

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Hisense USA Corporation

Petitioner

v.

Brightplus Ventures LLC

Patent Owner

Case IPR2023-01401

U.S. Patent No. 8,941,331

Ex. 2001 - Declaration of William Bohannon

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EXHIBIT LIST

Exhibit	Description
2001	Declaration of William K. Bohannon (“Bohannon Decl.”)
2002	Curriculum vitae of William K. Bohannon
2003	Joint Claim Construction Statement
2004	Brightplus Ventures LLC’s Opening Claim Construction Brief
2005	Hisense’ Opening Claim Construction Brief

I, William K. Bohannon, hereby declare under penalty of perjury:

I. INTRODUCTION

1. I am an independent consultant. I am over eighteen years of age, and I would otherwise be competent to testify as to the matters set forth herein if I am called upon to do so.

2. I have prepared this Declaration for consideration by the Patent Trial and Appeal Board in the Inter Partes Reviews of U.S. Patent No. 8,941,331 (“the ’331 Patent”).

3. I provide this Declaration at the request of and have been retained by Ni, Wang & Massand, PLLC, which represents Patent Owner Brightplus Ventures LLC (“Brightplus” or “Patent Owner”) in connection with the above-captioned Inter Partes Review.

4. I have been informed and understand that Petitioner Hisense USA Corporation (“Hisense” or “Petitioner”) contends that claims 17-22 of the ’331 Patent are invalid based on Grounds 1-6.

5. I am being compensated at an hourly rate of \$350 per hour. My compensation is not dependent on the outcome of or any issue in relation to the above-captioned Inter Partes Review, and I have no interest in either party.

6. In forming my opinions, I relied on my knowledge, education, experience, and training in the field and on documents and information referenced in this Declaration.

A. Expert Qualifications

7. My curriculum vitae (“CV”) is attached hereto as Exhibit 2002 and provides an accurate identification of my background and experience.

8. I have over (30) years of commercial industrial electronics experience including experience in the areas of LCD, Plasma, CRT and Large Screen Display Equipment: LCD manufacturing, substrates, drivers and other related components for rear screen displays including Avionics and cockpit displays.

9. I studied Physics and Mathematics in college as shown in my CV. I learned electronics in my physics course work and obtained practical experience making my own telescope drive electronics and with amateur radio projects. After graduation I worked with Science Applications (1976) developing neutron spectroscopy methods and laboratory equipment including specialized software and electronics. A paper I wrote regarding this work and published by American Nuclear Society, ANS. [Bohannon, W.K., et al., Fast Program for Automatic Gamma-Ray Analysis, Transactions of the American Nuclear Society, May 1978.]

10. Thereafter, I continued my electronics work with radar systems for a small defense contractor as well as with Hughes Aircraft Company. My work with

Hughes Aircraft Company included work as the Systems Engineer responsible for all hardware and software used in part of a large laser weapon system. In that capacity, I was required to debug, diagnose and repair problems in the electronic sub-systems including digital, analog and power supply sub-systems used on board the test aircraft. After I left Hughes Aircraft, I worked with TRW where I was responsible for hardware (including analog, RF and digital systems) and software as well as computer architectures used in complex avionics systems.

11. My work with electronics continued when I became Chief Scientist for Computer Accessories in charge of the company's technology direction for consumer products. As I recall well, one of the largest changes involved with moving from military avionics to consumer electronics was in the power sources and power supplies. In particular, military electronics used in aviation depend upon the on-board aircraft's power bus whereas the consumer electronics produced by Computer Accessories depended on inexpensive flyback converters used to convert 120 volt 60 Hz AC line power to the low voltage DC needed to power the product's PCBs as well as on board PCB buck and boost converters (for example 5, 12 and 25 volt) needed by LCD based display products. One of my patents (U.S. Patent No. 5,089,810) filed in 1990 shows how a portion of this low voltage DC power is supplied and used. I have been granted several other patents related to LCD displays as shown in my CV. As part of my work with Computer Accessories, I searched for

new sources of power supplies for our products as well as for other types of electronic components.

12. Since 1994, I have been an independent consultant for Manx Research working on various display products including managing and conducting detailed technical product evaluations for all kinds of display products – LCD, CRT, Plasma and LED direct view, projection products of all types, CRT products and plasma products. Furthermore, I was also a design and procurement consultant to an aerospace display company involved in re-designing Avionic LCD cockpit display sub-systems to use full color R, G, B LED light sources instead of short arc lamps in a compact, rear-screen 3 panel projection system. As a part of my work with Manx Research, I studied all available power supply architectures including isolated, off-line flyback AC/DC converters as well as buck and boost DC-DC converters. I also helped my customers manage their power supply intellectual property by identifying potential infringers of their power supply patents.

13. Edge Semiconductor designed and manufactured specialized analog ICs used in automatic testing equipment (ATE) for testing of other ICs (either in packages or on wafers) in mass production. Edge Semiconductor produced drivers, comparators, clock distribution ICs and PMUs. A parametric measurement unit (PMU) is an extremely accurate power supply used for testing that can force and measure both current and voltage to a device under test (DUT). When I worked with

Edge Semiconductor, I initially helped to define their analog PMU design requirements as well as worked with ATE customers, such as Advantest in Japan, when they evaluated some of our initial PMU prototypes. Advantest's requirements included the ability for a PMU to supply DC power and to accurately measure I-V during various transient conditions. For example, when a microprocessor or memory chip is being tested, the various power-on and power-down modes must also be tested. Switching from a sleep mode to a power-on mode causes a large transient to the power supply. Edge Semiconductor had to revise their initial PMU designs many times before finally achieving customer acceptance. Each time a new version became available, I worked with the customers to re-evaluate those new designs and to help with their board design.

14. Planet ATE went a step further than Edge-Semtech and developed a more powerful (more than 1 amp) DUT power supply with I-V measurement ability in a programmable analog IC format. I introduced each of these new designs to all of my customers, worked with them to evaluate the design and to design the ICs into their systems. Each of these power supply ICs could be ganged together to supply multi-Amp power to any part under test, all while maintaining an accurate, real time measurement of the voltage and current being used. Like the smaller PMUs, these analog power supply ICs needed to be able to handle large transients as well as to turn on and off quickly. Along with customers needing to test memory and

processors, these power supply ICs were also used by customers needing to test LEDs. Testing LEDs in a mass production process required contacting the LED's power leads, turning the LEDs on as quickly as possible and then getting an accurate measure of voltage and current as quickly as possible after the turn-on transients have passed. LED testing is a very strenuous requirement for a power supply.

15. ATE Engines took the DUT/PMU power supply architecture in a different direction by designing an IC that could be programmed to perform as a driver-comparator with a 50 ohm output and then re-programmed and changed into a DUT power supply capable of driving more than 1 amp through the same output pin with low impedance. Unfortunately, their designs struggled to deal with the various transients involved with mass production testing of various DUTs. As with Planet ATE, I took the early versions of this IC to my customers in Japan and worked through their evaluations and design studies. All in all, through my career I have worked with electronics from 1976 until the present time, concentrating upon consumer electronics and the power supplies relevant to this case since 1989.

16. I also have 7 issued U.S. Patents in displays and display technology.

B. Basis of My Opinion and Materials Considered

17. I have reviewed the '331 Patent, including the claims of the patent in view of the specification. In addition, I have reviewed the '331 Patent's prosecution

history, Mr. Betancourt's declaration (Ex. 1003), the prior art discussed herein, and the remaining exhibits listed herein.

C. Summary of Opinions

18. In my opinion, claims 17-25 of the '331 Patent are not rendered obvious by the prior art combinations cited in Grounds 1-6. In the remainder of this declaration, I demonstrate these in detail and also address the lack of motivation to combine certain references.

II. LEGAL STANDARDS TO BE APPLIED

19. Counsel has advised me of the following legal standards that are relevant to IPR proceedings, which I have applied in forming my opinions.

20. I understand that an inter partes review ("IPR") is a proceeding before the United States Patent & Trademark Office for evaluating the patentability of an issued patent's claims based on prior-art patents and printed publications.

A. Person of Ordinary Skill in the Art

21. I understand that the claims of a patent are reviewed from the point of view of a hypothetical person of ordinary skill in the art ("POSITA") at the time of the filing of the patent. The "art" is the field of technology to which a patent relates.

B. Claim Construction

22. I understand that, in IPR proceedings, claim terms in a patent are given their ordinary and customary meaning as understood by a POSITA in the context of

the entire patent and the prosecution history pertaining to the patent. If the specification provides a special definition for a claim term that differs from the meaning the term would otherwise possess, the specification's special definition controls. I have applied these standards in preparing the opinions in this declaration.

C. Validity

23. I understand that, in this proceeding, Petitioner has the burden of proving that the challenged claims of the '331 Patent are unpatentable by a preponderance of the evidence. I understand that "preponderance of the evidence" means that a fact or conclusion is more likely true than not true.

24. I understand that there are two ways in which prior art may render a patent claim unpatentable. First, the prior art can "anticipate" the claim. Second, the prior art can render the claim "obvious" to a POSITA. I understand that for an invention claimed in a patent to be patentable over the prior art, it must not be anticipated and must not be obvious based on what was known before the invention was made.

25. I understand that a patent claim may be invalid as anticipated under 35 U.S.C. § 102 if a prior art reference discloses each element of the claimed subject matter.¹

¹ Patent laws discussed herein refer to AIA versions of the relevant laws.

26. I understand that a patent claim may be invalid as obvious under 35 U.S.C. § 103 if the differences between the subject matter claimed and the prior art are such that the claimed subject matter as a whole would have been obvious to a POSITA at the time the invention was made. I also understand that several factual inquiries underlie a determination of obviousness. These inquiries include (1) the scope and content of the prior art, (2) the level of ordinary skill in the field of the invention, (3) the differences between the claimed invention and the prior art, and (4) any objective evidence of non-obviousness (i.e., “secondary considerations”).

27. I further understand that when a party alleges obviousness, that party may rely on one reference or a combination of multiple references. I also understand that, when a party alleges obviousness based on a combination of references, that party should identify a reason why a POSITA would have been motivated to combine the asserted references in the manner recited in the claims and to explain why a POSITA would have had a reasonable expectation of success in making such combinations.

28. I understand that an obviousness analysis permits the application of “common sense” in examining whether a claimed invention would have been obvious to a POSITA. For example, I understand that combining familiar elements according to known methods and in a predictable way may suggest obviousness when such a combination would yield nothing more than predictable results. And I

understand a party asserting obviousness should still provide a specific motivation to combine the references as recited in the claims and explain why one would have reasonably expected to succeed in doing so.

29. I understand that one indicator of nonobviousness is when prior art teaches away from combining certain known elements. For example, 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.

III. TECHNOLOGY OVERVIEW

30. The relevant field for that of the '331 Patent is that of solid state lighting systems, and more particularly to a lighting system, including a lighting panel with strings of solid state lighting devices and current supply circuits that supply on-state drive currents in response to control signals. Solid state lighting panels are commonly used as backlights for small liquid crystal display (LCD) display screens, such as LCD display screens used in portable [note: "portable" means low voltage battery powered like smart phones] electronic devices '331 Background.

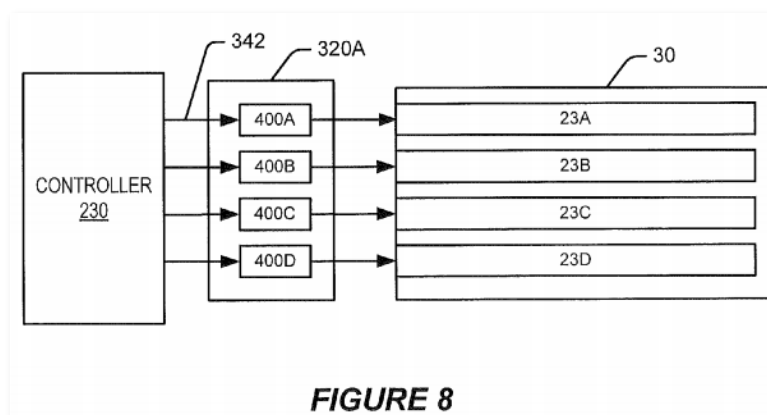
31. This may be accomplished through the use of at least a first and second strings of solid state lighting devices coupled to at least first and second current supply circuits configured to supply an on-state drive current to the respective first

and second strings of solid state lighting devices having a PWM controller coupled to the first and second current supply circuit and configured to generate a first and a second PWM control signal.

IV. THE '331 PATENT'S OVERVIEW

At the time of the invention, the prior art did not provide good coloring rendering index. '331 Patent, 2:5-7. Further, there were not adequate solid-state lighting solutions for larger LCD television displays. *See* '331 Patent, 1:51-53. As such, there existed a need for lighting systems with better LED control methods, such as being able to alter the intensities of different lighting sources in a backlight unit. '331 Patent, 2:27-29.

32. The invention of the '331 Patent improved over the prior art by providing for controllable current supply circuits that correspond to LED strings. The '331 Patent teaches solutions related to brightness uniformity and LED output change, as well as describes methods to provide “consistent, controllable light output characteristics for a light panel.” '331 Patent, 9:27-33; 9:43-48.



33. As shown in Fig. 8, “one current supply circuit 400A-400D for each LED string 23A-23D [...] Operation of the current supply circuits 400A-400B may be controlled by control signals 342 from the controller 230.” ’331 Patent, 12:40-44. Further in discussion of Fig. 9, “a current supply 400 may have a variable boost converter configuration including PWM controller 410, a charging inductor 420, a diode 430, an output capacitor 440, first and second transistors 450, 460 and a sense resistor 470.” *Id.*, 12:47-51. Additionally, the current supply circuit receives a pulse modulation signal PWM from the controller 230. *Id.*, 12:53-54.

A. Person of Ordinary Skill in The Art

34. I understand that the factors considered in determining the ordinary level of skill in a field of art at issue include the level of education and experience of persons working in the field; the types of problems encountered in the field; and the sophistication of the technology at the time of the purported invention, which I understand to be as early as November 18, 2005. I understand that a person of ordinary skill in the art (“POSITA”) is not a specific real individual, but rather is a hypothetical individual having the qualities reflected by the factors above. I understand that a POSITA would also have knowledge from the teachings of the prior art, including the art cited below.

35. Based on these factors, on or before November 18, 2005, a POSITA relating to the technology of the ’331 Patent would have (a) a Bachelor's of Science

degree in a technical field and at least four years of experience in the field of design and/or manufacture of display systems; (b) a Master's of Science degree in a technical field and at least two years of experience in the field of design and/or manufacture of display systems; or (c) a PhD in a technical field relating to the design and/or manufacture of display systems. Additional graduate education could substitute for professional experience, or significant experience in the field could substitute for formal education. A POSITA is presumed to have knowledge of all relevant prior art, and therefore would have been familiar with each of the references cited in this declaration and the full range of teachings they contain.

36. With respect to the subject matter of the '331 Patent, a Bachelor of Art in Mathematics is equivalent to a Bachelor of Science degree in a technical field.

37. Before November 18, 2005, my level of skill in the art was at least that of a POSITA. I am qualified to provide opinions concerning what a POSITA would have known and understood at that time, and my analysis and conclusions in this declaration are from the perspective of a POSITA prior to November 18, 2005. Furthermore, I have taught, worked with and supervised persons whom I would consider to be persons of ordinary skill in the art according with the description given above.

V. CLAIM CONSTRUCTION

38. For IPR petitions filed after November 13, 2018, I understand the Patent Trial and Appeal Board (“Board”) construes claim terms as having their ordinary and customary meaning to a POSITA at the time of invention (i.e., the same standard used in district court). I have applied this standard in rendering my opinions on claim construction. In addition, I have been asked to assume that the claims are not indefinite.

39. Claim terms are generally given their plain and ordinary meaning, which is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention. When the words in the context of the surrounding claim language make the ordinary meaning readily apparent, claim construction involves little more than the application of the widely accepted meaning of commonly understood words.

40. The claims must be read in view of the specification of which they are a part. The specification is the best source for understanding a technical term. The construction that stays true to the claim language and most naturally aligns with the patent’s description of the invention will be, in the end, the correct construction.

41. Although terms must be construed in light of the specification, it is improper to import a limitation from the specification into the claims. Courts must capture the scope of the actual invention, rather than strictly limit the scope of claims

to disclosed embodiments or allow the claim language to become divorced from what the specification conveys is the invention.

42. The prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be. The prosecution history consists of the complete record of the proceedings before the PTO and includes the prior art cited during the examination of the patent.

43. I understand that in the parallel district court litigation, Hisense has proposed a construction for the term “a first light and a second light.”

44. I agree with Patent Owner that the term would be understood based on its plain and ordinary meaning which can also be stated as the “at least a first string of solid state lighting devices configured to emit a first light, and a second string of solid state lighting devices configured to emit a second light.”

45. The '331 Patent provides various examples where the “at least first and second strings of solid state lighting devices” of claim 17 emit light having the same wavelength. For example, in one embodiment, “[t]he LED chips 16A-16D may include at least a red LED 16A, a green LED 16B and a blue LED 16C.” '331, 7:12-14. This contradicts Hisense’s proposed construction.

VI. PETITIONER’S PRIOR ART SUMMARY

46. I understand that Petitioner has identified two primary references and three secondary references as prior art to the ’331 Patent in its Grounds 1-6.

A. Lys

47. International Application WO 2005/089293 (Ex. 1005 – “Lys”²) was filed on March 15, 2005, and published on September 29, 2005. Petitioner relies on Lys as the primary reference for Grounds 1-3.

48. Lys primarily relates to networked lighting systems, “The methods disclosed herein include a method of determining an identifier of a networked lighting device among a group of networked lighting devices... delivering a plurality of signals to the lighting devices, observing a condition of the network in response to each one of the plurality of signals, and inferring an identifier of at least one of the plurality of lighting devices based on the condition of the network.” Lys, 1:11-17 (Background). Lys further describes a variety of lighting embodiments, for example “[t]he lighting system may include an architectural lighting fixture. The lighting system may include a theatrical lighting system. The lighting system may include a lighting system for a transportation environment. The lighting system may

² Page number citations for Lys is based on the original page numbering and not the numbering added by Petitioner.

include a general illumination lighting system for a venue. The venue may include an entertainment venue. The venue may include a restaurant...” Lys, 26: 2-6.

49. Lys further describes a variety of high voltage systems. Lys describes “high output linear lighting systems for various environments” and “power systems for driving light sources in high-voltage environments.” *Id.* at Abstract. In an embodiment described in Fig. 17, Lys details a single stage power factor correction/DC to DC converter facility 1908. *Id.* 60:18-20. The converter facility takes in high voltage and converts it into a suitable voltage for the lighting units 102. Further, the embodiment of Fig. 17 allows “lighting units 102 to be configured in long strings over very large geometries [...] Accordingly, it is one preferred embodiment of a power supply for disposing lighting units 102 on building exteriors and other large environments.” *Id.* 60:25-61:4.

50. Unlike the ’331 Patent which is directed to back lighting LCDs with low voltage LEDs, Lys is directed primarily to power systems for driving light sources in high-voltage environments. Lys, at Abstract.

B. Mueller

51. U.S. Application 2005/0047134 (Ex. 1009 – “Mueller”) was filed on September 3, 2004, and published on March 3, 2005. Petitioner relies on Mueller as the primary reference for Grounds 4-6.

52. Mueller relates to a networked lighting system for lighting displays for use in various applications. The networked lighting elements of Mueller may comprise different systems or be in many disparate locations, “[t]he lighting units can be used on the interior ceiling 2714 or along the floor 2712, such as being used as directional lights 2704. The lights can be used to light the seating environment 2710...The lighting units 100 can thus be used to provide aesthetic lighting, alarm lighting, safety lighting, lighting entertainment, indication of conditions or data, or many other purposes... Lighting units 100 can be disposed along the ceiling 2802, above seats 2808, or along the aisle 2804, to provide a variety of illumination effects, ranging from white light illumination or varying color temperatures to colored lighting for aesthetic, indication, safety, data, warning, entertainment or other purposes.” Mueller at [0248-49].

53. Additionally, Mueller teaches the use of lighting unit controllers (“LUCs”) that communicate control signals to lighting units. Mueller teaches that “the LUCs and the central controller may be coupled together in a variety of configurations using a variety of different communication media and protocols to form the networked lighting system 200...central controller 202 shown in FIG. 2 may be configured to implement Ethernet-based communications with the LUCs, and in turn the LUCs may be configured to implement an industrial, DMX-based communications with the lighting units 100. In particular, in one aspect of this

embodiment, each LUC may be configured as an addressable Ethernet-based controller and accordingly may be identifiable to the central controller 202 via a particular unique address (or a unique group of addresses) using an Ethernet-based protocol.” *Id.*, at [0190-91]. Mueller further teaches that the LUCs and lighting units need not be in electrical connection with one another or with the central controller: “FIG. 48 shows a system 4800 for controlling a plurality of lighting units 100 in a home network. A home network controller 4802 delivers control signals through a network 4804 (which may be a conventional network, a wire, a power line, a wireless network or other data facility). Each lighting unit 100 is responsive to a lighting unit controller 208A, 208B, 208C, 208D to provide illumination changes in response to signals from the home network controller 4802.” *Id.*, at [0271].

C. Grootes

54. U.S. Patent Publication No. 2007/0046485 (Ex. 1006 – “Grootes”) was filed on August 26, 2005, and published on March 1, 2007. Petitioner relies on Grootes as the secondary reference for Grounds 1-6.

55. Grootes discloses methods for setting voltages and currents for LEDs. An exemplary embodiment describes that “the transistors are each controlled by a separate PWM controller... a separate set of PWM controllers is provided for each LED color.” Grootes, at [0017]. Further, another embodiment teaches that “[t]he amount of current through an LED controls the brightness. The most straightforward

way to control the current of an LED driver, as shown in Fig. 1, is to measure the voltage across a current sense resistor 6 in series with the LEDs 8.” *Id.*, at [0005].

D. Xu

56. Chinese Publication No. 1588523 (Exs. 1007, 1008 – “Xu”) was filed on August 12, 2004, and published on March 2, 2005. Petitioner relies on Xu as a secondary reference for Grounds 2-3, and 5-6.

57. Xu teaches a driving device for LEDs in series and to make the light-emitting diode series to be quickly lit or extinguished. *See* Xu at pg. 5; Summary of the Invention. Xu primarily discloses methods that use a switch in order for the LEDs to be quickly lit, for example, “When the switch is turned on, the light emitting diode series is driven by a direct current voltage, and a direct-current flows through the light-emitting diode series... when the switch is turned on, the light emitting diode series is quickly lit to a predetermined brightness,” Xu, Abstract.

E. Blum

58. U.S. Patent No. 5,663,667 (Ex. 1010 – “Blum”) was filed on August 19, 1996, and published on September 2, 1997. Petitioner relies on Blum as a secondary reference for Grounds 3 and 6.

59. Blum discloses switching regulator controller circuits, in particular methods that reduce leading edge current spikes. As stated by Blum, “[s]witching

regulator controllers operate by monitoring the amount of current flowing into a switching device such as a transistor driving a transformer” Blum, 1:9-16.

VII. GROUND 1 – LYS IN VIEW OF GROOTES IN VIEW OF A POSITA FAILS TO RENDER OBVIOUS CLAIM 17.

60. Petitioner relies on the combination Lys and Grootes as its primary reference for Gound 1. But it is my opinion that a POSITA would not be motivated to combine Lys and Grootes, nor would the combination even if combined render claim 17 obvious for at least the below discussions in my declaration.

A. No Motivation to Combine Lys and Grootes Exists.

61. The invention of Lys is directed towards a completely different purpose than that of the '331 patent and relies on components that are extraneous to the invention of the '331 patent. Lys summarize its invention as: “*high output linear lighting systems for various environments*” and “*power systems for driving light sources in high-voltage environments.*” Lys, Abstract (emphasis added).

62. More specifically, Lys is focused on large scale lighting systems such as an architectural lighting fixture or a theatrical lighting system, or a general illumination lighting system for a venue. This systems are completely different from backlighting an LCD display as intended by the '331 Patent.

63. Petitioner has not provided any support for why Lys and Grootes should be combined other than saying that they are “in the same field of endeavor” but this does not actually provide any motivation.

64. The high voltage system of Lys has little in common in terms of operation with the backlighting of LCDs of Grootes. This includes the fact that they two types of systems would have different current control and supply to LEDs. Combining Lys and Grootes would not result in any improvement. Indeed, LED backlighting systems go to great length to separate high voltage from the LED and LCD drive electronics. On the other hand, Lys has high voltage directly tied to the low voltage circuits.

65. With respect to modifying Lys with Grootes to include a current source for each string of LEDs, it would be impractical if not impossible to modify Lys to include Grootes' independent current source for each string of LEDs. The arrangement of Lys precludes an independent current source.

66. Based on Petitioner's own arguments related to other elements of Claim 17B and the claim that the PFC/DC to DC converters of Lys are analogous to the current supply circuits of the '331 Patent, Petitioner would need to either modify the converter to include a current supply circuit or place the current supply circuit after the converter and before the lighting unit. However, PFC/DC to DC converters are only used on AC line voltage sources which need to be isolated from low voltage LED drive systems in consumer electronics.

67. Furthermore and ignored by petitioner, various systems within Lys cannot just be simply combined. Furthermore, a POSITA would not combine Lys's

large high voltage AC powered lighting network with Grootes's low voltage backlight system. Furthermore, a POSITA would not be motivated to modify the current supply circuit(s) described in Lys with the individually controllable current sources for each LED string described in Grootes to achieve the desired white point. It would be impracticable and incorrect to implement the low voltage current supply in Grootes with the high voltage DC to DC converters in Lys as it ignores safety and isolation from high voltage AC in consumer electronics design. This combination of Lys and Grootes would likely result in an unusable system that would not control current of LEDs.

B. Lys and Grootes Fail to Disclose [Claim 17B] “at least first and second current supply circuits coupled to the at least first and second strings of solid state lighting devices, respectively, and configured to supply an on-state drive current to a respective one of the first and second strings of solid state lighting devices.”

68. None of the elements of claim 17B are disclosed or taught in Lys. None of the power supplies, such as the PFC/DC to DC converter 1908, supply an on-state drive current to the first and second LED strings.

69. Lys does not mention or disclose supplying an on-state drive current to the strings. However, what is disclosed is merely a generic power supply circuit which can take many forms. This lack of disclosure does not teach the improved supply circuit described in the '331 Patent.

C. Lys and Grootes Fail to Disclose [Claim 17C] “a pulse width modulation (PWM) controller that is coupled to the first current

supply circuit and the second supply circuit and that is configured to generate, for each of the first current supply circuit and the second current supply circuit, a first PWM control signal and second PWM control signal that are supplied to each of the at least first and second strings.”

70. It is unclear from Lys what is meant by “the control facility 3500 can switch between a current-control mode 2502 (which itself could be controlled by a PWM stream) and a separate PWM mode 2504.” However, a reasonable interpretation is that the current control mode 2502 is controlled by a PWM stream, not that the control facility is controlled by a PWM stream. Fig. 25a of Lys shows the current control mode 2502 to be a PWM controlled mode.

71. A key factor in Lys that PWM signals are to be transmitted in one orientation. The PWM signal sent from the control facility 3500 is not transmitted to the converter facility 1908. Instead, as shown in Fig. 17, the converter 1908 only receives input from the AC line and data converter. There is no teaching in Lys of the lighting unit generating and sending a PWM control signal to the converter 1908, indeed this would likely cause issues with the system. Specifically, Lys states that converter 1908 is integrated with the lighting unit 102, which is controlled by the three wire power/data with no discussion of data going in the other direction. Lys, 60:18-24 Even if a PWM signal is sent to the converter 1908, there is no indication it would then be supplied to the first and second strings.

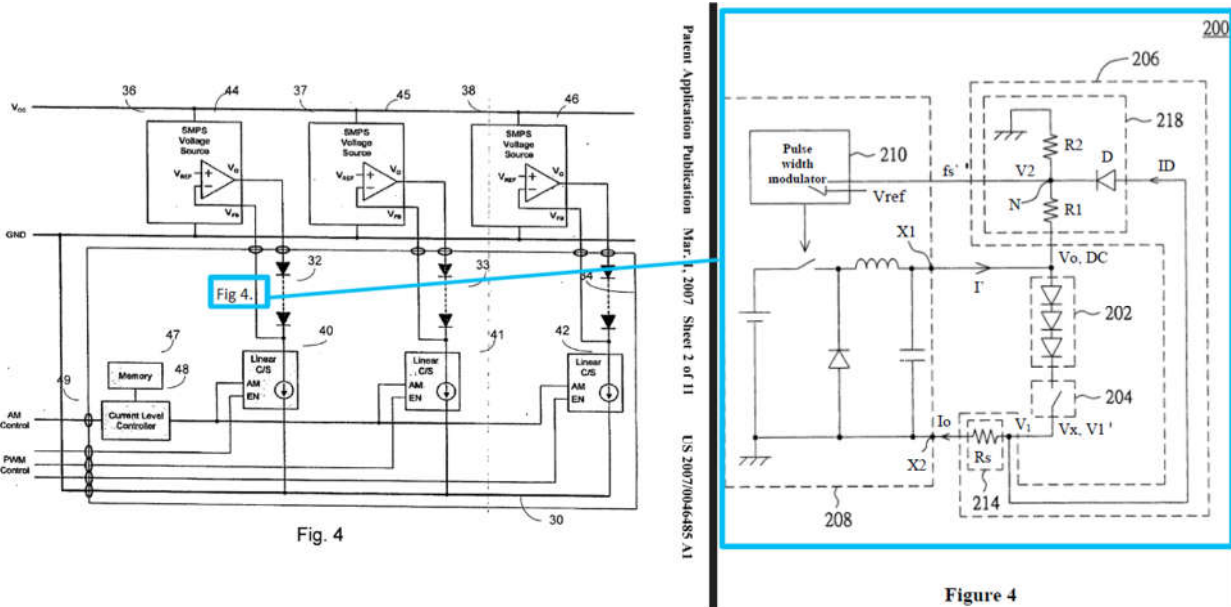
72. Lys explicitly describes that each light string would have its own microprocessor, and therefore each string would have its own PWM controller. This is further explained in Lys “The PWM signal can also be a PWM Digital-to-analog converter (DAC) such as those from Maxim and others.” Lys, 83:17-25.

73. Lys’s reference to a “a current control mode...and a separate PWM mode” is not two PWM control signals, it is just one signal that may be modulated by the PWM controller. This is not two distinct signals.

74. The combination of Lys and Grootes as proposed for element 17C is improper. Inserting a PWM between the cathode of the LED and the linear current supplies of Grootes would introduce a potential fault point in the system. In lighting applications such as the ones currently discussed, it would be common to employ a MOSFET PWM. Toggling the current source enable pin is not practical and would result in surges and current spikes. Employing an output side series switch as Petitioner contends would cause an instantaneous high voltage spike across the LED at the time of switch on which would cause damage to the LEDs since it may exceed the LED’s normal input range. Petitioner’s combined system would have a PWM controller for each current supply circuit. Petitioner has posited a system that would perform poorly if at all and still does not anticipate the invention of the ’331 patent. In short, Petitioner has failed to demonstrate an effective way to combine the PWM signals of Lys with the linear current supply of Grootes.

**VIII. GROUND 2 - PETITIONER'S LYS, GROOTES, AND XU IN VIEW OF A POSITA
FAIL TO RENDER OBVIOUS DEPENDENT CLAIMS 18-20 AND 22-25 &&&**

A. There is No Motivation to Combine Lys, Grootes, and Xu.



(Annotations added by Patent Owner)

75. Combining Xu to the Lys-Grootes combination would result in a non-functional system. First, the boost converter circuit 208 would be connected to the anode of LEDs 32 in Grootes. Consequently, this would mean that the stable DC voltage output of circuit 208 in Xu would be connected in series with the output voltage of the voltage source 44 in Grootes. The effect of this could cause the voltage across LEDs 32 to be greater than intended, thus likely causing the diodes to operate at higher voltage than intended. The voltage outputs would interfere with either the feedback circuit 206, the boost converter 208, the PWM control/voltage source 44 in Grootes, or any combination of those circuits

76. Another problem with this proposed combination is that the feedback signal in Grootes would interfere with the feedback loop of Xu. Essentially, the feedback signal would have to be connected in parallel with the two different circuits causing interference. This would result in two separate voltage supply circuits to the same LED strips. These two voltage supply circuits would operate independently but would have the outputs connected in series. This would likely cause the diodes to not operate correctly, or to breakdown due to over supplying voltage. Further, the combination would totally neglect the current control/PWM control methods described in each patent and cause more undue complexity.

77. Petitioner has overlooked the fact each of Lys, Xu, and Grootes have a specific method and circuit design to control the LEDs which are not easily combinable. Completed circuits cannot just be mashed together without complete redesigns. Lys, Xu and Grootes each describe unique PWM control systems. See Lys, Fig. 25a; Grootes at [0017], [0038], [0043]; Xu, [Embodiments 1 and 2]. The proposed combination has a high possibility of a signal mismatch between the three PWM signals and control methodologies, which would result in failure.

78. No reasonable argument has been presented as to why a POSITA would want to add more PWM control methods, or other circuitry (feedback resistor, boost converter, etc.) such as those in Xu, to Lys or Grootes. The Petition does not address the issues in combining those systems or the lack of improvement to the

overall system. On the other hand, a POSITA would not be motivated to combine them since they would not want to add additional and unstable complexity and would not find the combination to be an improvement over any one of the individual systems described by Xu, Grootes and Lys.

B. There is no motivation to combined Lys, Grootes and Xu to achieve the elements of dependent Claim 18

79. As discussed above, one would not be motivated to combine the teachings of Lys, Grootes and Xu and therefore would not arrive at the elements of claim 18.

80. The PFC/DC to DC converter 1908 of Lys reduces the high AC voltage to suitable level for the lighting unit 102. As I previously stated, a PFC/DC to DC converter is not equivalent to the current supply circuit but rather the “power factor correction or PFC” requires the varying load current to be in-phase with the varying AC voltage to minimize power usage in large variable systems. A POSITA would not combine the boost converter of Xu with the high voltage PFC/DC to DC converter of Lys, as it would likely destroy the lighting unit 102.

C. There is no motivation to combined Lys, Grootes and Xu to achieve the elements of dependent Claim 19

81. A POSITA would not add another switch, sense resistor and a feedback loop with a voltage reference and a comparator as shown in Xu’s figure 2 to Lys’s PFC/DC to DC converter. The referenced circuitry in Lys is dedicated to high

voltage conversion. Adding unnecessary circuitry, such as what is disclosed in Xu, would not improve the control of the lighting unit 102. not that the power supply does so in combination with the PWM. Furthermore, in the combined system, the feedback output would not be provided to the PWM. This combined system would not result in a better method of controlling the LEDs.

D. Lys, Grootes and Xu Fail to Render Obvious Dependent Claim [19A] “a temperature sensor that is configured to generate a sensor output signal that the PWM controller uses to generate the first PWM signal or the second PWM signal”

82. A POSITA would not be motivated to include a temperature sensor in the high voltage PFC/DC to DC conversion unit for a multitude of reasons. First, the temperature sensor value would be incorrect or inaccurate when surrounded by high voltage circuits. Second, the temperature sensor signal would interfere with, or be degraded by, the high voltage circuitry. Additionally, the PCF/DC to DC conversion unit is to convert high voltage to the lower voltage for the lighting unit – its purpose is not to supply signals such as temperature signals.

E. Dependent Claim 20

83. Xu does not teach first and second current supply circuits coupled to the feedback input. Instead, Xu only describes one feedback loop. Also, Xu does not describe a sense resistor coupled to the output of a current control supply, but a sense resistor coupled to the cathode side of the LEDs.

IX. GROUND 4 – THE COMBINATION OF MUELLER AND GROOTES IN VIEW OF A POSITA FAILS TO RENDER OBVIOUS CLAIM 17.

A. A POSITA Would Not Be Motivated to Combined Mueller and Grootes.

84. Mueller (like Lys described above) is directed to a networked lighting system for lighting displays in a variety of applications but not for backlighting for an LCD panel. Grootes, on the other hand, relates to LED backlighting for LCD panels.

85. The disclosures in Mueller is directed towards creating a networked lighting display. There is no motivation for why a POSITA would look to a compact backlight from an LCD panel to modify a networked lighting system for lighting displays, nor does Petitioner provide one. Instead, a POSITA would not combine the two as LCD backlight has nothing to do with computer controlled networks.

86. It would be impractical if not impossible to modify Mueller to include Grootes' independent current source for each string of LEDs. The way in which the invention of Mueller is arranged precludes an independent current source. Because Petitioner claims that the LUCs of Mueller are analogous to the current supply circuits of the '331 patent and there, a POSITA would need to either modify the LUCs to include a current supply circuit or place the current supply circuit after the LUC and before the lighting unit. However, either configuration is unworkable

given that Mueller states that processor is used to control the lamp's drive electronics.

Mueller [0156]

B. Mueller and Grootes Fail to Disclose [from Claim 17B] “at least first and second current supply circuits coupled to the at least first and second strings of solid state lighting devices, respectively, and configured to supply an on-state drive current to a respective one of the first and second strings of solid state lighting devices.”

87. Even if one was to assume that Mueller and Grootes could be combined, claim 17B is not taught by the combination.

88. Petitioner, citing Mueller, states that the “LUCs...shown in FIG.2 may be configured to be ‘intelligent’ in that the central controller may be configured to communicate higher level commands to the LUCs that need to be interpreted by the LUCs before lighting control information can be forwarded to the lighting units 100.” Petition at 51. Petitioner then concludes that a “POSITA would recognize that this discloses or at least suggests that each lighting unit includes its own power supply.” *Id.* However, a POSITA would not draw such an inference from the above information. This referenced section of Mueller in no way states that the LUCs provide power to the lighting units.

89. Mueller does not characterize the LUCs as current supply circuits, rather the LUCs of Mueller are akin to routing nodes in a network that passage information from a central controller to the lighting units. The “DMX-based communications” referenced above are described as “a lighting command protocol

conventionally employed in the lighting industry for some programmable lighting applications.” Mueller at [0183];

90. The only reference to current control that relates to a discrete element in Mueller is as follows: “[s]dditional examples of a signal source 124 include various metering/detection devices that monitor electrical signals or characteristics (e.g. voltage, current, power, resistance, capacitance, inductance, etc.)” Mueller at [0178]. However, referenced signal source 124 is not a part of the LUCs of Mueller. Rather, as shown below in figure 1, communication 120, which is the communication from the LUCs to the lighting units, is separate from signal source 124 and signal 122

91. The lighting units of Mueller are not strings of solid state lighting devices. Lighting units 100 referenced in Fig. 2 of Mueller refers to the whole apparatus of Fig. 1. Mueller includes multiple components between the LUCs and the light sources 104 that are not claimed or required by the’331 patent and Mueller does not disclose or describe a current supply circuit anywhere in the specification. Some of these components from Mueller would be extraneous in an LCD display backlight while others of these components from Mueller would be detrimental to the performance of an LCD backlight. This is because LCD display backlight system are compact stand alone systems, not part of some large integrated, industrial network like Mueller.

92. The LUC of Mueller does not provide an on-state drive current. As described and depicted in Mueller and depicted in the figures, the LUC cannot provide an on state drive current. They are on the other side of connection 120 from the power supply 108. The invention of Mueller is arranged in a completely different manner than that of the '331 patent and in a way that precludes the LUCs from providing an on-state drive current.. For example, Mueller as described in [0156] puts that function into the lighting unit 100's processor and power supply 108.

93. Combining Mueller with Grootes does not overcome the issues described above. There is no explanation at all how Mueller would be combined with Grootes to satisfy claim 17B because such a combination would be impractical, if not impossible. Presumably, Petitioner intended the LUCs to be modified so as to provide individual current control for each string. However, Petitioner does not explicit state this or explain how this would be achieved.

94. The lighting units of Mueller include power sources 108. Thus, by placing the current circuit in the LUC would have the on state drive current being transmitted over communication facility 120 which is not an electrical connection but rather a data transmission line. Further, placing the current supply circuit before the power supply, that is in the LUC, is not workable. This arrangement makes no sense.

C. Mueller and Grootes Fail to Disclose [from Claim 17C] “a pulse width modulation (PWM) controller that is coupled to the first

current supply circuit and the second supply circuit and that is configured to generate, for each of the first current supply circuit and the second current supply circuit, a first PWM control signal and second PWM control signal that are supplied to each of the at least first and second strings.

95. In Mueller, the control system 6900 functions as a current controller with a modulating PWM controller which can switch between “a current control mode...and a **separate** PWM mode.” Mueller at [0315]. Although Petitioner claims that each LED string receives two PWM control signals, in reality, it is just one signal that may be modulated by the PWM controller. In short, this is not the same as two distinct signals and it cannot drive two separate strings of LEDs. This is further apparent by examining the diagram of Figure 69. The two blocks are linked, the signal is passed between current controller 6904 and PWM controller 6908. This is similar to Lys.

96. Inserting a PWM between the cathode of the LED and the linear current supplies of Grootes would introduce a potential fault point in the system.. In lighting applications such as the ones currently discussed, it would be more common to employ a MOSFET PWM. Employing an output side series switch as Petitioner would have it would cause as instantaneous high voltage spike across the LED at the time of switch on which would cause damage to the LEDs.

X. GROUND 5 – THE COMBINATION OF MUELLER, GROOTES AND XU IN VIEW OF A POSITA WOULD NOT RENDER OBVIOUS DEPENDENT CLAIMS 18 & 20.

A. A POSITA Would Not Be Motivated to Combined Mueller, Grootes and Xu.

97. Petitioner argued that the LUCs are the current supply circuits. So, based on Petitioner's arguments, the constant on current and current voltage current from Xu would be implemented in the LUCs of Mueller. This combination is inoperable and would not result in an improved lighting system. First, the LUCs don't supply current to the LEDs. Therefore, implementing Xu into the LUCs of Mueller would not do anything to improve the operation or color temperature control of the LEDs. The LUCs of Mueller primarily route information to the lighting unit 100; implementing Xu into the LUC would result in either a degradation of the control information or a system malfunction.

98. Also, the LUCs in Mueller don't operate using feedback controls. The LUCs do not send feedback signals into any feedback input. Implementing the feedback circuit from Xu into the LUCs of Mueller would override Mueller's control method and cause system issues. A POSITA would not view the Xu – Mueller combination as improvement, but as unnecessary complexity

99. Additionally, a POSITA would have to add more than simply a sense resistor to implement Xu's version of constant current control in Mueller. A POSITA would know that another switch, along with the sense resistor and a feedback loop

with a voltage reference and a comparator (partially obscured) as shown in Xu's Fig. 2 are needed to make the combination. Alternatively, Fig. 2 of Xu would need to have Mueller's figure 69 inserted. Also, some kind of 3-way control logic would need to be developed, all of which would make a POSITA realize the combination is overly complex and likely not functional.

B. Claim 20 is Not Rendered Obvious by the Combination of Mueller, Grootes and Xu.

100. Petitioner argues that the LUCs in Mueller are equivalent to the current supply circuits but Mueller never teaches or describes a feedback sensor or feedback loop in the LUCs. The design of claim 20 is opposite to Mueller's invention, in that the LUCs (Lighting Unit Controllers) are tasked with providing control information to the lighting units. The LUCs of Mueller are not coupled to the feedback input in the lighting units. Additionally, Mueller does not disclose a sense resistor coupled to the output of the LUCs. Therefore, Mueller does not teach the elements of claim 20.

101. I declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Declaration of William K. Bohannon
Ex. 2001

IPR2023-01401
Patent No. 8,941,331

Dated December 21, 2023,

By 
William K. Bohannon,