

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMBILIGHT INC
Petitioner,

v.

LANNRAY OPTOELECTRONICS (ZHENJIANG) CO. LTD.
Patent Owner.

Case PGR2026-00053
U.S. Patent No. 12,502,870

**PETITION FOR POST GRANT REVIEW
OF U.S. PATENT NO. 12,502,870**

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LIST OF EXHIBITS

Exhibit No.	Description
EX1001	U.S. Patent No. 12,502,870 (“the ’870 Patent”)
EX1002	File History of the ’870 Patent
EX1003	Declaration of Dr. Colin Wolden
EX1004	Gauthier (U.S. Patent No. 9,810,963)
EX1005	Xu (U.S. Patent No. 7,826,124)
EX1006	Tonar (U.S. Patent No. 6,700,692)
EX1007	Carl M. Lampert, “Durability of Electrochromic Switching Devices for Glazings,” Lawrence Berkeley Laboratory Report No. LBL-24103 Rev., presented at The International Congress on Optical Science and Engineering, The Hague, The Netherlands, Mar. 12-15, 1990, and published in <i>Optical Materials Technology for Energy Efficiency and Solar Energy Conversion IX</i> , Proc. SPIE Vol. 1272, 1990.
EX1008	Hulya Demiryont & Kenneth Shannon III, “Solid-State Monolithic Electrochromic Switchable Visors and Spectacles,” in <i>Head- and Helmet-Mounted Displays XIV: Design and Applications</i> , Proc. of SPIE Vol. 7326, 73260K, 2009.
EX1009	R. Vergaz, J.M. Sánchez-Pena & D. Barrios, “Microcontrolled Electrooptic System for Online Light Transmission Control of Novel Electrochromic Devices,” <i>Microwave and Optical Technology Letters</i> , Vol. 48, No. 8, pp. 1572-1574, Aug. 2006.
EX1010	Gunnar A. Niklasson & Claes G. Granqvist, “Electrochromics for Smart Windows: Thin Films of Tungsten Oxide and Nickel Oxide, and Devices Based on These,” <i>Journal of Materials Chemistry</i> , Vol. 17, pp. 127-156, 2007.
EX1011	C.G. Granqvist, E. Avendaño & A. Azens, “Novel Electrochromic Materials and Devices,” <i>46th Annual Technical Conference Proceedings</i> , Society of Vacuum Coaters, p. 75 et seq., 2003, ISSN 0737-5921.
EX1012	U.S. Patent No. 5,610,756
EX1013	U.S. Patent No. 4,519,930
EX1014	WO 03/011688
EX1015	U.S. Patent No. 4,712,879
EX1016	[intentionally left blank]

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Exhibit No.	Description
EX1017	U.S. Patent No. 5,233,461
EX1018	U.S. Patent No. 6,195,193

LISTING OF CLAIMS

Claim 1	
[1.pre]	An electrochromic device comprising:
[1.1]	an electrochromic film comprising a first electrode layer and a second electrode layer facing the first electrode layer of the electrochromic film,
[1.2]	wherein: an edge of the first electrode layer is cut such that a portion of an inner surface of the second electrode layer is exposed, and
[1.3]	an edge of the second electrode layer is cut such that a portion of an inner surface of the first electrode layer is exposed, the edge of the first electrode layer and the edge of the second electrode layer are opposing edges;
[1.4]	a first edge protection material sealing the exposed portion of the inner surface of the second electrode layer; and
[1.5]	a second edge protection material sealing the exposed portion of the inner surface of the first electrode layer.
Claim 2	
[2]	The electrochromic device of claim 1, wherein: the first edge protection material is in an L shape, further sealing a side surface of the first electrode layer and a portion of an external surface of the first electrode layer.
Claim 3	
[3]	The electrochromic device of claim 1, wherein: the second edge protection material is in an L shape, further sealing a side surface of the second electrode layer and a portion of an external surface of the second electrode layer.
Claim 4	
[4]	The electrochromic device of claim 1, wherein: the first edge protection material and the second edge protection material comprise epoxy.
Claim 5	
[5]	The electrochromic device of claim 1, wherein the first edge protection material and the second edge protection material comprise electrically conductive material.
Claim 6	
[6]	The electrochromic device of claim 1, wherein: the first edge protection material and the second edge protection material are

	cured with heat or ultraviolet light, functioning as oxygen and moisture blockers.
Claim 7	
[7.1]	The electrochromic device of claim 1, further comprising: a first substrate;
[7.2]	a second substrate; and
[7.3]	an interlayer between the first substrate and the second substrate,
[7.4]	wherein: the first electrode layer, the second electrode layer, the first edge protection material, and the second edge protection material are laminated within the interlayer.
Claim 8	
[8]	The electrochromic device of claim 1, wherein the first electrode layer and the second electrode layer sandwich a layer of electrochromic material, a layer of electrolyte material, and a layer of charge storage material.
Claim 9	
[9]	The electrochromic device of claim 8, wherein the layer of electrochromic material, the layer of electrolyte material, and the layer of charge storage material are cut in a same way as the edge of the first electrode layer to expose the portion of the inner surface of the second electrode layer.
Claim 10	
[10]	The electrochromic device of claim 8, wherein the layer of electrochromic material, the layer of electrolyte material, and the layer of charge storage material are cut in a same way as the edge of the second electrode layer to expose the portion of the inner surface of the first electrode layer.
Claim 11	
[11]	The electrochromic device of claim 1, wherein the first electrode layer comprises a first electrode layer including tin doped indium oxide (ITO).
Claim 12	
[12]	The electrochromic device of claim 1, wherein the second electrode layer comprises a second electrode layer including tin doped indium oxide (ITO).

Ambilight, Inc (“Petitioner”) petitions for post-grant review (PGR) of Claims 1-12 (“Challenged Claims”) of U.S. Patent No. 12,502,870 (“the ’870 Patent,” EX1001). The evidence addressed in this Petition compellingly demonstrates that institution of PGR is warranted and that the Challenged Claims of the ’870 Patent should be cancelled as invalid as (1) failing to comply with the written description requirement of 35 U.S.C. §112 and (2) as obvious over the cited prior art. (EX1003, ¶¶1-238)

I. REQUIREMENTS FOR PGR UNDER 37 C.F.R. § 42.204

A. Grounds for Standing (37 C.F.R. § 42.204(A))

Petitioner certifies that the ’870 Patent is available for PGR and that Petitioner is not barred or estopped from requesting this proceeding.

The earliest possible effective filing date for the ’870 Patent is November 14, 2018, and the ’870 Patent issued on December 23, 2025. The instant Petition was timely filed within nine months of issuance.

B. Identification of Claims Being Challenged (37 C.F.R. § 42.204(B))

Petitioner requests institution of post-grant review of Claims 1-12 of the ’870 Patent and that these claims be found invalid on the following bases:

Ground	Claims	Basis of Unpatentability
1	1-12	§112 – Lack of Written Description
2	1-12	§103 – Gauthier
3	2-3	§103 – Gauthier in view of Xu
4	5	§103 – Gauthier in view of Tonar

Although Gauthier (EX1004) discloses all of the limitations of the Challenged Claims in Ground 2, Petitioner is relying on §103 for Ground 2 because of alternative obviousness arguments for certain claim limitations, and because “a disclosure that anticipates under §102 also renders the claim invalid under §103, for anticipation is the epitome of obviousness.” *Realtime Data, LLC v. Iancu*, 912 F.3d 1368, 1373 (Fed. Cir. 2019) (internal quotations and citations omitted). Petitioner further relies on Xu (EX1005) and Tonar (EX1006) as alternative obviousness positions for certain dependent claims and limitations, including in the event the Board determines that Gauthier alone does not disclose or render obvious every aspect of certain claims in Ground 2.

The '870 Patent is subject to post-AIA law. The '870 Patent was filed as U.S. Patent Application No. 18/606,980 on March 15, 2024, and it claims priority to U.S. Patent Application No. 16/190,723 filed November 14, 2018. (*See* EX1001, Cover.) Petitioner therefore treats November 14, 2018 as the Earliest Effective Filing Date of the '870 Patent.

Each of the references relied upon by Petitioner is prior art under post-AIA 35 U.S.C. §102:

Reference	Effective Filing Date	Publication Date	AIA Prior Art Status
Gauthier (EX1004)	3/6/2014	2/4/2016	§102(a)(1)
Xu (EX1005)	10/2/2008	2/26/2009	§102(a)(1)

Reference	Effective Filing Date	Publication Date	AIA Prior Art Status
Tonar (EX1006)	4/3/2002	10/24/2002	§102(a)(1)

II. SUMMARY OF THE '870 PATENT

A. Specification and Claims

The '870 Patent, titled “Electrochromic Films with Edge Protection,” relates to electrochromic devices with edge protection, including electrochromic films used in laminated smart-window structures. Electrochromism involves a reversible change in optical properties when a potential is applied, and electrochromic materials can reversibly change color through electrochemical oxidation-reduction reactions caused by an electric field. (EX1001, 1:23-30.) One identified application is smart-window technology, where electrochromic films are integrated with glass substrates. (*Id.*, 1:40-45; EX1003, ¶44.)

The '870 Patent describes the problem it was trying to solve. The specification explains that electrochromic films are “typically sandwiched between two glass panels, with interlayers (e.g., PVB, SentryGlas, etc.) disposed between the electrochromic film and the glass panels.” (*Id.*, 1:40-44.) “[T]he glass panels, interlayers, and electrochromic film are pressed together and heated so that the interlayers are cured and the electrochromic film is fixed between the two glass panels.” (*Id.*, 1:44-48.) According to the '870 Patent, “additives within the interlayers can infiltrate into multilayer electrochromic films and adversely affect

the electrochromic films.” (*Id.*, 1:48-53.) “As a result, the performance and lifetime of the electrochromic films can be severely compromised.” (*Id.*, 1:48-53; EX1003, ¶45.)

Figure 2 shows a schematic for a typical multilayer electrochromic film that can be affected by such interlayer infiltration during lamination. Electrochromic film 200 includes first and second transparent substrates 202 and 204, such as glass, arranged in spaced, parallel relation. (*Id.*, 4:40-47.) A first transparent electrically conductive film 206 is deposited on interior surface 208 of first substrate 202 to act as an electrode, and a second transparent electrically conductive film 210 is deposited on interior surface 212 of second substrate 204 to act as an electrode. (EX1001, 4:52-56.) Between those electrode-forming conductive films, the device includes an electrochromic material layer 214 on first electrically conductive film 206, a charge storage layer 218 on second electrically conductive film 210, and an electrolyte layer 222 between the electrochromic material layer and charge storage layer. (EX1001, 5:8-16, 5:47-61; EX1003, ¶46.)

The '870 Patent sets out to solve the infiltration problem through “edge protection to protect the edges of the electrochromic film from being infiltrated by undesired materials as well as oxygen and moisture.” (EX1001, 1:60-64.) Although the specification provides several examples of edge-protection, Figures 8 and 9 are the most relevant embodiment for the challenged claims, with Fig. 8 depicting an

unlaminated electrochromic film and Fig. 9 depicting a laminated electrochromic film. (EX1003, ¶47.)

Figure 9, annotated below, depicts an electrochromic device 900 including substrates 902 and 904 (e.g. glass panels) (green), first and second sides 901a and 901b (the electrodes) (blue), and edge protection material 905 and 915 (e.g., epoxy) (yellow). (EX1001, 7:56-64.) One of the two electrodes 901a and 901b serves as an anode and the other as a cathode. (*Id.*) To manufacture the electrochromic device 900, first “[t]he edges of the electrochromic film 901a and 901b are covered by an edge protection material, e.g., a layer of epoxy 905 and 915” (yellow). (EX1001, 7:58-64.) The epoxy 905/915 (yellow) is then cured with heat or ultraviolet light, enabling the epoxy to work as an effective oxygen and moisture blocker for the edges of the electrochromic film. The protected electrochromic film can be laminated in the interlayer 903 between the glass substrates 902 and 904 (green). (EX1001, 7:64-67, 8:1-5; EX1003, ¶48.)

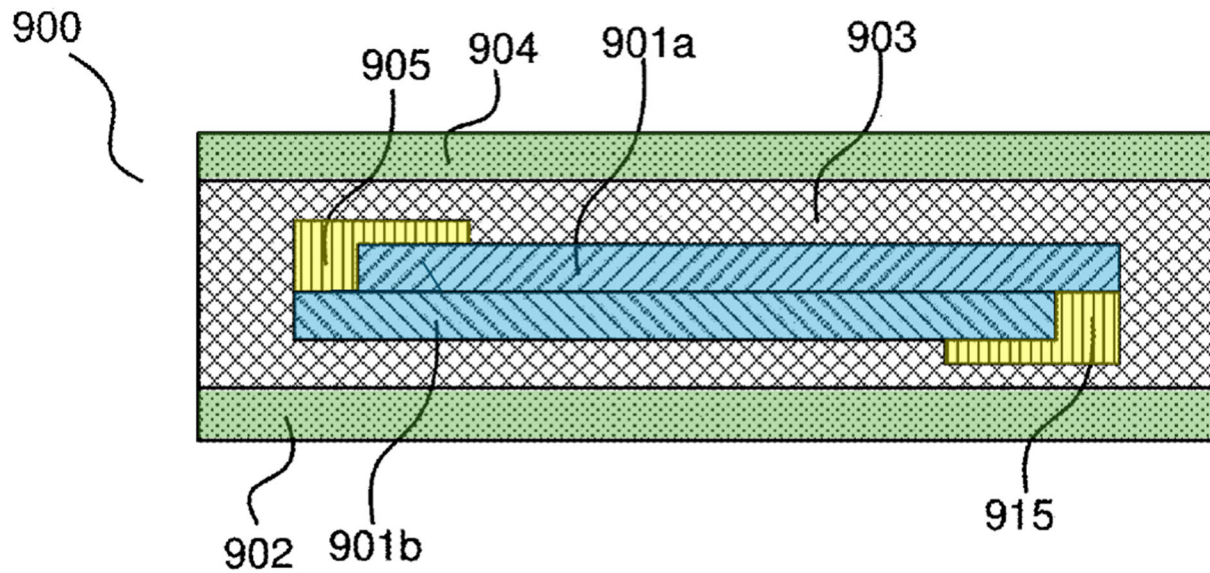
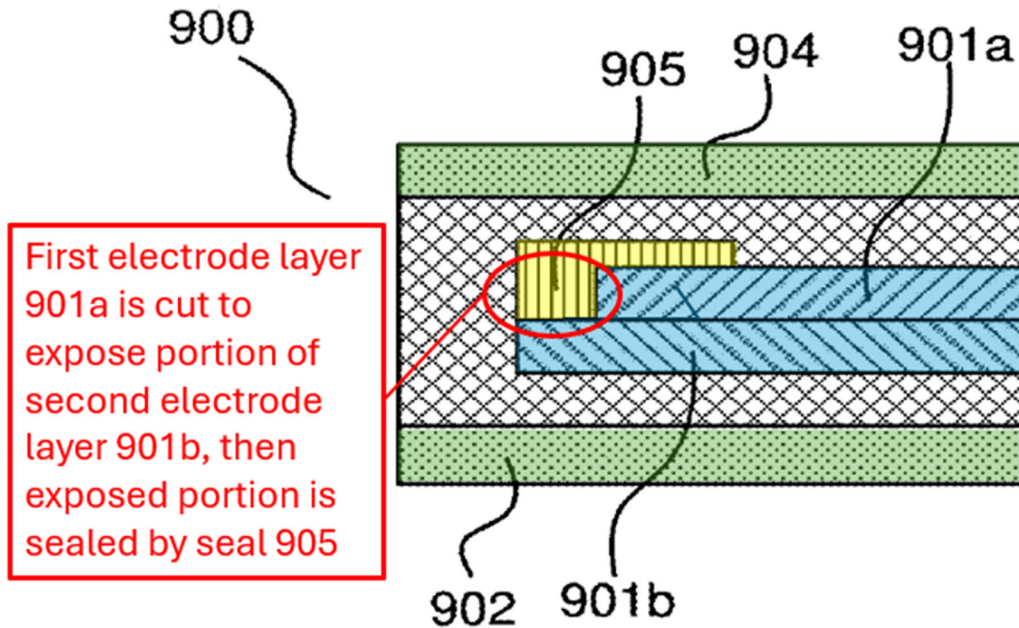


FIG. 9

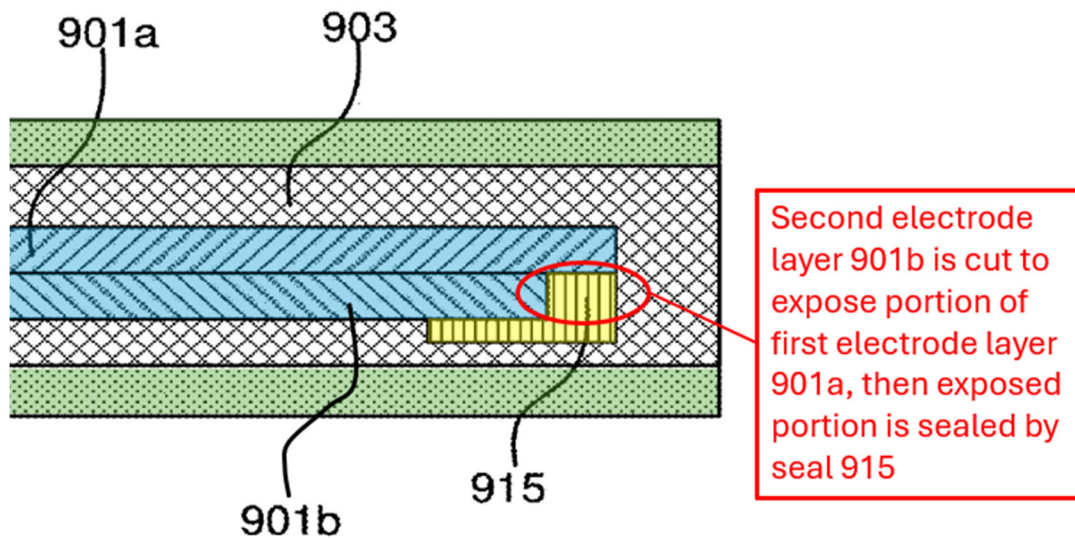
EX1001, Figure 9 (annotated); EX1003, ¶48.

Claim 1, the only independent claim, is directed to edge-protected configuration shown in Figure 9. Claim 1 recites an electrochromic device having an electrochromic film comprising first and second electrode layers (blue) facing each other. An edge of the first electrode layer (901a) is cut such that a portion of an inner surface of the second electrode layer (901b) is exposed:



EX1001, Figure 9 (annotated); EX1003, ¶49.

Likewise, an edge of the second electrode layer (901b) is cut such that a portion of an inner surface of the first electrode layer (901a) is exposed:



EX1001, Figure 9 (annotated); EX1003, ¶50.

Notably, the '870 specification *never once* mentions or describes cutting electrodes or any other layers of the electrochromic film, let alone cutting electrodes to expose portions of the other electrodes. (EX1003, ¶¶51-53.)

The first and second edge protection materials (yellow) seal the exposed portions of the inner surfaces of the first and second electrode layers (901a, 901b), respectively. (EX1001, 9:22-35.) Likewise, the edge protection materials can seal the side surfaces of the first and second electrode layers (901a, 901b), and even extend around the edge to the top surfaces of the first and second electrode materials. (EX1003, ¶¶51-53.)

The '870 Patent touts the benefits of the edge protection (yellow) as protecting the electrochromic film from being infiltrated by unwanted additives and exposed to materials such as oxygen and moisture, thus improving the performance and lifetime of the electrochromic film. (EX1001, 7:61-67, 1:60-64, 2:4-15; EX1003, ¶54.) However, as shown in this Petition, prior art discloses these exact features.

B. Prosecution History

The prosecution history was brief and did not include any prior-art based rejection of the issued claims. The Examiner did not reject the claims under § 102 or § 103, and did not apply any prior art reference against the limitations that ultimately issued in claim 1. Instead, the Examiner only rejected claims under § 112(b). (EX1003, ¶¶55-57.)

The Examiner's first rejection was very limited: claims 1-12 were rejected for not having antecedent basis for the claimed "second electrochromic film." (EX1002 Non-Final Office Action, 547-550 of PDF) Applicant responded by simply correcting the antecedent basis issue, changing "electrochromic film" to "electrode layer." (EX1002, Applicant Response, 559-565 of PDF) The Examiner then issued a final "terminology-based" rejection, arguing that the phrase "a first edge of the first electrode layer" renders claim 1 indefinite because a corresponding "second edge of the first electrode layer" was not recited. (EX1002 Final Office Action, 650-654 of PDF) Applicant responded by again correcting antecedent basis. (*Id.* at 672-678 of PDF.)

In response, the Examiner allowed the claims. The Examiner's stated reason for allowance was that the prior art failed to disclose the claimed edge protection. (EX1002, Notice of Allowance, 705-711 of PDF.) In particular, the Examiner stated that "the prior art fails to disclose wherein a first edge protection material sealing the exposed portion of the inner surface of the second electrode layer, and a second edge protection material sealing the exposed portion of the inner surface of the first electrode layer." (*Id.* at 710 of PDF.)

C. Examiner Error

The Examiner clearly did not do his job. Although Gauthier (EX1004) is not itself cited on the face of the '870 Patent, Gauthier's corresponding PCT publication

is WO 2014/134714 A2 dated September 2014, and is cited on the face of the '870 Patent. Gauthier WO 2014/134714 A2 was cited in an IDS dated March 15, 2024, but ignored by the Examiner. (EX1002, 30-35 of PDF.) The Examiner did not apply Gauthier WO 2014/134714 A2 or any other prior art to the original claims of the '870 Patent. Rather, he allowed the claims based on the mistaken view that the prior art failed to disclose the two edge-protection limitations: (1) a first edge protection material sealing the exposed portion of the inner surface of the second electrode layer, and (2) a second edge protection material sealing the exposed portion of the inner surface of the first electrode layer. (EX1002, Notice of Allowance, 705-711 of PDF; EX1003, ¶¶58-59.)

This was clear Examiner error. As shown by this Petition, Gauthier clearly discloses the very limitations the Examiner identified as missing from the prior art. The Examiner never applied or addressed the disclosure of Gauthier WO 2014/134714 of a very similar electrochromic film structure comprising (1) an electrochromic film including two electrode layers sandwiching switching material all laminated in an interlayer between two glass substrates, (2) cutting portions of the first and second electrodes to expose surfaces of the opposite electrode, (3) sealing the exposed portions and side edges of the electrodes and switching material and (4) encapsulating the electrochromic film stack between two transparent/glass substrates. (EX1003, ¶¶60-61.)

III. PERSON OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the art is evidenced by the references. *See In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed.Cir.1995). A person of ordinary skill in the art (“POSA”) as of the priority date of the ’870 Patent would have had at least a bachelor’s degree in electrical engineering, materials science, chemical engineering, physics, or a similar discipline, and at least 2-3 years of experience working with electrochromic devices, thin-film optical devices, smart-window systems, electrochemical devices, or control systems for such devices. Additional education, such as a master’s degree or Ph.D. in one of these fields, could substitute for some practical experience. (EX1003, ¶30.)

IV. CLAIM CONSTRUCTION (37 C.F.R. § 42.204(b)(3))

The claims should be construed as having their plain and ordinary meaning to a person of ordinary skill in the art according to the *Phillips* standard. *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005); 37 C.F.R. § 42.200. Petitioner submits that no formal claim constructions are necessary because “claim terms need only be construed to the extent necessary to resolve the controversy.” *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011). Petitioner reserves the right to respond to any constructions offered by Patent Owner or adopted by the Board. Petitioner is not conceding that each challenged claim satisfies all statutory

requirements, nor is Petitioner waiving any arguments concerning claim scope or grounds that can only be raised in district court. (EX1003, ¶¶31-32.)

V. GROUND 1: CLAIMS 1-12 ARE INVALID FOR LACK OF WRITTEN DESCRIPTION

A patent claim is invalid if the patent does not contain an adequate written description of the claimed invention. 35 U.S.C. §112. To satisfy the written description requirement under 35 U.S.C. § 112(a), an application must “reasonably convey[] to those skilled in the art that the inventor had possession of” and “actually invented” the claimed subject matter. *Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). This requirement is in place to ensure that the claims do “not overreach the scope of the inventor’s contribution to the field of art as described in the patent specification.” *Reiffin v. Microsoft Corp.*, 214 F.3d 1342, 1345 (Fed. Cir. 2000). The test for adequate written description support “requires an objective inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art. Based on that inquiry, the specification must describe an invention understandable to that skilled artisan and show that the inventor actually invented the invention claimed.” *Ariad*, 598 F.3d at 1351.

The written description requirement limits subsequent claims to the scope of an application’s disclosure, and provides a critical safeguard in preventing retroactive claiming of others’ inventions. *See Chiron Corp. v. Genentech, Inc.*, 363

F.3d 1247, 1255 (Fed. Cir. 2004). This requirement is particularly important for patents issuing from continuation applications, such as the '870 Patent. *See Agilent Technologies, Inc. v. Affymetrix, Inc.*, 567 F.3d 1366, 1379 (Fed. Cir. 2009). “[T]he written description must lead a person of ordinary skill in the art to understand that the inventor possessed the entire scope of the claimed invention.” *Juno Therapeutics, Inc. v. Kite Pharma, Inc.*, 10 F.4th 1330, 1337 (Fed. Cir. 2021).

Here, the claims of the '870 Patent fail the written description requirement because the '870 Patent does not demonstrate possession of the claimed subject matter. Claim 1 includes the following two limitations:

- (1) an edge of the first electrode layer is **cut such that a portion of an inner surface of the second electrode layer is exposed**, and
- (2) an edge of the second electrode layer is **cut such that a portion of an inner surface of the first electrode layer is exposed**, the edge of the first electrode layer and the edge of the second electrode layer are opposing edges;

Similarly, Claim 9 includes the following limitation: “wherein the layer of electrochromic material, the layer of electrolyte material, and the layer of charge storage material are **cut in a same way as the edge of the first electrode layer to expose the portion of the inner surface of the second electrode layer.**” Claim 10 includes a similar limitation: “wherein the layer of electrochromic material, the layer of electrolyte material, and the layer of charge storage material are **cut in a same**

way as the edge of the second electrode layer to expose the portion of the inner surface of the first electrode layer.”

However, the specification of the '870 Patent does not describe or even mention cutting an edge of the first electrode to expose a portion of the inner surface of the second electrode, or cutting an edge of the second electrode to expose a portion of the inner surface of the first electrode. Not once. Other than the claim language itself, the '870 Patent's specification does not include the word “cut,” “cutting,” any other variant thereof, or any similar concept. Even the Summary of the Invention, which typically includes a summary of the claims or a repeat of the claim language, does not include any mention of “cut” or “cutting”, and does not disclose the two “cut to expose” limitations of Claim 1, or the “cut to expose” limitations of Claims 9 and 10. (EX1003, ¶¶65-67.)

Rather, the '870 Patent's specification describes laminating the various layers of the electrochromic device together, including by roll-to-roll processing: “[t]he specification described protecting edges of an electrochromic film that is usually fabricated by a roll-to-roll process with low cost. Since the electrochromic films need to be laminated between substrates (e.g., two glass panels) in their actual application . . .” (EX1001, 8:54-62.) The '870 specification includes many other instances of laminating the electrochromic film between two glass substrates,

sometimes with interlayers. Nowhere does the '870 specification teach or disclose cutting. (EX1003, ¶¶66-69)

A POSA would read the '870 Patent and understand that the structure that exposes a portion of the inner surfaces of the first and second electrodes is formed by laminating the electrodes together in an off-set fashion. (EX1003, ¶¶68-69.) That is the most common, efficient and cost-effective way to laminate two layers of material together while leaving portions of the inner surfaces of each layer exposed. (*Id.* at ¶69.) A POSA would understand that cutting portions of the first and second electrodes, or cutting the electrochromic layer(s), would require additional time, effort, expense and expertise, while running the risk of damaging or harming the electrodes. (*Id.* at ¶70.)

Additionally, while the original claims in Application No. 18/606,980 filed on March 15, 2024 that ultimately resulted in the '870 Patent included the “cutting to expose” claim language, those claims cannot provide support under §112 for the “cutting to expose” elements in the '870 claims. The '870 Patent is a continuation of U.S. patent application Ser. No. 18/152,033 filed on Jan. 9, 2023 (parent), which is a continuation of U.S. patent application Ser. No. 16/190,723 filed on Nov. 14, 2018 (grandparent), now issued as U.S. Pat. No. 11,571,878. The '870 Patent is a straight continuation of both the parent and grandparent upstream applications. Neither the parent U.S. Application No. 18/152,033 or the original grandparent U.S. Application

No. 16/190,723 included any mention or description of cutting. Like the '870 specification, the specification of the two upstream applications did not mention “cut”, “cutting” or any variant at all, not even once. Additionally, neither of the two upstream applications mentioned “cut”, “cutting” or any variant thereof in the original claim sets or in the issued claims. (EX1003, ¶¶71-72.) The “cutting to expose” limitations showed up for the first time in the as-filed claims of the '870 Patent, filed nearly six years after the original grandparent priority application. (*Id.*)

Use of the “cutting to expose” language in the original '870 claims cannot satisfy the written description requirement. When an applicant seeks to add new claims pursuant to a continuation or divisional application, U.S. patent law explicitly requires that the original specification provide adequate support for the new claims in the original specification to satisfy the §112 written description requirement for the new claims. 35 U.S.C. § 120. Patent Owner cannot manufacture written description support for “cutting to expose” nearly 6 years later by inserting that language into a new set of claims in a grandchild continuation application.

Because Claim 1 lacks written description support (as do Claims 9 and 10), and each of dependent Claims 2-12 depend either directly or indirectly from Claim 1, Claims 1-12 of the '870 Patent are all invalid because they fail to satisfy the written description requirement of 35 U.S.C. §112. (EX1003, ¶¶62-73.)

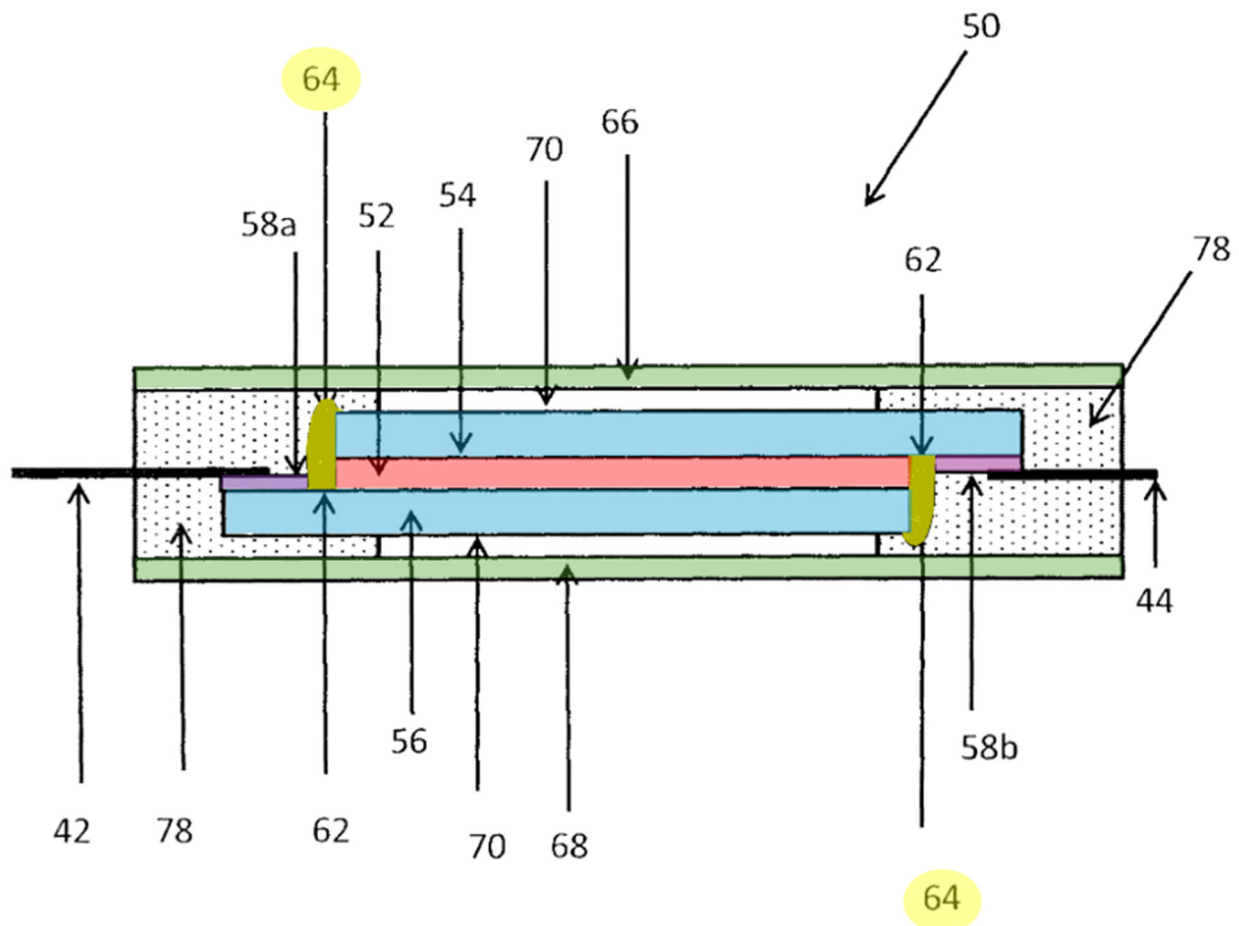
VI. GROUND 2: CLAIMS 1-12 ARE OBVIOUS OVER GAUTHIER

A. Overview of Gauthier

Gauthier solves the same problem as the '870 Patent: protecting sensitive switchable/electrochromic film materials from environmental exposure and degradation. (EX1003, ¶76.) Gauthier teaches an edge seal system to protect layered switchable films. Gauthier explains that a switchable film generally includes two electrode substrates with switchable material between them, and discloses a “seal around the perimeter of the switchable material to keep it separated from water, air, oxygen or other aspects of the external environment.” (EX1004, 1:13-22.) Gauthier further states that doing so “may be beneficial in preserving function, or preventing degradation or diminished performance.” (EX1004, 1:22-24.)

Gauthier’s layered structure tracks the '870 Patent’s claimed structure. (EX1003, ¶¶77-80.) Gauthier generally discloses a sealed electrochromic film comprising first and second substrates (*i.e.* glass or other transparent material), first and second electrodes disposed inside the first and second substrates, and switching material disposed between first and second electrodes. (EX1004, 5:5-17, 10:17-28.) The first seal is disposed along an exposed edge of the switching material, is compatible with the switching material and may adhere to the electrodes. (EX1004, 5:5-22.) A second seal may be used to encapsulate the first seal. (*Id.*)

An embodiment of Gauthier's encapsulated electrochromic film is illustrated in annotated Figure 6 below. (EX1003, ¶¶78-80.) Switching material 52 (red) is sandwiched between first and second substrates 54 and 56 (blue), each of which includes a conductive coating that functions as an electrode in contact with the switching material 52. (EX1004, 10:54-59; 23:20-30.) Portions of these electrode-bearing substrates 54 and 56 and switching material 52 are removed to expose the conductive coating on the inner surface of both the top electrode-bearing substrate 54 and the bottom electrode-bearing substrate 56. (EX1004, 10:59-61.)



EX1004, Figure 6 (annotated); EX1003, ¶78.

Still referring to Fig. 6 above, busbar 58a (purple) is attached to the exposed inner surface of the top electrode-bearing substrate 54, and busbar 58b is attached to the exposed inner surface of the bottom electrode-bearing substrate 56, thus placing the busbars in contact with the conductive coatings on substrates 54 and 56. (EX1004, 10:54-59.) First seals 64 (yellow) are applied to the remaining exposed surfaces of the top electrode 54 and the bottom electrode 56. Specifically, first seals 64 are applied in the space 62 between the busbars and the switching material on the inner surfaces of both electrode-bearing substrates 54 and 56, adjacent to the cut edges of the switching material and the opposite electrode. (EX1004, 10:61-64; EX1003, ¶79.)

Transparent layers 66 and 68 (such as glass, shown in green above) are positioned on the top and bottom of the electrochromic film. The transparent layers 66 and 68 and a second seal 78 encapsulate the electrode-bearing substrates 54 and 56 (blue), switching material 52 (red), busbars 58a and 58b (purple), and first seal 64 at both edge regions (yellow), while being separated from the switching material by first seal 64. (EX1004, 10:64-11:5; EX1003, ¶80.)

Gauthier explains how the offset-edge structure of Figure 6 is made. (EX1003, ¶¶80-81.) The switchable material is first coated onto a conductive coating of a substrate/electrode, and a second substrate/electrode is then laminated on top with

its conductive coating side in contact with the switching material to form an electrochromic film sandwich structure. (*Id.*; EX1004, 24:39-54.) The electrochromic film sandwich structure is cured and then cut to size. (EX1004, 24:54-57.)

Once the sandwich is cured, the substrate and switchable material may be cut to expose conductive electrode surfaces. Gauthier teaches different ways to cut the first and second electrode-bearing substrates to form offset edges and remove switching material, thereby providing a busbar platform directly on the conductive layer on the interior side of the electrodes. (EX1004, 5:67-6:5.) One way is mechanical cutting with items like scissors or a knife. (EX1004, 8:58-67.) Another way is laser kiss-cutting the film so that the laser cuts through the uppermost substrate, conductive coating, and switching material without cutting through or damaging the lower conductive coating and lower substrate. (EX1004, 5:67-6:5; 8:52-9:3, 9:32-41.) Those offset cuts expose conductive electrode surfaces in the same manner claimed by the '870 Patent. (EX1003, ¶82.)

The busbars may be applied to exposed first and second conductive surfaces of the substrates. The first seal is then applied along the cut edge of the switching material, the cut edge of electrode-bearing substrate and the remaining exposed surfaces of the electrode-bearing substrates not covered by the busbars. (EX1004, 10:51-67.) The first seal also includes a portion that extends onto the top surface of

the cut electrodes, opposite exposed surface of the opposite electrode. Seals may be “a thermoplastic, a thermoset, a rubber, a polymer or metal, a metallized tape, or combinations thereof.” (EX1004, 16:63-65.) The seal may be electrically insulating, and may be gas impermeable. (*Id.*, 17:9-11.) The seal may also have a low amount of electrical conductivity, or be overlaid with a metal layer or metal foil or tape. (*Id.*, 3:49-55; 18:65-19:1.) (EX1003, ¶83.)

First seal 64 serves the same protective function the '870 Patent attributes to its edge protection material, namely blocking undesired materials, oxygen, and moisture. Gauthier teaches that its seal may isolate the switching material from other components or from the ambient environment, including air and moisture. (EX1004, 6:41-55.) In the offset-edge region, first seal 64 seals the cut edge of switching material 52 and contacts the conductive coating of the uncut substrate, helping maintain the seal in position. (EX1004, 5:67-6:5, 10:51-60.) Gauthier further teaches selecting seal materials for adhesion to contacted surfaces, including substrates, conductive layers, and electrodes, and for barrier properties, gas-impermeability, water resistance, and water impermeability. (EX1004, 16:64-17:16.) Accordingly, Gauthier discloses the same core concept: offset cut edges exposing conductive electrode surfaces, with seal material applied at those exposed edge regions to protect the switchable film. (EX1003, ¶¶84-85.)

Like the '870 Patent, Gauthier also teaches that the switchable electrochromic film may be laminated with heat and pressure between top and bottom glass or transparent substrates. (EX1004, 16:25-45.) The transparent conductive coatings may include ITO-coated glass or ITO-coated PET, and that “[a] conductive coating may be an electrode of a switchable film.” (EX1004, 23:13-30.) Likewise, the second seal may be laminated between the glass/transparent substrates to encapsulate the first seal and switching film. Although Gauthier often uses the broader term “switchable film” or “switchable material,” its disclosure expressly includes electrochromic implementations. Gauthier explains that an active layer may respond to electricity as an “electrochromic active layer,” and describes electrochromic active layers in which compounds behave as a redox pair when electricity is applied. (EX1004, 19:64-20:29.) (EX1003, ¶¶86-87.)

B. Claim Element Analysis

1. Claim 1

a) [1.pre] An electrochromic device comprising:

To the extent the preamble is limiting, Gauthier teaches an electrochromic device. Gauthier is directed to layered switchable devices, including switchable films used in optical filters and laminated glass. (EX1004, 1:10-13, 1:60-64.) Gauthier explains that a switchable film generally includes two substrates with switchable material between them, and that a seal may be provided around the

switchable material to separate it from water, air, oxygen, or other aspects of the external environment. (EX1004, 1:13-24.)

Although Gauthier often uses the broader term “switchable film” or “switchable material,” its disclosure expressly includes electrochromic devices. Gauthier explains that an active layer may alter light transmittance in response to a stimulus, including electricity, which Gauthier identifies as “an electrochromic active layer.” (EX1004, 19:64-20:8.) Gauthier further describes electrochromic active layers in which compounds behave as a redox pair: when electricity is applied, one compound is electrochemically oxidized to a colored state and another is electrochemically reduced to a colored state. (EX1004, 20:14-29.) A POSA therefore would have understood Gauthier’s switchable film/device disclosure to include electrochromic devices. (EX1003, ¶¶88-91.)

Gauthier also describes applying electrical potential to electrodes to cause electrochemical switching. For example, Gauthier states that, “[t]o electrochemically switch a lens,” electrical potential is applied to the electrodes of the film via busbars, causing the switching material to switch. (EX1004, 8:29-32.) Gauthier further states that electrical connectors may be mounted to busbars “to connect the lens to a source of power to facilitate electrochromic switching of the lens.” (EX1004, 8:55-57.)

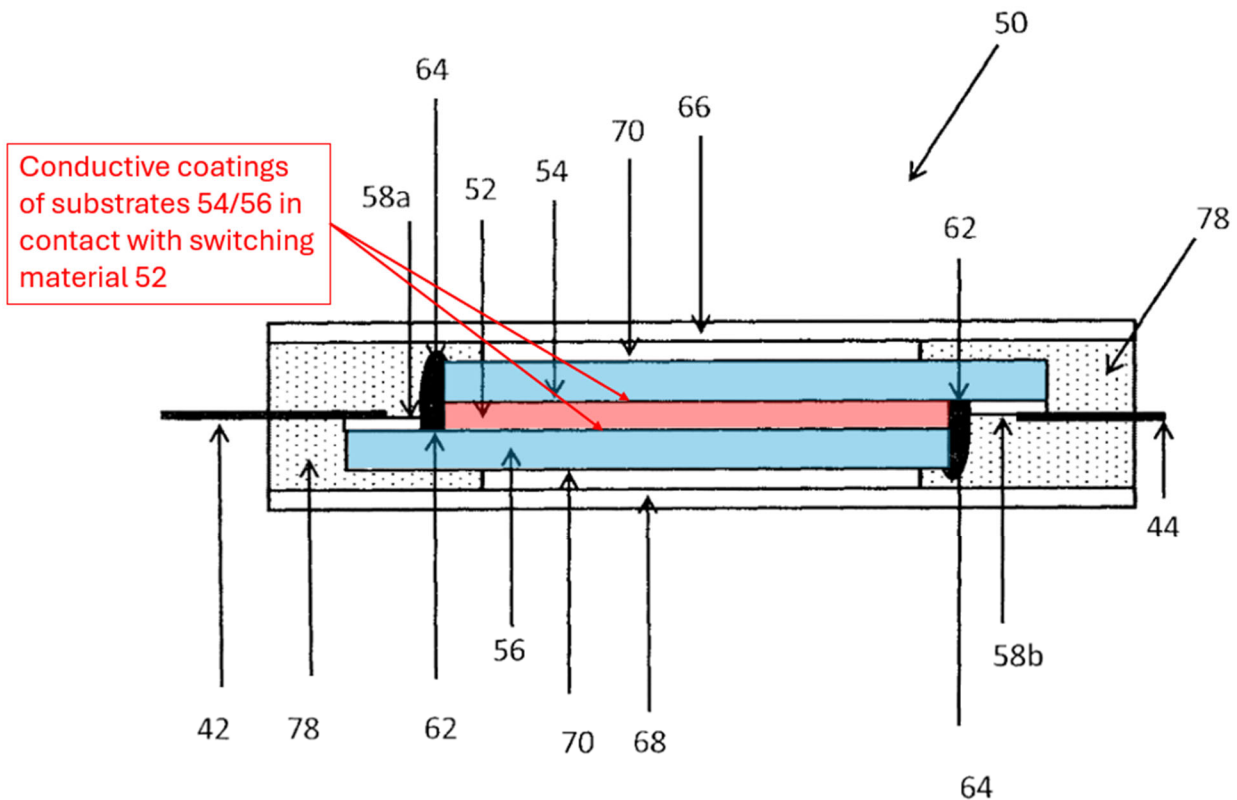
Thus, Gauthier discloses an “electrochromic device.” (EX1003, ¶¶88-91.)

- b) **[1.1] an electrochromic film comprising a first electrode layer and a second electrode layer facing the first electrode layer of the electrochromic film,**

Gauthier teaches an electrochromic film comprising a first electrode layer and a second electrode layer facing the first electrode layer. (EX1003, ¶92.) Gauthier discloses a switchable film having first and second substrates/electrodes and switching material disposed between the substrates/electrodes and in contact with the electrically conductive layer of the substrates/electrodes. (EX1004, 5:5-17.) As explained above, Gauthier's switchable-film disclosure expressly includes electrochromic implementations. (EX1004, 19:64-20:29.)

Gauthier's electrode layers are the substrates coated with conductive coatings. Gauthier describes an encapsulated switchable film comprising "a layer of switching material between a pair of parallel substrates" and "a first and a second conductive coating or layer (first and second electrode)" disposed on a substrate surface. (EX1004, 10:17-28.) Gauthier further explains that conductive coatings may be transparent and may include transparent conducting oxides such as indium tin oxide (ITO) or fluorine tin oxide (FTO), metal or metal oxide coatings, transparent conducting polymers, or other substantially transparent conductive coatings. (EX1004, 23:13-23.) Examples include ITO-coated glass and ITO-coated PET. (EX1004, 23:20-28.) Gauthier then states expressly: "A conductive coating may be an electrode of a switchable film." (EX1004, 23:28-30.) (EX1003, ¶93.)

Annotated Figure 6 (reproduced below) is illustrative. Here, substrates 54 and 56 are shown in blue. Those substrates carry the conductive coatings/electrode layers on their inward-facing surfaces, *i.e.*, the surfaces facing switching material 52 (red). (EX1004, 10:54-59.) Gauthier explains that switching material 52 is positioned between first substrate 54 and second substrate 56, and that busbars 58a and 58b contact the conductive coatings on substrates 54 and 56. (EX1004, 10:54-59.) Gauthier further states that “the conductive coating is in contact with the switching material 52.” (EX1004, 10:57-59.) (EX1003, ¶94.)



EX1004, Figure 6 (annotated); EX1003, ¶94.

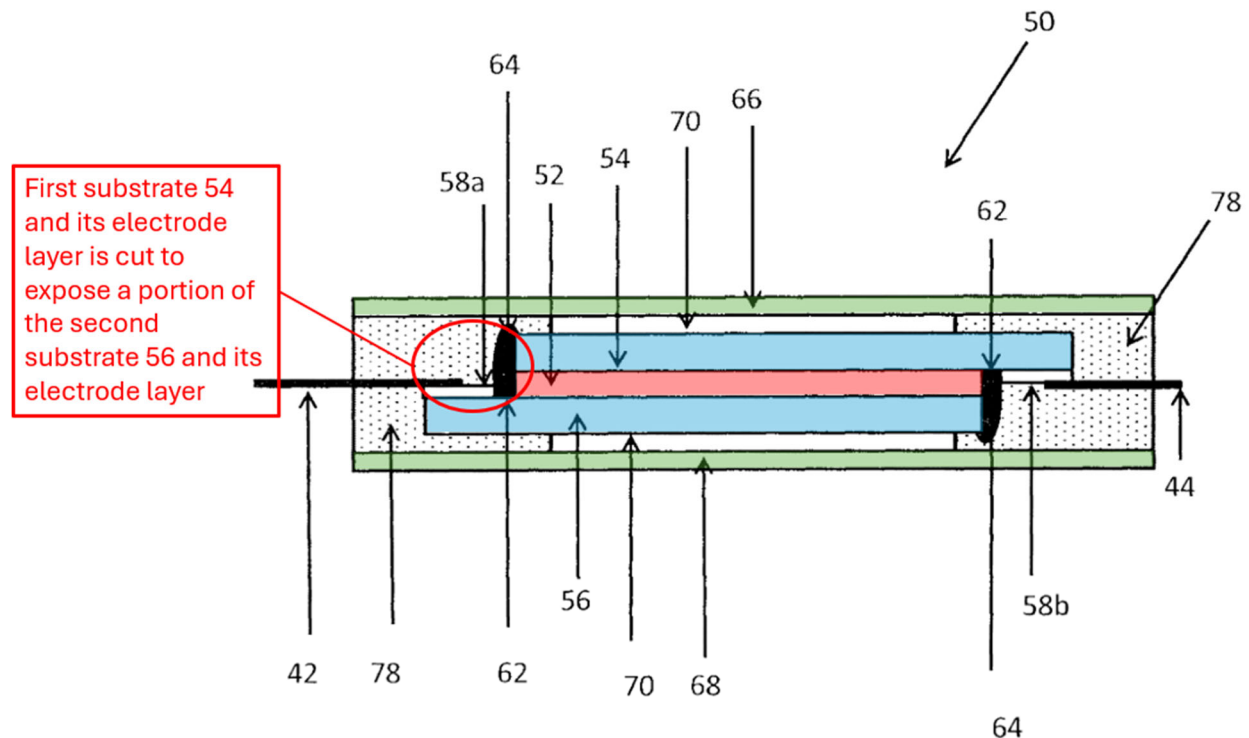
A POSA would have understood Gauthier's conductive coatings on substrates 54 and 56 to be the claimed first and second electrode layers, respectively. (EX1003, ¶95.) Those conductive coatings face one another across switching material 52, contact the switching material, and receive electrical connection through busbars 58a and 58b. (EX1004, 10:54-61.) Gauthier also teaches that portions of substrates 54 and 56 are removed to expose the conductive coating where the busbars are applied, confirming that the electrically conductive layers are located on the substrate-side surfaces exposed in the offset-edge regions. (EX1004, 10:59-61.) (EX1003, ¶95.)

Accordingly, Gauthier discloses an electrochromic film comprising a first electrode layer and a second electrode layer facing the first electrode layer. (EX1003, ¶96.)

c) [1.2] wherein: an edge of the first electrode layer is cut such that a portion of an inner surface of the second electrode layer is exposed, and

Gauthier teaches an edge of the first electrode layer cut such that a portion of an inner surface of the second electrode layer is exposed. (EX1003, ¶¶97-100.) As an example, Figure 6 shows an offset-edge structure in which one side of the electrochromic film stack is cut back relative to the opposing side, thereby exposing the conductive coating/electrode layer on the opposing substrate. Gauthier explains that, in Figure 6, portions of substrates 54 and 56 have been removed “to expose the conductive coating where the busbars may be applied.” (EX1004, 10:54-61.)

Because Gauthier identifies the substrate with conductive coating as an electrode of the switchable film, the exposed conductive coating on the opposing substrate corresponds to the exposed portion of the inner surface of the second electrode layer. (EX1004, 23:28-30; EX1003, ¶¶97-98.)



EX1004, Figure 6 (annotated); EX1003, ¶97.

Gauthier expressly teaches cutting the film stack to create that offset and exposed electrode surface. Gauthier discloses both mechanical and laser cutting, and explains that a laser is preferred “to cut only through the upper most substrate and conductive coating, without cutting through or damaging the conductive coating of the lower substrate.” (EX1004, 8:58-63.) Gauthier similarly describes cutting a portion of a first substrate, but not a second substrate, thereby “leaving the

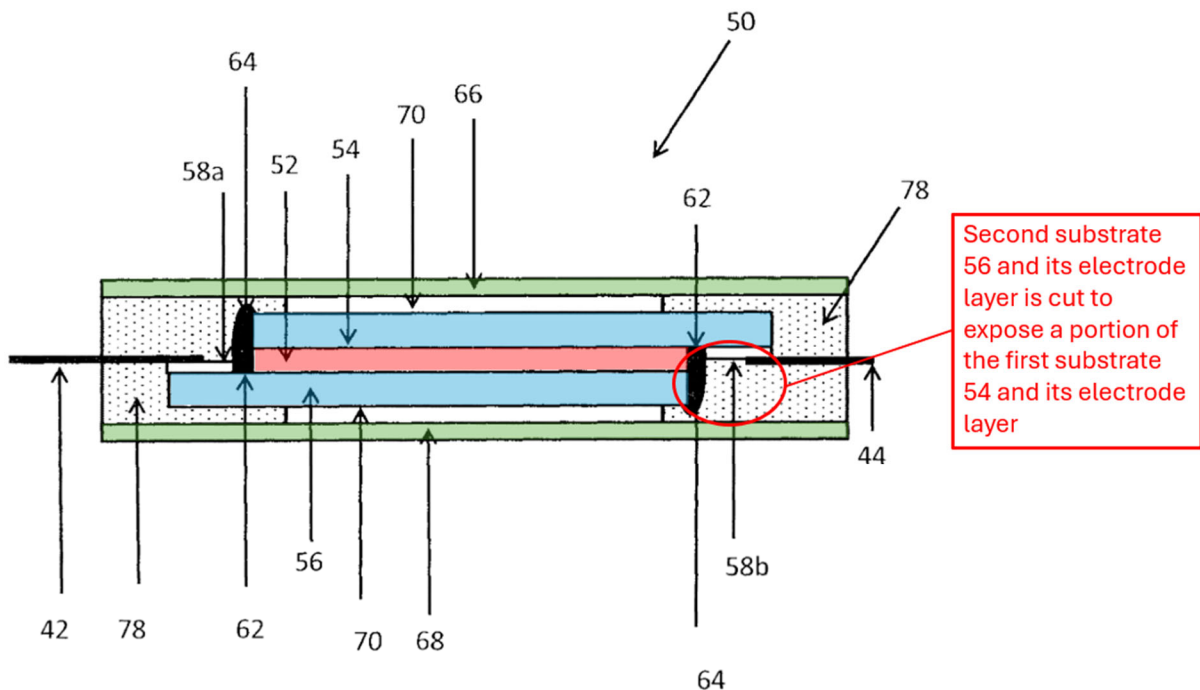
conductive layer of the second substrate intact.” (EX1004, 3:15-20.) After the cut, the substrate/electrode portion is removed, and any switching material remaining on the uncut substrate may be removed to expose the conductive surface. (EX1004, 9:32-41.) (EX1003, ¶99.)

Thus, at one offset edge of Figure 6, Gauthier discloses cutting back the upper substrate/electrode 54 and its conductive coating while leaving the lower substrate/electrode 56 and its conductive coating intact and exposed. A POSA would have understood this to disclose an edge of the first electrode layer cut such that a portion of an inner surface of the second electrode layer is exposed. (EX1003, ¶100.)

- d) [1.3] an edge of the second electrode layer is cut such that a portion of an inner surface of the first electrode layer is exposed, the edge of the first electrode layer and the edge of the second electrode layer are opposing edges**

Gauthier teaches an edge of the second electrode layer cut such that a portion of an inner surface of the first electrode layer is exposed, with that edge opposing the edge discussed relative to [1.2]. (EX1003, ¶¶101-105.) This limitation is the counterpart to [1.2] and is shown at the opposite offset edge of Figure 6. As explained for [1.2], Gauthier teaches offset edge regions in which one side of the film stack is cut back relative to the opposing side, thereby exposing the conductive coating on the opposing electrode-bearing substrate. In Figure 6, portions of electrode-bearing substrate 54 and 56 have been removed “to expose the conductive

coating where the busbars may be applied.” (EX1004, 10:54-61.) At the opposite offset edge, the second electrode-bearing substrate 56 and its conductive coating are cut back, exposing the inward-facing conductive coating of the first substrate 54 where the corresponding busbar is applied. Because Gauthier identifies the substrate with conductive coating as an electrode of a switchable film, that exposed conductive coating corresponds to the exposed portion of the inner surface of the first electrode layer. (EX1004, 23:28-30; EX1003, ¶¶101-102.)



EX1004, Figure 6 (annotated); EX1003, ¶102.

Gauthier expressly teaches that the two cut-back regions are opposing edges. Gauthier describes Figure 6 as showing “the cut edges, busbar and electrical connectors for an encapsulated film with offset edges.” (EX1004, 4:53-56.) In the

related offset-edge embodiment, Gauthier explains that first substrate 54 and second substrate 56 are “offset along opposing sides 60a and 60b,” which “provides for access to the conductive surfaces to apply busbars and electrical connectors.” (EX1004, 6:37-40.) Figure 6 applies that same offset-edge concept in cross-section: busbar 58a is applied at one exposed conductive surface, and busbar 58b is applied at the opposing exposed conductive surface. (EX1004, 10:54-61.) (EX1003, ¶103.)

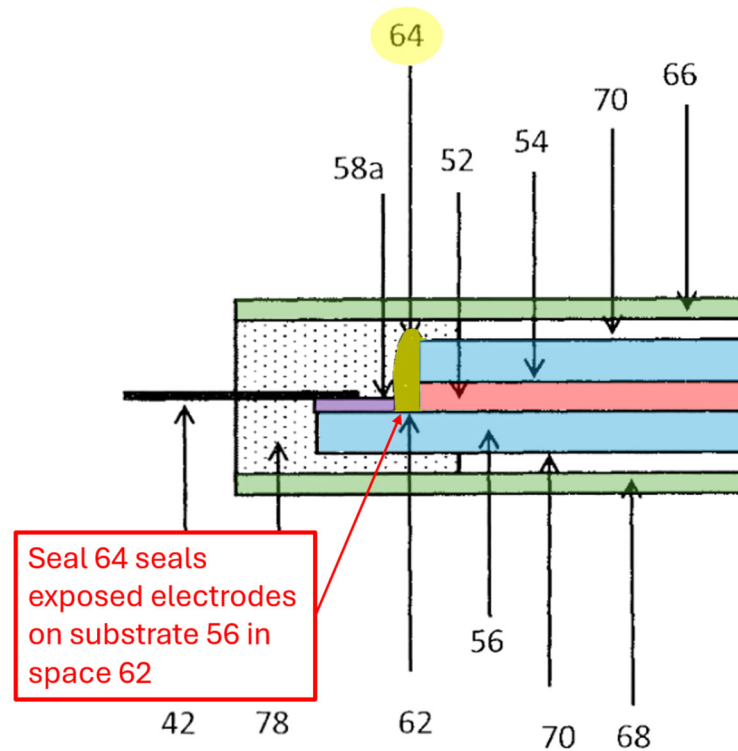
Gauthier’s cutting disclosures confirm that these opposing exposed electrode surfaces are created by cutting. Gauthier teaches mechanical and laser cutting, with laser cutting preferred “to cut only through the upper most substrate and conductive coating, without cutting through or damaging the conductive coating of the lower substrate.” (EX1004, 8:58-63.) The cut electrode-bearing substrate portions are removed, and any switching material remaining on the uncut substrate may be removed to expose the conductive surface. (EX1004, 9:32-41.) Applied at the opposite side of the film, the same process cuts back the second electrode-bearing substrate 56, thereby exposing the conductive coating on the inner surface of the electrode-bearing substrate 54. (EX1003, ¶104.)

Thus, Gauthier discloses opposing offset edges: at one edge, the conductive coating on electrode-bearing substrate 54 is cut back to expose the conductive coating on electrode-bearing substrate 56, as discussed for [1.2]; at the opposing edge, the conductive coating on electrode-bearing substrate 56 is cut back to expose

the conductive coating on electrode-bearing substrate 54. Those conductive coatings correspond to the claimed electrode layers. Gauthier therefore discloses [1.3]. (EX1003, ¶105.)

- e) **[1.4] a first edge protection material sealing the exposed portion of the inner surface of the second electrode layer; and**

Gauthier teaches a first edge protection material sealing the exposed portion of the inner surface of the second electrode layer. (EX1003, ¶¶106-111.) As explained for [1.2], the left-hand offset edge of Figure 6 exposes the conductive coating on electrode-bearing substrate 56. Gauthier's first seal 64 (highlighted in yellow below) is applied to the remaining exposed portion of the conductive coating on electrode-bearing substrate 56 not occupied by busbar 58a and seals the exposed portion.



EX1004, Figure 6 (annotated); EX1003, ¶106.

As explained above with reference to [1.2], Gauthier describes that a portion of electrode-bearing substrate 54 has been removed “to expose the conductive coating where the busbars [58a] may be applied.” (EX1004, 10:54-61.) At the left-hand offset edge, the removed portion exposes the conductive coating on electrode-bearing substrate 56. (EX1003, ¶107.) Gauthier then applies first seal 64 “in a space 62 between the busbar and switching material, adjacent to the cut edge of the switching material.” (EX1004, 10:61-64.) Thus, first seal 64 is located in the same offset edge region as the exposed conductive coating on electrode-bearing substrate 56 and seals that region. (EX1003, ¶107.)

Gauthier further confirms that first seal 64 seals the exposed conductive coating on electrode-bearing substrate 56. Gauthier explains that cutting the substrates to form offset edges and removing switching material provides a busbar platform “directly on the transparent conductive layer on the interior side.” (EX1004, 5:67-6:5.) Busbar 58a may then be positioned on the exposed conductive coating of electrode-bearing substrate 56 to leave gap 62 for seal 64 positioned “along the cut edge of the switching material, thereby sealing the switching material, and physically separating the busbar from the switching material.” (EX1004, 5:67-6:5; 6:34-36.) Gauthier also states that, along the cut edges, “the first seal contacts the cut edge of the switching material and the conductive coating of the uncut substrate,” and that contact with the uncut surface helps maintain the position of the first seal “to ensure a suitable seal for the switching material.” (EX1004, 10:51-60.) For the left-hand offset edge, the uncut electrode-bearing substrate is 56, and its conductive coating is the exposed inner surface of the second electrode layer. (EX1003, ¶¶108-109.)

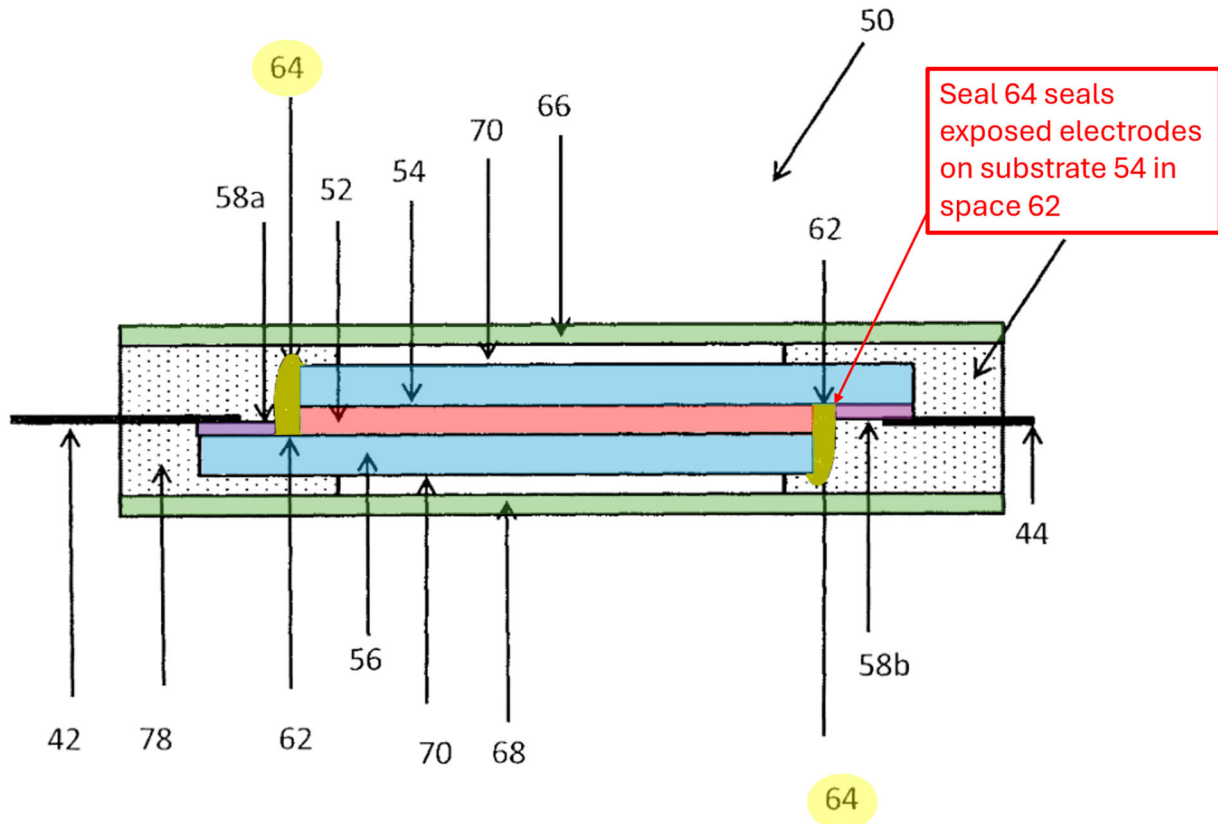
Gauthier’s other descriptions of its seal confirm the same mapping. Gauthier discloses a method of sealing a switchable film by “disposing a first seal in contact with an electrode and adjacent to the switching material.” (EX1004, 2:43-47.) Gauthier also teaches selecting seal materials for adhesion to contacted surfaces, including a “substrate,” “conductive layer,” “electrode,” and “switching material,”

and for barrier properties, including gas-impermeability and water resistance or impermeability. (EX1004, 16:64-17:16.) These are the same protective functions attributed to the '870 Patent's edge protection material. (EX1003, ¶110.)

Accordingly, Gauthier's first seal 64 at the left-hand offset edge is the claimed first edge protection material. It is applied at the exposed electrode region created by the offset cut between the busbar and the cut portion of the switching material, contacts the conductive coating of substrate electrode layer 56, and seals the exposed edge region including the exposed portion of the inner surface of the second electrode layer. Gauthier therefore discloses [1.4]. (EX1003, ¶111.)

f) [1.5] a second edge protection material sealing the exposed portion of the inner surface of the first electrode layer.

The analysis for [1.4] applies equally to [1.5] because Gauthier provides two corresponding offset cut regions and two corresponding seals 64. (EX1003, ¶¶112-115.) As illustrated below in Fig. 6, at the right-hand offset edge, electrode-bearing substrate 56 and its conductive coating are cut back to expose the conductive coating on electrode-bearing substrate 54, and the right-hand seal 64 is applied at that exposed edge region between busbar 58b and switching material 52. (EX1004, 10:54-64; EX1003, ¶¶112-113.)



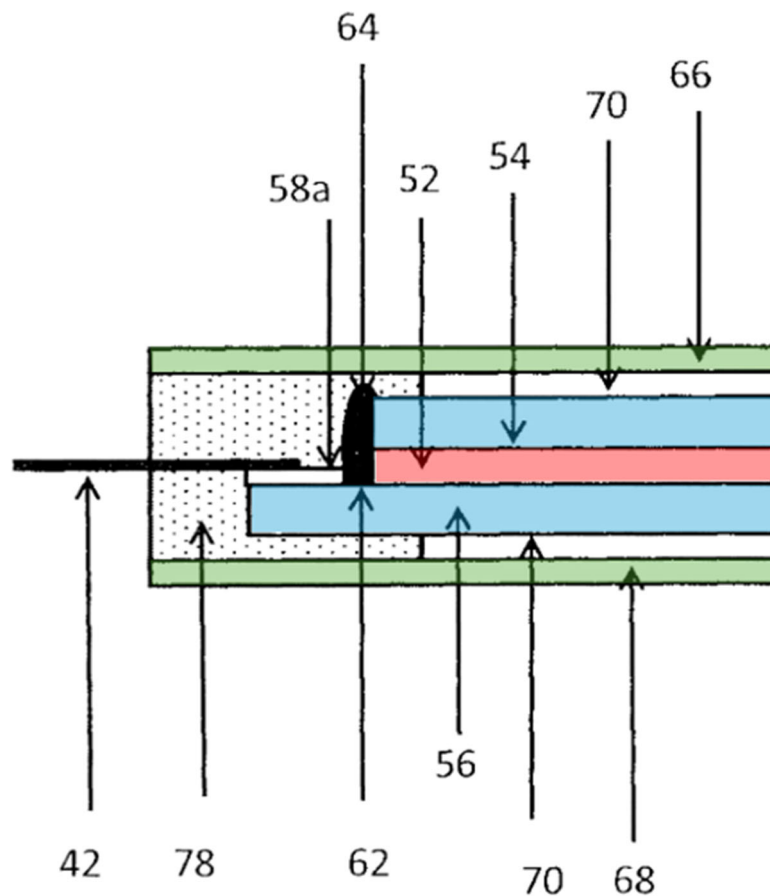
EX1004, Figure 6 (annotated); EX1003, ¶112.

Gauthier teaches that a portion of the first and second electrode-bearing substrates 54 and 56 are removed “to expose the conductive coating where the busbars may be applied,” and that first seal 64 is applied “between the busbar and switching material, adjacent to the cut edge of the switching material.” (EX1004, 10:54-64; EX1003, ¶113.) Gauthier also teaches that first seal 64 contacts the conductive coating of the uncut substrate, ensures a suitable seal, and that its seal materials may adhere to substrates, conductive layers, electrodes, and switching material while providing barrier properties including gas-impermeability and water resistance or impermeability. (EX1004, 10:51-60, 16:64-17:16.) Thus, the right-

hand seal 64 in Figure 6 constitutes the claimed second edge protection material sealing the exposed conductive coating that forms the inner surface of the first electrode layer. (EX1003, ¶¶114-115.)

- 2. Claim 2: The electrochromic device of claim 1, wherein:
the first edge protection material is in an L shape, further
sealing a side surface of the first electrode layer and a
portion of an external surface of the first electrode layer.**

Gauthier discloses the L-shaped first edge protection material recited in claim 2. (EX1003, ¶¶116-124.) As explained relative to [1.4], the left-hand first seal 64, shown for instance in Figure 6, corresponds to the claimed first edge protection material. Seal 64 is positioned at the offset cut region, adjacent to the cut edge of switching material 52, and contacts the conductive coating of uncut electrode-bearing substrate 56. (EX1004, 10:51-64.) Figure 6 further shows that first seal 64 extends along the side of the cut switching material 52 and the electrode-bearing substrate 54, and extends onto at least a portion of the top or upper surface of electrode-bearing substrate 54, giving seal 64 an L-shaped profile. (EX1003, ¶117.)



EX1004, Figure 6 (annotated); EX1003, ¶117.

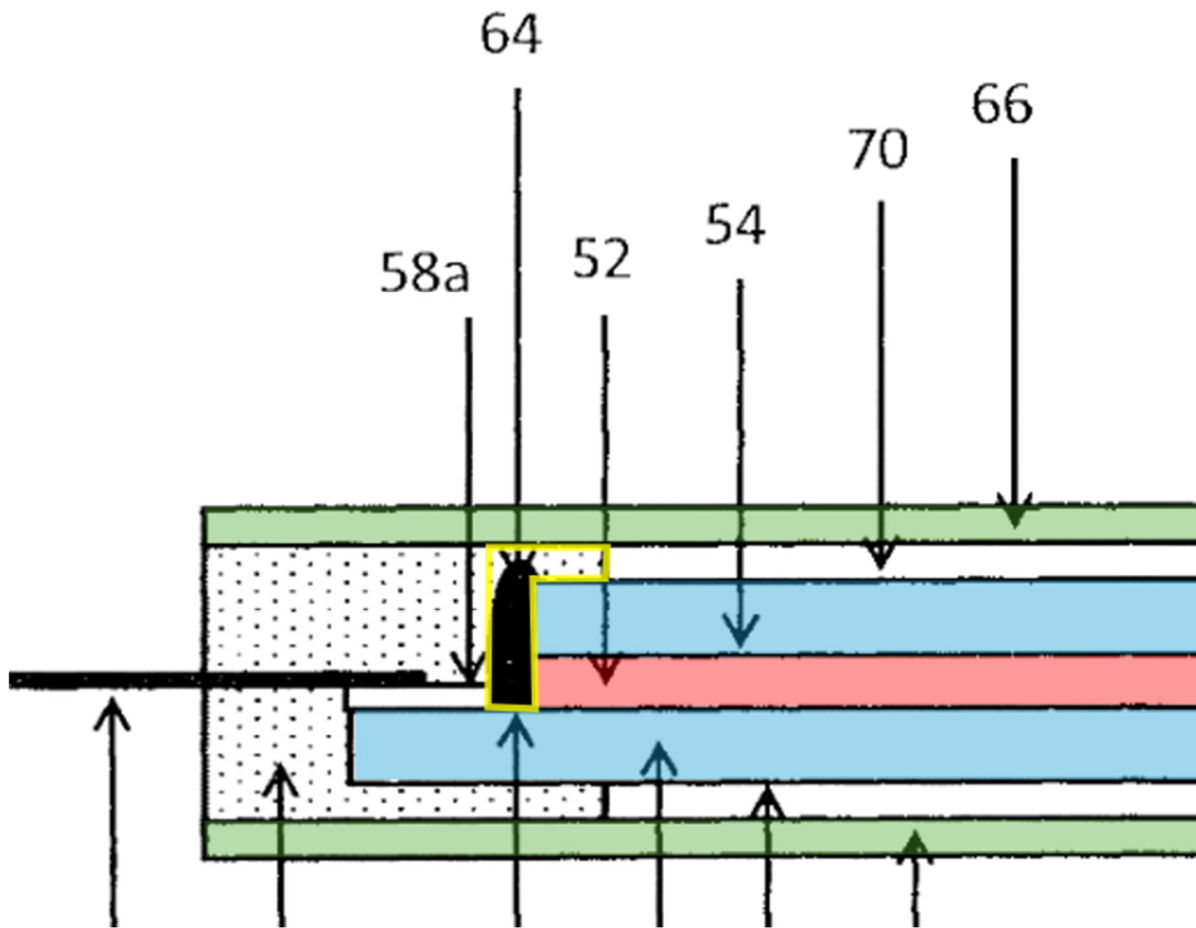
A POSA would have understood the L-shaped profile of seal 64 to seal not only the side surface of the cut portion of electrode-bearing substrate 54, but also a portion of the top or upper surface of that same electrode-bearing substrate 54. (EX1003, ¶118.) That configuration is consistent with Gauthier’s express teaching that seal material may be selected “to provide good adhesion to contacted surfaces,” including a “substrate,” “conductive layer,” “electrode,” “switching material,” and electrical connectors. (EX1004, 16:64-17:3.) As shown in Fig. 6, seal 64 extends up

the side of the cut portion of electrode-bearing substrate 54 and onto the top/upper surface of electrode-bearing substrate 54 to increase the contacted surface area and improve retention of the seal to the switching film at the cut edge. (EX1003, ¶¶118-119.) Gauthier expressly recognizes the benefit of increased adhesion area: offsetting the substrate and conductive layer may provide “a larger surface area for the first, second or first and second sealing material to adhere to,” whereas without an offset, adhesion would depend on the through-cut edge of the film, “a substantially reduced surface area.” (EX1004, 6:61-7:3.)

A POSA would likewise have readily recognized that the portion of the seal extending onto the top surface of electrode-bearing substrate 54 could be modified slightly to be longer or have a different length in order to secure the seal to the electrode-bearing substrate, depending on factors such as seal material and substrate/electrode materials and dimensions. (EX1003, ¶119.)

Alternatively, it would have been obvious to combine Gauthier’s first seal 64 with a portion of Gauthier’s second seal 78 to provide the L-shaped seal. (EX1003, ¶120.) Gauthier teaches that “[t]he second seal may be a separate application of the same material as the first seal, or may be a different seal.” (EX1004, 12:6-9.) As illustrated in Figure 6, second seal 78 encapsulates the switching film and the seals 64. Gauthier explains that second seal 78 is disposed in a space defined in part by transparent layers 66 and 68 and first seal 64, “encapsulating the first seal, busbar

and electrical connector,” while first seal 64 prevents second seal 78 from contacting the switching material. (EX1004, 10:64-11:2.) A portion of the second seal 78 is positioned on top of the first electrode-bearing substrate 54 adjacent first seal 64 between the top transparent/glass layer 66 and the top surface of electrode-bearing substrate 54. (*Id.*) As illustrated below, it would have been obvious to a POSA to combine first seal 64 with a portion of second seal 78, or to simply modify and extend first seal 64, to improve adhesion to and protection of the first seal to the first electrode-bearing substrate 54. (EX1003, ¶¶120-122.) Thus, it would have been obvious to combine Gauthier’s first seal 64 and a portion of Gauthier’s second seal 78, or to modify Gauthier’s seal 64, to form an L-shaped edge protection material with a longer L-leg, particularly where the same seal material is used for both. (EX1003, ¶¶120-122.)



EX1004, Figure 6 (annotated); EX1003, ¶121.

This is consistent with the '870 Patent's stated purpose for edge protection. (EX1003, ¶123.) The '870 Patent does not identify a unique technical benefit for an "L-shaped" seal apart from further sealing the edge structure. Rather, the '870 Patent describes edge protection generally as protecting the electrochromic film from undesired materials, oxygen, and moisture. (EX1001, 1:60-64, 7:61-67.) Gauthier's (1) slightly modified first seal, or (2) combined first and second seals to yield an "L-shaped" seal serves the same purpose: ensuring proper adherence of the seal to the electrodes and switching material in order to isolate switching material from the

ambient environment, including air and moisture, and providing barrier properties such as gas-impermeability and water resistance or impermeability. (EX1004, 6:41-55, 16:64-17:16; EX1003, ¶123.) Accordingly, Gauthier anticipates and/or renders obvious claim 2. (EX1003, ¶124.)

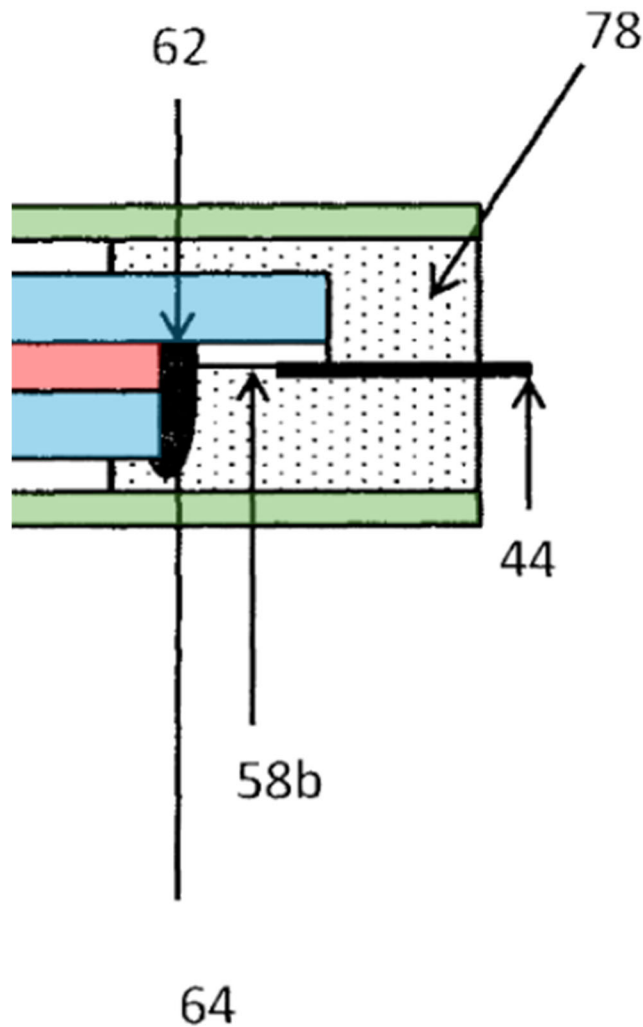
**3. Claim 3: The electrochromic device of claim 1, wherein:
the second edge protection material is in an L shape, further
sealing a side surface of the second electrode layer and a
portion of an external surface of the second electrode layer.**

Gauthier discloses the L-shaped second edge protection material recited in claim 3 for the same reasons discussed for claim 2. (EX1003, ¶¶125-130.) Figure 6 provides, for instance, two corresponding offset cut regions and two corresponding seals 64. As explained relative to [1.5], the right-hand seal 64 corresponds to the claimed second edge protection material and is applied at the offset edge where the second electrode-bearing substrate 56 is cut back to expose the conductive coating on the first electrode-bearing substrate 54. (EX1004, 10:54-64; EX1003, ¶126.)

As with the left-hand seal discussed relative to claim 2, the right-hand seal structure extends along the cut portions of the switching material and second electrode-bearing substrate edge region, and continues over to the bottom surface of the second electrode-bearing substrate 56. Seal 64 thus seals both the side surface and bottom or lower surface of the cut-back electrode-bearing substrate 56 to form an L-shape. Gauthier teaches that seal materials may adhere to substrates, conductive layers, electrodes, and switching material, and may provide barrier properties

including gas-impermeability and water resistance or impermeability. (EX1004, 16:64-17:16.)

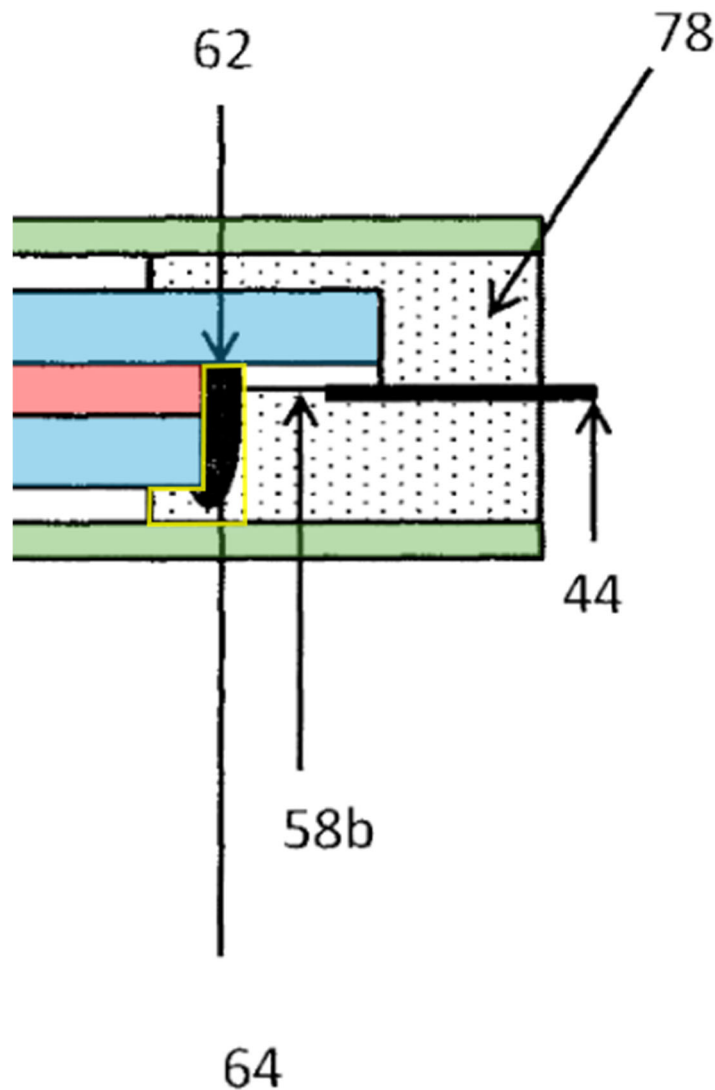
Additionally, as with the first edge protection material described relative to Claim 2, a POSA would likewise have readily recognized that the portion of the seal extending onto the bottom surface of electrode-bearing substrate 56 could be modified to be slightly longer or have a different length in order to secure the seal to the substrate/electrode, depending on factors such as seal material and substrate/electrode materials and dimensions. (EX1003, ¶¶127-128.)



EX1004, Figure 6 (annotated); EX1003, ¶127.

Alternatively, and for the same reasons explained relative to Claim 2 above, it would have been obvious to a POSA to combine first seal 64 with a portion of second seal 78, or to simply modify and extend first seal 64, to improve adhesion to and protection of the first seal to the second electrode-bearing substrate 56. (EX1003, ¶129.) Thus, it would have been obvious to combine Gauthier's first seal 64 and a portion of Gauthier's second seal 78, or to modify Gauthier's seal 64, to

form an L-shaped edge protection material, particularly where the same seal material is used for both. (EX1003, ¶129.) Accordingly, Gauthier anticipates and/or renders obvious claim 3. (EX1003, ¶130.)



EX1004, Figure 6 (annotated); EX1003, ¶129.

**4. Claim 4: The electrochromic device of claim 1, wherein:
the first edge protection material and the second edge
protection material comprise epoxy.**

Gauthier discloses the first and second edge protection materials comprise epoxy. (EX1003, ¶¶131-134.) As explained for [1.4] and [1.5], the left- and right-hand seals 64 in Figure 6 correspond to the claimed first and second edge protection materials. Gauthier teaches that seals may be “a thermoplastic” or a “thermoset” material. (EX1004, 16:63-65.) Gauthier identifies “epoxy groups” among exemplary groups for thermoset seals. (EX1004, 17:17-24.) (EX1003, ¶132.) Gauthier also expressly identifies epoxy seal materials, including DP100, DP105, DP110, and DP125 from 3M, as exemplary seal materials. (EX1004, 18:1-3, 19:5-31.) A POSA would therefore clearly understand that Gauthier’s seals 64 can be epoxy. (EX1003, ¶133.) And because Figure 6 includes corresponding left- and right-hand seals 64, a POSA would have understood that the same epoxy-based material could be used for both the first and second edge-protection materials. (EX1003, ¶134.)

**5. Claim 5: The electrochromic device of claim 1, wherein
the first edge protection material and the second edge
protection material comprise electrically conductive
material.**

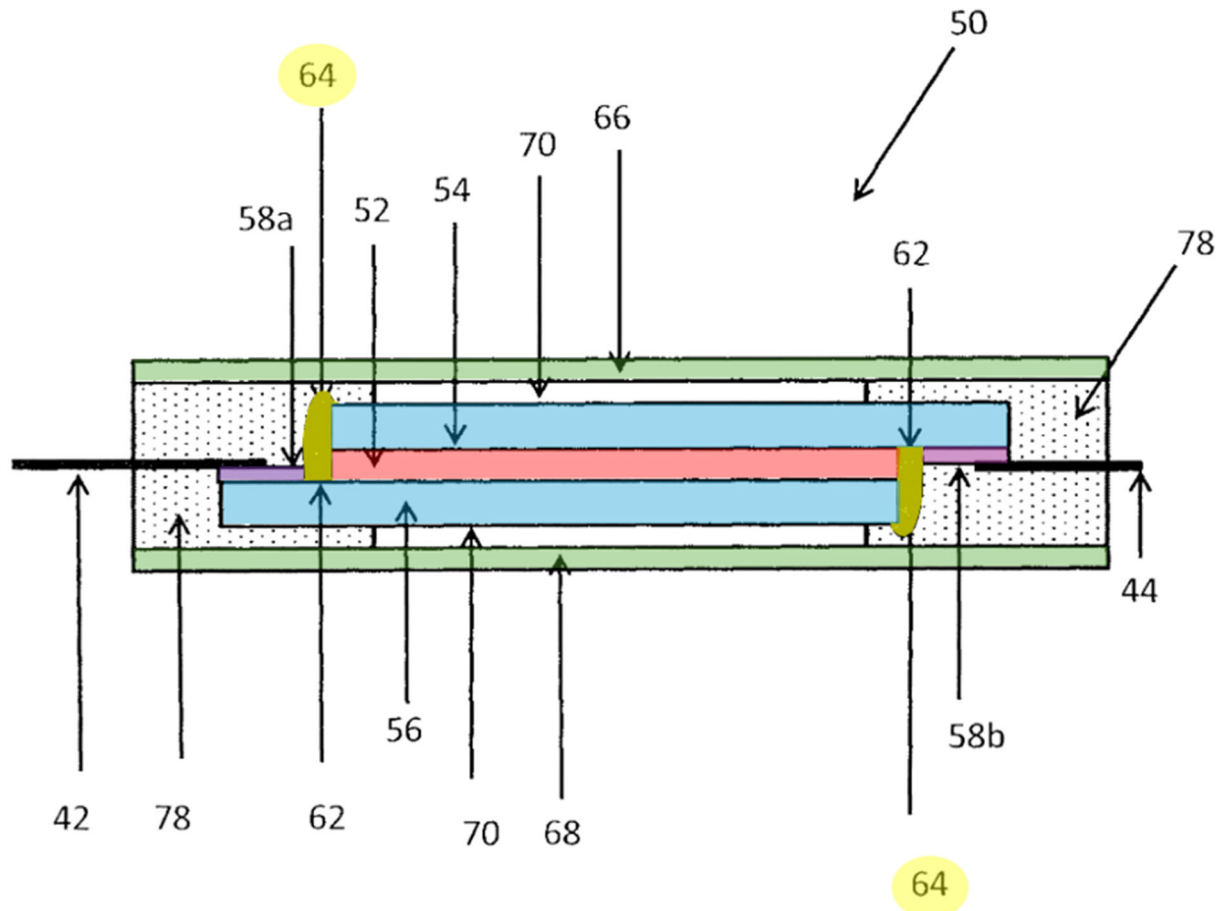
Gauthier discloses that the first edge protection material and the second edge protection material comprise electrically conductive material. (EX1003, ¶¶135-144.) First, Gauthier expressly contemplates electrical conductivity in the first seal 64 itself, stating that, “[i]n some aspects, the first seal has low amount of electrical

conductivity.” (EX1004, 3:49-51.) That disclosure reinforces that Gauthier’s seal 64 may include some electrical conductivity, while the “low amount” qualifier is consistent with implementing conductivity in a controlled manner that avoids shorting the opposed electrodes. (EX1003, ¶136.)

Second, Gauthier teaches that its seals 64 may comprise “metal” or “a metallized tape,” or combinations thereof, and that seal materials may be selected for adhesion and barrier properties. (EX1004, 16:63-17:16.) Gauthier further teaches that “[a] seal overlaid with a metal layer or metal foil or tape may be a useful edge seal system.” (EX1004, 18:65-19:1.) A POSA would have understood Gauthier’s metal layer, metal foil, metal tape, or metallized tape to be electrically conductive material. (EX1003, ¶137.)

Gauthier’s disclosure is particularly relevant because its seals are located adjacent to the busbar and exposed conductive coating of the electrode surface. In Figure 6 (annotated below), first seal 64 is applied in space 62 between the busbar 58a/58b and switching material 52, adjacent to the cut edge of the switching material, while the busbars contact the conductive coatings of the electrode-bearing substrates 54 and 56 exposed by the offset cuts. (EX1004, 10:54-64.) Thus, a POSA would have understood that Gauthier’s metal-overlay teaching could be implemented as a conductive portion of the edge seal system, for example to provide localized conductivity or shielding in connection with the busbar region, without making the

entire seal conductive in a way that shorts the opposed electrodes. (EX1003, ¶¶138-139.)



EX1004, Figure 6 (annotated); EX1003, ¶138.

Claim 5 recites edge protection materials that “comprise” electrically conductive material. Claim 5 thus requires that the edge protection materials *include* electrically conductive material, not consist completely of electrically conductive material. This is because if the first and second edge protection materials themselves are electrically conductive across the claimed sealed edge regions, the claim encompasses an inoperable configuration and Claim 5 is invalid. The '870 Patent

describes Figure 9 as including electrochromic-film sides 901a and 901b, “one as an anode and the other as a cathode,” with the edges covered by edge protection material, such as epoxy 905 and 915 (shown in yellow below). (EX1001, 8:57-65.) If those edge protection materials 905/915 were made electrically conductive across the entire edge regions, they would electrically connect the anode-side and cathode-side electrode structures and short the device, preventing normal electrochromic switching. (EX1003, ¶¶140-141.) The ’870 Patent itself recognizes only that, “[i]n some embodiments,” the edge protection material “may be electrically conductive so that it can function as the electrodes” or, alternatively, “can conduct current to the electrode layer and/or charge storage layer.” (EX1001, 8:11-16; EX1003, ¶141.) The ’870 Patent, however, does not explain how the claimed first and second edge protection materials could be completely electrically conductive in the claimed edge-sealing arrangement without shorting the opposed electrodes. (EX1001, 8:11-16; EX1003, ¶¶142-143.)

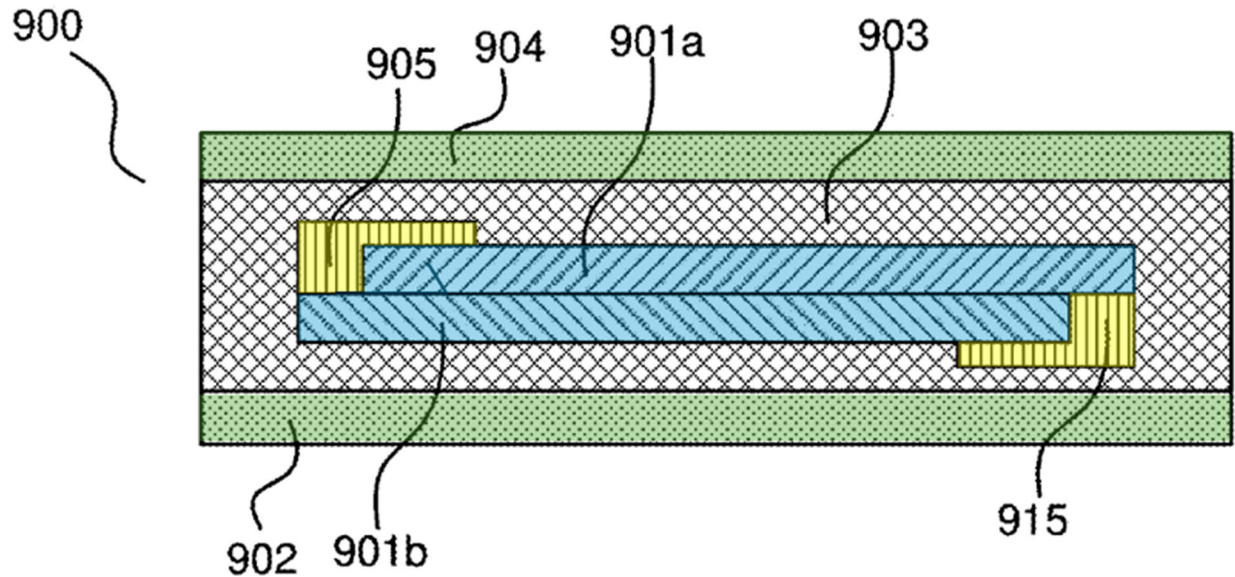


FIG. 9

EX1001, Figure 9 (annotated); EX1003, ¶141.

Accordingly, Gauthier teaches all the elements of claim 5. (EX1003, ¶144.)

To the extent Claim 5 is read to require fully conductive edge protection materials spanning the claimed sealed edge regions, it is inoperable, not enabled, and invalid.

6. **Claim 6: The electrochromic device of claim 1, wherein: the first edge protection material and the second edge protection material are cured with heat or ultraviolet light, functioning as oxygen and moisture blockers.**

As a preliminary matter, claim 6's recitation that the edge protection materials "are cured with heat or ultraviolet light" is product-by-process language. For purposes of patentability, such a process limitation is not entitled to patentable weight unless the process imparts a structural or functional difference to the claimed product. *See In re Thorpe*, 777 F.2d 695, 697-98 (Fed. Cir. 1985) ("If the product in

a product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.”). Here, the claim does not recite any particular chemical structure, crosslink density, composition, permeability value, or other structural property resulting from heat-curing or UV-curing; it merely recites alternative curing mechanisms for forming the same edge protection materials. (EX1003, ¶¶145-146.) Accordingly, the “cured with heat or ultraviolet light” language should be treated as a product-by-process limitation and afforded no patentable weight beyond any structural or functional characteristics actually present in the claimed device. (*Id.*)

To the extent claim 6 is treated as limiting, Gauthier nonetheless discloses this limitation. (EX1003, ¶¶147-150.) As explained for [1.4] and [1.5], Gauthier’s left- and right-hand seals 64 correspond to the claimed first and second edge protection materials. Gauthier teaches that the first seal may comprise thermoplastic and/or thermosetting polymers, that “the first seal is a thermoset material,” and that the first seal may be selected so that it “does not release water when curing.” (EX1004, 4:59-63.) Gauthier further teaches that thermoset seal materials may include polymers with reactive groups, and that “[c]uring or hardening of such materials may be chemical, radiation, temperature or moisture dependent.” (EX1004, 17:17-27.) Gauthier expressly identifies the same curing mechanisms recited in claim 6: “radiation curing may include exposure to light (UV light or visible light),” and

“temperature curing may include resting the material at an elevated temperature.” (EX1004, 17:25-30.) Gauthier also teaches that a chemical cure may be heated to accelerate curing. (EX1004, 17:30-35; EX1003, ¶148.)

Gauthier likewise teaches that the cured seals function as oxygen and moisture blockers. (EX1003, ¶149.) Gauthier explains that a seal for a switchable film prevents ingress of matter that may affect performance of the switching material, and that seal materials may be selected to maintain isolation of the switching material. (EX1004, 6:41-55, 16:64-17:10.) Gauthier further teaches that a seal “may be gas-impermeable” and “may be resistant to water, or may be water impermeable.” (EX1004, 17:7-10.) Those teachings correspond to claim 6’s recitation that the edge protection materials function as oxygen and moisture blockers. (EX1003, ¶149.)

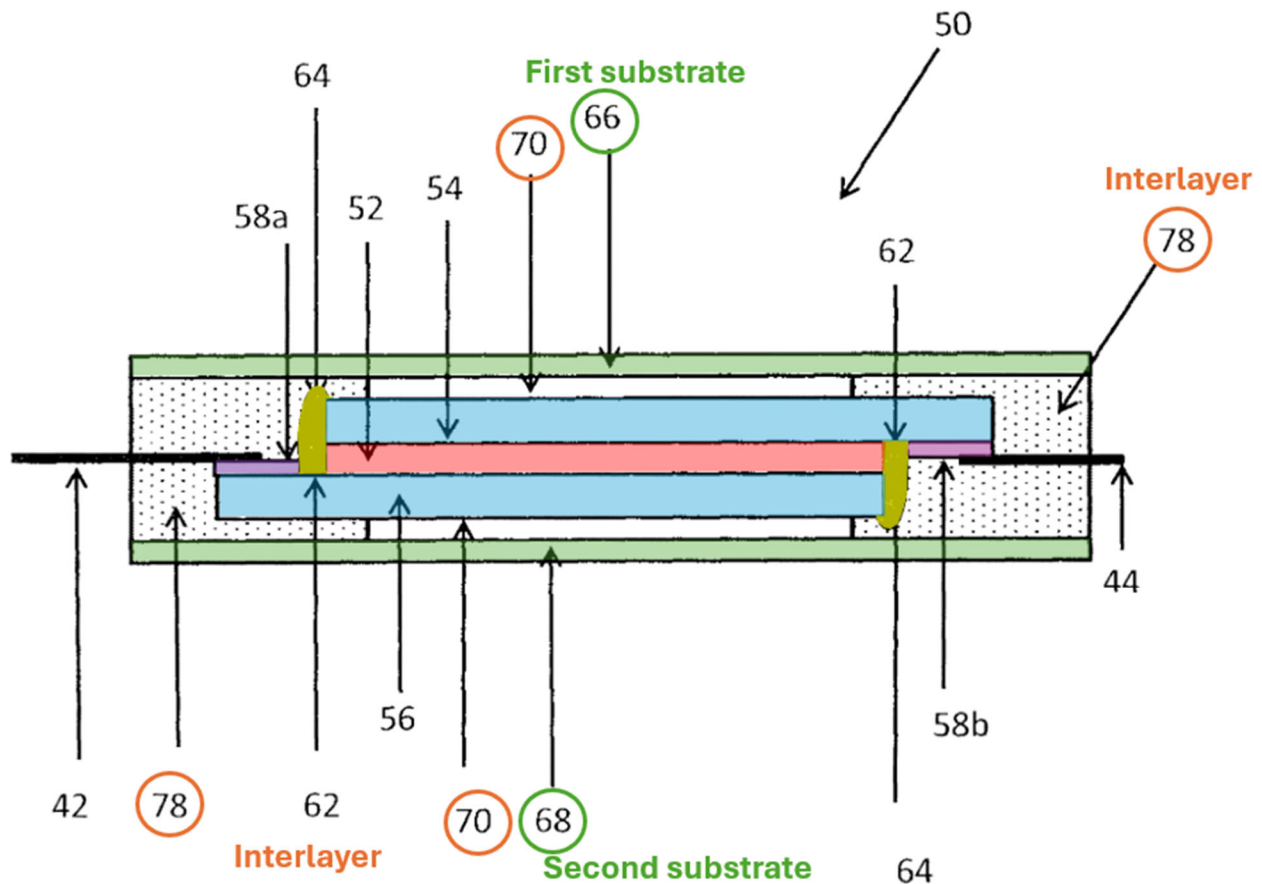
Thus, even if the curing language is given patentable weight, Gauthier discloses using heat- or UV-curable thermoset seal materials for the first and second edge protection materials to provide cured barrier seals that block oxygen and moisture. (EX1003, ¶150.)

7. Claim 7

- a) [7.1] The electrochromic device of claim 1, further comprising: a first substrate; a second substrate; and an interlayer between the first substrate and the second substrate,**

Gauthier teaches a first substrate, a second substrate, and an interlayer between the first and second substrates. (EX1003, ¶¶151-153.) Figure 6 shows the

sealed switchable/electrochromic film positioned between first and second transparent layers (e.g., glass) 66 and 68 (illustrated in green below). Gauthier explains that second seal 78 may be disposed in a space defined in part by “the first and second transparent layers 66, 68 and first seal 64,” thereby “encapsulating the first seal, busbar and electrical connector.” (EX1004, 10:64-11:2.) Gauthier further explains that transparent layers 66 and 68 “may be affixed to substrates 54, 56 by an adhesive 70.” (EX1004, 11:2-5.) Thus, transparent layers 66 and 68 correspond to the claimed first and second substrates, and the material region between them — including adhesive 70 and second seal 78 — corresponds to the claimed interlayer. (EX1003, ¶151-152.)



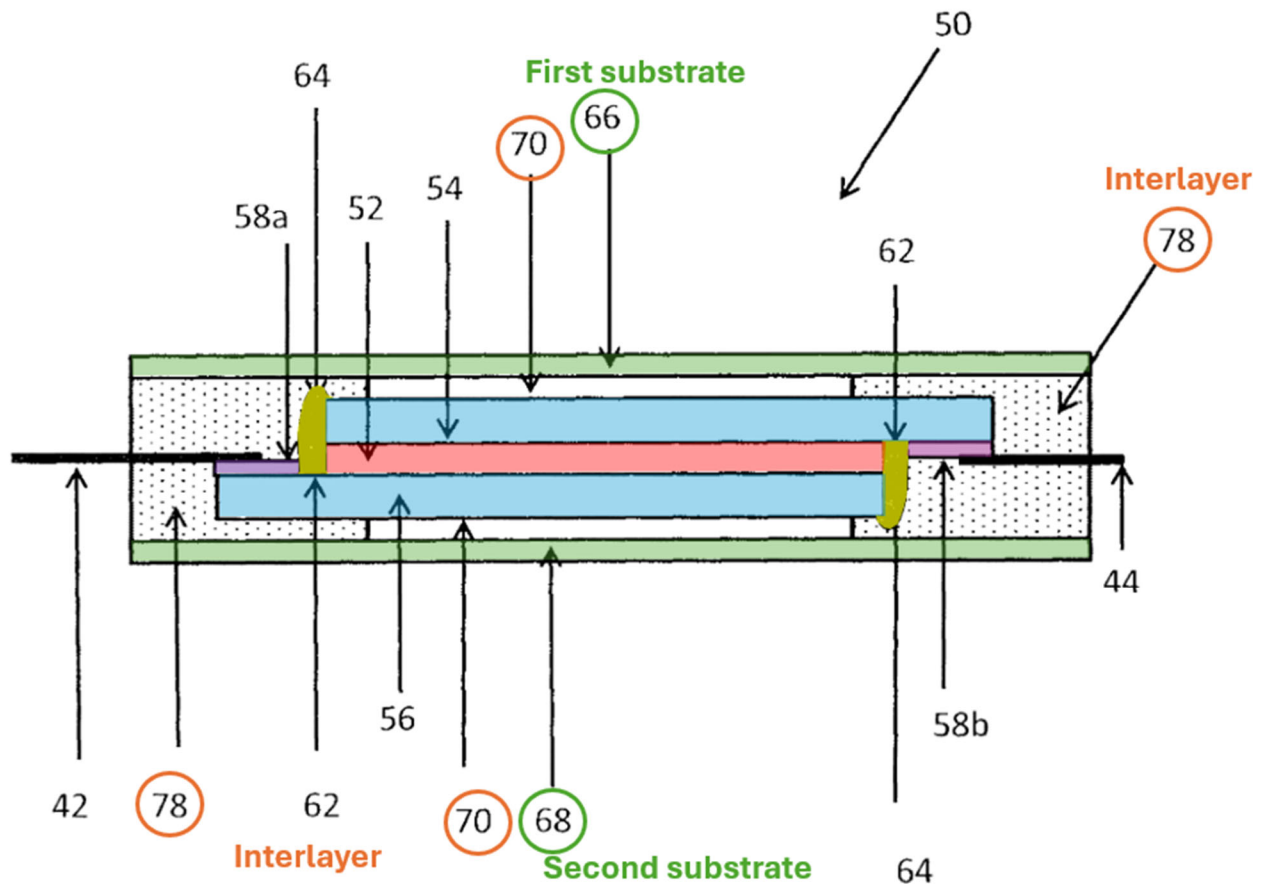
EX1004, Figure 6 (annotated); EX1003, ¶151.

Gauthier confirms that this structure is used in a laminated assembly. Gauthier teaches that “[a] switchable film may be further laminated with heat and pressure between layers of glass, to provide a switchable, laminated glazing,” and that “[t]he switchable film may be layered between layers of PVB, and this between first and second layers of glass.” (EX1004, 16:25-33.) Gauthier further describes processing a “glass-PVB-switchable film-PVB-glass sandwich” using heat and pressure. (EX1004, 16:33-41.) A POSA would have understood these disclosures to teach an

interlayer between first and second substrates that encapsulates the switchable/electrochromic film structure. (EX1003, ¶153.)

- b) [7.2] wherein: the first electrode layer, the second electrode layer, the first edge protection material, and the second edge protection material are laminated within the interlayer.

Gauthier discloses the first electrode layer, second electrode layer, first edge protection material, and second edge protection material are laminated within the interlayer. (EX1003, ¶¶154-156.) As explained for claim 1, Gauthier includes first and second electrode-bearing substrates 54 and 56, and Gauthier's left- and right-hand seals 64 correspond to the claimed first and second edge protection materials. As illustrated in Figure 6, the first electrode layer, second electrode layer, and first and second edge protection materials are laminated between transparent substrate layers 66 and 68 within second seal 78 and adhesive 70. (EX1004, 10:54-11:5; EX1003, ¶¶154-155.)



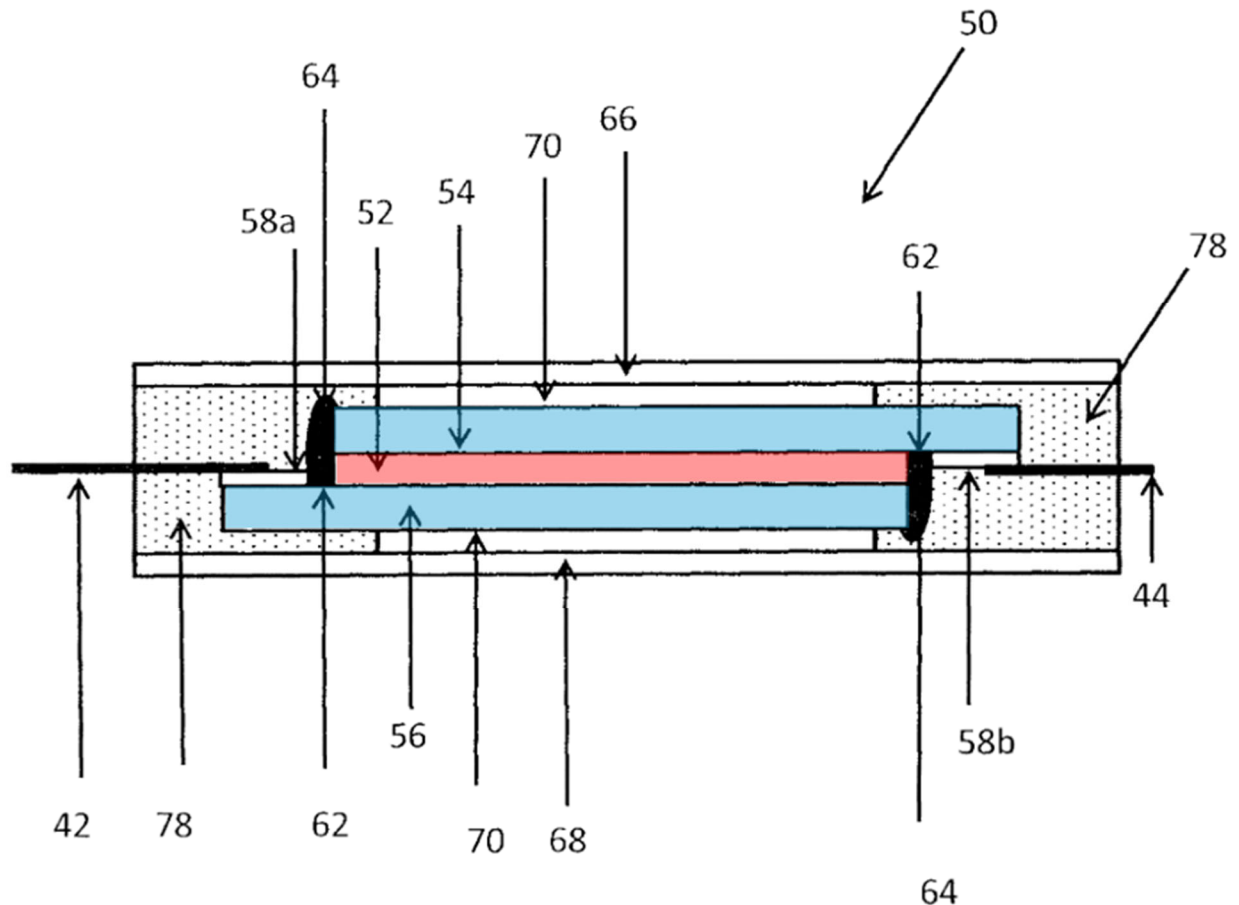
EX1004, Figure 6 (annotated); EX1003, ¶154.

Second seal 78 occupies the edge/perimeter space between transparent layers 66 and 68 and encapsulates first seals 64, busbars 58a and 58b, and a portion of the electrical connector. (EX1004, 10:64-11:2.) Thus, at the edge regions, Gauthier's second seal 78 surrounds and encapsulates the claimed first and second edge protection materials. In the central region, adhesive 70 affixes transparent layers 66 and 68 to electrode-bearing substrates 54 and 56. (EX1004, 11:2-5.) Accordingly, the electrode layers and edge protection materials are laminated within the interlayer between the first and second transparent substrates 66 and 68. (EX1003, ¶155.)

This is further supported by Gauthier's specification as Gauthier teaches laminating the switchable film between PVB layers and outer glass layers in a glass-PVB-switchable film-PVB-glass sandwich. (EX1004, 16:25-41.) Because the switchable film includes the electrode layers and seals discussed relative to claim 1, laminating that film within the PVB/glass stack places those electrode layers and edge protection materials within the interlayer between the outer substrates. (EX1003, ¶156.) Gauthier therefore discloses all the elements of claim 7. (*Id.*)

8. Claim 8: The electrochromic device of claim 1, wherein the first electrode layer and the second electrode layer sandwich a layer of electrochromic material, a layer of electrolyte material, and a layer of charge storage material.

Gauthier discloses the elements of claim 8. As explained for [1.1], Gauthier teaches first and second electrode-bearing substrates 54 and 56, and switching material 52 positioned between the first and second electrode layers. (EX1004, 10:54-59.) Thus, Gauthier's first and second electrode layers sandwich the active electrochromic switching material. (EX1003, ¶¶157-158.)



EX1004, Figure 6 (annotated); EX1003, ¶158.

Gauthier further teaches that the switching material includes a layer of electrochromic material, a layer of electrolyte material, and a layer of charge storage material. Gauthier's active layer may be an "electrochromic active layer" responsive to electricity. (EX1004, 19:64-20:8.) Gauthier explains that electrochromic active layers may comprise compounds that behave as a redox pair: when electricity is applied, one compound is electrochemically oxidized to a colored state and another compound is electrochemically reduced to a colored state. (EX1004, 20:14-29.) A POSA would have understood the electrochemically color-changing compound to

correspond to electrochromic material, and the complementary redox/charge-balancing compound to provide charge-storage or counter-electrode functionality. (EX1003, ¶159.)

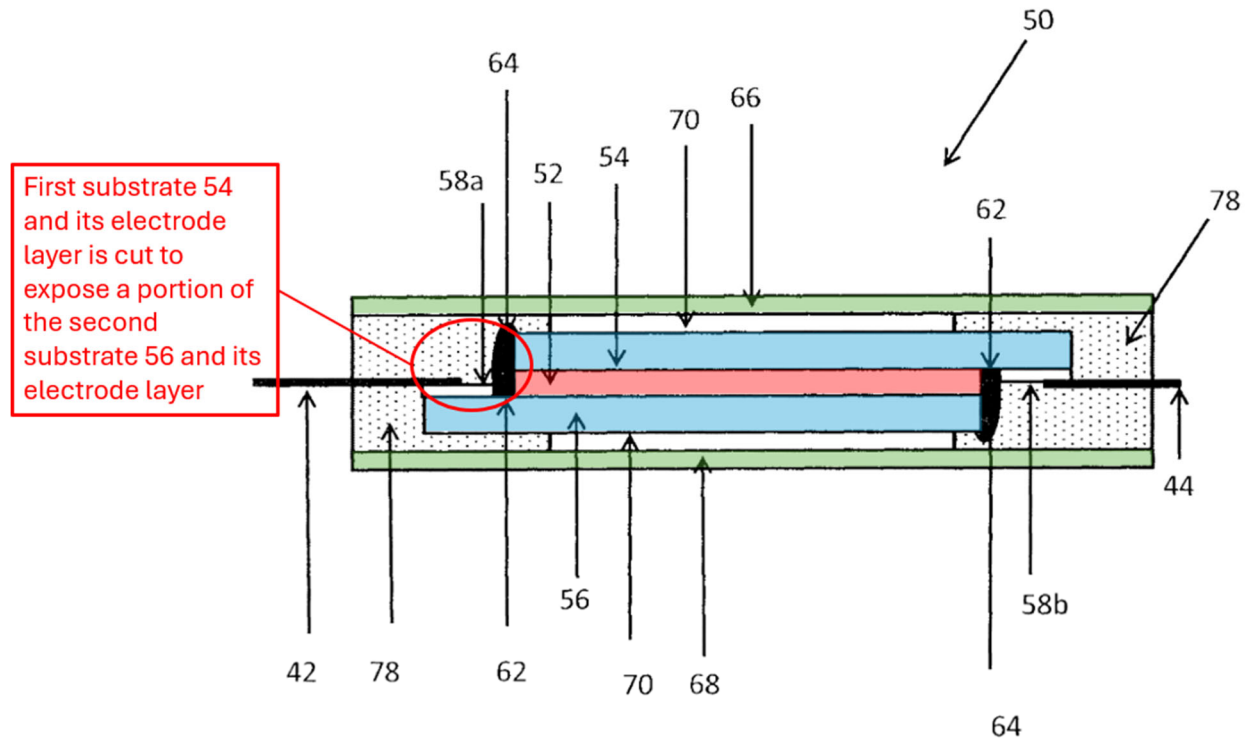
Gauthier also teaches electrolyte material within the sandwiched switching material. Gauthier states that switching material may comprise a polymer and switchable compound and may optionally include a “supporting electrolyte.” (EX1004, 20:43-49.) Gauthier further explains that components of the switching material, including a supporting electrolyte and charge carrier, may provide secondary functions, and that a polymer comprising a switching compound may provide multiple functionalities, including “a charge carrier function” and/or “a supporting electrolyte function.” (EX1004, 20:61-21:5.) Gauthier also identifies exemplary supporting electrolytes, including tetrabutylammonium tetrafluoroborate and tetrabutylammonium bis((trifluoromethyl)sulfonyl)imide (TBATFSI) (EX1004, 21:18-20; EX1003, ¶160.)

Gauthier also teaches that the switching material may be “a single layer of material” or “two or more layers, cast or extruded sequentially or simultaneously one on top of the other.” (EX1004, 20:49-52.) Gauthier further teaches embodiments in which two or more layers of switching material are co-extruded, or a first layer is applied to a first substrate, a second layer is applied to a second substrate, and the resulting substrate-switching material-substrate sandwich is laminated. (EX1004,

22:23-45.) In view of Gauthier's electrochromic redox-pair, supporting-electrolyte, and charge-carrier teachings, a POSA would have understood Gauthier to implement the sandwiched switching material as layered electrochromic, electrolyte, and charge-storage/counter-electrode materials between the opposing electrode layers. (EX1003, ¶¶161-162.) Accordingly, Gauthier discloses all the elements of claim 8. (*Id.*)

- 9. Claim 9: The electrochromic device of claim 8, wherein the layer of electrochromic material, the layer of electrolyte material, and the layer of charge storage material are cut in a same way as the edge of the first electrode layer to expose the portion of the inner surface of the second electrode layer.**

Gauthier discloses the elements of claim 9. (EX1003, ¶¶163-167.) As explained relative to claim 8, Gauthier's switching material 52 includes the claimed electrochromic material, electrolyte material, and charge-storage material between the first and second electrode layers. As explained for [1.2], Gauthier teaches cutting the edge of the first electrode layer to create the left-hand offset edge of Figure 6 and expose the conductive coating on electrode-bearing substrate 56. Gauthier teaches that portions of electrode-bearing substrates 54 and 56 are removed "to expose the conductive coating where the busbars may be applied," and that first seal 64 is then applied adjacent to "the cut edge of the switching material." (EX1004, 10:54-64.)



EX1004, Figure 6 (annotated); EX1003, ¶164.

Gauthier’s cutting process confirms that the active material layers are cut or removed in the same way as the edge of the first electrode layer to expose the second electrode layer. (EX1003, ¶165.) Gauthier teaches cutting the electrochromic film with a laser “to cut only through the upper most substrate and conductive coating, without cutting through or damaging the conductive coating of the lower substrate.” (EX1004, 8:58-63.) Gauthier further explains that, after the electrochromic film is cut, “portions are removed, and any switching material remaining on the uncut substrate is removed.” (EX1004, 9:32-41.) Gauthier similarly teaches that “cutting the first and second substrates [e.g. electrodes] to form offset edges, and removing a

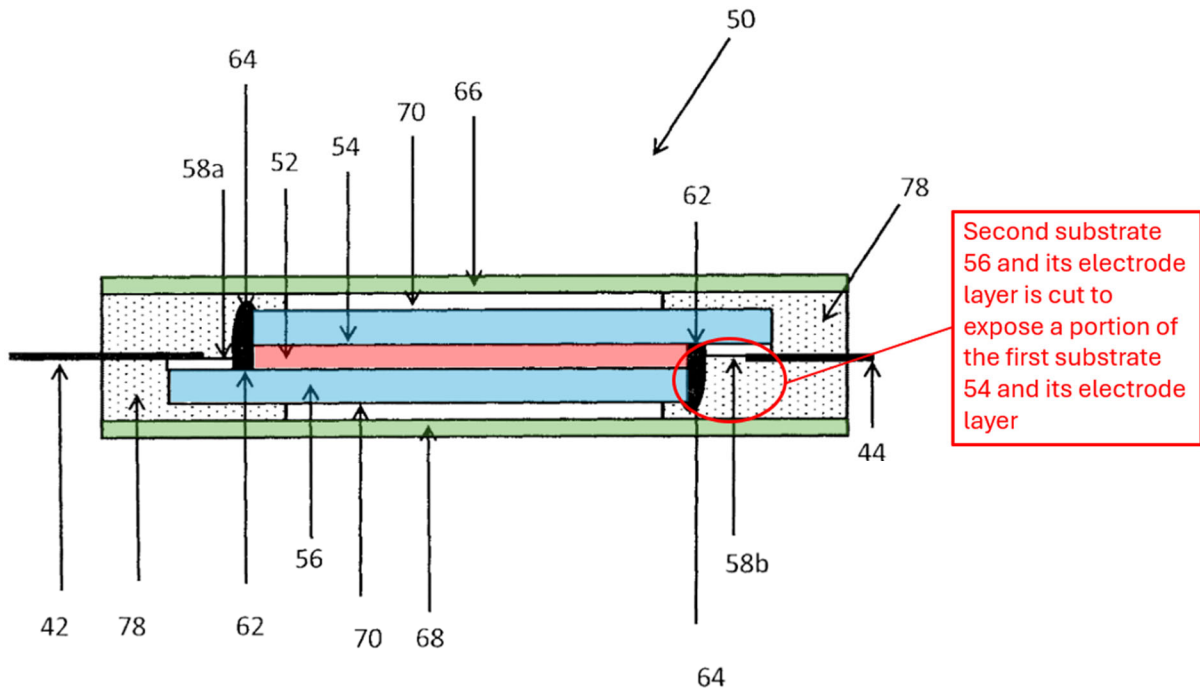
portion of the switching material provide a platform for mounting busbars ... directly on the transparent conductive layer on the interior side.” (EX1004, 5:67-6:5.)

Thus, at the left-hand offset edge shown in the annotated figure above, Gauthier cuts back the upper electrode-bearing substrate 54 and removes the corresponding portion of switching material 52 in the same offset region, exposing the inner conductive coating on electrode-bearing substrate 56. Because Gauthier’s switching material includes the electrochromic material, electrolyte material, and charge-storage material discussed for claim 8, a POSA would have understood those materials to be cut or removed with the same offset geometry as the edge of the first electrode layer to expose the second electrode layer. (EX1003, ¶166.) Accordingly, Gauthier discloses all elements of claim 9. (EX1003, ¶¶166-167.)

10. Claim 10: The electrochromic device of claim 8, wherein the layer of electrochromic material, the layer of electrolyte material, and the layer of charge storage material are cut in a same way as the edge of the second electrode layer to expose the portion of the inner surface of the first electrode layer.

Gauthier discloses the elements of claim 10 for the same reasons discussed for claim 9, applied to the opposite/right-hand offset edge of Figure 6. (EX1003, ¶¶168-171.) As explained for claim 8, Gauthier’s switching material 52 includes the claimed electrochromic material, electrolyte material, and charge-storage material. And as explained for [1.3], the right-hand offset edge cuts back the second electrode layer 56 to expose the conductive coating on the first electrode layer 54. Gauthier

teaches that portions of electrode-bearing substrates 54 and 56 are removed “to expose the conductive coating where the busbars may be applied,” and that seal 64 is applied adjacent to “the cut edge of the switching material.” (EX1004, 10:54-64; EX1003, ¶169.)



EX1004, Figure 6 (annotated); EX1003, ¶169.

The same cutting process discussed for claim 9 applies at the opposing edge. Gauthier teaches cutting to form offset edges and removing switching material to provide a busbar platform “directly on the transparent conductive layer on the interior side.” (EX1004, 5:67-6:5; EX1003, ¶170.) Gauthier also teaches that, after the electrochromic film is cut, “portions are removed, and any switching material remaining on the uncut substrate is removed.” (EX1004, 9:32-41.) Thus, at the right-

hand side of Figure 6, the electrochromic material, electrolyte materials, and charge-storage materials of switching material 52 are cut or removed in the same offset geometry as the edge of the second electrode layer, exposing the inner surface of the first electrode layer. (EX1003, ¶171.) Accordingly, Gauthier discloses all elements of claim 10. (*Id.*)

11. Claim 11: The electrochromic device of claim 1, wherein the first electrode layer comprises a first electrode layer including tin doped indium oxide (ITO).

Gauthier discloses a first electrode layer that includes tin doped indium oxide. (EX1003, ¶¶172-174.) As explained for [1.1], Gauthier discloses the claimed first electrode layer 54. Gauthier expressly teaches that the conductive coating on first electrode layer 54 may include indium tin oxide. In particular, Gauthier states that “[a] conductive coating may include a transparent conducting oxide (TCO) such as indium tin oxide (ITO),” and further explains that examples of transparent substrates with conductive coatings include “ITO-coated glass” and that, in some embodiments, “a substrate with a conductive layer may be ITO-coated glass, or ITO-coated PET.” (EX1004, 23:20-28.) Gauthier also confirms that “[a] conductive coating may be an electrode of a switchable film.” (EX1004, 23:28-30.) Thus, a POSA would have understood Gauthier to teach using a tin doped indium oxide for the first electrode layer 54. (EX1003, ¶¶172-174.) Accordingly, Gauthier discloses all the elements of claim 11. (*Id.*)

12. Claim 12: The electrochromic device of claim 1, wherein the second electrode layer comprises a second electrode layer including tin doped indium oxide (ITO).

Gauthier discloses the elements of claim 12 for the same reasons discussed relative to claim 11. (EX1003, ¶¶175-177.) As explained for [1.1], Gauthier discloses the claimed second electrode layer 56. Gauthier teaches that a conductive coating on second electrode layer 56 may include a transparent conducting oxide such as ITO, identifies ITO-coated glass and ITO-coated PET as exemplary conductive substrates, and confirms that a conductive coating may be an electrode of a switchable film. (EX1004, 23:20-30.) Thus, a POSA would have understood Gauthier to teach using a tin doped indium oxide for the second electrode layer 56. (EX1003, ¶¶175-177.) Accordingly, Gauthier discloses all the elements of claim 12. (*Id.*)

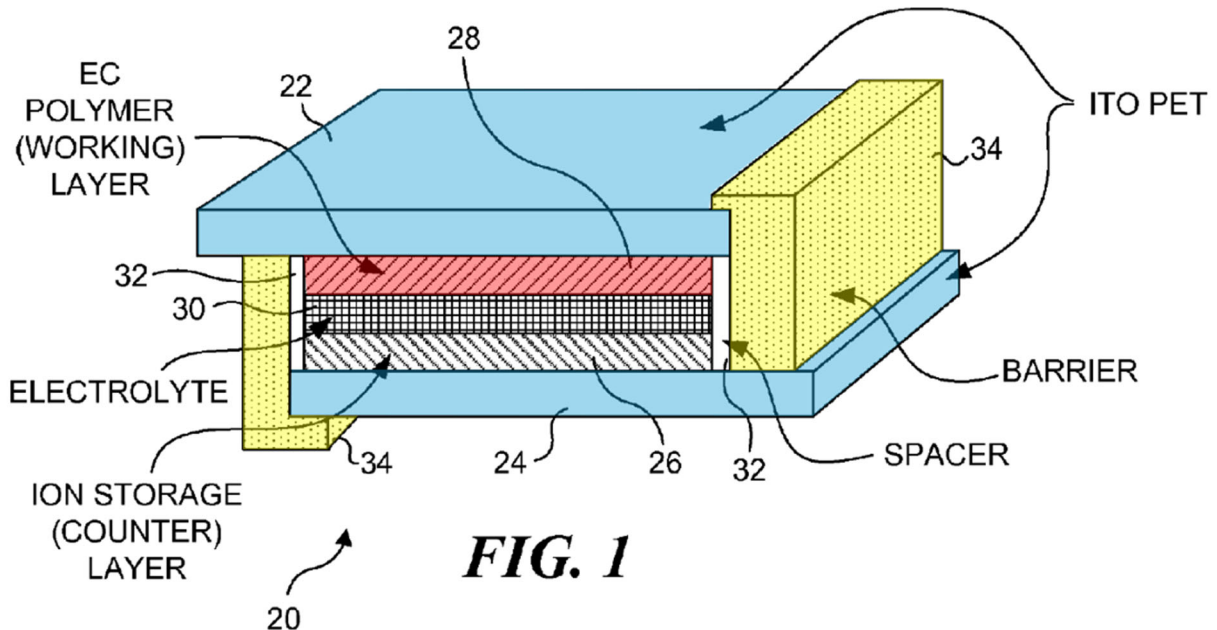
VII. GROUND 3: CLAIMS 2-3 ARE OBVIOUS OVER GAUTHIER IN VIEW OF XU

A. Overview of Xu

Xu is directed to flexible electrochromic panels that, like Gauthier, require reliable sealing of layered electrochromic structures. Xu explains that a flexible electrochromic device must retain spacing between the working and counter electrodes and must retain the seal that keeps electrolyte between the electrodes, even when the device is flexed. (EX1005, 1:21-31.) As illustrated in Figure 1 below, Xu's exemplary panel includes an electrochromic working layer 28 deposited on an

ITO-coated PET substrate 22, an ion-storage/counter layer 26 deposited on another ITO-coated PET substrate 24, and a transparent electrolyte layer 30 sandwiched between the working and counter layers. (EX1005, 5:41-6:42; EX1003, ¶¶178-179.)

Xu further teaches edge sealing and barrier structures that are directly relevant to claims 2 and 3. (EX1003, ¶180.) In Figure 1, Xu shows barrier 34 (shown below in yellow) at the edge regions of the electrochromic stack. Xu explains that an ultraviolet-light-cured film sealant is used to seal the flexible electrochromic device. (EX1005, 6:42-65.) The cured film sealant serves as spacer 32 to maintain a gap between the working and counter electrodes, while also serving as a barrier, in addition to barrier 34, to prevent moisture and oxygen absorption by the display device. (EX1005, 6:42-55.) Xu further teaches that the cured film sealant may itself function as barrier 34, so that separate barrier and spacer elements are not required. (EX1005, 6:55-65.)



EX1005, Figure 1 (annotated); EX1003, ¶179.

Xu also confirms the purpose and effectiveness of these edge seals. (EX1003, ¶181.) Xu teaches that, after electrolyte injection, the inlet port is sealed and the device is irradiated with ultraviolet light, causing the sealant “to fully bond between the two substrate layers and to become impermeable to moisture and oxygen.” (EX1005, 7:10-21.) Xu further explains that, before UV curing, barriers 34 can be provided “to more fully seal the ends of the layers comprising the flexible ECD.” (EX1005, 7:21-24.) Xu’s claims likewise recite a barrier disposed around one or more edges to seal the flexible electrochromic panel and prevent entry of liquid and oxygen from the surrounding environment. (EX1005, 12:4-8.)

Thus, Xu discloses a closely related electrochromic device in which edge seal/barrier material is used to bond, space, and environmentally protect a layered

electrochromic stack. (EX1003, ¶182.) For Ground 3, Xu is not used to replace Gauthier's primary disclosure of the offset exposed-electrode edge regions and seals 64. Rather, Xu reinforces that an L-shaped edge barrier/seal geometry was a known electrochromic-device sealing implementation for protecting side and surface portions of a layered electrochromic structure against moisture and oxygen ingress. (EX1003, ¶183.)

B. Motivation to Combine Gauthier With Xu

A POSA would have been motivated to modify Gauthier's first seal 64 in view of Xu's barrier seal 34 so that it extends farther along the top surface of first electrode 54 and the bottom surface of second electrode 56, thus creating a longer "L" leg of the L-shaped edge protection configuration taught by Xu to create more surface area for adhesion between Gauthier's first seals and the electrodes. This modification would not change Gauthier's device architecture or the purpose of first seal 64. Rather, it would enhance Gauthier's existing edge-seal structure by using Xu's known L-shaped electrochromic edge-barrier configuration to increase adhesion, improve environmental sealing, and more fully protect the exposed offset edge regions shown in Gauthier Figure 6. (EX1003, ¶184.)

First, a POSA would have been motivated to extend Gauthier's first seal 64 farther over the outer surfaces of substrates 54 and 56 to increase the area of contact between the seal and the electrode substrate surfaces, thereby improving adhesion

and mechanical retention of the edge seal. (EX1003, ¶¶185.) Gauthier expressly recognizes that seal performance depends on available bonding area, explaining that offsetting the substrate and conductive layer may provide “a larger surface area” for the sealing material to adhere to, whereas a through-cut edge would provide only “a substantially reduced surface area.” (EX1004, 6:61-7:3.) Xu reinforces the same design principle by showing L-shaped edge barriers 34 extending around the ends of the electrochromic stack, and by explaining that barriers 34 may be provided “to more fully seal the ends of the layers” of the flexible electrochromic device. (EX1005, 7:21-24.) A POSA would have understood that extending Gauthier’s first seal 64 farther onto the outer surfaces of substrates 54 and 56 would increase the contact area between the seal and the substrates, thereby improving mechanical retention, adhesion strength, and seal reliability. (EX1003, ¶¶185-186.)

Second, a POSA would have been motivated to design Gauthier’s seal with a longer “L” leg, as taught by Xu, to improve environmental protection of the offset edge regions. (EX1003, ¶187.) Gauthier teaches that seals isolate the switching material from ambient conditions, including air and moisture, and that suitable seal materials may provide barrier properties, including being gas-impermeable, water resistant, or water impermeable. (EX1004, 6:41-55, 17:7-16.) Xu addresses the same problem in an electrochromic device and teaches that its cured sealant becomes impermeable to moisture and oxygen. (EX1005, 6:42-65, 7:10-24.) Xu’s Figure 1

further shows L-shaped barriers 34 positioned at the device edges, and Xu explains that the barriers help more fully seal the ends of the electrochromic layers. (EX1005, 7:21-24.) Gauthier already teaches extending the first seal along the top surface of first electrode 54 and the bottom surface of second electrode 56. A POSA therefore would have been motivated to extend Gauthier's first seal 64 further over the outer electrode surfaces to create a longer environmental ingress path and more complete edge coverage, thereby improving protection against moisture and oxygen at the exposed edge. (EX1003, ¶¶187-188.)

Third, Xu provides a known and predictable structure and solution for improving Gauthier's already-disclosed edge seal structure. (EX1003, ¶189.) Gauthier already teaches placing first seal 64 at the offset edge, adjacent to the cut edge of switching material 52 and the exposed electrode region, and further teaches using second seal 78 to encapsulate the first seal, busbar, and electrical connector. (EX1004, 10:54-11:5.) Gauthier also teaches that the second seal 78 may be "a separate application of the same material as the first seal," supporting an integrated edge-seal structure that extends further on the top and bottom surfaces of the first and second electrodes. (EX1004, 12:6-9.) Xu confirms that electrochromic sealant/barrier material can be patterned around device edges, cured, bonded between substrate layers, and used as an environmental barrier. (EX1005, 6:42-65, 7:10-24.) Thus, extending Gauthier's first seal 64 farther over the outer surfaces of

substrates 54 and 56, consistent with Xu's L-shaped edge barriers 34, would have been a predictable use of known electrochromic film sealing techniques to improve adhesion and environmental protection at Gauthier's offset edge regions. (EX1003, ¶¶189-190.)

C. Reasonable Expectations of Success

A POSA would have had a reasonable expectation of success in modifying Gauthier's first seal 64 to extend further along the top and bottom surfaces of electrode-bearing substrates 54 and 56, as taught by Xu's L-shaped edge barriers 34. (EX1003, ¶¶191-195.) Gauthier first seal 64 already extends to the top surface of first electrode 54, and the bottom surface of electrode 56. (EX1004, 10:54-64.) Gauthier also teaches that the seal material may be selected for adhesion to contacted surfaces, including substrates and conductive layers, and for barrier properties such as gas impermeability and water resistance or water impermeability. (EX1004, 16:64-17:16.) Thus, Gauthier already contemplates seal materials suitable for adhering to the relevant outer electrode surfaces and protecting the overall edge region of the electrochromic film. (EX1003, ¶¶191-192.)

Xu confirms that extending electrochromic seal/barrier material around device edges was a predictable and workable implementation. Xu's Figure 1 shows barriers 34 at the edges of the electrochromic stack, and Xu teaches that barriers/seals 34 may be provided "to more fully seal the ends of the layers" of the

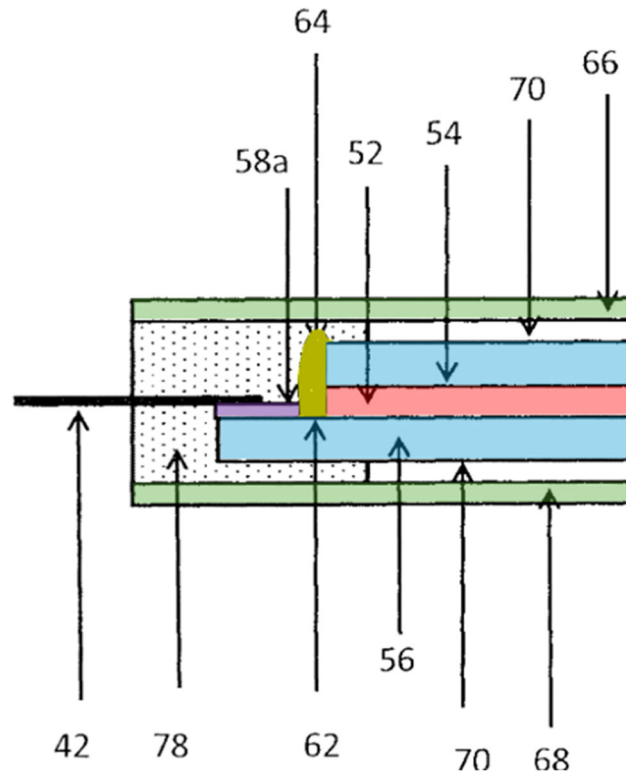
flexible electrochromic device. (EX1005, 7:21-24.) Xu further teaches that the ultraviolet-cured film sealant bonds between substrate layers and becomes impermeable to moisture and oxygen. (EX1005, 6:42-65, 7:10-21.) A POSA would therefore have understood that extending Gauthier's first seal 64 "L" leg further over the top and bottom surfaces of the first and second electrodes, in the L-shaped manner taught by Xu, would use known sealant placement and curing techniques for their ordinary purpose: increasing adhesion area and improving environmental sealing. (EX1003, ¶193.)

The proposed modification would not require changing Gauthier's electrochromic stack, electrode arrangement, switching material, or busbar placement or function. It would merely extend the coverage by slightly adjusting the geometry of Gauthier's existing edge seal so that the seal covers more of the outer electrode surfaces. Because both references use sealant/barrier materials in layered electrochromic devices to bond, seal, and protect against moisture and oxygen, a POSA would have expected the modified Gauthier seal to operate successfully and to provide the predictable benefits of improved adhesion, mechanical retention, and environmental protection. (EX1003, ¶¶194-195.)

D. Claim Element Analysis

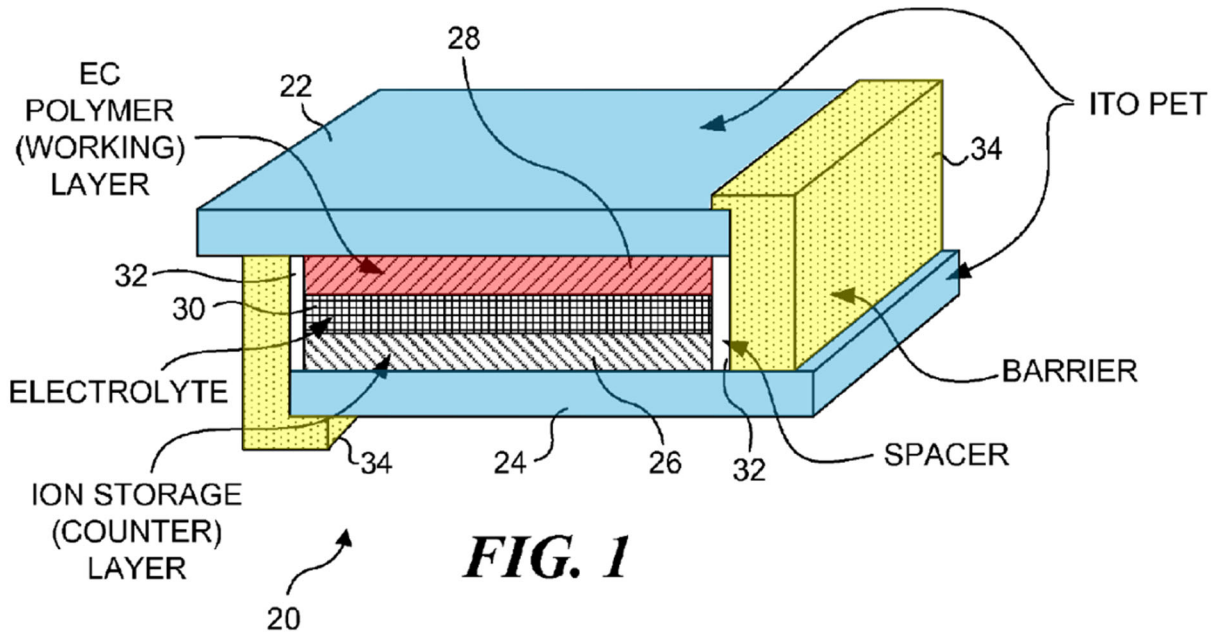
- 1. Claim 2: The electrochromic device of claim 1, wherein: the first edge protection material is in an L shape, further sealing a side surface of the first electrode layer and a portion of an external surface of the first electrode layer.**

As explained in Ground 2 above, Gauthier discloses the underlying claim 1 structure, including the first electrode layer, the exposed offset edge region, and the first seal 64 corresponding to the claimed first edge protection material. (EX1003, ¶¶196-197.) In Gauthier Figure 6, switching material 52 is disposed between first and second electrode-bearing substrates 54 and 56, portions of the first and second electrode-bearing substrates are removed to expose the conductive coating where busbars may be applied, and first seal 64 is applied in space 62 between the busbar and switching material, adjacent to the cut edge of the switching material. (EX1004, 10:54-64.) Gauthier's first seal 64 extends onto the top surface of the first electrode-bearing substrate 54. (EX1003, ¶¶197-198.) Gauthier further teaches that offsetting the electrodes provides access to the conductive surface and may provide "a larger surface area" for the seal material to adhere to. (EX1004, 6:61-7:3.)



EX1004, Figure 6 (annotated); EX1003, ¶198.

To the extent Gauthier does not expressly disclose that first seal 64 extends far enough along the top surface of first electrode-bearing substrate 54 to satisfy the claimed “L shape,” Xu demonstrates a seal with a longer “L” leg to supply that implementation detail. (EX1003, ¶199.) Figure 1 of Xu shows L-shaped edge barriers 34 at the edge regions of an electrochromic device, and Xu teaches that those barriers may be provided “to more fully seal the ends of the layers comprising the flexible ECD [20].” (EX1005, 7:21-24.) Xu further teaches that its UV-cured sealant seals the flexible electrochromic device, maintains electrode spacing, and serves as a barrier to prevent moisture and oxygen absorption; Xu also teaches that the cured sealant may itself function as barrier 34. (EX1005, 6:42-65.)



EX1005, Figure 1 (annotated); EX1003, ¶199.

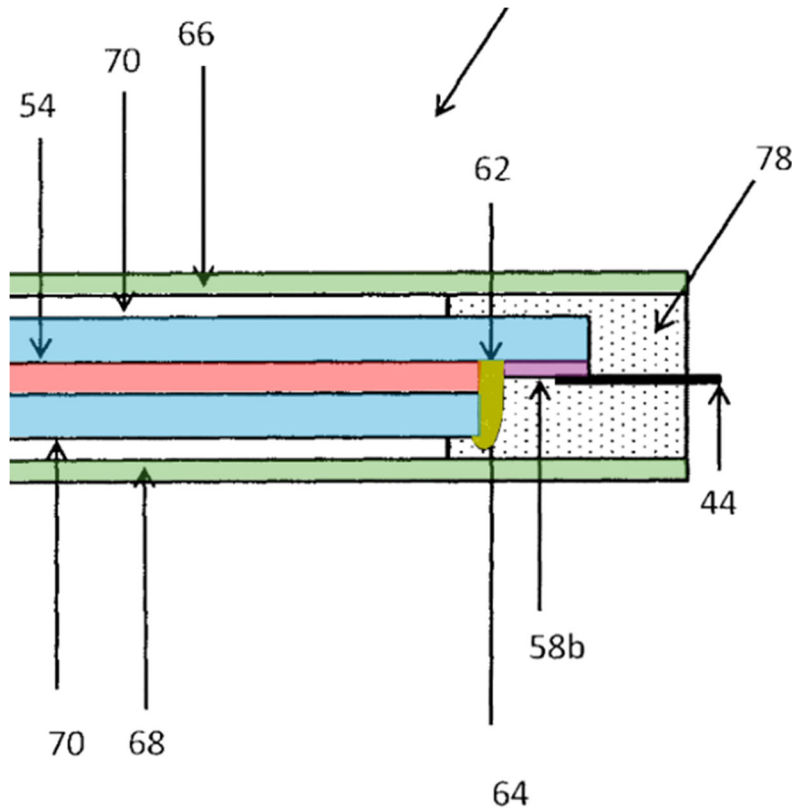
A POSA would have been motivated to modify Gauthier's first seal 64 so that it extends further along the top surface of first electrode-bearing substrate 54 of the corresponding electrochromic stack, forming more pronounced the L-shaped edge protection geometry taught by Xu's barriers 34. Gauthier's modified seal would still perform Gauthier's disclosed function of sealing the cut edge region and separating the switching material from the busbar region, while providing additional contact area and sealing between the seal and the top surface of the first electrode layer as recited in claim 2. (EX1004, 10:54-64; EX1005, 6:42-65, 7:21-24; EX1003, ¶200.)

For the reasons discussed in the Motivation to Combine section above (Section VII.B.), this modification would have been obvious. A POSA would have been motivated to extend Gauthier's first seal 64 further over the top surface of the

first electrode-bearing substrate to increase seal/substrate contact area and improve adhesion, consistent with Gauthier's teaching that larger surface area improves seal adhesion. (EX1004, 6:61-7:3.) (EX1003, ¶201.) A POSA also would have been motivated to use Xu's longer "L" leg barrier geometry to more fully seal the exposed electrochromic edge region against moisture and oxygen, consistent with both Gauthier's and Xu's environmental-barrier teachings. (EX1004, 6:41-55, 17:7-16; EX1005, 6:42-65, 7:10-24.) Thus, Xu supplements Gauthier by confirming a known electrochromic edge-seal geometry and implementation detail for improving adhesion and edge protection. (EX1003, ¶¶201-203.)

**2. Claim 3: The electrochromic device of claim 1, wherein:
the second edge protection material is in an L shape, further
sealing a side surface of the second electrode layer and a
portion of an external surface of the second electrode layer.**

Claim 3 depends from claim 1 and recites the same L-shaped edge-protection requirement as claim 2, but for the second edge protection material at the opposite side of the device. Gauthier discloses corresponding offset edge regions and corresponding seals 64 on both sides of Figure 6. (EX1004, 10:54-64.) Thus, the right-side seal 64 corresponds to the claimed second edge protection material. (EX1003, ¶¶204-208.)



EX1004, Figure 6 (annotated); EX1003, ¶205.

For the same reasons discussed for claim 2, it would have been obvious to modify Gauthier's right-side seal 64 so that it extends further along the bottom surface of second electrode 56 of the corresponding electrochromic stack, forming more pronounced the L-shaped edge protection geometry taught by Xu's barriers 34. (EX1003, ¶206.) Xu teaches that barriers 34 more fully seal the ends of the electrochromic device layers and that the cured sealant provides moisture and oxygen barrier protection. (EX1005, 6:42-65, 7:10-24.) As explained above in Sections VII.B-C, a POSA would have been motivated to apply Xu's longer "L" leg seal geometry to Gauthier's first seal to predictably increase seal/electrode contact

area, improve adhesion of the seal to electrochromic film, and enhance environmental protection without changing Gauthier's electrochromic stack, conductive coatings, busbar arrangement, or switching-material operation. (EX1003, ¶¶207-208.)

VIII. GROUND 4: CLAIM 5 IS OBVIOUS OVER GAUTHIER IN VIEW OF TONAR

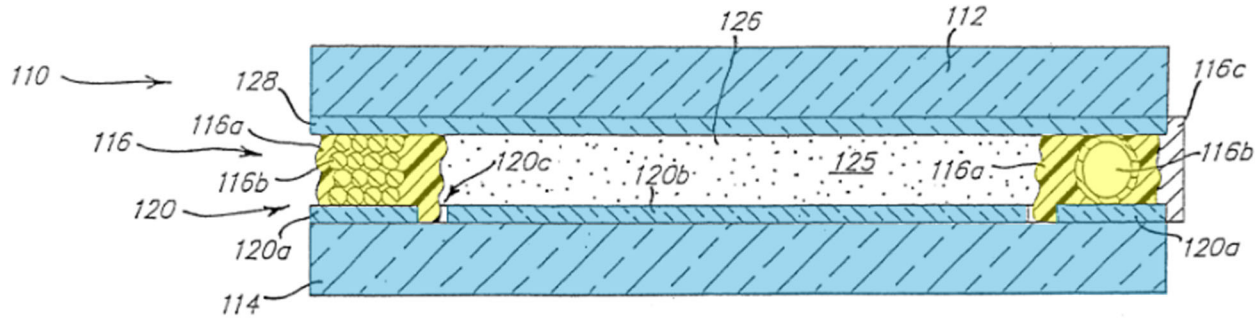
A. Overview of Tonar

Tonar is directed to electrochromic mirror devices and, like Gauthier, recognizes the importance of perimeter sealing in an electrochromic device. Tonar explains that the perimeter seal bonds the device layers together and seals the electrochromic material within the device. In particular, Tonar teaches that the seal “must have good adhesion to glass, metals and metal oxides,” “must have low permeabilities for oxygen, moisture vapor, and other detrimental vapors and gases,” and “must not interact with or poison the electrochromic or liquid crystal material it is meant to contain and protect.” (EX1006, 13:8-18.) Tonar further teaches that “epoxy based organic sealing resins are preferred” because of their “excellent adhesion to glass, low oxygen permeability and good solvent resistance.” (EX1006, 13:24-39; EX1003, ¶209.)

Tonar discloses electrochromic devices that include opposing electrode structures. For example, Tonar teaches that a transparent electrically conductive material is deposited “to act as an electrode,” and that a reflector/electrode is

disposed on the opposing glass element. (EX1006, 14:17-28, 14:40-48.) Tonar further explains that the electrochromic medium is controlled by applying a potential across the reflector/electrode and the transparent electrode, causing the electrochromic medium to darken and attenuate light. (EX1006, 27:44-55.) Thus, Tonar, like Gauthier, concerns a layered electrochromic device having opposed electrodes and a perimeter seal. (EX1003, ¶210.)

As illustrated in Figure 5A below, Tonar's seal includes electrically conductive material. Tonar describes Figure 5A as showing "an improved mechanism for applying a drive potential to the layer of transparent conductive material." (EX1006, 28:12-18; EX1003, ¶210.) In that arrangement, electrical connection is made so that the drive potential travels through reflector/electrode area 120a and "conductive particles 116b in sealing member 116 before reaching the transparent conductor 128." (EX1006, 28:18-27, emphasis added.) Tonar then states that, "[i]n such a configuration, sealing member 116 comprises a typical sealing material, e.g., epoxy 116a, with conductive particles 116b contained therein." (EX1006, 28:36-40.) Tonar identifies exemplary conductive particles as "gold, silver, copper, etc., coated plastic" particles, and also teaches coated glass or plastic beads that may provide conductivity and act as spacers. (EX1006, 28:40-50; EX1003, ¶¶211-212.)



EX1006, Figure 5A (annotated); EX1003, ¶211.

Tonar further confirms that the conductive material in the seal must be controlled so the electrochromic device remains operable. (EX1003, ¶213.) Tonar explains that conductive particles in sealing member 116 provide a conductive path between the relevant reflector/electrode area and the transparent conductive material. (EX1006, 28:18-27, 28:57-63.) But Tonar also warns that “[n]o conductive particles 116b can be placed” in the other reflector/electrode area “because of the possibility of an electrical short” with the transparent conductive material, and that “[i]f such an electrical short occurred, the electrochromic device would not operate properly.” (EX1006, 28:63-29:5.) Thus, Tonar teaches what a POSA would have understood: that an electrochromic seal may comprise electrically conductive material, but the conductive material must be arranged in a controlled or localized manner so that the seal does not short the opposed electrodes. (EX1003, ¶¶213-214.)

Tonar also discloses practical ways to implement that controlled conductivity. (EX1003, ¶215.) Tonar teaches that “a variety of methods can be used to ensure that no conductive particles 116b enter” the area where they would create a short,

including using nonconductive material in selected regions, using a dual dispenser to deposit conductive-particle seal material in one region and nonconductive material in another, curing a nonconductive seal and then adding conductive material into the edge gap, controlling seal flow so the conductive portion stays behind, or placing a conductive member or material on or in the outer edge of the seal. (EX1006, 29:6-29.) Tonar therefore confirms that electrochromic-device seals were known to comprise electrically conductive material in selected portions while remaining sufficiently insulating elsewhere to avoid shorting the device. (EX1003, ¶¶215-216.)

B. Motivation to Combine Gauthier with Tonar

A POSA would have been motivated to modify Gauthier's first seals 64 to include Tonar's localized electrically conductive material within the seal, such as conductive particles or a conductive member, while preserving insulating portions of the seal to avoid shorting the opposed electrodes. (EX1003, ¶¶217-225.) This modification would not change Gauthier's electrochromic device architecture. (EX1003, ¶217.) Instead, it would implement Gauthier's own disclosure that, "[i]n some aspects, the first seal has low amount of electrical conductivity," and that seals may comprise "metal" or "a metallized tape," or may be overlaid with a metal layer, metal foil, or tape. (EX1004, 3:49-51, 16:63-17:16, 18:65-19:1.) Tonar provides a known electrochromic-device implementation for doing exactly that: incorporating

electrically conductive material into an electrochromic seal in selected regions while preventing the conductive material from creating a short circuit. (EX1006, 28:36-50, 28:63-29:29; EX1003, ¶217.)

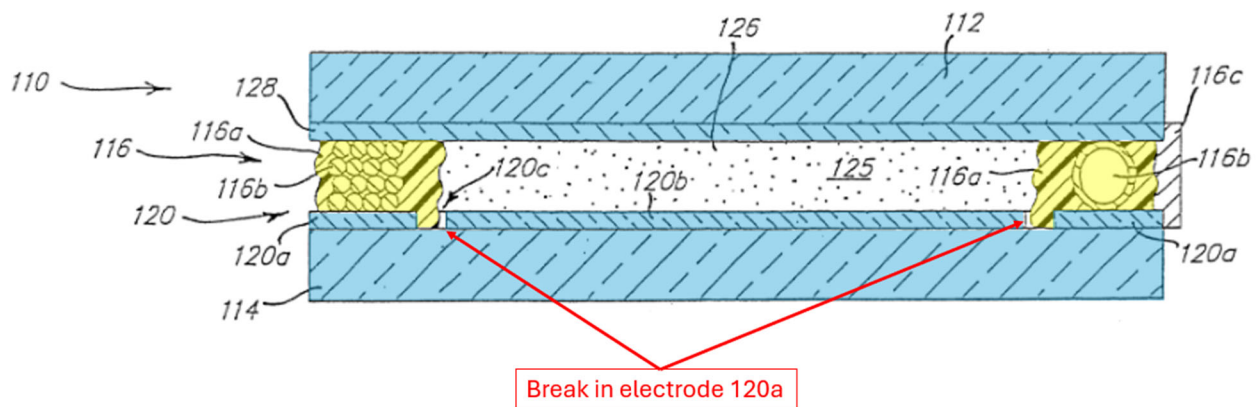
First, a POSA would have been motivated to look to Tonar to implement Gauthier's conductive or metal-containing seal in a well-known, operable, and controlled manner. (EX1003, ¶218.) Gauthier teaches that its first seal may have a "low amount of electrical conductivity," and further teaches metal-containing seal options. (EX1004, 3:49-51, 16:63-17:16, 18:65-19:1.) A POSA knew at the time of Gauthier and Tonar that embedding conductive particles (made of or containing metals) in epoxy seals was a well-known way of imparting electrical conductivity to a seal. (EX1003, ¶218.) A POSA would also have understood that in Gauthier's electrochromic film configuration, a seal that is conductive across the entire sealed edge region could short the opposed electrode structures, preventing the electrochromic device from operating properly. (EX1003, ¶218.) Tonar expressly confirms this concern. Tonar teaches a sealing member 116 that "comprises a typical sealing material, e.g., epoxy 116a, with conductive particles 116b contained therein," but also warns that conductive particles cannot be placed in certain regions "because of the possibility of an electrical short" and that, "[i]f such an electrical short occurred, the electrochromic device would not operate properly." (EX1006, 28:36-40, 28:63-29:5.) Thus, a POSA would have been motivated to use Tonar's

localized-conductive particle approach to implement Gauthier's electrically conductive or metal-containing seal without creating a continuous conductive path that would short the electrochromic stack. (EX1003, ¶219.)

Second, a POSA would have been motivated to use Tonar's seal because Tonar teaches a practical, predictable way to impart electrical conductivity to an electrochromic seal while maintaining insulating regions where needed. (EX1003, ¶¶220-221.) Tonar explains that conductive particles 116b in sealing member 116 provide an electrical path through the seal in a selected region. (EX1006, 28:18-27, 28:57-63.) At the same time, Tonar deliberately separates reflector/electrode regions 120a and 120b with an electrode-free area 120c so "there is no chance of current flow" from one reflector/electrode area to the other. (EX1006, 28:27-31, 28:50-57.) Tonar then identifies multiple techniques for keeping conductive particles out of regions where they would cause a short, including using nonconductive material in selected areas, using a dual dispenser to deposit conductive-particle seal material in one area and nonconductive material in another, curing a nonconductive seal before adding conductive material, controlling seal flow so conductive material stays behind, or placing a conductive member or material on or in the outer edge of the seal. (EX1006, 29:6-29.) A POSA would have recognized these teachings as directly applicable to Gauthier's seal 64 because Gauthier already uses seal material at the electrochromic edge regions and teaches similar seal materials, such as epoxies,

selected for adhesion and barrier properties. (EX1004, 10:54-64, 16:64-17:16; EX1003, ¶¶220-221.)

Third, a POSA would have been motivated to look to Tonar because Tonar addresses the same type of design constraint presented by claim 5: an electrochromic seal may include conductive material, but the device must not be shorted. (EX1003, ¶¶222-223.) Tonar teaches that the seal may include conductive particles, such as gold-, silver-, or copper-coated particles or beads, while still functioning as a perimeter seal for an electrochromic device. (EX1006, 13:8-18, 28:36-50.) Tonar also teaches that the conductive material is not indiscriminately placed throughout the seal; instead, Tonar uses a gap or break in the electrode 120a where the seal 116 does not have any conductive particles 116b, thereby preventing an unintended electrical connection between electrode regions. (EX1006, 28:27-31, 28:63-29:29.)



EX1006, Figure 5A (annotated); EX1003, ¶222.

A POSA modifying Gauthier's seal 64 would have followed the same principle: include electrically conductive material in the seal in locations to provide

electrical conductivity, but preserve nonconductive portions or gaps so current continues to travel through the electrochromic film rather than shorting around it. (EX1003, ¶223.)

This combination also aligns with the proper understanding of claim 5. Claim 5 recites edge protection materials that “comprise” electrically conductive material; it does not mean that the edge protection materials consist entirely of conductive material or to be uniformly conductive throughout. If claim 5 were instead interpreted to require the entire edge protection material to be electrically conductive across the entire edge protection regions, that interpretation would encompass an inoperable configuration because it would short the opposed electrode structures. Tonar confirms the operable understanding: the seal can comprise electrically conductive material in localized portions while remaining insulating in other portions to avoid an electrical short. (EX1006, 28:63-29:29; EX1003, ¶224.)

Accordingly, a POSA would have been motivated to modify Gauthier’s seals 64 to include Tonar’s localized conductive particles, conductive member, or other localized conductive material. Doing so would have implemented Gauthier’s own teaching of electrically conductive or metal-containing seals in a known, operable manner, while preserving the insulating regions needed to prevent a short circuit in the electrochromic device. (EX1003, ¶225.)

C. Reasonable Expectation of Success

A POSA would have had a reasonable expectation of success in modifying Gauthier's seals 64 to include Tonar's localized conductive material because both references use perimeter/edge seals in electrochromic devices for the same basic purposes: bonding device layers, sealing electrochromic material, and protecting the device from environmental factors. (EX1003, ¶226.) Gauthier already teaches that its seal materials may adhere to substrates, conductive layers, electrodes, and switching material, and may be selected for barrier properties such as gas impermeability, water resistance, or water impermeability. (EX1004, 16:64-17:16.) Tonar likewise teaches that electrochromic perimeter seals must adhere to glass, metals, and metal oxides, have low permeability to oxygen and moisture vapor, and remain compatible with the electrochromic medium. (EX1006, 13:8-18.) Thus, a POSA would have understood Tonar's conductive-particle seal implementation to be compatible with Gauthier's electrochromic edge-seal environment. (EX1003, ¶226.)

The modification also would have been predictable because a POSA knows that embedding conductive particles seals, such as epoxy or other seals, was known for years prior to Gauthier and Tonar. (EX1003, ¶227.) Tonar provides specific, working examples of this technique for imparting controlled conductivity to a seal while avoiding a short. Tonar teaches an epoxy sealing member containing

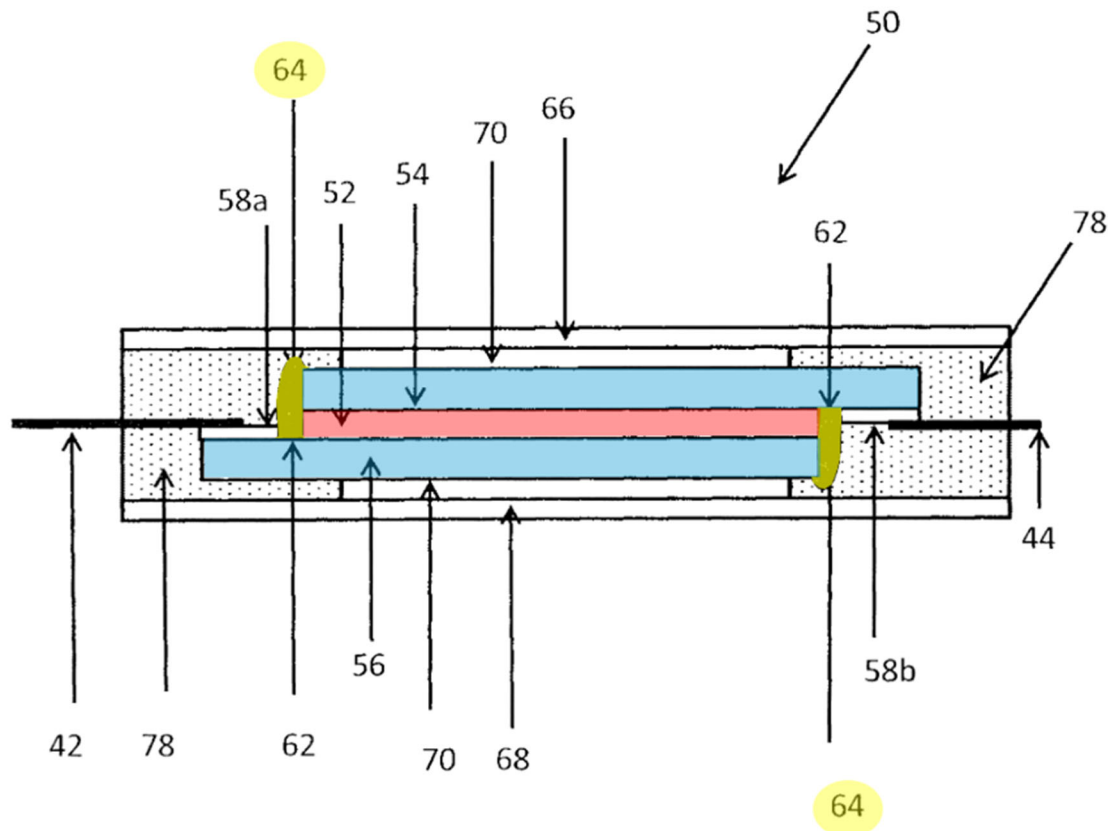
conductive particles, such as gold-, silver-, or copper-coated particles or beads, and explains that those conductive particles can provide a localized conductive path through the seal. (EX1006, 28:36-50, 28:57-63; EX1003, ¶227.) Tonar also teaches maintaining electrode-free or nonconductive regions so that conductive particles do not create an electrical short, because such a short would prevent the electrochromic device from operating properly. (EX1006, 28:27-31, 28:63-29:29.) A POSA therefore would have expected that incorporating Tonar's localized conductive particles or conductive member into Gauthier's seal 64—while preserving insulating portions or gaps where needed—would predictably provide a seal that comprises electrically conductive material without shorting Gauthier's opposed electrodes. (EX1003, ¶¶227-229.)

D. Claim Element Analysis

- 1. Claim 5: The electrochromic device of claim 1, wherein the first edge protection material and the second edge protection material comprise electrically conductive material.**

As explained above in Ground 2, Gauthier discloses the claimed first and second edge protection materials through the left- and right-side seals 64 shown in Figure 6. (EX1003, ¶¶230-231.) As explained for claim 1, Gauthier discloses opposing first and second electrode-bearing substrates layers 54 and 56 with switching material 52 sandwiched between them, offset edge regions exposing conductive coatings for busbar connection, and seals 64 applied in spaces 62

between the busbars and the switching material, adjacent to the cut edge of the switching material. (EX1004, 10:54-64; EX1003, ¶231.) Gauthier further teaches that the first seal contacts the cut edge of the switching material, the cut substrate electrode and the conductive coating of the uncut substrate, helping maintain the seal in position to ensure suitable sealing of the electrochromic film. (EX1004, 10:51-60.) Thus, Gauthier supplies the first and second edge protection materials recited in claim 5.

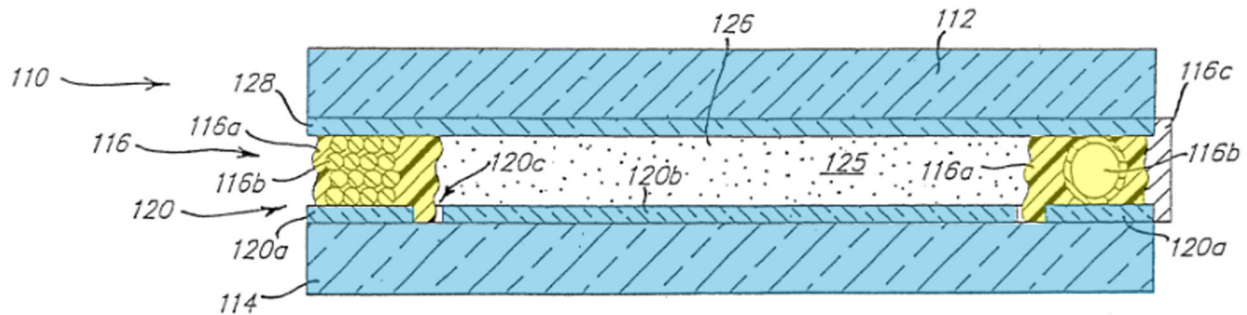


EX1004, Figure 6 (annotated); EX1003, ¶231.

Gauthier teaches that its seals 64 may include electrically conductive material. Gauthier states that, “[i]n some aspects, the first seal has low amount of electrical

conductivity.” (EX1004, 3:49-51.) Gauthier also teaches that seal materials may include “metal” or “a metallized tape,” or combinations thereof, and that “[a] seal overlaid with a metal layer or metal foil or tape may be a useful edge seal system.” (EX1004, 16:63-17:16, 18:65-19:1.) A POSA would have understood metal, metallized tape, metal foil, and metal layers to be electrically conductive materials. (EX1003, ¶232.) Although well known to a POSA, Tonar supplies additional detail on how to implement an electrically conductive seal without shorting the device. (*Id.*)

Tonar teaches an electrochromic-device seal that comprises electrically conductive material in a controlled, localized manner. In connection with Figure 5A, Tonar teaches that “sealing member 116 comprises a typical sealing material, e.g., epoxy 116a, with conductive particles 116b contained therein.” (EX1006, 28:36-40.) Tonar explains that conductive particles 116b in sealing member 116 provide a conductive path before reaching transparent conductor 128. (EX1006, 28:18-27, 28:57-63.) Tonar identifies exemplary conductive particles as “gold, silver, copper, etc., coated plastic” particles, and also teaches coated glass or plastic beads that can provide conductivity and act as spacers. (EX1006, 28:40-50.) Tonar therefore confirms that an electrochromic seal may comprise electrically conductive material, including conductive particles, while still functioning as a perimeter seal. (EX1003, ¶233.)



EX1006, Figure 5A (annotated); EX1003, ¶233.

Claim 5 recites edge protection materials that “comprise” electrically conductive material. Claim 5 thus requires that the edge protection materials *include* electrically conductive material, not consist completely of electrically conductive material. Tonar teaches that conductive material in a seal must be controlled to avoid shorting the electrochromic device. Specifically, Tonar explains that reflector/electrode area 120a and reflector/electrode area 120b are separated by an area 120c devoid of reflector/electrode so “there is no chance of current flow” from area 120a to 120b. (EX1006, 28:27-31, 28:50-57.) Tonar further warns that “[n]o conductive particles 116b can be placed” in reflector/electrode area 120b because of “the possibility of an electrical short” with transparent conductive material 128, and that “[i]f such an electrical short occurred, the electrochromic device would not operate properly.” (EX1006, 28:63-29:5.)

Thus, a POSA would have been motivated to modify Gauthier’s left- and right-side seals 64 to include Tonar’s localized conductive particles, conductive member, metal-containing material, or other localized conductive material, while

preserving insulating portions or gaps where needed to prevent a short between opposed electrode structures. (EX1003, ¶¶234-236.) This modified seal would still perform Gauthier’s edge-protection function—sealing the cut edge region adjacent to switching material 52 and the exposed conductive coating/busbar region—while also “compris[ing] electrically conductive material” as required by claim 5. (EX1004, 10:51-64; EX1006, 28:36-50, 28:63-29:29; EX1003, ¶236.)

For the reasons discussed in Sections VIII.B.-C, the modification would have achieved predictable, well-known results because Tonar provides specific additional ways to impart electrical conductivity to edge seals – by using conductive particles in epoxy with controlled particle placement, nonconductive regions, and conductive material on or in the outer edge of the seal—while avoiding a short. (EX1006, 28:36-50, 28:63-29:29.) Applying those known techniques to Gauthier’s seals 64 would have predictably yielded seals that include electrically conductive material while preserving insulating portions needed for normal electrochromic operation. (EX1003, ¶237.)

Accordingly, Gauthier in view of Tonar renders claim 5 obvious. (EX1003, ¶238.)

IX. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

A. Real Party-In-Interest — 37 C.F.R. § 42.8(b)(1)

Petitioner, Ambilight Inc, is the real party-in-interest.

B. Related Matters — 37 C.F.R. § 42.8(b)(2)

Petitioner is not aware of any civil actions involving the '870 Patent, or any disclaimers, reexamination certificates or other petitions for post-grant review for the '870 Patent.

C. Lead and Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

LEAD COUNSEL	BACKUP COUNSEL
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D. Service Information Under 37 C.F.R. § 42.8(b)(4)

Please address all correspondence/service to all counsel listed above.

Petitioner consents to service by email directed to:

Ambilight@dickinson-wright.com.

X. SERVICE

Petitioner will serve the Petition, Power of Attorney, and supporting evidence on the Patent Owner's correspondent attorney of record as listed on USPTO Patent Center. A certificate of service is attached at the end of this Petition, pursuant to 37 C.F.R. § 42.6(e)(4)(i).

XI. FEES

The required fees are submitted herewith. If any additional fees are due at any time during this proceeding, the Patent Office is authorized to charge such fees to Deposit Account No. 04-1061.

Dated: June 1, 2026

Respectfully submitted,

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Certificate of Service 37 C.F.R. §§ 42.6(e)(4)(i) and 42.205(b)

The undersigned certifies that on June 2, 2026, I will cause true and correct copies of the foregoing PETITION FOR POST GRANT REVIEW OF U.S. PATENT NO. 12,502,870, and all associated exhibits or appendices referred to therein, to be served via FedEx Overnight to patent counsel of record at:

Mr. Weiguo Chen
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Respectfully submitted,

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Dickinson Wright, PLLC

Certificate of Compliance Pursuant to 37 C.F.R. § 42.24

This paper complies with the type-volume limitation of 37 C.F.R. § 42.24.

This paper contains 16,037 words, which includes all annotated words in the Figures, but excludes the parts of the paper exempted by 37 C.F.R. § 42.24(a).

This paper also complies with the typeface requirements of 37 C.F.R. § 42.6(a)(ii) and the type style requirements of 37 C.F.R. § 42.6(a)(iii)&(iv).

Dated: June 1, 2026

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