

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

LUMINEX INTERNATIONAL COMPANY LTD.,
Petitioner

v.

SIGNIFY HOLDINGS B.V.,
Patent Owner

Case IPR2024-00101
U.S. Patent No. 10,299,336

DECLARATION OF DR. MICHAEL KRAMES

Signify Ex. 2031
Luminex v. Signify
IPR2024-00101

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I, Dr. Michael Krames, declare as follows:

I. INTRODUCTION

1. I have been retained by Patent Owner Signify Holding B.V. (“Patent Owner or “Signify”) as an independent technical expert to provide opinions regarding the subject matter recited in certain claims of U.S. Patent No. 10,299,336 (“the ’336 Patent”). In particular, I have been asked to provide my opinion as to whether a person of ordinary skill in the art at the time of the invention (“POSITA”) would have found claims 1 through 20 of the ’336 Patent (“challenged claims”) anticipated or obvious in view of (i) U.S. Patent No. 10,234,091 (“Chaimberg”) alone, (ii) Chaimberg in view of U.S. Patent No. 7,178,941 (“Roberge”), (iii) U.S. Patent No. 9,801,250 (“Halliwell”), or (iv) U.S. Patent No. 7,192,160 (“Reiff”), based on the arguments and evidence submitted by Petitioner Luminex International Company, Ltd. (“Petitioner” or “Luminex”) and its declarant, Dr. J. Gary Eden.

2. I understand that the Patent Trial and Appeal Board of the U.S. Patent and Trademark Office (“Board”) has instituted an IPR of the patentability of Claims 1 through 20 of the ’336 patent following the submission of a Petition by Luminex. I understand that Luminex also submitted a supporting declaration by Dr. Eden (Ex. 1004).

3. I understand that the Board has instituted review on the following grounds:

- [1a] Claims 1, 3, 6-9, 11-13, 15, and 17-19 as anticipated or obvious in view of Chaimberg;
- [1b] Claims 2, 4, 5, 10, 14, 16, and 20 as obvious in view of Chaimberg alone or in further view of Roberge;
- [2] Claims 1, 2-5, 7, 9-13, 15, 16, 19, and 20 as anticipated or obvious in view of Halliwell; and
- [3] Claims 13 and 15 as anticipated or obvious in view of Reiff.

4. My analysis and conclusions regarding the '336 Patent and the instituted grounds are set forth below.

5. In connection with forming my opinions, I have considered the references and materials submitted by the parties in this proceeding, as well as the additional materials and information cited and discussed herein. These include the following:

Exhibit	Title
N/A	Luminex's Petition
1001	U.S. Patent No. 10,299,336 ("the '336 Patent").
1002	U.S. Patent No. 7,014,336 ("Ducharme")
1003	U.S. Patent No. 10,234,091 ("Chaimberg")
1004	Supporting Declaration Submitted by Dr. J. Gary Eden

Exhibit	Title
1005	CCT: Understanding the Basics, superbrightleds.com (March 2, 2016) (https://www.superbrightleds.com/blog/what-is-cctunderstanding-the-basics.html)
1006	U.S. Patent No. 9,345,112 (the “’112 Patent”)
1007	File history of the ’336 Patent
1008	U.S. Provisional Application No. 62/297,424 (“the ’424 Provisional”)
1009	U.S. Patent No. 9,820,350 (the “’350 Patent”)
1010	Signify’s infringement claim chart concerning the ’336 Patent served in the district-court case
1011	U.S. Patent No. 7,178,941 (“Roberge”)
1012	U.S. Patent No. 9,801,250 (“Halliwell”)
1013	U.S. Patent No. 7,192,160 (“Reiff”)
1014	Gregory Kay, “Architectural SSL: Tunable white light and its benefits become more accessible”, LEDS Magazine (September 14, 2023) (https://www.ledsmagazine.com/architecturallighting/article/14298849/architectural-ssl-tunable-whitelight-and-its-benefits-become-more-accessible)
1015	U.S. Patent No. 2,828,393 (the “’393 Patent”)
1016	U.S. Patent No. 3,502,825 (the “’825 Patent”)
1017	Excerpts of the Assignment History for U.S. Patent No. 7,178,941
1021	File history of U.S. Application No. 15/811,062
1022	File history of U.S. Application No. 15/435,141
1023	U.S. Patent No. 10,299,335
2028	Yoshi Ohno, Calculation of CCT and Duv and Practical Conversion Formulae, CORM 2011 Conference, Gaithersburg, MD (May 3-5, 2011)
2029	Tyco Electronics, Switches Core Program (March 2008)
2030	Transcript of the Deposition of Dr. J. Gary Eden, taken on December 5, 2024

Exhibit	Title
2032	Website Printout of TE Connectivity ALCOSWITCH Switches 1571999-1, https://www.digikey.com/en/products/detail/te-connectivity-alcoswitch-switches/1571999-1/969165
2033	DIP Switch ADE, ADF & ADP Series Datasheet
2034	Excerpt from McGraw-Hill Dictionary of Electronics and Computer Technology (3d Ed. 1984)
2035	Taru Oksala, “Why the Same Color Temperatures Look Different?” (Apr. 13, 2016), https://light.fi/why-same-color-temperatures-look-different/
2036	PR8 HALO Commercial Brochure, Eaton (2017)
2037	HALO Canless Recessed Lighting, Cooper
2038	Signify Press Release (2020)
2039	HALO Spec Sheet (2018)
2040	“Home Depot Announces 2018 Innovation Award Winners,” Builder Magazine (2018)
2041	ADEX Award (2019)
2042	HALO Commercial Spec Sheet (2017)
2043	“Please Explain the Term ‘Black Body Curve,’” X-Rite (2024)
2044	Light-Emitting Diodes, 2 nd Ed., Schubert, Cambridge University Press (2006)
2045	Excerpt from McGraw-Hill Dictionary of Scientific and Technical Terms (5th Ed. 1994)
2049	Website Printout for “Patriot Lighting® 5070 Lumen 47-3/4” LED Back-Lit Flat Panel Light.”

6. My opinions set forth below are based on my personal education, training, experience in the field, and professional judgment, as well as the content of the references considered. My understanding of the relevant law, as discussed below, is based on my discussions with counsel for Signify. I am prepared to testify competently about my analysis and opinions set forth herein.

7. It is my opinion that Petitioner and Dr. Eden have not shown that any challenged claim is anticipated or obvious in view of the grounds set forth in the Petition.

II. PROFESSIONAL BACKGROUND AND COMPENSATION

8. In 1989, I earned a Bachelor of Science in Electrical Engineering with High Honors from the University of Texas in Austin, TX.

9. In 1995, I earned a Ph.D. in Electrical Engineering from the University of Illinois Urbana-Champaign in Urbana, IL, under the supervision of Prof. Nick Holonyak, Jr., the original inventor of the light-emitting diode (LED).

10. I have over twenty-five years of experience in compound semiconductors, with an emphasis on wide-bandgap semiconductor materials and devices, and specifically including the field of LEDs. I have extensive experience in R&D and manufacturing settings, creating innovative LEDs and LED-based products for various solid-state lighting applications. I am a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) and a Fellow of the Illuminating Engineering Society (IES).

11. Currently, I am the President of Arkesso LLC, which is a consulting firm specializing in wide bandgap semiconductors and applications.

12. From 2009 to 2015, I was the Chief Technology Officer at Sora, Inc, where I worked with Nobel Prize winner and inventor of the blue LED, Shuji

Nakamura, and other key innovators from the University of California, Santa Barbara, to develop leading LED products for professional directional lighting by creating a new LED materials platform based on bulk gallium-nitride substrates (GaN-on-GaN).

13. I was also the Executive Vice President of Advanced Laboratories at Philips Lumileds/Lumileds Lighting and was a design engineer and engineering scientist at Hewlett Packard Co. While at Philips Lumileds/Lumileds Lighting (from 1999-2009), I developed key innovations behind the LUXEON high power LED platform and managed the advanced technology roadmaps, identified Auger recombination as the primary loss mechanism in InGaN- based LEDs, and designed LED solutions for the iMac, iPhone Flash, digital imaging, and general illumination applications. My contributions there also led to the first automotive LED headlights, demonstrated in the Audi R8.

14. I am a named inventor on 171 U.S. granted patents in the fields of LEDs and wide bandgap semiconductors and am a named author on over 100 publications in these fields.

15. A copy of my curriculum vitae is attached hereto as Appendix A, which provides further details about my background and experience, including details regarding my publications, professional awards, and prior testifying experience.

16. I am being compensated by Signify at my standard hourly rate for my work in this proceeding. My compensation is not tied in any way to the substance of my testimony or the outcome of this proceeding. I have no financial interest in the Patent Owner, the '336 patent, or the outcome of this proceeding.

III. APPLICABLE LAW

17. I am not an attorney. I have been informed by counsel of the following applicable legal standard relating to claims of patent invalidity.

A. Priority

18. I understand that a patentee is entitled to claim the filing date of an earlier application (e.g., the “parent” application) if the later patent (the “child” patent) includes a priority claim to the parent application (e.g., is a continuation or continuation-in-part of the parent application or includes a priority claim to the parent application if the parent is a provisional application) and if the corresponding disclosure in the parent application supports the later claimed subject matter.

19. I understand that whether a reference is eligible as prior art and whether a reference anticipates or renders obvious a patent claim are two separate questions. I understand that the status of a reference as prior art is a legal question based upon underlying fact issues.

B. Claim Construction

20. I understand that when construing patent claims (if necessary), the Board applies what is termed the “*Phillips* standard,” which requires construing claim language according to its ordinary and customary meaning in the art, consistent with the claims, patent specification and prosecution history.

C. Anticipation

21. I understand that evaluating anticipation involves two steps. The first step is construing the claims, which is a question of law. Second is a comparison of the construed claims to the prior art, a question of fact.

22. I understand that a patent claim to a device is anticipated if the same device, including all the claim limitations, is shown in a single prior art reference. The identical invention must be shown in as complete detail as is contained in the patent claim.

23. I understand that differences between the prior art reference and the claimed invention, however slight, prevent anticipation. Every element of the claimed invention must be literally present in the reference, arranged as in the claim. I understand that the hallmark of anticipation is prior invention, where unless a reference discloses within the four corners of the document not only all of the limitations claimed but also all of the limitations arranged or combined in the

same way as recited in the claim, it cannot be said to prove prior invention of the thing claimed and, thus, cannot anticipate.

24. I understand that a prior art reference that discloses individual claim elements that could have been arranged in the same way as the claim but does not itself describe or depict them arranged in that way, does not anticipate the claim. A prior art reference that teaches all elements of the claim but does not contain any discussion suggesting or linking the elements with each other, does not show the invention arranged as in the claim. Thus, I understand that anticipation cannot be based on merely picking and choosing multiple, distinct teachings from the reference that could somehow be combined to arrive at the claimed invention.

25. I understand that a claim limitation may be alleged to be present in a reference by “inherency.” I understand that facts or limitations asserted to be “inherent” in the prior art must be shown by evidence from the prior art. Anticipation by inherent disclosure is appropriate only when the reference discloses prior art that must *necessarily* include the unstated limitation.

26. I understand that inherency may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. Under principles of inherency, a party must demonstrate that the prior art necessarily functions in accordance with, or includes, the claimed limitations. Thus, that one of ordinary skill in the art understands that a

prior art reference may possibly disclose, or suggest, a feature is inadequate to prove inherency, and therefore inadequate to show anticipation of the claim by that reference. Similarly, the mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency.

D. Obviousness

27. I understand that a patent may not issue “if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.” This has typically been referred to as the “obviousness” inquiry.

28. I understand that obviousness is a question of law based on underlying factual determinations, including: (1) the scope and content of prior art; (2) differences between prior art and claims; (3) the level of ordinary skill in the art; and (4) objective indicia of nonobviousness.

29. I understand that a party asserting that a patent is obvious must demonstrate that a skilled artisan would have had reason to modify the teaching of a prior art reference and/or combine the teaching of the prior art references to achieve the claimed invention, and that the skilled artisan would have had a reasonable expectation of success from doing so. This is often referred to as “motivation to combine.”

30. I understand that reasonable expectation of success is assessed as of the date of the invention described in the patent. That the inventors were ultimately successful is irrelevant to whether one of ordinary skill in the art, at the time the invention was made, would have reasonably expected success. I understand that the use of hindsight in the obviousness inquiry is prohibited.

31. I understand that the claimed invention must be considered as a whole in analyzing obviousness or nonobviousness. In determining the differences between the prior art and the claims, the question under the obviousness inquiry is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. I understand that it is an improper approach to the obviousness inquiry to try to distill the invention down to a “gist” or “core,” as this superficial mode of analysis disregards elements of the whole.

32. I understand that, as part of determining the scope and content of the prior art, it is appropriate to consider whether there is evidence of a “teaching, suggestion, or motivation” to combine the prior art teachings in the prior art, the nature of the problem or the knowledge of a person having ordinary skill in the art. The question is not simply whether the prior art teaches the particular element of the invention. Knowledge of the goal does not render its achievement obvious.

33. I understand that one indicator of non-obviousness is when prior art “teaches away” from combining certain known elements. A prior art reference teaches away from the patent’s particular combination if it leads in a different direction or discourages that combination, recommends steps that would not likely lead to the patent’s result, or otherwise indicates that a seemingly inoperative device would be produced. Likewise, the fact that elements work together in an “unexpected and fruitful manner” supports the conclusion that an invention is not obvious to those skilled in the art.

34. I understand that a patent claim that is composed of several elements is not made obvious merely because each of those elements was independently known in the prior art. Rather, the useful inquiry is whether there was a reason that would have prompted a person having ordinary skill in the art to combine the elements in the manner of the new invention. Thus, I understand that the challenger must show that at the time of the invention a person of ordinary skill in the art would have been motivated to combine the references, not just that the references could have been combined.

35. I understand that certain objective indicia, with a nexus to the invention claimed in the patent issue, can be important evidence regarding whether a patent is obvious or non-obvious. I understand such indicia include:

- Commercial success;

- Long-felt but unsolved needs in the art for the invention, particularly in the face of prior art later asserted to lead to a solution;
- Failure of others to achieve the results of the invention;
- Unexpected or surprising results;
- Unexpected properties of the claimed invention;
- Licenses showing industry respect for the invention;
- Skepticism of skilled artisans before the invention or accepted wisdom contrary to it;
- Copying of the invention by others in the field;
- Seemingly minor technological differences having practical impact in a crowded field;
- A previously unrecognized problem; and
- Industry acceptance or praise.

I understand such indicia are referred to as “objective indicia of nonobviousness” or “secondary considerations,” such indicia must be considered when present.

IV. PERSON OF ORDINARY SKILL IN THE ART

36. I understand that claim construction and patentability is generally analyzed from the perspective of a person of ordinary skill in the art at the time of the invention (“POSITA”).

37. I understand that a POSITA is a hypothetical person that is considered to have the normal skills and knowledge of a person in a certain technical field, as of the time of the invention at issue. I understand that factors that may be considered in determining the level of ordinary skill in the art include: (1) the education level of the inventor; (2) the types of problems encountered in the art; (3) the prior art solutions to those problems; (4) the rapidity with which

innovations are made; (5) the sophistication of the technology; and (6) the education level of active workers in the field.

38. The '336 Patent issued from U.S. Patent Application No. 16/014,394 ("394 Application"), filed June 21, 2018. As noted on the face of the '336 Patent, the '394 Application was filed as a continuation-in-part of U.S. Patent Application No. 15/811,062 (filed on November 13, 2017), which is itself a continuation of U.S. Patent Application No. 15/435,141 ("141 Application") (filed February 16, 2017). The '336 Patent also includes a priority claim to U.S. Provisional Patent Application No. 62/297,424 ("424 Provisional"), filed February 19, 2016.

39. I understand that in his declaration, Dr. Eden applied the following definition of a POSITA:

28. Based on my review of the '336 Patent and my background and experience in the fields of LEDs and lighting design, it is my opinion that a person of ordinary skill in the art of the '336 Patent would have had a bachelor's degree in mechanical engineering, electrical engineering, or physics with at least three years of experience working in LEDs and lighting design; a master's degree in one of the above disciplines with at least two years of experience working in LEDs and lighting design; or other equivalent experience. This definition for the POSA would have been applicable: (i) at the '336 patent's earliest-claimed priority date of February 19, 2016; and also (ii) at the June 21, 2018 priority date to which claims 1-20 of the '336 patent are entitled.

Eden Dec., ¶ 28.

40. For purposes of this proceeding only, I have applied Dr. Eden's definition of a POSITA when analyzing the materials discussed herein. I had at least the qualifications of a POSITA under the above definition at all relevant times, including at both the June 21, 2018 filing date of the '394 Application, and the February 19, 2016 filing date of the '424 Provisional.

V. TECHNICAL BACKGROUND OF THE '336 PATENT

A. '336 Patent Background and Disclosure

41. The '336 Patent is titled "Configurable Lighting System." The underlying application (No. 16/014,394) was filed on June 21, 2018, and includes the following priority claim: "[c]ontinuation-in-part of application No. 15/811,062, filed on Nov. 13, 2017, which is a continuation of application No. 15/435,141, filed on Feb. 16, 2017, now Pat. No. 9,820,350." Application No. 15/811,062 has since issued as U.S. Patent No. 10,299,335. The '336 Patent also identifies provisional application No. 62/297,424 ("424 Provisional") which was filed on February 19, 2016. The named inventors are John Edwards Bowen and Raymond Janik, and the '336 Patent was originally assigned to Eaton Intelligent Power Limited.

42. The '336 Patent contains 20 total claims. Claims 1 and 13 are independent claims, where claims 2 through 12 depend from claim 1, and claims

14 through 20 depend from claim 13 (directly or through additional dependency).

Independent claims 1 and 13 are reproduced below:

1. A luminaire comprising:

a housing comprising at least one outer surface that forms a first cavity;

at least one electrical component disposed, at least in part, within the first cavity;

an electrical cable comprising a first end and a second end, wherein the first end is coupled to the at least one electrical component; and

a switch coupled to the electrical cable, wherein the switch is disposed remotely from the housing, wherein the switch has a plurality of positions, wherein each position of the plurality of positions of the switch corresponds to a discrete correlated color temperature (CCT) output by one or more light sources of the luminaire.

13. A switch for controlling a correlated color temperature (CCT) of light emitted by a luminaire, the switch comprising:

a body;

at least one first coupling feature disposed on the body, wherein the at least one first coupling feature is configured to electrically couple to an electrical cable of the luminaire; and

an actuator disposed on the body, wherein the actuator has a range of positions,

wherein each position of the range of positions of the actuator corresponds to a CCT of the light emitted by the luminaire.

'336 Patent, Claims 1 and 13.

43. The '336 Patent claims are generally directed to providing improved LED devices for adapting to various applications, including by providing multiple color temperatures selectable via a switch in a single LED luminaire that can be quickly configured, achieve energy savings, and/or be installed in a manner that avoids external display of the switch, for example by disposing the switch remotely from the housing (e.g., concealed within a junction box). *See, e.g.,* '336 Patent at 1:25-62.

44. The '336 Patent explains that at the time, existing incandescent and fluorescent lighting devices provided some flexibility with respect to customizing color temperature through, e.g., bulb or tube replacement within the luminaire. For example, a user could swap out a fluorescent tube having a different associated CCT to generate a different effect. However, conventional LED luminaires did not have such customizability, as the LEDs are typically attached to the luminaire and pre-configured with a specific CCT setting. As a result, retail locations would need to stock numerous lighting devices having identical form-factors, but differing CCT outputs, which can be costly and take up significant inventory space.

45. For example, the '336 Patent states:

With luminaires that incorporate incandescent or fluorescent technology, some flexibility can be obtained by swapping lamps to

meet user preferences. In such luminaires, lamp selection can provide flexibility in terms of correlated color temperature (CCT or color temperature) and light output (lumen output). For example, a compact fluorescent downlight might accept 6-, 32-, and 42-watt lamps in 2700, 3000, and 3500 K CCT. Additionally, changing lamp position and focal point in a reflector of an incandescent or fluorescent fixture can change the fixture spacing criteria (SC) of a luminaire.

In contrast, conventional light-emitting-diode-based luminaires typically offer reduced flexibility when the luminaire's light-emitting-diode-based light source is permanently attached to the luminaire. Stocking conventional light-emitting-diode-based luminaires at distribution to accommodate multiple configurations that users may desire can entail maintaining a relatively large or cumbersome inventory.

Need is apparent for a technology to provide a light emitting diode system that can adapt to various applications, for example by delivering multiple color temperatures, multiple lumens, and/or multiple photometric distributions. Need further exists for a capability to enable a single luminaire to be stocked at distribution and then quickly configured according to application parameters and deployment dictates. Need further exists for luminaires that are both energy efficient and flexible. A capability addressing one or more such needs, or some other related deficiency in the art, would support improved illumination systems and more widespread utilization of light emitting diodes in lighting applications.

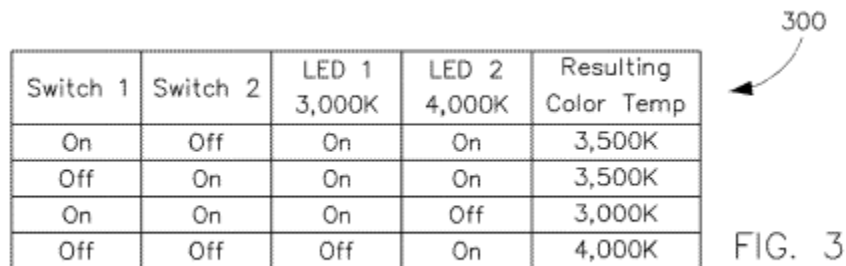
...

A luminaire can include a housing having at least one outer surface that forms a cavity. The luminaire can also include at least one electrical component disposed, at least in part, within the cavity. The luminaire can further include an electrical cable having a first end and a second end, where the first end is coupled to the at least one electrical component. The luminaire can also include a switch coupled to the electrical cable, where the switch is disposed remotely from the housing, where the switch has multiple positions, wherein each position of the switch corresponds to a discrete correlated color temperature (CCT) output by one or more light sources of the luminaire.

'336 Patent at Abstract, 1:26-62; *see also, e.g., id.* at 2:66-3:2, 13:20-14:16.

46. The '336 Patent also discloses exemplary CCT switches in accordance with the disclosed invention. One such switch is a dual inline pin (DIP) switch that includes an actuator having a plurality of positions, each position corresponding to a discrete CCT output:

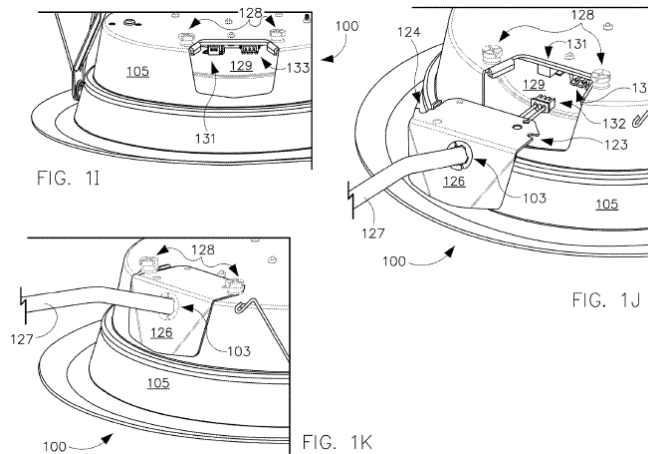
The dual inline pin switch 131 comprises individual switches 210 that provide an input for configuring the luminaire 100 to operate at a selected color temperature.



Switch 1	Switch 2	LED 1 3,000K	LED 2 4,000K	Resulting Color Temp
On	Off	On	On	3,500K
Off	On	On	On	3,500K
On	On	On	Off	3,000K
Off	Off	Off	On	4,000K

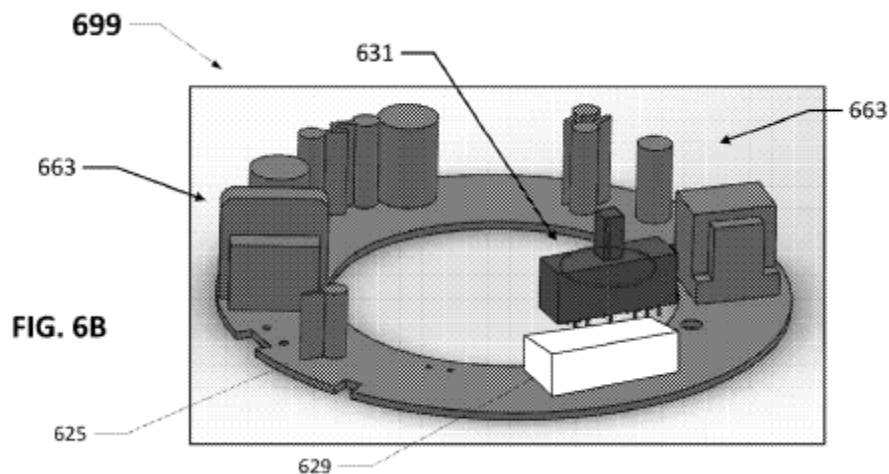
FIG. 3

Id. at 7:22-24, Fig. 3; *see also id.* at 3:57-67, 5:64-6:16 (“As illustrated, the dual inline pin switch 131 is mounted on a circuit board adjacent the access aperture 129 ... An electrical cable 127 extends through a wiring aperture 103 in the cover 126. The electrical cable 127 terminates in a plug 132 that mates with a receptacle 133 that is mounted inside the housing 105 ...”), 7:1-11 (“As discussed in further detail below, the circuit 200 supplies electricity to the light emitting diodes 150, 155 with a level of flexibility that facilitates multiple configurations suited to different applications and installation parameters.”), 7:22-33, 7:45-8:37; Figs. 1I, 1J, 1K, 2, 3.



The specification further explains that “[o]ther embodiments may have fewer or more switches 210.” *Id.* at 7:26-27. The patent further discloses exemplary circuitry for carrying out the disclosed CCT switching functionality. *See* Figs. 2, 4.

47. Another exemplary switch disclosed in the specification is a slide switch (631), as illustrated, for example, in Figures 6A, 6B and 6C:



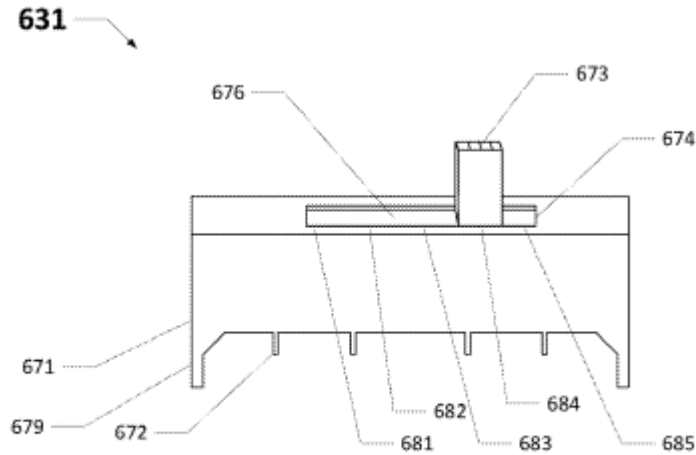


FIG. 6C

See '336 Patent at 9:6-10:65; Figs. 6A-C, 7. The slide switch depicted above “can include a number of detents and/or other features to limit or create discrete stopping locations for the actuator 673 (and so also the plate 676) along the length of the slot 674,” allowing for accurate CCT selection. *Id.* at 10:17-28; *see also id.* at 3:57-67, 7:64-8:37, 12:16-32, 13:6-19. The slide switch also includes pins 672, that allow the slide switch to electrically couple to power provided to the luminaire via a circuit board. *See id.* at 9:64-10:16.

48. In addition, the '336 Patent states:

As an alternative to the illustrated dual inline pin switch 131, the input can comprise multiple DIP switches, one or more single in-line pin packages (SIP or SIPP), one or more rocker switches, one or more reed switches, one or more magnetic switches, one or more rotary switches, one or more rotary dials, one or more selectors or selector switches, one or more slide switches, one or more snap switches, one or more thumbwheels, one or more toggles or toggle switches, one or more keys or keypads, or one or more buttons or pushbuttons, to mention a few representative examples without limitation.

...

The example switch 631 can be used to select one or more of a number of variables that affect the operation of the luminaire 600. For example, the switch 631 can be used to select one of a number of CCTs. The switch 631 can be any of a number of types of switches, including but not limited to one or more DIP switches, one or more SIPP switches, one or more rocker switches, one or more reed switches, one or more magnetic switches, one or more rotary switches, one or more rotary dials, one or more selectors or selector switches, one or more slide switches (as shown in FIG. 6C), one or more snap switches, one or more thumbwheels, one or more toggles or toggle switches, one or more keys or keypads, and one or more buttons or pushbuttons.

Id. at 7:34-44; 9:51-63.

49. The '336 Patent explains, for example, that CCT selection can be carried out by switching between or amongst different LED groupings having different associated Kelvin temperature, e.g.:

For example, the luminaire can comprise a 3,000 K group of light emitting diodes and a 4,000 K group of light emitting diodes. When only the 3,000 K group is on, the luminaire can deliver 3,000 K illumination. When only the 4,000 K group is on, the luminaire can deliver 4,000 K illumination. When the 3,000 K group and the 4,000 K group are both on, the luminaire can deliver 3,500 K illumination. If the 4,000 K group of light emitting diodes is concurrently operated at a low lumen output and the 3,000 K group is operated at a high lumen output, the luminaire may deliver illumination of another selected color temperature, for example 3,100 K.

'336 Patent at 3:57-67. The patent further explains that:

In some example embodiments, a controller can adjust lumen output automatically to maintain constant delivered lumens across multiple color temperatures or to suite application requirements. The controller implements the adjustment utilizing programmable driver current and/or via turning on and off various groups of light emitting diodes. Configurable color temperature or lumen output can function in

combination with integral dimming, for example to facilitate interface with building automation, sensors, and dimmers.

In some example embodiments, luminaires can achieve an additional level of flexible configuration at a distribution center using interchangeable optics. For example, primary optics can provide medium distribution (e.g. spacing criteria equals 1.0), while a diffuser or concentrator lens can be used to achieve wide distribution (e.g. spacing criteria equals 1.4), and narrow distribution (e.g. spacing criteria equals 0.4).

In some example embodiments, a luminaire's configuration of delivered lumens and color temperatures can be set at the factory, at distribution, or in the field. To meet current and emerging code compliance, performance markings on a luminaire can indicate and correspond to the desired setting. Economical, field-installed nameplates can identify the various electrical and optical performance ratings and, when installed, permanently program the delivered lumens and color temperature. Other settings, such as dimming protocols, can likewise be configured. The interface between the nameplate and internal logic can use mechanical, electrical or optical means, for example.

Id. at 4:1-30.

50. For example, the '336 Patent provides exemplary depictions and illustrations of a luminaire (see Figures 1A-K), including an exemplary embodiment (illustrated in, e.g., Figure 10, reproduced below) of a luminaire that includes, among other things, a housing 1005 having a cover 1026, an electrical cable 1027 coupled to electrical components ("e.g., light sources" such as LEDs) within the housing, and a junction box 1090, where the disclosed switch 1031 is located within the junction box such that when the luminaire is installed, the junction box "can be inaccessible," but when the housing is removed the junction box "can be accessible":

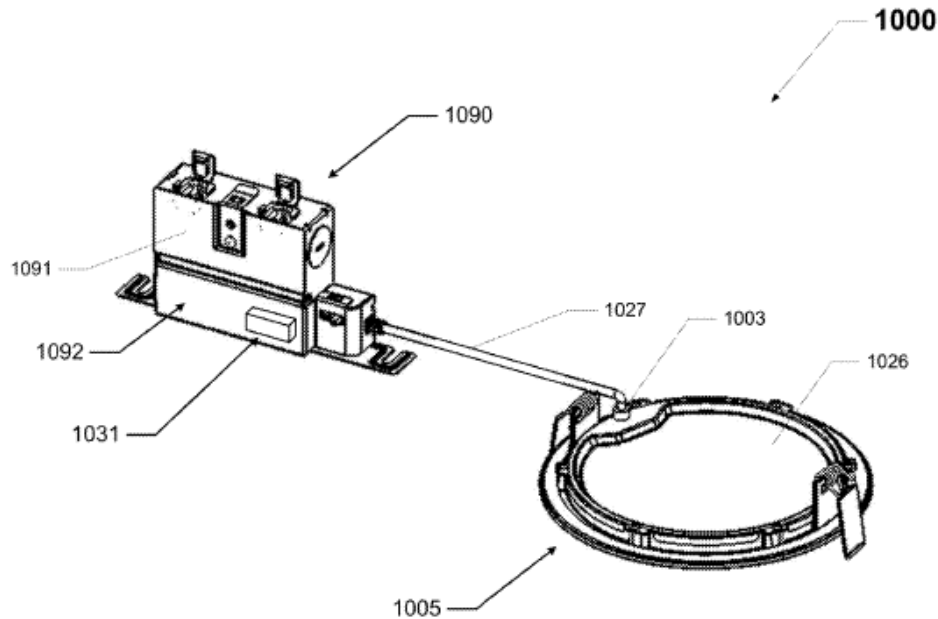


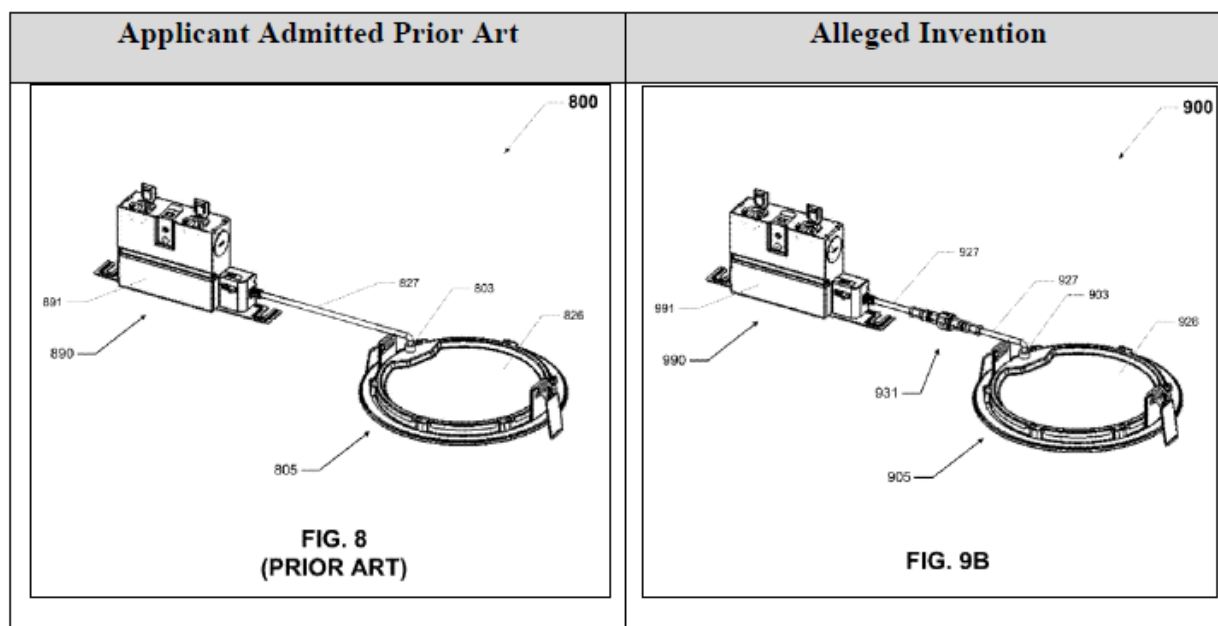
FIG. 10

See '336 Patent at 12:33-13:19; Fig. 10. The patent provides additional examples of a luminaire, including examples where the switch is remote from the housing, but not necessarily located within the junction box. See, e.g., id. at 11:21-12:32; Figs. 9A, 9B.

51. The '336 Patent does not limit the recited invention to the disclosed exemplary embodiments, and it states, e.g., that “[m]any modifications and other embodiments of the disclosures set forth herein will come to mind to one skilled in the art to which these disclosures pertain having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the disclosures are not to be limited to the specific

embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of this application.” ’336 Patent at 14:17-28.

52. I note that in his declaration, Dr. Eden compares certain figures of the ’336 Patent (as illustrated below) in an apparent effort to show that the disclosed invention was of little merit or obvious, calling the prior art and exemplary embodiments of the invention “substantially the same”:



Ex. 1004 at ¶ 50. Dr. Eden misses the point. What is shown above is simply a figure illustrating the incorporation of a CCT switch in a device that previously did not include one, which a POSITA would of course understand would also include associated components that the switch controls (which are not shown in the external view of the figures), as discussed in detail in the ’336 Patent. Moreover, the Figures above demonstrate that the invention can be implemented in an

existing luminaire design, in such a way as to retain the overall look and appearance of the luminaire, which itself would be understood as a significant benefit (when compared to substantial or bulky modifications that may otherwise be required). Indeed, the claimed invention is not a round housing or the junction box itself, but rather the novel implementation of the CCT switch in a luminaire as disclosed and claimed in the patent. Thus, Dr. Eden's observation is untethered to the claims, and has no bearing on validity.

B. Prosecution History

53. As noted above, the '394 Application was filed on June 21, 2018. Following the applicant's correction of certain deficiencies identified by the Examiner, on October 16, 2018, the Examiner issued a Notice of Allowance indicating that all claims (1-20) were allowed. The Examiner further stated:

The primary reasons for the allowance of the claims are in the inclusion of the limitation(s):

" ... an electrical cable comprising a first end and a second end, wherein the first end is coupled to the at least one electrical component; and a switch coupled to the electrical cable, wherein the switch is disposed remotely from the housing, wherein the switch has a plurality of positions, wherein each position of the plurality of positions of the switch corresponds to a discrete correlated color temperature (CCT) output by one or more light sources of the luminaire" and combination thereof, in the claim(s), i.e., claim 1, (claims 2-12 are allowed as being dependent on claim 1), and

" ... at least one first coupling feature disposed on the body, wherein the at least one first coupling feature is configured to electrically couple to an electrical cable of the luminaire; and an actuator disposed on the body, wherein the actuator has a range of positions, wherein each

position of the range of positions of the actuator corresponds to a CCT of the light emitted by the luminaire" and combination thereof, in the claim(s), i.e., claim 13, (claims 14-20 are allowed as being dependent on claim 13), which are not found in the prior art references.

The prior art made of record and relied upon is considered pertinent to applicant's disclosure. The best consider with this application can be filed in Yan (U.S. Patent 8,598,793 B2).

Ex. 1007 at 98-100. It is my understanding, based on the file history, that these statements were not made by the applicant, but rather that the Examiner made these statements based on the Examiner's own opinion, and without the benefit of any input from the applicant. I further understand that the applicant was not invited to, and did not, submit any response to the Examiner's opinions above.

54. On December 31, 2018, in response to a Notice to File Corrected Application Papers, the applicant submitted an Amendment After Notice of Allowance, where certain amendments were made to the specification and drawings in view of revisions to the originally-filed drawings, but no new matter was added.

55. On January 16, 2019, the applicant filed a Request for Continued Examination and an Information Disclosure Statement (IDS) identifying additional references for consideration by the Examiner. On January 22, 2019, the Examiner issued a communication stating that the references submitted by the applicant had been considered.

56. On February 12, 2019, the Examiner issued a Notice of Allowance again indicating that all claims (1-20) were allowed.

57. The applicant thereafter submitted two additional IDSs on February 22 and 27, 2019. Following that, on March 28, 2019, the Examiner issued a communication stating that the references submitted by the applicant had been considered.

C. Industry Praise for the Invention

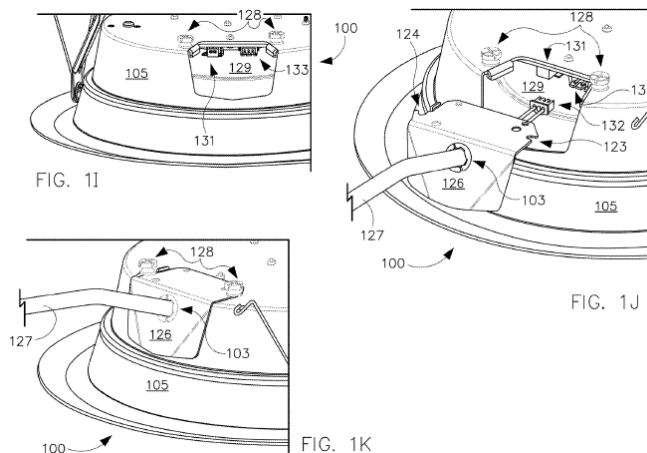
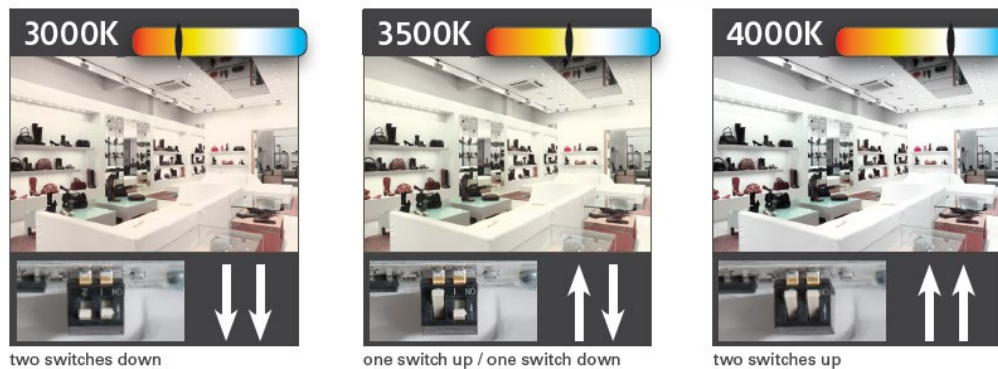
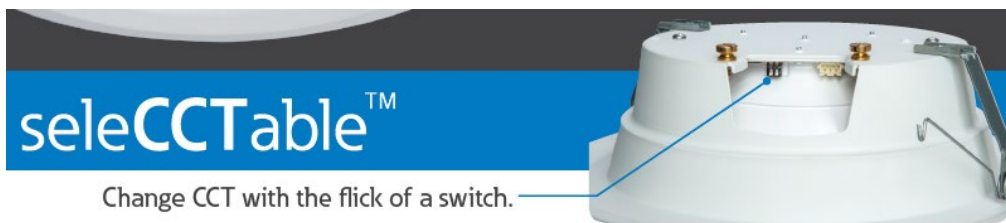
58. In his declaration, Dr. Eden characterizes the '336 Patent invention in a manner that suggests it was merely obvious at the time of the invention. *See* Eden Dec. at 11-23. I disagree with this characterization, which appears to be based largely on hindsight and a post hoc interpretation of various references using the '336 Patent as a guide. Furthermore, this characterization is contradicted, for example, by Dr. Eden's inability to demonstrate that the challenged claims are unpatentable in view of the grounds in his declaration, as discussed below. It is also contradicted by significant industry praise the invention received upon release, including from industry associations and large retailers, e.g., Home Depot.

59. On its face, the '336 Patent was assigned to Eaton Intelligent Power Limited ("Eaton"). I understand that Signify later acquired Cooper Lighting

Solutions (“Cooper”) from Eaton,¹ and as a result the ’336 Patent and related applications were conveyed to Signify. I understand that the CCT switch invention recited in, for example, claim 13 of the ’336 Patent was introduced in, and is embodied in, the Halo Commercial PR8 family of products with SelecCCTable™ technology introduced by Eaton, which is confirmed by my analysis below.

60. For example, I understand that the PR8 with SelecCCTable™ technology was first introduced in or around January 2017. I have reviewed documents describing the PR8, and as illustrated below for example, it is my opinion that the PR8 is the same, or substantially the same, as the embodiment illustrated in, e.g., Figures 1 and 3 of the ’336 Patent (and applications to which the ’336 Patent claims priority):

¹ See Ex. 2038; <https://www.signify.com/global/our-company/news/press-releases/2020/20200302-signify-successfully-completes-acquisition-of-cooper-lighting-solutions>. I understand that Eaton had acquired Cooper before the Signify acquisition, and the sale of Cooper to Signify was a sale of Eaton’s lighting business. <https://www.eaton.com/us/en-us/company/news-insights/news-releases/2020/eaton-completes-the-sale-of-its-lighting-business-.html>.



Switch 1	Switch 2	LED 1 3,000K	LED 2 4,000K	Resulting Color Temp
On	Off	On	On	3,500K
Off	On	On	On	3,500K
On	On	On	Off	3,000K
Off	Off	Off	On	4,000K

FIG. 3

See Ex. 2036 at 2; Ex. 1001 at 3:57-67, 5:67-6:15, 7:22-44, 7:64-8:37, Figs. 1A-4.

61. For example, as can be seen from available documentation and below, the PR8 includes the same DIP switch, in the same location, as DIP switch 131 in

Fig. 1J in the '336 patent (which is also reflected in other figures of the '336 patent, including Figures 1E, 1G and 1I):

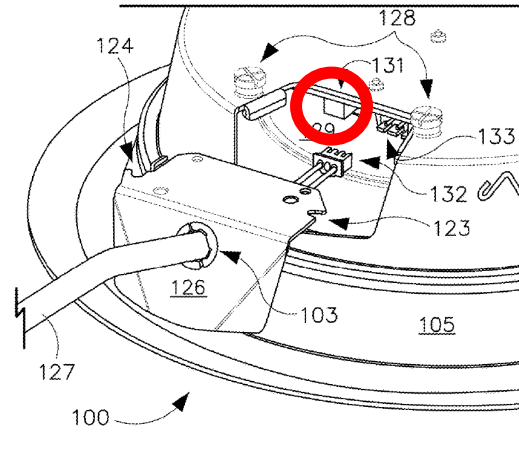
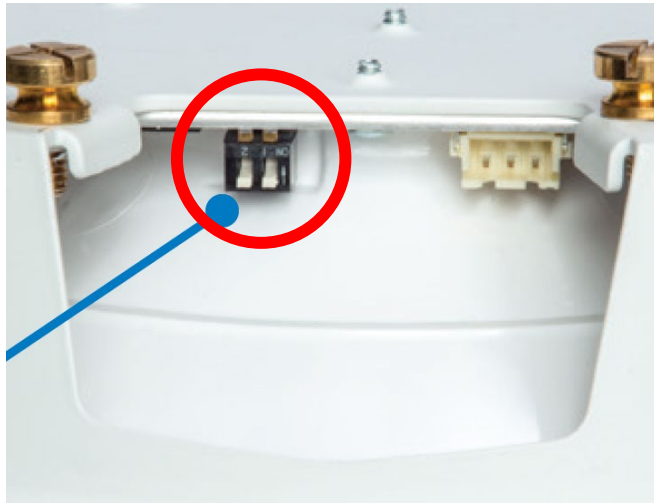
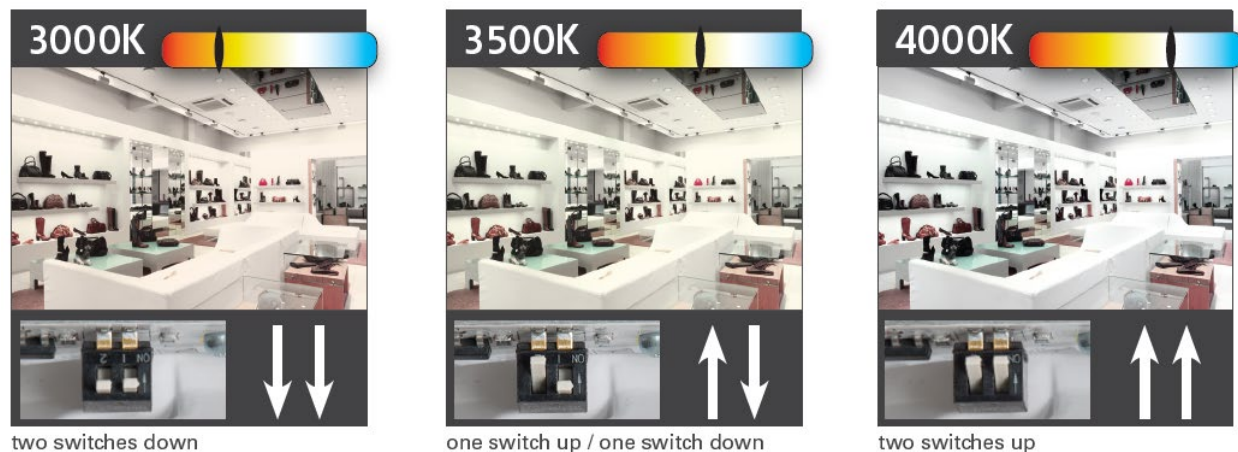


FIG. 1J

See Ex. 2036 at 2; Ex. 1001, Figs. 1E, 1G, 1J, 1I. Likewise, the PR8 also includes the same receptacle (to the right of the DIP switch), in the same location, for mating with an electrical cable, as receptacle 133 in Fig. 1J in the '336 patent (as well as other figures in the patent). These features are also present in the '424 Provisional, as discussed below.

62. This is also consistent with the described operation of the PR8, which uses the same operation with respect to the DIP switch as that disclosed in the '336 Patent and priority patents and applications. For example, the same disclosed switch actuator arrangements result in the same CCT outputs (where “down” corresponds to “on” and “up” corresponds to “off”):



Switch 1	Switch 2	LED 1 3,000K	LED 2 4,000K	Resulting Color Temp
On	Off	On	On	3,500K
Off	On	On	On	3,500K
On	On	On	Off	3,000K
Off	Off	Off	On	4,000K

FIG. 3

See Ex. 2036 at 2; Ex. 1001 at 7:64-8:37, Fig. 3; *infra* at Section VI.

63. Thus, the available information demonstrates that the PR8 uses the same configuration (with respect to the switch) as the configuration disclosed in Fig. 1. As discussed below (*see infra* at Section VI), the DIP switch and its arrangement illustrated in Fig. 1 and used in the PR8 is an embodiment of the switch claimed in Claims 13, 15 and 16 of the '336 Patent. This concept was also disclosed in the '424 Provisional and the other applications to which the '336 Patent claims priority. *See id.*

64. The '336 Patent explains that, prior to the invention, the availability of luminaires and lighting devices having different singular pre-set CCT values was

permeating the marketplace. Ex. 1001, 1:42-62. This means that LED lighting devices having singular pre-set CCT values would need to be provided as separate saleable units or SKUs, such that commercial/retail stores (e.g., Home Depot) were required to stock multiple different SKUs of the same model, but different pre-set CCT values. Given the numerous other differences amongst various product models (e.g., color, aperture size, lumen value), this would logically create difficulty securing sufficient shelf space for the different permutations based on CCT settings. For example, a single luminaire at a single size (e.g., an 8" downlight) would require three separate units if three different colors were to be offered, effectively tripling the number of units (which would only increase as the number of available CCT settings increased). Further, if customers and end users purchase certain SKUs only to find, once installed, that the CCT setting did not result in the desired light output, it could lead to returns and exchanges, and resulting costs.

65. I understand that the PR8 was the first product to provide a luminaire or lighting device with CCT selectability via a switch, which allowed customers, end users and installers to adjust the CCT of the product after purchase. I am also not aware of a commercial product that was offered or available prior to the PR8 that provided a luminaire or lighting device with CCT selectability customizable at the lighting device via a switch.

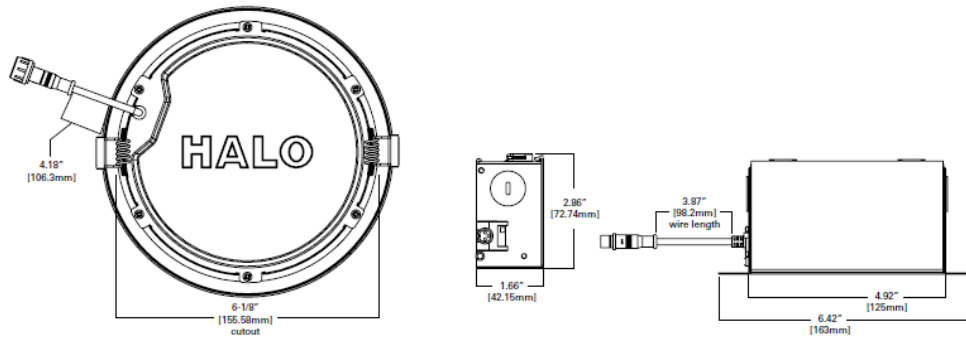
66. I understand that the PR8 received industry praise for addressing these needs and issues within the industry, including those relating to shelf space discussed above. Ex. 2040 at 2; Ex. 2041. For example, Home Depot awarded “Eaton’s Halo Color Selectable LED Downlights” (the PR8 product) a “2018 Innovation Award” shortly after its release, and included the statement:

“Working with Eaton, we were able to deliver this at the same retail or less than the dedicated color temperature product before,” says Kevin Doughty, merchant of commercial and recessed lighting at Home Depot. “Just a great, huge, awesome innovation, and a great value for our customers that’s exclusive to Home Depot.”

Ex. 2040 at 2.

67. I further understand that, as early as August 2018, Eaton/Cooper Lighting also introduced a CCT selectability switch located remotely from the luminaire in a junction box in, for example, its canless recessed lighting. For example:





See Ex. 2037 at 3; Ex. 2039 at 2.

68. I have reviewed documents describing this design, and as illustrated below for example, it is the same, or substantially the same, as the embodiment illustrated in Figure 10 of the '336 Patent (and related disclosures):

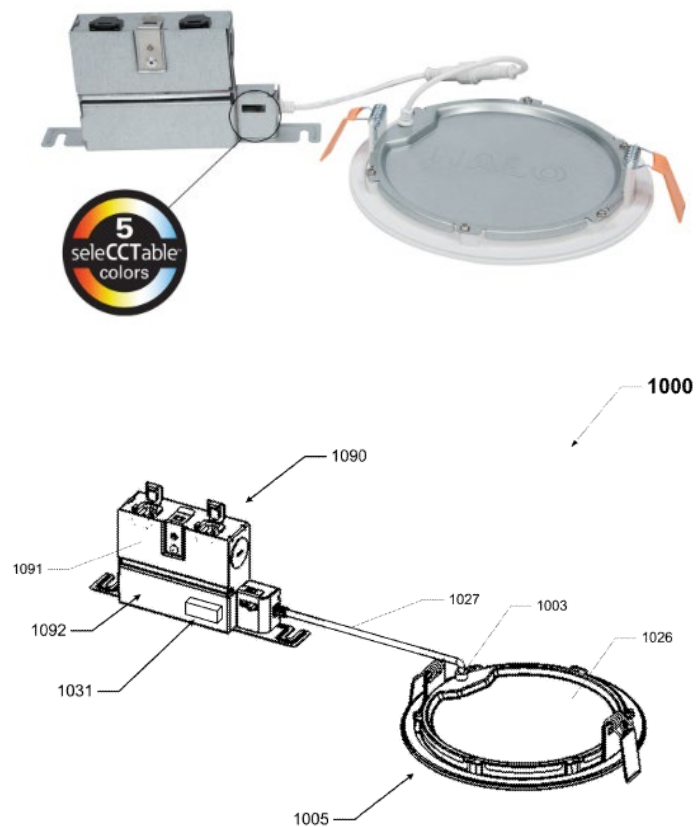
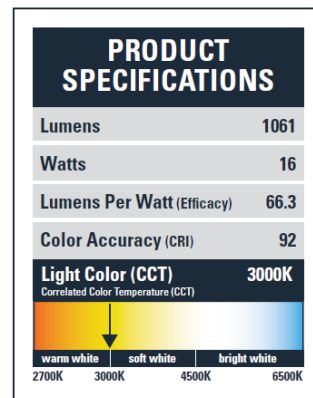


FIG. 10

69. For example, as can be seen from available documentation and below, the HALO canless recessed light above includes a housing, at least one electrical component disposed in the housing (LEDs), an electrical cable where the first end is coupled to the at least one electrical component (the white cable between the junction box and the housing above), and a slide switch coupled to the cable and disposed remotely from the housing having a plurality of positions corresponding to CCT outputs (circled in the image above and identified has having “5 seleCCTable colors”). *See* Ex. 2037 at 3; Ex. 2039 at 1-2; Ex. 1001 at 12:33-13:19; Fig. 10. Consistent with this, the product is described as having “Field Selectable CCT,” including “Field selectable color temperature, select 2700, 3000, 3500, 4000 or 5000 K CCT.”

	CCT	Lumens	Power (W)	LPW
6in HLB	2700K	1037.3	16	64.8
	3000K	1061	16	66.3
	3500K	1078.9	16	67.4
	4000K	1094.9	16	68.4
	5000K	1103.4	16	69



Ex. 2039 at 2.

70. Thus, the available information demonstrates that, for example, the HALO product above (and products using similar configuration) uses the same

configuration as disclosed in Figure 10 and the portions of the specification relating to the same.

71. I understand that the CCT selectable HALO products (with “SeleCCTable” technology) continue to be sold to this day.

VI. '336 PATENT PRIORITY DATE

72. It is my opinion, based on the '336 Patent, its related prosecution history and the applications to which it claims priority, that claims 13, 15 and 16 are entitled to a priority date at least as early as February 19, 2016² (i.e., the filing date of the '424 Provisional), and the remaining challenged claims are entitled to a priority date at least as early as June 21, 2018 (i.e., the filing date of the '336 Patent).

73. I understand that to show entitlement to a priority date of a parent application, the patent owner must show that the parent application: (1) provides adequate written description for the subjected matter recited in the claims to which priority would apply; asnd (2) enables a POSITA to make and use the inventions in those claims. It is my opinion that the '424 Provisional (Ex. 1008) both provides adequate written description for claims 13, 15 and 16, and enables those claims.

² As discussed below, at the very least claims 13, 15 and 16 are entitled to a priority date at least as early as February 16, 2017.

My opinion is based on how a POSITA would have understood the '424 Provisional, as demonstrated below.

74. In his declaration, Dr. Eden opines that all of the '336 Patent claims have a priority date “no earlier than June 21, 2018.” Eden Dec. at ¶¶ 59-66. I disagree with his opinion, and as I have noted in my analysis below, Dr. Eden’s deposition testimony contradicts the opinion in his declaration, and supports my opinion that claims 13, 15 and 16 are entitled to a priority date at least as early as February 19, 2016.

A. Claim 13

1. Preamble: “A switch for controlling a correlated color temperature (CCT) of light emitted by a luminaire, the switch comprising:”

75. The '424 Provisional (Ex. 1008) discloses a switch—e.g., a “dual inline pin” (DIP) switch—for controlling a correlated color temperature or “CCT” of light emitted by a luminaire.

76. The '424 Provisional discloses the inclusion of switches 210 of a DIP switch within or on the housing of a luminaire, where the state of switches 210 configure the luminaire to operate sets of LEDs to achieve certain correlated color temperatures. For example:

Switches 210 provide an input for configuring the luminaire 100 to operate at a selected correlated color temperature. In the illustrated embodiment, the circuit 200 comprises two manual switches 210. Other

embodiments may have fewer or more switches 210. In some embodiments, **the switches 210 comprise dual inline pin (DIP) switches**. In various embodiments, the switches 210 can be mounted to the housing 105 of the luminaire 100, for example within the housing 105 or on an exterior surface of the housing. In some embodiments, the switches 210 are mounted on the substrate 125.

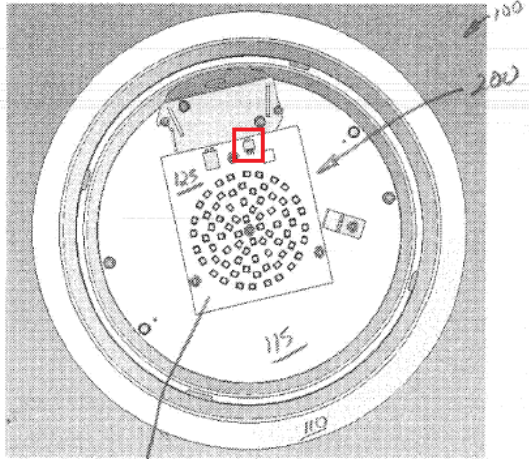
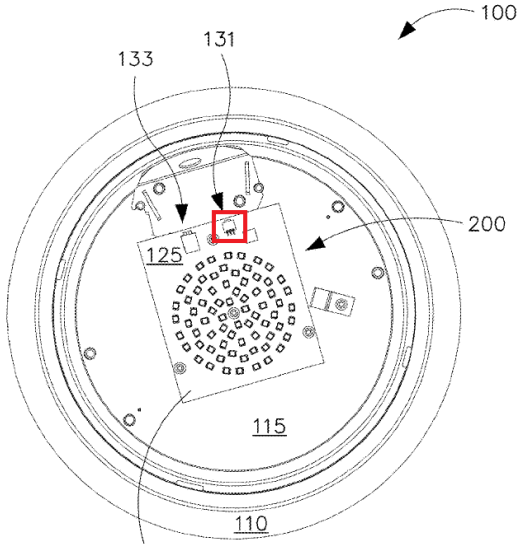
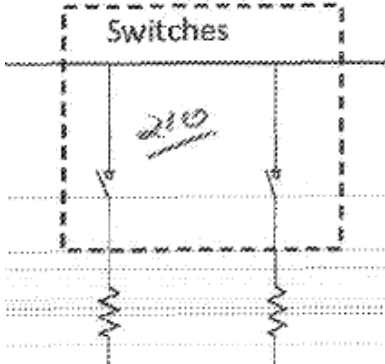
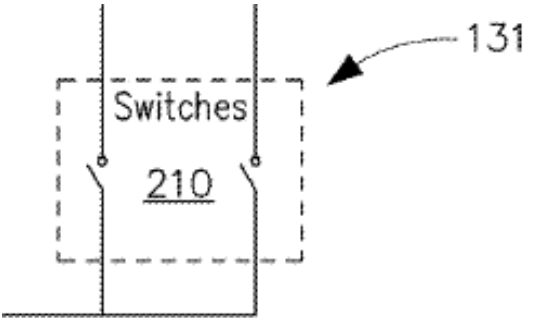
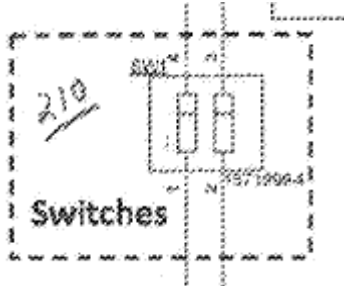
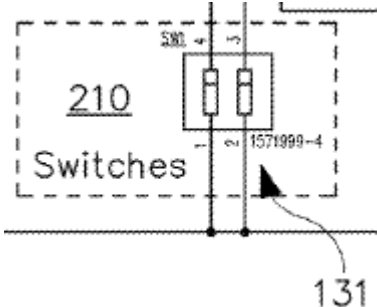
As further discussed below, a controller 215 operates the light emitting diodes 150, 155 according to state of the switches 210. In some example embodiments, the controller 215 comprises logic implemented in digital circuitry, for example discrete digital components or integrated circuitry. In some example embodiments, the controller 215 utilizes microprocessor-implemented logic with instructions stored in firmware or other static or non-transitory memory.

In the illustrated embodiment, the outputs of the controller 215 are connected to two MOSFET transistors 160 to control electrical flow through two light emitting diodes 150, 150. **The switches thus configure the luminaire 100 to operate with either or both of the light emitting diodes 150, 155.**

Ex. 1008 at 5:12-28 (emphasis added).³

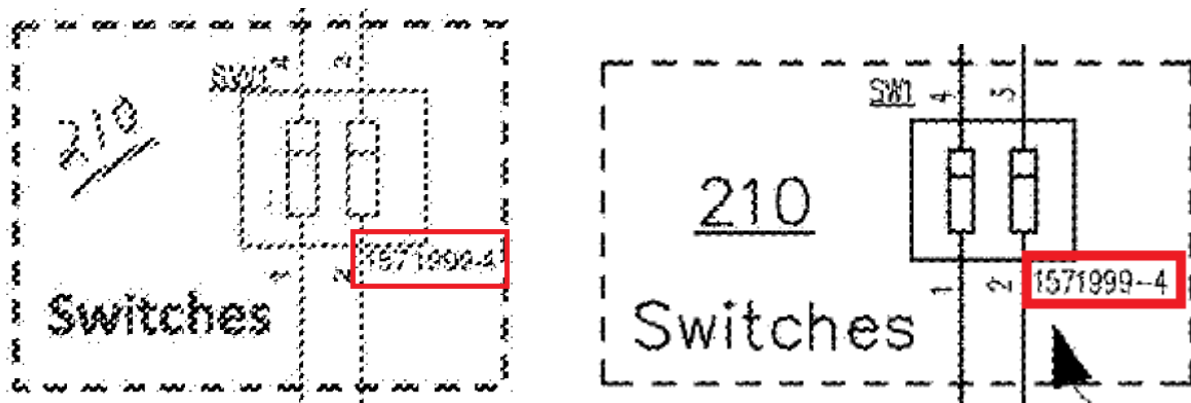
77. The disclosed DIP switch embodiment is also illustrated in, for example, Figures 1E, 2 and 4 of the '424 Provisional, which are the same (or substantially the same) as the corresponding figures that appear in the '336 Patent, as demonstrated below:

³ My citation to page numbers in Ex. 1008 are to the page numbers of the actual application, which begins at page 15 of the exhibit.

'424 Provisional	'336 Patent
Figure 1E (red box added):  150/155 FIG. 1E	Figure 1E (red box added):  150/155 FIG. 1E
Excerpt of Figure 2: 	Excerpt of Figure 2: 
Excerpt of Figure 4: 	Excerpt of Figure 4: 

Ex. 1008, 3:25-4:1, Figs. 1E, 2, 4; Ex. 1001, Figs. 1E, 2, 4. I note that according to the '424 Provisional, Figure 1 “illustrate[s] views of a luminaire 100 in accordance with some example embodiments of the disclosure,” “Figure 2 illustrates a functional block diagram of a circuit 200 that the luminaire 100 can comprise in accordance with some example embodiments of the disclosure,” and “Figure 4 illustrates a schematic of the circuit 200 in accordance with some example embodiments of the disclosure.” Ex. 1008 at 3:25-4:1.

78. I note that in Figure 4 of the '424 Provisional above, the exemplary DIP switch illustrated in the figure includes a notation indicating a part number “1571999-4,” which also appears in the same figure of the '336 Patent:



This number corresponds to the ADP0204 DIP switch manufactured by Tyco Electronics (“Tyco”) having two individual switches, which is consistent with the disclosure of the '424 Provisional and depiction of the DIP switch in its figures.



See Exs. 2032, 2033; <https://www.digikey.com/en/products/detail/te-connectivity-alcoswitch-switches/1571999-1/969165>. I note that the same part number is listed in the Tyco Electronics catalog from March 2008 that Dr. Eden discussed at his deposition:

ADP Series



Product key	Positions	Mounting	Packaging	Part number
ADP0204	2	THT	tube	1571999-1
ADP02STR04		SMT	tape and reel	1571999-4
ADP0404	4	THT	tube	1571999-6
ADP04STR04		SMT	tape and reel	1571999-9
ADP0604	6	THT	tube	1-1571999-6
ADP06STR04		SMT	tape and reel	1-1571999-9
ADP0804	8	THT	tube	2-1571999-6
ADP08STR04		SMT	tape and reel	2-1571999-9
ADP1004	10	THT	tube	3-1571999-6
ADP10STR04		SMT	tape and reel	3-1571999-9



Ex. 2029 at 1, 15; Ex. 2030 at 75:1-77:6. I further note that the '424 Provisional disclosure is not limited to this particular exemplary DIP switch.

79. The '424 Provisional also explains how the disclosed DIP switch is used to control the correlated color temperature of light emitted by a luminaire. For example, the '424 Provisional explains that the exemplary disclosed design includes two sets of LEDs: "a 3,000 K group of light emitting diodes and a 4,000 K group of light emitting diodes." Ex. 1008 at 2:7-16. The '424 Provisional further

explains how the disclosed DIP switch controls the CCT of the luminaire based on the position of switches 210, such that the DIP switch setting controls whether the exemplary luminaire outputs light at a CCT of 3,000K, 4,000K, or 3,500K:

As shown in the example table 300, when both of the switches 210 are in the on state, the controller 215 causes the light emitting diode 155 to be off and the light emitting diode 150 to be on. Accordingly, the luminaire 100 emits illumination having a correlated color temperature of 3,000 degrees Kelvin.

When both of the switches 210 are in the off state, controller 215 causes the light emitting diode 155 to be on and the light emitting diode 150 to be off. Accordingly, the luminaire 100 emits illumination having a correlated color temperature of 4,000 degrees Kelvin.

When one of the switches 210 is in the off state and the other of the switches 210 is on the on state, the controller 215 causes the light emitting diode 155 to be on and the light emitting diode 150 to be on. The luminaire thus 100 emits illumination having a correlated color temperature of 3,500 degrees Kelvin.

Accordingly, the controller maps the four configurations of the two switches 210 to three states for configuring the two light emitting diodes 150, 155 for permanent or long-term operation. Mapping two switch configurations to a single mode of long-term operation can simplify configuration instructions and reduce errors during field configuration. **The resulting configurations support multiple correlated color temperatures of illumination from a single luminaire 100.**

Ex. 1008 at 6:4-21 (emphasis added).

80. This description of how the DIP switch embodiment controls the CCT output of the luminaire based on the setting of switches 210 of the DIP switch is also illustrated in, for example, Figure 3 of the '424 Provisional, which is the same (or substantially the same) as the corresponding figure that appear in the '336 Patent, as demonstrated below:

'424 Provisional				
Figure 3:				
Switch 1	Switch 2	LED 1 3,000 K	LED 2 4,000K	Resulting Color Temp
On	Off	On	On	3,500 K
Off	On	On	On	3,500 K
On	On	On	Off	3,000 K
Off	Off	Off	On	4,000 K

300
↙
FIG. 3

'336 Patent				
Figure 3:				
Switch 1	Switch 2	LED 1 3,000K	LED 2 4,000K	Resulting Color Temp
On	Off	On	On	3,500K
Off	On	On	On	3,500K
On	On	On	Off	3,000K
Off	Off	Off	On	4,000K

300
↙
FIG. 3

I note that according to the '424 Provisional, "Figure 3 illustrates a state table for the circuit 200 in accordance with some example embodiments of the disclosure."

Ex. 1008 at 3:29-30.

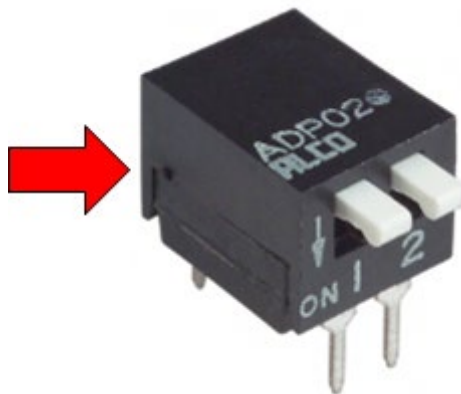
81. I further note that at his deposition, Dr. Eden agreed that actuating switches 201 of the disclosed DIP switch changes the luminaire's CCT output. Ex. 2030, 58:12-23, 62:14-63:8, 67:8-68:12.

2. Element 13(a): “a body”

82. The DIP switch disclosed in the '424 Provisional (Ex. 1008) includes a “body,” which can be seen, for example, in Figures 1E and 4 where the rectangular body is depicted:



Ex. 1008, Figures 1E, 4. I further note that the DIP switch corresponding to part number “1571999-4” in Figure 4 has a square body, consistent with the body depicted in Figures 1E and 4.



Ex. 2032; Ex. 2033.

83. I further note that at his deposition, Dr. Eden confirmed that the disclosed DIP switch includes a body. Ex. 2030 at 55:20-56:1 (“Q. And that’s the ... square body of the DIP switch we see from a top view in Figure 1E, correct? A. Yes.”), 82:24-83:4, 222:1-12.

3. Element 13(b): “at least one first coupling feature disposed on the body, wherein the at least one first coupling feature is configured to electrically couple to an electrical cable of the luminaire”

84. The DIP switch disclosed in the ’424 Provisional (Ex. 1008) includes a “body,” where disposed on the body is a first coupling feature (i.e., pins) that are configured to electrically couple to an electrical cable of the luminaire (i.e., “wiring” that enters the housing at aperture 103 and electrically couples to the switch via the substrate on which it is mounted).

85. First, a POSITA would have understood that the disclosed DIP switch has a coupling feature in the form of pins disposed on the body of the switch. Such pins can be seen, for example, in the DIP switch corresponding to part number “1571999-4” (labeled in Figure 4):



Ex. 2032; Ex. 2033. This type of coupling feature is to be expected for a DIP switch, and is included in nearly every DIP switch capable of being mounted on a substrate as described in the '424 Provisional. For example, the March 2008 Tyco catalog addressed by Dr. Eden at his deposition contains numerous depictions of DIP switches, all of which include pins for mounting the DIP switches on a circuit board or substrate. Ex. 2029 at 2-4; Ex. 2030 at 75:1-78:1, 79:2-81:17.

86. As noted above, the '424 Provisional describes mounting the disclosed DIP switch on substrate 125 of luminaire 100, which is a standard manner of integrating DIP switches. Ex. 1008 at 5:12-18 (“In some embodiments, the switches 210 are mounted on the substrate 125.”), Fig. 1E. I note that at his deposition, Dr. Eden testified that inserting the disclosed DIP switch into substrate 125 using “pins on the DIP switch body” is “normally how it’s done.” Ex. 2030 at 59:22-60:7, 117:7-118:1, 109:6-21; Ex. 1008, 5:12-18, claim 24, Fig. 1E; Ex. 1001, 9:64-10:16 (describing electrical coupling). I agree with his description.

87. Furthermore, a POSITA would have also understood that, e.g., the pins of the DIP switch disclosed in the '424 Provisional are configured to electrically couple to an electrical cable of the luminaire. For example, as described below, the '424 Provisional discloses an electrical cable (or “wiring”) that connects and provides power to the substrate into which the pins of the disclosed DIP switch are inserted, thereby electrically coupling the pins to the electrical cable. I note that Dr. Eden acknowledged that there are no specific “structural requirements” for the recited electrical cable, and that “an electrical cable, as recited in the patent claims, [could] be a single wire.” Ex. 2030, 107:9-22.

88. The electrical cable is received by the housing at aperture 103, which is depicted in Figures 1E and 1H of the application near the DIP switch on substrate 125:

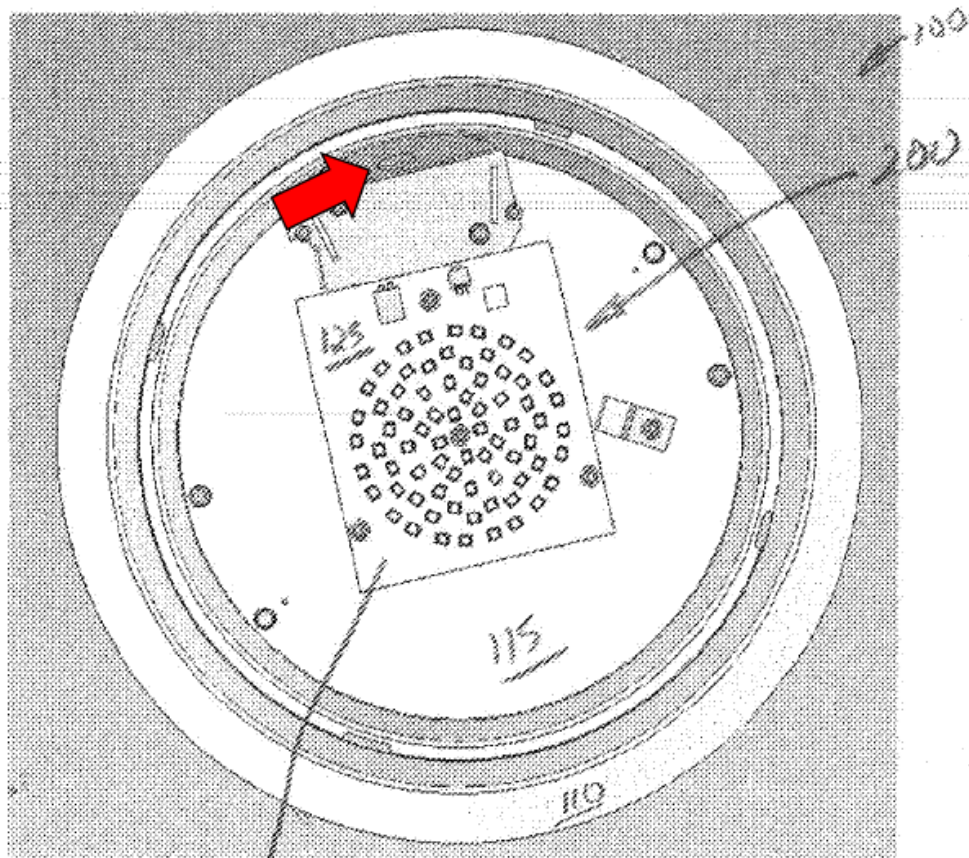


FIG. 1E

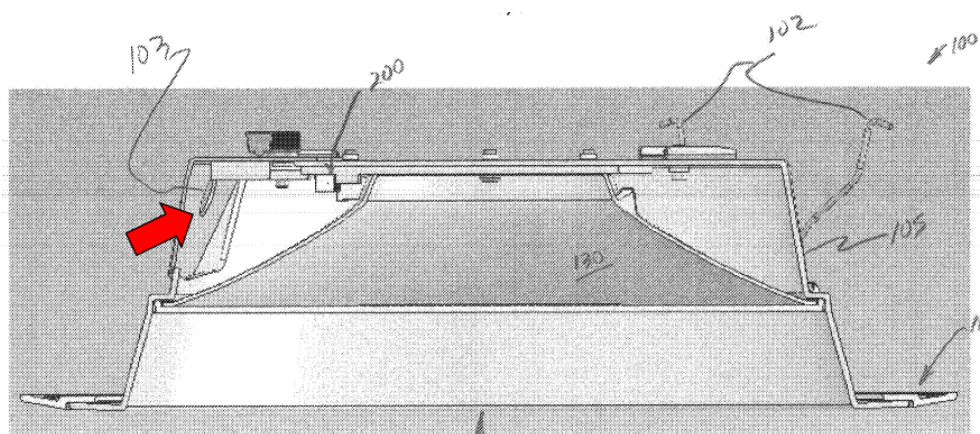
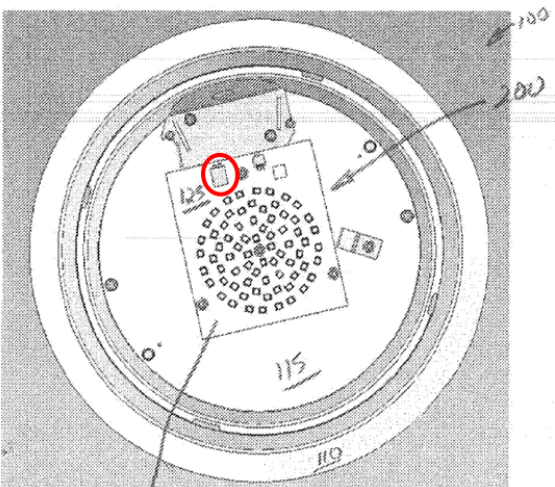
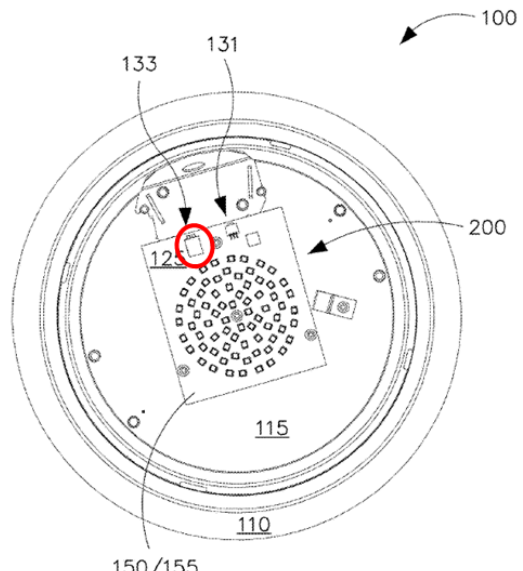


FIG. 1H

89. The '424 Provisional explains that this aperture 103 allows an electrical cable (or "wiring") to enter the housing in order to power the circuit

board within the housing on which the LEDs (150/155) and DIP switch are mounted. Ex. 1008, 2:7-16, 5:1-4, 5:12-24 (“Electrical wiring (not illustrated) extends through a wiring aperture 103 in the housing 105.”), Figs. 1E, 1H (annotation added), *see also* claims 29, 33 (requiring “a wiring port disposed on a side of the housing”).

90. I note that Figure 1E of the '424 Provisional discloses a receptacle (also labeled “133” in the corresponding figure in the '336 Patent) on substrate 125 near aperture 103 for receiving power from the electrical cable:

'424 Provisional	'336 Patent
Figure 1E (red annotation identifying cable receptacle):  150/155 FIG. 1E	Figure 1E (red annotation identifying cable receptacle):  150/155 FIG. 1E

Ex. 1008, Fig. 1E; Ex. 1001, Fig 1E, 6:11-16 (“The electrical cable 127 terminates in a plug 132 that mates with a receptacle 133 that is mounted inside the housing 105 adjacent the access aperture 129 for convenient field access.”).

91. I further note that Figures 2 and 4 depict a functional block diagram and schematic of a circuit (200) comprising a DC power supply (205) for supplying electrical energy to the LEDs (150/155). Ex. 1008, 5:7-11, Figs. 2, 4. Both Figures disclose switches 210 of the DIP switch coupled to power supply 205. *Id.*

92. A POSITA would have understood from these disclosures that an electrical cable (or “wiring”) passes through aperture 103 and connects to substrate 125 to power the electrical circuit on the substrate, such that the pins disposed on the body of the DIP switch are electrically coupled to the electrical cable via substrate 125 on which the DIP switch is mounted. This is consistent with the ordinary and customary meaning of the term “electrical coupling” (or “coupling” in the context of electricity), which would be understood to refer to forming a part of a pathway that permits energy transfer (e.g., current flow) between components. *See, e.g.*, Ex. 2034 at 108 (“**coupling** 1. A mutual relation between two circuits that permits energy transfer from one to another, through a wire, resistor, transformer, capacitor, or other device.”); *see also* Ex. 1001 (’336 Patent), 9:64-10:10 (“The switch 631 has a body 671 and a number of **coupling features 672 (in**

this case, pins) disposed on the bottom of the body 671 that allow the switch 631 to become **electrically coupled to an electrical connector 629 on the substrate 625 (and therefore also to one or more of the other components 663 mounted on the substrate 625,** such as a controller, as described above).”), Figs. 6A, 6B, 6C.

93. The DIP switch disclosed in the ’424 Provisional would need to be electrically coupled to the power source provided to the substrate (i.e., the “wiring”) in order to operate as described in the application. I further note that Dr. Eden testified that “the sole function of switches 210 [of the DIP switch] is to apply power to the controller 215,” which controls the LEDs according to the DIP switch settings. Ex. 2030, 68:13-70:5 (“Q. And so to do that, the DIP switch must receive power that is connected to the exemplar luminaire in Figure 1, correct? A. Yes, that’s shown in circuit diagram Figure 4”). This is consistent with my explanation above.

4. Element 13(c): “an actuator disposed on the body, wherein the actuator has a range of positions”

94. The DIP switch disclosed in the ’424 Provisional includes an actuator (actuating switches 210) disposed on the body that has a range of positions. The actuator is illustrated in Figures 1E and 4, and can also be seen in the DIP switch corresponding to part number “1571999-4” (labeled in Figure 4):

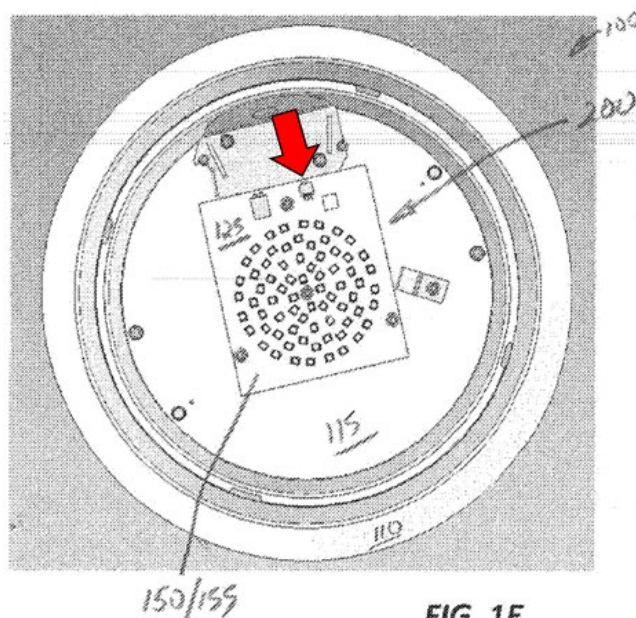
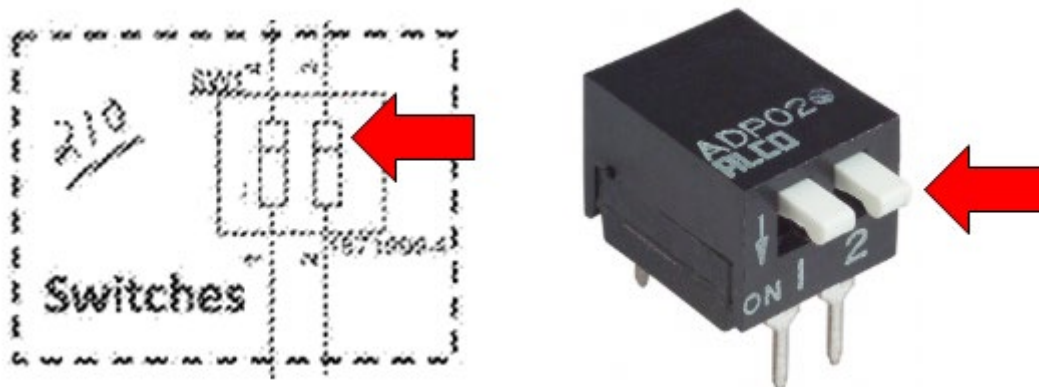


FIG. 1E

95. I note that the '424 Provisional describes the CCT output of the luminaire as depending on the configuration of the actuator (in other words, the manner in which switches 210 are actuated to the various positions described in the application). Ex. 1008, 2:7-16, 6:4-21 ("The resulting configurations support multiple correlated color temperatures of illumination from a single luminaire 100."), Fig. 3.

96. This is also illustrated in Figure 3, which shows that switches 210 are capable of four discrete positions each corresponding to discrete CCT outputs of 3,500K, 3,000K, or 4,000K. Ex. 1008, 2:7-16, 6:4-21, Fig. 3.

Switch 1	Switch 2	LED 1 3,000 K	LED 2 4,000K	Resulting Color Temp
On	Off	On	On	3,500 K
Off	On	On	On	3,500 K
On	On	On	Off	3,000 K
Off	Off	Off	On	4,000 K

300
↙

FIG. 3

I note that Dr. Eden also acknowledged the disclosed DIP switch to include an “actuator” with a range of positions when discussing the DIP switch embodiment, consistent with my understanding above. Ex. 2030, 67:8-68:12, 58:12-23, 72:16-73:7, 125:8-18, 224:6-13, 226:3-8.

97. I further note that Dr. Eden recognized that DIP switches available at the time of the '424 Provisional include a rotary DIP switch, which would perform the same functionality with a single rotating actuator (in place of the two physical switches 210). Ex. 2030, 74:19-75:2 (“a person of ordinary skill would have understood that a DIP switch could have a rotary actuator”), 76:6-8, 76:23-77:6, 78:11-22 (discussing Ex. 2029). In my opinion, a POSITA would have understood that such DIP switches capable of position-based selection and mounting on a substrate as described in the '424 Provisional could be used to similarly achieve the described CCT selection.

5. Element 13(d): “wherein each position of the range of positions of the actuator corresponds to a CCT of the light emitted by the luminaire”

98. As explained above, the DIP switch disclosed in the '424 Provisional includes an actuator, wherein each position of the range of positions corresponds to a CCT of light (e.g., 3,500K, 3,000K, or 4,000K) emitted by the luminaire. The '424 Provisional explains in detail how the actuator of the DIP switch controls the correlated color temperature of light emitted by a luminaire, including how switches 210 can be set to each position to achieve CCT outputs of, e.g., 3,000K, 4,000K, and 3,500K. Ex. 1008 at 2:7-16, 5:29-6:21 (“The resulting configurations support multiple correlated color temperatures of illumination from a single luminaire 100.”), claim 4. This correspondence of CCT outputs to each position of the exemplary DIP switch actuator is also illustrated in Figure 3 of the '424 Provisional.

Switch 1	Switch 2	LED 1 3,000 K	LED 2 4,000K	Resulting Color Temp
On	Off	On	On	3,500 K
Off	On	On	On	3,500 K
On	On	On	Off	3,000 K
Off	Off	Off	On	4,000 K

300
↙

FIG. 3

Ex. 1008, Fig. 3.

99. I further note that Dr. Eden also agreed that “each different configuration of switches 210 of the DIP switch 131 results in a particular CCT output of light.” Ex. 2030, 62:14-63:8, 58:12-23, 67:8-68:12.

B. Claim 15: “The switch of claim 13, wherein each position is discrete within the range of positions”

100. As noted above, the DIP switch disclosed in the '424 Provisional includes an actuator where each position of the actuator is discrete within the range of positions (either “on” or “off”). For example, the '424 Provisional details how switches 210 are actuated to achieve four different CCT outputs, as shown below in Figure 3. Ex. 1008, 2:7-16, 5:29-6:21, claim 4.

Switch 1	Switch 2	LED 1 3,000 K	LED 2 4,000K	Resulting Color Temp
On	Off	On	On	3,500 K
Off	On	On	On	3,500 K
On	On	On	Off	3,000 K
Off	Off	Off	On	4,000 K

300
4

FIG. 3

Ex. 1008, Fig. 3.

C. Claim 16: “The switch of claim 15, wherein the range of positions comprises a first position, a second position, a third position, a fourth position, and a fifth position”

101. From the disclosure of the '424 Provisional, a POSITA would have readily understood that the exemplary DIP switch could include a range of positions that comprises a first position, a second position, a third position, a fourth position, and a fifth position, and such configuration was within the possession of

the applicants. DIP switches are mechanical switches that can include a number of positions based on the size of the DIP switch and the corresponding number of switches it can accommodate. For example, the Tyco catalog from March 2008 (well before the '424 Provisional date) that Dr. Eden discussed at his deposition depicts numerous DIP switches that have as many as 8, 10 and 12 available positions, or more, depending on the need.

ADE Series

- Extended actuator
- High pressure contact system
- Processable without tape seal
- Auto insertable



Dips

Standard number of positions	2...12
Mounting style	IHI, SMI
Tape seal	No
Contact rating	100 mA @ 24 Vdc
Electrical endurance	1000 ops.
Integral resistors	Optional
Operating temperature range	-30...+85°C
Dimensions (WxH)	7.5 x 3.5 mm
Packaging	Tube

Ex. 2029 at 2-4; Ex. 2030 at 79:15-80:12. In fact, the same Tyco catalog lists part number 1571999-1 (i.e., the same part number identified in Figure 4 of the '424

Provisional), which is part of the ADP series that offers configurations from 2-10 positions:

ADP Series



Product key	Positions	Mounting	Packaging	Part number
ADP0204	2	THT	tube	1571999-1
ADP02STR04		SMT	tape and reel	1571999-4
ADP0404	4	THT	tube	1571999-6
ADP04STR04		SMT	tape and reel	1571999-9
ADP0604	6	THT	tube	1-1571999-6
ADP06STR04		SMT	tape and reel	1-1571999-9
ADP0804	8	THT	tube	2-1571999-6
ADP08STR04		SMT	tape and reel	2-1571999-9
ADP1004	10	THT	tube	3-1571999-6
ADP10STR04		SMT	tape and reel	3-1571999-9



Ex. 2029 at 15 (annotation added).

102. A POSITA would have understood, particularly in view of the '424 Provisional's disclosure (including Figures 2, 3 and 4), that such exemplary DIP switches may include additional actuator positions to provide access to additional discrete CCT outputs, including the five positions recited in Claim 16. For example, a POSITA considering Figures 2, 3 and 4 and their associated descriptions would have readily understood that the depicted DIP switch is used for illustrative purposes, and that, when using more than two sets of LEDs (e.g., a set of LEDs in addition to LEDs 150 and 155), one could use a DIP switch having at least five positions, to select additional CCT outputs. Indeed, the '424 Provisional suggests to the POSITA the ADP series of DIP switches, which included 10-position options. I note that Dr. Eden also expressed the opinion that a POSITA would have known that "any set of CCT values that one wishes" could be achieved and be within the skill of a POSITA. Ex. 2030, 232:18-234:7, 235:10-19.

D. Dr. Eden's Opinions Concerning the '424 Provisional

103. Dr. Eden states in his report that, in his opinion, a POSITA would not have understood the disclosures of the '424 Provisional to adequately describe “a CCT switch that is coupled to an electrical cable of the luminaire, or remotely located from the housing.” Eden Report, ¶¶ 59-66. I disagree.

104. I first note that Dr. Eden's opinions in his declaration appear to be in direct contradiction to his testimony at his deposition. For example, as noted above, the switch recited in claim 13 requires “at least one first coupling feature disposed on the body, wherein the at least one first coupling feature is configured to electrically couple to an electrical cable of the luminaire.” Ex. 1001, claim 13. Notwithstanding the opinions in his declaration, Dr. Eden testified that, in his opinion: **“Every switch that's ever been devised has what the patent refers to as coupling features.** There have to be at least two. Some have more. **And they can all couple to an electrical cable, every one of them.**” Ex. 2030 at 222:1-224:13. While I do not agree with the broad and absolute nature of this pronouncement,⁴ Dr. Eden's testimony correctly recognizes that a DIP switch like

⁴ I do not agree with Dr. Eden's broad pronouncement that “every switch that's ever been devised” includes the features of claim 13, including in view of wireless switches which need not include, for example, the recited “coupling feature ... configured to electrically couple to an electrical cable of the luminaire” as discussed further below. However, his statement is true for existing DIP switches like the one disclosed in the '424 Provisional.

the one disclosed in the '424 Provisional (which is indisputably a mechanical switch that was “devised” prior to the '424 Provisional) includes a “coupling feature” that is configured to “couple to an electrical cable” of the luminaire, which is precisely what is recited as the limitation in claim 13. It is therefore unclear what feature of claim 13 he believes to be missing from the '424 Provisional.

105. In fact, I note that he further testified that a DIP switch “[i]n the configuration shown in the '336 patent” would include “the limitations of claim 13”:

Q. In that scenario, a DIP switch, in your opinion, would have the limitations of claim 13, like the other switches you mentioned?

A. Yes. In the configuration shown in the '336 patent, but not in others.

Ex. 2030 at 225:15-226:8. As demonstrated above, the DIP switch disclosed in the '424 Provisional is in the same configuration as the DIP switch “shown in the '336 patent.” *See also, e.g.*, Ex. 1008, Figs. 1A-1H, 2, 3, 4; Ex. 1001, Figs. 1A-1H, 2, 3, 4. Therefore, Dr. Eden and I appear to agree that the '424 Provisional would have been understood by a POSITA to disclose and support each and every limitation of claim 13.

106. Dr. Eden does not identify any other features of claims 13, 15 or 16 that he believes a POSITA would not have understood as taught by the '424

Provisional, nor am I aware of any such features, as discussed above. Therefore, I disagree with Dr. Eden's conclusion concerning claim priority.

VII. THE GROUNDS ADVANCED AGAINST THE '336 PATENT

107. I address below the grounds set forth in the Petition and discussed in Dr. Eden's declaration. I note that the '336 Patent includes two independent claims: claim 1 and claim 13. Because claim 13 is impacted by a priority date based on the '424 Provisional (as discussed above), I address claim 13 and the challenged claims depending therefrom first in each ground, starting with Ground 3 (Reiff), which only challenges claims 13 and 15.

108. I present below exemplary reasons demonstrating why Dr. Eden (and Petitioner) fail to demonstrate any of the challenged claims are unpatentable. In doing so, I do not represent or concede that any of the unaddressed claims or limitations are necessarily present or obvious—rather, it is my opinion that for at least the reasons set forth below, Dr. Eden (and Petitioner) fails to demonstrate any of the challenged claims are unpatentable, and therefore any remaining claims or limitations need not also be addressed.

A. Ground 3: Claims 13 and 15 in View of Reiff

109. Dr. Eden opines that U.S. Patent No. 7, 192,160 (Ex. 1013, "Reiff") "anticipates and/or renders obvious" claims 13 and 15. I disagree.

110. As an initial matter, I note that Dr. Eden’s opinion appears to be based solely on an anticipation theory that assumes that all claim elements are disclosed, and he does not provide any opinions about any claim element that would have been obvious to a POSITA. The word “obvious” appears only in his “conclusion” section for each claim, and is not tied to any particular claim element or theory (e.g., he provided no modifications or supplements to Reiff). Ex. 1004, ¶¶ 352, 355. In any event, I address the opinions provided in his declaration.

111. Reiff is directed to a device intended for specific and specialized industrial or military applications. Reiff does not mention “correlated color temperature” or “CCT” **at all**, which Dr. Eden recognized at his deposition. Ex. 2030 at 148:5-150:2. That is because Reiff is not directed to CCT selection, much less design and use of a switch for selecting amongst different discrete correlated color temperature outputs of a lighting device. Instead, Reiff is directed to a control box for selecting between different **light sources**, where a source may have colored light (e.g., “red, blue, infrared, or UV”), which is a very different concept altogether. *See* Ex. 1013 at 1:43-49.

112. In particular, Reiff describes the need for lighting devices that can emit different colors (not color temperatures) depending on the specific application. For example, Reiff describes the need for “specialized lighting” in military applications to avoid detection by the enemy, where the difference in

lighting is based on whether it can detect certain kinds of events (e.g., leaks) or whether the light can be visually detected at all:

In some of these applications, specialized lighting may be required. **Such specialized lighting includes the use of “invisible” light, e.g., the use of a red or blue light** for tasks including map reading, tent lighting, or cockpit lighting. Other specialized lighting may include **infrared light for night vision, and UV lights used for curing epoxies or detecting leaks.**

Ex. 1013 at 1:12-20 (emphasis added). Reiff further explains that there is a need for different types of light sources for different military applications, where the color of the light source (i.e., not the correlated color temperature output) is important:

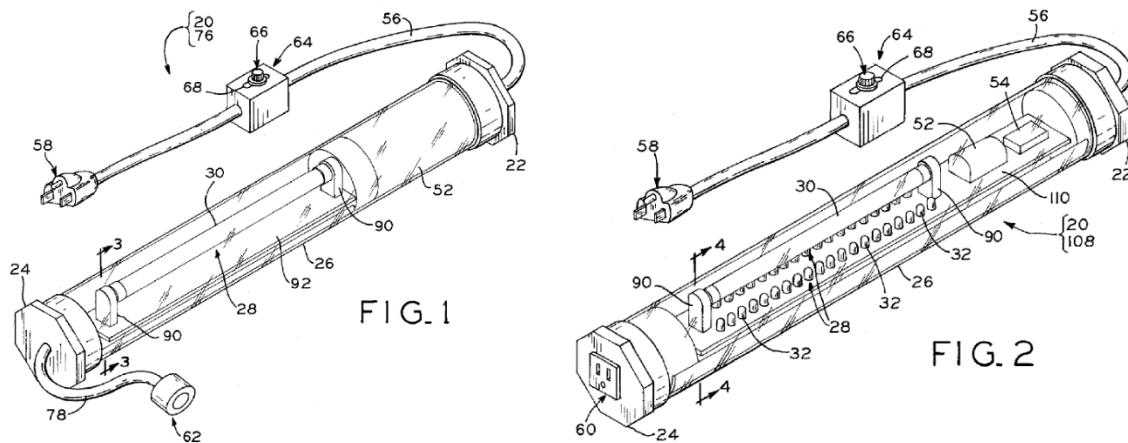
With particular regard to the military applications, conventional fluorescent lamps used to illuminate tents, for example, produce white light which is not “invisible” light. The light produced by fluorescent lamps may be detectable, and is therefore undesirable. **In order to provide invisible light, a light source emitting red or blue light, for example, may be used. The red or blue light may be provided by placing a covering over a fluorescent light, the use of a colored incandescent bulb, or colored Light Emitting Diodes (LEDs).** When such lights are mounted in a position which is not readily accessible, it is difficult and time consuming to snap such covers on to change the color of the emitted light. The use of incandescent bulbs is undesirable as the life of the bulb is much less than that of a fluorescent lamp. Additionally, the heat produced by incandescent bulbs is greater than a fluorescent lamp and may also be detectable. Finally, many conventional lights are not sufficiently sturdy for industrial/ military applications.

Ex. 1013 at 1:21-38 (emphasis added). It is within this context that Reiff discloses its invention, which is intended to provide accessibility to different types of light sources and light colors:

It is desired to provide a light having the capability of producing both conventional and specialized light colors for an area while being sturdy and durable enough to endure harsh and extreme environments, and wherein the color of the emitted light can be switched by means of an in line switch.

Ex. 1013 at 1:50-55.⁵ Notably, Reiff does not mention color temperature at all, because that concept is not contemplated by Reiff's purposeful design.

113. Reiff thereafter discloses various embodiments of its light source selection concept, two examples of which are below:



Ex. 1013, Figs. 1 and 2.

⁵ This is also reflected in the claims of Reiff, which refer to “different color[s] of light” from entirely different light sources, not correlated color temperature. See Ex. 1013, Claims 1, 16.

114. Figure 1 above depicts an embodiment with a single light source, i.e., fluorescent lamp 30. Ex. 1013 at 5:11-33; Figs. 1, 3. Reiff explains that “[t]he fluorescent lamp may also be provided with a colored covering to provide red or blue ‘invisible’ light,” consistent with Reiff’s focus on the actual color of light emitted by the device (not the color temperature). *Id.* at 5:16-18. The Figure 1 embodiment includes a control box 64 with a switch 66 that “slides linearly in slot 68 formed in control box 64 to turn the light on and off,” and also is “rotatable to control the intensity of [the] light source.” *Id.* at 5:21-24. Thus, a POSITA would readily recognize switch 66 to be an on-off switch that has a secondary function of controlling light “intensity” (i.e., the amount of visible light emitted by the light source). A POSITA would certainly not have understood switch 66 to be a CCT switch as contemplated by the ’336 Patent.

115. Similarly, Figure 2 depicts an embodiment with two light sources, i.e., fluorescent lamp 30 and LEDs 32. Ex. 1013 at 5:62-6:30; Figs. 2, 4. Reiff explains that in this embodiment, the light sources emit different colors of light (not different correlated color temperatures). *Id.* at 5:64-66 (“Light 108 is provided with two light sources 28 one of which is fluorescent lamp 30 emitting white light and LEDs 32 emitting red, blue, or UV light, for example.”). Like Figure 1, the Figure 2 embodiment includes a control box 64 with a switch 66. Because Figure 2 includes two light sources (instead of just one), “[s]witch 66 has

three positions, one position being the off position as shown in FIG. 2, one position operating the fluorescent lamp and one position operating the LEDS.” *Id.* at 6:18-23. In this embodiment, switch 66 is also “rotatable to control the intensity of the light source.” *Id.* at 6:23-25. Reiff also notes that increasing the number of LEDs in the lamp will generally provide for a greater “maximum intensity.” *Id.* at 6:27-30. Thus, like the control box in Figure 1, a POSITA would readily recognize switch 66 to be an on-off switch that can select between different sources of light (fluorescent vs. LEDs) and has a secondary function of controlling light “intensity.” *See also id.* at 4:28-32 (“Lights 20 may be provided with control box 64 which includes a switch of any suitable type for turning the light on and off and selecting between different light sources 28.”). Again, a POSITA would not have understood switch 66 to be a CCT switch as contemplated by the ’336 Patent (or even a switch used to mix two different sources of light).

116. In my opinion, a POSITA would not have understood Reiff to disclose or suggest at least the claim elements addressed below.

1. Element 13(d): “each position of the range of positions of the actuator corresponds to a CCT of the light emitted by the luminaire”

117. Claim element 13[d] recites: “*wherein each position of the range of positions of the actuator corresponds to a CCT of the light emitted by the*

luminaire.” Dr. Eden fails to show that this element is disclosed by or obvious in view of Reiff.

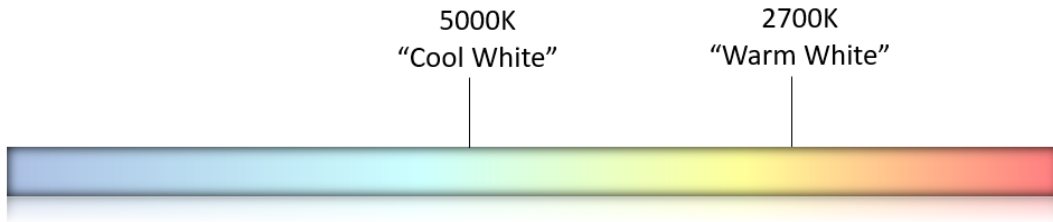
118. Dr. Eden relies on Reiff’s Figure 2 embodiment, and in particular on the “three positions” of control box 64 switch 66, as disclosing this limitation. Ex. 1004, ¶ 350. In particular, Dr. Eden states: “Moreover, “[e]ach of the light sources emits a different color of light,” so, each light source emits light having a different CCT value. *Id.* (citing Ex. 1012, 2:19-22). However, a POSITA would not have understood control box 64 to be a CCT switch at all, much less a CCT switch having a range of positions where “each position of the range of positions of the actuator corresponds to a CCT of the light emitted by the luminaire.”

119. A POSITA would readily recognize control box 64 to contain a switch 66 that is an on-off switch that can select between different sources of light (fluorescent vs. LEDs). *See* Ex. 1012 at 4:28-32 (“Lights 20 may be provided with control box 64 which includes a switch of any suitable type for turning the light on and off and selecting between different light sources 28.”); 6:18-30. A POSITA would not have understood switch 66 to be a CCT switch as contemplated by the ’336 Patent, where different selections of the switch correspond to discrete CCT outputs from a luminaire (i.e., different Kelvin values of white light, corresponding to “warm” and “cool” whites). Indeed, as discussed above, Reiff makes clear that its purpose is to provide different light “colors” (not correlated color temperatures)

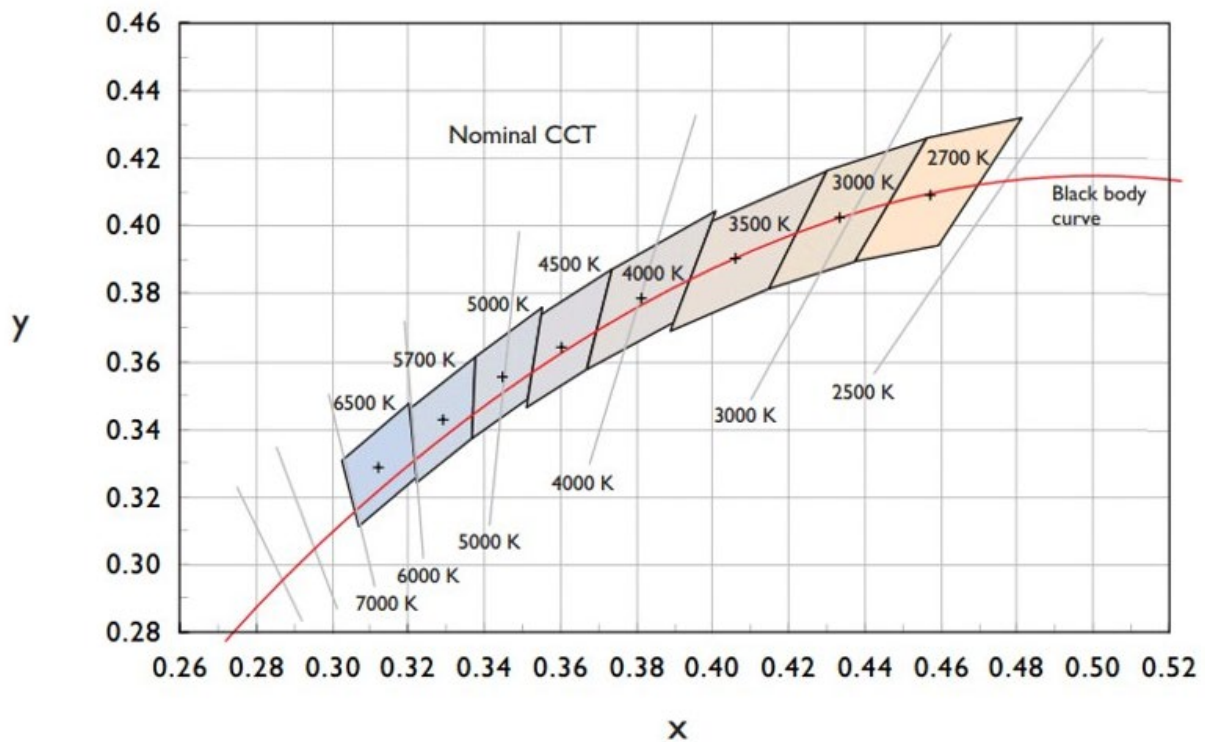
through its purposeful design—e.g., white fluorescent light and red LED light. *See id.* at 1:12-55; 2:17-22; 5:62-66. Dr. Eden incorrectly conflates the concepts of color with correlated color temperature, when a POSITA would have recognized that these are very different concepts.

120. White light is generally defined with reference to color temperature based on a blackbody radiator measured in degrees Kelvin. The perceived color of the broadband emission from black-body radiators, when heated, is generally perceived as white to the human eye. Not all white light is equal. As the black-body is heated, the hue of white light changes and the trace of these chromaticities in color space (e.g., CIE 1931 color space) form a curve called the blackbody curve or blackbody loci (also called the Planckian loci). *See, e.g.*, Ex. 2051, 2-3. This scale is widely understood and used throughout the lighting industry to describe the color temperature⁶ of, e.g., white LEDs, denoted as Correlated Color Temperature (CCT). CCT's generally range from below 1,700 K (very warm) to above 27,000 K (very cool). An exemplary image depicting a range of white color temperatures, is shown below.

⁶ Color temperature often refers to the Planckian loci, whereas “correlated color temperature” is a broader term that accounts for hues of white around but near the Planckian loci. *See* Ex. 2044, 306-311.

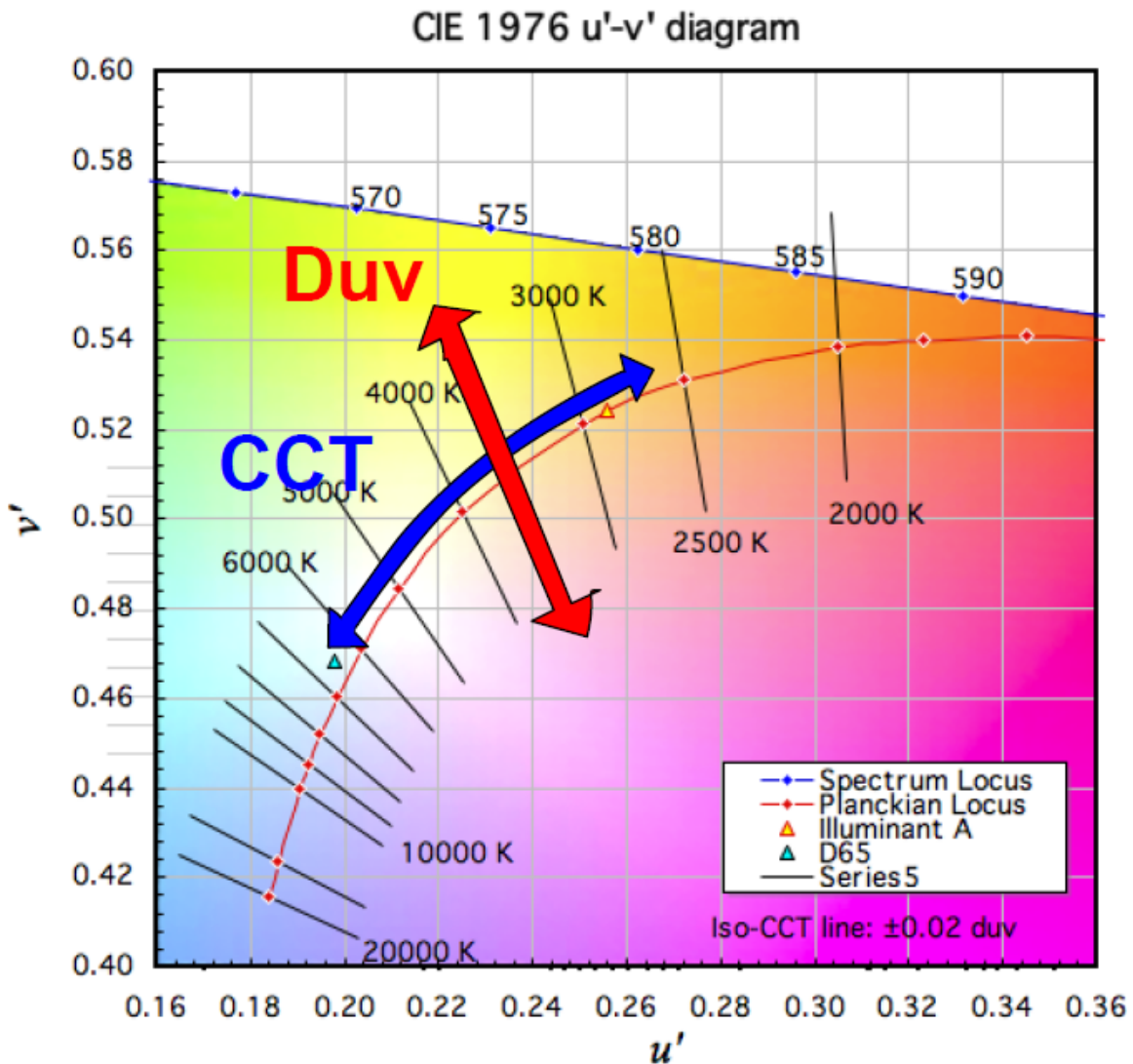


121. White light LEDs have been commercially available as early as 1997, but in 2008, ANSI and NEMA collaborated to establish a binning standard for LED manufacturers called ANSI/NEMA C78 377A, also known as “Specifications for Chromaticity of Solid-State Lighting Products.” This standard leveraged the Kelvin scale and was created around perceivable white light to ensure illumination products and systems conform to certain norms with respect to how white light is perceived. These white color bins are built around the blackbody loci, as shown below:



122. The white color bins surround the blackbody curve to include colors that are tinted (either above the blackbody curve or “greenish”, or below the blackbody curve or “pinkish”). Accordingly, a POSITA would understand “essentially white light” to refer to white light within the visible spectrum, across a range of colors defined by the Kelvin scale, as further detailed in ANSI/NEMA C78 377A.

123. Color is a separate concept from color *temperature* (and correlated color temperature), as illustrated, for example, in the following diagram presented at the CORM⁷ 2011 Conference in Gaithersburg, Maryland:



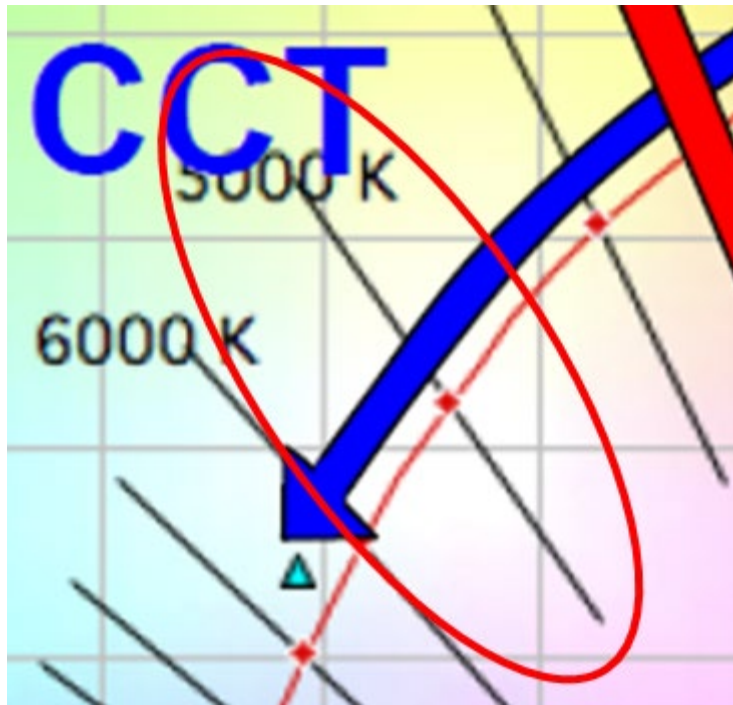
⁷ “CORM” refers to the Council for Optical Radiation Measurements. See <https://cormusa.org/2011-presentations/>.

Ex. 2028. The above diagram contains a zoomed-in depiction of the well-known CIE⁸ chromaticity diagram published in 1976, which appears at the top-left of the same slide of this presentation (slide 2). *Id.*

124. In the above diagram, a color space is depicted which corresponds to various wavelengths of color and how they would be observed by the human eye. For example, the top-left of the diagram corresponds to light that would be perceived as greenish-yellow, and the bottom-right of the diagram corresponds to light that would be perceived as reddish-purple. The Planckian locus or curve is depicted as the red curve passing through the color space, and indicates the various color temperatures across the range of essentially white light (from cool to warm whites), with the color temperature relating to the hue of the light emitted from an incandescent black body heated to that temperature. *See, e.g.,* Ex. 2044, 306-311; Ex. 2045.

125. There are also several lines shown above that intersect the Planckian locus, which represent specific CCT values (e.g., “3000 K,” “4000 K,” “5000 K”). Notably, each of these lines pass through various colors of the color space. For example, the line corresponding to “5000 K” (shown zoomed-in below) includes colors ranging from yellowish-green to pinkish-purple:

⁸ “CIE” refers to the International commission on Illumination or “Commission Internationale de l’éclairage,” a French organization that maintains the standards relating to colorimetry.



Notably, every point that line corresponds to a CCT value of 5000 K, even though it passes through different perceived “colors.” That is because “color” and “correlated color temperature” are different concepts, and a POSITA would have readily understood that two different colors do not necessarily corresponds to two different **correlated color temperatures**.

126. This basic and fundamental difference in concepts is reflected in numerous publications. As but one example, an article published by Taru Oksala on April 13, 2016 (around the time of the '424 Provisional) on a website for the company Arrant-Light uses similar diagrams to explain this very concept. *See Ex. 2035*. As the end of the article explains:

So when you have three luminaires which have the same 4000K CCT, you can have three totally different colored lights.

If the light has a greenish white light, that will mean that the chromaticity coordinate is above the planckian locus.

If the light has a purple tone, then chromaticity coordinates are below the locus.

If the light is normal white light, then the chromaticity coordinates are on the locus or at least very close to it.

So please remember that staring at the CCT doesn't always tell you everything. **If you use two different light sources with the same CCT, you should always check the coordinates and see if these two are actually the same color.**

Id. (emphasis added). This again reflects the well-known principle that two different colors do not necessarily corresponds to two different correlated color temperatures.

127. As noted above, it is important to recognize that the concept of correlated color temperature is itself **specific to white light sources**. In particular, CCT is used to describe “the color of a **white light source** [that] does not fall on the planckian locus.” Ex. 2044 at 309 (emphasis added). Correlated color temperature or CCT is **not** used when describing monochromatic or saturated light sources (e.g., red light, green light, blue light). *See, e.g.*, Ex. 2050 at 5-6, Fig. 1 (CIE Technical Note explaining that “[b]ased on the concept of CCT, this term applies **only to white light stimuli and should not be used for coloured light**

sources,” and therefore “the concept of CCT **should not be used**” for chromaticity differences (“ ΔC ”) beyond a certain limit from the Planckian curve defining white light (emphasis added)). This, again, is a fundamental concept of chromaticity that would be well-known to any POSITA.

128. As Dr. Eden correctly recognized, the chromaticity diagram above and the principles relating thereto are not specific to LED light, and instead apply equally to any light source (including the fluorescent light of Reiff). Ex. 2030 at 48:19-21. He also recognized that two different light sources, one LED and one non-LED (for example, the LED and fluorescent light sources of Reiff) could output light at the same correlated color temperature. *Id.* at 48:22-49:1.

129. However, Dr. Eden appeared to be unfamiliar with the several of the concepts of CCT and the chromaticity diagram above. For example, when asked “so color and color temperature are not the same thing, correct?” he answered “I don’t know.” *Id.* at 47:5-11. He also did not know if “any point in the line labeled 4000k would correspond to a CCT value of 4000k” in the CIE diagram above, despite that being what is clearly depicted and understood in the art. *Id.* at 42:14-23. Also, he repeatedly testified that two different colors **cannot** have the same correlated color temperature, when that is simply incorrect and runs contrary to the well-known concepts of chromaticity and correlated color temperature, discussed above:

Q. My question is: Can two different colors have the same CCT?

A. I do not believe so.

Id. at 244:1-3; *see also* 45:22-46:4, 48:4-7, 243:1-17.

130. Dr. Eden applied this fundamental misunderstanding of chromaticity and correlated color temperature to Reiff, to arrive at the opinion that because Reiff described two light sources that may emit “a different color of light,” that must mean “each light source emits light having a different CCT value. Ex. 1004, ¶ 350. This is simply incorrect, as demonstrated above.

131. In fact, Reiff does not contemplate CCT at all in its disclosure, much less the concept of using a switch to select different CCT outputs as recited in the ’336 Patent. This makes sense because Reiff’s LED light source is described as a monochromatic or “colored” (e.g., “red”) light source, and therefore would not be understood to have an associated CCT value (as such values are specific to white light sources). *See* Ex. 2044 at 309, Ex. 2050 at 5-6; Ex. 1013 at 4:28-32 (“Then, either a regular white light fluorescent light source can be selected, or a **‘colored’ LED light source** can be selected.”), 5:62-66 (“Referring to FIGS. 2 and 4 ... Light 108 is provided with two light sources 28 one of which is fluorescent lamp 30 emitting white light and LEDs 32 emitting **red, blue, or UV light**, for example.”). For this reason alone, a POSITA would not have understood Reiff to

contemplate the concept of a switch for CCT selection, much less disclose or suggest element 13(d).

132. Dr. Eden correctly recognized that not only do the words “CCT” or “color temperature” never appear in Reiff, Reiff is also silent on the CCT values of the light emitted from the disclosed LED and fluorescent light sources. Ex. 2030 at 148:5-150:2. Thus, a POSITA would not have understood Reiff to be attempting to achieve any kind of different CCT outputs. At most, a POSITA would instead have understood that Reiff only contemplates a single white light source (that might have an undisclosed associated CCT value). And, even if the second light source emitted a white light (that may lean more, e.g., red—which is not suggested by Reiff) the two different light sources in Reiff could very well output light at the same CCT value. In any event, Reiff’s reference to two different light sources, where one light source may be a different “color,” does not disclose or suggest to a POSITA that the light sources output light at different CCT values (or a switch for achieving the same), as discussed above.

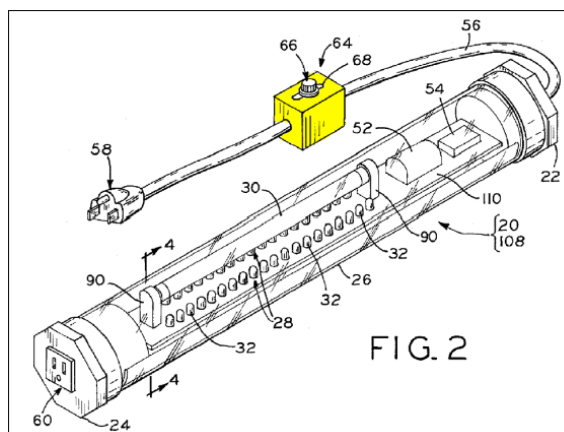
133. I further note that Dr. Eden does not rely on any inherency or obviousness theory for this limitation, and instead relies solely on Reiff allegedly expressly disclosing this limitation based on Reiff’s disclosure. In my opinion, Dr. Eden has not demonstrated that this limitation is disclosed or obvious in view of Reiff.

2. Element 13(a): a body

134. Claim elements 13(a) recites: “*a body*.” Dr. Eden fails to identify a switch “body” in Reiff.

135. As used in the '336 Patent, a POSITA would have understood the ordinary and customary meaning of a switch “body” to be part of the switch itself, on which the recited “first coupling feature” and “actuator” are disposed, as recited in Element 13(b). Ex. 1001 at 15:21-16:2. For example, as discussed above, Dr. Eden and I agree that the DIP switch depicted in Figure 1 of both the '336 Patent and the '424 Provisional includes a square “body” on which the “first coupling feature” and “actuator” are disposed. *See supra* at Section VI.A.2. A body of an exemplary slide switch is also depicted in Figure 6C (671). Ex. 1001 at 9:65-10:4, Fig. 6C.

136. In his declaration, Dr. Eden identifies the following highlighted portion of Figure 2 as the switch “body” claimed in Claim 13:



Ex. 1004, ¶ 341 (“The portion of the control box 64 that forms a body for the switch has been highlighted in yellow in Fig. 2”). However, a POSITA would not have understood what Dr. Eden highlighted to be “a body” of a switch as described and claimed in the ’336 Patent.

137. A POSITA would have understood the portion of Figure 2 highlighted by Dr. Eden to at most depict the outer surfaces of a separate “control box” within which a switch (and other components) may be located, as described by Reiff. Ex. 1013, 4:28-39 (“control box 64 may include switch 66”). In other words, the highlighted control box 64 is entirely separate from switch 66 described in Reiff, and thus a POSITA would not have understood the surfaces highlighted by Dr. Eden to correspond to a switch “body.” *See also infra* at Section VII.B.1.a.

138. I further note that at his deposition, Dr. Eden appeared to recognize this incorrect identification, and explained it was “an oversight,” and that it was “not [his] intent to associate the body with the exterior surface of the control box.” Ex. 2030 at 139:21-141:23.

139. I further note that Dr. Eden does not rely on any inherency or obviousness theory for this limitation, and instead relies solely on the highlighted surfaces of control box 64 as expressly disclosing this limitation. In my opinion, Dr. Eden has not demonstrated that this limitation is disclosed or obvious in view of Reiff.

3. Element 13(b): “at least one first coupling feature disposed on the body, wherein the at least one first coupling feature is configured to electrically couple to an electrical cable of the luminaire.”

140. Claim element 13[b] recites: “*at least one first coupling feature disposed on the body, wherein the at least one first coupling feature is configured to electrically couple to an electrical cable of the luminaire.*” Dr. Eden fails to show that this element is disclosed by or obvious in view of Reiff.

141. As discussed above, a POSITA would not have understood the outer surfaces of control box 64 highlighted in Figure 2 by Dr. Eden to constitute a switch “body,” which he later acknowledged at his deposition. Likewise, a POSITA would not have understood control box 64 to include a “coupling feature” disposed on it that is “configured to electrically couple to an electrical cable of the luminaire,” as control box 64 is simply described as a container for other components (including a switch), and not something that would itself electrically couple to anything else (electrical cable or otherwise). For this reason alone, Dr. Eden fails to show that Reiff discloses this claim element.

142. Furthermore, Reiff is silent as to the contents of control box 64, and does not describe, for example, how switch 66 is constructed, or how it operates or whether or not it has any “coupling feature” (configured to couple with cable 56 or otherwise). I note that Dr. Eden recognized the same at his deposition. Ex. 2030

at 150:14-20 (“Reiff doesn’t describe what component may be inside control box 64, correct? A. No, he does not ...”); 154:17-156:3.

143. Dr. Eden instead opines that:

both the input and output terminals of the control box (and switch) *must* be electrically connected to the cable 56 by soldering, screw terminals, spade lugs, pins, or a myriad of other connectors or connections that have been developed over the past century. If the control box (and switch) and cable are not electrically connected, current will not flow and the luminaire will not function.

Ex. 1004, ¶ 344. This statement is incorrect for several reasons. First, Dr. Eden again refers to features of “the control box,” which is not a switch body, and therefore would not satisfy element 13(b). Second, while Dr. Eden also refers to the “switch” contained within the control box, he incorrectly suggests that the switch “*must* be electrically connected to the cable 56.”

144. For example, the switch could instead be electrically coupled to a battery and wireless transmitter (e.g., via a circuit board within control box 64) that is communicative with circuitry and/or other components within the tubular lighting device, such that the switch can inform the components which light source to selectively energize, which would not require any “coupling feature” that is configured to “electrically couple” to a cable of the luminaire. In this regard, I note that Dr. Eden recognized that wireless switches were known in the art, and that it would be “possible ... to have a wireless switch that does not require a

coupling feature that couples to a cable of the luminaire.” Ex. 2030 at 136:20-137:14, 152:91-153:6.

145. Dr. Eden also recognized that Reiff “does not describe how switch 66 interfaces with cable 56 inside control box 64,” and that there could be other components within control box 64, including components that would possibly allow “the switch in control box 64 to communicate wirelessly with components within the housing.” Ex. 2030 at 150:14-20, 151:12-25, 153:14-154:16 (“Q. But it would at least be possible for the switch in control box 64 to communicate wirelessly with components within the housing, correct? A. It’s possible ...”), 156:14-157:4 (“Q. Well, it would be possible to include, for example, a battery within control box 64 to power the switch, correct? A. Well, you could ...”), 159:7-12 (“Q. And the wireless switch could communicate with a control circuit within the tube housing of Figure 2, right? A. It could interface with the electronics -- all of the electronics that's shown in Figure 2.”), 159:13-161:2. Thus, given that there is a wireless configuration that would not require the recited “coupling feature” that we both agree is possible, it is incorrect to state that the recited coupling feature “*must*” be present, as that is simply not the case.

146. I further note that Dr. Eden also appears to refer to possible switch designs that are not disclosed in Reiff at all, and are instead based on some undisclosed switch that he “can choose.” Ex. 2030 at 154:17-156:3. Dr. Eden does

not identify or provide any details at all concerning any such switch in his declaration, and he does not raise any obviousness theory concerning this limitation either. This also does not appear anywhere in his declaration, and therefore does not appear relevant to his opinions in this proceeding.

147. Therefore, in my opinion, Dr. Eden has not demonstrated that this limitation is disclosed or obvious in view of Reiff.

4. Claim 15

148. Because Dr. Eden has not demonstrated that Reiff renders claim 13 unpatentable, he likewise fails to demonstrate that all claims depending from claim 13 are unpatentable, including claim 15.

B. Ground 1a: Claims 1, 3, 6-9, 11-13, 15, and 17-19 in View of Chaimberg

149. Dr. Eden opines that U.S. Patent No. 10,234,091 (Ex. 1003, “Chaimberg”) “anticipates and/or renders obvious” claims 1, 3, 6-9, 11-13, 15, and 17-19. I disagree, and it is my opinion that Dr. Eden fails to show that Chaimberg discloses at least the claim elements discussed below, including those in independent claims 1 and 13. Further, because all claims are or depend from claims 1 and 13, Dr. Eden fails to show that those claims are anticipated or obvious in view of Chaimberg.

150. I further note that Chaimberg, on its face, states that it issued on March 19, 2019, from an underlying application (No. 15/932,801) that was filed on

April 27, 2018. As I established above, in my opinion, claims 13, 15 and 16 are entitled to a priority date at least as early as February 19, 2016. Therefore, the priority date for claims 13, 15 and 16 predates the filing date of Chaimberg.

Therefore, it is my understanding that Chaimberg does not qualify as prior art for claims 13, 15 and 16, and for this reason it is my opinion that Chaimberg (as well as any proposed reference combination involving Chaimberg) cannot anticipate or render obvious claims 13, 15 and 16. Nevertheless, I explain below that Dr. Eden fails to show that any challenged claim is anticipated or obvious in view of Chaimberg.

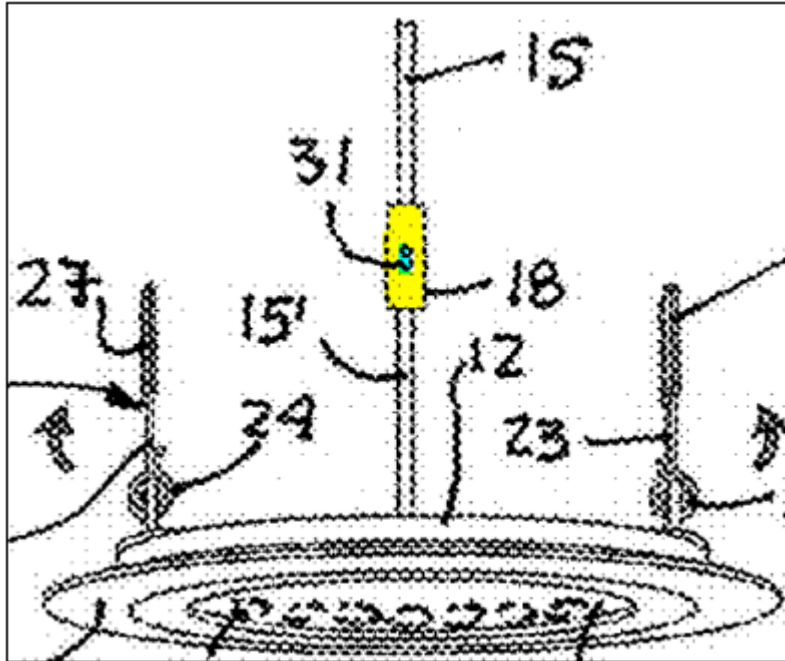
1. Claims 13, 15, and 17-19

a. Element 13(a): a body

151. Claim elements 13(a) recites: “*a body*.” Dr. Eden fails to identify a switch “body” in Chaimberg.

152. As discussed above, a POSITA would have understood the ordinary and customary meaning of a switch “body” to be part of the switch itself, on which the recited “first coupling feature” and “actuator” are disposed, as recited in Element 13(b). Ex. 1001 at 15:21-16:2, 9:65-10:4, Fig. 6C; *supra* at Section VI.A.2.

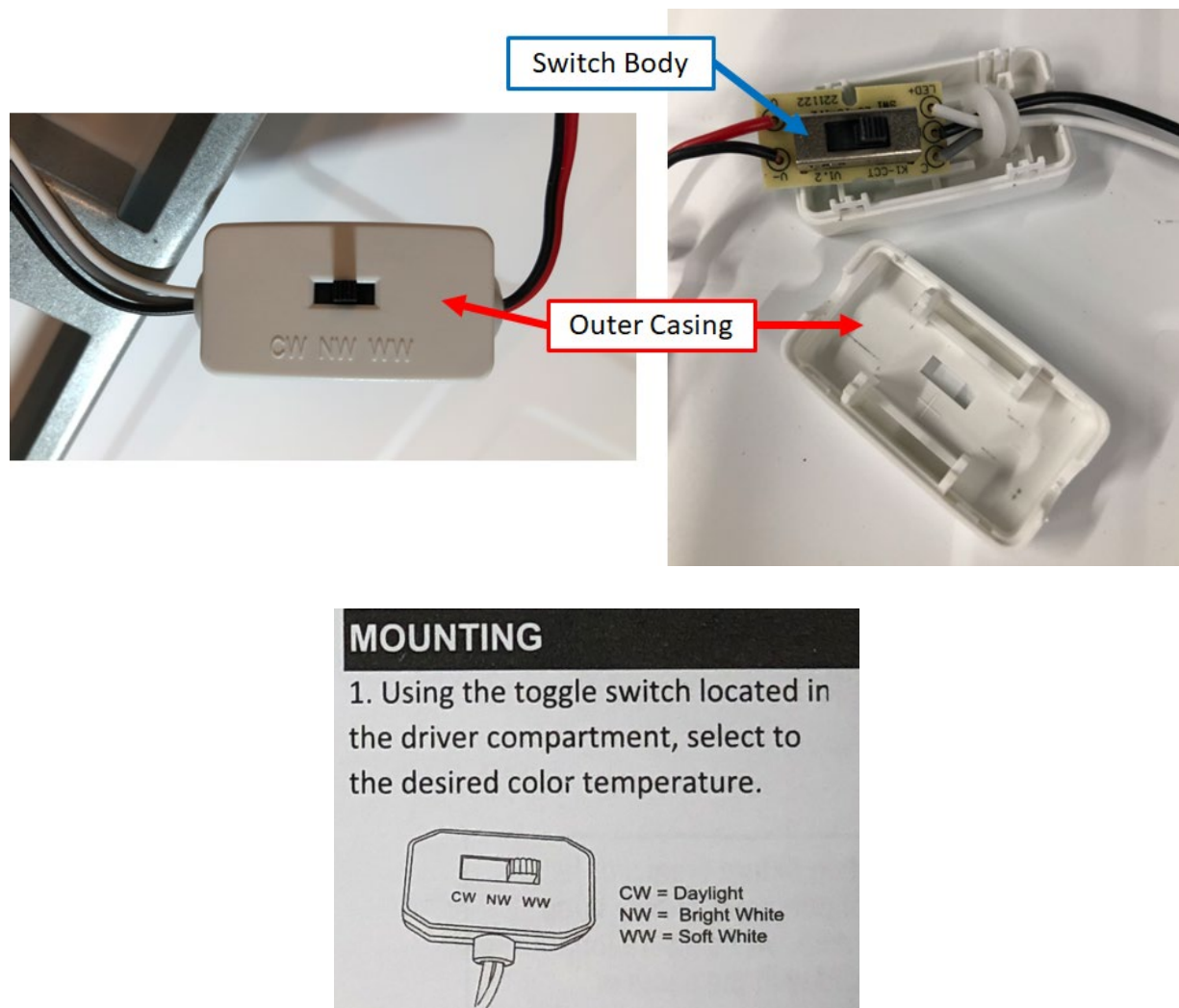
153. In his declaration, Dr. Eden identifies the switch body as the “dashed rectangular box” that he highlights in Figure 1 below:



Ex. 1004, ¶ 154 (“the perimeter of the switch “body” is represented by the dashed rectangular box”). However, a POSITA would not have understood what Dr. Eden highlighted to be “a body” of a switch as described and claimed in the ’336 Patent.

154. A POSITA would have instead understood the portion of Figure 1 highlighted by Dr. Eden to at most depict an outer casing within which a switch may be located. Indeed, this type of outer casing is common for switches like the one disclosed in Chaimberg, as it can provide additional protection to the switch itself as well as any other components that may be located within the casing. One example of such an outer casing can be seen in a product I analyzed in connection with the related litigation pending in the Western District of Wisconsin. In particular, I analyzed a Menard product corresponding to shop keeper unit or “SKU” 348-2107, which is sold as “Patriot Lighting® 5070 Lumen 47-3/4” LED

Back-Lit Flat Panel Light.” Ex. 2049. The images below were taken of a sample product purchased from Menard’s website, as well as an image from the instruction manual included with the product packaging, with my additional annotation added:



As illustrated above, SKU 348-2107 includes a slide switch that includes a body, but that switch is located within an outer plastic outer casing that a POSITA would not have understood to be a switch “body.”

155. To be clear, it is not my opinion that the switch in SKU 348-2107 is the same as the switch in Chaimberg, nor would a POSITA have had that

understanding (or even have been aware of SKU 348-2107 as of the priority date for the challenged claims). I provide the above example for illustrative purposes only, to demonstrate that, in my opinion, a POSITA would not have understood that the object highlighted by Dr. Eden in Figure 1 constitutes a switch “body” as claimed in the ’336 Patent.

156. I further note that, consistent with my opinion, Dr. Eden testified that Chaimberg does not disclose details regarding switch 18, and that his identification of the highlighted portion of Figure 1 above as the recited switch “body” was because “that’s what [he] would do if [he] were inserting a switch into a cable,” not due to any particular disclosure in Chaimberg. Ex. 2030, 208:6-209:11, 214:8-11, 218:16-24.

157. I further note that Dr. Eden does not rely on any inherency or obviousness theory for this limitation, and instead relies solely on the highlighted “dashed rectangular box” in Figure 1 as expressly disclosing this limitation. In my opinion, Dr. Eden has not demonstrated that this limitation is disclosed or obvious in view of Chaimberg.

b. Element 13(b): “at least one first coupling feature disposed on the body, wherein the at least one first coupling feature is configured to electrically couple to an electrical cable of the luminaire”

158. Claim element 13[b] recites: “*at least one first coupling feature disposed on the body, wherein the at least one first coupling feature is configured*

to electrically couple to an electrical cable of the luminaire.” Dr. Eden fails to show that this element is disclosed by or obvious in view of Chaimberg.

159. As discussed above, a POSITA would not have understood the object highlighted by Dr. Eden in Figure 1 to constitute a switch “body.” At most, a POSITA would have understood that object to be an outer casing. Likewise, a POSITA would not have understood an outer casing like the one highlighted by Dr. Eden in Figure 1 to include a “coupling feature” disposed on it that is “configured to electrically couple to an electrical cable of the luminaire,” despite his opinion otherwise. A POSITA would instead have understood that an outer casing is simply meant to protect its contents. The outer casing may be physically connected to the electrical cable in some manner to keep it in place, but a POSITA would not have understood an outer casing illustrated in Chaimberg to have a coupling feature configured to “**electrically couple**” the switch to an electrical cable. For this reason alone, Dr. Eden fails to show that this claim element is present.

160. Furthermore, Chaimberg is silent on the construction of its switch, and does not mention the presence of any “coupling feature” at all. I note that Dr. Eden acknowledged the same at his deposition, and therefore we appear to agree on Chaimberg’s lack of disclosure. Ex. 2030, 209:6-11, 214:8-11 (“Q. Now, Chaimberg doesn’t disclose any image or description of coupling features, correct?

A. Right.”), 218:16-24, 220:18-221:1 (“There could be a pot of gold inside it. I have no idea.”). Therefore, we agree that Chaimberg does not disclose this claim feature.

161. Dr. Eden separately opines that it “would *not* be possible” for Chaimberg’s switch to operate as described without the presence of this limitation. Ex. 1004 at ¶ 158. But as discussed above (and acknowledged by Dr. Eden), a wireless switch would not require the presence of this limitation. *See supra* at Section VII.A.3; Ex. 2030 at 136:20-137:14, 152:91-153:6. And, Dr. Eden further acknowledged that Chaimberg does not disclose any “coupling feature” associated with its switch, and it is possible that it could be implemented as a wireless switch. Ex. 2030 at 212:8-213:2, 218:16-219:21. Thus, a POSITA would have understood that it *would* be possible for Chaimberg’s switch to operate as described without this claim element present, e.g. as a wireless switch that is communicative with the driver circuit in the driver housing to inform the driver how to supply current to the LEDs in the light housing.

162. I further note that that Dr. Eden does not appear to raise any inherency or obviousness theory concerning this limitation. In my opinion, Dr. Eden has not demonstrated that this limitation is disclosed or obvious in view of Chaimberg.

c. Claim 19: “The switch of claim 13, wherein the body is configured to be disposed within a junction box”

163. Claim element 19 recites: “*The switch of claim 13, wherein the body is configured to be disposed within a junction box.*” Dr. Eden opines that this limitation is present “for the same reasons presented in Section IX.D” (corresponding to claim 7). Ex. 1004, ¶¶ 185-186. Therefore, for the same reasons I discuss below with respect to claim 7, in my opinion, Dr. Eden has not demonstrated that this limitation is disclosed by or obvious in view of Chaimberg. *See infra* at Section VII.B.2.b (claim 7).

d. Claims 15, 17 and 18

164. Because Dr. Eden has not demonstrated that Chaimberg renders claim 13 unpatentable, he likewise fails to demonstrate that all claims depending from claim 13 are unpatentable, including claims 15, 17 and 18.

2. Claims 1, 3, 6-9 and 11-12

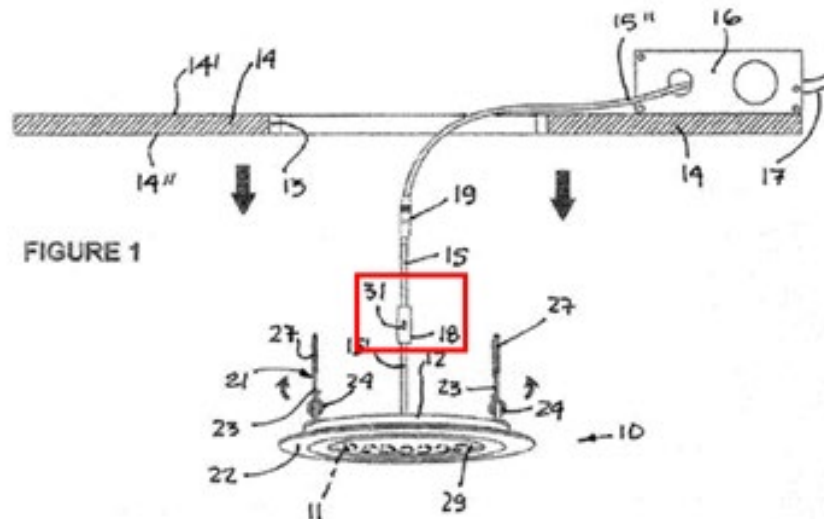
a. Element 1(d): “wherein the switch is disposed remotely from the housing”

165. Claim element 1[d] recites: “*a switch coupled to the electrical cable, wherein the switch is disposed remotely from the housing.*” Dr. Eden fails to show that this element is disclosed by or obvious in view of Chaimberg.

166. Dr. Eden relies on Chaimberg’s Figure 1, and descriptions within Chaimberg regarding that figure, such as the description that the selector switch is “mounted on the cable 15,” to conclude that “Chaimberg’s switch 18 is ‘a switch

coupled to the electrical cable [*i.e.*, cable 15], wherein the switch is disposed remotely from the housing.’” Ex. 1004 at ¶¶ 105-108. I disagree that a POSITA would have concluded from Chaimberg that this is the case.

167. For example, Chaimberg’s disclosure demonstrates that, contrary to Dr. Eden’s opinion, the switch identified in his report (switch 18) is in fact designed to remain inside or within the housing (or at the very least, attached to and not remote from the housing). This is illustrated, for example, in Figure 2 (which Dr. Eden fails to address in his opinions concerning this limitation). In particular, when Figure 1 is considered in context with Figure 2, it is clear that switch 18 is not disclosed as being “disposed remotely from the housing”:



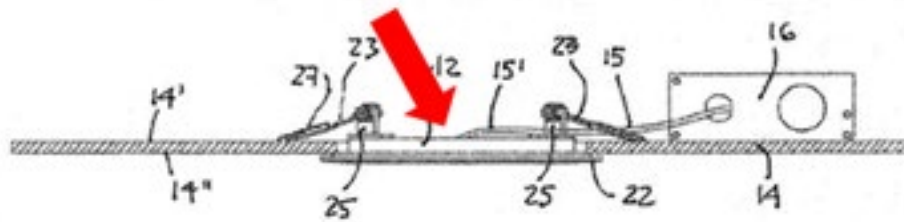


FIGURE 2

Ex. 1003 at Figures 1 and 2 (annotation in red added). As illustrated above, switch 18 is only shown to be visible when the disclosed lighting device is in the process of being installed or removed. However, Figure 2 plainly illustrates that when the lighting device is actually installed and operational, the switch is located within the housing.

168. Indeed, the switch is not visible at all in Figure 2, as the switch is not designed to be remote from the housing at all. The indication 15' on "cable 15" generally indicates a "lower end section" of cable 15 from connector 19 to the housing, that can be disconnected from "driver housing 16," whereas "far end" section 15" is secured to a driver circuit 20 within driver housing 16. Ex. 1003 at 3:18-25, 3:49-60. But as Figure 1 clearly shows, the switch is well below connector 19 (i.e., the disconnection point), and is thus consistent with the switch being disposed within the housing. *See id.* at 3:49-60.

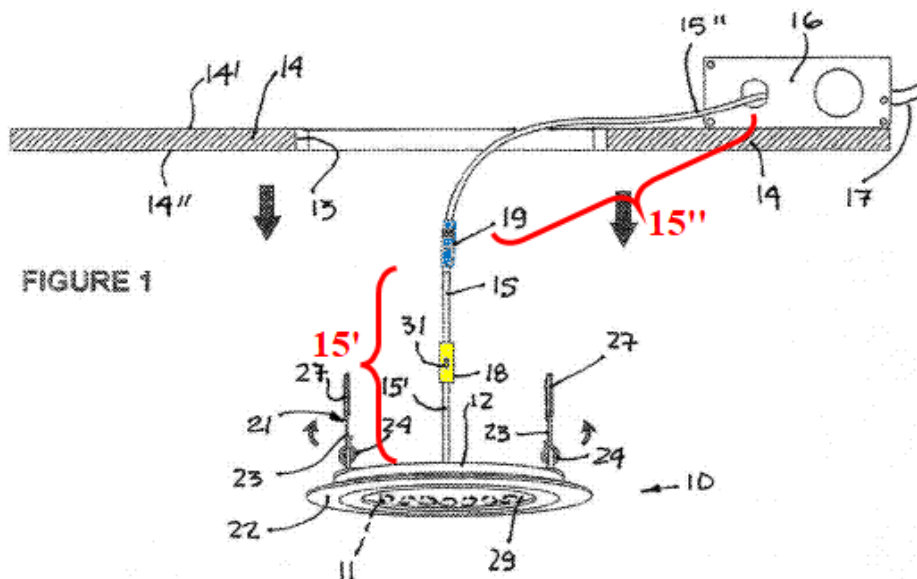


FIGURE 1

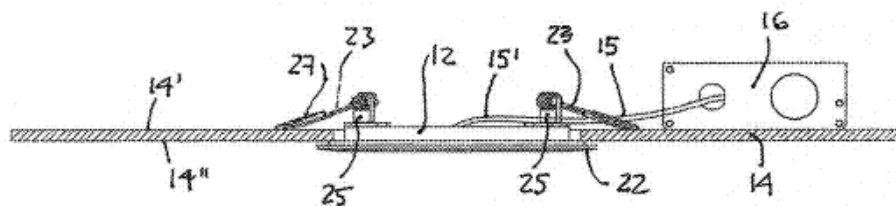


FIGURE 2

Ex. 1003 at Figures 1 and 2 (annotation in color added). A POSITA would have understood that a switch located within the lighting device housing (as disclosed in Chaimberg) is not “disposed remotely from the housing.”

169. I further note that Chaimberg does not provide any disclosure concerning the backing portion of the lighting device (to the extent such a backing exists in the disclosed design), and thus there is nothing in Chaimberg to suggest a design contrary to Figure 2 (e.g., where the switch is somehow not within the housing despite being illustrated in a manner to show that is the case). I also note

that Chaimberg depicts various components in Figures 1 and 2 that are not central to its design (including, e.g., coil springs 24, arms 23, protective sleeve 27, among others). It stands to reason that if switch 18—which is a focus of the disclosed design and referenced in the patent’s title—was designed to be disposed remotely from the housing, it would be observable in Figure 2 like other remote components, but it is not.

170. In fact, a POSITA would have understood Chaimberg to discourage the general concept of disposing the switch remotely from the housing. In particular, Chaimberg discusses numerous perceived problems with disposing a switch in a remote position (e.g., mounted on a driver housing), including perceived issues with accessing the switch, causing damage to the periphery of the mounting hole, and physical harm due to live wires, such that, in Chaimberg’s view, CCT selection would become difficult and dangerous. *See* Ex. 1003 at 1:48-67; 3:29-48.⁹ Instead, Chaimberg teaches that the switch should be located as illustrated in Figures 1 and 2, where the switch remains inside the housing by design. *See id.* at 3:14-29, 3:49-4:29. In addition, a POSITA would have understood that Chaimberg is concerned with making sure that the switch is remote

⁹ While Chaimberg disparages the possibility of mounting a switch on a driver housing, there is also no disclosure concerning what such a switch, if mounted on a driver housing would be or how it would work at all, much less a disclosure sufficient to meet the claim limitations.

from the **driver** housing, not the lighting device housing. In many places, the specification discusses the need to ensure that the cable is long enough that you can access the switch “without having to withdraw the driver housing 16 from the fixture mounting hole.” *See id.* at 3:49-53. Thus, a POSITA would have understood that the problem to be solved is different, i.e., ensuring the switch is remote from the driver, rather than ensuring the switch is remote from the housing, as required by Claim 1.

171. I further note that Dr. Eden does not rely on any obviousness theory for this limitation, and instead relies solely on Chaimberg allegedly expressly disclosing this limitation. In my opinion, Dr. Eden has not demonstrated that this limitation is disclosed by or obvious in view of Chaimberg.

- b. Claim 7: “The luminaire of claim 1, further comprising: a junction box comprising at least one wall that forms a second cavity, wherein the switch is disposed within the second cavity, wherein the second end of the electrical cable is coupled to the switch.”**

172. Claim 7 recites: “*The luminaire of claim 1, further comprising: a junction box comprising at least one wall that forms a second cavity, wherein the switch is disposed within the second cavity, wherein the second end of the electrical cable is coupled to the switch.*” Dr. Eden fails to show that limitations is disclosed by or obvious in view of Chaimberg.

173. As discussed above, Chaimberg discloses a switch that is designed to reside within (or at the very least directly attach to) the lighting device housing when installed. Chaimberg does not disclose or suggest disposing a CCT switch within a cavity formed by at least one wall of a junction box. In fact, as discussed above, Chaimberg expressly discourages and teaches away from the general concept of mounting a CCT switch on, or anywhere near (or otherwise requiring access to) a junction box. *See* Ex. 1003 at 1:48-67 (describing the driver housing location for a switch as “not recommended for safety reasons”); 3:29-48.¹⁰ And to be clear in this regard, Chaimberg only mentions (and disparages) mounting a switch “on the driver housing” (in other words, entirely on the outside of the driver housing, not disposed within a cavity of the housing). *See id.* Thus, a POSITA would not understand the disclosure of Chaimberg to teach or suggest a switch is disposed within the second cavity as claimed.

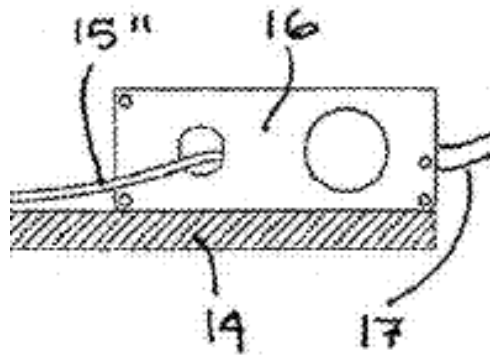
174. Dr. Eden nevertheless attempts to overcome this lack of disclosure by generally asserting that the limitation would nevertheless be “obvious” in view of

¹⁰ Dr. Eden states that Chaimberg teaches it was “common in prior art” and “well known” to mount a switch on a driver housing. Ex. 1003 at ¶ 124. I disagree with his interpretation of Chaimberg, which at most suggests, conceptually, that while it could be done, it should not be done for the various reasons described in the reference. Dr. Eden identifies no passage in Chaimberg that suggests doing so was “common,” and I disagree a POSITA would have interpreted Chaimberg in that manner. Notably, Dr. Eden did not rely on any prior art in his declaration demonstrating that such arrangement was in fact “common.”

Chaimberg’s teaching away from mounting a switch on a driver housing (as discussed above), or from his own description of general design considerations divorced from any specific reference or disclosure (such as use “for *some* applications,” “industrial, commercial, public, or residential application at hand,” using a junction box that “serve[s] several luminaires,” “the decision of lighting designers”). Eden Report, ¶¶ 125-126. Dr. Eden’s opinions contradict the reference’s disclosure (which, as discussed above, does not suggest locating a CCT switch in a junction box or that doing so was “well known in the art”), and appear to be based on hindsight to reconstruct the claims using Chaimberg in a way that Chaimberg does not disclose or suggest (or even intend), and that a POSITA would not have simply assumed. If anything, a POSITA reading Chaimberg would have specifically avoided locating a CCT switch anywhere near a driver housing based on its disclosure (to avoid the various concerns that Chaimberg emphasizes). *See, e.g.*, Ex. 1003 at 1:48-67; 3:29-48. Indeed, as discussed above, Chaimberg is specifically concerned with providing accessibility to the switch, so the very notion of providing *less* accessibility (by locating the switch even farther away at a location Chaimberg discourages) flies in the face of its disclosure.

175. Dr. Eden’s other purported “motivation” for modifying Chaimberg is likewise contradictory and apparently based on a hindsight reconstruction of claim 7. For example, Dr. Eden opines that his proposed modification would be

“obvious” due to a ceiling environment, including “elements (*e.g.*, dust, debris, insects, rodents, etc.) that could detrimentally affect the operation of the switch 18.” Ex. 1004 at ¶ 125. Yet, as discussed above, a POSITA would have understood that Chaimberg’s switch mechanism is already located within an outer casing depicted in Figure 1, and thus further protection would not be necessary. *See supra* at Section VII.B.1.a. Furthermore, there is no suggestion in Chaimberg or elsewhere that its cable-located switch 18 would be impacted by any such elements, nor any suggestion that driver housing 16 would prevent any such elements from reaching the switch, particularly in view of the large openings and lack of top panel in the disclosed design.



Ex. 1003, Fig. 1 (excerpt). In fact, contrary to the alleged motivations identified in Dr. Eden’s declaration, he testified about additional hazards involving the driver housing that would steer a POSITA away from such a modification, including “fire” resulting from “live wire connections” inside the housing due to “debris build up.” Ex. 2030, 203:18-204:1. Notably, Dr. Eden does not propose any further

modification to driver housing 16 to address any purported “elements,” and a POSITA would not have understood such disclosed design to prevent access from dust, insects, rodents or other elements.

176. Dr. Eden further does not address the nature of Chaimberg’s driver housing (i.e., the purported “junction box”), which is not designed to accommodate a switch at all, as made clear by Chaimberg’s cautions against such switch location. Indeed, Dr. Eden does not propose any modification to the driver housing itself, nor does he address where or how the switch would be located in the driver housing actually disclosed in Chaimberg. This is another flaw in his analysis demonstrating that such a design would not have been obvious.

177. Further still, Chaimberg also contains no disclosure concerning the portion of the claim requiring “the second end of the electrical cable is coupled to the switch.” In fact, Chaimberg’s design requires the cable to terminate at “driver circuit 20,” which itself receives power from “live wire 17.” Ex. 1003, 3:21-25, claim 1. Yet, Dr. Eden does not identify where Chaimberg discusses at all where a second end of cable 15 terminates, how it would interface with a switch that is instead located within the driver housing, or how such a revision of Chaimberg would even be carried out, instead just asserting that it would be done “to have a complete circuit” (despite the fact that such a location of the switch is not necessarily required to allow power to the lighting device). Ex. 1004 at ¶ 128. He

certainly does not explain in view of this arrangement why a POSITA would instead couple the cable to switch 18 (instead of driver circuit 20), how the switch would interface with the driver circuit (if at all), or how such a modification would be carried out to ensure the switch operates in the same manner as disclosed. Regardless of his assertion that recreating the claim “would have been known,” he has not demonstrated that a POSITA would have been motivated to do so, or would have otherwise found such a modification obvious. Thus, Dr. Eden fails to address how his proposed modification of Chaimberg would meet the claim limitations (or work at all), and I therefore disagree that he has shown that Chaimberg discloses or renders obvious this limitation.

178. Therefore, I disagree with Dr. Eden, and in my opinion, he has not demonstrated that this limitation is disclosed by or obvious in view of Chaimberg.

c. Claims 3, 6, 8-9 and 11-12

179. Because Dr. Eden has not demonstrated that Chaimberg renders claim 1 unpatentable, he likewise fails to demonstrate that all claims depending from claim 1 are unpatentable, including claims 6, 8-9 and 11-12.

C. Ground 1b: Claims 2, 4, 5, 10, 14, 16 and 20 in View of Chaimberg Alone or in Further View of Roberge

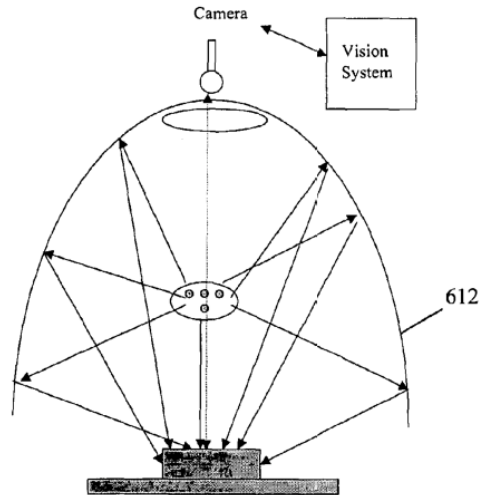
1. Dr. Eden’s “Motivation to Combine Chaimberg and Roberge”

180. Dr. Eden recognizes that Chaimberg does not disclose the limitations of claims 2, 4, 5, 10, 14, 16 or 20, but nevertheless asserts that those claims would

have been obvious in view of Chaimberg alone, or combined with U.S. Patent No. 7,178,941 (Ex. 1011, “Roberge”). I disagree, and in my opinion, Dr. Eden again uses hindsight to cobble together cherry-picked disclosures in a manner that would not have been obvious to a POSITA.

181. On its face, Roberge states that it issued on February 20, 2007, from an application that was filed on May 5, 2004. Roberge is titled “Lighting Methods and Systems,” and its Abstract states that it is directed to “[m]ethods and systems are provided for lighting systems, including high output linear lighting systems for various environments. The linear lighting systems may include power systems for driving light sources in high-voltage environments.” Ex. 1011, Abstract. In particular, Roberge is directed to the issue of separate power supplies for LED fixtures, and states that “[a] need exists for lighting systems that provide the benefits of other LED lighting systems but provide for more convenient installation and maintenance, particularly with respect to power supplies.” *Id.* at 1:14-24.

182. Roberge discusses certain conceptual ideas for lighting applications. For example, Roberge discusses at length proposed “optical facilit[ies],” such as a proposed “machine vision system,” for apparent use in camera imaging.



See, e.g., id. at 11:23-40; 13:55-14:12; Fig 6. Roberge also discusses generally use of different lighting sources in embodiments, including LEDs, fluorescent and halogen sources, incandescent bulbs and the like (*see, e.g., id.* at 9:20-35), as well as, for example, lighting effects, mapping and shows (*see, e.g., id.* at 34:19-36:29), networked lighting and networked lighting effects (*see, e.g., id.* at 36:34-38:26), and heat dissipation concepts (*see, e.g., id.* at 22:12-43). Roberge also discloses, e.g., linear lighting systems, control signals, tools, lighting animation and visual effects. *See generally id.* at, e.g., Figs. 10-13, 20-23, 33, 45, 48-55, 71, 74, and associated descriptions.

183. Roberge also discusses certain control interfaces for controlling a lighting system. These can be a “physical interface” or a “computer facility” to deliver data to the system. *See id.*, 6:14-22. Roberge also discloses “simple user

interfaces [that] can be used to trigger control signals,” some of which are illustrated in Figure 34. *Id.*, 38:27-48; 40:15-48; 42:11-44:34.

184. Before addressing Roberge, Dr. Eden first notes that Chaimberg’s Abstract states “wherein at least two sets of LED’s of different correlated color temperatures (CCT) are mounted in its housing,” and then opines:

In considering Chaimberg, therefore, one skilled in the art would have understood that the luminaire could include additional LEDs having CCTs other than 3000 K or 5000 K. In other words, expanding the number of CCT values available from the luminaire is straightforward. If LEDs of additional CCT values were incorporated into Chaimberg’s LED light fixture, switch 18 would of course require additional switch positions, but a wide variety of switches able to accommodate more positions have long been available. Rotary switches, in particular, are known to conveniently offer multiple positions.

Ex, 1004 at ¶¶ 188-189. Dr. Eden reads into Chaimberg a suggestion that a POSITA would not have understood to be present, and significantly oversimplifies the construction of an LED lighting system with adjustable CCT values.

185. Chaimberg’s reference to “at least two sets of LEDs” is not in reference to any suggestion at all of including “additional” LEDs to achieve more CCT settings, or use in any modified system in which additional CCT settings are possible. It is instead a generally statement about what a lighting device may include, as (according to Chaimberg’s disclosure) the described CCT control must include at least two sets of LEDs (i.e., if only one set of LEDs is present, the disclosed control scheme will not work). *See* Ex. 1003 at 4:30-5:10; Fig. 3. Dr.

Eden's interpretation appears to be based on hindsight, where he starts with, e.g., '336 Patent claim 4 and then uses Chaimberg's bare reference to "at least two sets of LED's" to spin out an entirely new design that is not disclosed nor suggested by Chaimberg's actual disclosure. I disagree a POSITA would have read Chaimberg in this manner.

186. Indeed, Dr. Eden simply concludes it would have been "understood" that Chaimberg could be completely redesigned to achieve additional CCT values, including by adding new LEDs (without explaining how or why that would have been carried out to Chaimberg's purposeful design, including with respect to both the luminaire itself and the disclosed switch), with apparently non-specific technology that he does not describe at all in his declaration (and that is beyond that disclosed in Chaimberg) to control relative intensities, and he further states that it would be understood to do so using a rotary switch (which is not disclosed or suggested in Chaimberg at all). Ex. 1004 at ¶¶ 188-189. Nor does Dr. Eden address the various design concerns, including with respect to space, heat issues, load control and electronics, that would need to be considered in such a redesign, all of which would not be viewed by a POSITA as simply "obvious." In effect, Dr. Eden attempts to reverse-engineer the '336 Patent claims using Chaimberg, which does not contemplate the design claimed, and then use hindsight to fill in what a POSITA would have known. I disagree with his opinions, and his conclusion that

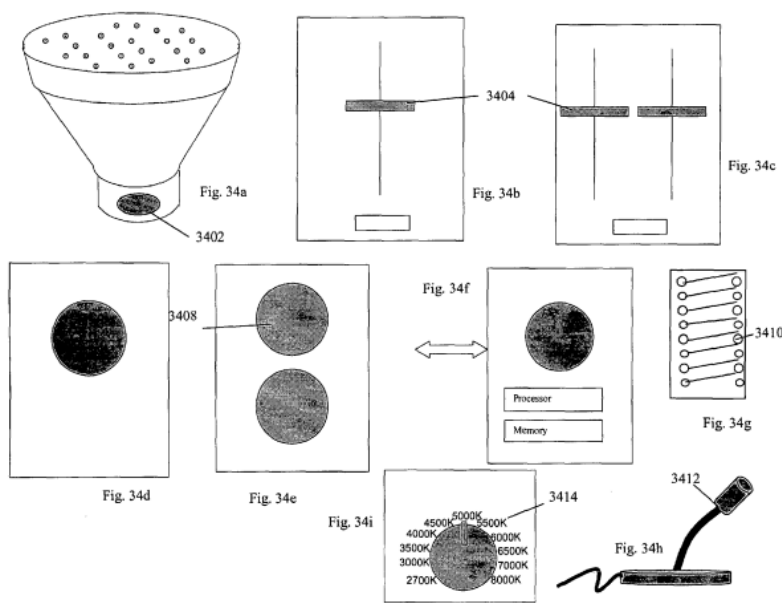
a POSITA would have simply understood to carry out these ideas, particularly where he offers no evidence aside from his own opinions on this issue.

187. Dr. Eden then states that carrying out these changes would also have been motivated by Roberge, because Roberge purportedly discloses use of a plurality of LEDs using sets of white sources that can be contained in a lighting device, and disclosing a manner of mixing those sources to achieve CCT values. Ex. 1004 at ¶ 190. However, this simply describes the concept of blending LED light of different color values to achieve different CCT outputs. As an initial matter, Dr. Eden jumps around to different disclosures and embodiments within Roberge to suggest that its CCT disclosure renders the challenged claim limitations obvious, but I disagree that a POSITA would have understood the reference in this manner. For example, he cites to “17:23-26” to suggest Roberge describes carrying CCT outputs of LEDs “in a conventional lighting fixture, such as a lamp or a cylindrical fixture” (Ex. 1004 at ¶ 190) but that portion of Roberge instead generally discusses the design of lighting *housings*: “Housings 800 can take various shapes, such as one that resembles a point source, such as a circle or oval. Such a point source can be located in a conventional lighting fixture, such as lamp or a cylindrical fixture.” Ex. 1011 at 17:23-26. While he identifies an earlier portion of Roberge generally discussing “[v]arious mixtures of sources” using different light sources, this disclosure is conceptual and not tied to any particular

lighting design, much less the design contemplated by Chaimberg. *See id.* at 7:18-39; Fig. 3. Dr. Eden then jumps again to a passage in a different portion of Roberge that discusses “[m]ixing all three sources [of LED light],” where that passage primarily discusses the mixing of green, red and blue LEDs to produce the appearance of white light, where adjusting the amount of green, red or blue LED light can impact the apparent color. *See id.* at 33:20-46; Fig. 26. Then, Dr. Eden follows this by jumping again to an earlier passage discussing use of an “amber source” to “improve the color” of light when selecting color temperature. *See id.* at 8:7-34. Again, these general concepts concerning light mixing and color selection are broad in nature, and certainly would not suggest to a POSITA, nor provide any motivation, to change the purposeful design of Chaimberg. Nor do they suggest that a POSITA would have reason to look to Roberge for any reason to modify Chaimberg’s disclosure, as there is no apparent reason to do so (aside from Dr. Eden’s use of hindsight) in view of these general concepts.

188. Nor do I believe motivation to modify Chaimberg’s disclosure is provided by Roberge’s discussion of CCT switches generally (whether, as Dr. Eden puts, by manual or electronic switches). The general concept of using a switch to select a CCT setting using two or more sets of LEDs as disclosed in Chaimberg does not provide any specific motivation for a POSITA to redesign Chaimberg in the specific fashion Dr. Eden proposes.

189. For example, the exemplary “user interfaces” to “trigger control signals” shown in Figure 34 (on which Dr. Eden relies) are located, e.g., directly on a lighting device housing:



Ex. 1011 at 42:11-44:34; Fig. 34.¹¹ Roberge describes Figure 34a as “a push button 3402 that triggers stored modes when pressed,” where the push button is directly on the lighting device housing. *See id.* at 42:11-34. Roberge goes on to describe other types of user interfaces shown in Figure 34, which are described in the same context, i.e., located on the lighting device. *See, e.g., id.* at 42:29-34 (“In embodiments such as FIG. 34 a, the slide can provide voltage input to a lighting unit 102, and the switch can allow the user to switch between modes of operation

¹¹ Dr. Eden appears to use the original figures when discussing the disclosure of Roberge in his report, rather than those in the Certificate of Correction appended to the reference, and I therefore reference the same herein.

...”). One clear exception to this is “microphone 3412,” which is merely used to “trigger lighting by voice interaction” (*id.* at 42:27-29).¹²

190. Further, when describing the specific dial embodiment in Figure 34i—which is the embodiment identified and relied upon by Dr. Eden—is not described as being part of a luminaire at all. Roberge instead first explains that “it may be desirable to limit user control.” Ex. 1011 at 42:39-50. In this regard, Roberge explains that there is a desire to set a particular lighting environment and “wish to have it remain that way over time.” *Id.* Roberge thereafter describes using the Figure 34i dial in the following manner: “the designer can specify a particular setting, and the installer can set it according to the design plan.” *Id.* at 42:60-65. In other words, a POSITA would have understood that the Figure 34i embodiment is intended to pre-set a specific CCT value for a device (e.g., by networked communication), but not remain accessible for further configuration after device installation. *Id.* at 42:39-50. By contrast, Chaimberg is directed to addressing the problem where “the end user desires to later change the color of the light generated

¹² While Roberge also contemplates elsewhere different types of switches (e.g., a “standard wall switch”), that concept is not disclosed in conjunction with the embodiments relied upon by Dr. Eden, nor does he assert a POSITA would have understood that to be the case or otherwise purport to rely on such a configuration (much less demonstrate how it could meet and particular claim limitation). Likewise, in my opinion, a POSITA would not have understood that to be the type of switch disclosed in Figure 34 on which Dr. Eden relies.

by the LED light fixture,” and therefore requires continued user access after installation. Ex. 1003, 2:8-13.

191. Roberge goes on to explain that “the fixture, socket 3302 or lighting unit 102 can command color setting at installation, either a new setting or a fine adjustment to provide precise color control.” Ex. 1011 at 42:66-43:1. Roberge further explains “[t]he lighting unit 102 is settable, but the fixture itself stores an instruction or value for the setting of a particular color temperature or color. Since the fixture is set, the designer or architect can ensure that all settable lighting units 102 will be set correctly when they are installed or replaced.” *Id.* at 43:3-11. Roberge explains that any further adjustments would not be made via the disclosed dial as part of any luminaire or lighting device, but rather through making a “physical connection ... with a small handheld device, such as a Zapi available from Color Kinetics.” *Id.* at 43:12-20.

192. Thus, a POSITA would not have understood the Figure 34i embodiment of Roberge to be used for a different purpose than the switch in Chaimberg, and would not have understood or been motivated to modify Roberge’s switch in the manner he proposes.

193. I further note that Dr. Eden does not identify any passage in Roberge that describes or suggest any particular benefits or motivation to a POSITA to add additional CCT selection options to a lighting device like that of Chaimberg that

already includes CCT selection. Nor does he cite any disclosure of Chaimberg suggesting that such a modification would even be contemplated. He instead refers to the general disclosure of Roberge, and then concludes that a POSITA would somehow be motivated by that disclosure to change the purposeful design of Chaimberg (including not just the switch, but additional electrical components and product operation). His additional citations to general passages from Roberge, out of context and with respect to different embodiments, does not change this result. *See* Ex. 1004 at ¶¶ 191-197.

194. I further note that Dr. Eden provides no opinions concerning whether a POSITA would have had a reasonable expectation of success in carrying out any proposed combination involving Chaimberg and Roberge. I understand that demonstrating obviousness requires a reasonable expectation of success, and failing to address this aspect further demonstrates that he has not shown any particular combination of the references to be obvious.

195. I therefore disagree that Dr. Eden has shown that a POSITA would have been motivated to modify Chaimberg and/or combine Chaimberg and Roberge in the manner proposed.

2. Claims 2, 4, 5, 10, 14, 16 and 20

- a. Claim 4: “The luminaire of claim 3, wherein the plurality of positions of the switch comprises a first position, a second position, a third position, a fourth position, and a fifth position”**

196. Claim 4 recites: “*The luminaire of claim 3, wherein the plurality of positions of the switch comprises a first position, a second position, a third position, a fourth position, and a fifth position.*” Dr. Eden fails to show that Claim 4 is obvious over Chaimberg alone or in combination with Roberge.

197. Dr. Eden’s opinion again relies heavily on the words “at least” in Chaimberg’s statement that the disclosed lighting device may include “at least two sets of LED’s of different correlated color temperatures.” Ex. 1004 at ¶ 204 (citing Chaimberg, Abstract). From this statement, Dr. Eden concludes it would have been “obvious” to include two additional positions on Chaimberg’s disclosed switch. I disagree, including for the reasons stated above. *See supra* at Section VII.C.1.

198. Chaimberg’s reference to “at least two sets of LEDs” is not in reference to any suggestion at all of including additional CCT settings or use in a modified system in which additional CCT settings are possible. It is instead a general statement about what the lighting device may include, as according to Chaimberg’s disclosure, the described CCT control must include at least two sets of LEDs (i.e., if only one set of LEDs is present, the disclosed control scheme will

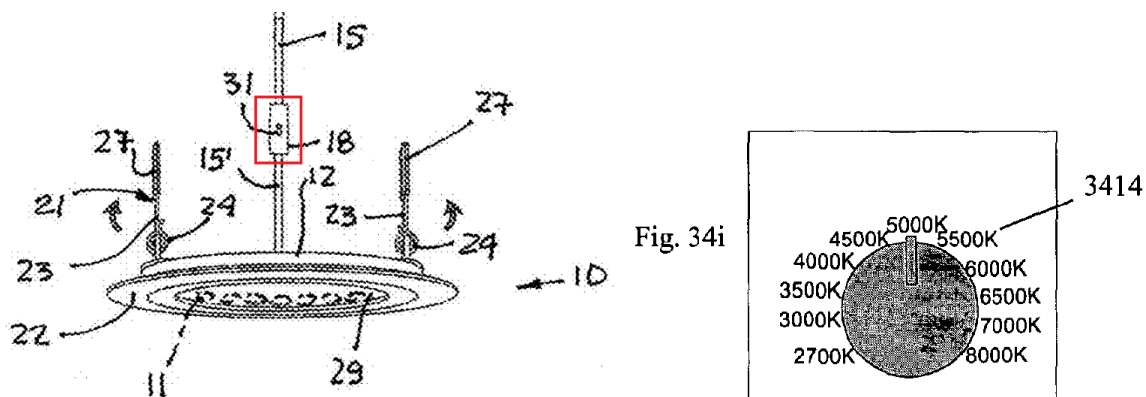
not work). *See* Ex. 1003 at 4:30-5:10; Fig. 3. There is no suggestion in Chaimberg of including more LEDs, much less how one would use such LEDs to achieve different settings using the disclosed design, or how the disclosed design would operate according to Dr. Eden's modification, nor does Dr. Eden explain in his opinions concerning claim 4 how a POSITA would have understood such a modification would be carried out, or why a POSITA would do so in view of the words "at least." I disagree that Dr. Eden has shown it would have been obvious for a POSITA to do so, or that Chaimberg provides any motivation to do so.

199. Dr. Eden next relies on Roberge (and specifically, the Figure 34i embodiment of Roberge) as allegedly rendering obvious Claim 4 in combination with Chaimberg. I again disagree with his conclusion. As discussed above, Roberge is not directed to the type of lighting device disclosed in Chaimberg, and in my opinion, Dr. Eden has not provided any reason or motivation as to why a POSITA would look to the general concepts disclosed in Roberge to modify Chaimberg in the manner proposed, other than based on hindsight in view of the '336 Patent claims. *See supra* at Section VII.C.1.

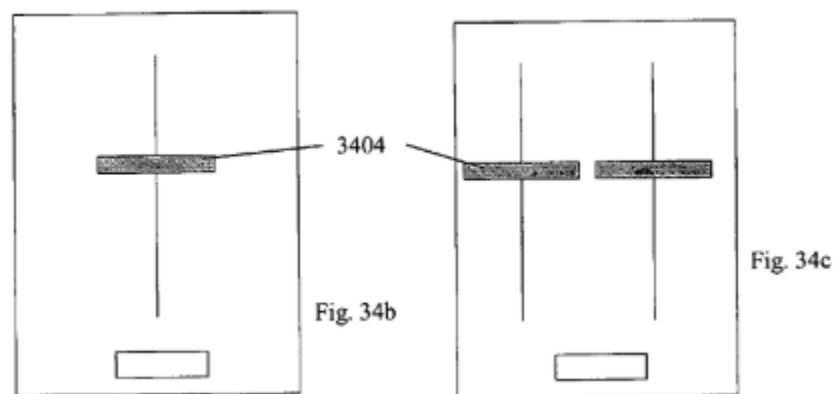
200. To the contrary, in my opinion, a POSITA would not have been motivated to modify the lighting device in Chaimberg (including in the significant manner apparently proposed by Dr. Eden). Roberge at most contemplates a device for pre-setting a CCT value, and a POSITA would have understood Roberge's

Figure 34i embodiment to be used to select a particular CCT value for pre-setting a lighting parameter prior to installation. *See id.* The mere fact that Roberge discloses a rotary dial that includes multiple CCT options, or that it discloses the possibility of using multiple sources of white light in other portions of the reference, does not itself provide any motivation to significantly modify Chaimberg. The general concept of different color temperatures for white light was previously known, and the mere disclosure of this concept in a different type of system does not provide the specific type of motivation that Dr. Eden suggests (indeed, if it was as obvious as Dr. Eden suggests, one would suspect his proposed modification to be expressly contemplated by Chaimberg—which it is not).

201. Moreover, the dial disclosed by Roberge is different from the toggle switch disclosed in Chaimberg, which I discuss above. Indeed, the disclosed switches that Dr. Eden relies on in each reference are designed in a significantly different manner, as illustrated below:



Dr. Eden does not explain how a POSITA would have implemented the Figure 34i embodiment into Chaimberg's design. While Dr. Eden also notes that Roberge also refers to a "slide mechanism" that could alternately be used (Ex. 1004 at ¶ 210), the slide mechanisms contemplated by Roberge (as shown below) are not toggle switches at all, and otherwise bear no resemblance to the switch depicted in Chaimberg.



Ex. 1011 at Figs. 34b, 34c, 42:13-17. As illustrated above, a POSITA would have understood such depictions to generally illustrate the concept of continuous sliders. Further, use of a "scale" or indications of particular values (on a slide mechanism or dial embodiment) to assist in making a selection does not provide the required distinct positions that correspond to targeted and discrete CCT outputs (i.e., discrete stopping locations of the actuator, see Ex. 1001 at 10:17-20), and Dr. Eden does not provide any explanation as to why a POSITA would make such an assumption.

202. Therefore, I disagree with Dr. Eden, and in my opinion, he has not demonstrated that this limitation is disclosed by or obvious in view of Chaimberg alone, or in combination with Roberge.

- b. **Claim 5: “The luminaire of claim 4, wherein the first position of the switch corresponds to 2700 Kelvin (K) output by the one or more light sources, wherein the second position of the switch corresponds to 3000 K output by the one or more light sources, wherein the third position of the switch corresponds to 3500 K output by the one or more light sources, wherein the fourth position of the switch corresponds to 4000 K output by the one or more light sources, and wherein the fifth position of the switch corresponds to 5000 K output by the one or more light sources”**

203. Claim 5 recites: “*The luminaire of claim 4, wherein the first position of the switch corresponds to 2700 Kelvin (K) output by the one or more light sources, wherein the second position of the switch corresponds to 3000 K output by the one or more light sources, wherein the third position of the switch corresponds to 3500 K output by the one or more light sources, wherein the fourth position of the switch corresponds to 4000 K output by the one or more light sources, and wherein the fifth position of the switch corresponds to 5000 K output by the one or more light sources.*” Dr. Eden fails to show that Claim 5 is obvious over Chaimberg alone or in combination with Roberge. Dr. Eden largely relies on the same rationales for modifying Chaimberg as those presented for Claim 4, and I disagree with those rationales for the same reasons set forth above.

204. For example, as discussed above, I disagree with Dr. Eden that Chaimberg's disclosure alone would motivate a POSITA to modify Chaimberg's switch (as well as make the additional significant modifications to the lighting device) to implement five different CCT selection options, including the specific, discrete CCT values recited in Claim 5. *See supra* at Section VII.C.2.a. While Dr. Eden points to different possible "applications" as providing motivation (Ex. 1004 at ¶ 215), he does not explain why a POSITA would find any particular application to necessitate or render obvious modifying Chaimberg in the manner proposed, much less for the specific CCT values recited in Claim 5. That it may generally be possible to achieve those CCT values, divorced from the actual device in Chaimberg, does not make modifying Chaimberg in this manner obvious. Indeed, if it were obvious to do so, one would expect Chaimberg to disclose such modifications, or at least suggest such modifications are contemplated. In my opinion, Dr. Eden is improperly imputing motivation to a POSITA that would simply not have been there, and certainly not in view of Chaimberg.

205. Nor do I agree with Dr. Eden that a POSITA would have found it obvious to make the modifications to Chaimberg in view of Roberge. As discussed above, Roberge is not directed to the type of lighting device disclosed in Chaimberg, and in my opinion, Dr. Eden has not provided any reason or motivation as to why a POSITA would look to the general concepts disclosed in

Roberge to modify Chaimberg in the manner proposed, other than based on hindsight in view of the '336 Patent claims. Nor has Dr. Eden explained why a POSITA would have modified Chaimberg to implement the five specific CCT value selections claimed in Claim 5. Instead, Dr. Eden simply notes that Roberge includes those values amongst several others on a rotary dial in Figure 34i (Ex. 1004 at ¶¶ 217-218) and then simply concludes that it would have been obvious for a POSITA to cherry pick the specific values in Claim 5 when modifying Chaimberg. He has provided no apparent motivation for this specific selection, and I disagree that a POSITA would have been motivated to do so in view of Chaimberg and Roberge. While Dr. Eden notes that 2700 K was a known CCT setting (Ex. 1003 at ¶ 220), he fails to demonstrate why that alone would have motivated a POSITA to modify the purposeful design disclosed in Chaimberg.

206. I further note that at his deposition, Dr. Eden opined that “Roberge doesn’t disclose the five specific CCT settings in claim 5 in [the] five positions” claimed in claim 5, and that his opinion was instead that it would generally be obvious to select the different, claimed values based on Roberge’s disclosure. Ex. 2030, 236:2-19. In my opinion, this again demonstrates that Dr. Eden is using hindsight by starting with claim 5 and then using Roberge to attempt to backfill information in a manner that a POSITA would not have done.

207. Therefore, I disagree with Dr. Eden, and in my opinion, he has not demonstrated that this limitation is disclosed by or obvious in view of Chaimberg alone, or in combination with Roberge.

c. Claim 16: “The switch of claim 15, wherein the range of positions comprises a first position, a second position, a third position, a fourth position, and a fifth position”

208. Claim 16 recites: “*The switch of claim 15, wherein the range of positions comprises a first position, a second position, a third position, a fourth position, and a fifth position.*” Dr. Eden fails to show that Claim 16 is obvious over Chaimberg alone or in combination with Roberge.

209. As an initial matter, I note that the priority date for claims 13, 15 and 16 predates the filing date of Chaimberg. Therefore, it is my understanding that Chaimberg does not qualify as prior art for claim 16, and for this reason it is my opinion that Chaimberg (as well as any proposed reference combination involving Chaimberg) cannot render obvious claim 16, either alone or in combination with Roberge.

210. In any event, I note that Dr. Eden opines that this limitation is present “for the same reasons presented in Section X.D” (corresponding to claim 4). Ex. 1004, ¶¶ 230-231. Therefore, for the same reasons I discuss above with respect to claim 4, in my opinion, Dr. Eden has not demonstrated that this limitation is

disclosed by or obvious in view of Chaimberg alone or combined with Roberge.

See supra at Section VII.C.2.a.

d. Claims 2, 10, 14 and 20

211. Because Dr. Eden has not demonstrated that claims 1 or 13 are unpatentable in view of Chaimberg alone or in further view of Roberge, he likewise fails to demonstrate that all claims depending from claim 1 or 13 are unpatentable, including claims 2, 10 and 14.

D. Ground 2: Claims 1, 2-5, 7, 9, 10-13, 15, 16, 19 and 20 in View of Halliwell

212. Dr. Eden maintains that Claims 1, 2-5, 7, 9, 10-13, 15, 16, 19 and 20 are anticipated or obvious to a POSITA in view of U.S. Patent No. 9,801,250 (Ex. 1012, “Halliwell”). I disagree and explain below that Dr. Eden fails to show that any of those claims are anticipated or obvious in view of Halliwell.

213. I further note that Halliwell, on its face, states that it issued on October 24, 2017, from an underlying application (No. 15/274,575) that was filed on September 23, 2016. As I established above, in my opinion, claims 13, 15 and 16 are entitled to a priority date at least as early as February 19, 2016. *See supra* at Section VI. Thus, the priority date for claims 13, 15 and 16 predates the filing date of Halliwell. Therefore, it is my understanding that Halliwell would not qualify as prior art for claims 13, 15 and 16, and for this reason it is my opinion that Halliwell alone, as well as any proposed modification involving Halliwell in Dr. Eden’s

report, would not anticipate or render obvious claims 13, 15 and 16. Nevertheless, I explain below that Dr. Eden fails to show that any of claims 13, 15 and 16 are anticipated or obvious in view of Halliwell.

1. Dr. Eden’s Understanding of Halliwell in His Declaration is Incorrect and Contradicted By His Deposition Testimony

214. In his declaration, Dr. Eden appears to fundamentally misunderstand the disclosure of Halliwell. In particular, Dr. Eden makes two statements that directly contradict Halliwell’s disclosure:

- “However, Halliwell discloses that its LED lighting device could also employ a remote switch in addition to or in place of a housing-mounted switch.” Ex. 1004 at ¶ 236;
- “Thus, Halliwell explicitly states that the ‘junction box mounted CCT Switch’ could be a switch like that disclosed in Fig. 4” (or using switch 30 in Figure 4 would otherwise be “obvious”). Ex. 1004 at ¶ 237.

Both of these assumptions underlie Dr. Eden’s opinions concerning Halliwell applied against the challenged claims, but both are demonstrably false, thereby rendering his opinions incorrect and flawed.

215. In fact, I note that Dr. Eden later acknowledged at his deposition that these statements are **incorrect**, and not how a POSITA would have understood Halliwell. For example, Dr. Eden correctly testified at his deposition that switch 30 must be present in the housing of the disclosed lighting device, because that is the

actual "switch" (not "remote switch 40," which is a secondary input to the switch)

and without it the lighting device could not operate as disclosed:

Q. So, Dr. Eden, I would like to discuss remote switch 40 in a little more detail. Now, according to Halliwell, the switch selector 34 of device located switch 30 must be moved to position 32D, or auto, in order for the remote switch 40 to communicate with the lighting device; is that right?

A. I believe what you're saying is correct.

Ex. 2030 at 178:7-16;

Q. ... But I guess sitting here today, **are you aware of any passage in Halliwell that describes using remote switch 40 without or completely in place of device located switch 30?**

A. **I'm not aware of such an option**, but I don't understand -- just, again, from a POSITA's view of the specification, why 30 would be necessary given a remote switch. If we looked at Figure 4A that we were looking at earlier -- oh, and in the particular, Figure 3 -- well, switch -- well, 30 -- what's labeled 30 is the unit that remotely transmits the desire of the user to the switch control unit 35. **So why would you want to dispense with 30?**

Q. I am not proposing to do anything. I'm asking you if there is any disclosure in Halliwell at all where remote switch 40 is used without switch 30 being located on the lighting device.

A. I don't think -- **you need to have switch 30** on the -- the reason that you're not seeing an embodiment that eliminates switch 30 is that **the actual switching process is conducted at the luminaire**, which it has to be because that's where the -- that's where all the electronics, the driving circuitry is located. **So even though 40 is known as a remote switch, it's not a switch at all. It's simply a**

unit that conveys instructions from the user to the unit. The hardware – the switching hardware is actually at the luminaire. **So I don't think you want to do away with switch 30.**

Q. Okay.

A. Because **it won't switch otherwise.**

Ex. 2030 at 182:20-184:7 (emphasis added).

216. Likewise, Dr. Eden states that a POSITA would not use “a switch like that disclosed in Fig. 4” (i.e., switch 30) in place of remote switch 40 (in a junction box), which he believes would likely have a different interface altogether (e.g., a touch screen):

Q. Now, **the remote switch is described at column 17, starting at line 33 and running through, it looks like, column 19, line 9;** is that right?

A. Yes. That's the area that I was just quoting from a few moments ago.

Q. Is **switch 30 mentioned at all** in that passage?

A. **No**, it's not. But why should it be mentioned?

Q. Is **Figure 4 mentioned at all** in this passage?

A. **No**. Is it necessary for it to be mentioned?

Q. If switch 30 depicted in Figure 4 was used as remote switch 40, what would be the purpose of the auto position?

...

A. I'm sorry. I don't understand where you're going. I thought we decided a little while ago that **Figure 3 tells us that switch 30 is not remote.**

Q. I am –

A. It's the -- it's the hardware on -- excuse me. Let me finish, if I might. **Switch 30 is the switch that's actually on the luminaire. It's not remote.** So in this section in column 17, the topic of discussion is not the hardware at the luminaire. This is -- this is the hardware and the means -- or it is a piece of hardware -- and the means of delivering the signals from that remote switch to the luminaire or also receiving power, perhaps, from the junction box.

Q. I'm referring to your sentence in paragraph 237 of your declaration where you refer to the junction box-mounted CCT switch, which would be remote switch 40, being a switch like that disclosed in Figure 4, right?

A. **But my text is saying it does not disclose using the switch of Figure 4 as the remote switch.** It's not used as the remote switch. That's why it's labeled 30.

Q. So in your opinion, **the junction box-mounted CCT switch or remote switch 40 would not be a switch like the type depicted in Figure 4; is that right?**

A. **No. No, that's labeled 30.** Figure 4 is labeled 30, not 40.

Ex. 2030 at 190:19-192:19 (emphasis added);

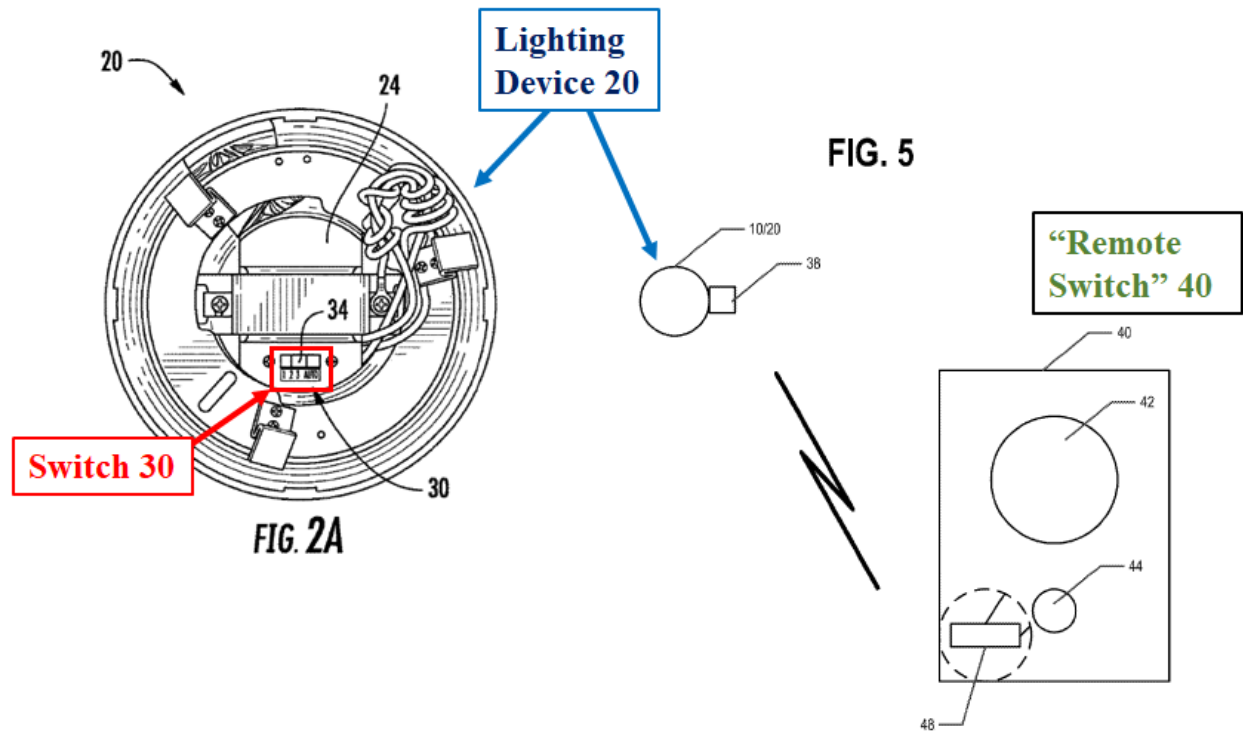
Q. And remote switch 40 in Halliwell could be a slide button switch, right?

A. Probably not. There probably -- there's probably, most likely, with today's technology, a screen that you -- like a touchscreen on your phone.

Ex. 2030 at 211:18-212:7.

217. Unlike his declaration, Dr. Eden's deposition testimony is consistent with how a POSITA would have understood Halliwell, which describes a very

different type of lighting device design when compared to the '336 Patent, as explained in further detail below. In particular, Halliwell's design requires a switch at the light device and integrated into the housing of that device, as depicted below using figures from the reference:



Ex. 1012, 11:35-39, 11:62-12:15, 12:60-13:49, Figs. 2A, 4, 5. Without switch 30 being present, the lighting device could not receive input from remote switch 40 (via communication interface element 38 of the switch control unit), and thus would not be able to operate as intended. It would make no sense at all to move switch 30 to a junction box or modify switch 40 to use the design of switch 30, as switch 30 is specifically designed to be located on the lighting device and allow for

communication **with** remote switch 40 (via its “Auto” position selection, position 32D), as Dr. Eden acknowledged above. *See* Ex. 1012 at 12:60-13:49.

218. The errors in Dr. Eden’s declaration opinions are carried into his analysis of the challenged claims, and likewise render those opinions incorrect, including for these reasons and the additional reasons set forth below.

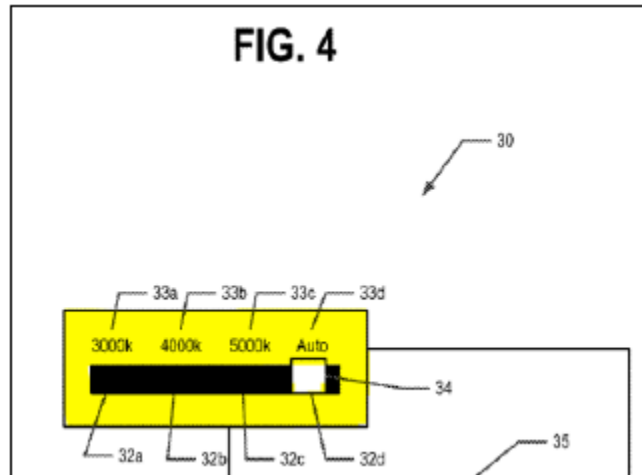
2. Claims 13, 15-16 and 19-20

a. Element 13(a): a body

219. Claim element 13[a] recites: “*a body*.” Dr. Eden fails to identify a switch “body” in Halliwell.

220. As discussed above, a POSITA would have understood the ordinary and customary meaning of a switch “body” to be part of the switch itself, on which the recited “first coupling feature” and “actuator” are disposed, as recited in Element 13(b). Ex. 1001 at 15:21-16:2, 9:65-10:4, Fig. 6C; *supra* at Section VI.A.2.

221. In his declaration, Dr. Eden identifies the switch body as the highlighted box in Figure 4 below:



Ex. 1004, ¶ 308 (“The switch includes a body which is highlighted in yellow in Fig. 4 below.”). However, a POSITA would not have understood what Dr. Eden highlighted to be “a body” of a switch as described and claimed in the ’336 Patent. Instead, a POSITA would have understood the highlighted box to represent a portion of the lighting device housing into which the switch 30 is integrated.

222. As Dr. Eden correctly recognized at his deposition, switch 30 is **always** depicted and described as being integrated into the housings of the disclosed lighting devices in Halliwell. Ex. 2030, 163:2-6, 164:11-16, 165:4-20. This can also be seen in every figure in Halliwell depicting a lighting device, where switch 30 is integrated into the device housing itself, and is not a separate box as illustrated in Figure 4:

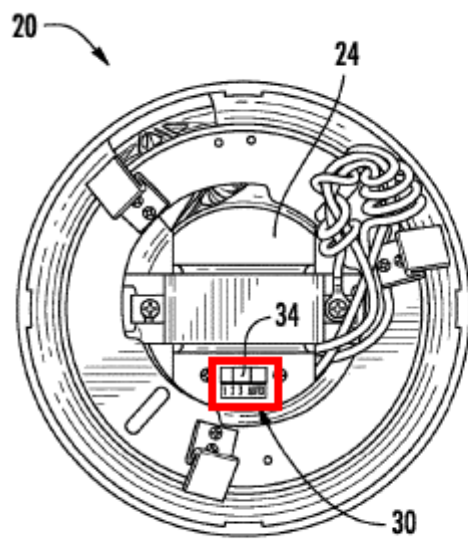


FIG. 2A

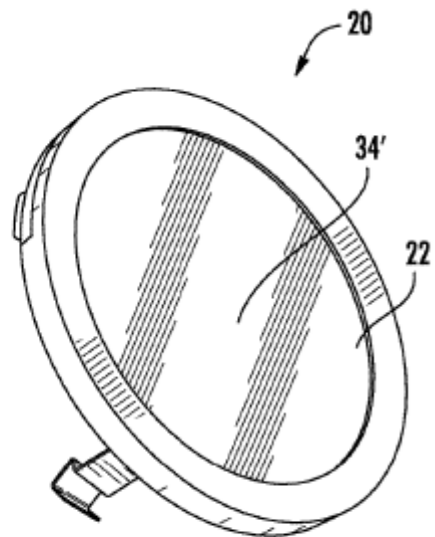


FIG. 2B

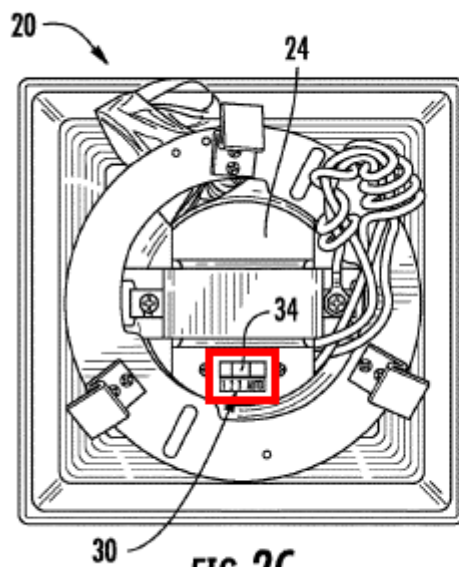


FIG. 2C

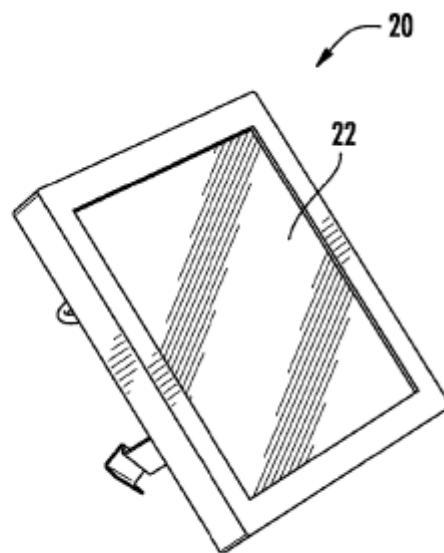
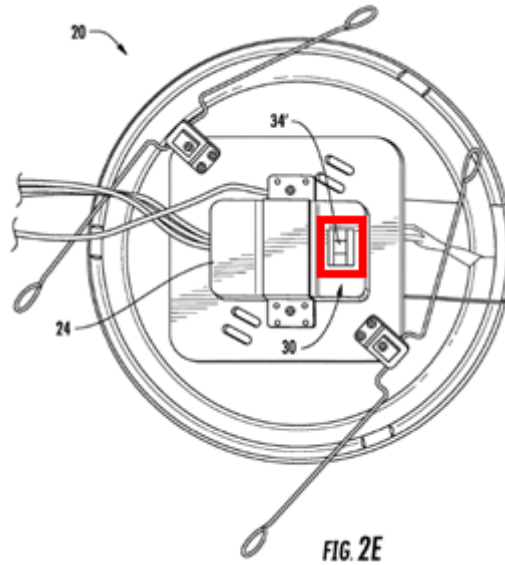
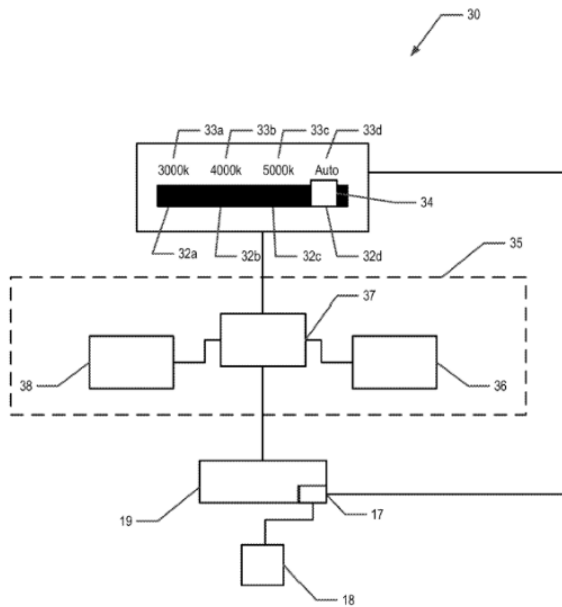
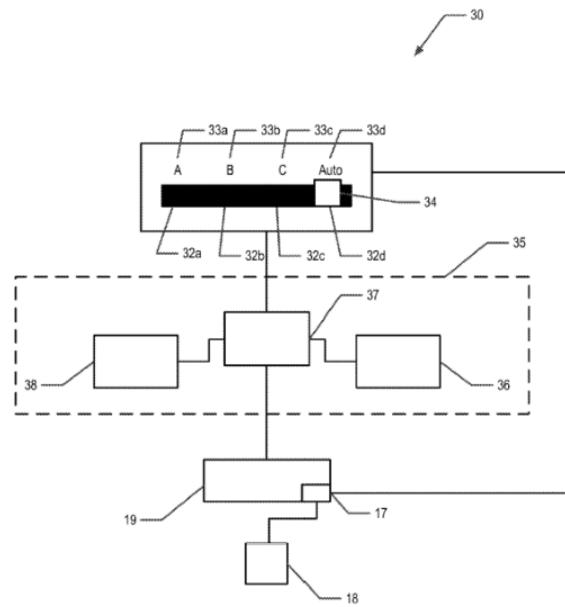


FIG. 2D

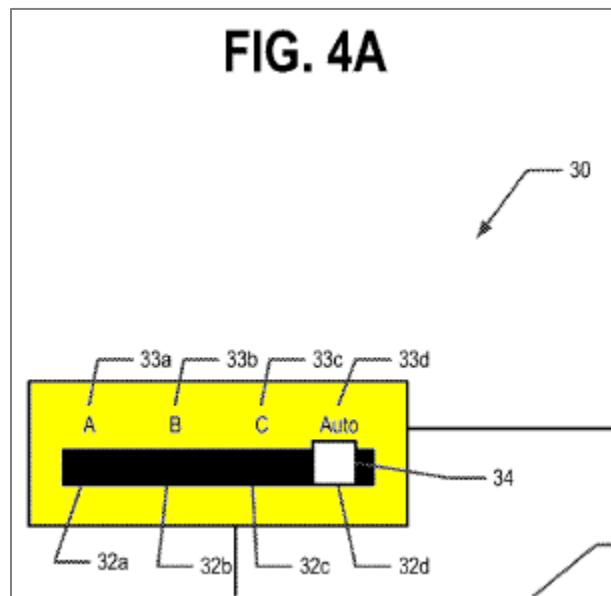
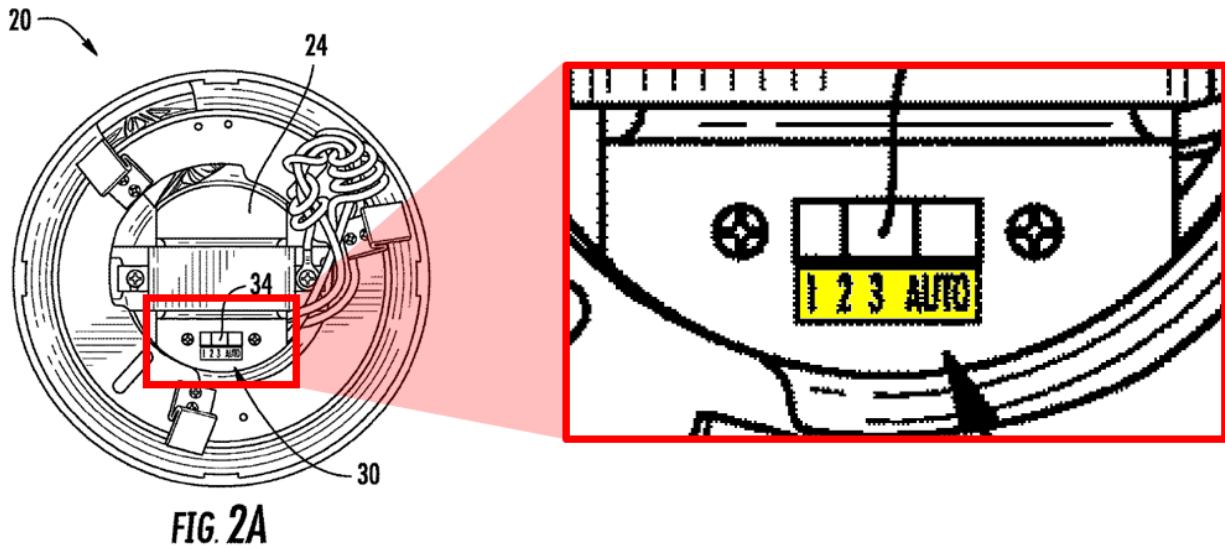


Ex. 1012, Figs. 1-2E (annotation added).

223. By contrast, Figure 4 (and similar Figure 4A) are not depictions of any actual lighting device or components of a lighting device, and are instead “**block diagram[s]** of at least some of the electrical components of an LED lamp or LED lighting device,” and thus are “blocks” intended to generally represent components at a conceptual level. As Dr. Eden also recognized, all of the Figure 4 components are actually part of the lighting device itself. Ex. 2030 at 166:9-19.

FIG. 4**FIG. 4A**

224. As can be seen in both Figures 4 and 4A, the box labeled “30” includes “switch position indicators 33 (e.g., 33a, 33b, 33c, 33d),” which are “configured to indicate” to the user which operating mode is selected. Ex. 1012 at 11:55-58, 12:60-13:17, Figs. 4, 4A. Indicators 33a-33c are labeled with CCT values in Figure 4 (e.g., “3000k”), but are represented by letters A, B and C in Figure 4A, as that embodiment contemplates custom preset values. *Id.* at 7:65-8:3, 12:60-13:17, Figs. 4, 4A. Halliwell’s figures make clear that these indicators are located on the device housing itself, not on any “body” of switch 30. For example, Figure 2A includes switch 30, where indicators “1, 2, 3, Auto” (corresponding to the similar indicators “A, B, C, Auto” in Figure 4A) appear on the device housing, not on any portion of the “switch” itself:



Ex. 1012, Figs. 1-2E, 4, 4A (annotation added). The same is true for the other figures in Halliwell. Indeed, Figure 1A further demonstrates that the indicators are located on the device housing (not a switch) by depicting the indicators as even more physically distant from switch 30 on the housing of a bulb:

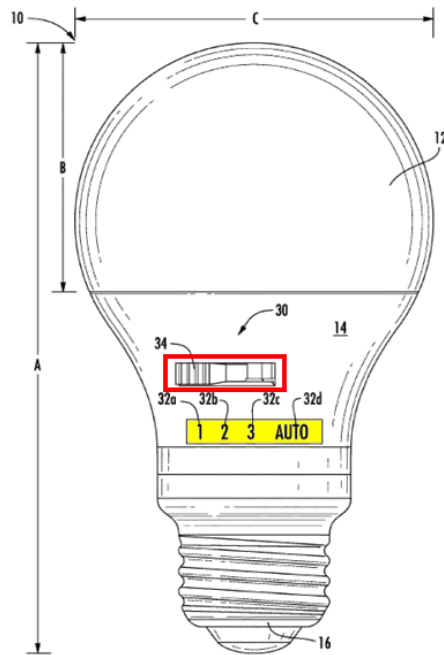


FIG. 1A

Ex. 1012, Fig. 1A (annotation added). Thus, a POSITA would *not* have understood the block highlighted by Petitioner in Figure 4 to constitute a switch “body” as recited in claim 13, but instead to be depicting of a portion of the lighting device housing where the switch and (and indicators) are located, consistent with Halliwell’s disclosure.

225. I note that Dr. Eden appeared to recognize this at his deposition, where he testified (correctly) that “Halliwell **doesn’t** depict or describe [a] switch body” at all. Ex. 2030, 193:21-194:20. I agree, and further note that Dr. Eden does not rely on any inherency or obviousness theory for this limitation, and instead relies solely on Halliwell allegedly expressly disclosing this limitation via the

object he has highlighted in Figure 4. In my opinion, Dr. Eden has not demonstrated that this limitation is disclosed by or obvious in view of Halliwell.

b. Element 13(b): “at least one first coupling feature disposed on the body, wherein the at least one first coupling feature is configured to electrically couple to an electrical cable of the luminaire”

226. Claim element 13[b] recites: “*at least one first coupling feature disposed on the body, wherein the at least one first coupling feature is configured to electrically couple to an electrical cable of the luminaire.*” Dr. Eden fails to show that this element is disclosed by or obvious in view of Halliwell.

227. Dr. Eden offers several opinions in his declaration concerning this element that are premised on a misunderstanding of Halliwell and how it would have been understood by a POSITA.

228. As an initial matter, Dr. Eden’s opinion concerning the presence of “at least one first coupling feature disposed on the body” assumes that the “body” is the same box depicted in Figure 4 above. Ex. 1004 at ¶¶ 311-312. As discussed above, that identification is incorrect, and a POSITA would not have understood the lighting device housing (or portion thereof) to constitute the “body” of switch 30. *See supra* at Section VII.D.2.a. Therefore, for this reason alone, I disagree that Dr. Eden has shown that a POSITA would have understood Halliwell to disclose or suggest this limitation.

229. Furthermore, Dr. Eden’s opinion is premised on the (incorrect) assumptions that “Halliwell discloses that its CCT switch can be located remotely from the housing” and that a POSITA “would have understood that Halliwell’s LED luminaire could use the switch disclosed in Fig. 4 as the ‘junction box mounted’ CCT switch.” Ex. 1004 at ¶¶ 311-312. As explained above, those assumptions are in fact incorrect and contradictory to Halliwell’s disclosure, which Dr. Eden later recognized during his deposition. *See supra* at Section VII.D.1. As explained above, a POSITA would immediately recognize from Halliwell’s disclosure that switch 30 must always remain on the lighting device housing, and remote switch 40 is simply an additional interface that a user can use to further configure the lighting device when switch 30 is in “Auto” (configurable) mode. Ex. 1012, 11:35-39, 11:62-12:15, 12:60-13:49, Figs. 2A, 4, 5. A POSITA would not use switch 30 in place of (or integrated into) remote switch 40, because switch 30 is specifically designed to remain on the lighting device housing and communicate with remote switch 40—it would make no sense to locate such a switch remotely. Indeed, as soon as switch 30 was removed from the luminaire, remote switch’s control of the same would have no effect on the luminaire. And Dr. Eden fails to explain how it would even work (including, for example, the “Auto” position it is specifically designed to include). *See* Ex. 2030 at 182:20-

184:7, 190:19-192:19. Therefore, Dr. Eden’s opinion is incorrect for this additional reason as well.

230. Further still, Halliwell does not depict or describe any “first coupling feature” associated with either of the disclosed “switches” (device-located switch 30 or remote switch 40), much less a “coupling feature” configured in the manner recited in claim 13. I note that Dr. Eden also recognized this at his deposition as well. See Ex, 2030 at 195:1-4 (“Q. Now, Halliwell also doesn’t disclose or depict a coupling feature associated with a switch, correct? A. ***That’s correct.***”), 192:20-194:20; 132:24-133:3, 195:16-197:5. Therefore, Dr. Eden and I appear to be in agreement that Halliwell simply does not disclose this limitation.

231. Finally, element 13(b) requires that the “first coupling figure” be configured to electrically couple to an “electrical cable ***of the luminaire.***” Halliwell is entirely silent on this, and does not disclose any switch being electrically coupled to any “electrical cable of the luminaire.” Dr. Eden also appeared to recognize this at his deposition where he agreed that “Halliwell doesn’t say that it’s switch [is] coupled to a cable of luminaire.” Ex. 2030, 196:16-197:5.

232. Dr. Eden nevertheless attempts to rely on Halliwell’s description of having “electrical components ***of the LED lighting device 20*** (e.g., the driver circuitry 19, switch control unit 35, and/or the like) ... directly wired ***to line***

voltage (e.g. through a junction box)” as disclosing this limitation, because according to Dr. Eden, a POSITA would have understood this language to mean “the LED luminaire would necessarily include an electrical cable that electrically connects (‘couples’) the luminaire and junction box.” Ex. 1004 at ¶ 312 (citing Ex. 1012, 7:8-19). This opinion is flawed for several reasons.

233. As an initial matter, Dr. Eden states in this section of his declaration that he is relying on Halliwell’s “junction box mounted” switch (i.e., remote switch 40). But as can be seen above, the passage he cites instead relates to an electrical connection for the lighting device 20, **not** a remote junction box in which remote switch 40 is located. Therefore, the passage he relies on does not support his opinion. Furthermore, a POSITA would not have understood “directly wired to line voltage” to refer to an electrical cable of the luminaire, as claim 13 requires. In particular, “line voltage” is a common term that typically refers to the standard voltage supplied by an electrical power line in a home or building (e.g., 120 volts). A POSITA would not have understood existing house wiring that is wired directly into a lighting device to constitute “an electrical cable *of the luminaire*,” which Dr. Eden likewise acknowledged. Ex. 2030 at 91:12-16. Dr. Eden further recognized (and I agree) that it would be possible to power a luminaire by directly connecting it to existing house wiring. Ex. 2030 at 90:7-91:16. Figure 4 does not change this understanding, as it merely depicts a block diagram of components that may

receive power, and does not “necessarily” require a switch configured to couple to an electrical cable “of the luminaire” as Dr. Eden suggests. Ex. 1004 at ¶ 312.

234. I further note that a POSITA would have understood the “junction box” in which “remote switch 40” may be located would not be a junction box of the lighting device itself, but rather that of a wall switch located some distance away from the lighting device, and thus likely wired into house wiring for power. Dr. Eden appeared to have the same understanding about the “junction box” in Halliwell at his deposition. Ex. 2030 at 185:13-19 (“Q. ... [R]emote switch 40 would not be, for example, in a junction box of the luminaire up in the ceiling, for example. A. Right. ... it may be wall-mounted is one possibility”); Ex. 1012 at 17:39-42. Therefore, Dr. Eden has not shown that this limitation is “necessarily” present in Halliwell.

235. I further note that that Dr. Eden does not appear to raise any obviousness theory concerning this limitation. In my opinion, Dr. Eden has not demonstrated that this limitation is disclosed by or obvious in view of Halliwell.

c. Claims 15, 16, and 19-20

236. Because Dr. Eden has not demonstrated that Halliwell renders claim 13 unpatentable, he likewise fails to demonstrate that all claims depending from claim 13 are unpatentable, including claims 15, 16 and 19-20.

3. Claims 1, 2-5, 7, 9 and 10-12

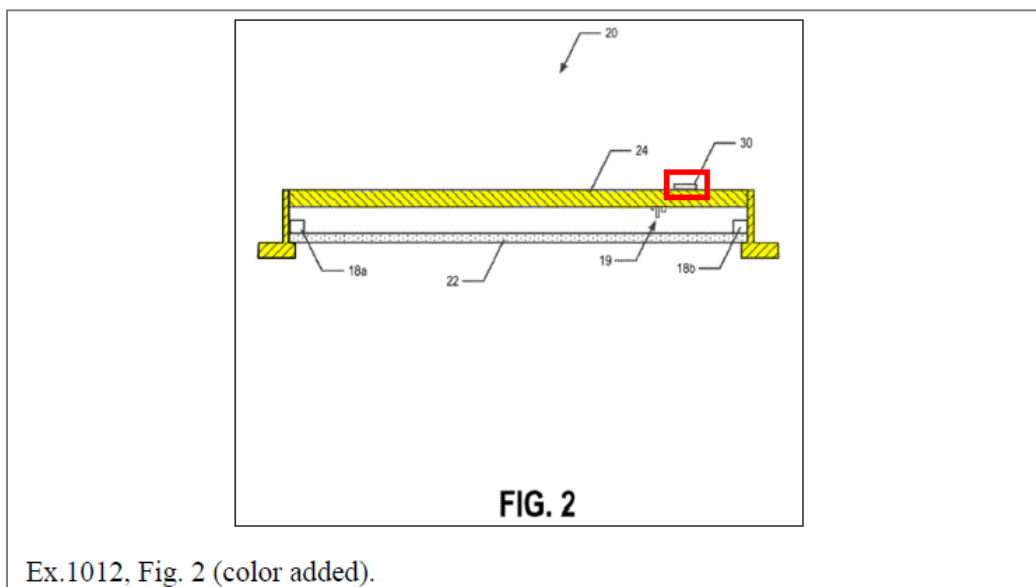
a. Element 1(d): “wherein the switch is disposed remotely from the housing”

237. Claim element 1[d] recites: “*a switch coupled to the electrical cable, wherein the switch is disposed remotely from the housing, wherein the switch has a plurality of positions, wherein each position of the plurality of positions of the switch corresponds to a discrete correlated color temperature (CCT) output by one or more light sources of the luminaire.*” Dr. Eden fails to show that this element is disclosed by or obvious in view of Halliwell.

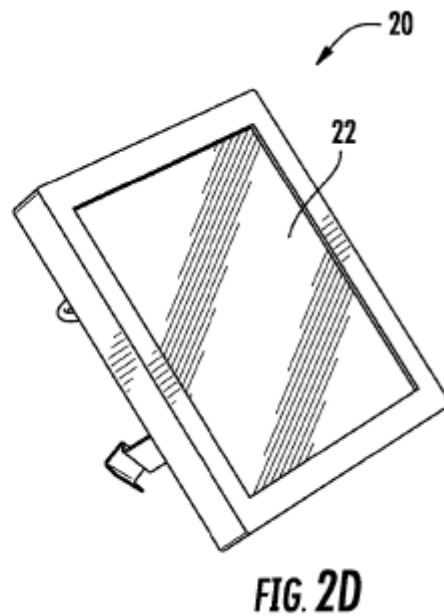
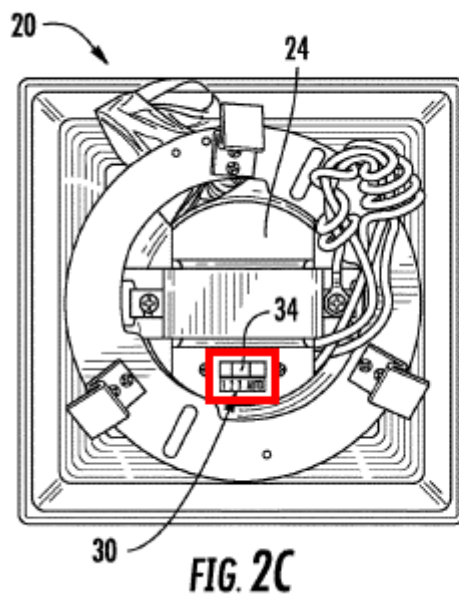
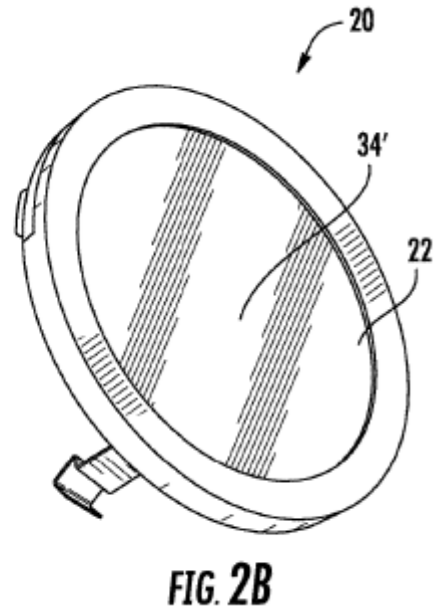
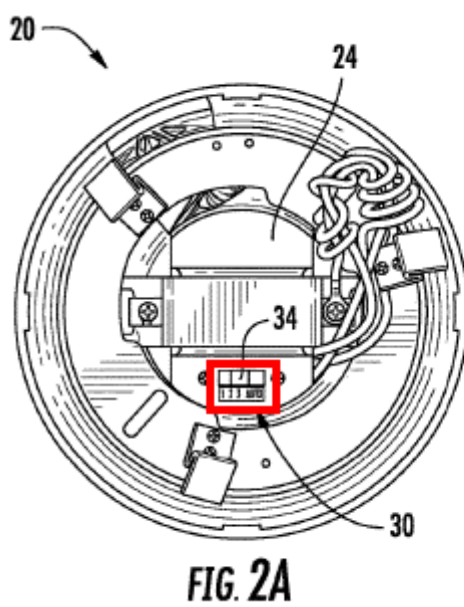
238. Dr. Eden’s opinions in his declaration are again based on the faulty and incorrect assumption that the disclosed “CCT switch can be located remotely from the housing,” and that ‘Fig. 4 is a perfectly good candidate as the “junction box mounted’ CCT switch.’ Ex. 1004 at ¶¶ 257-259. Both of these assumptions are demonstrably incorrect, as Dr. Eden acknowledged at his deposition. *See supra* at Section VII.D.1. As explained above, a POSITA would immediately recognize from Halliwell’s disclosure that switch 30 must always remain on the lighting device housing, and remote switch 40 is simply an additional interface that a user can use to further configure the lighting device when switch 30 is in “Auto” (configurable) mode. Ex. 1012, 11:35-39, 11:62-12:15, 12:60-13:49, Figs. 2A, 4, 5. A POSITA would not use switch 30 in place of (or integrated into) remote switch 40, because switch 30 is specifically designed to remain on the lighting device

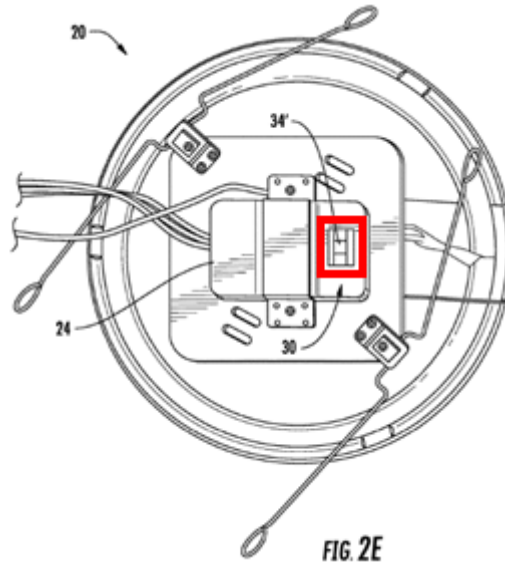
housing and communicate with remote switch 40—it would make no sense to locate such a switch remotely, and Dr. Eden fails to explain how it would even work (including, for example, the “Auto” position it is specifically designed to include). *See* Ex. 2030 at 182:20-184:7, 190:19-192:19. Therefore, Dr. Eden’s opinion is incorrect for this additional reason as well.

239. Indeed, as demonstrated above, Halliwell’s disclosed design requires switch 30 (the CCT switch) to be located at (and integrated into) the device housing, where remote switch 40 is a separate interface that can send additional input **to switch 30** if switch 30 is set to the “configurable” mode (i.e., position 32d, corresponding to “Auto”). *See id.* This required location for switch 30 is even illustrated in the very embodiment that Dr. Eden relies on in his declaration, as illustrated below from page 108 of his declaration:



Ex. 1004, ¶¶243-244 (annotation in red added); Ex. 2030, 165:4-20. It can also be seen in every figure of Halliwell depicting a lighting device, for example:





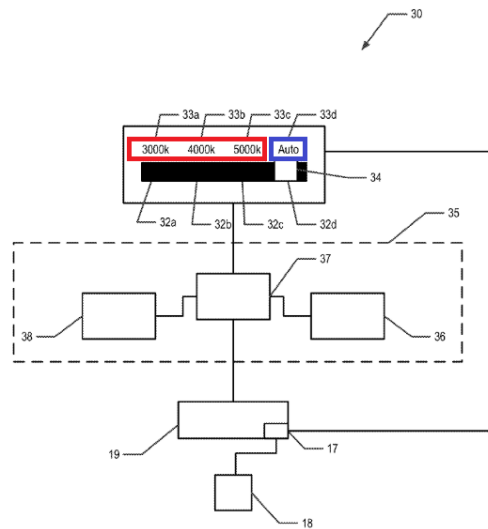
Ex. 1012, Figs. 1-2E (annotation added).

240. Halliwell further discloses that device-located switch 30 is intended to provide access to at least two operating modes: “a set operating mode” and “a configurable operating mode.” *See id.* at Abstract; *see also id.* at 2:1-60; 11:62-12:15; 13:22-42; 14:36-42; 16:54-17:32. Halliwell describes these operating modes as follows:

One of the switch positions may correspond to a configurable operating mode (e.g., a configurable operating color temperature mode, configurable brightness mode, configurable brightness-color temperature mode, etc.) and the remaining switch positions may correspond to set operating modes (e.g., set operating color temperature modes, set brightness modes, set operating brightness-color temperature modes, etc.) wherein the different switch positions select the particular set light aspects or qualities (e.g., brightness, operating color temperature, CRI, and/or the like). For example, switch positions 32 a, 32 b, and 32 c may correspond to set operating color temperature modes with each position corresponding to a particular set operating color temperature. The switch position 32 d may correspond to a configurable operating color temperature mode.

11:67-12:15. With reference to the block diagram depicted in Figure 4, for example, Halliwell illustrates a depiction of a switch 30 that includes four modes: three set operating modes annotated in red below (3000K, 4000K, 5000K), and one configurable operating mode annotated in blue below (“Auto”).

FIG. 4

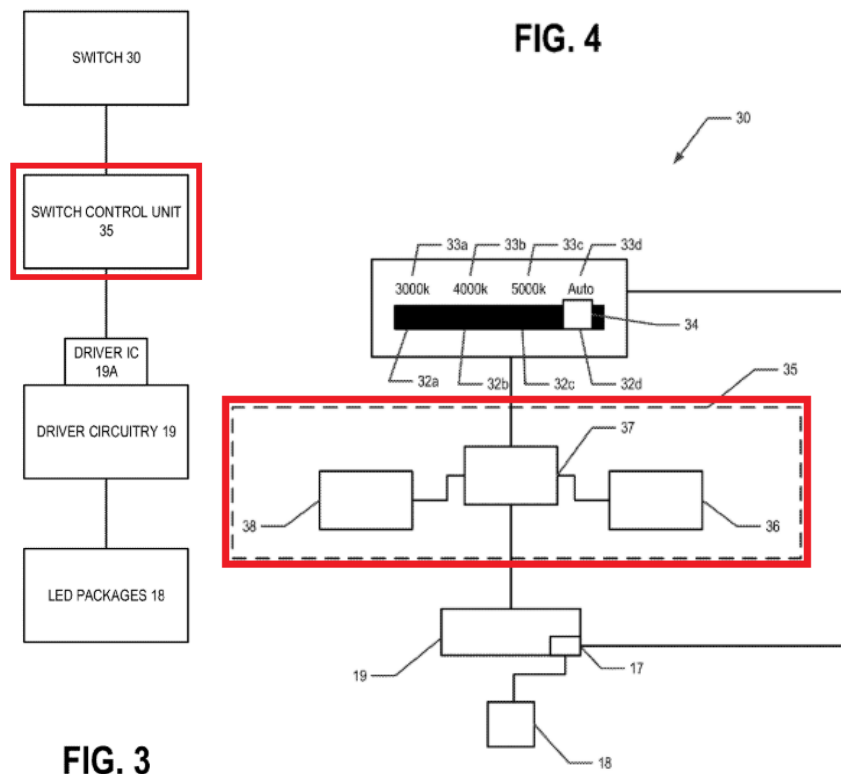


Id. at 12:60-13:49; Fig. 4 (annotations added); *see also* Fig. 4A (providing similar disclosure). Halliwell states that when the switch is in the configurable position (33d), it may then receive input from a remote device 40 (“wall switch, remote control and/or the like”). *Id.*

241. Halliwell explains that the remote device 40 (depicted in Figure 5) is not an independent switch in its own right, but rather a device that provides input to switch 30 via its configurable operating mode, and which always remains located on, and integrated with, the lighting device housing. Dr. Eden recognized

the same at his deposition, where he testified: “**So even though 40 is known as a remote switch, it’s not a switch at all.** It’s simply a unit that conveys instructions from the user to the unit. The hardware – the switching hardware is actually at the luminaire. So I don't think you want to do away with switch 30.” Ex. 2030 at 182:20-184:7 (emphasis added).

242. Halliwell explains that the lighting device includes a “switch control unit” 35 that is part of the switch circuitry located on the lighting device itself, and which interfaces with switch 30:



Id., Figs. 3, 4 (annotations added); *see also* Fig. 4A. Halliwell explains that the switch control unit is part of the LED lamp or lighting device, and contained within

the device. *See id.* at 5:62-67; 6:21-34, 6:51-7:7. As shown in Figure 3, the disclosed switch is in electrical communication with the switch control unit. *See id.* at 7:20-32. Halliwell explains that “[t]he selection of which LED packages 18 are operated by the driver circuitry 19, when the LED lamp 10 or LED lighting device 20 is operated, is determined by the status of the switch 30 and/or by the switch control unit 35.” *Id.* at 9:23-27.

243. With respect to the “remote switch 40,” Halliwell explains that selections from this device are also received and processed by switch control unit 35 *if switch 30 is set to a configurable mode*. For example, with respect to the switch depicted in block diagram Figures 4 and 4A, Halliwell states:

For example, **if the switch selector 34 is placed in switch position 34 d, the operating color temperature of the LED lamp 10 or LED lighting device 20 may be configurable by using a wall switch, remote control, and/or the like (e.g., remote switch 40 shown in FIG. 5).** In another example, as shown in FIG. 4A, the switch position indicator 33 a indicates that if the switch selector 34 is placed in the switch position 32 a, a set operating mode is selected with the set light aspects or qualities being A; the switch position indicator 33 b indicates that if the switch selector 34 is placed in the switch position 32 b, a set operating mode is selected with the set light aspects or qualities being B; the switch position indicator 33 c indicates that if the switch selector 34 is placed in the switch position 32 c, a set operating mode is selected with the set light aspects or qualities being C; and **the switch position indicator 33 d indicates that if the switch selector 34 is placed in the switch position 32 d, the configurable operating is selected wherein a user may use a remote switch 40 to toggle between A, B, and C, wherein A, B, and C may be operating states of any preset color temperature, brightness, CRI, and/or the like, provided each operating state is different in at least one light aspect or quality relative to one**

another. **The status of the switch 30 is determined by the switch position 32 (e.g. 32 a, 32 b, 32 c, 32 d) in which the switch selector 34 is positioned.**

Id. at 12:60-13:49 (emphasis added).

244. This is further confirmed in Figure 5, which illustrates remote switch 40, and specifically depicts it as communicating (i.e., the lightning bolt symbol) directly with communication interface element 38 of the switch control unit 35 (which is part of lamp 10/lighting device 20 along with switch 30):

FIG. 5

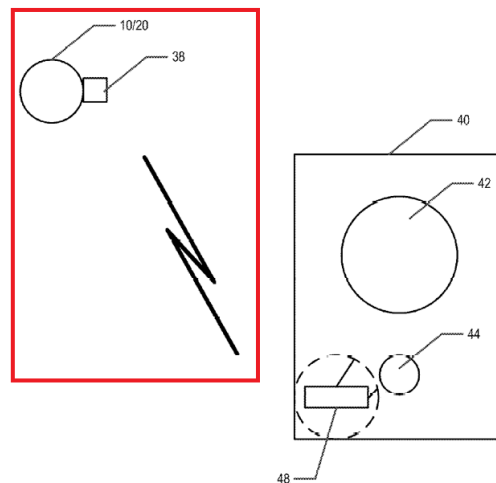


Fig. 5 (annotation added); *see also* Figs. 4, 4A. Halliwell contemplates that switch 30 is in “hard-wired” communication with switch control unit 35, while remote switch 40 preferably communicates wirelessly. *See id.* at 14:25-42; *see also id.* at 17:49-60 (“wired or wireless communication”).

245. Thus, a POSITA would have understood that according to Halliwell’s design, the CCT switch **cannot be disposed remotely from the housing** (such as

with switch 40), and instead must remain part of the housing in order to operate as intended. While the design contemplates possible *additional* inputs beyond the device-mounted switch, such as from a “wall and/or junction box mounted” selection device for user configurations (Ex. 1012 at 17:39-42), that does not change the fact that Halliwell’s design requires the device-mounted CCT switch to always be present in order for the device to operate as intended (i.e., there are no configurations where the CCT switch is disposed remotely from the housing).

246. Dr. Eden does not identify any disclosure suggesting otherwise in his declaration (nor could he, as Halliwell does not contemplate, much less disclose, how a remote switch could operate without the presence of the primary device-mounted switch). Instead, he appears to assume that Halliwell discloses a CCT switch depicted in Figure 4 that could somehow be entirely disposed remotely from the housing, i.e., in a junction box.¹³ Ex. 1004 at ¶¶ 258-259. Halliwell does not disclose or suggest this arrangement as explained above, and Dr. Eden provides no explanation as to how this could even be carried out and still result in an operable device in view of Halliwell’s disclosure.

247. Furthermore, a POSITA would not have understood switch 30 could simply be moved to Halliwell’s remote junction box, as this misunderstands that

¹³ As discussed above, a POSITA also would not have understood the reference to a “junction box” for remote switch 40 to describe a junction box of the luminaire, as Dr. Eden later acknowledged. Ex. 2030 at 185:6-19.

the “remote control” (remote switch 40) controls switch 30, such that making switch 30 remote makes no sense. Dr. Eden acknowledged this at his deposition. Ex. 2030 at 190:19-192:19 (“It’s not used as the remote switch. That’s why it’s labeled 30.”). And, as discussed below, the Halliwell’s “junction box” relating to “remote switch 40” pertains to a wall switch, not the luminaire. *See* Ex. 2030 at 185:6-19.

248. In any event, Dr. Eden later confirmed at his deposition that the disclosed design **must** include switch 30 located at the lighting device housing, as it would not be able work without it, which is consistent with how a POSITA would have understood Halliwell. Ex. 2030 at 182:20-184:7 (“... the reason that you're not seeing an embodiment that eliminates switch 30 is that the actual switching process is conducted at the luminaire So I don't think you want to do away with switch 30. ... **Because it won’t switch otherwise.**”).

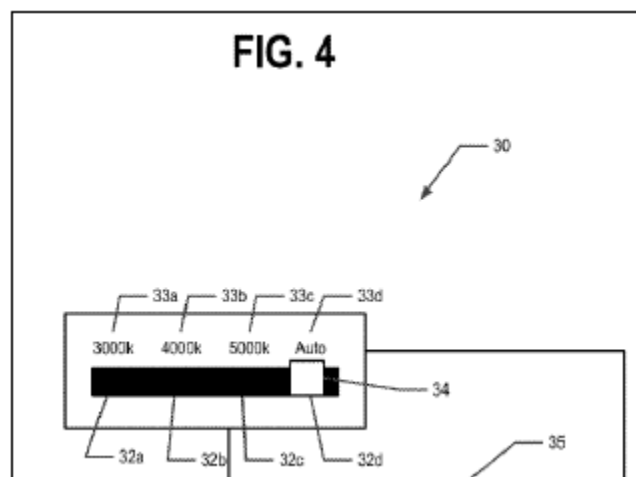
249. In my opinion, Dr. Eden has not demonstrated that this limitation is disclosed by or obvious in view of Halliwell.

- b. Element 1(e): “wherein the switch has a plurality of positions, wherein each position of the plurality of positions of the switch corresponds to a discrete correlated color temperature (CCT) output emitted by one or more light sources of the luminaire”**

250. Claim element 1[e] recites: “*wherein the switch has a plurality of positions, wherein each position of the plurality of positions of the switch*

corresponds to a discrete correlated color temperature (CCT) output emitted by one or more light sources of the luminaire.” Dr. Eden fails to show that this element is disclosed by or obvious in view of Halliwell.

251. In his declaration, Dr. Eden opines that “[t]he exemplary slide switch shown in Fig. 4 includes **four positions** that ‘correspond to set operating color temperature modes with **each position** corresponding to a particular set operating color temperature.’” Ex. 1004 at ¶ 262 (emphasis added). He also includes a cropped image of Figure 4 depicting these “four position” illustrated in Figure 4:



Id. However, a POSITA would not have understood each of the four positions relied on by Dr. Eden to “correspond[] to a discrete [CCT] output” by the lighting device as claimed in claim 1.

252. In particular, one of the “four positions” relied upon by Dr. Eden is the “Auto” position (position “32d” of switch 30). As explained at length above (*supra* at Section VII.D.3.a), “Auto” does **not** correspond to a discrete CCT output

by the lighting device. Instead, the “Auto” selection results in a “configurable operating mode,” whereby a separate input device (e.g., remote switch 40) can communicate with switch control unit 35 of switch 30 (via interface 38) to remotely configure the lighting device as desired by the user. See Ex. 1012 at Abstract, 2:1-60, 11:62-12:15 (describing “set operating color temperature modes” 32a-32c and “configurable operating color temperature mode” 32d), 13:22-42, 14:36-42, 16:54-17:32, Figs. 4, 4A, 5. For example, Halliwell states:

For example, if the switch selector 34 is placed in switch position 34 d, the operating color temperature of the LED lamp 10 or LED lighting device 20 may be configurable by using a wall switch, remote control, and/or the like (e.g., remote switch 40 shown in FIG. 5). In another example, as shown in FIG. 4A, the switch position indicator 33 a indicates that if the switch selector 34 is placed in the switch position 32 a, a set operating mode is selected with the set light aspects or qualities being A; the switch position indicator 33 b indicates that if the switch selector 34 is placed in the switch position 32 b, a set operating mode is selected with the set light aspects or qualities being B; the switch position indicator 33 c indicates that if the switch selector 34 is placed in the switch position 32 c, a set operating mode is selected with the set light aspects or qualities being C; and **the switch position indicator 33 d indicates that if the switch selector 34 is placed in the switch position 32 d, the configurable operating is selected wherein a user may use a remote switch 40 to toggle between A, B, and C, wherein A, B, and C may be operating states of any preset color temperature, brightness, CRI, and/or the like, provided each operating state is different in at least one light aspect or quality relative to one another. The status of the switch 30 is determined by the switch position 32 (e.g. 32 a, 32 b, 32 c, 32 d) in which the switch selector 34 is positioned.**

Id. at 12:60-13:49 (emphasis added).

253. Therefore, a POSITA would have understood that one of the four positions of disclosed switch 30 corresponds to a non-discrete input, where the output of the luminaire would not constitute a discrete CCT (e.g., 3000 K), but rather could be adjusted in any manner by the user operating remote switch 40. This operation is completely at odds with what the claim requires.

254. Dr. Eden only refers to the “Auto” position possibly “overlap[ping]” with the other CCT selection options (Ex. 1004 at ¶ 263), but this fundamentally misunderstands Halliwell’s design. “Auto” is not a set CCT value like the other positions, but rather a selection to enter a different mode altogether, where there is no set CCT value associated with that position—it is instead based on user input from remote switch 40, as discussed above.

255. I further note that that Dr. Eden does not appear to raise any inherency or obviousness theory concerning this limitation. Nor does Dr. Eden propose any modification of switch 30, or omission of any of the positions disclosed in Halliwell. In my opinion, Dr. Eden has not demonstrated that this limitation is disclosed by or obvious in view of Halliwell.

- c. **Claim 7: “The luminaire of claim 1, further comprising: a junction box comprising at least one wall that forms a second cavity, wherein the switch is disposed within the second cavity, wherein the second end of the electrical cable is coupled to the switch”**

256. Claim 7 recites: “*The luminaire of claim 1, further comprising: a junction box comprising at least one wall that forms a second cavity, wherein the switch is disposed within the second cavity, wherein the second end of the electrical cable is coupled to the switch.*” Dr. Eden fails to show that this element is disclosed by or obvious in view of Halliwell.

257. Claim 7 depends from claim 1, which is directed to “A luminaire.” Ex. 1001, claim 1. Claim 7 further requires that “[t]he luminaire of claim 1” further comprise “a junction box.” *Id.*, claim 7. Therefore, the plain language of claim 7 requires the recited junction box to be a junction box of the luminaire—not just any junction box associated with other device.

258. This is also reflected in the specification of the ’336 Patent, which includes several exemplary depictions of luminaire junction boxes (i.e., junction boxes associated with the luminaire itself), for example junction box 990 and 1090 in Figures 9B and 10, respectively:

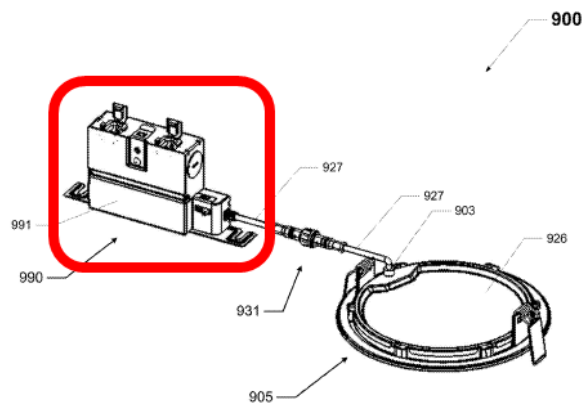


FIG. 9B

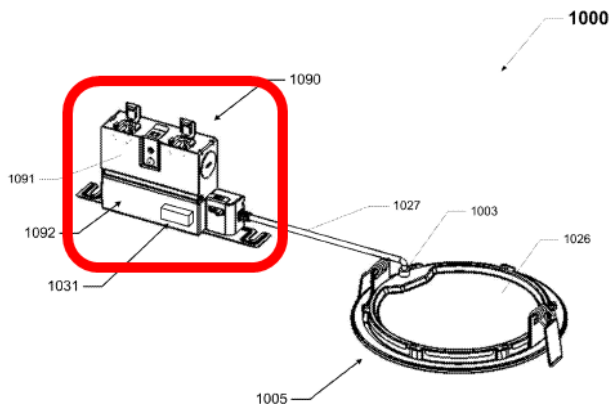


FIG. 10

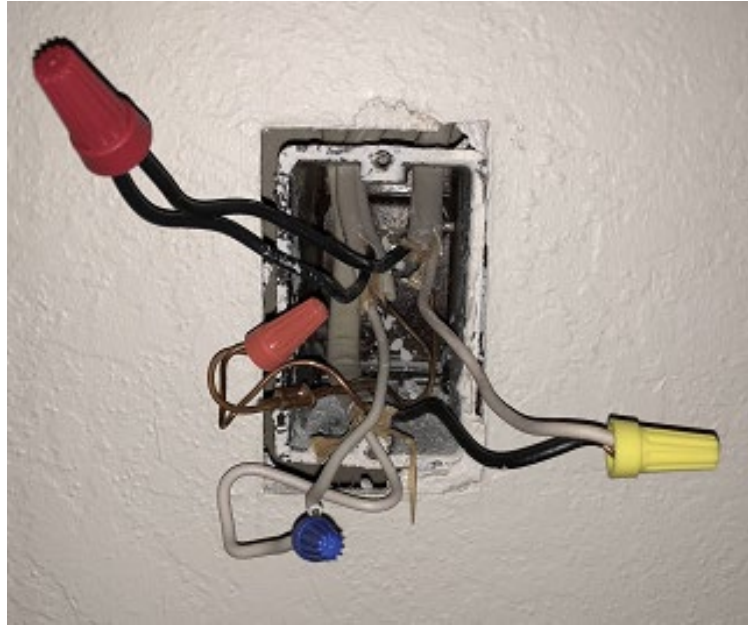
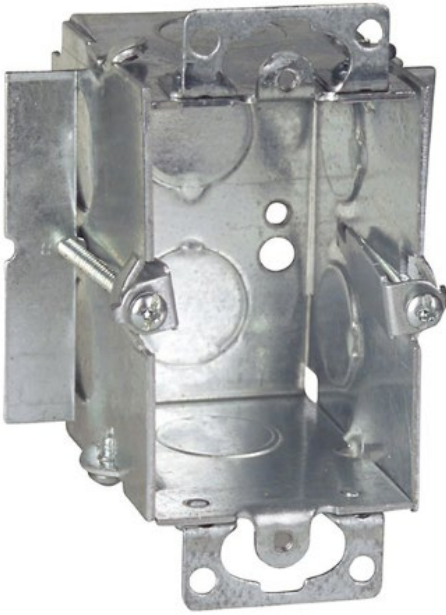
Ex. 1001 at Figs. 9B, 10 (annotation added).

259. By contrast, in his declaration, Dr. Eden relies on the “junction box” associated with “remote switch 40.” Ex. 1004 at ¶ 284 (“Further, as discussed above, Halliwell discloses that ‘the remote switch 40 may be a ... junction box mounted toggle switch ...in wired communication with the switch control unit 35.’”) (citing Ex. 1012 at 17:39-42). From this, he concludes that “[a] POSA would have therefore understood that Halliwell discloses that its CCT switch (including the exemplary switch 30) could be mounted in the junction box.” *Id.* This conclusion is incorrect.

260. First, as noted several times above, a POSITA would have understood that switch 30 is always located on the lighting device housing in order for it to operate as disclosed, which Dr. Eden later acknowledged at deposition. *See supra* at Section VII.C.1, VII.D.3.a. Therefore, the premise of Dr. Eden’s conclusion is simply incorrect.

261. Second, the “junction box” recited in the passage quoted by Dr. Eden **not** a junction box of the lighting device itself, but rather a separate junction box associated with, e.g., a “wall switch.” Ex. 1012 at 17:39-42. Dr. Eden also acknowledged this at his deposition. Ex. 2030 at 185:6-19 (“Q. ... [I]n this arrangement, remote switch 40 would not be, for example, in a junction box of the luminaire up in the ceiling, for example. A. **Right**. As it says in line 37 -- excuse me -- 36, it may be wall-mounted is one possibility.”). Dr. Eden further recognized that “you would want that remote switch 40 to remain accessible at all times” (even if located in a wall switch “junction box”), which would not be the case if you disposed the switch in a junction box **of the luminaire**, as disclosed in the '336 Patent. Ex. 2030 at 187:22-188:21 (“that, by definition, would make it accessible at all times”).

262. I further note that a “junction box” is not unique to lighting devices. It is instead a well-known type of enclosure that can be used to protect electrical components and connections from damage or accidental contact. For example, wall switch junction boxes (or “electrical boxes”) are often used in connection with standard on/off light switches or other electrical connections around a house, such as the common examples below:



263. A POSITA would have understood the junction boxes referenced in Halliwell to be of a similar type (including the junction box for line voltage and the junction box for remote switch 40, Ex. 1012 at 7:8-19, 17:39-42)—in other words, **not** junction boxes “of the luminaire,” but rather separate junction boxes of a similar nature to the above examples. This, again, is consistent with Dr. Eden’s testimony that the junction box of remote switch 40 would be for a “wall-mounted” switch, separate from the luminaire. Ex. 2030 at 185:6-19.

264. Further, Dr. Eden opines that “since Halliwell’s switch is mounted in the junction box (as disclosed in Halliwell) and the ‘electrical components’ are ‘directly wired to line voltage’,” a POSITA would have understood that “the switch would be coupled to the ‘second end’ of the electrical cable.” Ex. 1004 at ¶
285. I disagree, including for the same reasons stated above with respect to

limitation 13(b). *See supra* at Section VII.D.2.b. Dr. Eden conflates the “electronics components” of the lighting device itself with the separate location of remote switch 40, and further misconstrues “directly wired to line voltage” to refer to an electrical cable of the luminaire, when a POSITA would instead have understood that term to refer to the standard voltage supplied by an electrical power line in a home or building. *See id.* Existing house wiring is not an electrical cable of the recited “luminaire” and therefore his conclusion is incorrect. *See Ex. 2030 at 90:7-91:16.*

265. Therefore, in my opinion, Dr. Eden has not demonstrated that this limitation is disclosed by or obvious in view of Halliwell.

d. Claim 11: “The luminaire of claim 1, wherein the switch is inaccessible when the housing is installed”

266. Claim 11 recites: “*The luminaire of claim 1, wherein the switch is inaccessible when the housing is installed.*” Dr. Eden fails to show that this element is disclosed by or obvious in view of Halliwell.

267. Dr. Eden’s opinion in his declaration appears to be premised on the incorrect assumption that the “junction box” within which remote switch 40 is located is a junction box “of the luminaire,” such that it would become inaccessible (and thus the switch mounted on it would likewise become inaccessible) when the lighting device is mounted, as depicted in the ’336 Patent figures. *See Ex. 1004 at 296 (citing Ex. 1012 at 17:39-24).* This assumption is incorrect, which Dr. Eden

later recognized at his deposition. In fact, Dr. Eden acknowledged that remote switch 40 is “**by definition ... accessible at all times.**” Ex. 2030 at 187:22-188:21. A POSITA would also have the same understanding, as the very purpose of remote switch 40 is to allow a user to configure the lighting device from a remote location, rather than manipulate the switch located on the lighting device itself (switch 30), which also must be present for the device to work as disclosed, as discussed above. *See supra* at Sections VII.D.1, VII.D.3.a. In other words, switch 30 is always disposed on the housing (and thus cannot be the switch recited in claim 11), and remote switch 40 is at a remote location entirely separate from the lighting device (e.g., a wall switch), and thus has no relation to whether or not the housing is installed or not (and is by definition accessible).

268. I note that Dr. Eden also cites to Halliwell’s description of selecting color temperature “before the ... LED lighting device is installed” (Ex. 1004 at ¶ 296), but this language is plainly in reference to device-located switch 30, not remote switch 40. This is made clear by the sentence that follows the sentence Dr. Eden cited, which describes remote selection via remote switch 40 “**following installation**” (i.e., regardless of the installation state of the lighting device):

For example, a user may select a desired operating light aspects or qualities (e.g., color temperature, brightness, CRI, and/or the like, and/or a combination thereof) for the LED lamp or LED lighting device before the LED lamp or LED lighting device is installed. **Alternatively, the user may select to operate the LED lamp or LED lighting**

device in a configurable operating mode following installation.

Ex. 1012, 4:31-37 (emphasis added). As noted above, device-located switch 30 is not “disposed remotely from the housing” and thus its inaccessibility cannot satisfy claim 11.

269. I further note that that Dr. Eden does not appear to raise any inherency or obviousness theory concerning this limitation. In my opinion, Dr. Eden has not demonstrated that this limitation is disclosed by or obvious in view of Halliwell.

e. Claims 2-5, 9-10 and 12

270. Because Dr. Eden has not demonstrated that Halliwell renders claim 1 unpatentable, he likewise fails to demonstrate that all claims depending from claim 13 are unpatentable, including claims 2-5, 9-10 and 12.

VIII. CONCLUSION

271. In conclusion, it is my opinion that a POSITA would not have understood any of claims 1 through 20 of the '336 Patent to be unpatentable based on the grounds set forth in the Petition and Dr. Eden's declaration.

272. I hereby declare that all statements made herein of my own knowledge are true, and all statements made on information and belief are believed to be true. Further, these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. § 1001, and may jeopardize the validity of the application or any patent issuing thereon. I declare under penalty of perjury that the foregoing is true and correct.

Dec. 23, 2024

Date

/ Michael Krames /

Dr. Michael Krames

APPENDIX A

MICHAEL KRAMES, PhD, FIEEE, FIES

San Francisco Bay Area

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C-LEVEL EXECUTIVE IN PHOTONICS AND SEMICONDUCTORS: TECHNOLOGY, PRODUCT, AND GALLIUM NITRIDE EXPERT

Accomplished Research Professional with 25+ years of experience in photonics including LEDs and wide bandgap semiconductors. Extensive experience in R&D and manufacturing settings, creating some of the most innovative LEDs for solid-state lighting. Recruit technology teams, overseeing design, fabrication, characterization, and integration of technologies. Work with major companies in the LED market, including Philips and innovative start-ups. PhD in Electrical Engineering. IEEE and IES Fellow.

Overview

- Recruit top-performing professionals and make critical hires of technology experts.
- Manage large teams of up to 40, including globally distributed teams across the U.S. and Europe.
- Create unique strategic plans and product roadmaps for innovative technologies.
- Maintain strong partnerships with research institutions to develop industry-leading products.
- Oversee intellectual property (IP) portfolios and file dozens of successful patent applications.

Selected Core Competencies

R&D • Team Leadership • Strategic Planning • Photonics Technologies • Device Design • Speaker
Investment & Fundraising • Recruitment • Project Management • Multimillion USD Budgets • IP Portfolios

PROFESSIONAL EXPERIENCE

ARKESSO LLC – Palo Alto, CA – 2015-Present

President & Founder

Strategic technology, investment and intellectual property development and consulting for wide bandgap semiconductor technologies and applications, including expert work in patent litigation.

IBEAM MATERIALS INC – Sante Fe, NM – 2019-Present

Board of Directors

Guide and govern Los Alamos National Lab start-up for depositing semiconductor grade gallium nitride on large area, flexible amorphous materials with application to flexible lighting systems and displays.

SEABOROUGH RESEARCH BV – Amsterdam, NL – 2015-Present

Senior Advisor

Drive materials research and development programs for lighting applications using nano materials, focused on advancing the overall solid-state lighting industry in terms of energy savings and performance capability.

MOMENTUM CAPITAL BV – Amsterdam, NL – 2016-2019

Principal

Technology scouting, assessment, and due diligence for growth market venture financing with a global view and emphasis on clean technology and energy sectors.

PROFESSIONAL EXPERIENCE (CONTINUED)

SORAA INC. – Fremont, CA – 2009-2015

Chief Technology Officer (CTO)

First Management Team member hired to work with Nobel Prize Winner Shuji Nakamura and other key innovators from the University of California, Santa Barbara, to develop leading LED products for professional directional lighting using a brand-new LED materials platform: GaN-on-GaN. Established the GaN-on-GaN LED technology direction and performance roadmaps. Spearheaded projects to commercialize the technology and built successful LED and Product teams from the ground up to implement these. Directly involved in venture and strategic fundraising including successful Series B & C venture capital funding worth more than \$100M.

- Created the world's first LED to surpass halogen and the most efficient light-emitting diodes in the world.
- Built a strong intellectual property portfolio, resulting in more than 140 issued patents for Soraa.
- Developed practical strategies for the use of bulk GaN substrate, improving LED performance 10X.
- Supervised bulk GaN ammonothermal growth team and secured strategic investment to cover burn.
- Recruited a core team of talented technology professionals and made critical hires of senior executives.
- Developed LED roadmaps and oversaw innovation from substrate and epitaxy to fabrication and packaging.
- Established the value of higher color quality in products, including color and whiteness rendering.
- Successful implementation of a research contract with Penn State to advance the state of art for LED lighting.

PHILIPS LUMILEDS / LUMILEDS LIGHTING (Originally an HP-Philips Joint Venture) – San Jose, CA – 1999-2009

Executive Vice President, Advanced Laboratories

Formed and managed an R&D laboratory focused on designing groundbreaking LED technologies. Recruited and hired high-performing team, including employees from HP / Agilent Labs. Managed a 40-member department and a budget of up to \$20M. Coordinated with engineering, marketing, product development, and sales teams across the U.S. and Europe. Oversaw technology transfers and managed IP. Developed prototypes for next-generation, solid-state light emitters. Led development of ceramic phosphor technologies.

- Developed the critical LUXEON high power LED platform and managed the technology roadmaps.
- Identified Auger recombination as primary loss mechanism in InGaN-based LEDs.
- Designed LED technologies for the iMac, iPhone Flash, digital imaging, and general illumination.
- Created the first automotive LED headlights for the Audi R8, creating new technology breakthroughs.
- Produced a strong intellectual property (IP) portfolio of groundbreaking innovations.
- Oversaw the European phosphor research teams and partners, including nitride-based phosphors
- Spearheaded the creation of thin film flip-chip LED technology and designed new ceramic phosphors.
- Played a critical role in the development and management of the LED technology roadmap.

HEWLETT PACKARD CO., Optoelectronics Division – San Jose, CA – 1995-1999

Design Engineer and Engineering Scientist

Developed innovative, high-energy LED technologies for traffic signal, road lighting, and automotive applications. Developed high-power LED products using novel device structures and epitaxial layer design.

- Worked with teams to develop the world's first high-power LEDs, expanding from milli-Watts to Watt-class.
- Successfully developed the first LED to surpass 100 lumens per Watt.
- Re-engineered LED chip design for red and amber emitters, delivering groundbreaking performance.
- Delivered record-setting performance for visible-spectrum LEDs with 55%+ external quantum efficiency.

EXPERT TESTIFYING EXPERIENCE (LAST 5 YEARS)

Case Description	Role	Jurisdiction	Testimony
Signify NA Corp. & Signify Holding BV (Plaintiffs) vs. LEPRO Innovation Inc. et al. (Defendants)	Expert witness for Signify	UNITED STATES DISTRICT COURT DISTRICT OF NEVADA	Deposition testimony Oct 2, 2024
ALSI Holdings, LLC (Plaintiff) vs. Current Lighting Solutions, LLC, and HLI Solutions, Inc. (Defendants)	Expert witness for Current	UNITED STATES DISTRICT COURT WESTERN DISTRICT OF TEXAS WACO DIVISION	Deposition testimony Aug 14, 2023
CAO Lighting, Inc., (Plaintiff) vs. GE Lighting, Inc., General Electric Co., and Consumer Lighting (U.S.), LLC d/b/a GE Lighting (Defendants)	Expert witness for GE	UNITED STATES DISTRICT COURT DISTRICT OF DELAWARE	Trial testimony June 8, 2023
Wolfspeed, Inc. & Ideal Industries Lighting, LLC d/b/a Cree Lighting (Petitioners) v. CAO Lighting, Inc. (Patent Owner)	Expert witness for Wolfspeed	U.S. PATENT AND TRADEMARK OFFICE BEFORE THE PATENT TRIAL AND APPEAL BOARD	Deposition testimony May 15, 2023
CAO Lighting, Inc., (Plaintiff) vs. GE Lighting, Inc., General Electric Co., and Consumer Lighting (U.S.), LLC d/b/a GE Lighting (Defendants)	Expert witness for GE	UNITED STATES DISTRICT COURT DISTRICT OF DELAWARE	Jury trial testimony Feb 16, 2023
CAO Lighting, Inc., (Plaintiff) vs. GE Lighting, Inc., General Electric Co., and Consumer Lighting (U.S.), LLC d/b/a GE Lighting (Defendants)	Expert witness for GE	UNITED STATES DISTRICT COURT DISTRICT OF DELAWARE	Deposition testimony May 25, 2022
Seoul Semiconductor Co., Ltd., and Seoul Viosys Co., Ltd. (Plaintiffs/Counter-Defendants) v. Satco Products, Inc. (Defendant/Counter-Plaintiff)	Expert witness for Satco	UNITED STATES DISTRICT COURT EASTERN DISTRICT OF NEW YORK	Deposition testimony December 2, 2021
Satco Products, Inc. (Petitioner) v. Seoul Semiconductor Co., Ltd. (Patent Owner), IPR2021-00230	Expert witness for Satco	U.S. PATENT AND TRADEMARK OFFICE BEFORE THE PATENT TRIAL AND APPEAL BOARD	Deposition testimony August 20, 2021
Satco Products, Inc. (Petitioner) v. Seoul Viosys Co., Ltd. (Patent Owner), IPR2020-00750	Expert witness for Satco	U.S. PATENT AND TRADEMARK OFFICE BEFORE THE PATENT TRIAL AND APPEAL BOARD	Deposition testimony April 23, 2021
Satco Products, Inc. (Petitioner) v. Seoul Semiconductor Co., Ltd. (Patent Owner), IPR2020-00410	Expert witness for Satco	U.S. PATENT AND TRADEMARK OFFICE BEFORE THE PATENT TRIAL AND APPEAL BOARD	Deposition testimony March 4, 2021

EDUCATION

UNIVERSITY OF ILLINOIS: URBANA-CHAMPAIGN – Urbana, IL

PhD in Electrical Engineering • Master of Science in Electrical Engineering

Research Assistant • Solid State Devices Laboratory • Electro-Optic Systems

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PhD.: Native Oxidation of Area-Selective-Disordered AlGaAs-GaAs: Deep Oxide Structures for Device Applications

Master: Volume Holographic and Surface-Relief Transmission Gratings in Wavelength-Division-Multiplexing Receivers

UNIVERSITY OF TEXAS – Austin, TX

Bachelor of Science in Electrical Engineering, with High Honors

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MEMBERSHIPS AND LEADERSHIP

- IEEE Fellow • IEEE Consultants Network of Silicon Valley • Sigma Xi
- Chair, IEEE Nick Holonyak, Jr. Medal (2023-)
- IES Fellow • University of Texas at Austin ECE Academy of Distinguished Alumni
 - U.S. Department of Energy Solid-State Lighting Roundtable
 - Panelist, Basic Energy Sciences Workshop on Solid-State Lighting
 - Chair, SPIE Photonics West conferences on LEDs (2016-)
- Organizing Committee, Phosphor & Quantum Dots Industry Forum (2016-)
 - Executive Committee, CS Mantech (2021-)

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87. **Transparent-substrate (Al_xGa_{1-x})_{0.5}In_{0.5}P light-emitting diodes with thin active regions**; Gardner, N.F., Chui, H.C., Chen, E.I., Krames, M.R., Huang, J.-W., Kish, F.A., Stockman, S.A., Kocot, C.P., Tan, T.S., Moll, N.; (1999) Annual Device Research Conference Digest, pp. 190-191.
88. **Coupling of InGaN quantum well photoluminescence to silver surface plasmons**; Gontijo, I., Boroditsky, M., Yablonovitch, E., Keller, S., Mishra, U.K., DenBaars, S.P., Krames, M.; (1999) Conference Proceedings - Lasers and Electro-Optics Society Annual Meeting-LEOS, 1, pp. 100-101.

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92. **A vertical cavity light emitting InGaN quantum well heterostructure**; Song, Y.-K., Zhou, H., Diagne, M., Ozden, I., Vertikov, A., Nurmikko, A.V., Carter-Coman, C., Kern, R.S., Kish, F.A., Krames, M.R.; (1999) Applied Physics Letters, 74 (23), pp. 3441-3443.
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97. **Deep-oxide curved resonator for low-threshold AlGaAs-GaAs quantum well heterostructure ring lasers**; Krames, M.R., Minervini, A.D., Holonyak Jr., N.; (1995) Applied Physics Letters, 67 (1), pp. 73-75.
98. **Deep-oxide planar buried-heterostructure AlGaAs-GaAs quantum well heterostructure laser diodes**; Krames, M.R., Chen, E.I., Holonyak Jr., N.; (1994) Applied Physics Letters, 65 (25), pp. 3221-3223.
99. **Buried-oxide ridge-waveguide InAlAs-InP-InGaAsP ($\lambda \sim 1.3 \mu\text{m}$) quantum well heterostructure laser diodes**; Krames, M.R., Holonyak Jr., N., Epler, J.E., Schweizer, H.P.; (1994) Applied Physics Letters, 64 (21), pp. 2821-2823.
100. **Long wavelength (λ approximately $1.5 \mu\text{m}$) native-oxide-defined InAlAs-InP-InP-InGaAsP quantum well heterostructure laser diodes**; Caracci, S.J., Krames, M.R., Holonyak, N., Ludowise, M.J., Fischer-Colbrie, A.; (1994) Journal of Applied Physics, 75 (5), pp. 2706-2708.
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103. ***Thin upper-confining layer $\text{Al}_x\text{Ga}_{1-x}\text{As}$ -GaAs quantum well heterostructure laser diodes***; Caracci, S.J., Kish, F.A., Krames, M.R., Ries, M.J., Holonyak Jr., N., Smith, S.C., Burnham, R.D.; (1993) Applied Physics Letters, 62 (9), pp. 1006-1008.

PRESENTATIONS (RECENT)

1. ***The unspoken challenge for linear fluorescent retrofits - and a solution***, Roy S.; Krames M. R.; 17th Int'l Symposium on Science & Technology of Lighting (LS:17); Toulouse, FR (2022)
2. ***UV-C LEDs for Germicidal/Virucidal Applications***, Krames M. R.; U.S. Dept. of Energy Solid-State Lighting R&D Workshop – GUV Panel; Virtual (2022)
3. ***UV-C Technology Roadmap***, Krames M. R.; Strategies In Light; Virtual (2021)
4. ***UV-C Advancements Enable Innovative Germicidal Uses Displacing Lamps In Some Scenarios***; Krames M. R.; LedsMagazine Webinar; Virtual (2021)
5. ***Ultra-Violet Germicidal Irradiation (UVGI): LEDs vs. Hg Lamps***; Krames M. R.; U.S. Dept. of Energy GUV R&D Discussion; Virtual (2020)
6. ***Converters for Illumination: New Approaches and Applications***; Krames, M.; Phosphors & Quantum Dots Industry Forum; Virtual (2020)
7. ***Gallium Nitride and the Transformation of the Lighting Industry***; Krames, M.; Stanford Optical Society Seminar; Stanford University, Stanford, CA (2020)
8. ***How LEDs are Changing the World***; Krames, M.; UT ECE Colloquia Seminar; University of Texas, Austin, TX (2018)
9. ***Status and Prospects for GaN-based LEDs / Lasers and Their Applications***; Krames, M.; Optics & Photonics International Congress: LEDIA'17; Yokohama, JP (2017)
10. ***Legacy: The Birth of Solid-State Lighting in Silicon Valley***; Krames, M.; Invited Seminar at Lumileds; San Jose, CA (2017)
11. ***The Solid-State Lighting Revolution: Technologies that will Shape the Future of Lighting***; Krames, M.; SPIE Photonics West – Panel Presentation; San Francisco, CA (2017)
12. ***The Challenge for Bulk Nitride Materials***; Krames, M.; Workshop on Ultra-Precision Processing for Wide Bandgap Semiconductors (WUPP); Monterey, CA (2017)
13. ***Status and Future Prospects for Visible-Spectrum LEDs***; Krames, M.; Society for Information Display – Display Week; San Jose, CA (2016)
14. ***LEDs for Lighting Applications: Past, Present, and Future***; Krames, M.; IEEE Photonics Society – Santa Clara Valley Chapter; Santa Clara, CA (2016)
15. ***What is Next for LEDs?***; Krames, M.; Strategies in Light; Santa Clara, CA (2016)
16. ***Opportunities for Down-Converters – Lighting Device Perspective***; Krames, M.; Phosphor Global Summit & Quantum Dot Forum; Newport Beach, CA (2016)
17. ***Challenges for Power Electronics in Solid-State Lighting***; Krames, M.; ARPA-e CIRCUITS Workshop; Washington, DC (2016)
18. ***Triumph of GaN Lighting***; Krames, M.; UC Berkeley ECE Seminar; Berkeley, CA (2015)

PATENTS (U.S. only)

- 1) 12,107,113 Variable composition ternary compound semiconductor alloys, structures, and devices
- 2) 11,879,085 Converter system
- 3) RE49,677 Reusable nitride wafer, method of making, and use thereof
- 4) 11,725,783 Circadian-friendly LED light source
- 5) 11,662,067 LED lamps with improved quality of light
- 6) 11,611,023 System and method for selected pump LEDs with multiple phosphors
- 7) 11,605,618 LED array for in-plane optical interconnects
- 8) 11,511,071 Circadian-friendly LED light sources
- 9) 11,287,090 Circadian-friendly LED light source
- 10) 11,233,181 Converter system
- 11) 11,162,026 Converter system
- 12) 11,105,473 LED lamps with improved quality of light
- 13) 10,955,608 Circadian-friendly LED light sources
- 14) 10,900,615 Circadian-friendly LED light source
- 15) 10,847,625 Indium-gallium-nitride structures and devices
- 16) 10,830,405 Sunlight-based large area light source and large area luminaire
- 17) 10,700,244 System and method for selected pump LEDs with multiple phosphors
- 18) 10,693,041 High-performance LED fabrication
- 19) 10,677,981 Large area light source and large area luminaire
- 20) 10,557,595 LED lamps with improved quality of light
- 21) 10,553,754 Power light emitting diode and method with uniform current density
- 22) 10,529,902 Small LED source with high brightness and high efficiency
- 23) 10,436,422 Multi-function active accessories for LED lamps
- 24) 10,324,250 Circadian-friendly LED light sources
- 25) 10,312,422 Light emitting devices with optical elements and bonding layers
- 26) 10,312,404 Semiconductor light emitting device growing active layer on textured surface
- 27) 10,290,775 Luminescent ceramic for a light emitting device
- 28) 10,168,009 LED lamps with improved quality of light
- 29) 10,147,850 System and method for providing color light sources in proximity to predetermined wavelength conversion structures
- 30) 10,139,056 LED lamps with improved quality of light
- 31) 10,137,277 Circadian-friendly LED light source
- 32) 10,115,865 High-performance LED fabrication
- 33) 10,087,550 Reusable nitride wafer, method of making, and use thereof
- 34) 10,084,121 Small LED source with high brightness and high efficiency
- 35) 10,076,633 Circadian-friendly LED light source
- 36) 9,995,439 Glare reduced compact lens for high intensity light source
- 37) 9,722,148 Luminescent ceramic for a light emitting device
- 38) 9,677,723 LED lamps with improved quality of light
- 39) 9,660,152 System and method for selected pump LEDs with multiple phosphors

- 40) 9,653,554 Reusable nitride wafer, method of making, and use thereof
- 41) 9,650,723 Large area seed crystal for ammonothermal crystal growth and method of making
- 42) 9,640,724 III-nitride light emitting device with double heterostructure light emitting region
- 43) 9,618,183 Apportioning optical projection paths in an LED lamp
- 44) 9,589,792 High quality group-III metal nitride crystals, methods of making, and methods of use
- 45) 9,583,683 Light emitting devices with optical elements and bonding layers
- 46) 9,583,678 High-performance LED fabrication
- 47) 9,564,553 Power light emitting diode and method with uniform current density operation
- 48) 9,435,525 Multi-part heat exchanger for LED lamps
- 49) 9,419,189 Small LED source with high brightness and high efficiency
- 50) 9,410,664 Circadian friendly LED light source
- 51) 9,368,695 LED lamps with improved quality of light
- 52) 9,360,190 Compact lens for high intensity light source
- 53) 9,359,260 Luminescent ceramic for a light emitting device
- 54) 9,293,667 System and method for selected pump LEDs with multiple phosphors
- 55) 9,293,644 Power light emitting diode and method with uniform current density operation
- 56) 9,267,661 Apportioning optical projection paths in an LED lamp
- 57) 9,117,944 Semiconductor light emitting devices grown on composite substrates
- 58) D736,724 LED lamp with accessory
- 59) D736,723 LED lamp
- 60) 9,046,227 LED lamps with improved quality of light
- 61) D730,302 Heat sink
- 62) 9,000,450 Grown photonic crystals in semiconductor light emitting devices
- 63) 8,985,794 Providing remote blue phosphors in an LED lamp
- 64) 8,933,644 LED lamps with improved quality of light
- 65) 8,911,518 Method and system for dicing substrates containing gallium and nitrogen material with conductive core via structures
- 66) 8,905,588 System and method for providing color light sources in proximity to predetermined wavelength conversion structures
- 67) 8,884,517 Illumination sources with thermally-isolated electronics
- 68) 8,847,252 III-nitride light emitting device with double heterostructure light emitting region
- 69) 8,846,423 Bonding an optical element to a light emitting device
- 70) 8,748,923 Wavelength-converted semiconductor light emitting device
- 71) 8,748,912 Common optical element for an array of phosphor converted light emitting devices
- 72) 8,740,413 System and method for providing color light sources in proximity to predetermined wavelength conversion structures
- 73) 8,729,559 Method of making bulk InGaN substrates and devices thereon
- 74) 8,686,458 Power light emitting diode and method with current density operation

- 75) 8,679,869 Contact for a semiconductor light emitting device
- 76) 8,628,985 Light emitting devices with improved light extraction efficiency
- 77) 8,597,967 Method and system for dicing substrates containing gallium and
nitrogen material
- 78) 8,502,465 Power light emitting diode and method with current density operation
- 79) 8,492,244 Methods for relaxation and transfer of strained layers and structures
fabricated thereby
- 80) 8,486,771 Methods of forming relaxed layers of semiconductor materials,
semiconductor structures, devices and engineered substrates including same
- 81) 8,482,104 Method for growth of indium-containing nitride films
- 82) 8,481,408 Relaxation of strained layers
- 83) 8,471,280 Silicone based reflective underfill and thermal coupler
- 84) 8,455,913 Package-integrated thin film LED
- 85) 8,450,754 Series connected flip chip LEDs with growth substrate removed
- 86) 8,445,929 Wavelength-converted semiconductor light emitting device
- 87) 8,415,694 Light emitting devices with improved light extraction efficiency
- 88) 8,334,543 III-V light emitting device including a light extracting structure
- 89) 8,334,155 Substrate for growing a III-V light emitting device
- 90) 8,288,186 Substrate for growing a III-V light emitting device
- 91) 8,278,674 Luminescent ceramic element for a light emitting device
- 92) 8,203,153 III-V light emitting device including a light extracting structure
- 93) 8,174,025 Semiconductor light emitting device including porous layer
- 94) 8,163,575 Grown photonic crystals in semiconductor light emitting devices
- 95) 8,153,475 Back-end processes for substrates re-use
- 96) 8,114,692 Light source including a wavelength-converted semiconductor light
emitting device and a filter
- 97) 8,105,852 Method of forming a composite substrate and growing a III-V light
emitting device over the composite substrate
- 98) 8,080,828 Low profile side emitting LED with window layer and phosphor layer
- 99) 8,067,254 Common optical element for an array of phosphor converted light
emitting devices
- 100) 8,062,916 Series connected flip chip LEDs with growth substrate removed
- 101) 8,053,905 Compliant bonding structures for semiconductor devices
- 102) 8,049,234 Light emitting devices with improved light extraction efficiency
- 103) 8,039,866 Mount for a semiconductor light emitting device
- 104) 7,981,767 Methods for relaxation and transfer of strained layers and
structures fabricated thereby
- 105) 7,902,564 Multi-grain luminescent ceramics for light emitting devices
- 106) 7,888,691 Light source including a wavelength-converted semiconductor
light emitting device and a filter
- 107) 7,880,186 III-nitride light emitting device with double heterostructure light
emitting region
- 108) 7,875,984 Compliant bonding structures for semiconductor devices
- 109) 7,875,533 Package-integrated thin film LED
- 110) 7,863,631 AlInGaP LED having reduced temperature dependence

111)	7,808,011	Semiconductor light emitting devices including in-plane light emitting layers
112)	7,804,100	Polarization-reversed III-nitride light emitting device
113)	7,791,096	Mount for a semiconductor light emitting device
114)	7,675,084	Photonic crystal light emitting device
115)	7,663,148	III-nitride light emitting device with reduced strain light emitting layer
116)	7,642,108	LED including photonic crystal structure
117)	7,626,210	Low profile side emitting LED
118)	7,601,989	LED with porous diffusing reflector
119)	7,544,525	AlInGaP LED having reduced temperature dependence
120)	7,514,721	Luminescent ceramic element for a light emitting device
121)	7,491,565	III-nitride light emitting devices fabricated by substrate removal
122)	7,488,621	Package-integrated thin film LED
123)	7,442,965	Photonic crystal light emitting device
124)	7,419,839	Bonding an optical element to a light emitting device
125)	7,408,201	Polarized semiconductor light emitting device
126)	7,402,840	Selective filtering of wavelength-converted semiconductor light emitting devices
127)	7,361,938	Luminescent ceramic for a light emitting device
128)	7,341,878	Wavelength-converted semiconductor light emitting device
129)	7,294,862	Photonic crystal light emitting device
130)	7,279,718	LED including photonic crystal structure
131)	7,279,345	Method of forming light emitting devices with improved light extraction efficiency
132)	7,268,371	Light extraction from a semiconductor light emitting device via chip shaping
133)	7,256,483	Package-integrated thin film LED
134)	7,244,630	AlInGaP LED having reduced temperature dependence
135)	7,221,000	Reverse polarization light emitting region for a semiconductor light emitting device
136)	7,122,839	Semiconductor light emitting devices with graded composition light emitting layers
137)	7,087,941	III-phosphide light emitting devices with thin active layers
138)	7,064,355	Light emitting diodes with improved light extraction efficiency
139)	7,053,419	Light emitting diodes with improved light extraction efficiency
140)	7,026,663	Selective filtering of wavelength-converted semiconductor light emitting devices
141)	7,015,054	Semiconductor light emitting device and method
142)	7,012,279	Photonic crystal light emitting device
143)	6,995,389	Heterostructures for III-nitride light emitting devices
144)	6,992,334	Multi-layer highly reflective ohmic contacts for semiconductor devices
145)	6,989,555	Strain-controlled III-nitride light emitting device
146)	6,956,246	Resonant cavity III-nitride light emitting devices fabricated by growth substrate removal
147)	6,946,309	III-Phosphide and III-Arsenide flip chip light-emitting devices

- 148) 6,903,376 Selective placement of quantum wells in flipchip light emitting diodes for improved light extraction
- 149) 6,849,472 Nitride semiconductor device with reduced polarization fields
- 150) 6,847,057 Semiconductor light emitting devices
- 151) 6,844,571 III-nitride light-emitting device with increased light generating capability
- 152) 6,800,500 III-nitride light emitting devices fabricated by substrate removal
- 153) 6,784,463 III-Phospide and III-Arsenide flip chip light-emitting devices
- 154) 6,744,077 Selective filtering of wavelength-converted semiconductor light emitting devices
- 155) 6,683,327 Nucleation layer for improved light extraction from light emitting devices
- 156) 6,649,440 Aluminum indium gallium nitride-based LED having thick epitaxial layer for improved light extraction
- 157) 6,646,292 Semiconductor light emitting device and method
- 158) 6,642,652 Phosphor-converted light emitting device
- 159) 6,576,488 Using electrophoresis to produce a conformally coated phosphor-converted light emitting semiconductor
- 160) 6,570,190 LED having angled sides for increased side light extraction
- 161) 6,525,335 Light emitting semiconductor devices including wafer bonded heterostructures
- 162) 6,521,914 III-Nitride Light-emitting device with increased light generating capability
- 163) 6,514,782 Method of making a III-nitride light-emitting device with increased light generating capability
- 164) 6,504,171 Chirped multi-well active region LED
- 165) 6,486,499 III-nitride light-emitting device with increased light generating capability
- 166) 6,420,199 Methods for fabricating light emitting devices having aluminum gallium indium nitride structures and mirror stacks
- 167) 6,323,063 Forming LED having angled sides for increased side light extraction
- 168) 6,320,206 Light emitting devices having wafer bonded aluminum gallium indium nitride structures and mirror stacks
- 169) 6,280,523 Thickness tailoring of wafer bonded AlxGayInzN structures by laser melting
- 170) 6,229,160 Light extraction from a semiconductor light-emitting device via chip shaping
- 171) 6,133,589 AlGaInN-based LED having thick epitaxial layer for improved light extraction
- 172) 6,046,465 Buried reflectors for light emitters in epitaxial material and method for producing same
- 173) 5,779,924 Ordered interface texturing for a light emitting device
- 174) 5,400,354 Laminated upper cladding structure for a light-emitting device