nm, as recited in claim 1. Pet. 16, 26 (citing Ex. 1003, 14:7–18; Ex. 1008 ¶ 112); *see also* Ex. 1003, 15:25–28 (“[U]ltraviolet radiation entering panels 163 is conducted . . . through the panels by total internal reflection.”).

Petitioner relies on scene-views 164, 167 of Chapin as disclosing the claimed “at least one photoluminescent feature,” of claim 1. Pet. 16–17, 26–27. As seen in Figures 24 and 28 of Chapin, discussed above, scene-views

164, 167 are disposed on a surface of ultraviolet transmitting panels 163. Ex. 1003, 14:25–28, 14:64–68. Ultraviolet light propagating through ultraviolet transmitting panels 163 is received by scene-views 164, 167, causing them to “fluoresce visibly.” Pet. 17 (citing Ex. 1003, 14:21–25, Abstract); *see id.* at 24; *see also* Ex. 1003, 15:25–31 (“Frustrating the total internal reflection [in panels 163] by painting fluorescent scene-views on the surfaces of the panels causes the scene-views to fluoresce brightly.”). As noted by Petitioner, the claimed “420–650 nm wavelength range recited in claim 1 covers substantially all of the visible light spectrum, and as such, the light from scene views 164[,] 167 will fall within this range.” Pet. 17 (citing Ex. 1008 ¶¶ 113–114, 158).

With respect to the “at least one photoluminescent feature further comprises a primary color luminescent ink having an optical transparency of about 50% or greater” limitation of claim 1, Petitioner asserts that this feature would have been obvious to one of ordinary skill in the art. Pet. 48–49. Regarding the luminescent ink being a primary color, Petitioner points to the teaching in Chapin that scene-views 164, 167 may include blue, green, or red ink. Pet. 17, 27 (citing Ex. 1003, 11:13–17). Petitioner provides declaration testimony that one of ordinary skill in the art would have understood blue, green, and red to be primary colors. Pet. 17 (citing Ex. 1008 ¶¶ 115–116).

Regarding the luminescent ink having the claimed optical transparency, Petitioner points to the teaching in Chapin that the inks used to create scene-views 164, 167 are “substantially transparent.” Pet. 17–18, 27 (citing Ex. 1003, 8:8–13, 8:33–34). Petitioner asserts that one of ordinary skill in the art would have understood “substantially transparent” ink to be

“well more than 50% optically transparent.” *Id.* at 17–18, 27 (citing Ex. 1003, 8:9–14, 8:29–36; Ex. 1008 ¶¶ 120–122). Petitioner asserts “the fluorescent material used to create the scene-views must be transparent to visible light, in order to prevent one scene view from absorbing fluorescent light from another scene view and ‘permit that light to be viewable by an observer in front of the panel,’” as discussed in Chapin. *Id.* at 18 (citing Ex. 1003, 8:9–13); *see id.* at 48–49 (citing Ex. 1003, 8:9–36; Ex. 1008 ¶¶ 224–225).

Petitioner further points to the teaching in Chapin that “the thickness of the fluorescent material can be controlled to achieve a desired transparency to induced visible light” (*id.* at 49 (citing Ex. 1003, 8:9–36)), arguing that “one of ordinary skill in the art would have known to create a very thin coating of fluorescent material in order to achieve a high optical transparency (e.g., >50%), and thereby achieve the stated goal of preventing obscuring images behind the respective scene view.” *Id.* (citing Ex. 1008 ¶¶ 226–228.)

Patent Owner’s Contentions

Patent Owner argues that Chapin does not teach several features of claim 1. *See* PO Resp. 25–31. We address each of Patent Owner’s arguments in turn.

signage device

Patent Owner contends that Chapin does not teach a “signage device,” as claimed. PO Resp. 25–26. In particular, Patent Owner asserts “it is apparent that there are significant differences in design consideration and functionality between the animated signs of Chapin and the high-brightness reconfigurable displays of the ’355 Patent.” *Id.* at 26 (citing Ex. 2008 ¶ 58).

For example, Patent Owner asserts that “[i]n contrast [to the embodiments of Chapin], the ’355 Patent is directed towards creating high-brightness reconfigurable displays that function with high efficiency.” *Id.* at 25 (citing Ex. 2008 ¶ 58). Patent Owner further notes the embodiments of the ’355 patent “describe methods of uniformly distributing the excitation radiation within the waveguide, and ways in which the photoluminescent features may be arranged and/or selectively activated to create displays suitable for a range of different applications.” *Id.* at 25–26 (citing Ex. 2008 ¶ 58).

Patent Owner, however, does not point to persuasive evidence that the claim term “signage device” has any special meaning, and claim 1 does not include any such configurability, efficiency, or uniformity limitations as those argued by Patent Owner. *See also* Reply 10–13 (asserting that the claims do not recite any of the special requirements argued by Patent Owner). Chapin discloses “illuminated signs and displays.” Ex. 1003, Abstract. We have considered Patent Owner’s arguments but find, based on Petitioner’s evidence, that Chapin discloses a “signage device,” as claimed.

waveguide adapted to propagate light

Patent Owner contends that Chapin does not teach a “waveguide adapted to propagate light,” as claimed. PO Resp. 26–27. In particular, Patent Owner asserts that “Dr. Blair has not shown that the ‘ultraviolet transmitting panel 163’ described in the eleventh embodiment of Chapin is ‘adapted to propagate light’ in the same sense as the waveguides of the ’355 Patent.” *Id.* at 26 (citing Ex. 2008 ¶ 59).

Patent Owner’s arguments are premised on an assertion that the waveguides of the embodiments described in the ’355 patent allow the light to be “uniformly distributed throughout the waveguide” in a manner for

“efficiently and uniformly illuminating the scene-views.” *Id.* (citing Ex. 2008 ¶ 59; Ex. 1001, 11:49–56, 11:66–12:16, 26:20–27:14). Patent Owner further asserts that “Chapin does not discuss the technical considerations that are pertinent when engineering light propagation within a waveguide.” *Id.* at 27 (citing Ex. 2008 ¶ 59).

Patent Owner, however, does not point to persuasive evidence that the claim term “adapted to propagate light” has any special meaning, and claim 1 does not include any such uniform distribution or efficiency requirements. *See also* Reply 13–15 (asserting that the claims do not recite any of the special requirements argued by Patent Owner). As discussed above, ultraviolet transmitting panels 163 of Chapin, upon which Petitioner relies as teaching the claimed waveguide, conduct ultraviolet light (i.e., light of a wavelength shorter than about 450 nm) through the panels by total internal reflection. Ex. 1003, 15:25–28. Patent Owner’s arguments notwithstanding, we find, based on Petitioner’s evidence, that Chapin discloses a “waveguide adapted to propagate light,” as claimed.

the at least one photoluminescent feature further comprises a primary color luminescent ink having an optical transparency of about 50% or greater

Patent Owner contends that Chapin does not teach that “the at least one photoluminescent feature further comprises a[n] . . . ink having an optical transparency of about 50% or greater,” as claimed. PO Resp. 28–31. Patent Owner asserts that Chapin, instead of utilizing transparent ink, describes using “open spaces” in the scene-views, “to allow light from a scene-view that is further from the observer to be viewable through a scene-view that is closer to the observer.” *Id.* at 28 (citing Ex. 1003, 7:65–8:2); *accord id.* at 28–29 (citing Ex. 1003, 8:29–43). According to Patent Owner,

Chapin “confirms that the paints [disclosed therein] are not transparent to visible light,” because they must be used in a coating thin enough “to ensure that visible fluorescence induced in the pigment in the outer layers of the coating is not excessively attenuated by absorption of pigments contained in the inner layers.” *Id.* at 28 (citing Ex. 1003, 8:15–19).

There is express disclosure in Chapin, however, that the scene-views may be applied with inks containing fluorescent dyes, and that such inks may be “substantially transparent.” *See* Ex. 1003, 8:29–31 (“If the scene-views are applied to the ultraviolet absorbing panel with inks containing fluorescent dyes rather than with paints containing fluorescent pigments.”), 8:33–34 (“inks containing fluorescent dyes are substantially transparent to the induced fluorescence”). Patent Owner argues that this discussion is not a disclosure of using an optically transparent ink, but instead that Chapin “merely notes that the feature thickness would not be an issue if one used ‘inks containing fluorescent dyes.’” PO Resp. 30 (citing Ex. 1008, 8:29–34). Patent Owner continues,

When determining a suitable fluorescent ink, one of skill in the art would understand that several parameters and attributes would need to be considered. . . . Chapin does not teach the relevance of, nor disclose a means for determining or optimizing certain considerations relevant to the invention of the ’355 Patent, such as the brightness or efficiency of the luminescent features.

Id. (citing Ex. 2008 ¶ 65). According to Patent Owner, “Chapin does not present an engineered solution to the technical issues identified in the ’355 Patent, and a person of ordinary skill in the art would not gain enough insight from Chapin to use the fluorescent dyes and pigments of Chapin to

achieve the claimed invention of the '355 Patent.” *Id.* at 31 (citing Ex. 2008 ¶ 67).

Patent Owner’s arguments in this regard rely on limitations not present in the claims. Claim 1 does not include any requirement of brightness or efficiency of the luminescent features (*see* PO Resp. 30–31 (citing Ex. 2008 ¶¶ 65–67)), but recites only that “the at least one photoluminescent feature . . . comprises a[n] . . . ink having an optical transparency of about 50% or greater.” Chapin includes an express disclosure that inks containing fluorescent dyes may be used (Ex. 1003, 8:29–31) and that “inks containing fluorescent dyes are *substantially transparent* to the induced fluorescence” (*id.* at 8:33–34). *See also* Ex. 1008 ¶ 120 (Dr. Blair testifying that “one of ordinary skill in the art would conservatively interpret ‘substantially transparent to the induced fluorescence’ as having a transparency of at least 50% across the visible spectrum.”).

Patent Owner argues also that Chapin does not teach “making the inks themselves transparent so a panel behind the inks can be seen *through the inks*,” but instead teaches that “the only purpose for modifying the inks [to be transparent] is to let the fluorescence escape to the viewer.” PO Resp. 14 (citing Ex. 1003, 8:29–34). In this regard, Patent Owner emphasizes language in Chapin that the “inks containing fluorescent dyes are substantially transparent *to the induced fluorescence*.” We do not find this argument persuasive. As Petitioner notes in its Reply, the “intent” of the ink disclosed in Chapin is irrelevant if the disclosed signs have the same properties as those claimed. *See* Reply 16. The “induced fluorescence,” as admitted by Dr. Brennan, Patent Owner’s expert, is in the visible spectrum.

See Ex. 1020 (deposition of Dr. Brennan), 112:4–113:8 (“Q. Would that fluorescent light [induced in the material] be visible? A. Yes.”). Thus, because the ink of Chapin is “substantially transparent to the induced fluorescence” (Ex. 1003, 8:34), and the induced fluorescence is in the visible spectrum, we find that Chapin teaches using an ink which transmits 50% or more of light in the visible range of frequencies, which meets the claim language, as construed above (*see supra* Section II.A.2).

Conclusion

Given the evidence on this record, we determine Petitioner has shown, by a preponderance of the evidence, that Chapin renders obvious claim 1.

c. Claim 11

Claim 11, which depends from claim 1, recites “a plurality of light sources . . . coupled with the waveguide.” Patent Owner argues that, contrary to Petitioner’s assertion that the mere duplication of a component to perform the same function would have been obvious (Pet. 50; Ex. 1008 ¶¶ 232–235), “having more than one light source coupled to the waveguide adds additional functionality not possible with just a single light source, such as selectively illuminating different regions of the waveguide,” and, thus, this limitation is not obvious ‘as a matter of law.’” PO Resp. 31 (citing Ex. 2008 ¶ 68). Patent Owner further argues that Figure 28 of Chapin, upon which Petitioner further relies as disclosing this claim feature, “clearly shows that each panel 163 is only coupled to a single light source.” *Id.* at 33.

Based on our construction of waveguide, discussed above (*see supra* Section II.A.1), however, we are persuaded by Petitioner’s assertion that Figure 28 of Chapin, which shows lamps 161 corresponding one each to

panels 163 (collectively, the claimed waveguide), teaches “a plurality of light sources . . . coupled with the waveguide,” as recited in claim 11.

Accordingly, we are persuaded that Petitioner has shown, by a preponderance of the evidence, that Chapin renders obvious claim 11.

d. Claim 12

Claim 12, which depends from claim 11, recites “a plurality of photoluminescent features, wherein the [plurality of] light sources may be operated to temporally sequence the light of the first wavelength for coupling with different photoluminescent features to create multiple images.” Patent Owner argues that Chapin does not teach or suggest this feature, because “[c]laim 12 requires that multiple light sources *coupled to the same waveguide* be temporally sequenced, and this is not possible in the embodiments of Chapin because they only have a single light source coupled to panel 163” and that the different photoluminescent features “must all be on the *same waveguide*.” PO Resp. 35 (citing Ex. 2008 ¶ 77).

Based on our construction of waveguide discussed above (*see supra* Section II.A.1), however, we find that Figure 28 of Chapin, which shows lamps 161 corresponding one each to panels 163 (collectively, the claimed waveguide) and includes “controller 68 which can ‘alternately energize[]’ two or more lamps to combine multiple images to create an animation” (Pet. 20 (citing Ex. 1003, 7:35–64; Ex. 1008 ¶¶ 134–136)), teaches “a plurality of photoluminescent features, wherein the [plurality of] light sources may be operated to temporally sequence the light of the first wavelength for coupling with different photoluminescent features to create multiple images,” as recited in claim 12. Accordingly, we are persuaded that

Petitioner has shown, by a preponderance of the evidence, that Chapin renders obvious claim 12.

e. Claim 23

Claim 23, which depends from claim 1, recites “a plurality of photoluminescent features applied to the waveguide in a predominantly overlapping pattern.” Patent Owner argues that Chapin does not teach or suggest this feature because “the features of Chapin are not transparent and so cannot be used in an overlapping pattern.” PO Resp. 35 (citing Ex. 2008 ¶ 77). Patent Owner also argues that overlapping features is not a simple design choice. *Id.* at 35–36 (citing Ex. 2008 ¶ 77). As discussed above with respect to claim 1, we find that Chapin teaches that the luminescent features are transparent, as claimed. *See supra* Section II.D.1.b. Further, we are persuaded by Petitioner’s assertion and find that Figures 28 and 29 of Chapin, and the corresponding discussion in the specification thereof, teach overlapping scene-views to produce animation effects. Pet. 20–21, 51; *see* Ex. 1003, 14:63–15:41, Figs. 26, 28, 29. Accordingly, we are persuaded that Petitioner has shown, by a preponderance of the evidence, that Chapin renders obvious claim 23.

f. Claim 27

Claim 27, which depends from claim 1, recites that “the photoluminescent features have different sizes.” Patent Owner argues that it would not have been obvious to change the size of the photoluminescent features of Chapin, because in Chapin “no consideration is given to the uniformity of the radiation within the waveguide,” and the “presence of a non-uniform excitation . . . introduces technical issues that must be considered when designing the size of the features, and so changing the size

of the features is not merely a simple design choice.” PO Resp. 36 (citing Ex. 2008 ¶ 79). The claim, however, includes no requirement for uniform excitation, and we are persuaded by Petitioner’s evidence and find that Chapin teaches or suggests using scene views of different sizes. See Pet. 22 (citing Ex. 1003, 11:53–57, Fig. 11 (showing scene views of different sizes)); *id.* at 52–53 (citing Ex. 2008 ¶¶ 244–246 (Dr. Blair testifying that it would have been a simple design choice to use scene views of different sizes)). Accordingly, we are persuaded that Petitioner has shown, by a preponderance of the evidence, that Chapin renders obvious claim 27.

g. Claims 8, 24, 26, 30, 32, and 33

Patent Owner does not substantively discuss dependent claims 8, 24, 26, 30, 32, and 33, apart from its discussion of independent claim 1, which we have addressed above. For each of claims 8, 24, 26, 30, 32, and 33, Petitioner provides arguments as to how each claim limitation is taught or suggested by Chapin, and relies upon Dr. Blair’s testimony. See Pet. 18, 21–23, 49–53 (citing Ex. 1003, 5:50–51, 6:1–11, 11:13–17, 14:7–9, 14:68–15:2, 15:35–41, Figs. 26, 29; Ex. 1008 ¶¶ 125–127, 139–142, 145–150, 230–231, 237–243, 247–248; Ex. 1001, 5:20–24). We have considered Petitioner’s evidence and are persuaded that Petitioner has shown, by a preponderance of the evidence, that Chapin renders obvious claims 8, 24, 26, 30, 32, and 33.

2. *Obviousness in View of Chapin and Snider*

a. Overview of Snider

Snider relates to a head-up display system, particularly useful in vehicles, that includes a fluorescent material carried on a support. Ex. 1004 ¶ 3, Abstract. Snider also describes that the display system may be used in other fields, such as commercial signs or advertising displays. *Id.* ¶ 16.

Electromagnetic radiation is directed toward the fluorescent material to cause it to emit light. *Id.* ¶ 9. The fluorescent material “emits electromagnetic radiation, e.g., in the visible region of 390 nm to 800 nm, upon exposure to external radiation,” which may be ultraviolet light (e.g., “in a range of 325 nm to 425 nm”). *Id.* ¶ 23. The fluorescent material can “fluoresce at different visible colors,” such as blue and yellow. *Id.* ¶ 47.

Figure 5 of Snider is reproduced below.

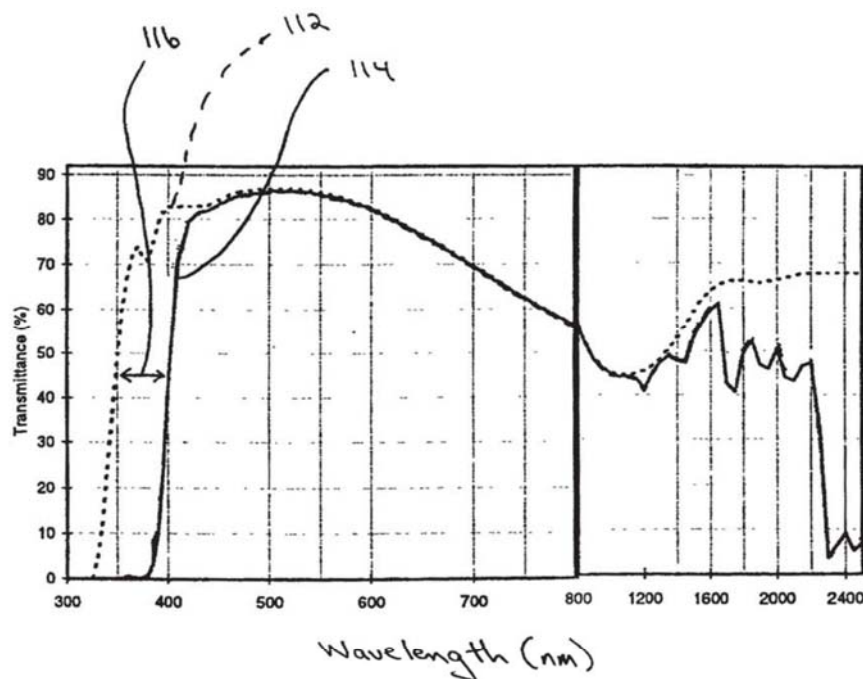


Fig 5

Figure 5 is a graph of transmittance (transparency) versus wavelength for a support with and without the fluorescent material. Ex. 1004 ¶¶ 54–55, 58. As can be seen in Figure 5, line 114, which represents the transmittance for a support including the fluorescent material, shows a transmittance that is well

above 50% across the visible spectrum. *See id.* at Fig. 5; Ex. 1008 ¶¶ 96, 181.

b. Analysis

In the asserted ground based on the combination of Chapin and Snider, Petitioner relies on Snider for an express disclosure of an “ink having an optical transparency of about 50% or greater,” as recited in claim 1, and asserts that it would have been obvious to use the ink disclosed in Snider in the signs of Chapin. Pet. 33–35; *see* Ex. 1004, Fig. 5.

We are persuaded by Petitioner’s assertion and find that Snider teaches a photoluminescent ink, as recited in claim 1. *See* Pet. 33–35 (citing Ex. 1004 ¶¶ 23, 47, 54, 58, Fig. 5; Ex. 1008 ¶¶ 180–181). Snider teaches fluorescent material that “emits electromagnetic radiation, e.g., in the visible region of 390 nm to 800 nm, upon exposure to external radiation,” which may be ultraviolet light (e.g., “in a range of 325 nm to 425 nm”). Ex. 1004 ¶ 23. Snider further teaches that the fluorescent material can “fluoresce at different visible colors,” such as blue and yellow. *Id.* ¶ 47. Further, as seen in Figure 5 of Snider, the transmittance of the fluorescent material is well in excess of 50% across the visible spectrum. *Id.* at Fig. 5.

Patent Owner asserts that one of skill in the art would not have been motivated to combine Snider with Chapin. PO Resp. 37–38, 43. Patent Owner argues that Chapin and Snider are “very different and relate to different fields of endeavor.” PO Resp. 37 (citing Ex. 2008 ¶ 87; Ex. 2007 ¶¶ 4–6); *see id.* at 37–38 (citing Ex. 1004 ¶¶ 41–45; Ex. 2008 ¶ 87).

We are persuaded, however, by Petitioner’s argument and evidence that “it would have been obvious to a person of ordinary skill in the art to combine . . . the disclosed optically transparent fluorescent material [of

Snider], with the signage devices disclosed by Chapin.” Pet. 34 (citing Ex. 1008 ¶ 173). As noted by Petitioner, “Snider expressly discloses that its embodiments can be practiced in many fields, including commercial signs, entertainment displays, and advertising displays.” Pet. 34 (citing Ex. 1004 ¶ 16, claim 22). Chapin also relates to signs and displays. Ex. 1003, 1:10–14. Additionally, Snider and Chapin both disclose visibly transparent fluorescent displays utilizing ultraviolet light sources. Pet. 34; *see* Ex. 1003, 8:9–34, 14:19–33; Ex. 1004 ¶¶ 23, 58. Petitioner asserts that, given Chapin’s teaching of the desirability of using an ink that is “substantially transparent,” one of skill in the art would have been motivated to use the transparent fluorescent material taught in Snider in the signs of Chapin. Pet. 35 (citing Ex. 1008 ¶ 181).

Patent Owner argues that Petitioner’s asserted reason for using the ink of Snider in Chapin (e.g., “in view of Chapin’s teaching regarding the desirability of using an ink that is substantially transparent” (Ex. 1008 ¶ 181)) is flawed because, according to Patent Owner, “Chapin does not teach the desirability of using features that are substantially transparent.” PO Resp. 43 (citing Ex. 2008 ¶ 96). However, as discussed above (*see supra* Section II.D.1.b), we find that Chapin teaches using an ink that is substantially transparent for the photoluminescent features. Thus, we are not persuaded that it would have been beyond the skill of one in the art to use the transparent ink described in Snider in the signs of Chapin.

Patent Owner also argues that the combination of Chapin and Snider does not teach various other features of the claims. *See* PO Resp. 38–51. However, as discussed above (*see supra* Sections II.D.1.b–f), we find that Chapin teaches each of these additional features Patent Owner argues is

missing from the combination. Accordingly, we are persuaded that Petitioner has shown, by a preponderance of the evidence, that the combination of Chapin and Snider renders obvious claims 1, 8, 11, 12, 23, 24, 26, 27, 30, 32, and 33.

E. Claims 42, 48, and 49 — Anticipation by Chapin or Obviousness in View of Chapin and Schropp

Petitioner argues that Chapin discloses all limitations of independent claim 42, as well as dependent claims 48 and 49 which depend therefrom. Pet. 23–32. Petitioner also asserts that claims 42, 48, and 49, would have been obvious in view of the combination of Chapin and Schropp. Pet. 53–60. Patent Owner argues that the cited references do not disclose all limitations of the claims. PO Resp. 52–58.

We have reviewed the entire record before us, including the parties’ contentions and supporting evidence presented during this trial. For the reasons explained below, we determine that Petitioner has demonstrated, by a preponderance of the evidence, that claims 42, 48, and 49 are unpatentable.

1. Anticipation by Chapin

a. Claim 42

Claim 42 recites similar limitations to those in claim 1. Claim 42, however, does not include the “primary color luminescent ink having an optical transparency of about 50% or greater” limitation, included in claim 1, and instead recites a “plurality of waveguides” in a particular configuration.

With respect to the claimed waveguide adapted to propagate light of a first wavelength shorter than about 450 nm, and at least one photoluminescent feature, coupled to the waveguide and adapted to emit light of a second wavelength between about 420 nm and about 650 nm,

Petitioner relies on the same disclosures of Chapin, as discussed above with respect to claim 1. Pet. 23–24; *see supra* Section II.D.1.b. Patent Owner argues that Chapin does not disclose a signage device or waveguide adapted to propagate light, as recited in claim 42. *See* PO Resp. 52–54. We have addressed these arguments above with respect to claim 1 (*see supra* Section II.D.1.b), and for the same reasons do not find Patent Owner’s arguments persuasive with respect to claim 42. Thus, for the reasons discussed above, we find that Chapin discloses these features. We now address the features of claim 42 not present in claim 1.

Petitioner asserts that Chapin discloses “a plurality of” ultraviolet transmitting panels 163 “arranged with an overlapping relationship” with respect to the vantage of the viewer, as recited in claim 42. Pet. 24 (citing Ex. 1003, Figs. 28, 29). With respect to the “light of the second wavelength emitted from the at least one photoluminescent feature of at least one of the waveguides being transmitted to a viewer through at least another of the waveguides” limitation of claim 42, Petitioner points to disclosure in Chapin that “scene views 164, 167, and 174 in FIG. 29 fluoresce to produce animation-like effects, such as ‘the visual sensation of an arrow initially pointing upward.’” Pet. 24 (citing Ex. 1003, 15:33–41). Petitioner cites to declaration testimony indicating that “[t]hose animation-like effects require that the viewer observe the light from scene views through the adjacent panels 163.” Pet. 24 (citing Ex. 1008 ¶ 160). Patent Owner does not substantively discuss these claim limitations. Based on our review of the record, we are persuaded by Petitioner’s argument and evidence and find that Chapin discloses these claim features.

Given the evidence on this record, we determine Petitioner has shown, by a preponderance of the evidence, that Chapin anticipates claim 42.

b. Claim 48

Claim 48 recites “a plurality of light sources . . . , each of the light sources optically coupled with a respective one of the waveguides.” Petitioner relies on Figure 28 of Chapin, as disclosing this claim feature. Pet. 25 (citing Ex. 1003, Fig. 28; Ex. 1008 ¶¶ 163–164). Patent Owner argues that Petitioner’s position regarding claim 48 is inconsistent with its position regarding claims 11 and 12—namely, that Petitioner relies on the two panels 163 shown in Figure 28 of Chapin as teaching both a single waveguide and as disclosing two separate waveguides. PO Resp. 54–55.

We disagree. As discussed above (*see supra* Section II.A.1), we interpret the term waveguide, in view of the specification of the ’355 patent, to mean “*one piece or multiple separate pieces* of optically transparent material capable of propagating short wavelength light (e.g., ultra-violet, violet, or blue light), where the light is confined to the waveguide via internal reflection.” Thus, we are persuaded by Petitioner’s assertion and find that Figure 28 of Chapin teaches both a single waveguide (including both panels 163 shown in the figure as segments thereof) *and* multiple waveguides (where each of panels 163 is an individual and separate waveguide).

Accordingly, we are persuaded that Petitioner has shown, by a preponderance of the evidence, that Chapin anticipates claim 48.

c. Claim 49

Patent Owner does not substantively discuss dependent claim 49, apart from its discussion of claims 42 and 48, which we have addressed

above. Petitioner provides arguments as to how each limitation of claim 49 is disclosed in Chapin, and relies upon Dr. Blair's testimony. Pet. 25, 32 (citing Ex. 1003, 7:35–64, 14:60–62, 14:68–15:2, Fig. 28; Ex. 1008 ¶¶ 165–166); see Pet. 19–20, 23 (citing Ex. 1003, 7:35–64, 14:68–15:2, Fig. 28; Ex. 1008 ¶¶ 134–136, 149–150). We have considered Petitioner's evidence and are persuaded that Petitioner has shown, by a preponderance of the evidence, that Chapin anticipates claim 49.

2. *Obviousness in View of Chapin and Schropp*

a. Overview of Schropp

Schropp relates to “luminous display boards in which information is conveyed by differences in luminosity and/or color between adjacent portions of a board.” Ex. 1007, 1:10–13. A plurality of carrier plates 1 are “capable of diverting light emanating from the respective source of edge lighting through a major face of the respective plate toward the right.” *Id.* at 4:8–14, Fig. 2. “To a viewer looking at the display board from that direction[,] the several secondary light sources constituted by the sign layers appear to be located in a single plane so that many optical illusions can be produced.” *Id.* at 4:14–18. For example, “[c]onsecutive lighting of sign layers . . . may produce the appearance of color changes, of movement, and the like.” *Id.* at 4:18–20.

b. Analysis

In the asserted ground based on the combination of Chapin and Schropp, Petitioner relies on Schropp for explicit disclosure that the light from a feature on one waveguide is transmitted to a viewer through at least another of the waveguides, as recited in claim 42, and asserts that it would have been obvious to include this feature of Schropp in the sign of Chapin

for the “ability to ‘produce the appearance of color changes [and] movement,’ as taught by Schropp.” Pet. 56–57 (citing Ex. 1007, 4:11–20, Fig. 2; Ex. 1008 ¶¶ 267–268). We are persuaded by Petitioner’s argument and evidence that it would have been obvious to incorporate this feature of Schropp into the signs of Chapin.

Patent Owner argues that Schropp does not disclose several features of the claims, and particularly that Schropp does not relate to ultraviolet light nor fluorescent features. PO Resp. 55–58 (citing Ex. 2008 ¶¶ 118, 120–122). Petitioner, however, relies on Schropp only for its disclosure that “light from each carrier plate 1 is ‘capable of diverting light . . . through a major face of the respective plate toward the right’ so that ‘[t]o a viewer looking at the display board from that direction[,] the several secondary light sources constituted by the sign layers appear to be located in a single plane.’” Pet. 56–57 (citing Ex. 1007, 4:11–18, Fig. 2). Regarding the other features of claims 42, 48, and 49, as discussed above (*see supra* Sections II.E.1.a–c), we find that Chapin teaches each of these features Patent Owner argues is missing from Schropp.

Accordingly, we are persuaded that Petitioner has shown, by a preponderance of the evidence, that the combination of Chapin and Schropp renders obvious claims 42, 48, and 49.

III. CONCLUSION

For the foregoing reasons, we determine that Petitioner has demonstrated, by a preponderance of the evidence, that claims 42, 48, and 49 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Chapin; that claims 1, 8, 11, 12, 23, 24, 26, 27, 30, 32, and 33 are unpatentable under 35 U.S.C. § 103(a) as obvious in view of Chapin; that claims 1, 8, 11, 12,

23, 24, 26, 27, 30, 32, and 33 are unpatentable under 35 U.S.C. § 103(a) as obvious in view of Chapin and Snider; and that claims 42, 48, and 49 are unpatentable under 35 U.S.C. § 103(a) as obvious in view of Chapin and Schropp.

IV. ORDER

Accordingly, it is

ORDERED that claims 1, 8, 11, 12, 23, 24, 26, 27, 30, 32, 33, 42, 48, and 49 of U.S. Patent No. 7,430,355 B2 are held *unpatentable*; 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.

IPR2015-00393
Patent 7,430,355 B2

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