

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ADVANCED LIGHTING CONCEPTS LLC,
Petitioner

v.

MATE LLC.,
Patent Owner

Case No. IPR 2023-01264

U.S. Patent No. 9,078,310

DECLARATION OF JOSEPH C. McALEXANDER IN SUPPORT OF
PETITIONER'S PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT
NO. 9,078,310 UNDER 35 U.S.C. §§311-319 AND 37 C.F.R. §42.100 ET SEQ.

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INTRODUCTION

1. My name is Joseph C. M^cAlexander III, President of M^cAlexander Sound, Inc., located at 101 W. Renner Rd., Suite 350, Richardson, TX 75082. I have been retained by Munsch Hardt Kopf and Harr, Counsel for Advanced Lighting Concepts LLC d/b/a Environmental Lights (“EL”) in connection with the above-captioned matter, to provide my analyses and conclusions in this *inter partes* review proceeding before the United States Patent and Trademark Office regarding U.S. Patent No. 9,078,310 (“the ‘310Patent”).

2. I understand that mate., LLC is the Plaintiff and that EL is the Defendant in a patent infringement case filed in the United States District Court for the Southern District of California, Civil Action No. 3:22-cv-0195-CAB-DEB.

3. I submit this declaration based on my personal knowledge and experience, as well as the materials that I reviewed and considered in formulating my opinions.

QUALIFICATIONS AND EXPERIENCE

4. I am a technical expert in the subject matter areas relevant to the ‘310 Patent, including the design and testing of LED drivers and dimmers. I am qualified to reach the opinions and conclusions stated in this Declaration. I address my background and qualifications in Section I below and provide additional detail in my CV submitted with this report.

5. I am the Founder and President of M^cAlexander Sound, Inc., formerly IP Director of CCI and Vice President of EPI Technologies, Inc.

6. I am a Registered Professional Engineer (#79454) in the State of Texas and am also a senior lifetime member of the Institute of Electrical and Electronics Engineers, Inc. (IEEE) and, in particular, have joined the Computer, Electron Devices, and Solid State Circuits societies of IEEE. I hold a Bachelor of Science degree in Electrical Engineering from North Carolina State University and completed 1.5 years of graduate level studies in Neurophysiology at the University of Texas Graduate School of Biomedical Science. I have been associated with the integrated circuit and electronics industry as a designer and consultant for the past 50 years and am a named inventor on 31 U.S. patents and a number of foreign patents, some of which are related to LED systems.

7. My skills and experience are in the areas of circuit design and analysis, device fabrication and assembly, testing, marketing, control system design and analysis, manufacturing operations, software development, management, and respective areas of quality, reliability, and defect/failure analysis. Specifically, I have:

- designed memories, including Dynamic Random Access Memories (DRAMs), Static Random Access Memories (SRAMs), Charge Coupled Devices (CCDs), Shift Registers (SRs), and functional circuits including I/O buffers for address and data, decoders, clocks, sense amplifiers, fault tolerant (incorporating both non-volatile EPROM and random access memory components), parallel-to-serial data paths for video applications, level

shifters, converters, pumps, and logic, as well as wireless communication systems and MEMs;

- managed operations including engineering, training, and quality assurance for device fabrication, assembly, test, analysis, and reliability assessment, as well as manufacturing control, each of which involved both volatile and non-volatile memory; testing, analysis, and control involved use of mechanical calibration and measuring equipment, including optical, scanning e-beam, IR, capacitive, and laser using phase contrast and Fast Fourier Transform (FFT) for High Aspect Ratio Inspection (HARI) applications;
- taught courses in solid-state device physics, integrated circuit design, integrated circuit fabrication, and statistical control; provided expert services, investigating both process and design technologies of various devices (microprocessor and controller, volatile and non-volatile memory, programmable logic, card, tag, module, mixed signal, custom, and other), systems (PC and peripheral, computer, control, laser measurement, switch, architecture, software, and other), and consumer products (medical, TV, telephone, VCR, facsimile, copier, lighting, game, and other); and designed and managed development, testing, and evaluation of memory devices and systems incorporating such devices, including simulation of operation. I have also had experience in programming, erasing, and wearout of electrically programmable and erasable non-volatile memories.

8. Of particular relevance is my experience as an integrated circuit designer, manager, and consultant. I spent nine years designing integrated circuit products at Texas Instruments, Inc., and an additional five years there managing wafer fabrication operations and assembly (packaging), test, and reliability analysis facilities. As such, I participated directly in the strategic design and process decisions required to bring competitive products to market and managed cost and revenue (both projected and actual) associated with those marketed products. I also worked directly with clients regarding product manufacturer-to-customer integration,

implementing direct-ship-to-customer productivity enhancements and establishing and executing product reliability and performance assessment studies. Often, such analyses suggested that certain modifications be made to design, fabrication, or assembly structures or methods, or to product flow and distribution. It was my responsibility to implement selected improvements to achieve the designated goals without negatively impacting the revenue models and time-to-market projections while maintaining and improving product yield and reliability.

9. As a designer and design manager, for example, I developed new, leading edge technology designs from conception to production. As such, my designs were always created in parallel with innovations in design simulation, in wafer processing, and in packaging architecture. I had to develop simulation behavioral models, tested against actual prototype designs, to determine the most appropriate fit between design, process, and assembly to deliver the best product to the market. In each case, my product prototype and production designs worked the first time; and the memory products were widely accepted in the market by major OEM companies.

10. I also worked with consumers evaluating performance of my designs in system applications to better match those designs to the consumers' requirements. New outgoing test methods and algorithm test patterns were designed to improve overall performance and reliability and to provide feedback for design and process

improvements. I thus developed a comprehensive understanding of the key factors, such as design, process, assembly, cost, equipment, facility, personnel resources, and timing necessary to bring a product from conception to market. These factors have continued to be key contributors to the success of products throughout the history of integrated circuits, even to the present.

11. Additionally, I have evaluated and provided expert services related to memory technology, both as standalone components and as components integrated into memory modules and systems, and also process and design technologies of various devices including microprocessors, controllers, memory, and programmable logic. I have also provided expert services related to product procurement and contract purchase order fulfillment according to contract agreement deliverables. I am also knowledgeable of communication control, addressing, and data transfer protocol as it relates to system architecture.

12. Additionally, I have innovations in the areas of LED technology, as embodied in a number of my patents, including LED drivers.

13. Because of my background, education, training, and experience, I am qualified as an expert to opine on the technology and other, related technical factors. A more detailed account of my work experience and other qualifications is listed in my Curriculum Vitae submitted with this Report as Attachment A.

I. METHODOLOGY AND MATERIALS CONSIDERED

14. My opinions expressed herein are based on my review of the U.S. Patent Nos. 8,525,446 (“the ‘446 Patent”), 8,957,601 (“the ‘601 Patent”), 9,049,759 (“the ‘759 Patent”), 9,078,310 (“the ‘310 Patent”), 9,320,093 (“the ‘093 Patent”) and 9,591,713 (“the ‘713 Patent”) (collectively, the “Challenged Patents”), their respective prosecution histories (including several patents listed within those prosecution histories), extrinsic evidence relating to the technology of the Challenged Patents, and other evidence cited in this declaration.

15. I further understand that this application is a national stage filing under 35 U.S.C. 371 of International Patent Application PCT/CA2009/001295, filed on Sep. 17, 2009, which claims the benefit of priority of U.S. Provisional Application No. 61/097,963, filed Sep. 18, 2008, and that the Patents all but the ‘713 Patent share the same specification. My opinions are also based on my technical experience, knowledge, and expertise in the area of LED drivers and dimmers.

16. More specifically, for this work, I have been asked to review the ‘310 Patent including the specification and claims, the ‘310 Patent’s prosecution history (file history). In developing my opinions related to the ‘310 Patent, I have considered the materials cited herein, including those items itemized in the Exhibit Table below.

<u>EXHIBIT</u>	<u>DESCRIPTION</u>
Ex. 1001	U.S. Patent No. 9,078,310
Ex. 1004	File Wrapper for U.S. Patent No. 9,078,310
Ex. 1005	U.S. Patent No. 7,902,769 to Shteynberg
Ex. 1006	U.S. Patent Application No. WO2003067934 to Morgan
Ex. 1007	U.S. Patent Application No. US20120323394 A1 to Gandhi

17. This declaration contains my opinions with respect to the subject matter of this proceeding and with the understandings as set forth herein. I specifically reserve the right to formulate and offer additional or supplemental opinions based on any additional information, depositions, discovery, or evidence that may be provided or derived, future court rulings, or agreements between the parties, to the extent permitted by the Board.

II. OVERVIEW OF LEGAL STANDARDS

18. I do not have any formal legal training, and I am not an attorney. EL's counsel has informed me of certain legal principles that I applied in my analysis. Those legal principles are summarized below.

19. I understand that patent claims are presumed valid and cannot be invalidated unless there is a showing the preponderance of the evidence demonstrates that the claim is invalid.

20. The following section summarizes the law as I have been instructed to apply it in formulating and rendering my opinions found later in this declaration. I understand that, in an *inter partes* review proceeding, patent claims may be deemed unpatentable if it is shown that they were anticipated or rendered obvious in view of the prior art. I understand that prior art in an *inter partes* review is limited to patents or printed publications that predate the priority date of the patent at issue.

A. Person of Ordinary Skill in the Art

21. I was asked to provide my opinion as a person of skill in the art as it relates to the '310 Patent during the period leading up to the earliest claimed priority date. I considered several factors, including the types of problems encountered in the art, the solutions to those problems, the pace of innovation in the field, the sophistication of the technology, and the education level of active workers in the field. I provide that level below in Section V.

B. Anticipation

22. I understand that when determining whether a claim is anticipated is based on underlying factual issues including the content of the prior art and the level of ordinary skill in the art. I further understand that for a single reference to anticipate a claim, “the four corners of [that] document describes every element of the claimed invention, either expressly or inherently, such that a person of ordinary skill in the art could practice the invention without undue experimentation.” *In re Hodges*, 882

F.3d 1107, 1111 (Fed. Cir. 2018) (citing *Spanson, Inc. v. Int’l Trade Comm’n*, 629 F.3d 1331, 1356 (Fed. Cir. 2010)).

23. Invalidity for anticipation requires that “[t]he identical invention must be shown in as complete detail as contained in the patent claim.” *TF3 Ltd. v. Tre Milano, LLC*, 894 F.3d 1366, 1374 (Fed. Cir. 2018).

C. Obviousness

24. I understand that when determining whether a claim is “obvious,” the analysis is based on underlying factual issues including the content of the prior art and the level of ordinary skill in the art. I further understand that for a single reference or a combination of references to render the claimed invention obvious, a POSITA must have been able to arrive at the claims by modifying or combining the references.

25. I have further been informed and understand that a claim is unpatentable as obvious if the difference 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 POSITA.

26. I also have been informed and understand that the combination of familiar elements according to known methods is obvious when it does no more than yield predictable results. However, I further understand that a patent claim composed of several elements is not proved obvious merely by demonstrating that each of its

elements was, independently, known in the prior art. I understand that, to prove a claim would have been obvious, one must demonstrate that a POSITA would have been motivated to combine or modify the prior art to achieve the claimed invention, while having a reasonable expectation of success in doing so.

27. I further understand that a claim may be obvious if common sense directs one to combine multiple prior art references or add missing features to reproduce the alleged invention recited in the claims. I also understand that if a POSITA could implement a predictable variation, then the claim is likely unpatentable. For the same reason, if a technique has been used to improve one device and a POSITA would recognize that it would improve similar devices in the same way, then using the technique is obvious. I further understand that a claim can be obvious if it combines old elements with no change to their respective functions, or alters prior art by merely substituting one element for another known in the field to yield a predictable result.

D. Claim Construction

28. I have been advised that “in an *inter partes* review proceeding, a claim of a patent . . . shall be construed using the same claim construction standard that would be used to construe the claim in a civil action . . ., including construing the claim in accordance with the ordinary and customary meaning of such claim as is understood by” a person of ordinary skill in the art (“POSITA”). 37 C.F.R.

§ 42.100(b). Each claim term challenged by this Petition should be construed in accordance with its ordinary and customary meaning for the purposes of resolving the issues raised in this Petition.

29. I have followed these principles in my analysis throughout this declaration.

III. LEVEL OF ORDINARY SKILL IN THE ART

30. In determining the characteristics of a person of ordinary skill in the art at the time of the claimed invention, several things should be considered, including the factors discussed below, as well as (1) the levels of education and experience of the inventor and other persons actively working in the relevant field; (2) the types of problems encountered in the field; (3) prior art solutions to these problems; (4) the rapidity in which innovations are made; and (5) the sophistication of the relevant technology.

31. All of the opinions that I provide herein are provided through the lens of a person having ordinary skill at the relevant time (prior to 2006, which I understand is the priority date claimed by the '310 Patent). In my opinion, a person having ordinary skill in the art ("POSITA") at the time of the alleged invention would have had at least a bachelor's degree in electrical engineering, computer science, or a related field and significant experience with power regulation devices, like LED drivers and dimmers.

32. I am prepared to testify as an expert in this field and also as someone who had at least the knowledge of a POSITA, and someone who worked with other POSITAs at the time of the alleged invention.

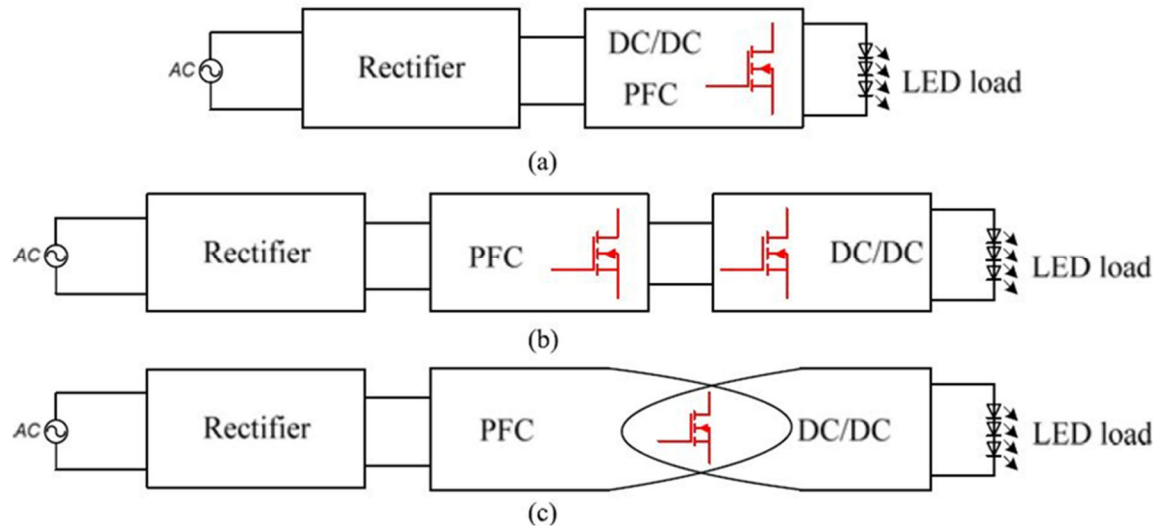
IV. TECHNICAL BACKGROUND AND THE ‘310 PATENT

A. Background of the Relevant Technology

33. The Challenged Patents relate to LED drivers. “LED drivers are devices that regulate and supply the power used to ‘drive’ runs of LED strip lights. Similar to traditional transformers, they convert mains voltage (240v AC) into a lower value (usually 12 or 24v).” What Is an LED Driver & Which Driver Do I Need?, ULTRA LEDS, <https://www.ultraleds.co.uk/what-is-led-driver-what-driver-do-i-need> (last visited July 29, 2023).

34. “Generally speaking, the driver circuit plays a significant role in dominating the energy efficiency, which means the system efficiency can be further improved via an appropriate driver circuit. Traditional LED systems are based on single-stage or two-stage LED drivers.” Yijie Wang, et al., A Review of LED Drivers and Related Technologies, 64 IEEE TRANSACTIONS ON INDUS. ELECTRONICS 5754, 5754 (July 2017).

35. A single-stage LED driver is a DC/DC converter with constant output current that can obtain power factor (PF) correction (PFC), while a two-stage system consists of a PFC circuit and a DC/DC converter as shown below. *Id.*



Id. at 5756 fig. 3.

36. “Due to the unique characteristics of LEDs, a current loop is always included in the [DC/DC stage] in order to acquire constant current control. Moreover, in practical applications when several strings of LEDs are adopted, a current balance stage may also be required. The advantage of the above two LED drivers is that they are easy to design with more accurate control. However, one of the drawbacks of single stage converters is the high value of the storage capacitor, which also increases the volume of the driver. As for the two-stage system, more devices are needed, which means the cost is quite high and reliability is relatively low.” *Id.* at 5754-55.

37. “In recent years, many integrated-stage topologies are designed for the sake of efficiency and cost.” *Id.* at 5755. “In order to obtain high PF and low total

harmonic distortion (THD), a topology which performs PFC characteristics as PFC stage is usually chosen, and a [DC/DC] stage is selected according to the power level of the system.” *Id.* Due to the integration technology, the PFC stage and DC/DC stage can be simplified into one stage by sharing active power switches and a control circuit. Therefore, cost and size of the system is reduced while ensuring high efficiency, high reliability, and fast output dynamics. *Id.*

B. Overview of the ‘310 Patent

38. The ‘310 Patent describes a configurable light emitting diode (LED) driver/dimmer for controlling a set of light fixture loads. Ex. 1001, Abstract. The ‘310 Patent purports to address the considerable challenges faced by lighting companies in adopting SSL technology due to their unfamiliarity and lack of expertise in the driving and dimming requirements for LEDs. Ex. 1001, 1:38-41.

39. The ‘310 Patent further notes “[w]ith the rapid increase in light emitting diode (LED) efficacies for high powered LEDs, the latest technologies have exceeded incandescent and halogen sources and are now starting to compete with fluorescent, mercury vapour, metal halide, and sodium lighting. In addition to better energy usage, LEDs also have considerable advantages over traditional light sources such as long life, better durability, and improved color generating abilities.” Ex. 1001, 1:20-27.

40. “In recent years, controllable power sources for Solid State Lighting (SSL) applications have entered the market with integrated features. In addition, digital controllers within power sources have enabled the development of configurable options to provide a wider flexibility of solutions for [SSL] applications.” Ex. 1001, 1:31-36. Finally, the ‘310 Patent states “[t]he ability to dim the light output of LEDs is also important to reduce energy consumption.” Ex. 1001, 1:36-37

C. The Alleged Invention

41. The claims of the ‘310 Patent are generally directed to a configurable LED driver for powering a set of light fixture loads. The LED driver of the ‘310 Patent includes a set of output current drivers, each of the set of output current drivers connected to one of the set of light fixture loads for controlling the associated light fixture load, and a secondary controller for controlling the set of output current drivers. The driver also includes an apparatus for mapping the set of output current drivers to various dimming zones and for mapping output channels into groups. Ex. 1001, Abstract.

D. Summary of Prosecution History

42. The application that issued as the ‘310 Patent (US14/597,788) was filed on January 15, 2015 and is a continuation of U.S. Patent Application No. 13/941,871, filed July 15, 2013, which is itself a continuation of U.S. Patent

Application No. 13/059,336, now U.S. Patent No. 8,525,446, filed February 16, 2011, which is a national stage filing under 35 U.S.C. 371 of International Patent Application PCT/CA2009/001295, filed on September 17, 2009, which claims the benefit of priority of U.S. Provisional Application No. 61/097,963, filed September 18, 2008. Ex. 1001, Cover Page.

43. In a Preliminary Amendment, the applicant amended the Abstract to recite that the LED driver includes an apparatus for mapping the set of output current drivers to various dimming zones and for mapping output channels into groups. Ex. 1004, at 55.

44. A Notice of Allowability was mailed on May 11, 2015, allowing claims 1-20. Ex. 1004, at 22-27. In the Notice, the Examiner provided that the prior art did not disclose a configurable light emitting diode (LED) driver for powering a set of light fixture loads that included an apparatus for mapping the set of output current drivers to various dimming zones and for mapping output channels into groups. Ex. 1004, at 27.

45. For the reasons provided below, an LED driver containing an apparatus for mapping output current drivers to dimming zones and for mapping output channels into groups was known in the prior art at least since 2006.

E. Overview of the Prior Art

46. The challenged claims are anticipated by or are obvious over the following prior art.

47. U.S. Patent No. 7,902,769 (“Shteynberg”) was filed on January 19, 2007, and claims priority to provisional application No. 60/760,157 filed on January 20, 2006. Ex. 1005, Cover Page. Shteynberg was issued on March 8, 2011, and is prior art to the ‘446 Patent under pre-AIA § 102(a). Ex. 1005, Cover Page. Shteynberg teaches a system, apparatus, and method for supplying power to solid-state lighting devices, such as for providing power to light-emitting diodes (“LEDs”) and LEDs integrated with digital controllers or processors. Ex. 1005, 1:19-22, figs. 7, 8, & 10.

48. More specifically, Shteynberg discloses the invention allows “for solid state lighting, such as LEDs, to be utilized with the currently existing lighting infrastructure and to be controlled by any of a variety of switches, such as phase modulating dimmer switches, which would otherwise cause significant operation problems for conventional switching power supplies or current regulators. The exemplary embodiments further allow for sophisticated control of the output brightness or intensity of such solid state lighting and may be implemented using fewer and comparatively lower cost components.” Ex. 1005, 1:46-57.

49. WIPO (PCT) Application No. WO2003067934 A2 to Morgan (“Morgan”) was filed on July 8, 2005, and claims priority to the following U.S. Provisional Applications: Serial No. 60/354,692, filed February 6, 2002, entitled “LED Based Lighting Systems”; Serial No. 60/401,964, filed August 8, 2002, entitled “LED Based Lighting Systems”; Serial No. 60/401,965, filed August 8, 2002, entitled “Methods and Apparatus for Controlling Addressable Systems;” and Serial No. 60/415,897, filed October 3, 2002, entitled “Methods and Apparatus for Illuminating Environments.”

50. Morgan is prior art to the ‘310 Patent under pre-AIA § 102(b). It teaches: Methods and systems disclosed herein include lighting systems that include a platform, circuit board wherein the circuit board comprises at least one circuit; an illumination source, LED, plurality of LEDs; multi-colored LEDs, wherein the illumination source is associated with the platform, wherein the illumination source is mounted on the circuit board; wherein the illumination source is associated with the at least one circuit, wire, bus, conductor, or plurality of conductors, wherein the foregoing comprises at least one data conductor and at least one power conductor, wherein the wire is electrically associated with the circuit through an insulation displacement system.

51. U.S. Patent Application No. US20120323394 to Gandhi (“Gandhi”) was filed on May 7, 2012, and was published on December 20, 2012. Gandhi is prior

art to the ‘310 Patent under pre-AIA § 102(b). Gandhi discloses “[l]ighting systems based on light-emitting devices and more specifically to a method and apparatus of controlling one or more light-emitting diodes (LED) clusters or triplets in order to provide a display of different colors as perceived by a person, and still more precisely, to effect various colors and display patterns from an array of LEDs based on high-low DC logical methods of signaling.” Ex. 1007, 1[0002].

V. SUMMARY OF MY OPINIONS

52. Having reviewed the ‘310 Patent and the prior art discussed herein, I have formed the following opinions:

- U.S. Patent No. 7,902,769 to Shteynberg (“Shteynberg”) discloses all limitations of claims 1, 11-13, 16, and 17, and these claims are anticipated by Shteynberg.
- WIPO (PCT) Application No. WO2003067934 A2 to Morgan (“Morgan”) discloses all limitations of claim 1-2, 5, 11-12 and 16
- The combination of Shteynberg and U.S. Patent Application No. US20120323394 (“Gandhi”) discloses all limitations of claims 2, 3, 5, and 7, and these claims are rendered obvious by this combination.
- I have attached a chart to this declaration establishing the prior art teaches the limitations of each claim. Ex. B.

A. Opinions

1. Ground 1: Shteynberg Anticipates Claims 1, 2, 8, 10-13, and 16-17

53. Independent claim 1 and dependent claims 11-13 and 16-17 of the ‘310 Patent are anticipated by Shteynberg under 35 U.S.C. § 102. In reaching this

conclusion, I provide the opinions as one of ordinary skill in the art.

54. A power circuit generally is any circuit used to carry electricity that operates a load. *Everything About Power Distribution Board Manufacturing*, DAS & Co. (Feb. 22, 2022), <https://www.dasenko.net/blog/post/1670466/electrical-power-distribution-panel-board-in-kolkata#:~:text=A%20power%20circuit%20is%20any,electricity%20that%20operates%20a%20load>. Similarly, a power converter processes and controls the flow of electrical energy by supplying voltages and currents in a form that is optimally suited for user loads, in this case to provide variable brightness levels for solid-state lighting. R. Petrocelli, *One-Quadrant Switched-Mode Power Converters*, CAS–CERN ACCELERATOR SCH. (2015), available at <http://cds.cern.ch/record/2038620>; Roger Bailey, *Proceedings of the CAS–CERN Accelerator School: RF for Accelerators*, CAS–CERN ACCELERATOR SCH. (2012), at 15, available at <https://cdsweb.cern.ch/record/1231364>.

55. In my opinion, the power converter of Shteynberg is analogous to the power circuit of the ‘310 Patent. Therefore, Shteynberg discloses a power circuit.

56. Inrush current occurs when a device is turned on during the initial stage a huge amount of current rushes into the circuit. *Sourav Gupta, Inrush Current – Causes, Effects Protection Circuits and Design Techniques*, CIR. DIG. (Nov. 27, 2019), <https://circuitdigest.com/tutorial/inrush-current-causes-effects-protection-circuits-and-design-techniques>. An inrush current limiter is a component used to

limit inrush current to avoid gradual damage to components and avoid blowing fuses or tripping circuit breakers. Using a resistor in series with a capacitor to limit inrush current, as described in Shteynberg, is analogous to the inrush current limit of the '310 Patent. Using a resistor in series with a capacitor to limit inrush current, as described in Shteynberg, is analogous to the inrush current limit of the '310 Patent. Additionally, A POSITA would understand that the built capability of the power stage to deliver power factor correction is analogous to the power factor correction (PFC) boost connected to the inrush current limit and the DC/DC converter.

57. A buck converter or step-down converter is a DC-to-DC converter that steps down voltage (while stepping up current) from its input (supply) to its output (load). *What is a Buck Converter?*, CIRCUITBREAD (Nov. 12, 2020), <https://www.circuitbread.com/ee-faq/what-is-a-buck-converter>. It would be readily understood that the buck converter of Shteynberg is equivalent to the DC/DC converter disclosed in the '310 Patent.

58. Power factor correction is the process of compensating for the lagging current by creating a leading current by connecting capacitors to the supply. A sufficient capacitance is connected so that the power factor is adjusted to be as close to unity as possible. John Ware, Power Factor Correction, IEE WIRING MATTERS, Spring 2006, at 22, <https://electrical.theiet.org/media/1687/power-factor-correction-pfc.pdf>. The rectifier (110) provides a regulated output voltage and is connected with

impedance matching network (120) and switching power supply (buck converter) (150) is the equivalent of the regulated output voltage bus of the '310 patent. Further, controlling the switching power supply 150 and modifying the brightness (or intensity) provided by the LEDs 140 is equivalent to establishing a power limit. A POSITA would recognize that the rectifier (110) provides a regulated output voltage that is connected with impedance matching network (120) and switching power supply (buck converter) is the equivalent of the regulated output voltage bus of the '310 Patent.

59. A POSITA would understand that the controller disclosed in Shteynberg is equivalent to the primary controller required by the '310 Patent. Ex. 1005, 10:57-61. As such, Shteynberg discloses the primary controller for controlling the power circuit required by claim 1 of the '310 Patent.

60. A POSITA would understand, as discussed above, that controller 160 can be programmed with a set of instructions or other code to map current drivers to dimming zones and map output channels into groups. Additionally, A POSITA would understand that the power sensing module coupled to a power supply input connection to provide power to the one or more lighting units via a power output connection is analogous to a set of output current drivers connected to a set of light fixture loads.

a. Claim 11

61. A digital controller is a system that can be used for controlling closed-loop feedback systems. The controller implements algebraic algorithms such as filters and compensatory to regulate, correct, or change the behavior of the controlled system. Edmund Lai, PRACTICAL DIGITAL SIGNAL PROCESSING FOR ENGINEERS AND TECHNICIANS 10 (1st ed. 2004). A POSITA would understand that controllers, such as microprocessors, digital signal processors (“DSPs”), parallel processors, multiple core processors, custom ICs, application specific integrated circuits (“ASICs”), field programmable gate arrays (“FPGAs”), adaptive computing ICs, and other ICs and components disclosed in the Shteynberg are digital because they each operate using a binary system as opposed to having to modify specific components as with analog controllers. Controllers can be programmed either via programming or hard-wiring which would require a port for connecting the programming device.

b. Claim 12

62. An electronic load is a device which takes electrical energy. *Electrical Load*, CIR. GLOBE, <https://circuitglobe.com/electrical-load.html> (last visited August 2, 2023). A load converts electricity into heat, light, or motion. Kevin Beck, *Types of Electrical Loads*, SCIENCING (Apr. 30, 2018), <https://sciencing.com/types-electrical-loads-8367034.html>. In this way an LED can be an electronic load. With respect to Claim 13, it is my opinion the electronic load 250 and LEDs 140 of

Shteynberg are equivalent to the LED load of the ‘310 Patent.

2. Ground 2: Morgan anticipates claims 1-2, 5, 8, 10-12, and 16

63. Independent claim 1 and dependent claims 2, 5, 8, 10-12, and 16 of the ‘310 Patent are anticipated by Morgan under 35 U.S.C. § 102. In reaching this conclusion, I provide the opinions as one of ordinary skill in the art.

a. Claim 1

64. A flyback converter is essentially a buck converter that is isolated by using a transformer as the storage inductor. Switch Mode Power Supply Topologies: A Comparison, <https://www.we-online.com/en/news-center/blog?d=switch-mode-power-supply> (last visited August 8, 2023); Additionally, a flyback converter has buck-boost functionality and could be easily modified to work in the ‘310 Patent. Power Supply Technology, <https://www.mouser.com/applications/power-supply-topology-flyback/> (last visited August 2, 2023).

65. A POSITA would recognize that Morgan’s disclosure of a control circuit that adjusts and regulates the output in response to a power measurement is equivalent to limiting the inrush current. Therefore, Morgan discloses an inrush current limit.

66. A POSITA would understand that the line filter (4102) of Morgan regulates the output voltage and is connected with PFC (4104) and DC/DC converter

(4110). As such, Morgan discloses a regulated output voltage bus connected to the apparatus for power factor correction and DC/DC conversion of the '310 Patent.

b. Claim 2

67. A POSITA would know that the LUC processor or central controller of Morgan can be a secondary controller.

68. In general, there are two types of communication ports in a computer: serial ports and parallel ports. A serial port is an interface through which peripherals can be connected as a communication channel using a serial (bit-stream) protocol. Usually, a serial mouse is connected to COM1 (communication port 1). The most common type of serial port is a 25-pin D-type connector carrying RS-232 signals. Smaller connectors (*e.g.*, 9-pin D-type) carrying a subset of RS-232 are often used on personal computers. The serial port is usually connected to an integrated circuit called a UART that handles the conversion between serial and parallel data.

69. A parallel port is an interface for a computer to communicate to peripherals in a parallel manner. Data is transferred in or out of the port in parallel, that is, on more than one wire. A parallel port carries 1 bit on each wire, thus multiplying the transfer rate obtainable over a single wire. There will usually be some control signals on the port that indicate when data is ready to be sent or received. The most common type of parallel port is a printer port (*e.g.*, a Centronics port that transfers 8 bits at a time). Disks are also connected via special parallel ports

(e.g., SCSI or IDE). Morris Chang, *Computer Architecture*, in THE ELECTRICAL ENGINEERING HANDBOOK 323, 331 (2004).

70. A POSITA would understand that the address information received through the communication port 120 and the lighting unit's ability to generate certain lighting control signals based on the data received from a programming device is equivalent to using a controller and a port to map output current into groups to produce a desired lighting effect. As such, Morgan discloses the secondary controller and a port for mapping the output channels into groups required by claim 2 of the '310 Patent.

c. Claim 5

71. Claim 5 depends from dependent claim 2. Morgan anticipates claims 1 and 2 for the reasons discussed above. Claim 5 of the '310 Patent requires that the port is an in-circuit serial programming (ICSP) port. Ex. 1001, 11:3-4. The additional limitation of claim 5 is disclosed by Morgan.

72. In-circuit serial programming (ICSP) is the ability of some programmable logic devices, microcontrollers, chipsets, and other embedded devices to be programmed while installed in a complete system, rather than requiring the chip to be programmed prior to installing it into the system. *See In-Circuit Serial Program (ICSP) Guide*, MICROCHIP TECH. INC. (May 2003), <https://ww1.microchip.com/downloads/en/DeviceDoc/30277d.pdf>. ICSPs also

allow firmware updates to be delivered to the on-chip memory of microcontrollers and related processors without requiring specialist programming circuitry on the circuit board and simplifies design work. *What is In-Circuit Serial Programming?*, LEARNING ABOUT ELECTRONICS, <http://www.learningaboutelectronics.com/Articles/In-circuit-serial-programming.php> (last visited Aug. 2, 2023).

73. A POSITA would understand that the programming device is an in-circuit serial port (ICSP). In-circuit serial programming (ICSP) is the ability of some programmable logic devices, microcontrollers, chipsets, and other embedded devices to be programmed while installed in a complete system, rather than requiring the chip to be programmed prior to installing it into the system. The receipt of lighting control instructions by the programming device is equivalent to the ICSP port of the '310 Patent. Therefore, Morgan discloses that the communication port is an in-circuit serial programming (ICSP) port. As such, claim 5 is anticipated by Morgan.

d. Claim 11

74. Claim 11 depends from independent claim 1. Morgan anticipates claim 1 for the reasons discussed above. Claim 11 discloses the primary and secondary controllers are digital controllers. The additional limitation of claim 11 is disclosed by Morgan.

75. Controllers can be programmed with a set of instructions or other code

to map current drivers to dimming zones and map output channels into groups and can be programmed to limit power to dimmer switch. Controller can also be addressable to control individual LEDs or groups of LEDs. Controllers can control a specific LED or specific part of an LED strip or LED.

76. A POSITA would readily understand that the addressable controller, LUC processor, or central controller can interchangeably serve as the primary and secondary controllers. A POSITA would further understand that the addressable controller, LUC processor, or central controller are digital because they each process data as a sequence of discrete values. Therefore, Morgan discloses that the primary and secondary controllers are digital controllers.

3. Ground 3: Shteynberg in View of Gandhi Renders Claims 6, 8-9, and 19-20 Obvious

77. Claims 6, 8-9, and 19-20 of the '310 Patent are rendered obvious under 35 U.S.C. § 103 by Shteynberg in view of Gandhi.

a. Claim 6

78. A communication interface is any wireless or wired technology that is used to connect devices to one another, such as the Internet remote servers, etc. Vlasios Tsiatsis, INTERNET OF THINGS (2d ed. 2019). With respect to Claim 6, a POSITA would understand that Gandhi's disclosure of using a complimentary output data signal (such as from computer interface 130) as an input from a microcontroller 242 port pin is analogous to a communication interface for receiving

data from an external transmitter, rendering claim 6 obvious.

b. Claim 8

79. Claim 8 of the ‘310 Patent discloses a “communication interface for receiving data from an external transmitter.” Ex. 1001, 11:11-13. Like the ‘310 Patent, Gandhi discloses receiving data from an external transmitter. For example, Gandhi provides “[t]he H-bridge 243 supplies power to the slaves through a connector J3 and maybe a line driver for the signal for the universal asynchronous receiver/transmitter (UART) microchip, U3, of the microcontroller 242. Other H-bridge topologies are envisioned where the common arrangement includes four binary position switches. In the example of FIG. 4F, an H-bridge circuit may be built around a part such as MC33887 that, in this example, may be driven by a CD4049 CMOS IC using a complimentary output data signal as an input from a microcontroller 242 port pin.” Ex. 1007, 4[0043].

80. Gandhi further discloses “FIG. 6C illustrates exemplary circuitry comprising an integrated circuit U22, connector J11, capacitors C24, C25, C26, and C27, functioning as a computer interface 130 control that may be attached to the master 101 (FIG. 1) and that may provide for a WINDOWS™-based graphic user interface (GUI) environment. Via the GUI, the user may program one or more modes into the master control unit 101.” Ex. 1007, 5[0050].

81. A communication interface is any wireless or wired technology that is

used to connect devices to one another, such as the Internet remote servers, etc. Vlasios Tsiatsis, INTERNET OF THINGS (2d ed. 2019). A POSITA would understand that a communications interface is necessary to receive the external and remote data control signal. A POSITA would understand that Gandhi's disclosure of using a complimentary output data signal (such as from computer interface 130) as an input from a microcontroller 242 port pin is analogous to a communication interface for receiving data from an external transmitter, rendering claim 8 obvious.

c. Claim 9

82. Claim 9 depends from dependent claim 8. Claims 1, 2, and 8 are anticipated for the reasons discussed above. The additional limitations of claim 9 are disclosed by Gandhi.

83. A POSITA would understand that the LED driver of Shteynberg containing a secondary controller could be readily modified to include the level converter, which may be used to interface the UART signals to the com port, *e.g.*, the IEEE RS232 C port, of the PC of Gandhi. The Shteynberg-Gandhi combination discloses “[t]he communication interface includes a universal asynchronous receiver/transmitter (UART) to transmit data to the secondary controller.” Ex. 1001, 11:14-16. Thus, the Shteynberg-Gandhi combination renders claim 9 obvious.

d. Claim 19

84. Claim 19 depends from independent claim 1. Claim 1 is anticipated for

the reasons discussed above. The additional limitations of claim 19 are disclosed by Gandhi.

85. Claim 19 of the '310 Patent discloses the LED driver of claim 1 further includes a load controller; a current source; and a current sense. Ex. 1001, 12:17-21. Like the '310 Patent, Gandhi discloses a load controller, current source, and current sense.

86. An electronic load controller or governor is a device which is designed to ensure that the electrical load on a generator remains constant. P. Robinson, *Microprocessor Control of Village Hydroelectric Systems*, in *ENERGY FOR RURAL AND ISLAND COMMUNITIES IV* 165, 165 (John Tidwell, et al. eds., 1985).

87. LED driver changes the power supply to a specific voltage current to drive the LED voltage converter. In general, the input of the LED driver includes the high voltage power frequency AC (*i.e.*, the city electricity), the low voltage DC, the high voltage DC, the low voltage and high frequency AC (such as the output of the electronic transformer). The output of LED driver power is mostly a constant current source that can change voltage with the change of LED forward voltage drop. The core components of the LED power supply include switch controller, inductor, switch component (MOSFET), feedback resistor, input filter device, output filter and so on. According to the requirements of different occasions, there must be input over-voltage protection circuit, input under-voltage protection circuit, LED open

circuit protection, over-current protection circuit and so on. *LED Driver Basics and Its Circuit Design*, APOGEEWEB (Apr. 9, 2018), https://www.power.com/sites/default/files/forum/files/LED%20Driver%20Circuits%20Design_0.pdf (last visited August 2, 2023).

88. In electrical engineering, current sensing is any one of several techniques used to measure electric current. The measurement of current ranges from picoamps to tens of thousands of amperes. The selection of a current sensing method depends on requirements such as magnitude, accuracy, bandwidth, robustness, cost, isolation or size. The current value may be directly displayed by an instrument or converted to digital form for use by a monitoring or control system. Current sense resistors, or shunt resistors, are devices used to gauge the flow of current. They detect and convert current to a measured output voltage. Current sense resistors are generally low-value, high-power resistors. They are designed for low resistance to minimize power consumption and to eliminate the risk of short circuits which are likely to damage other components. Stephen Oxley, *Using Current Sense Resistors to Improve Efficiency*, TT ELECTRONICS, <https://blog.ttelectronics.com/current-sense-resistors#:~:text=Current%20sense%20resistors%2C%20or%20shunt,value%2C%20high%2Dpower%20resistors> (last visited August 2, 2023).

89. A POSITA would recognize that slave microcontroller U30 is a load controller, that integrated circuit elements U1111, U1112, and U1113 serve as a current source, and that R1113, R1112, and R1111 serve as the current sense. Given Shteynberg and Gandhi's shared desire to control current to LEDs, a POSITA would know that the LED driver of Shteynberg could be modified to include the aforementioned circuit components of Gandhi.

B. Motivation to Combine Shteynberg and Gandhi

90. A POSITA would have been motivated to combine Shteynberg and Gandhi for several reasons.

91. First, Shteynberg and Gandhi are analogous art to the '310 Patent because they are in the same field of endeavor—namely, LED Drivers. The '310 Patent defines its “Technical Field” as a “novel LED Driver/dimmer for solid state lighting applications.” Ex. 1001, 1:42-43. Like the '310 Patent, Shteynberg and Gandhi are directed to powering and controlling solid state lighting applications. Ex. 1005, 1:18-22; Ex. 1007, 1[0004].

92. Like the '310 Patent, Shteynberg and Gandhi are directed to powering and controlling solid state lighting applications. Shteynberg discloses that its “Field of the Invention” is in general related to power conversion and more specifically, to a system, apparatus and method for supplying power to solid state lighting devices, such as providing power to light emitting diodes (“LEDs”) and LEDs integrated with

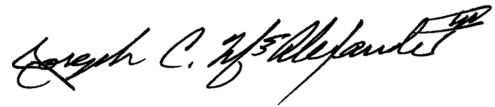
digital controllers or processors. Ex. 1006, 1:18-22. Similarly, Gandhi discloses that “in its several embodiments, generally relates to lighting systems based on light-emitting devices and more specifically to a method and apparatus of controlling one or more Light-Emitting Diodes (LED) clusters or triplets in order to provide a display of different colors as perceived by a person, and still more precisely, to effect various colors and display patterns from an array of LEDs based on high-low DC logical methods of signaling.” Ex. 1006, 1:[0002].

93. Moreover, Shteynberg and Gandhi are analogous to the ‘310 Patent because they are reasonably pertinent to the technical problem allegedly addressed by the claimed invention. For example, the ‘310 Patent describes that a novel LED Driver/dimmer is needed to address the lack of expertise by lighting companies in the driving and dimming requirements for LEDs. Ex. 1001, 1:34-37. Similarly, Shteynberg discloses that “a need remains for an LED driver circuit which can operate consistently with a typical or standard dimmer switch of the existing lighting infrastructure and avoid the problems discussed above (including perceptible LED flicker), while providing the environmental and energy-saving benefits of LED lighting. Ex. 1005, 25:29. Gandhi likewise discloses an LED driver is needed to more precisely, to effect various colors and display patterns from an array of LEDs based on high-low DC logical methods of signaling.” Ex. 1006, 1[0002].

94. Finally, a POSITA, would have had a reasonable expectation of success in making this modification. The LED Driver components described in Shteynberg and Gandhi were well-known at the time. Indeed, a wide variety of off-line LED drivers are known. For example, a capacitive drop off-line LED driver from On Semiconductor (Application Note AND8146/D) is a non-isolated driver with low efficiency, is limited to deliver relatively low power, and at most can deliver a constant current to the LED with no temperature compensation, no dimming arrangements, and no voltage or current protection for the LED.” Ex. 1005, 1:26-33.

95. As such, a POSITA would have recognized it would have been straightforward to modify the LED driver of Shteynberg to include the teachings of Gandhi.

I declare under penalty of perjury that the foregoing is true and accurate.

A handwritten signature in black ink, appearing to read "Joseph C. McAlexander III", written over a horizontal line.

Joseph C. McAlexander III

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Claims	Prior Art References		
U.S. Patent No 9,078,310	U.S. Patent No 7,902,769 to Shteynberg	WIPO (PCT) Application No WO2003067934 A2 to Morgan	U.S. Patent Application No US20120323394 to Gandhi
1[p]. A configurable light emitting diode (LED) driver for powering a set of light fixture loads comprising:	“In accordance with the present invention, therefore, an LED driver circuit is provided which is compatible for operation with the existing lighting infrastructure, such as dimmer switches, and may be coupled directly to and controlled by such dimmer switches.” Shteynberg, 8:9-13.	“Methods and systems disclosed herein include a lighting system that includes one or more of various configurations of LEDs, including an LED, an LED color controllable system, two LEDs, two rows of LEDs, two rows of multicolored LEDs, or LEDs 5 associated with a platform; an addressable controller; an optic, such as an extruded optic, polycarbonate optic, double lobe optic, upper and lower lobe, translucent, transparent, wherein the optic comprises platform guides.” Morgan, 8:27.	

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1(a). a power circuit including:	“A power converter for providing variable brightness levels for solid state lighting, the power converter couplable to a phase-modulating switch which is couplable to an AC line voltage.” Shteynberg, 22:26-29.	“Fig. 43 shows another power supply arrangement with an integrated PFC and DC-DC converter 4302.” Morgan, 122:1-2.	
1(b). an inrush current limit;	“For example, as illustrated in FIG. 5, a switching off-line LED driver 90 typically includes a full wave rectifier 20 with a capacitive filter 15, which allows current to flow to the filter capacitor (C) 15, when the input Voltage is greater than the Voltage across the capacitor. The inrush current to the capacitor is limited by the resistance in series with the capacitor. Under normal operating conditions, there may be a Negative Temperature Coefficient resistor (NTC) or thermistor in	“Again, a control circuit is shown that measures and responds to the output to provide a feedback system to adjust and regulate the output in real-time to maintain voltage levels. The current in the inductor 4504 is rapidly charged and then discharged through diode D3 4508 through control of switch Q2 4510 is typical of such circuits. A small output capacitor 4512 is appended to the	

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	series with the capacitor to minimize inrush current during initial charging.” Shteynberg, 3:42-51.	output to provide additional energy storage and minimize output ripple.” Morgan, 122:17-22.	
1(c). an apparatus for power factor correction and DC/DC conversion; and	“[T]he current regulator 100 comprises a rectifier 10, an impedance matching circuit 120, and a switching power supply (or driver) 130. FIG. 7 is a block diagram of an exemplary second embodiment of a current regulator (or converter) 200 in accordance with the teachings of the present invention.” Shteynberg, 8:65-9:5. “The current regulator 200 also provides power to one or more LEDs 140, which also may be an array or multiple arrays of LEDs 140 or any type or color, with the regulator 200 and LEDs 140	“Fig. 41 shows a typical low voltage switching power supply that incorporates a line filter 4102, power factor correction (PFC) facility 4104, a capacitor 4108 and a DC-DC converter 4110. The line filter provides general rectification and filtering of the high voltage AC input.” Morgan, 121:16-19.	

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	forming a system 180. The current regulator 200 may be coupled directly to a dimmer switch 75 (line 202) for receiving a phase-modulated AC voltage derived from the AC line voltage (35), and may operate in parallel with an incandescent lamp 95, under the common control of the dimmer switch 75.” Shteynberg, 9:9-17. “The switching power supply 150A is implemented in two stages, an AC/DC converter 265 and a buck converter 270.” Shteynberg, 13:65-67. “[The LED driver] has built-in capability to deliver power factor correction without additional power components.” Shteynberg, 16:61-63.		

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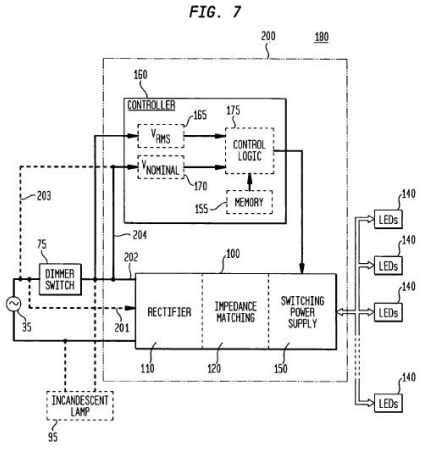
Claims	Prior Art References		
U.S. Patent No 9,078,310	U.S. Patent No 7,902,769 to Shteynberg	WIPO (PCT) Application No WO2003067934 A2 to Morgan	U.S. Patent Application No US20120323394 to Gandhi
	FIG. 7  The diagram illustrates a power supply system (100) within a larger unit (180). A controller (160) is connected to a rectifier (110) and an impedance matching block (120). The controller includes a V_{RMS} input (165), a V_{NOMINAL} input (170), control logic (175), and memory (155). A timer switch (75) is connected to the rectifier (110) and an incandescent lamp (95). The rectifier (110) is connected to the impedance matching block (120), which is then connected to a switching power supply (150). The switching power supply (150) outputs to four LEDs (140). A dashed line (203) indicates a connection from the controller (160) to the timer switch (75). Other components labeled include 180, 200, 201, 202, 204, and 35. Shteynberg, fig. 7.		

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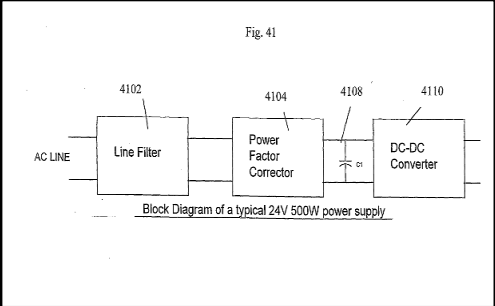
Claims	Prior Art References		
U.S. Patent No 9,078,310	U.S. Patent No 7,902,769 to Shteynberg	WIPO (PCT) Application No WO2003067934 A2 to Morgan	U.S. Patent Application No US20120323394 to Gandhi
	 Shteynberg, fig 41.		
1(d). a regulated output voltage bus connected to the apparatus for power factor correction and DC/DC conversion;	“The current regulator 200 comprises a rectifier 110, an impedance matching circuit 120, a switching power supply (or driver) 150, and further includes a controller 160 coupled to receive an output from the dimmer switch 75.” Shteynberg, 9:5-9. “The switching power supply 150A is implemented in two stages, an AC/DC converter 265 and a buck converter 270. . . . This	“Fig. 45 continues Fig. 44 to the output stage. Element 4108 is duplicated to show the overlap. The output of the high voltage DC output is then fed into the DC-DC converter as shown by a representative circuit diagram. Again, a control circuit is shown that measures and responds to the output to provide a feedback system to adjust	

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	first stage will convert a relatively poor, phased modulated AC voltage into a manageable DC voltage, while the second stage (buck converter 270) will perform LED driving using current PWM, through switching transistor 355 (Q2).” Shteynberg, 13:65-14:8. “The proposed power stage 265 of the converter 100, 200 has the following features making it compatible with the phase modulated input voltage: . . . (3) it uses a relatively small, low filtering capacitor for low frequency ripple, or can allow this ripple to be comparatively high (with filtering in the second stage 270), so smaller and/or a non-electrolytic capacitor may be used (such as a film or ceramic capacitor), decreasing costs and	and regulate the output in real-time to maintain voltage levels. The current in the inductor 4504 is rapidly charged and then discharged through diode D3 4508 through control of switch Q2 4510 is typical of such circuits. A small output capacitor 4512 is appended to the output to provide additional energy storage and minimize output ripple.” Morgan, 122:15-22.	

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Ex. 1005, fig. 7.

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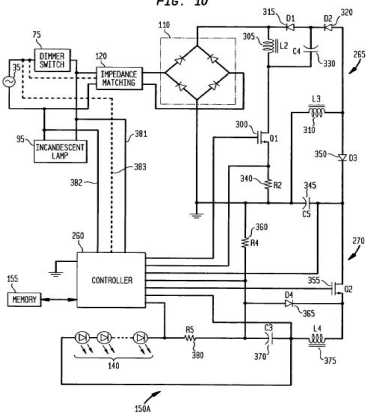
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	 Shteynberg, 13:65-14:8.		
1(e). a primary controller for controlling the power circuit;	“[T]he controller 160 (and 260, FIG. 10) is programmed, adapted or configured to emulate the brightness or intensity control provided by the dimmer switch 75, to control the switching power supply 150 and correspondingly modify the brightness (or	“As discussed further below in connection with Fig. 13, such a ‘binary’ determination of power either being consumed or not consumed by the collection of lighting units coupled to the LUC facilitates an identifier determination/learning	

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of the set of output current drivers connected to one of the set of light fixture loads for powering the connected light fixture load; and	will be wired within existing lighting infrastructure, such as replacing an incandescent bulb (placed within an Edison socket) or replacing an incandescent lamp, with wiring to existing switches, such as dimmer switches. In a second phase, existing switching connections may be re-wired, allowing LED driver circuits to be co-located in the same junction or wall box as the switches, but wired directly to the AC line voltage, with existing switching (such as dimmers) generating only a control signal to regulate LED brightness.” Shteynberg, 8:20-29.	include a processor 102 that is configured to output one or more control signals to drive the light sources 104A, 104B, 104C, and 104D so as to generate various intensities of light from the light sources. For example, in one implementation, the processor 102 may be configured to output at least one control signal for each light source so as to independently control the intensity of light generated by each light source. Some examples of control signals that may be generated by the processor to control the light sources include but are not limited to, pulse	

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		modulated signals, pulse width modulated signals (PWM), pulse amplitude modulated signals (PAM), pulse displacement modulated signals, analog control signals (e.g., current control signals, voltage control signals), combinations and/or modulations of the foregoing signals, or other control signals. In one aspect, the processor 102 may control other dedicated circuitry (not shown in Fig. 1), which in turn controls the light sources so as to vary their respective intensities.” Morgan, 23:4-16.	

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		“Fig. 11 shows a block diagram of a portion of a generic LUC 208 that includes a LUC processor 1102 and a power sensing module 1114. As indicated in Fig. 11, the power sensing module 1114 may be coupled to a power supply input connection 1112 and may in turn provide power to one or more lighting units coupled to the LUC via a plower output connection 1110. The power sensing module 1114 also may provide one or more output signals 1116 to the processor 1102, and the processor, in turn, may communicate to the central controller 202	

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		information relating to power sensing, via the connection 1108.” Morgan, 49:21-29.	
1(g). an apparatus for mapping the set of output current drivers to various dimming zones and for mapping output channels into groups.	“[T]he controller 160 (and 260, FIG. 10) is programmed, adapted or configured to emulate the brightness or intensity control provided by the dimmer switch 75, to control the switching power supply 150 and correspondingly modify the brightness (or intensity) provided by the LEDs 140.” Shteynberg, 9:21-26. “A controller (or processor) (such as controller 160, 260), with its associated memory, may be adapted or configured (via programming, FPGA interconnection, or hard-wiring) to perform the methodology of the	“These illumination sources may be associated with addressable controllers that require setting when incorporated as a part of the network or have preprogrammed lighting control programs to be selected, modified, or generated. A programming device according to the principles of the present invention may be used to program the address or perform other functions as described herein, in these	

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	invention, as discussed below. For example, the methodology may be programmed and stored, in a controller 160,260 with its associated memory (and/or memory 155) and other equivalent components, as a set of program instructions or other code (or equivalent configuration or other program) for Subsequent execution when the processor is operative (i.e., powered on and functioning).” Shteynberg, 18:29-39.	illumination sources as well.” Morgan, 126:23-27.	

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	FIG. 7 Shetynerg, fig.7.		
2. The LED driver of claim 1 wherein the apparatus for mapping comprises: a secondary controller; and		“As discussed further below in connection with Fig. 13, such a ‘binary’ determination of power either being consumed or not consumed by the collection of lighting units coupled to the LUC	

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Claims	Prior Art References		
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a port for mapping the output channels into groups.		facilitates an identifier determination/learning algorithm (e.g., that may be performed by the LUC processor 1102 or the central controller 202) according to one embodiment of the invention. In other aspects, the power sensing module 1114 and the processor 1102 may be adapted to determine, at least approximately, and actual power drawn by the lighting units at any given time.” Morgan, 50:2-8. “The lighting unit 100 may also include a communication port 120 adapted to communicate with a programming	

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		device. The communication port may be adapted to receive data through wired or wireless transmission In an embodiment of the invention, information received through the communication port 120 may relate to address information and the lighting unit 100 may be adapted to receive and then store the address information in the memory 114.” Morgan, 33:1-21). “[T]he lighting unit 100 may be adapted to select a given lighting program, modify a parameter of a lighting program, or otherwise make a selection	

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		or modification or generate certain lighting control signals based on the data received from a programming device.” Morgan, 33:23-26.	
5. The LED driver of claim 2 wherein the port is an in circuit serial programming (ICSP) port.		“[T]he lighting unit 100 may also include a communication port 120 adapted to communicate with a programming device. The communication port may be adapted to receive data through wired or wireless transmission.” Morgan, 33:5-7. “[T]he lighting unit 100 may be adapted to select a given lighting program, modify a parameter of a	

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		lighting program, or otherwise make a selection or modification or generate certain lighting control signals based on the data received from a programming device.” Morgan, 33:23-26.	
6. The LED driver of claim 1 further comprising a communication interface for receiving data from an external transmitter.			“The H-bridge 243 supplies power to the slaves through a connector J3 and maybe a line driver for the signal for the universal asynchronous receiver/transmitter (UART) microchip, U3, of the microcontroller 242. Other H-bridge topologies are envisioned where the common arrangement includes

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			four binary position switches. In the example of FIG. 4F, an H-bridge circuit may be built around a part such as MC33887 that, in this example, may be driven by a CD4049 CMOS IC using a complimentary output data signal as an input from a microcontroller 242 port pin.” Gandhi, 4[0043]). “FIG. 6C illustrates exemplary circuitry comprising an integrated circuit U22, connector J11, capacitors C24, C25, C26, and C27, functioning as a computer interface 130 control that may be

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			attached to the master 101 (FIG. 1) and that may provide for a WINDOWS™-based graphic user interface (GUI) environment. Via the GUI, the user may program one or more modes into the master control unit 101.” Gandhi, 5[0050].
8. The LED driver of claim 2 further comprising a communication interface for receiving data from an external transmitter.			“The H-bridge 243 supplies power to the slaves through a connector J3 and maybe a line driver for the signal for the universal asynchronous receiver/transmitter (UART) microchip, U3, of the microcontroller 242. Other H-bridge

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			topologies are envisioned where the common arrangement includes four binary position switches. In the example of FIG. 4F, an H-bridge circuit may be built around a part such as MC33887 that, in this example, may be driven by a CD4049 CMOS IC using a complimentary output data signal as an input from a microcontroller 242 port pin.” Gandhi, 4[0043]. “FIG. 6C illustrates exemplary circuitry comprising an integrated circuit U22, connector J11, capacitors C24, C25, C26, and C27,

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			functioning as a computer interface 130 control that may be attached to the master 101 (FIG. 1) and that may provide for a WINDOWS™-based graphic user interface (GUI) environment. Via the GUI, the user may program one or more modes into the master control unit 101.” Gandhi, 5[0050].
9. The LED driver of claim 8 wherein the communication interface includes a universal asynchronous receiver/transmitter			“As depicted by the example in FIG. 6B, two I/O pins of the master 101, particularly two I/O pins of the microcontroller UART, U3, may be used for this connection to the GUI

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(UART) to transmit data to the secondary controller.			interface (FIGS. 1B and 1C). FIG. 6C illustrates that the microprocessor may be programmed to function as a UART and may be implemented in a program that may communicate to the computer user interface through port pins. An integrated circuit, such as a level converter, may be used to interface the UART signals to the com port, e.g., the IEEE RS232 C port, of the PC.” Gandhi, 5[0050].
10. The LED driver of claim 8 further comprising an auxiliary flyback converter to provide	“[The] ‘controller’ or ‘processor’ 160, 260 may be any type of controller or processor, and may be embodied as one or more controllers 160, 260, adapted to		

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power to the primary controller, the secondary controller, and the communication interface.	perform the functionality discussed herein. As the term controller or processor is used herein, a controller 160, 260 may include use of a single integrated circuit ('IC'), or may include use of a plurality of integrated circuits or other components connected, arranged or grouped together, such as controllers, microprocessors, digital signal processors ('DSPs'), parallel processors, multiple core processors, custom ICs, application specific integrated circuits ('ASICs'), field programmable gate arrays ('FPGAs'), adaptive computing ICs, associated memory (such as RAM, DRAM and ROM), and other ICs and components." Shteynberg, 18:8-21.		

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	“A controller (or processor) (such as controller 160, 260), with its associated memory, may be adapted or configured (via programming, FPGA interconnection, or hard-wiring) to perform the methodology of the invention, as discussed below. For example, the methodology may be programmed and stored, in a controller 160, 260 with its associated memory (and/or memory 155) and other equivalent components, as a set of program instructions or other code (or equivalent configuration or other program) for subsequent execution when the processor is operative (i.e., powered on and functioning). Shteynberg, 18:8-21.		

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11. The LED driver of claim 10 wherein the primary and secondary controllers are digital controllers.	“[The] ‘controller’ or ‘processor’ 160, 260 may be any type of controller or processor, and may be embodied as one or more controllers 160, 260, adapted to perform the functionality discussed herein. As the term controller or processor is used herein, a controller 160, 260 may include use of a single integrated circuit (‘IC’), or may include use of a plurality of integrated circuits or other components connected, arranged or grouped together, such as controllers, microprocessors, digital signal processors (‘DSPs’), parallel processors, multiple core processors, custom ICs, application specific integrated circuits (‘ASICs’), field programmable gate arrays	“The terms ‘processor’ or ‘controller’ are used herein interchangeably to describe various apparatus relating to the operation of one or more light sources. A processor or controller can be implemented in numerous ways, such as with dedicated hardware, using one or more microprocessors that are programmed using software (e.g., microcode or firmware) to perform the various functions discussed herein, or as a combination of dedicated hardware to perform some functions and programmed microprocessors and associated circuitry to	

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	(‘FPGAs’), adaptive computing ICs, associated memory (such as RAM, DRAM and ROM), and other ICs and components.” Shteynberg, 18:8-21. “[T]he present invention in general is related to power conversion, and more specifically, to a system, apparatus and method for supplying power to solid state lighting devices, such as for providing power to light emitting diodes (‘LEDs’) and LEDs integrated with digital controllers or processors.” Shteynberg, 1:18-22.	perform other functions.” Morgan, 14:13-19. “As discussed further below in connection with Fig. 13, such a “binary” determination of power either being consumed or not consumed by the collection of lighting units coupled to the LUC facilitates an identifier determination/learning algorithm (e.g., that may be performed by the LUC processor 1102 or the central controller 202) according to one embodiment of the invention. In other aspects, the power sensing module 1114 and the processor 1102 may be adapted to	

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		determine, at least approximately, and actual power drawn by the lighting units at any given time.” Morgan, 50:2-8.	
12. The LED driver of claim 1 wherein the light fixture load is one of an Organic LED (OLED) load or an LED load.	“[T]he ‘electronic’ load 250, for example, is a system 105, 180, such as a current regulator (or converter) 100, 200 coupled to LEDs 140.” Shteynberg, 10:45-47.	“Another embodiment of the invention is directed to an apparatus for use in a lighting system including at least one LED light source and at least one other controllable device. The apparatus comprises at least one controller having at least first and second output ports to couple the at least one controller to at least the at least one LED light source and the at least one other controllable	

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		device” Morgan, 67:24-28.	
13. The LED driver of claim 12 wherein the primary and secondary controllers are digital controllers.	“[T]he ‘controller’ or ‘processor’ 160, 260 may be any type of controller or processor, and may be embodied as one or more controllers 160, 260, adapted to perform the functionality discussed herein. As the term controller or processor is used herein, a controller 160, 260 may include use of a single integrated circuit (‘IC’), or may include use of a plurality of integrated circuits or other components connected, arranged or grouped together, such as controllers, microprocessors, digital signal processors (‘DSPs’), parallel processors, multiple core processors, custom ICs, application specific integrated		

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	circuits ('ASICs'), field programmable gate arrays ('FPGAs'), adaptive computing ICs, associated memory (such as RAM, DRAM and ROM), and other ICs and components. As a consequence, as used herein, the term controller (or processor) should be understood to equivalently mean and include a single IC, or arrangement of custom ICs, ASICs, processors, microprocessors, controllers, FPGAs, adaptive computing ICs, or some other grouping of integrated circuits which perform the functions discussed below, with associated memory, such as microprocessor memory or additional RAM, DRAM, SDRAM, SRAM, MRAM, ROM,		

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	FLASH, EPROM or E2PROM.” Shteynberg, 18:11-29. “[T]he present invention in general is related to power conversion, and more specifically, to a system, apparatus and method for supplying power to solid state lighting devices, such as for providing power to light emitting diodes (‘LEDs’) and LEDs integrated with digital controllers or processors.” Shteynberg, 1:18-22.		
16. The LED driver of claim 1 wherein the apparatus for power factor correction and DC/DC conversion comprises:	“For example, as illustrated in FIG. 5, a switching off-line LED driver 90 typically includes a full wave rectifier 20 with a capacitive filter 15, which allows current to flow to the filter capacitor (C_{FILT}) 15, when the input voltage is greater than the voltage across the	“In embodiments the power factor correction includes an energy storage capacitor and a DCDC converter.” Morgan, 6:17-19. “Fig. 41 shows a typical low voltage switching	

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a DC/DC converter; and a power factor correction (PFC) boost connected to the inrush current limit and the DC/DC converter.	capacitor. The inrush current to the capacitor is limited by the resistance in series with the capacitor. Under normal operating conditions, there may be a Negative Temperature Coefficient resistor (NTC) or thermistor in series with the capacitor to minimize inrush current during initial charging.” Shteynberg, 3:42-51. “As illustrated, the current regulator 100 comprises a rectifier 10, an impedance matching circuit 120, and a switching power supply (or driver) 130. . . . FIG. 7 is a block diagram of an exemplary second embodiment of a current regulator (or converter) 200 in accordance with the teachings of	power supply that incorporates a line filter 4102, power factor correction (PFC) facility 4104, a capacitor 4108 and a DC-DC converter 4110. The line filter provides general rectification and filtering of the high voltage AC input.” Morgan, 121:16-19. Fig. 41 Block Diagram of a typical 24V 500W power supply Morgan, fig. 41.	

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	the present invention.” Shteynberg, 8:65-9:5. “The current regulator 200 may be coupled directly to a dimmer switch 75 (line 202) for receiving a phase-modulated AC voltage derived from the AC line voltage (35), and may operate in parallel with an incandescent lamp 95, under the common control of the dimmer switch 75.” Shteynberg, 9:13-17. “The switching power supply 150A is implemented in two stages, an AC/DC converter 265 and a buck converter 270.” Shteynberg, 13:61-14:8. “[The LED Driver has] built-in capability to deliver power factor correction without additional		

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	power components; and . . . it has a small size, fewer components, comparatively lower cost, and high efficiency.” Shteynberg, 16:61-65. “The AC/DC converter 265 comprises major elements such as switch Q1 (300), inductors L2(305) and L3 (310), capacitors C4 (330) and C5 (345), diodes D1 (315) and D2 (320), and current sense resistor R2 (340). Buck converter 270 portion of switching power supply 150A generally comprises a switching transistor Q2 (355) (for dimming), inductor L4 (375), capacitor C3 (370), and current sense resistor R4 (360).” Shteynberg, 14:11-18.		
17. The LED driver of claim 16 further	“[T]he controller 160 (and 260, FIG. 10) is programmed, adapted		

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comprising at least one power limit connected to the regulated output voltage bus.	or configured to emulate the brightness or intensity control provided by the dimmer switch 75, to control the switching power supply 150 and correspondingly modify the brightness (or intensity) provided by the LEDs 140.” Shteynberg, 9:13-26.		
19. The LED driver of claim 1 wherein each of the set of output current drivers comprises: a load controller; a current source; and a Current Sense.			“FIG. 11A is an exemplary LED driver circuit 920 where this driver circuit 920 comprising integrated circuit elements U1111, U1112, and U1113, may provide a constant current drive to the LEDs which is turned on and off at a faster rate, i.e., flicker rate, and the duty cycle of the PWM cycle that determines the

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			intensity of the PWM frequency may be selected such that the flicker is not noticeable due to the persistence of the human eye, for example. The PWM output from the slave microcontroller U30 is fed to the LED drivers 920 using transistors Q4, Q3, and Q2 for red, green, and blue LEDs respectively. The LED driver chip ZXLD1362 from ZETEX™ functions as a buck mode switching regulator. The LED current is sensed by using R1113, R1112, and R1111 for red, green, and blue LEDs respectively.

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			Voltage developed across this resistor is fed back to the LED driver for current regulation. Accordingly, it is possible in some embodiments of the present invention to set the LED current by changing the value of the sense resistor using the relationship: $I_{out} = (0.1/R_{sense}) \text{ Amps (1).}$ Gandhi, 6[0057].
20. The LED driver of claim 19 wherein the load controller comprises a signal generator.			“[V]ia pin 17 (ref no. 331) of the integrated circuit, U3 of the microcontroller 242 (FIG. 4A), a signal may be processed via the inverter circuitry 330 comprising resistors R15,

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			R16, and R17, and further comprising inverters U8A, U8B, and U8C.” Gandhi, 3[0043].