PUBLIC VERSION

EXHIBIT 8

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IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

VAXCEL INTERNATIONAL CO., LTD.,	)	
	)	C.A. No. 20-224-VAC
Plaintiff,	)	
	)	
v.	)	**JURY TRIAL DEMANDED**
	)	
HEATHCO LLC,	)	
	)	
Defendant.	)	
	)	

EXPERT REPORT OF THOMAS M. KATONA, PH.D. CONCERNING INVALIDITY OF U.S. PATENT NOS. 10,136,503; 9,326,362; 10,154,564; AND 10,667,367

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3. Dependent claim 11 - The microcontroller based electronic switch according to claim 8, wherein said direct touch interface is a detection circuitry to detect a voltage signal generated by a voltage divider and to convert a voltage value of said voltage signal into said at least one message carrying sensing signal with said signal format corresponding to said voltage value generated for setting said conduction rate of said first controllable switching element and said second controllable switching element respectively. 56

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3. Dependent claim 11 - The microcontroller based electronic switch according to claim 8, wherein said direct touch interface is a detection circuitry to detect a voltage signal generated by a voltage divider and to convert a voltage value of said voltage signal into said at least one message carrying sensing signal with said signal format corresponding to said voltage value generated for setting said conduction rate of said first controllable switching element and said second controllable switching element respectively.....94

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5. Dependent claim 41 - The lighting apparatus according to claim 40, wherein both said first switching element and said second switching element are controllable switching element[s], wherein when said microcontroller receives said at least one message carrying sensing signal, said microcontroller operates to output said first control signal and said second control signal with an arrangement that said conduction rate of said first switching element and said conduction rate of said second switching element are reversely adjusted with the same pace such that a total electric power transmitted to said first LED lighting load and said second LED lighting load is maintained at a constant level while said mingled color temperature of said lighting

apparatus is proportionately adjusted according to said signal format of said at least one message carrying sensing signal to perform said color temperature tuning control mode. 99

6. Dependent claim 53 - The lighting apparatus according to claim 40, wherein said at least one detection device is a direct touch interface for detecting said at least one external control signal and converting said at least one external control signal into said at least one message carrying sensing signal interpretable to said microcontroller. 103

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1. Independent claim 1 148

2. Dependent claim 2 - The two-level LED security light according to claim 1, wherein the external control unit is a push button, a touch panel, an infrared sensor or a wireless remote control device coupled to a pin of the microcontroller of the loading and power control unit; wherein, when the push button, the touch panel, the infrared sensor or the wireless remote control device is operated, a voltage signal is thereby generated to trigger the microcontroller for the manual setting or the free-running setting of the illumination characteristics. 175

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I. INTRODUCTION

1. My name is Thomas M. Katona and I have been asked to submit this report to provide my opinions on the technology claimed in the patent asserted in the patent case of *Vaxcel International Co., Ltd. v. HeathCo LLC*, (Civil Action No. 20-224-LPS) pending in the United States District Court for the District of Delaware.

2. I have been retained on behalf of Defendant HeathCo LLC ("Defendant" or "HeathCo") to and provide my opinions on the claimed technology of U.S. Patent No. 10,136,503 ("the '503 patent"); U.S. Patent No. 9,326,362 ("the '362 patent"); U.S. Patent No. 10,154,564 ("the '564 patent"); and U.S. Patent No. 10,667,367 ("the '367 patent"), referred to as the "Asserted Patents" and offer an expert opinion on the invalidity of the '503 patent, the '362 patent, the '564 patent, and the '367 patent. I submit this report to describe my opinions on these matters.

3. In reaching the conclusions described herein, I have considered the documents and materials identified in Appendix B, attached to this report. My opinions are further based upon my education, training, research and related publications, knowledge, and personal and professional experience in the relevant art.

4. I am prepared to testify to the matters set out in this report at trial. To support or summarize my opinions, any testimony I give may include appropriate visual aids, some or all of the data or other documents and information cited herein, and additional data or other information identified in discovery.

5. I reserve the right to supplement the opinions in this report based on any subsequent testimony or facts revealed through discovery, as well as any subsequent reports produced by Plaintiff's experts.

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6. I am being compensated for my work on this case at my standard consulting rate of $450 per hour. I am also being reimbursed for expenses that I incur. My compensation is not contingent upon the results of my study or the substance of my testimony.

II. SUMMARY OF OPINIONS

7. The tables below contain a summary of my opinions as contained in this report with respect to invalidity of the asserted patents. It is my opinion that each and every asserted claim is invalid in light of known prior art to the patents. The implementation of the specific circuit features claimed in the patents would have been well within the abilities of a person of ordinary skill. [redacted]

See, e.g., T. Chen 30(b)(6) (3/9/22) Tr. at 42-52, 67-68, 70-71, 137-141, 157-165, 192-197, 227-230; C.T. Chen Tr. at 38-41;151-161. A complete statement of the bases for my opinions follows in the report below. In the following chart, I have attempted to identify the primary theories explained in my report below. To the extent that additional theories exist in the report, those theories are part of my opinion that I intend to offer at trial.

Patent	**Invalidity Ground**
'503 patent	Claims 1, 8, 11, 40, 41, 53 and 56 are anticipated by Bora '528 or rendered obvious by Bora '528 Claims 1, 8, 11, 40, 41, 53 and 56 are anticipated by Rains or rendered obvious by rains alone or in view of Bora '528 Claims 1, 8, 11, 40, 41, 53 and 56 are invalid for improper inventorship
'362 patent	Claims 1 and 2 are rendered obvious by Kamii alone or in view of Nagaoka Claims 1 and 2 are rendered obvious by Nagaoka alone or in view of Kamii

	Claims 1 and 2 are invalid for improper inventorship Claims 1 and 2 are invalid for lack of written description and enablement
'564 patent	Claims 1 and 2 are anticipated by Bora '972 or rendered obvious by Bora '972 alone or in combination with Hotelling Claims 1 and 2 are invalid for improper inventorship Claims 1 and 2 are invalid as indefinite
'367 patent	Claims 12, 14, 15, and 24 are anticipated by Bora '972 or rendered obvious by Bora '972 alone or in view of Bondy and/or Hotelling Claims 12, 14, 15, and 24 are invalid for improper inventorship Claims 12, 14, 15, and 24 are invalid as indefinite

8. Moreover, below I address certain primary prior art references, and certain combinations of primary and secondary prior art references, that I may rely upon at trial. I also attached as Appendix C HeathCo's final invalidity contentions, which I also may rely upon at trial.

III. BASES FOR OPINIONS

A. QUALIFICATIONS

9. A copy of my curriculum vitae (CV), which contains information pertaining to my education, experience, scholarship, awards, and professional activities is attached as Appendix A.

B. EDUCATIONAL BACKGROUND

10. I received my Bachelor of Science in Engineering Physics from Westmont College in 1996. Thereafter, I received a Master of Science in Electrical and Computer Engineering from University of California at Santa Barbara in 2000. I further received a Doctor of Philosophy (Ph.D.) in Electrical and Computer Engineering from University of California at

Santa Barbara in 2003. In 2008, I received a Master of Business Administration from University of South Carolina.

C. CAREER HISTORY

11. I have experience in developing semiconductors, light emitting diodes, laser diodes, and lighting systems that contain and utilize light emitting diodes, including several years of practical experience. I also have academic experience in the subject matter from my graduate work at the University of California, Santa Barbara ("UCSB"), one of the premier research universities in this field of work. During my time at UCSB, I was involved in all aspects of the development of LEDs. In addition to my academic experience, I have worked in product development and manufacturing at Hughes Aircraft/Raytheon, Sensor Electronic Technology, Soraa, and NEXT Lighting. Throughout this work history, I developed optical sensors, LED die packaged LEDs, and lighting systems that utilized LEDs. In this capacity, I was a key member of a team that designed and manufactured the LED lighting products.

12. During my time at Sensor Electronic Technology, I was the primary individual that worked with external vendors and our internal engineering team to develop high power ultraviolet LEDs. In addition, I was the primary interface working with customers that designed ultraviolet lighting systems for the government that utilized ultraviolet LEDs. This included application support and product redesign based on intended system performance.

13. Soraa was a vertically integrated lighting company that internally developed and manufactured LED chips and white light LED packages, and integrated these packages into commercial lighting products. I was involved in the development of LED die, packages, and the lighting products and their transition to manufacturing. In addition, I was responsible for competitive analysis of both LED and lighting products which included tear-down analysis and

product testing. Due to this work, I personally analyzed and benchmarked the structure and performance characteristics of leading LED and lighting products.

14. NEXT Lighting was a lighting systems designer and manufacturer. I was responsible for all aspects of product development and manufacturing. At the component level this included LED component and vendor selection and integration. In addition, I was responsible for all aspects of product design (optical, mechanical, and electrical), certification, manufacturing, and launch. In this capacity, I was responsible for thermal design, electrical and optical analysis, and testing of LED systems to ensure compliance with design specifications and industry standards.

15. In addition to and because of my academic and work experience in this field, I have regularly served as an independent reviewer for the Department of Energy's Solid State Lighting Program. In this capacity I have assisted the Department of Energy in their selection of proposals to fund solid state lighting initiatives related to Research and Development, Product Development, and Manufacturing. I have also served as an independent reviewer for the Defense Advanced Research Projects Agency (DARPA) in their efforts to develop high power ultraviolet lasers.

16. In my current position at the California Polytechnic State University, I supervise students every year in product design and development. In this capacity I supervise and teach students both in designing hardware and software products. These include pure hardware, software, and hardware/software combinations with embedded systems controls.

17. Additional contributions of mine to the field are set forth in my current curriculum vitae and my list of publications (Appendix A).

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D. MATERIALS CONSIDERED

18. As part of my preparation for writing this report, I have considered the materials listed in Appendix B.

E. LEVEL OF ORDINARY SKILL IN THE ART

19. Based on my review of the patent specification and file history (including cited references), in my opinion, a person of ordinary skill in the art would have a B.S. degree in electrical engineering, or an equivalent field, as well as at least 2-4 years of academic or industry experience in the design of lighting products, including knowledge of LED lighting devices and related technology for controlling and driving LED lighting devices. A person of ordinary skill in the art with a higher level of education may have fewer years of academic or industry experience, or vice versa.

IV. LEGAL STANDARDS

20. In this section I describe my understanding of certain legal standards. I have been informed of these legal standards by HeathCo's attorneys. I am not an attorney and I am relying only on instructions from HeathCo's attorneys for these legal standards.

A. LEVEL OF ORDINARY SKILL IN THE ART

21. I understand that central to the process of understanding the disclosures in a patent and assessing the validity of a patent is the notion of a person of ordinary skill in the art.

22. I understand that a person having ordinary skill in the art is a hypothetical person who is used to analyzing the prior art without the benefit of hindsight. A person of ordinary skill in the art is presumed to be one who thinks along the lines of conventional wisdom in the art and is not one who undertakes to innovate, whether by extraordinary insights or by patient and often expensive systematic research.

23. I understand that the hypothetical person of ordinary skill is presumed to have knowledge of all references that are sufficiently related to one another and to the pertinent art, and to have knowledge of all arts reasonably pertinent to the particular problem that the claimed invention addresses.

B. LEGAL STANDARDS FOR PRIOR ART

24. I understand that a patent or other publication must first qualify as prior art before it can be used to invalidate a patent claim.

25. I understand that under pre-AIA patent law, a U.S. or foreign patent qualifies as prior art to an asserted patent if the date of issuance of the patent is prior to the invention of the asserted patent; and further for a U.S. patent that issues later than the invention, the U.S. patent qualifies as prior art if the application for the patent was filed prior to the invention of the asserted patent. I further understand that a printed publication, such as an article published in a magazine or trade publication, qualifies as prior art to an asserted patent if the date of publication is prior to the invention of the asserted patent.

26. I understand that under pre-AIA patent law, a U.S. or foreign patent qualifies as prior art to an asserted patent if the date of issuance of the patent is more than one year before the filing date of the asserted patent. I further understand that a printed publication, such as an article published in a magazine or trade publication, constitutes prior art to an asserted patent if the publication occurs more than one year before the filing date of the asserted patent.

27. I understand that under pre-AIA patent law, a U.S. patent qualifies as prior art to the asserted patent if the application for that patent was filed in the United States before the invention of the asserted patent.

28. I understand that under post-AIA patent law, a U.S. or foreign patent or patent application qualifies as prior art to a patent if the date of publication of the patent or patent application is prior to the priority date of the asserted patent.

29. I understand that under post-AIA patent law, a U.S. patent, a U.S. published patent application, and certain international published patent applications qualify as prior art to the asserted patent if the patent or patent application is entitled to claim a right of priority prior to the priority date of the asserted patent.

30. I understand that under post-AIA patent law, a printed publication qualifies as prior art to an asserted patent if the date of publication is prior to the priority date of the asserted patent.

31. I understand that to qualify as prior art, a reference must contain an enabling disclosure that allows one of ordinary skill to practice the claims without undue experimentation.

32. I understand that documents and materials that qualify as prior art can be used to invalidate a patent claim as anticipated or as obvious.

33. I understand that invalidity must be shown by clear and convincing evidence.

C. LEGAL STANDARDS FOR ANTICIPATION

34. I understand that, once the claims of a patent have been properly construed, the second step in determining anticipation of a patent claim requires a comparison of the properly construed claim language to the prior art on a limitation-by-limitation basis.

35. I understand that a prior art reference "anticipates" an asserted claim, and thus renders the claim invalid, if all elements of the claim are disclosed in that prior art reference, either explicitly or inherently (*i.e.*, necessarily present or implied).

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D. LEGAL STANDARDS FOR OBVIOUSNESS

36. I have been instructed by counsel on the law regarding obviousness, and understand that even if a patent is not anticipated, it is still invalid if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person of ordinary skill in the pertinent art.

37. I understand that a person of ordinary skill in the art provides a reference point from which the prior art and claimed invention should be viewed. This reference point prevents one from using his or her own insight or hindsight in deciding whether a claim is obvious.

38. I also understand that an obviousness determination includes the consideration of various factors such as (1) the scope and content of the prior art; (2) the differences between the prior art and the asserted claims; (3) the level of ordinary skill in the pertinent art; and (4) the existence of secondary considerations such as commercial success, long-felt but unresolved needs, failure of others, etc.

39. I am informed that secondary indicia of non-obviousness may include (1) a long felt but unmet need in the prior art that was satisfied by the invention of the patent; (2) commercial success or lack of commercial success of processes covered by the patent; (3) unexpected results achieved by the invention; praise of the invention by others skilled in the art; (4) taking of licenses under the patent by others; and (5) deliberate copying of the invention. I also understand that there must be a relationship, or nexus, between any such secondary indicia and the invention. I further understand that contemporaneous and independent invention by others is a secondary consideration supporting an obviousness determination.

40. I understand that an obviousness evaluation can be based on a combination of multiple prior art references. I understand that the prior art references themselves may provide a suggestion, motivation, or reason to combine, but other times the nexus linking two or more prior

art references is simple common sense or ordinary knowledge available to a person of ordinary skill in the art. I further understand that obviousness analysis recognizes that market demand, rather than scientific literature, often drives innovation, and that a motivation to combine references may be supplied by the direction of the marketplace.

41. I understand that if a technique has been used to improve one device, and a person of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill.

42. I also understand that practical and common sense considerations should guide a proper obviousness analysis, because familiar items may have obvious uses beyond their primary purposes. I further understand that a person of ordinary skill in the art looking to overcome a problem will often be able to fit the teachings of multiple publications together like pieces of a puzzle. I also understand that these puzzle pieces need not fit together perfectly. I understand that obviousness analysis takes into account the inferences and creative steps that a person of ordinary skill in the art would employ under the circumstances.

43. I understand that a particular combination may be proven obvious merely by showing that it was obvious to try the combination. For example, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp because the result is likely the product not of innovation but of ordinary skill and common sense.

44. The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. When a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in

the same field or a different one. If a person of ordinary skill can implement a predictable variation, it is not likely patentable.

45. It is further my understanding that a proper obviousness analysis focuses on what was known or obvious to a person of ordinary skill in the art, not just the patentee. Accordingly, I understand that any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

46. I understand that a claim can be obvious in light of a single reference, without the need to combine references, if the elements of the claim that are not found explicitly or inherently in the reference can be supplied by the common sense of one of skill in the art.

47. I understand that a person of ordinary skill in the art could have combined two pieces of prior art or substituted one prior art element for another if the substitution can be made with predictable results, even if the swapped-in element is different from the swapped-out element. In other words, the prior art need not be like two puzzle pieces that must fit together perfectly. The relevant question is whether prior art techniques are interoperable with respect to one another, such that that a person of ordinary skill in the art would view them as a design choice, or whether a person of ordinary skill in the art could apply prior art techniques into a new combined system.

48. In sum, my understanding is that prior art teachings are properly combined where a person of ordinary skill in the art having the understanding and knowledge reflected in the prior art and motivated by the general problem facing the inventor would have been led to make the combination of elements recited in the claims. Under this analysis, the prior art references themselves, or any need or problem known in the field of endeavor at the time of the alleged

invention, can provide a reason for combining the elements of multiple prior art references in the claimed manner.

49. I have been informed and understand that the obviousness analysis requires a comparison of the properly construed claim language to the prior art on a limitation-by-limitation basis.

50. I understand that obviousness must be proven by clear and convincing evidence. For an obviousness combination, obviousness must be proven by clear and convincing evidence such that a person of ordinary skill in the art at the time of the alleged invention would have had a reason (or reasons) for combining the teachings of those prior art references to achieve the claimed invention, and that same person of ordinary skill in the art would have had a reasonable expectation of success from combining those teachings.

E. LEGAL STANDARDS FOR WRITTEN DESCRIPTION AND ENABLEMENT

51. It is my understanding that a patent must contain a written description of the claimed invention. The written description must clearly convey to those skilled in the art that, as of the filing date sought, the applicant was in possession of the invention claimed.

52. I have further been advised that a claimed invention must be enabled. A claimed invention is not enabled and, therefore, unpatentable if the specification does not teach those of ordinary skill in the art how to make and use the invention as it is claimed, without undue experimentation. Undue experimentation is based on the level of skill in the art as of the effective filing date of the patent.

53. I understand that the patent must enable the full scope of the invention and not just the specific embodiments disclosed in the specification.

54. I understand that invalidity for lack of adequate written description or enablement must be shown by clear and convincing evidence.

F. LEGAL STANDARDS FOR INDEFINITENESS

55. I understand that the standard for determining indefiniteness of patent claims is whether the "claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." *Nautilus Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120, 2129 (2014).

G. LEGAL STANDARD FOR INVENTORSHIP

56. I understand that an inventor of a patent is one who contributed to the conception of the claimed invention. I further understand that conception is the formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention as it is thereafter to be applied in practice. I understand that an idea is sufficiently definite and permanent for conception if it provides one skilled in the art with enough guidance to understand the invention, that is, when the inventor has a specific, settled idea, a particular solution to the problem at hand, not just a general goal or research plan he hopes to pursue.

V. TECHNOLOGY BACKGROUND

57. The concept of using lighting for security is as old as lighting itself. In its simplest form, a flame or candle burning partially served the purpose of providing enhanced security for people at night or in dark places as they could more easily see potential dangers. As lighting technology evolved and expanded in the late 19th and into the 20th century, lighting adoption grew and provided increased safety in cities, in homes, and on roadways for example. After World War II, detection technologies developed during the war began to make their way into commercial applications and motion detection technology became one such technology.

58. Samuel Bagno developed ultrasonic motion detection technology in the mid 1940's and by the 1970's the technology was used in home burglar systems. These sensors detect the motion of a body by measuring the Doppler shift of reflected ultrasonic waves transmitted by the sensor. The earliest occupancy control for lighting using ultrasonic technology was patented by Ravas of Westinghouse in 1969 (filed in 1967).[1]

59. Passive infrared (PIR) sensors for intrusion detection were developed in 1972 by Herbert Berman.[2] Berman used a small thermistor to detect infrared radiation from a human that resulted in an electrical signal that could be utilized by ancillary security devices. At this time, both ultrasonic and PIR sensors were prone to false positives and this limited their widespread application. In addition, for lighting, some technologies such as High Intensity Discharge and most fluorescent lighting suffered either slow on/off or startup time and/or greatly reduced lifetimes when switched on and off frequently. Therefore, the use of motion detection in lighting, while understood, was not widely adopted.

60. Occupancy sensors to control lighting using pyroelectric technology became more widely available in the early 1980's.[3] In the mid 1990's, HeathCo developed technology (that was later patented in U.S. Patent Nos. 5,598,066 and 5,747,937) directed to the use of a quartz-halogen lamp with a photocell and passive infrared sensor for detecting motion and a circuit that caused the light to operate at 50% brightness in the absence of detection and 95% brightness in response to detected motion. This is known as two-level lighting.

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[1] Ravas, R, Movement responsive light control means, U.S. No. Patent 3,459,961

[2] J.P. Steiner, Conventional IR and Ultrasonic Sensor Systems, Springer International Publishing, Switzerland, 2016.

[3] Blissett K, Dunbar R, Control device responsive to infrared radiation. U.S. No. Patent 4,346,427.

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61. With the commercialization of high brightness white light emitting diode (LED) technology in the early to mid 1990's, and the rapid advances in efficacy that made this technology competitive with conventional lighting sources in that early to mid 2000's, it became clear that LEDs would provide an energy efficient lighting technology that would be energy efficient, long life, and easily controllable or switchable when used in combination with motion sensor technology and conventional dimmers. LEDs additionally had the advantage over many other conventional lighting sources of being able to be continuously or step dimmed without any negative effects to the light source. By the early 2000's, LED drivers that controlled the output and brightness of LED lights using PWM signals were widespread.

62. "In simple applications, LEDs can be dimmed up to 10% of the maximum output by reducing the drive current. However, a further reduction of the driver current can cause a noticeable colorimetric shift (see Mukai et. Al. 1999, Harle et. Al. 1999) and uneven luminous intensity of the LEDs within an array. Also, the output might vary nonlinearly with current. All these drawbacks can be removed by pulse-width modulation (PWM) at the constant driving current. By changing the duty cycle of the current pulses, the average output may be varied within three to four orders of magnitude."[4]

63. Another major feature of LED lighting, color tuning, was developed in the late 1990's and this feature also became widespread by the early 2000's. By this timeframe, the ability to color tune using LEDs was not only widely recognized, but the ability to color tune using different LED configurations, types, phosphors, and drive conditions for commercial

[4] A. Zukauskas, M.S. Shur, R. Gaska. Introduction to Solid-State Lighting. John Wiley & Sons, New York (2002).

applications were already being developed. These included using multiple (2-5) single color LEDs in combination, and multi-chip multi-color LED packages.[5]

64. By no later than 2007, companies were working with commercial LED lighting fixtures in combination with motion detectors and wireless protocols to provide lighting systems that resulted in enhanced security and energy efficiency. These systems utilized infrared and/or ultrasonic detection technology to provide sensing signals to the lighting systems that caused the systems to modify the lighting level. In addition, in some demonstrations the motion sensing signal was transmitted wirelessly to the lighting fixture.[6] These early tests combining LED lighting technology with motion sensing and wireless communication technology explored not only simple on/off switching of the lighting devices, but also step or bi-level dimming in which the lights would remain at a low intensity state during no perceived occupancy and be increased to full output power when the lighted region detected occupancy.

65. As LEDs continued to increase in efficiency and decrease in cost and therefore gain market adoption in almost all lighting segments in the early to mid 2010's, LED lighting systems with both motion detection and/or wireless communication became increasingly widespread. With the introduction of the iPhone and Android phones in the late 2000's, lighting companies began developing ways to control lights via mobile phone apps. In 2012, Philips became one of the first companies to release a connected lighting app for the iPhone, with its Hue app. The Hue app allowed a user to control Philips' Hue LED bulbs via the iPhone. The

[5] *See supra* note 4.

[6] Cori Jackson, Douglas Paton.2011. *Lighting California's Future: Wireless Integrated Photosensor and Motion Sensor Lighting Control System. C*alifornia Energy Commission, PIER Building End-Use Energy Efficiency Program. CEC-500-2011-013.

app not only allowed a user to turn the lights on and off, but also enabled color tuning, brightness control, and timer settings.

VI. THE '503 PATENT

A. DISCLOSURE OF THE CLAIMED INVENTION

66. The '503 patent was filed on September 13, 2017 and issued on December 11, 2018. The face of the document states it was assigned to Chia-Teh Chen. The named inventor is Chia-Teh Chen. I understand Plaintiff has asserted claims 1, 8, 11, 40, 41, 53, and 56.

67. The invention is described as covering "A microcontroller-based multifunctional electronic switch for lighting control uses a detection device to sense and convert at least one external control signal into at least one message carrying sensing signal interpretable to a microcontroller." '503 patent at Abstract.

1. Background of the Invention and Summary of the Invention

68. The Description of Related Art section of the '503 Patent describes how existing LED designs allow for "mechanical type electric switch[es]" which are "not suitable for installing in a space where has the concern of gas explosion, because an instantaneous surge current, produced by suddenly engaging or releasing the metallic contact of the switch, may generate electric sparks to ignite fire" or "in working places such as kitchens or hospitals." '503 Patent at 1:30-37; 1:62-65.

69. The '503 Patent purports to address this need by providing a:

> disclosure [that] provides a microcontroller based electronic switch for detecting an external motion signal. The microcontroller based electronic switch comprises a first controllable switching element, a second controllable switching element, a detection device and a microcontroller.

'503 patent at 2:17-22.

70. The '503 patent further discloses that:

> In one exemplary embodiment, the detection device is an infrared ray sensor comprising a means for emitting infrared light to form a defined infrared ray detecting zone and a means for detecting infrared light reflected from an object moving into said infrared ray detecting zone. A circuitry responsively generates a message carrying sensing signal having a first voltage with a time length corresponding to the time interval the object entering and staying in said infrared ray detecting zone

'503 patent at 2:50-58.

B. THE ASSERTED CLAIMS

71. Below, I have reproduced the asserted claims for reference:

1. [pre] A microcontroller based electronic switch for controlling lighting performance of an LED lamp configured with a plurality of LED lighting loads comprising:

[a] a first controllable switching element, electrically connected between a power source and a first LED lighting load for emitting light with a first color temperature;

[b] a second controllable switching element, electrically connected between said power source and a second LED lighting load for emitting light with a second color temperature;

[c] at least one detection device, for detecting at least one external control signal and converting said at least one external control signal into at least one message carrying sensing signal; and

[d] a microcontroller to receive and interpret said at least one message carrying sensing signal generated by said at least one detection device,

[e] wherein said microcontroller through a first control pin is electrically coupled to said first controllable switching element, and through a second control pin is electrically coupled to said second controllable switching element,

[f] wherein said microcontroller through at least a third control pin receives said at least one message carrying sensing signal from said at least one detection device,

[g] wherein said microcontroller controls a conduction state or a cutoff state of said first controllable switching element through said first control pin and said microcontroller controls said conduction state or said cutoff state of said second controllable switching element through said second control pin to control electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said at least one message carrying sensing signal generated by said at least one detection device;

[h] wherein said first color temperature is higher than said second color temperature;

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[i] wherein said at least one message carrying sensing signal is characterized with a signal format of a short voltage signal, a long voltage signal, a plurality of short voltage signals, a plurality of long voltage signals or a combination of said short voltage signal and said long voltage signal generated in a preset time interval; wherein said short voltage signal and said long voltage signal are respectively defined either by a time length of a voltage signal or by said time length of a series of pulse signals consecutively generated;

[j] wherein when said microcontroller receives said at least one message carrying sensing signal, said microcontroller manages according to said signal format of said at least one message carrying sensing signal to perform at least one of various working modes including at least an on/off switch control mode, a dimming control mode, a color temperature tuning control mode, a color temperature switching control mode, a dimming and color temperature tuning control mode, and a delay shutoff control mode;

[k] wherein when said first controllable switching element and said second controllable switching element are in said conduction state, said microcontroller further controls said electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said signal format of said at least one message carrying sensing signal received, wherein said microcontroller through said first control pin outputs a first control signal to control a conduction rate of said first controllable switching element, said microcontroller through said second control pin outputs a second control signal to control said conduction rate of said second controllable switching element;

[l] wherein said microcontroller is an integrated circuit programmable for generating said first control signal and said second control signal, or an application specific integrated circuit (ASIC) custom made for generating said first control signal and said second control signal.

8. The microcontroller based electronic switch according to claim 1, wherein said at least one detection device is configured with a direct touch interface for detecting and converting said at least one external control signal into said at least one message carrying sensing signal interpretable to said microcontroller.

11. The microcontroller based electronic switch according to claim 8, wherein said direct touch interface is a detection circuitry to detect a voltage signal generated by a voltage divider and to convert a voltage value of said voltage signal into said at least one message carrying sensing signal with said signal format corresponding to said voltage value generated for setting said conduction rate of said first controllable switching element and said second controllable switching element respectively.

40. [pre] A lighting apparatus comprising:

[a] a first LED lighting load for emitting light with a first color temperature;

[b] a second LED lighting load for emitting light with a second color temperature;

[c] a diffuser, covering said first LED lighting load and said second LED lighting load to create a diffused light with a mingled color temperature; and

[d] a microcontroller based electronic switch electrically connected to said first LED lighting load and to said second LED lighting load, said microcontroller based electronic switch further comprising:

[e] a first switching element, electrically connected between said first LED lighting load and a power source;

[f] a second switching element, electrically connected between said second LED lighting load and said power source;

[g] at least a detection device, for detecting at least one external control signal and converting said at least one external control signal into at least one message carrying sensing signal;

[h] a microcontroller to receive and interpret said at least one message carrying sensing signal generated by said at least one detection device, wherein said microcontroller through a first control pin is electrically coupled to said first switching element, and through a second control pin is electrically coupled to said second switching element, wherein said microcontroller through at least a third control pin receives said at least one message carrying sensing signal from said at least one detection device, wherein said microcontroller controls a conduction state or a cutoff state of said first switching element through said first control pin and said microcontroller controls said conduction state or said cutoff state of said second switching element through said second control pin to control electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said at least one message carrying sensing signal generated by said at least one detection device;

[i] wherein said first color temperature is higher than said second color temperature;

[j] wherein said at least one message carrying sensing signal is characterized with a signal format of a short voltage signal, a long voltage signal, a plurality of short voltage signals, a plurality of long voltage signals or a combination of short voltage signal and long voltage signal generated in a preset time interval; wherein said short voltage signal and said long voltage signal are respectively defined either by a time length of a voltage signal or by said-time length of a series of pulse signals consecutively generated; wherein when said microcontroller receives said at least one message carrying sensing signal, said microcontroller operates according to said signal format of said at least one message carrying sensing signal to perform at least one of various working modes including at least an on/off switch control mode, a dimming control mode, a color temperature tuning control mode, a color temperature switching mode, a dimming and color temperature tuning control mode, and a delay shutoff control mode;

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[k] wherein when said first switching element and said second switching element are in said conduction state, said microcontroller further controls said electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said signal format of said at least one message carrying sensing signal received, wherein said microcontroller through said first control pin outputs a first control signal to change a conduction rate of said first switching element, said microcontroller through said second control pin outputs a second control signal to change said conduction rate of said second switching element;

[l] wherein said microcontroller is an integrated circuit programmable for generating said first control signal and said second control signal, or an application specific integrated circuit (ASIC) custom made for generating said first control signal and said second control signal.

41. The lighting apparatus according to claim 40, wherein both said first switching element and said second switching element are controllable switching elements, wherein said first control signal and said second control signal are designed to operate with an arrangement that said conduction rate of said first switching element and said conduction rate of said second switching element are unidirectionally and proportionally adjusted with the same pace such that said mingled color temperature of said lighting apparatus is maintained at a constant level while a light intensity of said lighting apparatus is being proportionately adjusted according to said signal format of said at least one message carrying sensing signal to perform said dimming control mode.

53. The lighting apparatus according to claim 40, wherein said at least one detection device is a direct touch interface for detecting said at least one external control signal and converting said at least one external control signal into said at least one message carrying sensing signal interpretable to said microcontroller.

56. The lighting apparatus according to claim 53, wherein said direct touch interface is a circuitry to detect a voltage signal generated by a voltage divider and convert a voltage value of said voltage signal into said at least one message carrying sensing signal with said signal format corresponding to said voltage value-generated for setting conduction rates of said first switching element and said second switching element respectively.

72. As is apparent, the claims describe a conventional lighting device with color tuning capabilities.

C. PRIORITY DATE

73. I understand that Plaintiff's outside counsel has represented that it alleges that the priority date of the '503 patent is no earlier than December 22, 2014.

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D. PROSECUTION HISTORY

74. During prosecution of the application that led to the '503 patent, the Applicant filed a terminal disclaimer to traverse a double-patenting rejection over U.S. Patent No. 9,795,008. The terminal disclaimer was approved and the Patent Office allowed the claims based on the terminal disclaimer and other amendments the Applicant had made.

E. CLAIM CONSTRUCTION

75. I understand that certain terms of the '503 patent have been construed by the Court. D.I. 84 at 4. The relevant claim terms are listed below:

Term	Court's Construction
detection device	Means-plus-function. Function: "detecting at least one external control signal and converting the at least one external control signal into at least one message carrying sensing signal." Structure: Infrared sensor
message carrying sensing signal	One or more formatted signals interpretable by a processor, microcontroller or an ASIC (e.g., a signal having a voltage aspect and a timing aspect)
external control signal	A signal that is processed by the [detection device/external control unit]

76. For all terms of the '503 patent not addressed in the chart above, I understand that the term should be defined using its plain and ordinary meaning, which is the meaning that would be understood by a person of ordinary skill in the art of the priority date of the invention.

VII. INVALIDITY ANALYSIS REGARDING THE '503 PATENT

A. OVERVIEW OF PRIOR ART

1. Bora '528

77. U.S. Patent No. 9,113,528 ("Bora '528") was filed on February 7, 2014 and issued on August 18, 2015. I understand Bora '528 is therefore prior art to claims 1, 8, 11, 40, 41, 53, and 56 of the '503 patent.

78. Bora '528 is directed to a home lighting system for automating and controlling lighting features. Bora particularly notes and describes the following technologies:

> The present invention provides an easily installed and transferable lighting and home automation solution because special or customized installation is not required. The present invention presents a solution to controlling, programming, and automating lighting devices, such that the color and brightness of any individual light or a group of lights can be manually or automatically controlled using a wireless interface. A user has the flexibility to personalize the color, atmosphere, and mood of a room to better fit ones preference, time of day, or occasion at hand. Additionally, since the present invention requires no installation, the solution is fully portable and can be removed and reused in other locations throughout the long life of the lighting device. Automation and dimming of the lighting devices save more energy than is consumed by the additional components of the lighting device. Moreover, using on/off signals having specified cycle times to produce a blended light reduce the current requirements of the lighting device.
>
> The present invention, a wireless lighting control system, consists of methods, apparatuses, and associated software (device application) for controlling, programming, and automating one and/or multiple 'Intelligent Illuminating Devices' (II Device) utilizing a wireless communication protocol executed between one or many wireless devices and one or many II Devices (II Device network). The methods and apparatuses presented here would allow one to adjust and control a single or network of II Devices with high flexibility, user control, and intuitive user interaction, with minimal installation or complexity.

Bora '528 at 8:4-32.

2. Rains

79. U.S. Patent No. 8,222,584 ("Rains") was filed on April 5, 2011 and issued on July 17, 2012. I understand Rains is therefore prior art to claims 1, 8, 11, 40, 41, 53, and 56 of the '503 patent.

80. Rains is directed to a controllable LED light fixture. Rains particularly notes and describes the following technologies:

> A light fixture, using one or more solid state light emitting elements utilizes a diffusely reflect chamber to provide a virtual source of uniform output light, at an aperture or at a downstream optical processing element of the system. Systems disclosed herein also include a detector, which detects electromagnetic energy from the

> area intended to be illuminated by the system, of a wavelength absent from a spectrum of the combined light system output. A system controller is responsive to the signal from the detector. The controller typically may control one or more aspects of operation of the solid state light emitter(s), such as system ON-OFF state or system output intensity or color.

Rains, Abstract.

B. CLAIMS 1, 8, 11, 40, 41, 53 AND 56 ARE ANTICIPATED BY BORA '528 OR RENDERED OBVIOUS BY BORA '528

1. Independent claim 1

a. 1[pre] A microcontroller based electronic switch for controlling lighting performance of an LED lamp configured with a plurality of LED lighting loads comprising

81. Bora '528 discloses or renders obvious a microcontroller based electronic switch for controlling lighting performance of an LED lamp configured with a plurality of LED lighting loads.

82. Bora '528 discloses a "II Device 140" that includes "a controller/processor 106, . . . a light emitting diode (LED) current control circuit 120 communicably 20 coupled to the controller/processor 106, . . . two or more LEDs 122 electrically connected to the LED current control circuit 120. The LED current control circuit 120 can be a PWM driver, switching or multiplexer circuit, or light emitting diodes (LEDs) driver(s) circuit." Bora '528 at 9:17-26.

83. Bora '528 discloses a microcontroller/processor 106. Bora '528 at 57:10. Bora '528 discloses that "the various logical blocks, modules, and circuits described herein may be implemented or performed with a general purpose 55 processor (e.g., microprocessor, conventional processor, controller, microcontroller, state machine or combination of computing devices)." Bora '528 at 75:53-57.

84. Figure 1 of Bora '528 depicts a lighting device with a controller/processor 106, an LED control circuit 120, and LEDs 122a and 122b (elements highlighted below):

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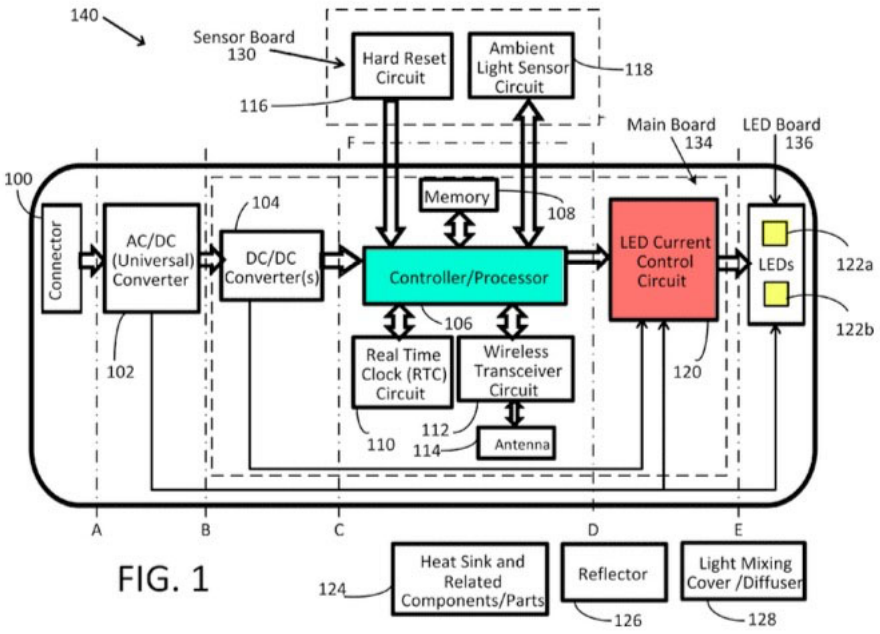


FIG. 1

Bora '528, Figure 1

85. To the extent the preamble is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

86. To the extent that the preamble is limiting, Bora '528 discloses it or renders it obvious.

b. 1[a] a first controllable switching element, electrically connected between a power source and a first LED lighting load for emitting light with a first color temperature

87. Bora '528 discloses or renders obvious a first controllable switching element, electrically connected between a power source and a first LED lighting load for emitting light with a first color temperature.

88. Bora '528 discloses multiple embodiments of the LED control circuit 120. I will refer to two of these embodiments respectively as the "Switch Embodiment" and the "LED Driver Embodiment."

89. The Switch Embodiment is depicted in Figure 5, reproduced below. Bora '528 discloses that "referring to FIG. 5, a circuit diagram of switches (500, 502, 504, and 506) and LED driver 508 scheme in accordance with one embodiment of the present invention is shown." Bora '528 at 17:66-18:1.

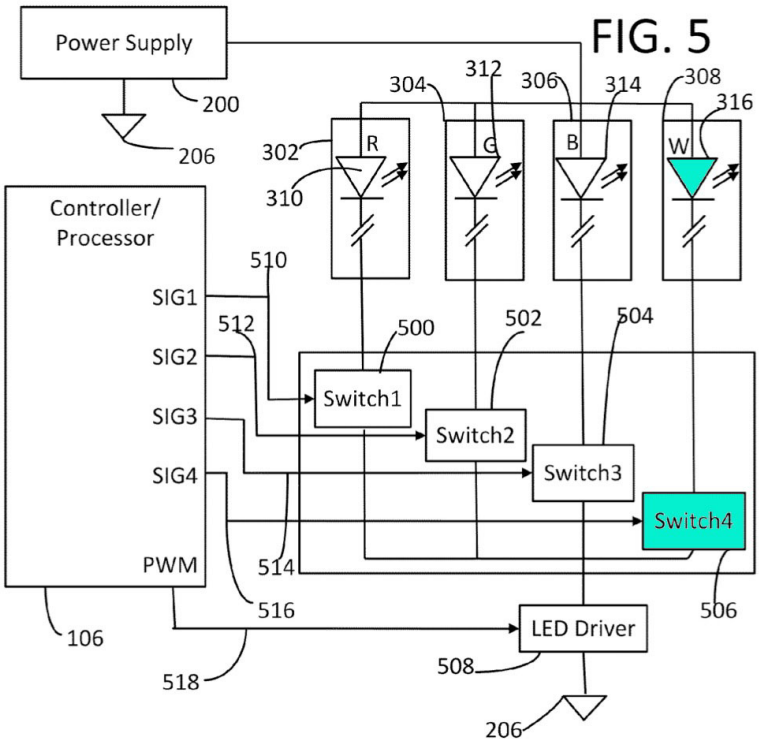
90. Bora '528 discloses that "the controller/processor 106 would send a Pulse Width Modulation (PWM) signal to one LED driver 508 which would control the average current flowing through it." Bora '528 at 18:2-4. "Variation in the average current passing through the LED driver 508 controlled by variations in the PWM sent by the controller would increase or decrease the average current passing through to the subsequent LED arms (302, 304, 306, 308), thus controlling the overall brightness of the LEDs." Bora '528 at 18:17-19.

91. Bora '528 also discloses that "there would be a switch for every LED arm between the LED driver 508 and each LED arm (302, 304, 306, and 308). The controller is connected to each switch (500, 502, 504, and 506) and can send an on/off signal for each." Bora '528 at 18:5-9. "[T]he controller 106 would send a signal to control Switch1 500, Switch2 502, Switch3 504 and Switch4 506." Bora '528 at 18:11-12. "The switches (500,502,504,506) turning on or off, would be able to create different colors and saturation produced by the light." Bora '528 at 18:19-21. Finally, Bora '528 discloses that "[c]onsidering the embodiment contains red, green, blue, and white LED arms (302, 304, 306 and 308 respectively), based on established color mixing principals, the variation in the luminosity of these four colors could produce all color combinations." Bora '528 at 18:25-29.

92. Bora '528 also discloses that "[t]he combination of LED arms or LEDs could be of various types and various colors dependent on the II Device embodiment. For example, the LEDs might vary in color such as red, green, blue, and/or white LEDs." Bora '528 at 13:16-20.

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93. Annotated Figure 5 depicts the first controllable switching element, Switch4 506, and a first LED lighting load for emitting light with a first color temperature, white LED arm 302, both highlighted in light blue.



Bora '528, Figure 5

94. Figure 5 of Bora '528 depicts a ground/negative terminal 206 of the power supply 200. Bora '528 at 15:60-62.[7] It also depicts a ground negative/terminal 206 connected to LED Driver 508. Switch4 506 is depicted as being electrically connected between the power supply 200 and the white LED arm 308, via the ground/negative terminal 206.

95. The LED Driver Embodiment is depicted in Figure 58, reproduced below. Bora '528 discloses that "[]various LEDs arms (302, 304, 306 and 308) are driven by the LED drivers

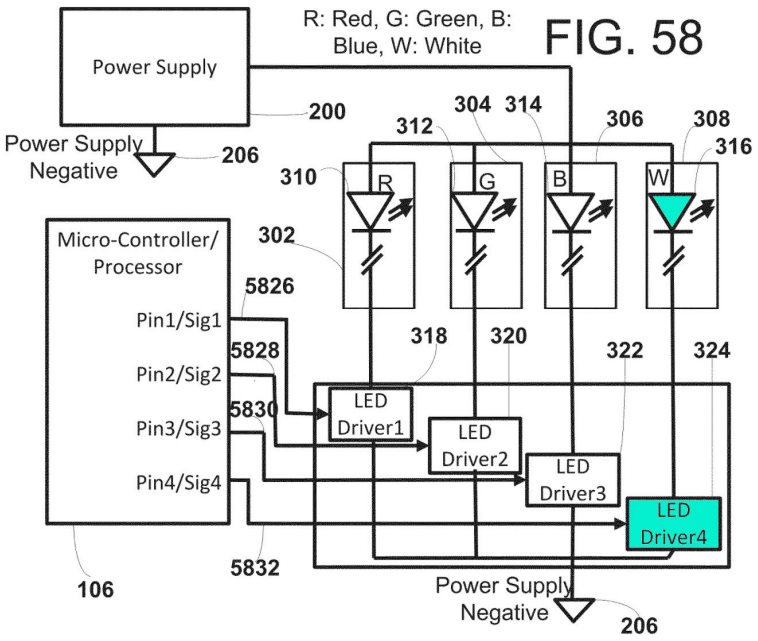
[7] Bora '528 describes ground/negative terminal 206 in reference to Figure 2, but the same element numbering is used in Figure 5.

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(318, 320, 322 and 324) as shown." Bora '528 at 57:7-9. "The LEDs drivers turn ON or OFF based on the ON or OFF signal provided by the microcontroller/processor 106 as shown." Bora '528 at 57:9-11. "When LED driver is ON, current passes through its LEDs arm, and LEDs in that arm produces light. LEDs arms (LEDs1 302, LEDs2 304, LEDs3 306, and LEDs4 308) can have different types of LEDs including different colors and different electronic ratings." Bora '528 at 57:11-15.

96. LED Driver4 324 is a controllable switching element because it includes a binary ON/OFF switching element that allows current to pass through the LED when in the ON state and restricts current flow through the LED when in the OFF state.

97. Annotated Figure 58 depicts the first controllable switching element, LED Driver4 324, and a first LED lighting load for emitting light with a first color temperature, white LED arm 308, both highlighted in light blue.



Bora '528, Figure 58

98. Figure 58 of Bora '528 depicts a power supply negative terminal 206 of the power supply 200. It also depicts a power supply negative terminal 206 connected to each of the LED Drivers, including LED Driver1 318. Thus, LED Driver1 318 is depicted as being electrically connected between the power supply 200 and the red LED arm 302, via the power supply negative terminal 206.

99. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

100. Thus, Bora '528 discloses or renders obvious this limitation.

c. 1[b] a second controllable switching element, electrically connected between said power source and a second LED lighting load for emitting light with a second color temperature

101. Bora '528 discloses or renders obvious a second controllable switching element, electrically connected between a power source and a second LED lighting load for emitting light with a second color temperature.

102. Bora '528 discloses that "[t]ypically, the first color LED 122 a and the second color LED 122 b will be selected from a red LED, a green LED, a blue LED, a red LED, a white LED, a tri-color LED and a four-color LED." Bora '528 at 9:31-34.

103. Bora '528 also discloses that "[t]he combination of LED arms or LEDs could be of various types and various colors dependent on the II Device embodiment. For example, the LEDs might vary in color such as red, green, blue, and/or white LEDs." Bora '528 at 14:44-48.

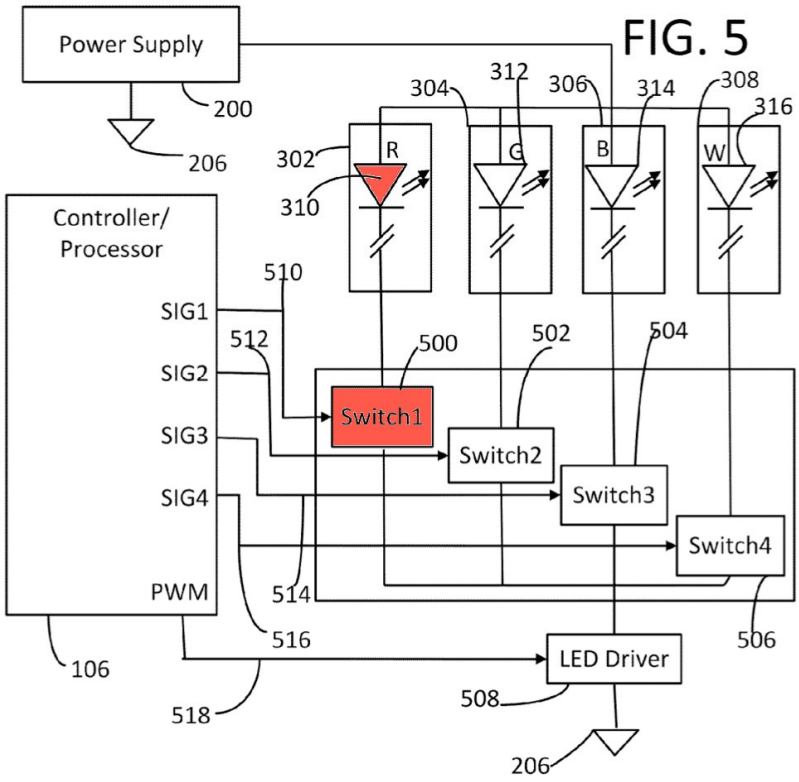
104. As discussed above, the Switch Embodiment discloses and depicts a circuit diagram of switches that are connected to the controller and are also connected between the LED driver 508 and each LED arm 302, 304, 306, and 308. Bora '528 at 17:66-18:29. "[T]he controller 106 would send a signal to control Switch1 500, Switch2 502, Switch3 504 and Switch4 506." Bora '528 at 18:11-12. "The switches (500,502,504,506) turning on or off, would

be able to create different colors and saturation produced by the light." Bora '528 at 18:19-21. Finally, Bora '528 discloses that "[c]onsidering the embodiment contains red, green, blue, and white LED arms (302, 304, 306 and 308 respectively), based on established color mixing principals, the variation in the luminosity of these four colors could produce all color combinations." Bora '528 at 18:25-29.

105. Annotated Figure 5 depicts the second controllable switching element, Switch1 500, and a second LED lighting load for emitting light with a second color temperature, LED arm 302, both highlighted in red. Bora '528 discloses that the LEDs can vary in color such as white LEDs. Bora '528 at 14:44-48. Thus, Bora '528 discloses or suggests using white LEDs, which can have different color temperatures. A person of ordinary skill in the art would select white LEDs with different color temperatures for the different LED arms so the "user has the flexibility to personalize the color, atmosphere, and mood of a room to better fit ones preference. Time of day, or occasion at hand." Bora '528 at 2:15-18.

106. Additionally, Figures 5 and 58 disclose using a red LED arm. A person of ordinary skill in the art would understand that the black body curve superimposed on the CIE 1960 color space diagram would span over a huge range of colors. Specifically, very warm color temperatures in the 1000K-1500K range would appear red. Thus, a person of ordinary skill in the art would understand that the red LED arm would output light having a color temperature. Thus, a person of ordinary skill in the art would understand that the red LED arm would output light having a color temperature, and that color temperature would be less than the color temperature of the white LEDs of the first LED lighting load.

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Bora '528, Figure 5

107. Figure 5 of Bora '528 depicts a ground/negative terminal 206 of the power supply 200. Bora '528 at 15:60-62.[8] It also depicts a ground negative/terminal 206 connected to LED Driver 508. Switch1 500 is depicted as being electrically connected between the power supply 200 and the LED arm 302, via the ground/negative terminal 206.

108. As discussed above, the LED Driver Embodiment discloses and depicts a circuit diagram of LED drivers that are connected to the controller and each LED arm 302, 304, 306, and 308. Bora '528 at 57:7-15. "The LEDs drivers turn ON or OFF based on the ON or OFF signal provided by the microcontroller/processor 106 as shown." Bora '528 at 57:9-11. "When LED driver is ON, current passes through its LEDs arm, and LEDs in that arm produces light.

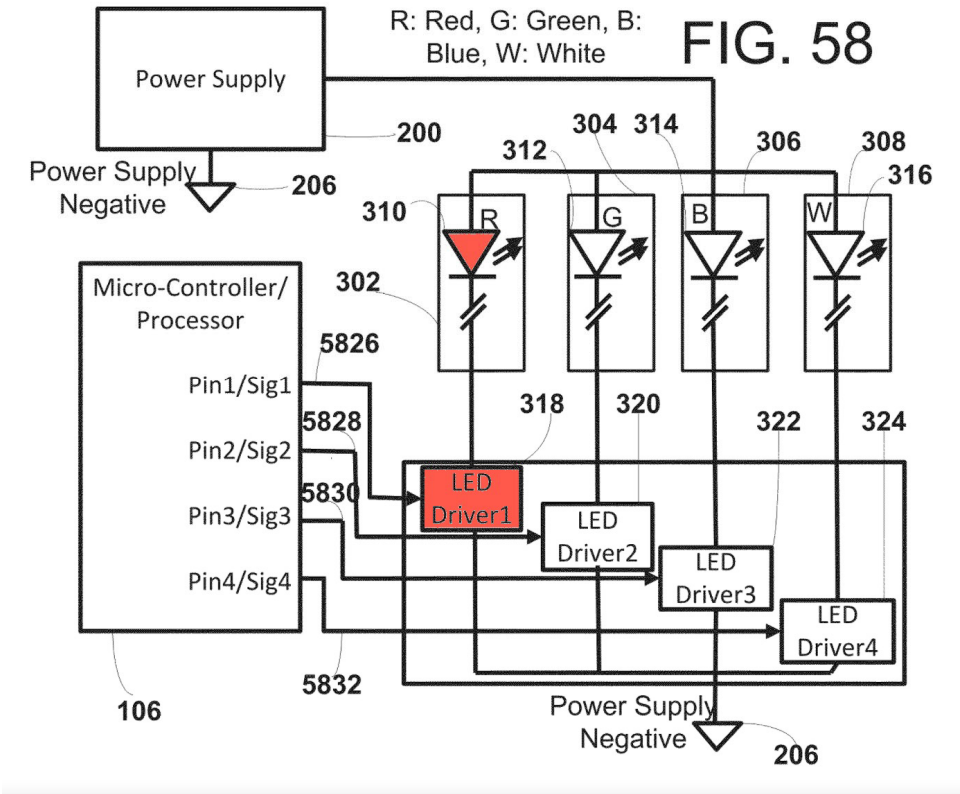
[8] Bora '528 describes ground/negative terminal 206 in reference to Figure 2, but the same element numbering is used in Figure 5.

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LEDs arms (LEDs1 302, LEDs2 304, LEDs3 306, and LEDs4 308) can have different types of LEDs including different colors and different electronic ratings." Bora '528 at 57:11-15.

109. LED Driver1 318 is a controllable switching element because it includes a binary ON/OFF switching element that allows current to pass through the LED when in the ON state and restricts current flow through the LED when in the OFF state.

110. Annotated Figure 58 depicts the second controllable switching element, LED Driver1 318, and a second LED lighting load for emitting light with a first color temperature, LED arm 302, both highlighted in red.



Bora '528, Figure 58

111. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

112. Thus, Bora '528 discloses or renders obvious this limitation.

d. 1[c] at least one detection device, for detecting at least one external control signal and converting said at least one external control signal into at least one message carrying sensing signal;

113. Bora '528 discloses or renders obvious at least one detection device, for detecting at least one external control signal and converting said at least one external control signal into at least one message carrying sensing signal.

114. I understand that the Court construed the term "detection device" is a means-plus-function term subject to 35 U.S.C. § 112(f). D.I. 83 at 6. I understand that the Court construed the function as "detecting at least one external control signal and converting the at least one external control signal into at least one message carrying sensing signal" and construed the corresponding structure as the "infrared sensor" of the '503 patent.

115. I understand that the Court construed the term "message carrying sensing signal" as "one or more formatted signals interpretable by a processor, microcontroller or an ASIC (e.g., a signal having a voltage aspect and a timing aspect)."

116. Bora '528 discloses that a "wireless transceiver circuit 112 allows the II Device 140 to communicate with other wireless devices and/or other II Devices. The wireless transceiver circuit 112 includes a transmitter and receiver circuit based on established wireless protocols. These protocols could differ based on different II Device embodiments and changing wireless communication standards." Bora '528 at 11:54-60. Bora '528 also discloses that "the wireless transceiver circuit 112 might utilize other protocols including but not limited to . . . infrared." Bora '528 further discloses that "[t]he antenna 114 captures wireless communication signals and passes them to the wireless transceiver circuit 112 to decode those signals." Bora '528 at 12:5-7. Thus, the wireless transceiver circuit 112 and antenna 114 are the claimed detection device.

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117. Bora '528 discloses that "the wireless transceiver circuit 112 will be connected to the controller/processor 106 and the antenna 114." Bora '528 at 11:62-63. It further discloses that "the controller/processor 106 processes signals received from . . . the wireless transceiver circuit 112." Bora '528 at 11:4-6.

118. Figure 1, annotated below, depicts the wireless transceiver circuit 112 and antenna 114 communicably coupled to the controller/processor 106.

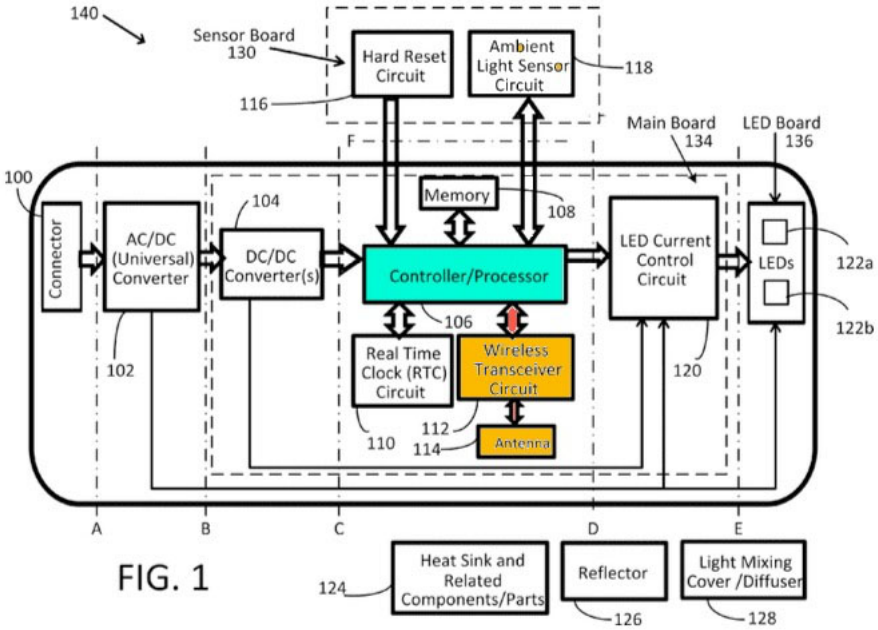


FIG. 1

Bora '528, Figure 1

119. Bora '528 also discloses that "a wireless device (WD) is equipped with hardware and systems to execute wireless communication protocols (Bluetooth, Wi-Fi, ZigBee, or any other wireless protocol) as well as an appropriate device application 2302" allowing a user to "send a lighting command to an II Device by selecting the command via the device application 2304. Bora '528 at 29:60-66. It also discloses that "[u]pon the user's selection of a command for a specific II Device, the device application would translate the user's requested command

into a light setting command and the specific stored ID for the selected II Device 2306. This light setting command would include instructions for the specified II Device ID to execute such as on/off, color, brightness, or a program." Bora '528 at 29:66-30:5.

120. Bora '528 discloses that "the light setting command would be translated into the appropriate wireless communication protocol and wirelessly sent via the wireless device 2308. The II Device if in range of the wireless communication or mesh network 2309 relay communication would receive the protocol via the II Device's antenna 2310. The transceiver/receiver circuitry would decode the wireless protocol to find the light setting command and send that to the controller/processor 2312." Bora '528 at 30:3-13. A person of ordinary skill in the art would understand that the signal from the transceiver/receiver circuitry to the microcontroller/processor via circuitry would be a voltage or voltages that vary with amplitude and/or time depending on the specific implementation used.

121. Thus, Bora '528 discloses that the wireless transceiver and antenna convert the external control signal received from the wireless device into a message carrying sensing signal.

122. As discussed above, I understand that the Court has construed this term as the infrared sensor of the '503 patent, which converts an infrared signal to a voltage (as described in the '503 patent at 10:11-65) and any equivalents. To the extent that the specific structures identified in the '503 patent are not inherently disclosed by the Bora '528 infrared sensor, they would be an obvious or conventional modification. Further, I understand that Vaxcel has alleged that a "voltage divider" in the color temperature control knob is such an equivalent. I disagree that a "voltage divider" is equivalent to the structures disclosed in the '503 patent. However, for purposes of my invalidity analysis, below I have additionally applied the broad range of equivalents utilized by Vaxcel in its infringement contentions. To the extent that a "voltage

divider" is an equivalent to the structures of the '503 patent, the "mechanical input" for "manual hue adjustment," "such as a button, a knob, or the like" disclosed by Bora '528 would necessarily have to be, as would of course the infrared sensor of Bora '528. Bora '528 at 64:61-64.

123. Bora '528 discloses that "[a] user can adjust the hue, color, or brightness of the II Device. One example of a button would be a rotating ring around the edge of the II Device that in different positions would relate to different hues or colors." Bora '528 at 64:65-67. Bora '528 discloses that "a button or switch somewhere on the embodiment that when turned would create a different hue, brightness, or color." Bora '528 at 65:5-6. When the disclosed button is pushed or the disclosed knob is turned, a person of ordinary skill in the art would understand that a voltage divider would be a common implementation to have this action output a different voltage reflecting the selected setting, i.e. the message carrying sensing signal, which would be sent to the controller/processor to control the LED loads.

124. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

125. Thus, Bora '528 discloses or renders obvious this limitation.

e. 1[d] a microcontroller to receive and interpret said at least one message carrying sensing signal generated by said at least one detection device

126. Bora '528 discloses or renders obvious a microcontroller to receive and interpret said at least one message carrying sensing signal generated by said at least one detection device.

127. Bora '528 discloses that the II Device 140 includes "a controller/processor 106." Bora '528 at 9:18. It also discloses that "[t]he processor 106 processes the signals received by the various other components of the embodiment, computes necessary actions, and sends signals back out to various other components of the embodiment." Bora '528 at 11:16-19.

128. Bora '528 discloses a microcontroller/processor 106. Bora '528 at 57:10. Bora '528 discloses that "the various logical blocks, modules, and circuits described herein may be implemented or performed with a general purpose 55 processor (e.g., microprocessor, conventional processor, controller, microcontroller, state machine or combination of computing devices)." Bora '528 at 75:53-57.

129. Bora '528 discloses that "the wireless transceiver circuit 112 will be connected to the controller/processor 106 and the antenna 114." Bora '528 at 11:62-63. It further discloses that "the controller/processor 106 processes signals received from . . . the wireless transceiver circuit 112." Bora '528 at 11:4-6.

130. Bora '528 discloses that "[t]he transceiver/receiver circuitry would decode the wireless protocol to find the light setting command and send that to the controller/processor 2312." Bora '528 at 30:11-13. It also discloses that "the controller will execute that command with the respective II Device's related components 2314. Upon successful execution, the II Device will respond through the appropriate wireless communication that it has executed the light setting command 2316-2318."

131. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

132. Thus, Bora '528 discloses or renders obvious this limitation.

f. 1[e] wherein said microcontroller through a first control pin is electrically coupled to said first controllable switching element, and through a second control pin is electrically coupled to said second controllable switching element

133. Bora '528 discloses or renders obvious wherein said microcontroller through a first control pin is electrically coupled to said first controllable switching element, and through a second control pin is electrically coupled to said second controllable switching element.

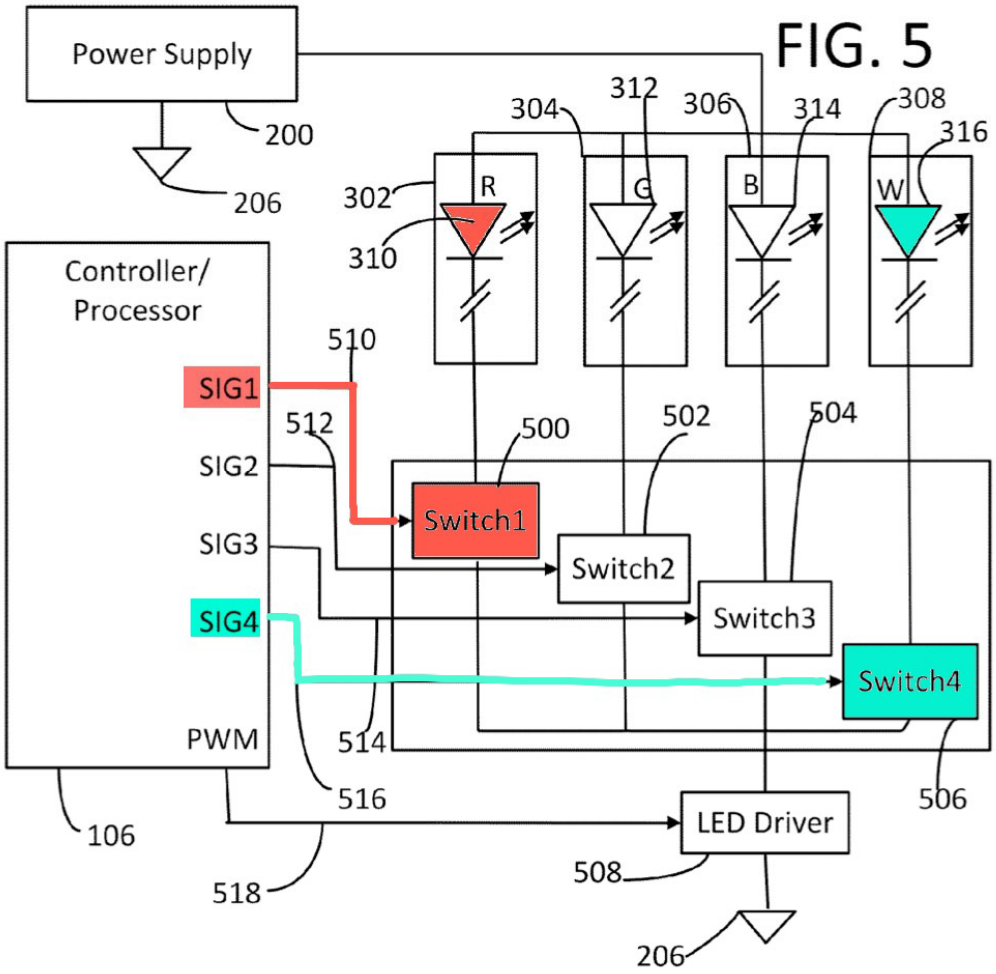
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134. Bora '528 discloses an embodiment where the controller/processor 106 and the LED board 136 are included on the main circuit board 134. It would be understood by a person of ordinary skill in the art that components on a circuit board would be electrically connected using electrical traces and that the components are electrically connected to those electrical traces via input and output pins or terminals. In particular, Bora '528 discloses "a main circuit board 134 may include the DC/DC power converter 104, the controller/processor 106, the LED current control circuit 120, the memory 108, the real time clock circuit 110, and the wireless transceiver circuit 112 and antenna 114. A sensor board 130 may include the hard reset circuit 116 and the ambient light sensor circuit 118. A LED board 136 may include the two or more LEDs 122 and additional LED related circuitry (e.g., LED arms)." Bora '528 at 10:7-15.

135. Bora '528's Switch Embodiment discloses that "[t]he controller is connected to each switch (500, 502, 504, and 506) and can send an on/off signal for each." Bora '528 at 18:7-9. "[T]he controller 106 would send a signal to control Switchl 500, Switch2 502, Switch3 504 and Switch4 506." Bora '528 at 18:11-12. "The switches (500, 502, 504, 506) turning on or off, would be able to create different colors and saturation produced by the light." Bora '528 at 18:19-21. A person of ordinary skill in the art would understand that the microcontroller disposed on the main circuit board is electrically coupled to each of the switches via output control pins on the controller.

136. Annotated Figure 5 below depicts the controller 106 electrically coupled to the first controllable switching element and electrically coupled to the second controllable switching element.

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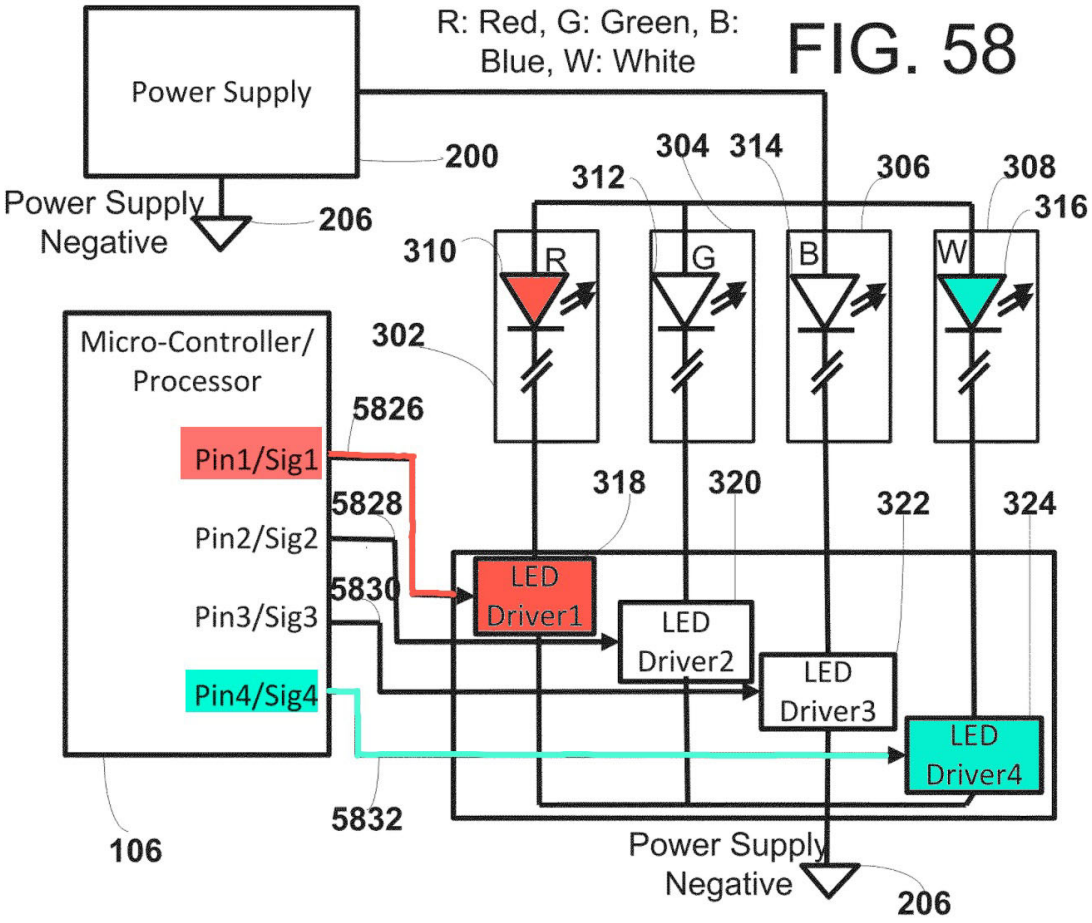
Bora '528, Figure 5

137. Bora '528's LED Driver Embodiment discloses "[]various LEDs arms (302, 304, 306 and 308) are driven by the LED drivers (318, 320, 322 and 324) as shown." Bora '528 at 57:7-9. "The LEDs drivers turn ON or OFF based on the ON or OFF signal provided by the microcontroller/processor 106 as shown." Bora '528 at 57:9-11. "When LED driver is ON, current passes through its LEDs arm, and LEDs in that arm produces light. LEDs arms (LEDs1 302, LEDs2 304, LEDs3 306, and LEDs4 308) can have different types of LEDs including different colors and different electronic ratings." Bora '528 at 57:11-15. Bora '528 further discloses that "[w]ith the driver scheme as per FIG. 58, color mixing can be achieved by controlling the signals to the LED Drivers (Sigl 5826, Sig2 5828, Sig3 5830 and Sig4 5832)

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which in turn control the ON/OFF times of the LED drivers individually i.e. by toggling the pins individually to ON or OFF states at a frequency that could be above 85 Hz." Bora '528 at 57:17-22.

138. Annotated Figure 58 below depicts the controller 106 electrically coupled to the first controllable switching element through a first control pin and electrically coupled to the second controllable switching element through a second control pin.



Bora '528, Figure 58

139. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

140. Thus, Bora '528 discloses or renders obvious this limitation.

g. 1[f] wherein said microcontroller through at least a third control pin receives said at least one message carrying sensing signal from said at least one detection device

141. Bora '528 discloses or renders obvious wherein said microcontroller through at least a third control pin receives said at least one message carrying sensing signal from said at least one detection device.

142. Bora '528 discloses that "[t]he components of the II Device 140 can be modularized to provide easy enhancement, customization, modification and repair of the II Device 140. For example, a main circuit board 134 may include the DC/DC power converter 104, the controller/processor 106, the LED current control circuit 120, the memory 108, the real time clock circuit 110, and the wireless transceiver circuit 112 and antenna 114. A sensor board 130 may include the hard reset circuit 116 and the ambient light sensor circuit 118. A LED board 136 may include the two or more LEDs 122 and additional LED related circuitry (e.g., LED arms)." Bora '528 at 10:5-15.

143. Bora '528 discloses that "the wireless transceiver circuit 112 will be connected to the controller/processor 106 and the antenna 114." Bora '528 at 11:62-63. It further discloses that "the controller/processor 106 processes signals received from . . . the wireless transceiver circuit 112." Bora '528 at 11:4-6.

144. Bora '528 also discloses that "a wireless device (WD) is equipped with hardware and systems to execute wireless communication protocols (Bluetooth, Wi-Fi, ZigBee, or any other wireless protocol) as well as an appropriate device application 2302" allowing a user to "send a lighting command to an II Device by selecting the command via the device application 2304. Bora '528 at 29:60-66. It also discloses that "[u]pon the user's selection of a command for a specific II Device, the device application would translate the user's requested command

into a light setting command and the specific stored ID for the selected II Device 2306. This light setting command would include instructions for the specified II Device ID to execute such as on/off, color, brightness, or a program." Bora '528 at 29:66-30:5.

145. Bora '528 discloses that "the light setting command would be translated into the appropriate wireless communication protocol and wirelessly sent via the wireless device 2308. The II Device if in range of the wireless communication or mesh network 2309 relay communication would receive the protocol via the II Device's antenna 2310. The transceiver/receiver circuitry would decode the wireless protocol to find the light setting command and send that to the controller/processor 2312." Bora '528 at 30:5-13.

146. Bora '528 discloses that microcontroller/processor receives the light setting command from the wireless transceiver circuit. A person of ordinary skill in the art would understand that the microcontroller/processor receives that command through a control pin.

147. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

148. Thus, Bora '528 discloses or renders obvious this limitation.

h. 1[g] wherein said microcontroller controls a conduction state or a cutoff state of said first controllable switching element through said first control pin and said microcontroller controls said conduction state or said cutoff state of said second controllable switching element through said second control pin to control electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said at least one message carrying sensing signal generated by said at least one detection device

149. Bora '528 discloses or renders obvious said microcontroller controls a conduction state or a cutoff state of said first controllable switching element through said first control pin and said microcontroller controls said conduction state or said cutoff state of said second controllable switching element through said second control pin to control electric power

transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said at least one message carrying sensing signal generated by said at least one detection device.

150. Bora '528 discloses that a wireless device and an appropriate device application 2302" allows a user to "send a lighting command to an II Device by selecting the command via the device application 2304. Bora '528 at 29:60-66. It also discloses that "[u]pon the user's selection of a command for a specific II Device, the device application would translate the user's requested command into a light setting command and the specific stored ID for the selected II Device 2306. This light setting command would include instructions for the specified II Device ID to execute such as on/off, color, brightness, or a program." Bora '528 at 29:66-30:5.

151. Bora '528 discloses that "[t]he transceiver/receiver circuitry would decode the wireless protocol to find the light setting command and send that to the controller/processor 2312." Bora '528 at 30:11-13. Bora '528 further discloses that "[t]he controller will execute that command." Bora '528 at 30:13-14.

152. Additionally, Figure 23, which is a flow chart of a communication process from a device to a II Device, discloses that in step 2313 that the "illuminating device's transceiver/receiver circuitry translates the wireless communication into the light setting command and sends to controller/processor." It also discloses in step 2314 that "Controller/processor interprets and executes the light setting command in association with other illuminating device components."

153. Bora '528's Switch Embodiment discloses that "[t]he controller is connected to each switch (500, 502, 504, and 506) and can send an on/off signal for each." Bora '528 at 18:7-9. "[T]he controller 106 would send a signal to control Switch1 500, Switch2 502, Switch3 504

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and Switch4 506." Bora '528 at 18:11-12. "The switches (500, 502, 504, 506) turning on or off, would be able to create different colors and saturation produced by the light." Bora '528 at 18:19-21. Bora '528 further discloses that "the controller could vary and alternate the length of time that the switches are turned on. This would create variations in lengths of time when the LED driver 508 would pass through current to the LED arms and thus create variations in lengths of time when the LEDs produce light." Bora '528 at 18:29-34.

154. Figure 6 depicts the timing diagram for the switches in the Switch Embodiment, showing when the switches are in the conduction state (On) and when the switches are in the cutoff state (Off).

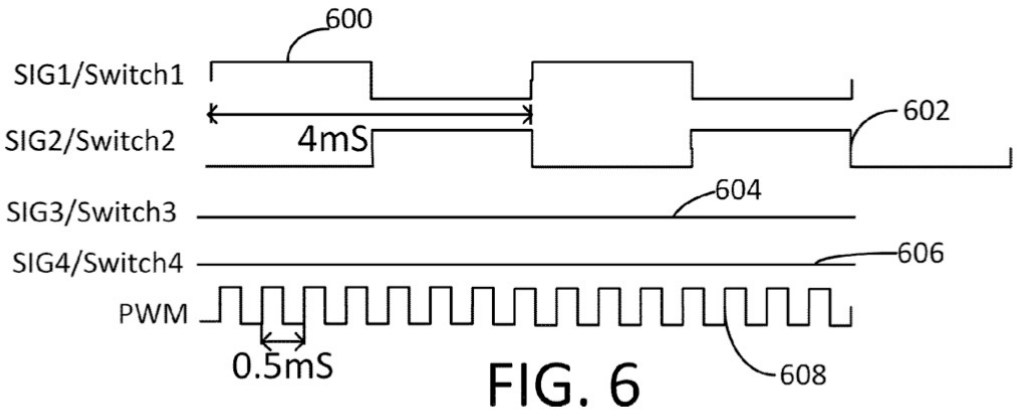


FIG. 6

Bora '528, Figure 6

155. Thus, the microcontroller turns the LEDs on or off by sending on/off signals to the switches, i.e. first controllable switching element and second controllable switching element. The on signal to the switch is the conduction state as it causes the switch to allow current to conduct from power supply 200 through the LED that is in series with the switch (e.g. Switch1 500 allows conduction through LED 310). The off signal to the switch is the cutoff state as it causes current flow or conduction to be cutoff or stopped by opening the switch thereby creating an open circuit in series with the switch's associated LED.

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156. Bora '528's LED Driver Embodiment discloses that "[t]he LEDs drivers turn ON or OFF based on the ON or OFF signal provided by the microcontroller/processor 106 as shown." Bora '528 at 57:9-11. "When LED driver is ON, current passes through its LEDs arm, and LEDs in that arm produces light. LEDs arms (LEDs1 302, LEDs2 304, LEDs3 306, and LEDs4 308) can have different types of LEDs including different colors and different electronic ratings." Bora '528 at 57:11-15. Bora '528 further discloses that "[w]ith the driver scheme as per FIG. 58, color mixing can be achieved by controlling the signals to the LED Drivers (Sigl 5826, Sig2 5828, Sig3 5830 and Sig4 5832) which in turn control the ON/OFF times of the LED drivers individually i.e. 20 by toggling the pins individually to ON or OFF states at a frequency that could be above 85 Hz." Bora '528 at 57:17-22.

157. Figures 60A-B and 61 depicts the timing diagram for the LED drivers in the LED Driver Embodiment, showing when the drivers are in the conduction state (On) and when the switches are in the cutoff state (Off).

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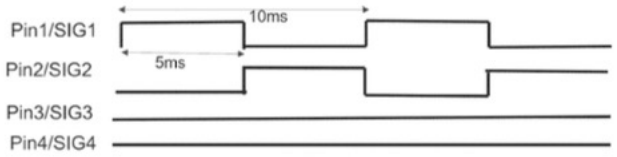


FIG. 60A

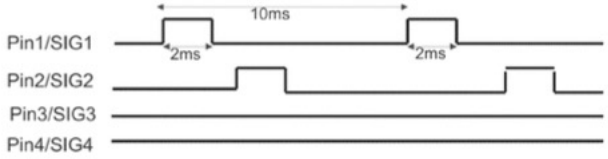


FIG. 60B

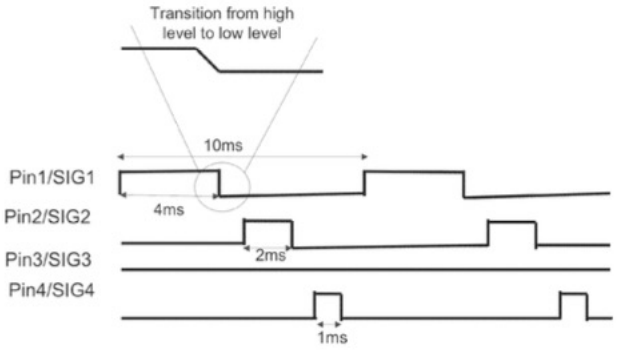


FIG. 61

Bora '528, Figure 60A-B, 61

158. Thus, the microcontroller turns the LEDs on or off by sending on/off signals to the LED drivers, i.e. first controllable switching element and second controllable switching element. The on signal to the LED driver is the conduction state as it causes the LED driver to allow current to conduct from power supply 200 through the LED that is in series with the driver (e.g. LED Driver1 318 allows conduction through LED 310). The off signal to the LED driver is the cutoff state as it causes current flow or conduction to be cutoff or stopped by opening a switch in the LED driver thereby creating an open circuit in series with the LED driver's associated LED. The on signal to the switch is the conduction state and the off signal to the switch is the cutoff state.

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159. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

160. Thus, Bora '528 discloses or renders obvious this limitation.

i. 1[h] wherein said first color temperature is higher than said second color temperature

161. Bora '528 discloses or renders obvious wherein said first color temperature is higher than said second color temperature.

162. As discussed above, Bora '528 discloses using multiple sets of white LEDs. Bora '528 at Bora '528 at 14:44-48. The first set of white LEDs has a color temperature higher than the second set of white LEDs. *See supra* claim 1[a], claim 1[b].

163. As discussed above, Bora '528 also discloses using white LEDs as the first LED lighting load and red LEDs as the second LED lighting load. *See supra* claim 1[a], claim 1[b]. The white LEDs of the first lighting load have a first color temperature that is higher than the second color temperature of the red LEDs. *See supra* claim 1[a], claim 1[b].

164. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

165. Thus, Bora '528 discloses or renders obvious this limitation.

j. 1[i] wherein said at least one message carrying sensing signal is characterized with a signal format of a short voltage signal, a long voltage signal, a plurality of short voltage signals, a plurality of long voltage signals or a combination of said short voltage signal and said long voltage signal generated in a preset time interval; wherein said short voltage signal and said long voltage signal are respectively defined either by a time length of a voltage signal or by said time length of a series of pulse signals consecutively generated

166. Bora '528 discloses or renders obvious wherein said at least one message carrying sensing signal is characterized with a signal format of a short voltage signal, a long voltage signal, a plurality of short voltage signals, a plurality of long voltage signals or a combination of

said short voltage signal and said long voltage signal generated in a preset time interval; wherein said short voltage signal and said long voltage signal are respectively defined either by a time length of a voltage signal or by said time length of a series of pulse signals consecutively generated.

167. Bora '528 discloses that "the wireless transceiver circuit 112 will be connected to the controller/processor 106 and the antenna 114." Bora '528 at 11:62-63. It further discloses that "the controller/processor 106 processes signals received from . . . the wireless transceiver circuit 112." Bora '528 at 11:4-6. Bora '528 also discloses that the wireless transceiver circuit can "include other components or circuitry." Bora '528 at 12:2-4. Those components or circuitry would be used to send electrical signals or voltages of varying time and length based on the information contained in the external control signal and the signals are sent to the microcontroller/processor 106.

168. Bora '528 discloses that a wireless device and an appropriate device application 2302" allows a user to "send a lighting command to an II Device by selecting the command via the device application 2304. Bora '528 at 29:60-66. It also discloses that "[u]pon the user's selection of a command for a specific II Device, the device application would translate the user's requested command into a light setting command and the specific stored ID for the selected II Device 2306. This light setting command would include instructions for the specified II Device ID to execute such as on/off, color, brightness, or a program." Bora '528 at 29:66-30:5.

169. Bora '528 discloses that "[t]he transceiver/receiver circuitry would decode the wireless protocol to find the light setting command and send that to the controller/processor 2312." Bora '528 at 30:11-13. It also discloses that "the controller will execute that command with the respective II Device's related components 2314. Upon successful execution, the II

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Device will respond through the appropriate wireless communication that it has executed the light setting command 2316-2318." Bora '528 at 30:13-17. In addition, Bora '528 discloses that "the antenna might be built into the physical structure of the II Device 140 or be part of the main board 134 inside the II Device." Bora '528 12:16-18. As part of the main board inside the II Device, the signal from the antenna and transceiver/receiver circuitry sent to the microcontroller/processor via electrical circuitry on the main board would be a voltage or voltages that vary with time and length depending on the specific implementation. These voltages of varying time and length are the message carrying signals input to the microcontroller that are used as one of the controls of the lighting device.

170. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

171. Thus, Bora '528 discloses or renders obvious this limitation.

k. [1j] wherein when said microcontroller receives said at least one message carrying sensing signal, said microcontroller manages according to said signal format of said at least one message carrying sensing signal to perform at least one of various working modes including at least an on/off switch control mode, a dimming control mode, a color temperature tuning control mode, a color temperature switching control mode, a dimming and color temperature tuning control mode, and a delay shutoff control mode

172. Bora '528 discloses or renders obvious wherein when said microcontroller receives said at least one message carrying sensing signal, said microcontroller manages according to said signal format of said at least one message carrying sensing signal to perform at least one of various working modes including at least an on/off switch control mode, a dimming control mode, a color temperature tuning control mode, a color temperature switching control mode, a dimming and color temperature tuning control mode, and a delay shutoff control mode.

173. Bora '528 discloses that a wireless device and an appropriate device application 2302" allows a user to "send a lighting command to an II Device by selecting the command via the device application 2304. Bora '528 at 29:60-66. It also discloses that "[u]pon the user's selection of a command for a specific II Device, the device application would translate the user's requested command into a light setting command and the specific stored ID for the selected II Device 2306. This light setting command would include instructions for the specified II Device ID to execute such as on/off, color, brightness, or a program." Bora '528 at 29:66-30:5.

174. A person of ordinary skill in the art would understand that the microcontroller or Controller/Processor 106 has input/output (I/O) peripherals for accepting input information, sending that information to the processor, and the processor subsequently then sends output instructions to external devices. When a light setting command such as on/off is sent to the II Device within an acceptable range, the antenna 2310 would receive that command and pass it to the transceiver/receiver circuitry to decode that wireless protocol to an appropriate on/off setting command to be sent to an input or inputs of the microcontroller. The input command information gets interpreted by the processor of the microcontroller based on instructions stored in its memory and sends an output command or commands to externally controlled devices. In the case of the on/off lighting command in Bora's Switch Embodiment, the processor will send a command via an output pin of the microcontroller to open a Switch1 500 when the light setting command is for the LED 310 to be in the off state or to close the Switch1 5100 when the light setting command is for the LED 310 to be in the on state.

175. Bora '528's LED Driver Embodiment discloses that "[t]he LEDs drivers turn ON or OFF based on the ON or OFF signal provided by the microcontroller/processor 106 as shown.

When LED driver is ON, current passes through its LEDs arm, and LEDs in that arm produces light." Bora '528 at 57:9-12.

176. Bora '528 additionally discloses that "[w]ith the driver scheme as per FIG. 58, color mixing can be achieved by controlling the signals to the LED Drivers (Sigl 5826, Sig2 5828, Sig3 5830 and Sig4 5832) which in turn control the ON/OFF times of the LED drivers individually i.e. 20 by toggling the pins individually to ON or OFF states at a frequency that could be above 85 Hz." Bora '528 at 57:16-22.

177. Bora '528's LED Driver Embodiment discloses that "[c]ontroller/processor 106 receives counts corresponding to at least one LED output in Block 5900. The controller/processor 106 multiplies or divides the count if and when required considering the ON/OFF trigger cycle that is dependent on processors internal clock cycle and persistence of vision requirement in block 5902. After the counts for LEDs are calculated, in block 5904, the controller/processor 106 turns the signal ON by toggling the signal pin to logic 1 for first color LED out of given N LEDs and starts the countdown from respective calculated LED count to 0 and then turns the signal OFF by toggling the signal pin to logic 0. In block 5906, controller/processor 106 waits with next countdown when all LEDs are supposed to be OFF depending upon the brightness level requirement. The countdown could be as low as 0. For example, the LED counts calculated for full intensity of color with Red, Blue, Green and White are 252, 100, 0 and 0 respectively, then the counts for Blue, Green and White for 75% intensity would be 189, 75, 0 and 0. For full intensity the Red signal will become high i.e. Red LED ON for countdown from 254 to 0 and then it will become low i.e. Red LED OFF. Immediately after that the Green signal will become high i.e. Green LED ON for countdown from 100 to 0 then it will turn OFF. As Blue and White counts are 0, they will not Turn ON but remain OFF.

Thereafter, the cycle with RED turning ON immediately continues. However, for 50% intensity, the Red signal will turn high i.e. Red LED ON for countdown from 189 to 0 and then it will turn OFF and will remain OFF for countdown from 63 (calculated as 252−189) to 0. Immediately after that Green will turn ON for countdown from 75 to 0 and then it will turn OFF and will remain OFF for countdown from 25 (calculated as 100−75) to 0. With Blue and White counts 0, Blue and White LED will always remain OFF. The cycle repeats until new counts are available. This countdown method could be different, however, it will be intended to keep percentage of Signal of a particular LED ON out of entire time cycle same as calculated in above example. Blocks 5904, 5906, 5908 and 5910 explain the process in general. The cycle repeats until the new counts for LEDs for new color and brightness combination are provided or calculated as shown in general in blocks 5912 and 5914." Bora '528 at 59:7-47.

178. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

179. Thus, Bora '528 discloses or renders obvious this limitation.

l. 1[k] wherein when said first controllable switching element and said second controllable switching element are in said conduction state, said microcontroller further controls said electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said signal format of said at least one message carrying sensing signal received, wherein said microcontroller through said first control pin outputs a first control signal to control a conduction rate of said first controllable switching element, said microcontroller through said second control pin outputs a second control signal to control said conduction rate of said second controllable switching element

180. Bora '528 discloses or renders obvious wherein when said first controllable switching element and said second controllable switching element are in said conduction state, said microcontroller further controls said electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load

according to said signal format of said at least one message carrying sensing signal received, wherein said microcontroller through said first control pin outputs a first control signal to control a conduction rate of said first controllable switching element, said microcontroller through said second control pin outputs a second control signal to control said conduction rate of said second controllable switching element.

181. Bora '528 discloses that "the wireless transceiver circuit 112 will be connected to the controller/processor 106 and the antenna 114." Bora '528 at 11:62-63. It further discloses that "the controller/processor 106 processes signals received from . . . the wireless transceiver circuit 112." Bora '528 at 11:4-6.

182. Bora '528's LED Driver Embodiment discloses that "[t]he LEDs drivers turn ON or OFF based on the ON or OFF signal provided by the microcontroller/processor 106 as shown." Bora '528 at 57:9-11. "When LED driver is ON, current passes through its LEDs arm, and LEDs in that arm produces light. LEDs arms (LEDs1 302, LEDs2 304, LEDs3 306, and LEDs4 308) can have different types of LEDs including different colors and different electronic ratings." Bora '528 at 57:11-15. Bora '528 further discloses that "[w]ith the driver scheme as per FIG. 58, color mixing can be achieved by controlling the signals to the LED Drivers (Sigl 5826, Sig2 5828, Sig3 5830 and Sig4 5832) which in turn control the ON/OFF times of the LED drivers individually i.e. 20 by toggling the pins individually to ON or OFF states at a frequency that could be above 85 Hz." Bora '528 at 57:17-22.

183. As discussed above, Figures 60A-B and 61 depicts the timing diagram for the LED drivers in the LED Driver Embodiment, showing when the drivers are in the conduction state (On) and when the switches are in the cutoff state (Off).

184. Thus, the controller turns the LEDs on or off by sending on/off signals to the LED drivers, i.e. first controllable switching element and second controllable switching element. The on signal to the LED driver is the conduction state as it causes the LED driver to allow current to conduct from power supply 200 through the LED that is in series with the driver (e.g. LED Driver1 318 allows conduction through LED 310). The off signal to the LED driver is the cutoff state as it causes current flow or conduction to be cutoff or stopped by opening a switch in the LED driver thereby creating an open circuit in series with the LED driver's associated LED. The on signal to the switch is the conduction state and the off signal to the switch is the cutoff state.

185. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

186. Thus, Bora '528 discloses or renders obvious this limitation.

m. 1[l] wherein said microcontroller is an integrated circuit programmable for generating said first control signal and said second control signal, or an application specific integrated circuit (ASIC) custom made for generating said first control signal and said second control signal.

187. Bora '528 discloses or renders obvious wherein said microcontroller is an integrated circuit programmable for generating said first control signal and said second control signal, or an application specific integrated circuit (ASIC) custom made for generating said first control signal and said second control signal.

188. Bora '528 discloses that "the various illustrative logical blocks, modules, circuits, and algorithm steps described herein may be implemented as electronic hardware, computer software, or combinations of both, depending on the application and functionality. Moreover, the various logical blocks, modules, and circuits described herein may be implemented or performed with a general purpose processor (e.g., microprocessor, conventional processor, controller, microcontroller, state machine or combination of computing devices), a digital signal processor

('DSP'), an application specific integrated circuit ('ASIC'), a field programmable gate array ('FPGA') or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein." Bora '528 at 75:53-61.

189. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

190. Thus, Bora '528 discloses or renders obvious this limitation.

2. Dependent claim 8 - The microcontroller based electronic switch according to claim 1, wherein said at least one detection device is configured with a direct touch interface for detecting and converting said at least one external control signal into said at least one message carrying sensing signal interpretable to said microcontroller.

191. As discussed above, Bora '528 discloses or renders obvious claim 1.

192. Bora '528 discloses or renders obvious wherein said at least one detection device is configured with a direct touch interface for detecting and converting said at least one external control signal into said at least one message carrying sensing signal interpretable to said microcontroller.

193. Bora '528 discloses "some embodiments might . . . also have a manual hue adjustment option with some mechanical input, such as a button, a knob, or the like. A user can adjust the hue, color, or brightness of the II Device. One example of a button would be a rotating ring around the edge of the II Device that in different positions would relate to different hues or colors. With torque a user could turn the ring to create different ring effects. Another example would be a very low voltage conductive area on the outside of the light that when touched would change the color or hue. Again another version might be a button or switch somewhere on the embodiment that when turned would create a different hue, brightness, or color." Bora '528 at 64:61-65:5.

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194. To the extent that Bora '528 does not disclose this limitation, it would have been rendered obvious over Bora '528.

195. A person of ordinary skill would understand that the manual adjustment is a direct touch interface, which works in complimentary fashion with the external control signal received by the IR sensor. The II Device can receive an external control signal via the IR sensor and via the manual input, which are converted into a message carrying sensing signal interpretable by the microcontroller. For example, the IR sensor could receive an external control signal via the IR sensor to adjust the color output and the manual input could be used to adjust the brightness of the II Device.

196. Accordingly, a person of ordinary skill in the art would have been motivated to configure at least one detection device with a direct touch interface in view of the disclosure in Bora '528, the state of the prior art at the time of the filing of the '503 patent, and the knowledge of a person of ordinary skill in the art.

197. Thus, Bora '528 discloses or renders obvious this claim.

3. Dependent claim 11 - The microcontroller based electronic switch according to claim 8, wherein said direct touch interface is a detection circuitry to detect a voltage signal generated by a voltage divider and to convert a voltage value of said voltage signal into said at least one message carrying sensing signal with said signal format corresponding to said voltage value generated for setting said conduction rate of said first controllable switching element and said second controllable switching element respectively.

198. As discussed above, Bora '528 discloses or renders obvious claim 8.

199. Bora '528 discloses or renders obvious said direct touch interface is a detection circuitry to detect a voltage signal generated by a voltage divider and to convert a voltage value of said voltage signal into said at least one message carrying sensing signal with said signal

format corresponding to said voltage value generated for setting said conduction rate of said first controllable switching element and said second controllable switching element respectively.

200. As discussed above, Bora '528 discloses that "some embodiments might . . . also have a manual hue adjustment option with some mechanical input, such as a button, a knob, or the like. A user can adjust the hue, color, or brightness of the II Device. One example of a button would be a rotating ring around the edge of the II Device that in different positions would relate to different hues or colors. With torque a user could turn the ring to create different ring effects. Another example would be a very low voltage conductive area on the outside of the light that when touched would change the color or hue. Again another version might be a button or switch somewhere on the embodiment that when turned would create a different hue, brightness, or color." Bora '528 at 64:61-65:5.

201. When the disclosed button is pushed, the disclosed knob or ring is turned, or the voltage conductive area is touched, a person of ordinary skill in the art would understand that a voltage divider would be a common implementation to have these actions output a different voltage to reflect the selected setting, i.e. the message carrying sensing signal, which would be sent to the controller/processor to control the conduction rate of the first and second controllable switching elements.

202. Such use of voltage dividers was well known in the art. For example, Ferrier[9] discloses a control device 102 configured with preset voltage outputs to control the linear mode transistors 112, 114, 116, 118, 128 and 138. Ferrier at 5:43-45. Ferrier discloses that "[t]he control device 102 may be a mechanical switch, such as a switch coupled to voltage dividers, a

[9] U.S. Patent No. 8,907,576 ("Ferrier") was filed on April 23, 2013 and issued on December 9, 2014. I understand Bora '528 is therefore prior art to claims 1, 8, 11, 40, 41, 53, and 56 of the '503 patent.

multi-position potentiometer, or other means of switching between voltage outputs." Ferrier at 5:55-58. Ferrier also discloses that "[t]he control device 102 can have one or more switch devices therein. For example, the control device 102 can have switches that adjust the gate voltages of the linear mode transistors. The control device 102 can include a plurality of operating states. In one embodiment, each state of the control device can adjust/switch all of the linear mode transistors' gate voltages simultaneously. In that embodiment, each state of the switches can correspond to a correlated color temperature of the LED strings. For example, the control device 102 can provide the option of three colors/correlated color temperatures (CCT) for the light emission from the LED strings." Ferrier at 5:64-6:7. Ferrier further discloses that the "changes in the gate voltages of the transistors in turn can change the output color temperatures of the LED strings." Ferrier 2:63-65.

203. Accordingly, a person of ordinary skill in the art would have been motivated to use a voltage divider to generate a voltage signal detected by the detection circuitry in Bora '528 in view of the disclosure in Bora '528, the state of the prior art at the time of the filing of the '503 patent, including Ferrier, and the knowledge of a person of ordinary skill in the art.

204. Thus, Bora '528 discloses or renders obvious this claim.

4. <u>Independent claim 40</u>

a. 40[pre] A lighting apparatus comprising

205. I incorporate my opinions *supra* regarding claim 1[pre] with respect to claim limitation 40[pre].

206. Thus, to the extent the preamble is limiting, Bora '528 discloses it or renders it obvious.

b. 40[a] a first LED lighting load for emitting light with a first color temperature

207. I incorporate my opinions *supra* regarding claim 1[a] with respect to claim limitation 40[a].

208. Thus, Bora '528 discloses or renders obvious this limitation.

c. a second LED lighting load for emitting light with a second color temperature

209. I incorporate my opinions *supra* regarding claim 1[b] with respect to claim limitation 40[b].

210. Thus, Bora '528 discloses or renders obvious this limitation.

d. 40[c] a diffuser, covering said first LED lighting load and said second LED lighting load to create a diffused light with a mingled color temperature

211. Bora '528 discloses or renders obvious a diffuser, covering said first LED lighting load and said second LED lighting load to create a diffused light with a mingled color temperature.

212. Bora '528 discloses that the II Device can include "a diffuser or lens 128 disposed above the two or more LEDs 122." Bora '528 at 10:2-4. Bora '528 further discloses that "[t]he diffuser 128 is a part of the II Device 140 that spreads and/or 'mixes' the illumination produced by the LEDs 122. The diffuser 128 could be made of different materials and come in different sizes, dependent on the specific variation and application of the II Device 140. Common material might be glass, plastics, or fiber. The diffuser 128 would be placed over the LEDs 122 so that the illumination passes through the diffuser 128. The exact placement, angle, and arc of the diffuser 128 related to the LEDs 122 would vary dependent on the variation and application of different II Devices." Bora '528 at 15:4-13.

213. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

214. Thus, Bora '528 discloses or renders obvious this limitation.

e. 40[d] a microcontroller based electronic switch electrically connected to said first LED lighting load and to said second LED lighting load, said microcontroller based electronic switch further comprising

215. I incorporate my opinions *supra* regarding claims 1[a] and 1[b] with respect to claim limitation 40[d].

216. Thus, Bora '528 discloses or renders obvious this limitation.

f. 40[e] a first switching element, electrically connected between said first LED lighting load and a power source

217. I incorporate my opinions *supra* regarding claims 1[a] and 1[b] with respect to claim limitation 40[e].

218. Thus, Bora '528 discloses or renders obvious this limitation.

g. 40[f] a second switching element, electrically connected between said second LED lighting load and said power source

219. I incorporate my opinions *supra* regarding claims 1[a] and 1[b] with respect to claim limitation 40[f].

220. Thus, Bora '528 discloses or renders obvious this limitation.

h. 40[g] at least a detection device, for detecting at least one external control signal and converting said at least one external control signal into at least one message carrying sensing signal

221. I incorporate my opinions *supra* regarding claims 1[c] and 1[d] with respect to claim limitation 40[g].

222. Thus, Bora '528 discloses or renders obvious this limitation.

i. 40[h] a microcontroller to receive and interpret said at least one message carrying sensing signal generated by said at least one detection device, wherein said microcontroller through a first control pin is electrically coupled to said first switching element, and through a second control pin is electrically coupled to said second switching element, wherein said microcontroller through a third control pin receives said at least one message carrying sensing signal from said at

least one detection device, wherein said microcontroller controls a conduction state or a cutoff state of said first switching element through said first control pin and said microcontroller controls said conduction state or said cutoff state of said second switching element through said second control pin to control electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said at least one message carrying sensing signal generated by said at least one detection device

223. I incorporate my opinions *supra* regarding claims 1[d] – 1[g] with respect to claim limitation 40[h].

224. Thus, Bora '528 discloses or renders obvious this limitation.

j. 40[i] wherein said first color temperature is higher than said second color temperature

225. I incorporate my opinions *supra* regarding claims 1[h] with respect to claim limitation 40[i].

226. Thus, Bora '528 discloses or renders obvious this limitation.

k. 40[j] wherein said at least one message carrying sensing signal is characterized with a signal format of a short voltage signal, a long voltage signal, a plurality of short voltage signals, a plurality of long voltage signals or a combination of short voltage signal and long voltage signal generated in a preset time interval; wherein said short voltage signal and said long voltage signal are respectively defined either by a time length of a voltage signal or by said-time length of a series of pulse signals consecutively generated; wherein when said microcontroller receives said at least one message carrying sensing signal, said microcontroller operates according to said signal format of said at least one message carrying sensing signal to perform at least one of various working modes including at least an on/off switch control mode, a dimming control mode, a color temperature tuning control mode, a color temperature switching mode, a dimming and color temperature tuning control mode, and a delay shutoff control mode

227. I incorporate my opinions *supra* regarding claims 1[i] and 1[j] with respect to claim limitation 40[j].

228. Thus, Bora '528 discloses or renders obvious this limitation.

l. 40[k] wherein when said first switching element and said second switching element are in said conduction state, said microcontroller further controls said electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said signal format of said at least one message carrying sensing signal received, wherein said microcontroller through said first control pin outputs a first control signal to change a conduction rate of said first switching element, said microcontroller through said second control pin outputs a second control signal to change said conduction rate of said second switching element

229. I incorporate my opinions *supra* regarding claims 1[j] and 1[k] with respect to claim limitation 40[k].

230. Thus, Bora '528 discloses or renders obvious this limitation.

m. 40[l] wherein said microcontroller is an integrated circuit programmable for generating said first control signal and said second control signal, or an application specific integrated circuit (ASIC) custom made for generating said first control signal and said second control signal

231. I incorporate my opinions *supra* regarding claims 1[l] with respect to claim limitation 40[l].

232. Thus, Bora '528 discloses or renders obvious this limitation.

5. Dependent claim 41 - The lighting apparatus according to claim 40, wherein both said first switching element and said second switching element are controllable switching element[s], wherein when said microcontroller receives said at least one message carrying sensing signal, said microcontroller operates to output said first control signal and said second control signal with an arrangement that said conduction rate of said first switching element and said conduction rate of said second switching element are reversely adjusted with the same pace such that a total electric power transmitted to said first LED lighting load and said second LED lighting load is maintained at a constant level while said mingled color temperature of said lighting apparatus is proportionately adjusted according to said signal format of said at least one message carrying sensing signal to perform said color temperature tuning control mode.

233. As discussed above, Bora '528 discloses or renders obvious claim 40.

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234. Bora '528 discloses or renders obvious said first switching element and said second switching element are controllable switching elements, wherein when said microcontroller receives said at least one message carrying sensing signal, said microcontroller operates to output said first control signal and said second control signal with an arrangement that said conduction rate of said first switching element and said conduction rate of said second switching element are reversely adjusted with the same pace such that a total electric power transmitted to said first LED lighting load and said second LED lighting load is maintained at a constant level while said mingled color temperature of said lighting apparatus is proportionately adjusted according to said signal format of said at least one message carrying sensing signal to perform said color temperature tuning control mode.

235. Bora '528 discloses that "[n]ow referring to FIG. 58, a block diagram of a LED driver scheme in accordance with one embodiment of the present invention is shown. Various LEDs arms (302, 304, 306 and 308) are driven by the LED drivers (318, 320, 322 and 324) as shown. The LEDs drivers turn ON or OFF based on the ON or OFF signal provided by the microcontroller/processor 106 as shown. When LED driver is ON, current passes through its LEDs arm, and LEDs in that arm produces light. LEDs arms (LEDs1 302, LEDs2 304, LEDs3 306, and LEDs4 308) can have different types of LEDs including different colors and different electronic ratings. Each LEDs arm may have one or multiple LEDs in a series or parallel or combinations of those. With the driver scheme as per FIG. 58, color mixing can be achieved by controlling the signals to the LED Drivers (Sig1 5826, Sig2 5828, Sig3 5830 and Sig4 5832) which in turn control the ON/OFF times of the LED drivers individually i.e. by toggling the pins individually to ON or OFF states at a frequency that could be above 85 Hz. To limit the sum of the currents going through different LED drivers at a time, one could make sure not to have

multiple pins controlling signals Sig1 5826, Sig2 5828, Sig3 5830 and Sig4 5832) of the LED drivers ON at a time. This could be achieved by a program running in the processor that controls the pins' ON/OFF states. In this way one need not have a PWM control of the LEDs drivers, which also helps to optimize the frequency required to run the LED drivers taking into the consideration their maximum and minimum frequency of operation and flickering issues associated with the LEDs being driven by their respective drivers." Bora '528 at 57:8-33

236. Bora '528 further discloses that "[a]n example of how this circuitry and program controlling the pins work will now be described with a specific case having these assumptions: (1) The high level (ON) signal if passing through each of the Pins, Pin1, Pin2, Pin3 and Pin4 in FIG. 58 passes at every 10 ms of a time period; (2) The ON signals through each of the pins are not overlapping; (3) LED drivers are designed for 1 A output current, i.e. when any Pin is set high (ON), it makes the respective driver ON allowing up to 1 A current pass through its LED arm; (4) The user wants a yellow light output at the maximum luminosity possible, for which LEDs1 302 and LEDs2 304 should be illuminated equally by sending same amount of average current through them; (5) LEDs1 302, LEDs2 304, LEDs3 306, and LEDs4 308 arms have multiple RED, Green, Blue and White LEDs in series respectively; (6) For full luminosity of yellow light that can be produced through this scheme, the average current passing through RED LEDs and Green LEDs should be half the maximum average current possible through them, which can be achieved by turning LEDs drivers ON/OFF as per the timing diagram in FIG. 60A. For 40% of the maximum luminosity of yellow light, RED LEDs should be ON for 20% time and Green LEDs should be ON for 20% time as shown with the signals SIG1 and SIG2 in FIG. 60B. Similarly, to produce a type of orange light consisting of 40% of Red, 20% Green and 10% of White could be achieved as per FIG. 61." Bora '528 at 57: 34-58.

237. Bora '528 further discloses "[s]imilarly, variations in the length of time that the controller 106 would alternatively send each PWM signal (326, 328, 330, 332) to the respective LED driver (318, 320, 322, 324), which would control the current passed through to the respective LED arm (302, 304, 306, 308), would also provide for a combinatory control of the average luminosity produced by each LED arm (302, 304, 306, 308) and thus allow for control of color and saturation of the light produced. The frequency of PWM signals (326, 328, 330, 332) and the rate at which LED drivers (318, 320, 322, 324) receive the PWM signals (326, 328, 330, 332) from controller/processor 106 will be high enough (still within the LEDs' and LED Drivers' technical specifications) so that due to the persistence of vision, consumers would see a constant light output, for example a yellow light instead of fast switching alternate red and green light outputs. The scheme in alternating PWM signals (326, 328, 330, 332) does not allow for simultaneous PWM signals (326, 328, 330, 332) executed by the LED driver (318, 320, 322, 324) at the same time. This maximizes the potential average current passed through LEDs arms (302, 304, 306, 308) and subsequent luminosity of each LED arm (302, 304, 306, 308) considering limited available current from the AC/DC converter 102. It allows for each LED arm (302, 304, 306, 308) to receive the full power provided by the AC/DC converter 102 and regulated by the LED driver (318, 320, 322, 324), such that when it is on all the available current could be sent through to the one LED arm." Bora '528 at 16:30-56.

238. Bora '528 additionally discloses "an example of how the solely LED driver scheme might work. Consider, the frequency of PWM signal is 2 KHz or total time period for one signal (one high and one low)=½ KHz=0.5 ms. Consider the duty cycle of each PWM1 400 and PWM2 402 is the same. The higher the duty cycle, the brighter the overall luminosity would be and vice-versa. Each LED driver (318, 320, 322, 324) is designed for a particular current

level, i.e. when LED driver (318 or 320 or 322 or 324) is ON (when they get high signal from the controller 106), the current passing through the LED driver (318, 320, 322, 324) would be the lesser value of either the designed particular current level or the maximum current that power supply 200 can provide. Assume that the luminosity created per unit of average current is the same for both the red LED arm 302 and the green LED arm 304. If in 4 ms cycles, the controller turns on the PWM1 and turns off PWM2 every first 2 ms and then turns off PWM1 and turns on PWM2 for the next 2 ms with PWM3 and PWM4 are off continuously, then, the overall light output would be yellow (mixture of Red and Green color light, each with same luminosity)." Bora '528 at 16:57-17:10.

239. Bora '528 discloses "[r]eferring now to FIG. 4, a timing diagram for the solely LED drivers scheme of FIG. 3 is shown. The clock signal 408 has a 0.5 ms cycle time. To produce a type of orange light which consists of 70% red and 30% Green light mixed together, PWM1/LED Driver1 400 should be ON for 70% of the cycle time (here, 70% of 4 ms=2.8 ms) and PWM2/LED Driver2 402 should be ON for remaining 30% of the cycle time (here, 30% of 4 ms=1.2 ms). Similarly, to produce brighter shade of orange light which may consist of 50% RED, 20% Green and 20% White light together, PWM1/LED Driven 400 should be ON for 50% of the cycle time (here, 50% of 4 ms=2 ms), PWM2/LED Driver2 402 should be ON for 20% of the cycle time (here, 20% of 4 ms=0.8 ms), PWM3/LED Driver3 404 should be ON for 0% of the cycle time (here, 0% of 4 ms=0 ms), PWM4/LED Driver4 406 should be ON for 20% of the cycle time (here, 20% of 4 ms=0.8 ms), and all PWM/LED Drivers (400, 402, 404, 406) should be OFF for the remaining 10% of cycle time (here, 10% of 4 ms=0.4 ms)." Bora '528 at 17:11-29.

240. Bora '528 further discloses "[i]n a similar way, by varying PWM signal duty cycle for four LEDs Drivers (318, 320, 322, and 324) for a given PWM ON/OFF time cycle (4 ms in an example above), II Device 140 could produce any color with different shades. When duty cycle is 100% i.e. 100% ON and 0% OFF, the PWM/LED Driver1 400 and PWM/LED Driver2 402 are ON for 2 ms alternately every PWM ON/OFF cycle of 4 ms, II Device 140 will produce highest possible (100%) luminosity for the Yellow light. Thus the output luminosity can be varied by varying duty cycle of the PWM signals (326, 328, 330, 332) to LED drivers (318, 320, 322, 324), providing dimming feature to II Device 140." Bora '528 at 17:30-41.

241. Bora '528 also discloses "[t]o further clarify the scheme, consider the following example. A yellow light with no white light added into it can be produced by the controller turning Switch 1 500 ON and Switch 2 502 OFF and then Switch 1 500 OFF and Switch 2 502 ON continuously at the same frequency, fast enough so that due to the persistence of vision, consumer sees it as a yellow light output instead of alternate Red and Green light output. LED driver 508 circuit can be designed for a particular current level i.e. it will regulate the flow of current through it to the set current level whenever the controller 106 provides a high signal to it. PWM (Pulse Width Modulation) 518 consists of high and low signals at a fixed frequency. One could change the duration of high and low signals in a given particular time (defined as time period=1/frequency)." Bora '528 at 18:63-19:9.

242. Bora '528 discloses "[a]n example of how this circuitry works will now be described. Assumptions: (1) frequency of PWM 518/608 set is 2 KHz, i.e. total time period for one signal (one high and one low)=½ KHz=0.5 ms; (2) frequency at which switches (510, 512, 514, 516/600, 602, 604, 606) are turned ON and OFF=250 Hz, i.e. total time period for switch to turn ON and OFF= 1/250 Hz=4 ms; and (3) LED driver 508 is designed for 1 A current, i.e.

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when any switch (500, 502, 504, 506) and LED driver 508 is ON (when they get high signal from the controller 108) current passing through it is 1 A or maximum current that power supply 200 can provide, whichever is less. The user wants a Yellow light output at half the maximum luminosity possible, for which Red 310 and Green 312 LEDs should be illuminated equally by sending same amount of average current through them. Also for half the luminosity, the average current passing through RED LEDs arm 302 and Green LEDs arm 304 should be half the maximum average current possible. This is achievable by turning Switches (510, 512, 514, 516/600, 602, 604, 606/500, 502, 504, 506) ON/OFF and setting PWM 518/608 as in the timing diagram below. The power supply can provide maximum current of 1 A for any LED arm (302, 304, 306, and 308) at a time." Bora '528 at 19:10-32.

243. Bora '528 discloses "[s]witching frequency of 250 Hz (cycle of 4 ms): When Switch1 500 is ON; Switch2 502 is OFF letting current flow through only one arm at a time. Also, time for which Switch1 500 is ON and time for which Switch2 502 is ON are equal, thus producing Yellow light as required. However, to produce a type of orange light which consists of 70% Red and 30% Green light together, SIG1/Switch1 510/600 should be ON for 70% of the cycle time (here, 70% of 4 ms=2.8 ms) and SIG2/Switch2 512/602 should be ON for remaining 30% of the cycle time (here, 30% of 4 ms=1.2 ms). Similarly, to produce brighter shade of orange light which consists of 50% RED, 20% Green and 20% White light together, SIG1/Switch1 510/600 should be ON for 50% of the cycle time (here, 50% of 4 ms=2 ms), SIG2/Switch2 512/602 should be ON for 20% of the cycle time (here, 20% of 4 ms=0.8 ms), SIG4/Switch4 516/606 should be ON for 20% of the cycle time (here, 20% of 4 ms=0.8 ms), and all switches (510, 512, 514, 516/600, 602, 604, 606) are off for the remaining 10% of cycle time

(here, 10% of 4 mA=0.4 ms). FIG. 6 is a timing diagram for the switches and LED driver scheme of FIG. 5." Bora '528 at 19:33-52

244. Bora '528 discloses "[i]n a similar way, by varying the switching combinations for a given time cycle, II Device 140 could produce any color with different shades. When duty cycle is 100% i.e. 100% ON and 0% OFF, the LED driver 508 is always ON, thus letting current pass continuously through an LED arm (302, 304, 306, 308) which has its switch ON, in turn providing highest possible luminosity for the color produced. Thus the output luminosity can be varied by varying duty cycle of the PWM signal 518/608 to the LED driver 508, providing dimming feature to II Device 140. The algorithm/program in the controller 106 is such that, at a time only one switch or limited number of switches will be turned ON. Thus, making sure that maximum possible current (mainly set by LED driver 508 circuit) flows through the LED arm of that particular switch at that time. This particular scheme is more useful when power supply has limited current output capability. With such algorithm one could achieve maximum luminosity for any color possible." Bora '528 at 19:53-20:3

245. To the extent this limitation is not disclosed by Bora '528, it would have been obvious in view of a person of ordinary skill.

246. Thus, Bora '528 discloses or renders obvious this claim.

6. <u>Dependent claim 53 - The lighting apparatus according to claim 40, wherein said at least one detection device is a direct touch interface for detecting said at least one external control signal and converting said at least one external control signal into said at least one message carrying sensing signal interpretable to said microcontroller.</u>

247. I incorporate my opinions *supra* regarding claims 8 and 11 with respect to claim 53.

248. Thus, Bora '528 discloses or renders obvious claim 53.

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7. Dependent claim 56 - The lighting apparatus according to claim 53, wherein said direct touch interface is a circuitry to detect a voltage signal generated by a voltage divider and convert a voltage value of said voltage signal into said at least one message carrying sensing signal with said signal format corresponding to said voltage value-generated for setting conduction rates of said first switching element and said second switching element respectively.

249. I incorporate my opinions *supra* regarding claim 11 with respect to claim 56.

250. Thus, Bora '528 discloses or renders obvious claim 56.

C. CLAIMS 1, 8, 11, 40, 41, 53 and 56 ARE ANTICIPATED BY RAINS OR RENDERED OBVIOUS BY RAINS ALONE OR IN VIEW OF BORA '528

1. Independent claim 1

a. 1[pre] A microcontroller based electronic switch for controlling lighting performance of an LED lamp configured with a plurality of LED lighting loads comprising

251. Rains discloses or renders obvious a microcontroller based electronic switch for controlling lighting performance of an LED lamp configured with a plurality of LED lighting loads.

252. Rains discloses, as depicted in Figure 1C, "an intelligent light emitting system using white light type solid state light emitting elements of different color temperatures, with certain elements of the fixture shown in cross-section." Rains at 4:21-24.

253. Rains discloses that "[t]he electrical components shown in FIG. 3 also include an LED control system 120. The system 120 includes driver circuits for the various LEDs, as well as a microcontroller. The driver circuits supply electrical current to the respective LEDs 113, 115, 117 and 119 of the array 111 to cause the LEDs of the array to emit light. The driver circuit 121 drives the Red LEDs 113, the driver circuit 123 drives the green LEDs 115, and the driver circuit 125 drives the Blue LEDs 117. In a similar fashion, when active, the driver circuit 127 provides electrical current to the other LEDs 119." Rains at 22:26-35.

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254. To the extent the preamble is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

255. Thus, to the extent the preamble is limiting, Rains discloses it or renders it obvious.

b. 1[a] a first controllable switching element, electrically connected between a power source and a first LED lighting load for emitting light with a first color temperature

256. Rains discloses or renders obvious a first controllable switching element, electrically connected between a power source and a first LED lighting load for emitting light with a first color temperature.

257. Rains discloses, as depicted in Figure 1C, "an intelligent light emitting system using white light type solid state light emitting elements of different color temperatures, with certain elements of the fixture shown in cross-section." Rains at 4:21-24.

258. Rains discloses that "in the system 1C the first solid state light emitting element 6_1 is a white LED W1 of a first type, for emitting white light of a first color temperature, whereas the second solid state light emitting element 6_2 is a white LED W_2 of a second type, for emitting white light of a somewhat different second color temperature. Controlled combination of the two types of white light within the cavity 2 allows for some color adjustment, to achieve a color temperature of the combined light output C that is somewhere between the temperatures of the two white lights, depending on the amount of each white light provided by the two elements 61 and 6_2." Rains 11:51-62.

259. Rains discloses that "[t]he electrical components shown in FIG. 3 also include an LED control system 120. The system 120 includes driver circuits for the various LEDs, as well as a microcontroller. The driver circuits supply electrical current to the respective LEDs 113, 115, 117 and 119 of the array 111 to cause the LEDs of the array to emit light. The driver circuit

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121 drives the Red LEDs 113, the driver circuit 123 drives the green LEDs 115, and the driver circuit 125 drives the Blue LEDs 117. In a similar fashion, when active, the driver circuit 127 provides electrical current to the other LEDs 119." Rains at 22:26-35.

260. Rains discloses that "[c]ontrol of the LED outputs could be controlled by selective modulation of the drive signals applied to the various LEDs." Rains at 22:47-49.

261. Rains further discloses that "[t]he third type of other LED of interest is a white LED. The entire array 111 [in Fig. 3] may consist of white LEDs of one, two or more color temperatures. For white lighting applications using primary color LEDs (e.g. RGB LEDs), one or more white LEDs provide increased intensity; and the primary color LEDs then provide light for color adjustment and/or correction." Rains at 21:64-22:2.

262. Annotated Figure 3, reproduced below, depicts the first controllable switching element, LED driver 121, and a first LED lighting load for emitting light with a first color temperature, LEDs 113, both highlighted in light blue. As discussed above, Rains discloses that the entire LED Array 111 can comprise white LEDs of two color temperatures.

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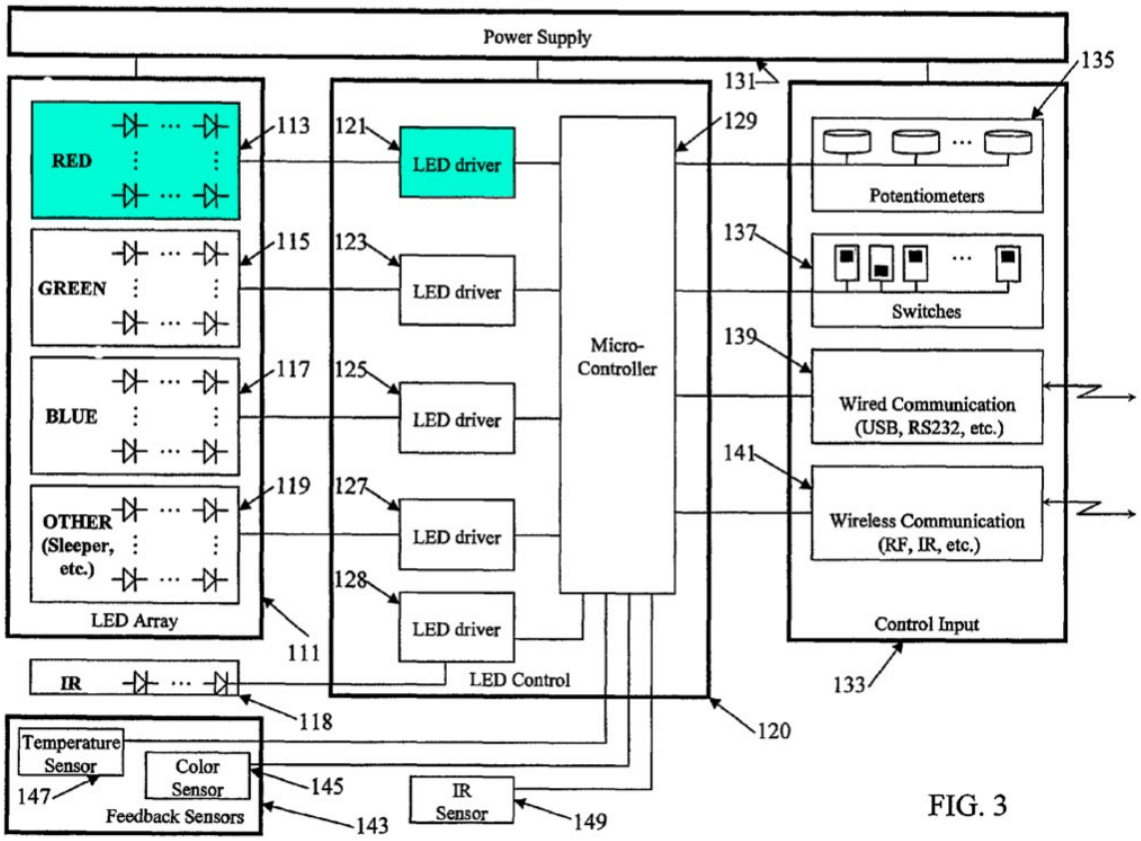


FIG. 3

Rains, Figure 3

263. Rains discloses that "[t]he LED driver circuits and the microcontroller 129 receive power from a power supply 131, which is connected to an appropriate power source (not separately shown)." Rains at 22:62-64. Figure 3 depicts the LED driver 121 electrically connected between the power supply 131 and the LEDs 113.

264. To the extent this limitation is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

265. Thus, Rains discloses or renders obvious this limitation.

c. 1[b] a second controllable switching element, electrically connected between said power source and a second LED lighting load for emitting light with a second color temperature

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266. Rains discloses or renders obvious a second controllable switching element, electrically connected between a power source and a second LED lighting load for emitting light with a second color temperature.

267. Rains discloses, as depicted in Figure 1C, "an intelligent light emitting system using white light type solid state light emitting elements of different color temperatures, with certain elements of the fixture shown in cross-section." Rains at 4:21-24.

268. Rains discloses that "in the system 1C the first solid state light emitting element 6_1 is a white LED W1 of a first type, for emitting white light of a first color temperature, whereas the second solid state light emitting element 6_2 is a white LED W_2 of a second type, for emitting white light of a somewhat different second color temperature. Controlled combination of the two types of white light within the cavity 2 allows for some color adjustment, to achieve a color temperature of the combined light output C that is somewhere between the temperatures of the two white lights, depending on the amount of each white light provided by the two elements 61 and 6_2." Rains 11:51-62.

269. Rains discloses that "[t]he electrical components shown in FIG. 3 also include an LED control system 120. The system 120 includes driver circuits for the various LEDs, as well as a microcontroller. The driver circuits supply electrical current to the respective LEDs 113, 115, 117 and 119 of the array 111 to cause the LEDs of the array to emit light. The driver circuit 121 drives the Red LEDs 113, the driver circuit 123 drives the green LEDs 115, and the driver circuit 125 drives the Blue LEDs 117. In a similar fashion, when active, the driver circuit 127 provides electrical current to the other LEDs 119." Rains at 22:26-35.

270. Rains discloses that "[c]ontrol of the LED outputs could be controlled by selective modulation of the drive signals applied to the various LEDs." Rains at 22:47-49.

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271. Rains further discloses that "[t]he third type of other LED of interest is a white LED. The entire array 111 [in Fig. 3] may consist of white LEDs of one, two or more color temperatures. For white lighting applications using primary color LEDs (e.g. RGB LEDs), one or more white LEDs provide increased intensity; and the primary color LEDs then provide light for color adjustment and/or correction." Rains at 21:64-22:2.

272. Annotated Figure 3, reproduced below, depicts the second controllable switching element, LED driver 123, and a second LED lighting load for emitting light with a second color temperature, LEDs 115, both highlighted in red. As discussed above, Rains discloses that the entire LED Array 111 can comprise white LEDs of two color temperatures.

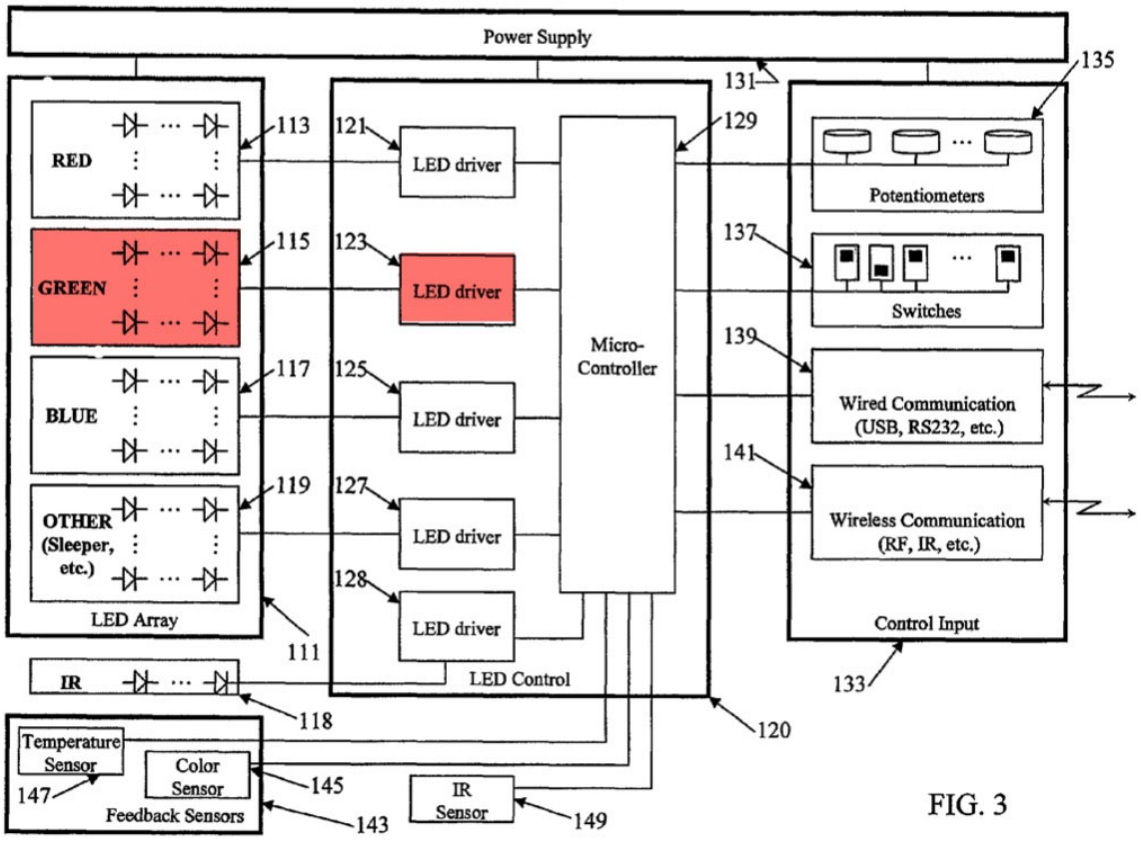


FIG. 3

Rains, Figure 3

273. Rains discloses that "[t]he LED driver circuits and the microcontroller 129 receive power from a power supply 131, which is connected to an appropriate power source (not separately shown)." Rains at 22:62-64. Figure 3 depicts the LED driver 123 electrically connected between the power supply 131 and the LEDs 115.

274. To the extent this limitation is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

275. Thus, Rains discloses or renders obvious this limitation.

d. 1[c] at least one detection device, for detecting at least one external control signal and converting said at least one external control signal into at least one message carrying sensing signal;

276. Rains discloses or renders obvious at least one detection device, for detecting at least one external control signal and converting said at least one external control signal into at least one message carrying sensing signal.

277. I apply the Court's construction of the term "detection device."

278. Rains discloses "[a] system controller will receive the signal from the detector. In several examples, the controller controls one or more aspects of operation of the solid state light emitter(s). The controller may perform such a function of light control in response to the detector signal, for example by turning the solid state light emitter(s) on or off or otherwise controlling the amount of light energy output by each of the solid state light emitter(s). The detector signal may represent a remote control command, or the controller may process the signal to detect occupancy status of the illuminated area. However, examples are also discussed that use the detection signal for other purposes, for example, to capture data that may be carried on electromagnetic energy of the particular wavelength sensed by the detector."1[d] a microcontroller to receive and interpret said at least one message carrying sensing signal generated by said at least one detection device." Rains at 3:49-62.

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279. Rains discloses "the system of FIG. 3 includes a detector for sensing at least one wavelength of electromagnetic energy that is not contained in the light generated by the LEDs 113, 115, 117 and 119 (or by the processing of that light within the optical integrating cavity). Although such a detector may detect energy in other spectral regions, in this circuit example, the system includes an IR detector or sensor 149." Rains at 25:34-40.

280. Rains discloses that "[t]he sensor 149 generates a detection signal proportional in some known manner to the amount of IR light energy reaching the optical input to the sensor 149. The sensor 149 provides this detection signal to the microcontroller 129 for processing for example as a pulse train of a frequency proportional to the amount of sensed IR light or as digitized amplitude signal proportional to the sensed IR light. As discussed earlier, the detected IR light may carry data, in which case the microcontroller demodulates the detection signal to capture or recover the data carried by the IR light, for remote control or data communication purposes. For purposes of further discussion here, however, it is assumed that the microcontroller 129 processes the detection signal from the IR sensor 149 to detect changes in IR light from the illuminated region, in a manner intended to facilitate detection of occupancy of that region and thus to control system operations accordingly." Rains at 25:47-64.

281. Rains discloses that "the microcontroller 129 . . . receives and processes a sensing signal from the IR sensor 149. In an example such as that of FIG. 2, IR light from the emitter would illuminate at least a portion of the area or region that is to be illuminated by the virtual source output light of the system, and IR light reflected from the portion of the area would enter the optical integrating cavity through the aperture. In turn, the sensor 149 would receive reflected IR light that has been diffusely processed within the cavity. In response to the received IR light, the IR sensor 149 provides a signal to the microcontroller 129. The sensing signal represents a

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measure of an amount of the IR light received by the sensor 149, e.g. its magnitude or intensity. In this manner, the system implements an IR detection step at S2 in FIG. 4." 26:19-32.

282. Annotated Figure 3, reproduced below, depicts the detection device, IR sensor 149, highlighted in yellow.

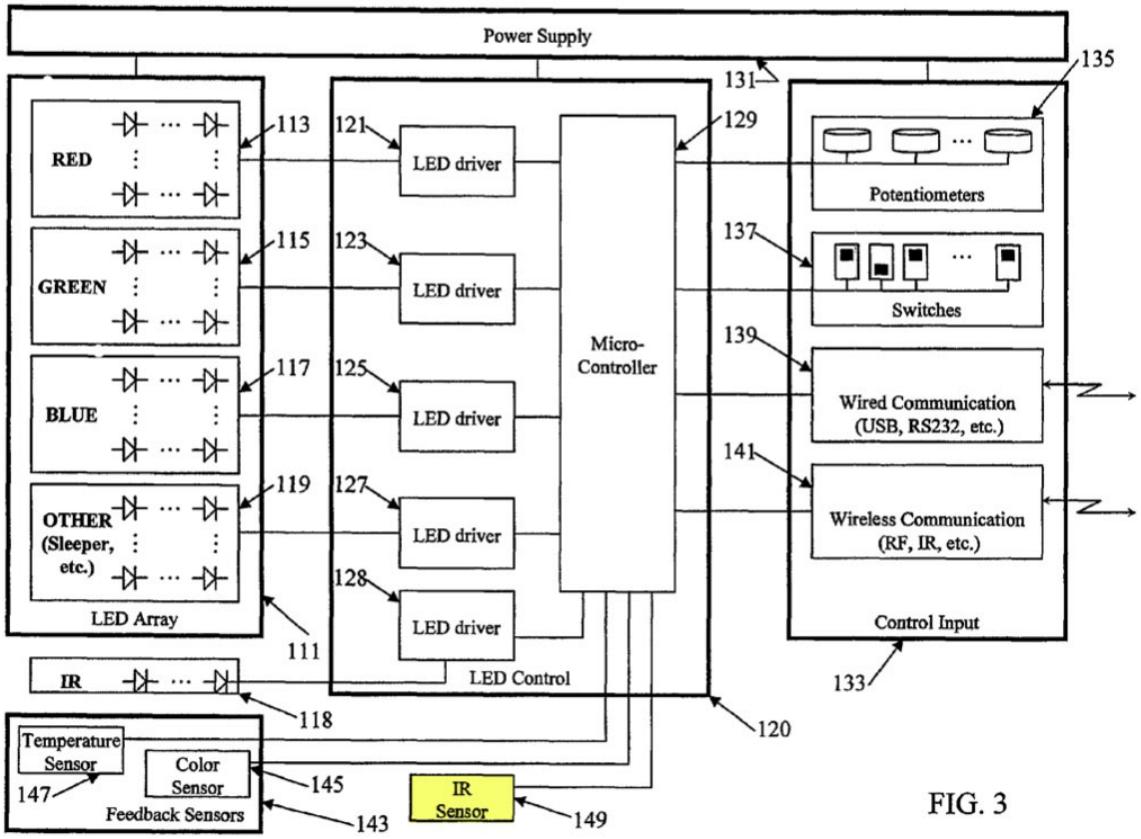


FIG. 3

Rains, Figure 3

283. To the extent this limitation is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

284. Thus, Rains discloses or renders obvious this limitation.

e. 1[d] a microcontroller to receive and interpret said at least one message carrying sensing signal generated by said at least one detection device

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285. Rains discloses or renders obvious a microcontroller to receive and interpret said at least one message carrying sensing signal generated by said at least one detection device.

286. Rains discloses "[t]he electrical components shown in FIG. 3 also include an LED control system 120. The system 120 includes driver circuits for the various LEDs, as well as a microcontroller." Rains at 22:26-28.

287. Rains discloses that "[a] programmable microcontroller typically includes or has coupled thereto random-access memory (RAM) for storing data and read-only memory (ROM) and/or electrically erasable read only memory (EEROM) for storing control programming and any pre-defined operational parameters, such as pre-established light 'recipes' or 'routines.' The microcontroller 129 itself comprises registers and other components for implementing a central processing unit (CPU) and possibly an associated arithmetic logic unit. The CPU implements the program to process data in the desired manner and thereby generates desired control outputs." Rains at 23:4-14.

288. Rains discloses that "the microcontroller 129 . . . receives and processes a sensing signal from the IR sensor 149. In an example such as that of FIG. 2, IR light from the emitter would illuminate at least a portion of the area or region that is to be illuminated by the virtual source output light of the system, and IR light reflected from the portion of the area would enter the optical integrating cavity through the aperture. In turn, the sensor 149 would receive reflected IR light that has been diffusely processed within the cavity. In response to the received IR light, the IR sensor 149 provides a signal to the microcontroller 129. The sensing signal represents a measure of an amount of the IR light received by the sensor 149, e.g. its magnitude or intensity. In this manner, the system implements an IR detection step at S2 in FIG. 4." 26:19-32.

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289. To the extent this limitation is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

290. Thus, Rains discloses or renders obvious this limitation.

f. 1[e] wherein said microcontroller through a first control pin is electrically coupled to said first controllable switching element, and through a second control pin is electrically coupled to said second controllable switching element

291. Rains discloses or renders obvious wherein said microcontroller through a first control pin is electrically coupled to said first controllable switching element, and through a second control pin is electrically coupled to said second controllable switching element.

292. Rains discloses that "[t]he electrical components shown in FIG. 3 also include an LED control system 120. The system 120 includes driver circuits for the various LEDs, as well as a microcontroller. The driver circuits supply electrical current to the respective LEDs 113, 115, 117 and 119 of the array 111 to cause the LEDs of the array to emit light. The driver circuit 121 drives the Red LEDs 113, the driver circuit 123 drives the green LEDs 115, and the driver circuit 125 drives the Blue LEDs 117. In a similar fashion, when active, the driver circuit 127 provides electrical current to the other LEDs 119." Rains at 22:26-35.

293. Rains discloses that "[t]he microcontroller 129 is programmed to control the LED driver circuits 121-127 to set the individual output intensities of the LEDs to desired levels, so that the combined light emitted from the aperture of the cavity has a desired spectral characteristic and a desired overall intensity." Rains at 23:23-27. A person of ordinary skill in the art would understand that the microcontroller is electrically coupled to each of the LED drivers via output control pins on the microcontroller.

294. To the extent this limitation is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

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295. Thus, Rains discloses or renders obvious this limitation.

g. 1[f] wherein said microcontroller through at least a third control pin receives said at least one message carrying sensing signal from said at least one detection device

296. Rains discloses or renders obvious wherein said microcontroller through at least a third control pin receives said at least one message carrying sensing signal from said at least one detection device.

297. Rains discloses that "[t]he sensor 149 generates a detection signal proportional in some known manner to the amount of IR light energy reaching the optical input to the sensor 149. The sensor 149 provides this detection signal to the microcontroller 129 for processing for example as a pulse train of a frequency proportional to the amount of sensed IR light or as digitized amplitude signal proportional to the sensed IR light. As discussed earlier, the detected IR light may carry data, in which case the microcontroller demodulates the detection signal to capture or recover the data carried by the IR light, for remote control or data communication purposes. For purposes of further discussion here, however, it is assumed that the microcontroller 129 processes the detection signal from the IR sensor 149 to detect changes in IR light from the illuminated region, in a manner intended to facilitate detection of occupancy of that region and thus to control system operations accordingly." Rains at 25:47-64. A person of ordinary skill in the art would understand that the microcontroller is electrically coupled to the IR sensor 149 via an input control pin on the microcontroller.

298. To the extent this limitation is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

299. Thus, Rains discloses or renders obvious this limitation.

h. 1[g] wherein said microcontroller controls a conduction state or a cutoff state of said first controllable switching element through said first control pin and said microcontroller controls said conduction

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state or said cutoff state of said second controllable switching element through said second control pin to control electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said at least one message carrying sensing signal generated by said at least one detection device

300. Rains discloses or renders obvious said microcontroller controls a conduction state or a cutoff state of said first controllable switching element through said first control pin and said microcontroller controls said conduction state or said cutoff state of said second controllable switching element through said second control pin to control electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said at least one message carrying sensing signal generated by said at least one detection device.

301. Rains discloses that "the microcontroller 129 . . . receives and processes a sensing signal from the IR sensor 149. In an example such as that of FIG. 2, IR light from the emitter would illuminate at least a portion of the area or region that is to be illuminated by the virtual source output light of the system, and IR light reflected from the portion of the area would enter the optical integrating cavity through the aperture. In turn, the sensor 149 would receive reflected IR light that has been diffusely processed within the cavity. In response to the received IR light, the IR sensor 149 provides a signal to the microcontroller 129. The sensing signal represents a measure of an amount of the IR light received by the sensor 149, e.g. its magnitude or intensity. In this manner, the system implements an IR detection step at S2 in FIG. 4." 26:19-32.

302. Rains discloses "[b]ased on the IR detection . . . the microcontroller 129 determines a relationship of the currently detected level of IR light detected by the sensor 149 to a first threshold T1 that microcontroller 129 uses as a reference indicating a predetermined change, e.g. to an occupied state." Rains at 26:39-43.

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303. Rains further discloses that "[w]hen a person enters the area to be illuminated by the system, the person will cause an increase in the amount of IR light reflected toward the light fixture. As a result, the amount of IR light sensed or detected by the IR sensor 149 will increase. At step S3 in the process flow of FIG. 4, when the signal from the IR sensor 149 indicates that the level of detected reflected IR has reached or exceeded (greater than or equal to) the first threshold T1, then the process flow branches to step S4. Essentially, the initial detection that the IR level has reached or exceeded the threshold represents a detection of a change in that signal of a type that corresponds to a change from an unoccupied state to an occupied state, upon entry of one or more people into the area to be illuminated by the system." Rains at 26:54-67

304. Rains additionally discloses that "when the processing branches to step S4, the microcontroller 129 transitions system operation to its ON-state. In the circuitry of FIG. 3, for example, the microcontroller 129 activates the drivers 121-127 to turn-ON the LEDs of the array 111, so that the array 111 emits light. The microcontroller 129 will control the amounts of light contributed by each of the groups of LEDs 113, 115, 117 and 119 in the manner discussed above, and the optical integrating cavity will diffusely process the light from the LEDs 113, 115, 117 and 119 of the array 111 to produce a virtual source output of combined light, as discussed above relative to FIGS. 1A to 3." Rains at 27:2-13.

305. Rains also discloses that "if the IR level as indicated by the sensor signal from IR sensor 149 is below the second threshold T2, i.e. indicating that the illuminated area is unoccupied, then the microcontroller 129 checks the state of the timer at step S9. If the timer has not yet timed out, then processing returns to step S8. In this way, the processing loops through steps S8 and S9 until the IR level rises again (the area again becomes occupied) or until the timer times out. If the IR level as indicated by the sensor signal from IR sensor 149 remains below the

second threshold T2 long enough for the timer to time out, then processing branches from step S9 to step S1, at which the microcontroller 129 turns OFF the system. Hence, when the area has been unoccupied for some measurable period, the microcontroller 129 will control the drivers 121-127 to reduce the power supplied to the LEDs 113, 115, 117 and 119 of the array 111, so that the array 111 no longer emits light, and of course, so that the system consumes substantially less power." Rains at 28:9-26.

306. Rains discloses that "[c]ontrol of the LED outputs could be controlled by selective modulation of the drive signals applied to the various LEDs. . . . The current output of each driver circuit is controlled by the higher level logic of the system. In this digital control example, that logic is implemented by a programmable microcontroller 129." Rains at 22:27-54.

307. Thus, the microcontroller turns the LEDs on or off by sending on/off signals to the LED drivers, i.e. first controllable switching element and second controllable switching element. The on signal to the LED driver is the conduction state as it causes the LED driver to allow current to conduct from the power supply through the LED that is in series with the driver (e.g. LED Driver 121 allows conduction through LEDs 113). The off signal to the LED driver is the cutoff state as it causes current flow or conduction to be cutoff or stopped by opening a switch in the LED driver thereby creating an open circuit in series with the LED drivers' associated LED. The on signal to the switch is the conduction state and the off signal to the switch is the cutoff state.

308. To the extent this limitation is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

309. Thus, Rains discloses or renders obvious this limitation.

i. 1[h] wherein said first color temperature is higher than said second color temperature

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310. Rains discloses or renders obvious wherein said first color temperature is higher than said second color temperature.

311. Rains discloses that "in the system 1C the first solid state light emitting element 6_1 is a white LED W1 of a first type, for emitting white light of a first color temperature, whereas the second solid state light emitting element 6_2 is a white LED W_2 of a second type, for emitting white light of a somewhat different second color temperature. Controlled combination of the two types of white light within the cavity 2 allows for some color adjustment, to achieve a color temperature of the combined light output C that is somewhere between the temperatures of the two white lights, depending on the amount of each white light provided by the two elements 61 and 6_2." Rains at 11:51-62.

312. To the extent this limitation is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

313. Thus, Rains discloses or renders obvious this limitation.

j. 1[i] wherein said at least one message carrying sensing signal is characterized with a signal format of a short voltage signal, a long voltage signal, a plurality of short voltage signals, a plurality of long voltage signals or a combination of said short voltage signal and said long voltage signal generated in a preset time interval; wherein said short voltage signal and said long voltage signal are respectively defined either by a time length of a voltage signal or by said time length of a series of pulse signals consecutively generated

314. Rains discloses or renders obvious wherein said at least one message carrying sensing signal is characterized with a signal format of a short voltage signal, a long voltage signal, a plurality of short voltage signals, a plurality of long voltage signals or a combination of said short voltage signal and said long voltage signal generated in a preset time interval; wherein said short voltage signal and said long voltage signal are respectively defined either by a time

length of a voltage signal or by said time length of a series of pulse signals consecutively generated.

315. Rains discloses that "[t]he sensor 149 generates a detection signal proportional in some known manner to the amount of IR light energy reaching the optical input to the sensor 149. The sensor 149 provides this detection signal to the microcontroller 129 for processing for example as a pulse train of a frequency proportional to the amount of sensed IR light or as digitized amplitude signal proportional to the sensed IR light. As discussed earlier, the detected IR light may carry data, in which case the microcontroller demodulates the detection signal to capture or recover the data carried by the IR light, for remote control or data communication purposes. For purposes of further discussion here, however, it is assumed that the microcontroller 129 processes the detection signal from the IR sensor 149 to detect changes in IR light from the illuminated region, in a manner intended to facilitate detection of occupancy of that region and thus to control system operations accordingly." Rains at 25:47-64.

316. Rains discloses that "the microcontroller 129 . . . receives and processes a sensing signal from the IR sensor 149. In an example such as that of FIG. 2, IR light from the emitter would illuminate at least a portion of the area or region that is to be illuminated by the virtual source output light of the system, and IR light reflected from the portion of the area would enter the optical integrating cavity through the aperture. In turn, the sensor 149 would receive reflected IR light that has been diffusely processed within the cavity. In response to the received IR light, the IR sensor 149 provides a signal to the microcontroller 129. The sensing signal represents a measure of an amount of the IR light received by the sensor 149, e.g. its magnitude or intensity. In this manner, the system implements an IR detection step at S2 in FIG. 4." 26:19-32.

317. A person of ordinary skill in the art would understand that the signal from the IR sensor 149 to the microcontroller/processor via circuitry would be a voltage or voltages that vary with amplitude and/or time.

318. To the extent this limitation is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

319. Thus, Rains discloses or renders obvious this limitation.

k. [1j] wherein when said microcontroller receives said at least one message carrying sensing signal, said microcontroller manages according to said signal format of said at least one message carrying sensing signal to perform at least one of various working modes including at least an on/off switch control mode, a dimming control mode, a color temperature tuning control mode, a color temperature switching control mode, a dimming and color temperature tuning control mode, and a delay shutoff control mode

320. Rains discloses or renders obvious wherein when said microcontroller receives said at least one message carrying sensing signal, said microcontroller manages according to said signal format of said at least one message carrying sensing signal to perform at least one of various working modes including at least an on/off switch control mode, a dimming control mode, a color temperature tuning control mode, a color temperature switching control mode, a dimming and color temperature tuning control mode, and a delay shutoff control mode.

321. Rains discloses "[b]ased on the IR detection . . . the microcontroller 129 determines a relationship of the currently detected level of IR light detected by the sensor 149 to a first threshold T1 that microcontroller 129 uses as a reference indicating a predetermined change, e.g. to an occupied state." Rains at 26:39-43.

322. Rains further discloses that "[w]hen a person enters the area to be illuminated by the system, the person will cause an increase in the amount of IR light reflected toward the light fixture. As a result, the amount of IR light sensed or detected by the IR sensor 149 will increase.

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At step S3 in the process flow of FIG. 4, when the signal from the IR sensor 149 indicates that the level of detected reflected IR has reached or exceeded (greater than or equal to) the first threshold T1, then the process flow branches to step S4. Essentially, the initial detection that the IR level has reached or exceeded the threshold represents a detection of a change in that signal of a type that corresponds to a change from an unoccupied state to an occupied state, upon entry of one or more people into the area to be illuminated by the system." Rains at 26:54-67

323. Rains additionally discloses that "when the processing branches to step S4, the microcontroller 129 transitions system operation to its ON-state. In the circuitry of FIG. 3, for example, the microcontroller 129 activates the drivers 121-127 to turn-ON the LEDs of the array 111, so that the array 111 emits light. The microcontroller 129 will control the amounts of light contributed by each of the groups of LEDs 113, 115, 117 and 119 in the manner discussed above, and the optical integrating cavity will diffusely process the light from the LEDs 113, 115, 117 and 119 of the array 111 to produce a virtual source output of combined light, as discussed above relative to FIGS. 1A to 3." Rains at 27:2-13.

324. Rains also discloses that "if the IR level as indicated by the sensor signal from IR sensor 149 is below the second threshold T2, i.e. indicating that the illuminated area is unoccupied, then the microcontroller 129 checks the state of the timer at step S9. If the timer has not yet timed out, then processing returns to step S8. In this way, the processing loops through steps S8 and S9 until the IR level rises again (the area again becomes occupied) or until the timer times out. If the IR level as indicated by the sensor signal from IR sensor 149 remains below the second threshold T2 long enough for the timer to time out, then processing branches from step S9 to step S1, at which the microcontroller 129 turns OFF the system. Hence, when the area has been unoccupied for some measurable period, the microcontroller 129 will control the drivers

121-127 to reduce the power supplied to the LEDs 113, 115, 117 and 119 of the array 111, so that the array 111 no longer emits light, and of course, so that the system consumes substantially less power." Rains at 28:9-26.

325. To the extent this limitation is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

326. Thus, Rains discloses or renders obvious this limitation.

l. 1[k] wherein when said first controllable switching element and said second controllable switching element are in said conduction state, said microcontroller further controls said electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said signal format of said at least one message carrying sensing signal received, wherein said microcontroller through said first control pin outputs a first control signal to control a conduction rate of said first controllable switching element, said microcontroller through said second control pin outputs a second control signal to control said conduction rate of said second controllable switching element

327. Rains discloses or renders obvious wherein when said first controllable switching element and said second controllable switching element are in said conduction state, said microcontroller further controls said electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said signal format of said at least one message carrying sensing signal received, wherein said microcontroller through said first control pin outputs a first control signal to control a conduction rate of said first controllable switching element, said microcontroller through said second control pin outputs a second control signal to control said conduction rate of said second controllable switching element.

328. Rains discloses that "when the processing branches to step S4, the microcontroller 129 transitions system operation to its ON-state. In the circuitry of FIG. 3, for example, the microcontroller 129 activates the drivers 121-127 to turn-ON the LEDs of the array 111, so that

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the array 111 emits light. The microcontroller 129 will control the amounts of light contributed by each of the groups of LEDs 113, 115, 117 and 119 in the manner discussed above, and the optical integrating cavity will diffusely process the light from the LEDs 113, 115, 117 and 119 of the array 111 to produce a virtual source output of combined light, as discussed above relative to FIGS. 1A to 3." Rains at 27:2-13.

329. Rains also discloses that "if the IR level as indicated by the sensor signal from IR sensor 149 is below the second threshold T2, i.e. indicating that the illuminated area is unoccupied, then the microcontroller 129 checks the state of the timer at step S9. If the timer has not yet timed out, then processing returns to step S8. In this way, the processing loops through steps S8 and S9 until the IR level rises again (the area again becomes occupied) or until the timer times out. If the IR level as indicated by the sensor signal from IR sensor 149 remains below the second threshold T2 long enough for the timer to time out, then processing branches from step S9 to step S1, at which the microcontroller 129 turns OFF the system. Hence, when the area has been unoccupied for some measurable period, the microcontroller 129 will control the drivers 121-127 to reduce the power supplied to the LEDs 113, 115, 117 and 119 of the array 111, so that the array 111 no longer emits light, and of course, so that the system consumes substantially less power." Rains at 28:9-26.

330. Therefore, in the case of the on/off lighting command based on the signal received from the IR sensor 149, the microcontroller will send a command via an output pin to open a switch in the LED drivers when the command is for the LEDs to be in the off state or to close the switch in the LED driver when the command is for the LEDs to be in the on state.

331. To the extent this limitation is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

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332. Thus, Rains discloses or renders obvious this limitation.

m. 1[l] wherein said microcontroller is an integrated circuit programmable for generating said first control signal and said second control signal, or an application specific integrated circuit (ASIC) custom made for generating said first control signal and said second control signal.

333. Rains discloses or renders obvious wherein said microcontroller is an integrated circuit programmable for generating said first control signal and said second control signal, or an application specific integrated circuit (ASIC) custom made for generating said first control signal and said second control signal.

334. Rains discloses that "[a] programmable microcontroller typically includes or has coupled thereto random-access memory (RAM) for storing data and read-only memory (ROM) and/or electrically erasable read only memory (EEROM) for storing control programming and any pre-defined operational parameters, such as pre-established light 'recipes' or 'routines.' The microcontroller 129 itself comprises registers and other components for implementing a central processing unit (CPU) and possibly an associated arithmetic logic unit. The CPU implements the program to process data in the desired manner and thereby generates desired control outputs." Rains at 23:4-14.

335. Rains further discloses that "[c]ontrol of the LED outputs could be controlled by selective modulation of the drive signals applied to the various LEDs. . . . The current output of each driver circuit is controlled by the higher level logic of the system. In this digital control example, that logic is implemented by a programmable microcontroller 129, although those skilled in the art will recognize that the logic could take other forms, such as discrete logic components, an application specific integrated circuit (ASIC), etc. Although not separately shown, digital to analog converters (DACs) may be utilized to convert control data outputs from

the microcontroller 129 to analog control signal levels for control of the LED driver circuits." Rains at 22:47-61.

336. To the extent this limitation is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

337. Thus, Rains discloses or renders obvious this limitation.

2. Dependent claim 8 - The microcontroller based electronic switch according to claim 1, wherein said at least one detection device is configured with a direct touch interface for detecting and converting said at least one external control signal into said at least one message carrying sensing signal interpretable to said microcontroller.

338. As discussed above, Rains discloses or renders obvious claim 1.

339. Rains discloses or renders obvious wherein said at least one detection device is configured with a direct touch interface for detecting and converting said at least one external control signal into said at least one message carrying sensing signal interpretable to said microcontroller.

340. Rains discloses "[t]he electrical system will also include one or more control inputs 133 for inputting information instructing the microcontroller 129 as to the desired operational settings. A number of different types of inputs may be used and several alternatives are illustrated for convenience. A given installation may include a selected one or more of the illustrated control input mechanisms." 23:45-51.

341. Rains further discloses "[a]s one example, user inputs may take the form of a number of potentiometers 135. The number would typically correspond to the number of different light wavelengths provided by the particular LED array 111. The potentiometers 135 typically connect through one or more analog to digital conversion interfaces provided by the microcontroller 129 (or in associated circuitry). To set the parameters for the integrated light output, the user adjusts the potentiometers 135 to set the intensity for each color. The

microcontroller 129 senses the input settings and controls the LED driver circuits accordingly, to set corresponding intensity levels for the LEDs providing the light of the various wavelengths." Rains at 23:52-63.

342. Rains also discloses that "[a]nother user input implementation might utilize one or more dip switches 137. For example, there might be a series of such switches to input a code corresponding to one of a number of recipes or to a stored dynamic routine. The memory used by the microcontroller 129 would store the necessary intensity levels for the different color LEDs in the array 111 for each recipe and/or for the sequence of recipes that make up a routine. Based on the input code, the microcontroller 129 retrieves the appropriate recipe from memory. Then, the microcontroller 129 controls the LED driver circuits 121-127 accordingly, to set corresponding intensity levels for the LEDs 113, 115, 117 and 119 providing the light of the various wavelengths for the illumination application." Rains at 23:64-24:9.

343. A person of ordinary skill would understand that the manual adjustment of the potentiometers and the dip switches is a direct touch interface, which works in complimentary fashion with the external control signal received by the IR sensor 149. The electrical lighting system can receive an external control signal via the IR sensor 149 and via the manual input, which are converted into a message carrying sensing signal interpretable by the microcontroller. For example, the IR sensor 149 could receive an external control signal via the IR sensor to turn on the light when a person enters the room and the manual input could be used to implement a stored routine or to change the intensity of the LEDs, as discussed above.

344. Accordingly, a person of ordinary skill in the art would have been motivated to configure at least one detection device with a direct touch interface in view of the disclosure in

Rains, the state of the prior art at the time of the filing of the '503 patent, and the knowledge of a person of ordinary skill in the art.

345. Thus, Rains discloses or renders obvious this claim.

3. Dependent claim 11 - The microcontroller based electronic switch according to claim 8, wherein said direct touch interface is a detection circuitry to detect a voltage signal generated by a voltage divider and to convert a voltage value of said voltage signal into said at least one message carrying sensing signal with said signal format corresponding to said voltage value generated for setting said conduction rate of said first controllable switching element and said second controllable switching element respectively.

346. As discussed above, Rains discloses or renders obvious claim 8.

347. Rains discloses or renders obvious said direct touch interface is a detection circuitry to detect a voltage signal generated by a voltage divider and to convert a voltage value of said voltage signal into said at least one message carrying sensing signal with said signal format corresponding to said voltage value generated for setting said conduction rate of said first controllable switching element and said second controllable switching element respectively.

348. As discussed above, Rains discloses that "[t]he electrical system will also include one or more control inputs 133 for inputting information instructing the microcontroller 129 as to the desired operational settings. A number of different types of inputs may be used and several alternatives are illustrated for convenience. A given installation may include a selected one or more of the illustrated control input mechanisms." 23:45-51. Rains discloses that these inputs include potentiometers and dip switches. A person of ordinary skill in the art would understand that potentiometers and dip switches use voltage dividers to generate voltage signals reflecting the selected setting, i.e. the message carrying sensing signal, which would be sent to the microcontroller to control the conduction rate of the first and second controllable switching elements.

349. Such use of voltage dividers was well known in the art. For example, Ferrier discloses a control device 102 configured with preset voltage outputs to control the linear mode transistors 112, 114, 116, 118, 128 and 138. Ferrier at 5:43-45. Ferrier discloses that "[t]he control device 102 may be a mechanical switch, such as a switch coupled to voltage dividers, a multi-position potentiometer, or other means of switching between voltage outputs." Ferrier at 5:55-58. Ferrier also discloses that "[t]he control device 102 can have one or more switch devices therein. For example, the control device 102 can have switches that adjust the gate voltages of the linear mode transistors. The control device 102 can include a plurality of operating states. In one embodiment, each state of the control device can adjust/switch all of the linear mode transistors' gate voltages simultaneously. In that embodiment, each state of the switches can correspond to a correlated color temperature of the LED strings. For example, the control device 102 can provide the option of three colors/correlated color temperatures (CCT) for the light emission from the LED strings." Ferrier at 5:64-6:7. Ferrier further discloses that the "changes in the gate voltages of the transistors in turn can change the output color temperatures of the LED strings." Ferrier 2:63-65.

350. Accordingly, a person of ordinary skill in the art would have been motivated to use a voltage divider to generate a voltage signal detected by the detection circuitry in Rains in view of the disclosure in Rains, the state of the prior art at the time of the filing of the '503 patent, including Ferrier, and the knowledge of a person of ordinary skill in the art.

351. Thus, Rains discloses or renders obvious this claim.

4. <u>Independent claim 40</u>

a. 40[pre] A lighting apparatus comprising

352. I incorporate my opinions *supra* regarding claim 1[pre] with respect to claim limitation 40[pre].

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353. Thus, to the extent the preamble is limiting, Rains discloses it or renders it obvious.

b. 40[a] a first LED lighting load for emitting light with a first color temperature

354. I incorporate my opinions *supra* regarding claim 1[a] with respect to claim limitation 40[a].

355. Thus, Rains discloses or renders obvious this limitation.

c. 40[b] a second LED lighting load for emitting light with a second color temperature

356. I incorporate my opinions *supra* regarding claim 1[b] with respect to claim limitation 40[b].

357. Thus, Rains discloses or renders obvious this limitation.

d. 40[c] a diffuser, covering said first LED lighting load and said second LED lighting load to create a diffused light with a mingled color temperature

358. Rains discloses or renders obvious a diffuser, covering said first LED lighting load and said second LED lighting load to create a diffused light with a mingled color temperature.

359. Rains discloses that "[i]n the example of FIG. 10B, the fixture 250b includes a curved transmissive diffuser 251a covering the aperture 17. The diffuser may take any convenient form, for example, a white or clear dome of plastic or glass. Alternatively, the diffuser 251b may be formed of a prismatic material. In addition to covering the aperture, the element 251b diffuses the emitted combined light, as desired for a particular application of the fixture 250b. The dome shaped diffuser may cover just the aperture 17, as shown at 251b, or it may cover the backs of the LEDs 19 as well. Of course, the dome shaped diffuser 251b will also

process incoming light, such as the IR light entering the cavity for detection by the detector 18." Rains at 35:5-29.

360. To the extent this limitation is not disclosed by Rains, it would have been obvious in view of a person of ordinary skill.

361. Thus, Rains discloses or renders obvious this limitation.

e. 40[d] a microcontroller based electronic switch electrically connected to said first LED lighting load and to said second LED lighting load, said microcontroller based electronic switch further comprising

362. I incorporate my opinions *supra* regarding claims 1[a] and 1[b] with respect to claim limitation 40[d].

363. Thus, Rains discloses or renders obvious this limitation.

f. 40[e] a first switching element, electrically connected between said first LED lighting load and a power source

364. I incorporate my opinions *supra* regarding claims 1[a] and 1[b] with respect to claim limitation 40[e].

365. Thus, Rains discloses or renders obvious this limitation.

g. 40[f] a second switching element, electrically connected between said second LED lighting load and said power source

366. I incorporate my opinions *supra* regarding claims 1[a] and 1[b] with respect to claim limitation 40[f].

367. Thus, Rains discloses or renders obvious this limitation.

h. 40[g] at least a detection device, for detecting at least one external control signal and converting said at least one external control signal into at least one message carrying sensing signal

368. I incorporate my opinions *supra* regarding claims 1[c] and 1[d] with respect to claim limitation 40[g].

369. Thus, Rains discloses or renders obvious this limitation.

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i. 40[h] a microcontroller to receive and interpret said at least one message carrying sensing signal generated by said at least one detection device, wherein said microcontroller through a first control pin is electrically coupled to said first switching element, and through a second control pin is electrically coupled to said second switching element, wherein said microcontroller through a third control pin receives said at least one message carrying sensing signal from said at least one detection device, wherein said microcontroller controls a conduction state or a cutoff state of said first switching element through said first control pin and said microcontroller controls said conduction state or said cutoff state of said second switching element through said second control pin to control electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said at least one message carrying sensing signal generated by said at least one detection device

370. I incorporate my opinions *supra* regarding claims 1[d] – 1[g] with respect to claim limitation 40[h].

371. Thus, Rains discloses or renders obvious this limitation.

j. 40[i] wherein said first color temperature is higher than said second color temperature

372. I incorporate my opinions *supra* regarding claims 1[h] with respect to claim limitation 40[i].

373. Thus, Rains discloses or renders obvious this limitation.

k. 40[j] wherein said at least one message carrying sensing signal is characterized with a signal format of a short voltage signal, a long voltage signal, a plurality of short voltage signals, a plurality of long voltage signals or a combination of short voltage signal and long voltage signal generated in a preset time interval; wherein said short voltage signal and said long voltage signal are respectively defined either by a time length of a voltage signal or by said-time length of a series of pulse signals consecutively generated; wherein when said microcontroller receives said at least one message carrying sensing signal, said microcontroller operates according to said signal format of said at least one message carrying sensing signal to perform at least one of various working modes including at least an on/off switch control mode, a dimming control mode, a color temperature tuning control mode, a color temperature switching mode, a dimming and

color temperature tuning control mode, and a delay shutoff control mode

374. I incorporate my opinions *supra* regarding claims 1[i] and 1[j] with respect to claim limitation 40[j].

375. Thus, Rains discloses or renders obvious this limitation.

l. 40[k] wherein when said first switching element and said second switching element are in said conduction state, said microcontroller further controls said electric power transmission levels from said power source respectively to said first LED lighting load and to said second LED lighting load according to said signal format of said at least one message carrying sensing signal received, wherein said microcontroller through said first control pin outputs a first control signal to change a conduction rate of said first switching element, said microcontroller through said second control pin outputs a second control signal to change said conduction rate of said second switching element

376. I incorporate my opinions *supra* regarding claims 1[j] and 1[k] with respect to claim limitation 40[k].

377. Thus, Rains discloses or renders obvious this limitation.

m. 40[l] wherein said microcontroller is an integrated circuit programmable for generating said first control signal and said second control signal, or an application specific integrated circuit (ASIC) custom made for generating said first control signal and said second control signal

378. I incorporate my opinions *supra* regarding claims 1[l] with respect to claim limitation 40[l].

379. Thus, Rains discloses or renders obvious this limitation.

5. Dependent claim 41 - The lighting apparatus according to claim 40, wherein both said first switching element and said second switching element are controllable switching element[s], wherein when said microcontroller receives said at least one message carrying sensing signal, said microcontroller operates to output said first control signal and said second control signal with an arrangement that said conduction rate of said first switching element and said conduction rate of said second switching element are reversely adjusted with the

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same pace such that a total electric power transmitted to said first LED lighting load and said second LED lighting load is maintained at a constant level while said mingled color temperature of said lighting apparatus is proportionately adjusted according to said signal format of said at least one message carrying sensing signal to perform said color temperature tuning control mode.

380. As discussed above, Rains discloses or renders obvious claim 40.

381. Rains discloses or renders obvious said first switching element and said second switching element are controllable switching elements, wherein when said microcontroller receives said at least one message carrying sensing signal, said microcontroller operates to output said first control signal and said second control signal with an arrangement that said conduction rate of said first switching element and said conduction rate of said second switching element are reversely adjusted with the same pace such that a total electric power transmitted to said first LED lighting load and said second LED lighting load is maintained at a constant level while said mingled color temperature of said lighting apparatus is proportionately adjusted according to said signal format of said at least one message carrying sensing signal to perform said color temperature tuning control mode.

382. Rains discloses that "when the processing branches to step S4, the microcontroller 129 transitions system operation to its ON-state. In the circuitry of FIG. 3, for example, the microcontroller 129 activates the drivers 121-127 to turn-ON the LEDs of the array 111, so that the array 111 emits light. The microcontroller 129 will control the amounts of light contributed by each of the groups of LEDs 113, 115, 117 and 119 in the manner discussed above, and the optical integrating cavity will diffusely process the light from the LEDs 113, 115, 117 and 119 of the array 111 to produce a virtual source output of combined light, as discussed above relative to FIGS. 1A to 3." Rains at 27:2-13.

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383. Rains also discloses that "if the IR level as indicated by the sensor signal from IR sensor 149 is below the second threshold T2, i.e. indicating that the illuminated area is unoccupied, then the microcontroller 129 checks the state of the timer at step S9. If the timer has not yet timed out, then processing returns to step S8. In this way, the processing loops through steps S8 and S9 until the IR level rises again (the area again becomes occupied) or until the timer times out. If the IR level as indicated by the sensor signal from IR sensor 149 remains below the second threshold T2 long enough for the timer to time out, then processing branches from step S9 to step S1, at which the microcontroller 129 turns OFF the system. Hence, when the area has been unoccupied for some measurable period, the microcontroller 129 will control the drivers 121-127 to reduce the power supplied to the LEDs 113, 115, 117 and 119 of the array 111, so that the array 111 no longer emits light, and of course, so that the system consumes substantially less power." Rains at 28:9-26.

384. Rains discloses that "[c]ontrol of the LED outputs could be controlled by selective modulation of the drive signals applied to the various LEDs. . . . The current output of each driver circuit is controlled by the higher level logic of the system. In this digital control example, that logic is implemented by a programmable microcontroller 129." Rains at 22:27-54.

385. To the extent that Rains does not disclose claim 41, Rains in combination with Bora '528 renders claim 41 obvious.

386. As discussed *supra*, Bora '528 discloses claim 41.

387. A person of ordinary skill in the art would have been motivated to combine the LED control of Bora '528 with the lighting system of Rains. Rains and Bora '528 are both references in the same technical area and seek to solve the same problem of providing a lighting device with controls and control signals that adjust the output of the lighting device to optimize

its performance based on external controls and inputs. Both Rains and Bora '528 specifically disclose controlling the individual drivers to modify the light output from the LEDs.

388. For example, Rains discloses that "when the processing branches to step S4, the microcontroller 129 transitions system operation to its ON-state. In the circuitry of FIG. 3, for example, the microcontroller 129 activates the drivers 121-127 to turn-ON the LEDs of the array 111, so that the array 111 emits light. The microcontroller 129 will control the amounts of light contributed by each of the groups of LEDs 113, 115, 117 and 119 in the manner discussed above, and the optical integrating cavity will diffusely process the light from the LEDs 113, 115, 117 and 119 of the array 111 to produce a virtual source output of combined light, as discussed above relative to FIGS. 1A to 3." Rains at 27:2-13.

389. Bora '528 likewise discloses that control of the individual microcontrollers to generate a mingled light output. *See supra* Bora '528, claim 41.

390. Both Rains and Bora '528 are directed in the general space of lighting devices with at adjustable levels of light output that adjust that light output based on inputs received from external inputs. The external inputs are processed by a microcontroller, which then subsequently modifies or controls the lighting load in the lighting device. Both Rains and Bora '528 disclose lighting devices that have lighting loads controlled by external signals. Both references are generally interested in controlling the loads for optimized performance and color tuning. Thus, a person of ordinary skill in the art would have been motivated to modify Rains to add Bora '528's LED control. Adding Bora '528's LED control would have been a simple modification to obtain predictable results, and a person of ordinary skill in the art would have had a reasonable expectation of success in doing so.

391. Thus, Rains alone or in view of Bora '528 renders claim 41 obvious.

6. Dependent claim 53 - The lighting apparatus according to claim 40, wherein said at least one detection device is a direct touch interface for detecting said at least one external control signal and converting said at least one external control signal into said at least one message carrying sensing signal interpretable to said microcontroller.

392. I incorporate my opinions *supra* regarding claims 8 and 11 with respect to claim 53.

393. Thus, Rains discloses or renders obvious claim 53.

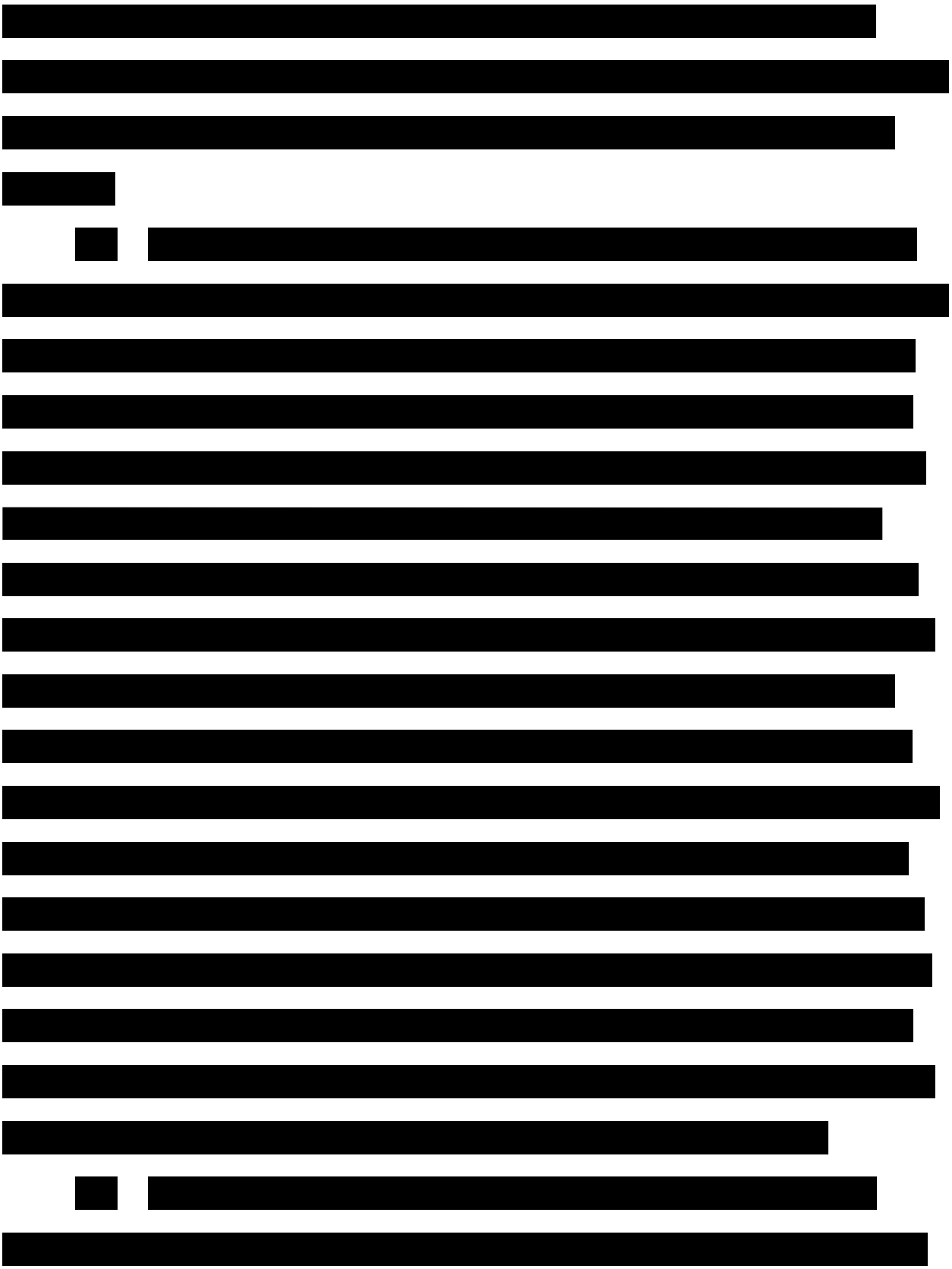
7. Dependent claim 56 - The lighting apparatus according to claim 53, wherein said direct touch interface is a circuitry to detect a voltage signal generated by a voltage divider and convert a voltage value of said voltage signal into said at least one message carrying sensing signal with said signal format corresponding to said voltage value-generated for setting conduction rates of said first switching element and said second switching element respectively.

394. I incorporate my opinions *supra* regarding claim 11 with respect to claim 56.

395. Thus, Rains discloses or renders obvious claim 56.

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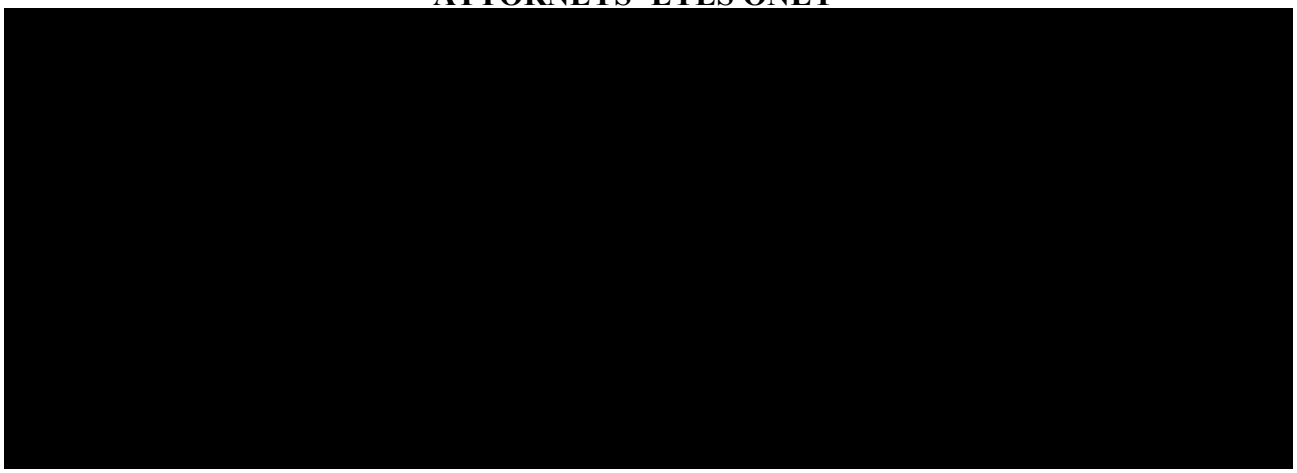
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VIII. THE '362 PATENT

A. DISCLOSURE OF THE CLAIMED INVENTION

416. The '362 patent was filed on September 16, 2014 and issued on April 26, 2016. The face of the document states it was assigned to Chia-Teh Chen. The named inventor is Chia-Teh Chen. I understand Plaintiff has asserted claims 1 and 2.

417. The invention is described as covering "A two-level LED security light [that] includes a power supply unit, a motion sensing unit, a time setting unit, a loading and power control unit, an external control unit, and a lighting-emitting unit." '362 Patent at Abstract.

1. Background of the Invention and Summary of the Invention

418. The Description of Related Art section of the '362 Patent discloses that Illumination operation controls such as auto-illumination in accordance to the background

brightness detection, illumination using timer, illumination operation control using motion sensing results (e.g., dark or low luminous power to fully illuminated), and brightness control are often implemented by complex circuitries. In particular, the design and construction of LED drivers are still of a complex technology with high fabrication cost." '362 Patent at 1:31-38.

419. The '362 Patent purports to address this need by providing:

> a two-level LED security light, comprising a light emitting unit, a loading and power control unit, a light sensing control unit, a motion sensing unit, a power supply unit, and an external control unit coupled with the loading and power control unit. The light emitting unit comprises at least one LED. The loading and power control unit comprises a microcontroller electrically coupled with a semiconductor switching device, wherein the semiconductor switching device is electrically connected in series with the power supply unit and the light emitting unit, wherein the microcontroller with program codes outputs a pulse width modulation (PWM) signal to a gate electrode of the semiconductor switching device to control the conduction period Ton and the cut-off period Toff of the semiconductor switching device for delivering different average electric currents from the power supply unit to drive the light emitting unit for generating different illuminations, wherein the microcontroller controls the semiconductor switching device respectively to have a first Ton and a second Ton of the conduction period such that the light-emitting unit respectively generates a first level and a second level illumination characterized by light intensity and/or color temperature according to the received signal outputted from the light sensing control unit and the motion sensing unit, wherein the external contr ol unit is for setting illumination characteristics of at least one of the first level illumination an and the second level illumination of the light-emitting unit.

'362 Patent at 1:56-2:16.

B. THE ASSERTED CLAIMS

420. Below, I have reproduced the asserted claims for reference:

1. [pre] A two-level LED security light, comprising

[a] a light-emitting unit

[b] a loading and power control unit

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[c] a light sensing control unit

[d] a motion sensing unit

[e] a power supply unit

[f] an external control unit, coupled with the loading and power control unit

[g] wherein the light-emitting unit comprises at least one LED

[h] wherein the loading and power control unit comprises a microcontroller electrically coupled with a semiconductor switching device, wherein the semiconductor switching device is electrically connected in series with the power supply unit and the light emitting unit,

[i] wherein the microcontroller with program codes outputs a pulse width modulation (PWM) signal to a gate electrode of the semiconductor switching device to control a conduction period (T_{on}) and a cut-off period (T_{off}) of the semiconductor switching device for delivering different average electric currents from the power supply unit to drive the light-emitting unit for generating different illuminations, wherein the microcontroller controls the semiconductor switching device respectively to have a short conduction period (T_{on}) and a long conduction period (T_{on}) such that the light-emitting unit respectively generates a first level and a second level illumination characterized by light intensity and/or color temperature according to the signals received from the light sensing control unit and the motion sensing unit

[j] wherein the external control unit is used in at least one of two setting modes respectively for setting illumination characteristics of one of the first level and the second level illumination; wherein the first setting mode is a manual setting incorporating with the external control unit when the light-emitting unit generates one of the first level and the second level illumination, in which the illumination characteristic of the light-emitting unit is changed directly by operating the external control unit; wherein the second setting mode is a free-running setting, in which the light-emitting unit performs a free-run of one of the first level and the second level illumination by gradually and periodically changing illumination characteristics, wherein the free-run is terminated by operating the external control unit at a time point corresponding to a specific illumination characteristic, such that, following the free-running illumination variation, the illumination characteristics of one of the first level and the second level illumination is set by operating the external control unit at the time point when the light-emitting unit performs the specific illumination characteristic; wherein the light-emitting unit performs one of the first level and the second level illumination characterized by the specific illumination characteristic being set thereof

2. The two-level LED security light according to claim 1, wherein the external control unit is a push button, a touch panel, an infrared sensor or a wireless remote control device coupled to a pin of the microcontroller of the loading and power control unit; wherein,

> when the push button, the touch panel, the infrared sensor or the wireless remote control device is operated, a voltage signal is thereby generated to trigger the microcontroller for the manual setting or the free-running setting of the illumination characteristics.

421. As can be seen above, the claims recite a conventional lighting device with the ability to modify lighting settings.

C. PROSECUTION HISTORY

422. The '362 patent issued after the Applicant corrected formalities noted by the Examiner.

D. PRIORITY DATE

423. I understand that Plaintiff's outside counsel has represented that it alleges that the priority date of the '362 patent is no earlier than September 16, 2014.

IX. INVALIDITY ANALYSIS REGARDING THE '362 PATENT

A. OVERVIEW OF PRIOR ART

1. Kamii

424. U.S. Patent App. Pub. No. 2013/0141018 ("Kamii") was filed on August 11, 2011 and published on June 6, 2013. I understand Kamii is therefore prior art to claims 1 and 2 of the '362 patent.

425. Kamii is directed to a home lighting system for automating and controlling lighting features based on user input and external sensors. Kamii particularly notes and describes the following technologies:

> Illumination control unit 20 includes control power supply circuit 21 for adjusting a voltage supplied from power source circuit 10 to be supplied to a CPU 22, CPU (Central Processing Unit) 22 for overall control of lighting device 1, a PWM (Pulse Width Modulation) control circuit 23, a signal reception unit 25, an SW input unit 26, a crystal oscillator 27, an illuminance sensor 28, and a memory 29. CPU 22, memory 29, and PWM control circuit 23 are implemented by a micro-computer by way of example.

> CPU 22 is connected to various units and gives instructions for necessary operations to control lighting device 1 as a whole.
>
> PWM control circuit 23 generates a PWM pulse necessary for driving LED modules 31 and 32 in accordance with an instruction from CPU 22.

Kamii at ¶¶ 0066-68.

2. Nagaoka

426. U.S. Patent App. Pub. No. 2010/0264831 ("Nagaoka") was filed on November 14, 2008 and published on October 21, 2010. I understand Nagaoka is therefore prior art to claims 1 and 2 of the '362 patent.

427. Nagaoka is directed to a home lighting system for automating and controlling lighting features based on user input and external sensors. Nagaoka particularly notes and describes the following technologies:

> [A] lighting load, . . . a filter, [a] load drive unit, which is configured by using the switching element such as a TRIAC element in order to drive the lighting load 1 by receiving a trigger signal output from the load controller 5; [a] load controller, which is composed of an IC such as a microcomputer in order to control an operation of the lighting load 1 . . . a control power supply generator, which is composed of a diode, the capacitor, a Zener diode, and the like in order to rectify the commercial ac power supply AC so as to convert to a dc voltage.

Nagaoka at ¶¶ 0058-63.

B. CLAIMS 1 AND 2 ARE RENDERED OBVIOUS BY KAMII ALONE OR IN VIEW OF NAGAOKA

1. Independent claim 1

a. 1 [pre] A two-level LED security light

428. Kamii discloses or renders obvious a two-level LED security light.

429. Kamii discloses "[a]n absence timer table for defining turn-on and turn-off operations in an absence timer mode is set." Kamii at Abstract.

430. Kamii discloses "[a] lighting device according to one aspect of the present invention includes an illumination unit, a control unit for controlling the illumination unit, a time keeping unit for keeping time or hours, and an operation portion for accepting an instruction for processing by the control unit. The operation portion includes first instruction means for accepting an instruction about setting/termination of processing for carrying out turn-on and turn-off control of the illumination unit in accordance with the set time by using the time keeping unit and second instruction means for accepting an instruction about different processing for controlling the illumination unit." Kamii at ¶ 0010.

431. Kamii discloses that "a criminal who repeatedly makes a preliminary inspection on a room equipped with lighting device 1 at certain time intervals will recognize change in color tone of lighting in the room from the daylight color to the light color without visual recognition of a moment of color tone change. Thus, camouflage as if a user actually performed an operation to change a color tone of lighting can be made use of, so that crime prevention can further be enhanced by making use of camouflage as if the user were at home." Kamii at ¶ 0401. Kamii also discloses that "by providing a plurality of patterns in the absence timer table, crime prevention can further be enhanced by using patterns different in operation, instead of continually using the same pattern." Kamii at ¶ 0402.

432. To the extent the preamble is not disclosed by Kamii, it would have been obvious in view of a person of ordinary skill.

433. To the extent the preamble is limiting, Kamii discloses it or renders it obvious.

b. 1[a] a light-emitting unit

434. Kamii discloses or renders obvious a light-emitting unit.

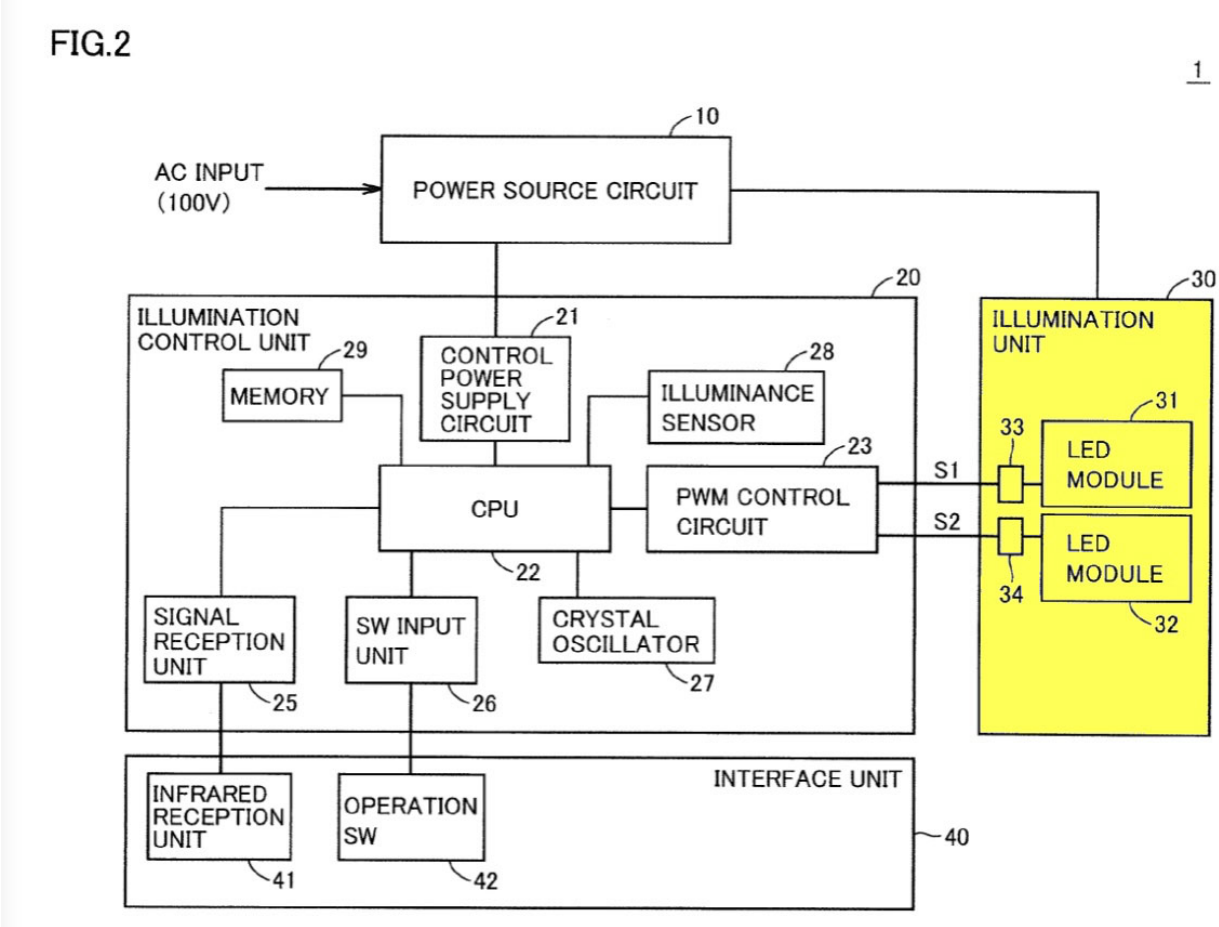
435. Kamii discloses a "lighting device 1 according to the embodiment of the present invention is shown to have a chassis 2 for attaching a main body portion and covers 8 and 9 for

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covering the entire surface of the main body portion together with chassis 2. In the present example, by way of example, it is assumed that chassis 2 of lighting device 1 is attached to a ceiling." Kamii at ¶ 0059. Kamii further discloses that "[c]over 8 is provided corresponding to an area where LED modules serving as light sources for illumination are arranged. Light is emitted from the area of cover 8." Kamii at ¶ 0060.

436. Kamii further discloses "[r]eferring to FIG. 2, lighting device 1 according to the embodiment of the present invention includes a power source circuit 10, an illumination control unit 20, an illumination unit 30, and an interface unit 40." Kamii at ¶ 0064.

437. Annotated Figure 2, reproduced below, depicts illumination unit 30 highlighted in yellow.



Kamii, Figure 2

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438. To the extent this limitation is not disclosed by Kamii, it would have been obvious in view of a person of ordinary skill.

439. Thus, Kamii discloses or renders obvious this limitation.

c. 1[b] a loading and power control unit

440. Kamii discloses or renders obvious a loading and power control unit.

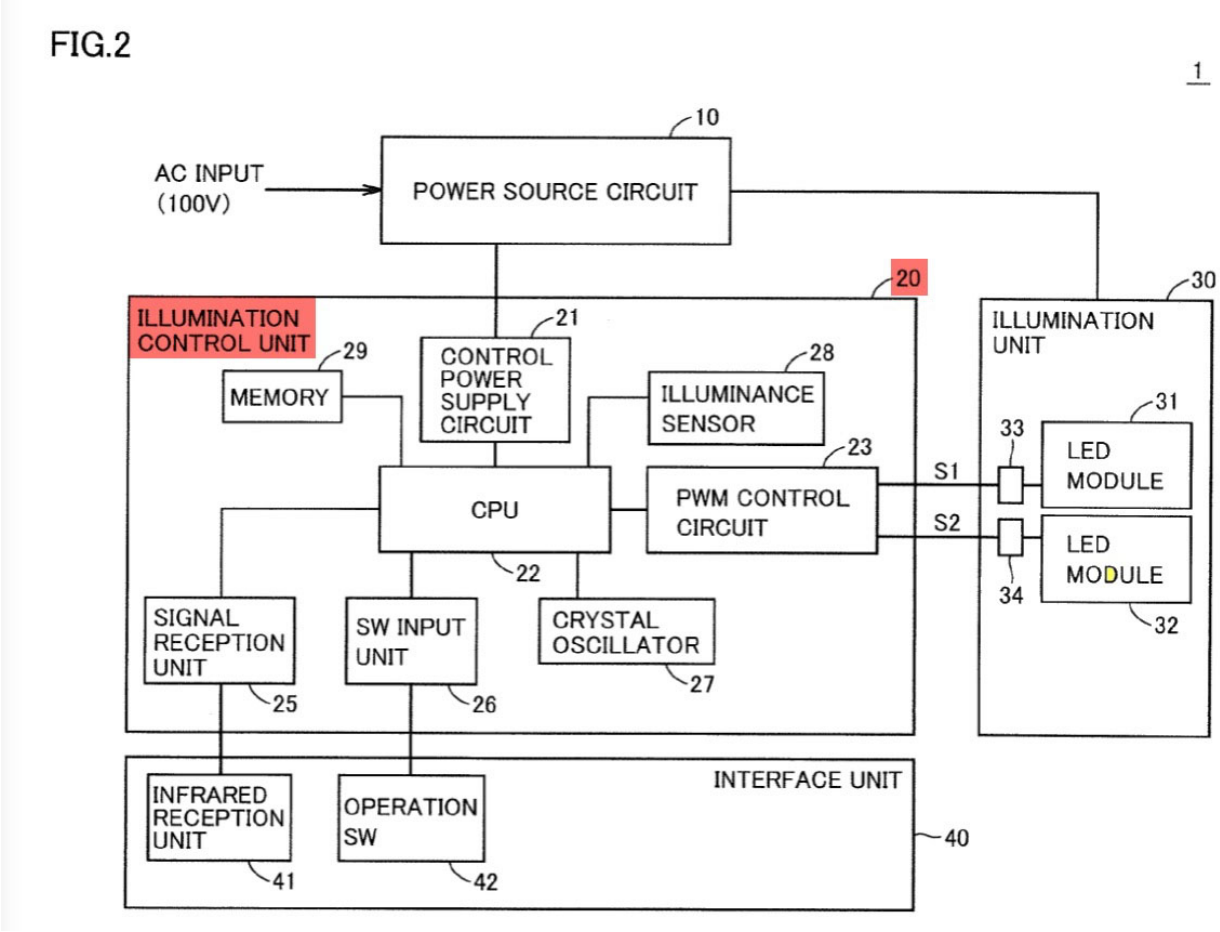
441. Kamii discloses "Illumination control unit 20 includes control power supply circuit 21 for adjusting a voltage supplied from power source circuit 10 to be supplied to a CPU 22, CPU (Central Processing Unit) 22 for overall control of lighting device 1, a PWM (Pulse Width Modulation) control circuit 23, a signal reception unit 25, an SW input unit 26, a crystal oscillator 27, an illuminance sensor 28, and a memory 29. CPU 22, memory 29, and PWM control circuit 23 are implemented by a micro-computer by way of example." Kamii at ¶ 0066.

442. Kamii discloses that "[p]ower source circuit 10 receives AC power input (AC input) (100 V), converts it to a DC voltage, and supplies the voltage to various portions of the device. Though the voltage is shown to be supplied only to a control power supply circuit 21 and illumination unit 30 by way of example here, it is not particularly limiting as such and a necessary voltage is supplied to other portions as well." Kamii at ¶ 0065.

443. Kamii further discloses "CPU 22 is connected to various units and gives instructions for necessary operations to control lighting device 1 as a whole." Kamii at ¶ 0067.

444. Annotated Figure 2, reproduced below, depicts illumination control unit 20 highlighted in red.

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Kamii, Figure 2

445. To the extent this limitation is not disclosed by Kamii, it would have been obvious in view of a person of ordinary skill.

446. Thus, Kamii discloses or renders obvious this limitation.

d. 1[c] a light sensing control unit

447. Kamii discloses or renders obvious a light sensing control unit.

448. Kamii discloses "[i]lluminance sensor 28 measures illuminance around lighting device 1 and outputs the illuminance to CPU 22. CPU 22 is capable of controlling a dimming ratio based on measurement results from illuminance sensor 28." Kamii at ¶ 0072.

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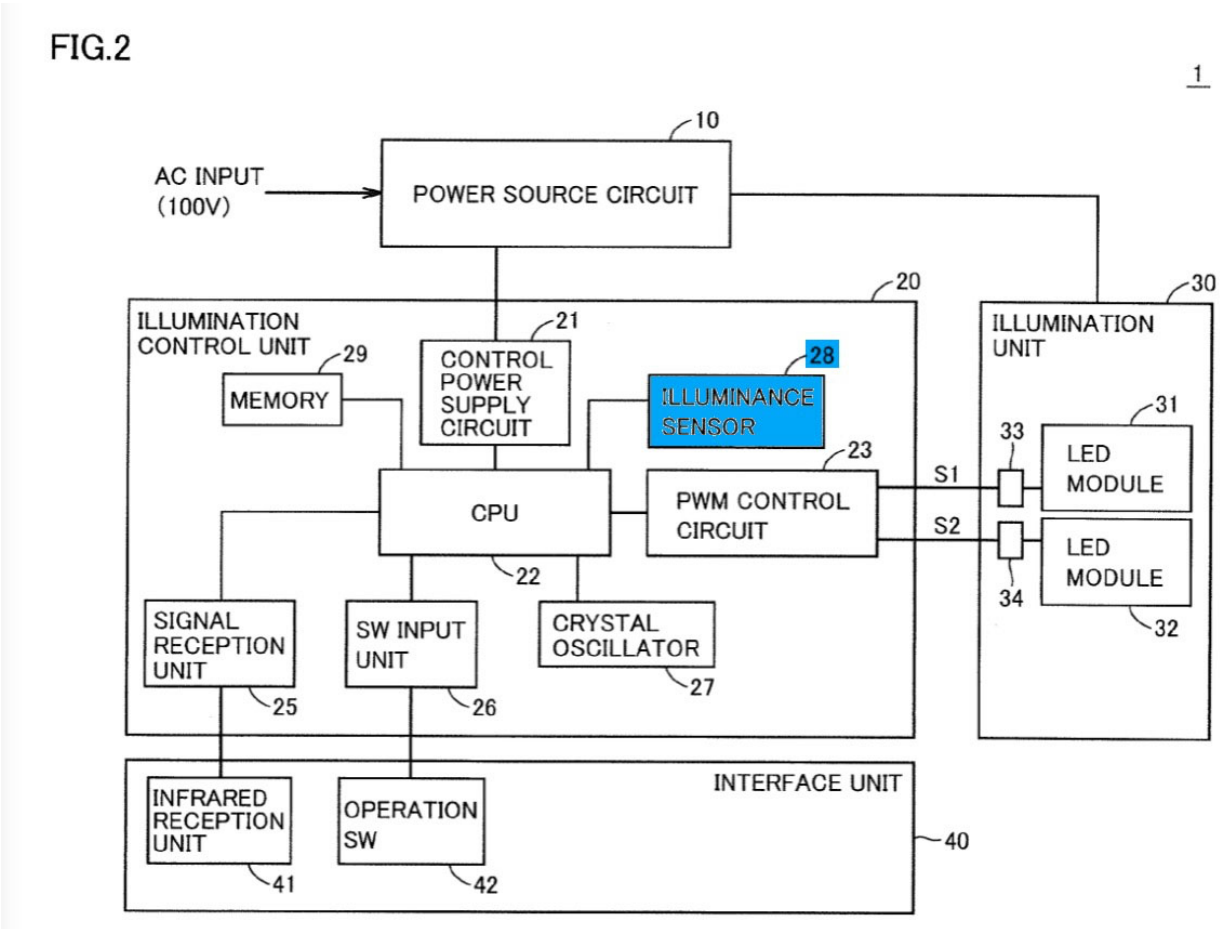
449. Kamii discloses "The illuminance sensor mode refers to a mode for controlling the dimming ratio based on a result of obtainment by illuminance sensor 28 so as to achieve preset illuminance." Kamii at ¶ 0330.

450. "Pressing of 'illuminance sensor' button 70 of remote controller 50 by the user causes transition to the illuminance sensor mode." Kamii at ¶ 0331.

451. "In the illuminance sensor mode, CPU 22 obtains a result of measurement by illuminance sensor 28 defined times at predetermined intervals (for example, 8 times every 0.5 milliseconds). Then, CPU 22 calculates an average value of the results." Kamii at ¶ 0332.

452. Annotated Figure 2, reproduced below, depicts illuminance sensor 28 highlighted in blue.

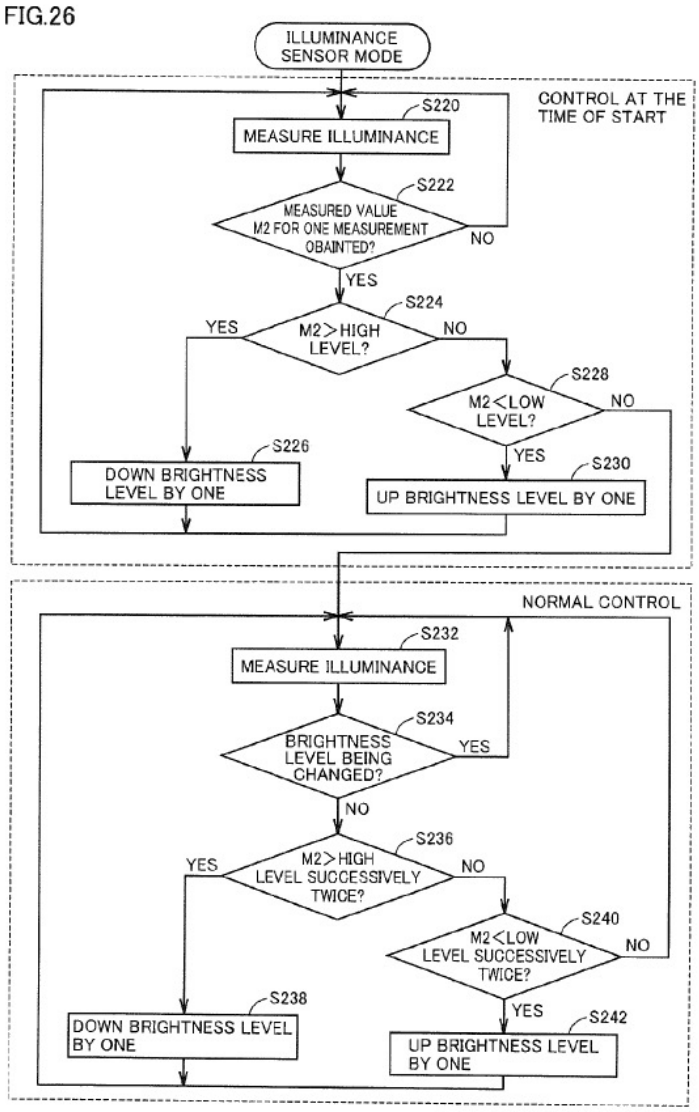
FIG.2



Kamii, Figure 2

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453. Figure 26 depicts the illuminance sensor mode.



Kamii, Figure 26

454. To the extent this limitation is not disclosed by Kamii, it would have been obvious in view of a person of ordinary skill.

455. Thus, Kamii discloses or renders obvious this limitation.

e. 1[d] a motion sensing unit

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456. Kamii renders obvious, alone or in combination with Nagaoka, a motion sensing unit.

457. A person of ordinary skill in the art would have been motivated to modify the invention disclosed in Kamii to add a motion sensing unit and would have had a reasonable expectation success of doing so. A person of ordinary skill in the art would understand that it would be desirable for a security light to be able to sense motion of individuals or animals near the light. Motion sensing as a security light feature was well known and widely adopted in the art at the time of the filing of the '362 patent. The use of a motion sensing unit to either provide light for individuals returning home at night or to prevent trespassers from approaching the house would have been routine in security lights available at the time of the filing of the '362 patent and a person of ordinary skill in the art would have been motivated to use commercially available motion sensing hardware with Kamii's lighting device 1. Accordingly, a person of ordinary skill in the art would have been motivated to add a motion sensing unit to the lighting device 1 disclosed by Kamii in view of the state of the prior art at the time of the filing of the '362 patent and the knowledge of a person of ordinary skill in the art. Kamii specifically references "changing a start time and the like periodically or randomly for the purpose of enhancing crime prevention" and adding means of detection or signal triggering, like a very commonly used motion sensing trigger, provides a means to further increase the non-periodic nature of a crime prevention setting.

458. Additionally, a person of ordinary skill in the art would have been motivated by Nagaoka to modify Kamii to add a motion sensing unit.

459. Nagaoka discloses a motion sensing unit.

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460. Nagaoka discloses a lighting fixture with a flange 24, which is "provided with a sensor unit 26 protruded therefrom at a lower portion equipped with an infrared sensor for turning on the lighting load 1 by detecting a movement of a human and an illuminance sensor for a lighting control according to peripheral illuminance, thereby reading changes of lighting into a load controller inside the lighting device." Nagaoka at ¶ 0003.

461. Nagaoka further discloses that "when a value read by the illuminance sensor corresponds to brightness in the daytime, the lighting load is configured to be in an off state regardless of a presence of a human, and when peripheral illuminance becomes arbitrary darkness, the incandescent lamp is controlled to dim with 30% of brightness. Furthermore, when the infrared sensor detects a movement of a human while dimming with 30% of brightness, the incandescent lamp is controlled to light with 100% of brightness. Furthermore, the lighting device has a function to turn off the lighting load again when determining that an arbitrary time has been passed and midnight has come, and to light the lighting load with 100% of brightness only when someone is present." Nagaoka at ¶ 0004.

462. Nagaoka also discloses that "[a] constitution example of a lighting device of the present embodiment is similar to the embodiment 9 (FIG. 29). An infrared sensor of the sensor unit 7 concurrently functions as the load lighting detector 8. The infrared sensor of the sensor unit 7 includes a pyroelectric sensor for detecting infrared radiated from a human body, for example. Based on an output of the pyroelectric sensor, the presence of a human body is detected." Nagaoka at ¶ 0138.

463. A person of ordinary skill in the art would have been motivated to combine the infrared motion sensor of Nagaoka with lighting device 1 of Kamii. Kamii and Nagaoka are both references in the same technical area and seek to solve the same problem of providing a

lighting device with controls and control signals that adjust the output of the lighting device to optimize its performance based on external controls and inputs. Both Kamii and Nagaoka specifically refer to security as one of the performance characteristics of the disclosed lighting devices.

464. For example, Kamii states as background art that "some lighting devices have such a timer function as automatically carrying out turn-on or turn-off." Kamii at ¶ 0004. Kamii additionally discloses that "[f]or example, Japanese Patent Laying-Open No. 2005-78834 (PTL 1) discloses a case where the function can be used for anticrime measures in such a manner as automatically turning a lighting device on at a preset time as if a user were at home. Specifically, PTL 1 proposes a method of changing a start time and the like periodically or randomly for the purpose of enhancing crime prevention." Kamii at ¶ 0005-6.

465. Nagaoka states as background art that "[r]ecently, a lighting fixture equipping a human body detection sensor for lighting by detecting a human and an illuminance sensor for performing a lighting control according to peripheral brightness has been prevailed outside a house and at a side surface of a house for the purpose of saving electricity and security." Nagaoka at ¶ 0002.

466. Both Kamii and Nagaoka are directed in the general space of lighting devices with at least two levels of light output that adjust that light output based on inputs received from sensors. The input signal from these sensors is processed by a controller, which then subsequently modifies or controls the lighting load in the lighting device. Both Kamii and Nagaoka specifically disclose the use of an illuminance sensor that detects the level of ambient light around or light directed at the sensor on the lighting device, as discussed above and below with respect to claim element 1[c]. Both Kamii and Nagaoka disclose lighting devices that have

lighting loads controlled by external signals, such as the surrounding illuminance as detected by an illuminance sensor (in both references) and motion (as disclosed in Nagaoka). Both references are generally interested in controlling the loads for optimized performance with increased security being one such performance parameter that both references discuss. Thus, a person of ordinary skill in the art would have been motivated to modify Kamii to add Nagaoka's infrared motion sensor. Adding Nagaoka's infrared motion sensor would have been a simple modification to obtain predictable results, and a person of ordinary skill in the art would have had a reasonable expectation of success in doing so. A person of ordinary skill would understand that Kamii's Illumination Control Unit 20 could easily include a motion sensor as described in Nagaoka. The motion sensor would provide a signal to CPU 22 that would send a control command to the Illumination Unit 30, adjusting the light output from the lighting device. Nagaoka itself discloses both an infrared motion sensor and illuminance sensor together in sensor unit 7. Both the motion sensor and illuminance sensor produce signals that are sent to the Load Controller 5 (microcomputer), which then acts to adjust the lighting level of the lighting device. Therefore, Nagaoka discloses how a motion sensor can be integrated into Kamii to add additional turn-on, turn-off, periodic, or random lighting controls for crime prevention.

467. Thus, Kamii alone or in combination with Nagaoka renders this limitation obvious.

f. 1[e] a power supply unit

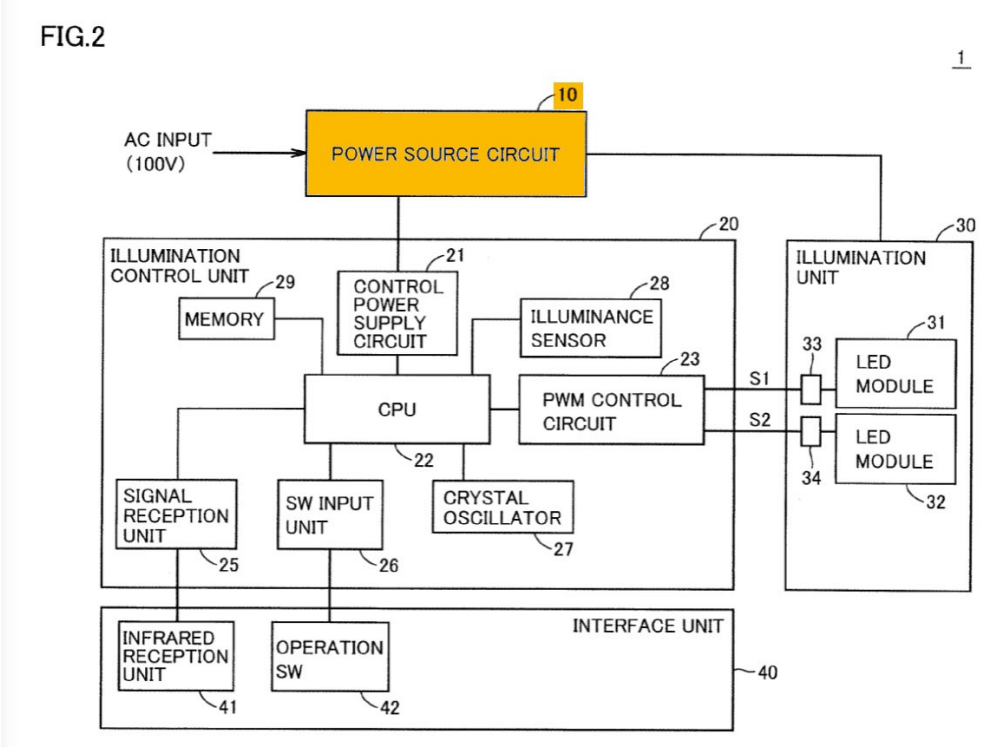
468. Kamii discloses or renders obvious a power supply unit.

469. Kamii discloses "Referring to FIG. 2, lighting device 1 according to the embodiment of the present invention includes a power source circuit 10, an illumination control unit 20, an illumination unit 30, and an interface unit 40." Kamii at ¶ 0064.

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470. Kamii further discloses "[p]ower source circuit 10 receives AC power input (AC input) (100 V), converts it to a DC voltage, and supplies the voltage to various portions of the device. Though the voltage is shown to be supplied only to a control power supply circuit 21 and illumination unit 30 by way of example here, it is not particularly limiting as such and a necessary voltage is supplied to other portions as well." Kamii at ¶ 0065.

471. Annotated Figure 2, reproduced below, depicts power source circuit 10 highlighted in orange.



Kamii, Figure 2

472. Thus, Kamii discloses or renders obvious this limitation.

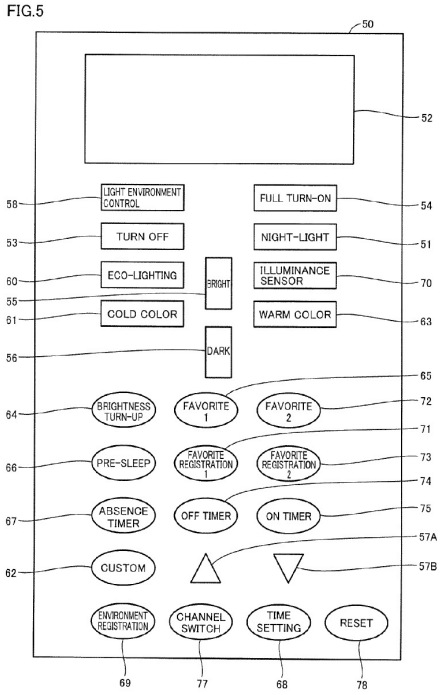
g. 1[f] an external control unit, coupled with the loading and power control unit

473. Kamii discloses or renders obvious an external control unit, coupled with the loading and power control unit."

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474. Kamii discloses "[r]eferring to FIG. 5, remote controller 50 is provided with a liquid crystal panel 52 and various buttons. A display device other than liquid crystal may be used in place of liquid crystal panel 52." Kamii at ¶ 0084.

475. Kamii discloses "[m]oreover, remote controller 50 is provided with a plurality of buttons," Kamii at ¶ 0085, as depicted in Figure 5, reproduced below.

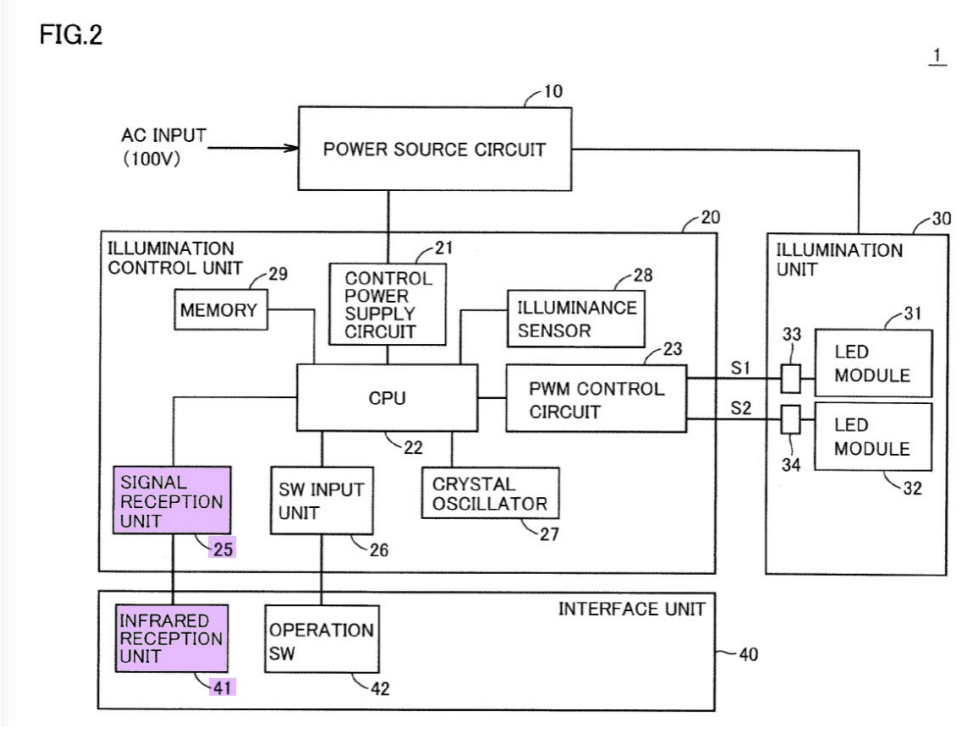


Kamii, Figure 5

476. Kamii also discloses "[i]nfrared reception unit 41 of lighting device 1 receives the infrared signal projected from infrared projection unit 87 of remote controller 50. Then, infrared reception unit 41 performs photoelectric conversion of the received infrared signal. Then, signal reception unit 25 outputs to CPU 22, the transmission signal obtained by photoelectric conversion and issued from remote controller 50. As a result of this operation, CPU 22 performs an operation in accordance with the input instruction from remote controller 50." Kamii at ¶ 0122.

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477. Annotated Figure 2, reproduced below, depicts the infrared reception unit 41 and signal reception unit 25 highlighted in purple.



Kamii, Figure 2

478. To the extent this limitation is not disclosed by Kamii, it would have been obvious in view of a person of ordinary skill.

479. Thus, Kamii discloses or renders obvious this limitation.

h. 1[g] wherein the light-emitting unit comprises at least one LED

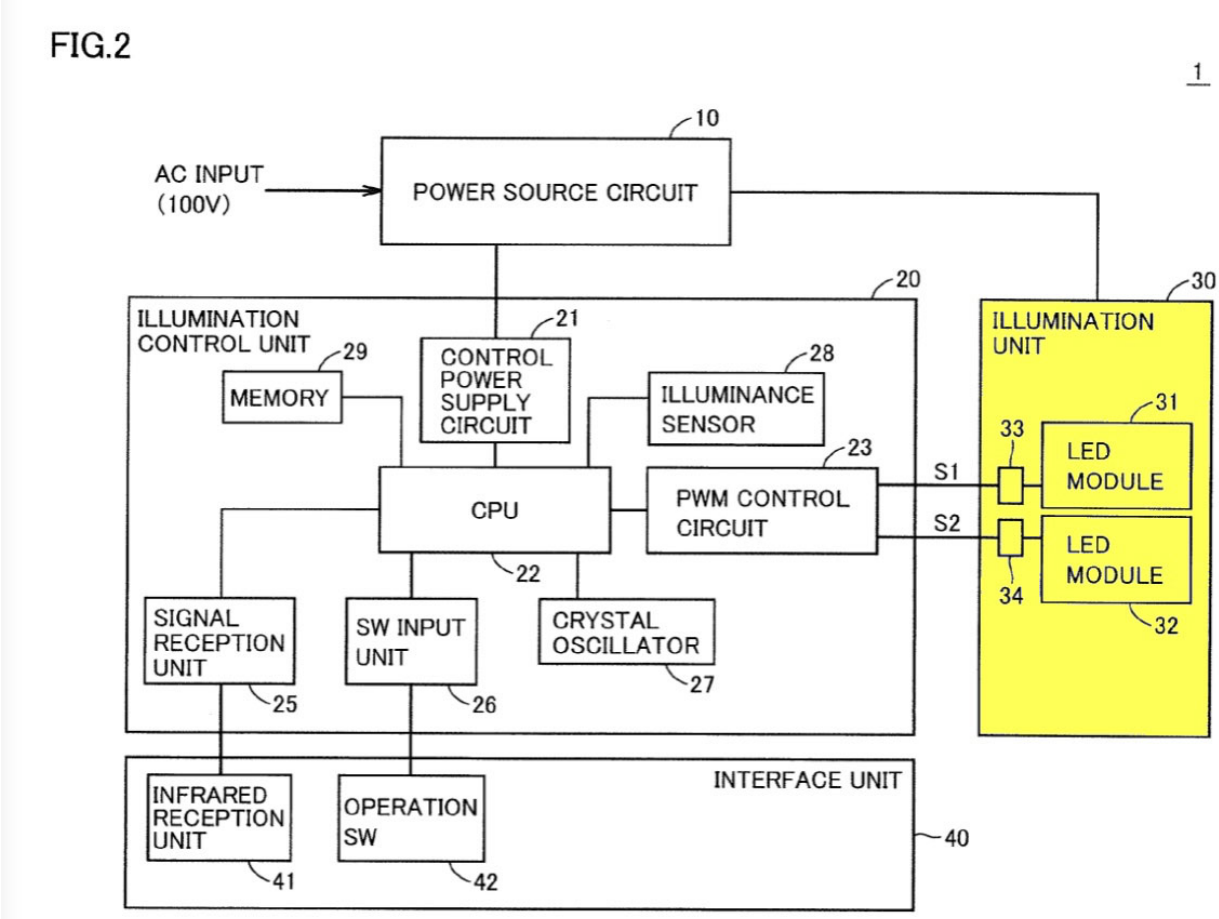
480. Kamii discloses or renders obvious that the light-emitting unit comprises at least one LED.

481. Kamii discloses "[i]llumination unit 30 includes LED modules 31 and 32 having color temperatures different from each other and FET (Field Effect Transistor) switches 33 and 34 used for driving LED modules 31 and 32, respectively. In the present example, it is assumed that a color temperature of LED module 31 is about 5600K and a color temperature of LED

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module 32 is about 3000K. In the following, LED module 31 will also be referred to as a daylight color LED (or simply daylight color) and LED module 32 will also be referred to as a light color LED (or simply light color). Here, a set consisting of one LED module 31 and one module 32 is shown as an example, and a plurality of such sets may be provided. Further, FET switches 33 and 34 may be provided in PWM control circuit 23." Kamii at ¶ 0074.

482. Annotated Figure 2, reproduced below, depicts illumination unit 30 (highlighted in yellow) with two LED modules.



483. To the extent this limitation is not disclosed by Kamii, it would have been obvious in view of a person of ordinary skill.

484. Thus, Kamii discloses or renders obvious this limitation.

i. 1[h] wherein the loading and power control unit comprises a microcontroller electrically coupled with a semiconductor switching device, wherein the semiconductor switching device is electrically connected in series with the power supply unit and the light emitting unit

485. Kamii discloses or renders obvious that the loading and power control unit comprises a microcontroller electrically coupled with a semiconductor switching device, wherein the semiconductor switching device is electrically connected in series with the power supply unit and the light emitting unit.

486. Kamii discloses that "[i]llumination control unit 20 includes control power supply circuit 21 for adjusting a voltage supplied from power source circuit 10 to be supplied to a CPU 22, CPU (Central Processing Unit) 22 for overall control of lighting device 1, a PWM (Pulse Width Modulation) control circuit 23, a signal reception unit 25, an SW input unit 26, a crystal oscillator 27, an illuminance sensor 28, and a memory 29. CPU 22, memory 29, and PWM control circuit 23 are implemented by a micro-computer by way of example." Kamii at ¶ 0066.

487. Kamii discloses that "CPU 22 is connected to various units and gives instructions for necessary operations to control lighting device 1 as a whole." Kamii at ¶ 0067.

488. Kamii discloses that "[m]emory 29 stores various programs and initial values for controlling lighting device 1, and it is also used as a working memory of CPU 22." Kamii at ¶ 0073.

489. Kamii discloses "[i]llumination unit 30 includes LED modules 31 and 32 having color temperatures different from each other and FET (Field Effect Transistor) switches 33 and 34 used for driving LED modules 31 and 32, respectively. In the present example, it is assumed that a color temperature of LED module 31 is about 5600K and a color temperature of LED module 32 is about 3000K. In the following, LED module 31 will also be referred to as a daylight color LED (or simply daylight color) and LED module 32 will also be referred to as a

light color LED (or simply light color). Here, a set consisting of one LED module 31 and one module 32 is shown as an example, and a plurality of such sets may be provided. Further, FET switches 33 and 34 may be provided in PWM control circuit 23." Kamii at ¶ 0074.

490. Kamii discloses that "FIG. 3 is a diagram showing configurations of LED modules 31 and 32 according to the embodiment of the present invention." Kamii at ¶ 00077.

491. Kamii discloses that "[r]eferring to FIG. 3, CPU 22 instructs PWM control circuit 23 to generate and output PWM pulses S1 and S2 for driving at least one of LED modules 31 and 32." Kamii at ¶ 0078. Kamii discloses that CPU 22, memory 29, and PWM control circuit 23 "are implemented by a microcomputer by way of example." Kamii at ¶ 0066.

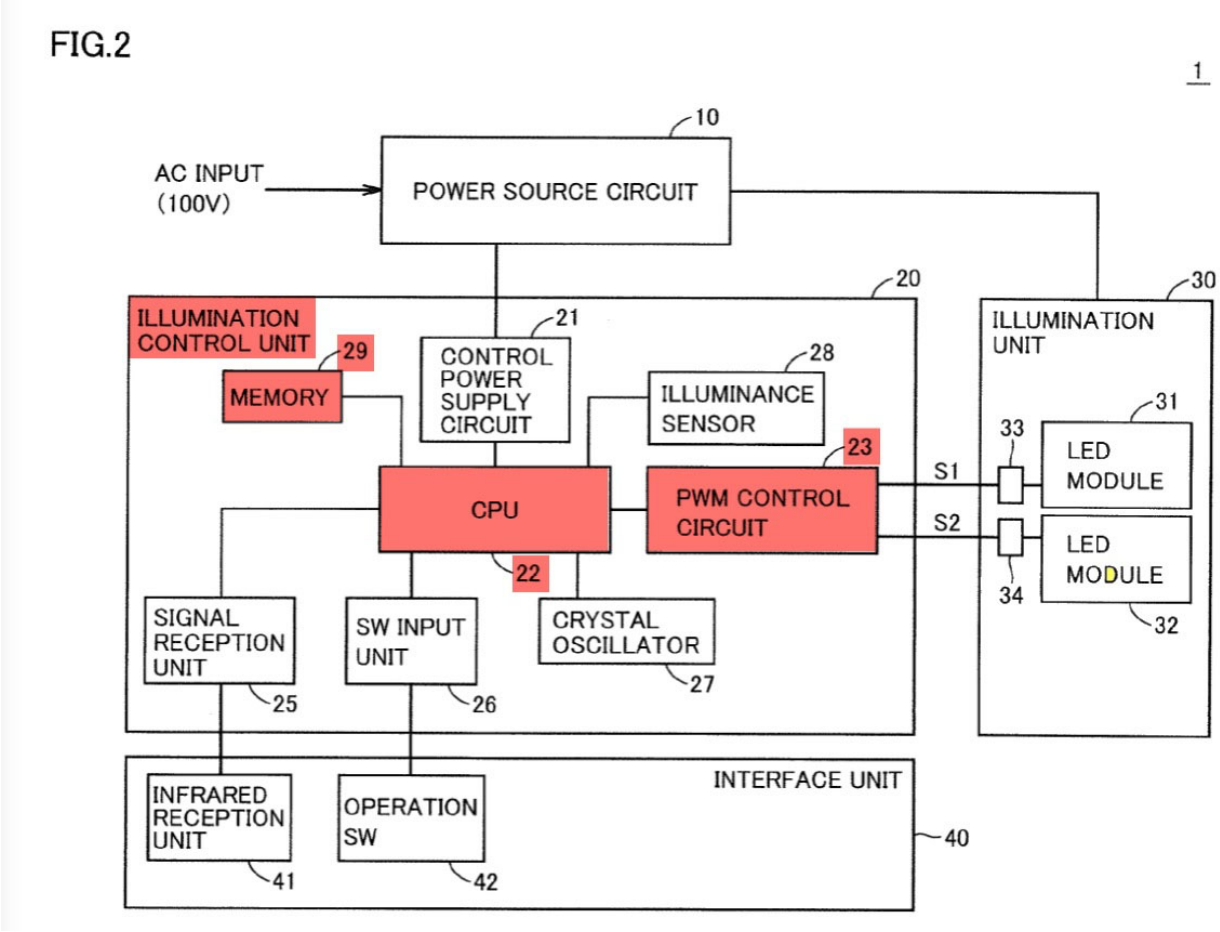
492. Kamii further discloses that "LED modules 31 and 32 receive supply of a necessary voltage from power source circuit 10. Between LED modules 31 and 32 and a ground voltage GND, FET switches 33 and 34 are provided, respectively." Kamii at ¶ 0079.

493. Kamii discloses that "[w]hen FET switches 33 and 34 are rendered conductive/non-conductive in response to PWM pulses S1 and S2, a current is supplied/cut off to LED modules 31 and 32. When a current is supplied to LED modules 31 and 32, LED modules 31 and 32 emit light. Though a configuration for driving LED modules 31 and 32 has been described above, the configuration is similar also in a case where a plurality of other LED modules are additionally provided." Kamii at ¶ 0080.

494. Annotated Figure 2, reproduced below, depicts the memory 29 coupled to the CPU 22, which is coupled to the PWM Control Circuit 23 highlighted in red.

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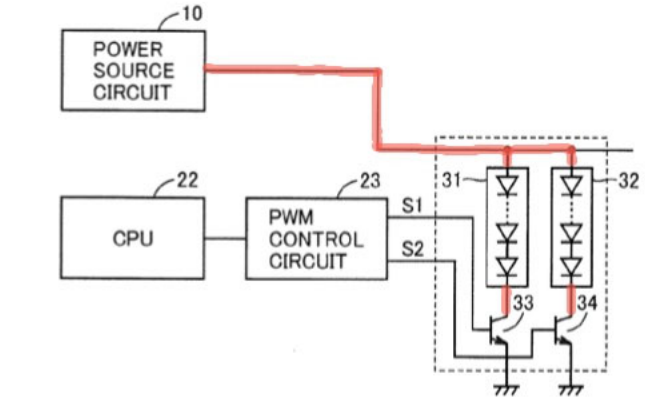
FIG.2



Kamii, Figure 2

495. Annotated Figure 3 depicts the power source circuit 10, the LED modules 31 and 32, and the FET switches 33 and 34 connected in series.

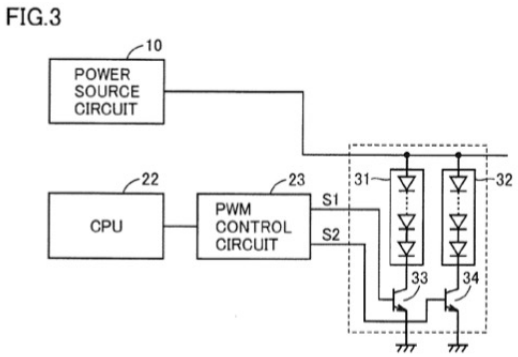
FIG.3

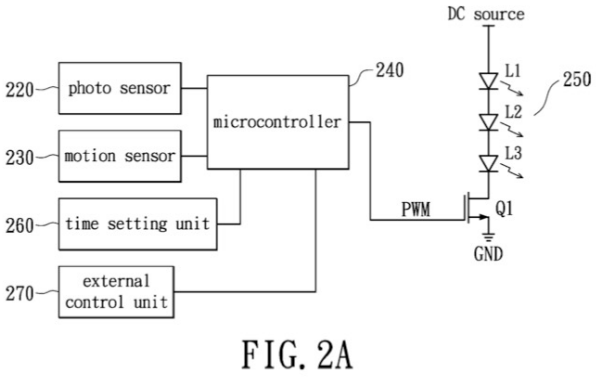


Kamii, Figure 3

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496. Figure 3 depicts power source circuit 10, the LED modules 31 and 32, and the FET switches 33 and 34 connected in series, similar to Figure 2A of the '362 patent, which depicts the DC source, LEDs L1, L2, and L3, and switch Q1 connected in series, as shown side-by-side below.





Kamii, Figure 3 '362 patent, Figure 2A

497. To the extent this limitation is not disclosed by Kamii, it would have been obvious in view of a person of ordinary skill.

498. Thus, Kamii discloses or renders obvious this limitation.

j. 1[i] wherein the microcontroller with program codes outputs a pulse width modulation (PWM) signal to a gate electrode of the semiconductor switching device to control a conduction period (T_{on}) and a cut-off period (T_{off}) of the semiconductor switching device for delivering different average electric currents from the power supply unit to drive the light-emitting unit for generating different illuminations, wherein the microcontroller controls the semiconductor switching device respectively to have a short conduction period (T_{on}) and a long conduction period (T_{on}) such that the light-emitting unit respectively generates a first level and a second level illumination characterized by light intensity and/or color temperature according to the signals received from the light sensing control unit and the motion sensing unit

499. Kamii discloses or renders obvious wherein the microcontroller with program codes outputs a pulse width modulation (PWM) signal to a gate electrode of the semiconductor

switching device to control a conduction period (T_{on}) and a cut-off period (T_{off}) of the semiconductor switching device for delivering different average electric currents from the power supply unit to drive the light-emitting unit for generating different illuminations, wherein the microcontroller controls the semiconductor switching device respectively to have a short conduction period (T_{on}) and a long conduction period (T_{on}) such that the light-emitting unit respectively generates a first level and a second level illumination characterized by light intensity and/or color temperature according to the signals received from the light sensing control unit and the motion sensing unit.

500. Kamii discloses "[i]llumination unit 30 includes LED modules 31 and 32 having color temperatures different from each other and FET (Field Effect Transistor) switches 33 and 34 used for driving LED modules 31 and 32, respectively. In the present example, it is assumed that a color temperature of LED module 31 is about 5600K and a color temperature of LED module 32 is about 3000K. In the following, LED module 31 will also be referred to as a daylight color LED (or simply daylight color) and LED module 32 will also be referred to as a light color LED (or simply light color). Here, a set consisting of one LED module 31 and one module 32 is shown as an example, and a plurality of such sets may be provided. Further, FET switches 33 and 34 may be provided in PWM control circuit 23." Kamii at ¶ 0074.

501. Kamii discloses that "FIG. 3 is a diagram showing configurations of LED modules 31 and 32 according to the embodiment of the present invention." Kamii at ¶ 00077.

502. Kamii discloses that "[r]eferring to FIG. 3, CPU 22 instructs PWM control circuit 23 to generate and output PWM pulses S1 and S2 for driving at least one of LED modules 31 and 32." Kamii at ¶ 0078.

503. Kamii further discloses that "LED modules 31 and 32 receive supply of a necessary voltage from power source circuit 10. Between LED modules 31 and 32 and a ground voltage GND, FET switches 33 and 34 are provided, respectively." Kamii at ¶ 0079.

504. Kamii discloses that "[w]hen FET switches 33 and 34 are rendered conductive/non-conductive in response to PWM pulses S1 and S2, a current is supplied/cut off to LED modules 31 and 32. When a current is supplied to LED modules 31 and 32, LED modules 31 and 32 emit light. Though a configuration for driving LED modules 31 and 32 has been described above, the configuration is similar also in a case where a plurality of other LED modules are additionally provided." Kamii at ¶ 0080. A person of ordinary skill in the art would understand that the PWM pulses S1 and S2 would be output to the gate electrodes of FET switches 33 and 34 because the gate electrodes of FET switches 33 and 34 control the on/off state of the switches.

505. Kamii discloses that "PWM control circuit 23 according to the embodiment of the present invention controls PWM pulses S1 and S2 to be output to LED modules 31 and 32 in accordance with an instruction from CPU 22. More specifically, corresponding to an ON period of PWM pulse S1, FET switch 33 is rendered conductive and LED module 31 is turned on. Corresponding to an OFF period of PWM pulse S1, FET switch 33 is rendered non-conductive and LED module 31 is turned off." Kamii at ¶ 0459.

506. Kamii further discloses that "[s]imilarly, for LED module 32, in response to PWM pulse S2 from PWM control circuit 23, FET switch 34 is rendered conductive/non-conductive and LED module 32 is turned on/off." Kamii at ¶ 0460.

507. Kamii additionally discloses that "CPU 22 is connected to crystal oscillator 27 that outputs an oscillation signal at 40 MHz (one period of 25 ns), and in accordance with an

instruction issued at the timing synchronized with the oscillation signal, PWM control circuit 23 outputs PWM pulses S1 and S2." Kamii at ¶ 0461.

508. As discussed above, Kamii discloses an illuminance sensor mode, in which the LED modules are dimmed based on signals received from the illuminance sensor.

509. Kamii discloses "when transition to the illuminance sensor mode is made, CPU 22 conducts illuminance measurement (step S220). The illuminance measurement here refers to processing for calculating measured value M2 from a result of measurement by illuminance sensor 28 as described above." Kamii at ¶ 0345.

510. Kamii discloses "[n]ext, when CPU 22 obtains one measured value M2, that is, measured value M2 which is the average value of results of measurement for 2 seconds in the example described above (YES in step S222), CPU 22 performs a determination operation for comparing measured value M2 with set illuminance level 1 which is the target illuminance." Kamii at ¶ 0346.

511. Kamii discloses that "[a]s a result of the determination operation, when measured value M2 indicates an illuminance higher than the high level of illuminance level 1 which is the target illuminance (YES in step S224), CPU 22 changes a dimming ratio so as to decrease the current brightness level by one (step S226)." Kamii at ¶ 0347.

512. Kamii additionally discloses that "[w]hen measured value M2 indicates an illuminance lower than the low level of illuminance level 1 which is the target illuminance (NO in step S224 and YES in step S228), CPU 22 changes the dimming ratio so as to increase the current brightness level by one (step S230)." Kamii at ¶ 0348.

513. Kamii further discloses that "[w]hen CPU 22 changes the dimming ratio in step S226 or step S230, CPU 22 thereafter returns to the operation in step S220. Then, CPU 22

repeats the foregoing operations until measured value M2 is determined to indicate an illuminance between the low level and the high level of illuminance level 1 which is the target illuminance." Kamii at ¶ 0349.

514. Thus, Kamii discloses this limitation.

515. To the extent that Kamii does not disclose this limitation, it would have been rendered obvious over Kamii alone or in combination with Nagaoka.

516. As discussed above, Kamii uses FET switches 33 and 34 to control the supply of current to the LED modules 31 and 32. A FET has a gate electrode, which controls the on/off state of the switches. Thus, it would have been obvious to a person of ordinary skill to have the PWM pulses S1 and S2 output to the gate electrodes of FET switches 33 and 34 to control a conduction period of the switches for delivering different average electric currents from the power supply unit to drive the light-emitting unit for generating different illuminations

517. Additionally, as discussed above, to the extent Kamii does not disclose a motion sensing unit (limitation 1[d]), Kamii renders the limitation obvious alone or in combination with Nagaoka. As discussed above, motion sensing as a security light feature was well known and widely adopted in the art at the time of the filing of the '362 patent. The use of a motion sensing unit to either provide light for individuals returning home at night or to prevent trespassers from approaching the house would have been routine in security lights available at the time of the filing of the '362 patent and a person of ordinary skill in the art would have been motivated to use commercially available motion sensing hardware with Kamii's lighting device 1. Additionally, two-level security lighting was well-known in the art at the time of the filing of the '362 patent. It would have been obvious to generate a first level and second level illumination level according to signals received from the motion sensing unit. Accordingly, a person of

ordinary skill in the art would have been motivated to have the microcontroller generate a first level and second level illumination level according to signals received from the motion sensing unit in view of the state of the prior art at the time of the filing of the '362 patent and the knowledge of a person of ordinary skill in the art.

518. Additionally, a person of ordinary skill in the art would have been motivated by Nagaoka to modify Kamii to have the microcontroller control the semiconductor switching device respectively to have a short conduction period (T_{on}) and a long conduction period (T_{on}) such that the light-emitting unit respectively generates a first level and a second level illumination characterized by light intensity according to the signals received from the motion sensing unit.

519. Nagaoka discloses the microcontroller controlling the semiconductor switching device respectively to have a short conduction period (T_{on}) and a long conduction period (T_{on}) such that the light-emitting unit respectively generates a first level and a second level illumination characterized by light intensity according to the signals received from the motion sensing unit.

520. Nagaoka discloses that "when a value read by the illuminance sensor corresponds to brightness in the daytime, the lighting load is configured to be in an off state regardless of a presence of a human, and when peripheral illuminance becomes arbitrary darkness, the incandescent lamp is controlled to dim with 30% of brightness. Furthermore, when the infrared sensor detects a movement of a human while dimming with 30% of brightness, the incandescent lamp is controlled to light with 100% of brightness. Furthermore, the lighting device has a function to turn off the lighting load again when determining that an arbitrary time has been

passed and midnight has come, and to light the lighting load with 100% of brightness only when someone is present." Nagaoka at ¶ 0004.

521. Nagaoka discloses that "[o]perations of the load controller 5 and the load drive unit 3 in an on state of the TRIAC element TR are described with reference to FIG. 5. The load controller 5 normally maintains an output to the load drive unit 3 at an H-level during a condition that the lighting load 1 is not turned on. When the TRIAC element TR is turned on, i.e. the lighting load 1 is turned on, a trigger waveform is configured to be a pulsed L-level from a timing after a predetermined phase period T1 (e.g. 9 milliseconds) since a timing when output of the power supply phase detector 4 is converted from an H-level into an L-level, to a timing after a pulse period T2 (e.g. 500 microseconds). Thus, a transistor Q2 of the load drive unit 3 is turned on, and the TRIAC element TR is turned on by applying a trigger current. Immediately after turning on, the lighting load 1 composed of the incandescent lamp as a resistive load is applied with a sine-wave current." Nagaoka at ¶ 0006.

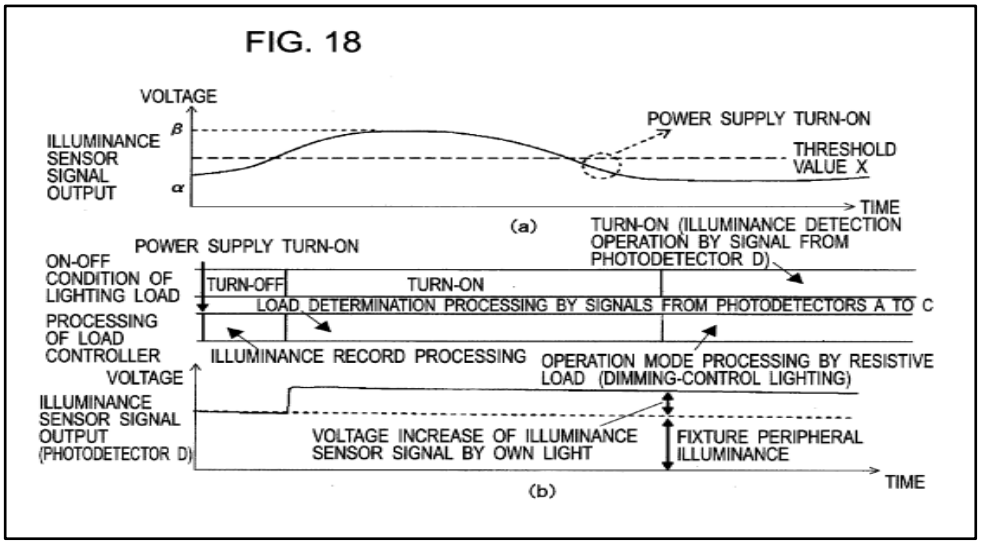
522. Nagaoka further discloses that "[a]s a result, it is possible to perform the dimming-control by controlling the period T1 and the period T2 by the load controller 5. For example, an effective value of an input current of the incandescent lamp as a resistive lighting load is to be proportionally increased by gradually shortening the period T1 and prolonging the period T2. Therefore, the lighting load is turned on by controlling brightness from 0% toward 100%." Nagaoka at ¶ 0007.

523. Nagaoka discloses that "[t]he reference numeral 3 represents the load drive unit, which is configured by using the switching element such as a TRIAC element in order to drive the lighting load 1 by receiving a trigger signal output from the load controller 5." Nagaoka at ¶ 0060.

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524. Nagaoka discloses that "FIG. 18(a) illustrates a relationship between the signal of the illuminance sensor and the peripheral illuminance of the lighting fixture. An output signal waveform of the illuminance sensor continuously varies within an arbitrary range α to β during a day. The illuminance sensor is composed of a photo IC diode, for example, and outputs a voltage signal with a higher voltage value as the periphery is brighter." Nagaoka at ¶ 0089.

525. Nagaoka further discloses that "[b]y arbitrarily setting a threshold value X with respect to the illuminance detection signal of the illuminance sensor in the load controller, it is possible to control the lighting load by turning off the lighting load when the signal level is above the threshold value X, and by turning on the lighting load when the signal level falls below the threshold value X. For example, by setting the threshold value X to a signal level of nightfall in the illuminance sensor, the lighting load can be automatically turned on at nightfall in every day." Nagaoka at ¶ 0090.

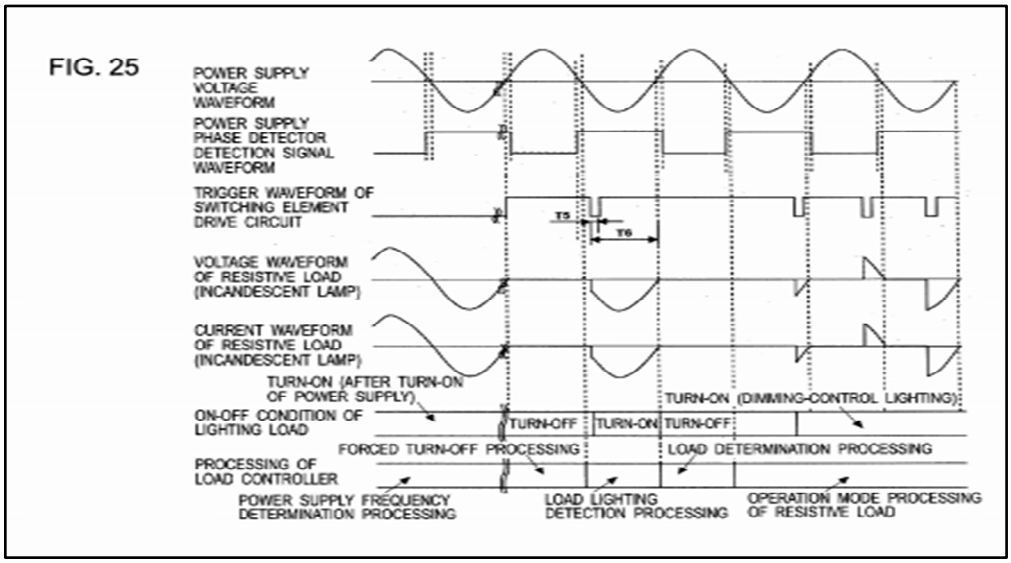


Nagaoka, Fig. 18

526. Nagaoka additionally discloses that "the trigger signal can be a pulse signal with an arbitrary width. In an operation of the TRIAC element, when a gate signal of the TRIAC element is once turned on, the TRIAC element is kept turning on until the power supply voltage

becomes zero as long as a current with more than a holding current value is applied to the TRIAC element even if the gate signal is turned off." Nagaoka at ¶ 0117.

527. Nagaoka further discloses that "in a treatment after the load determination, the lighting load can be turned on by applying the minimal gate signal even if the lighting control is the same condition, due to the pulse trigger signal as illustrated in FIG. 25 (T5 of the pulse width)." Nagaoka at ¶ 0120.



Nagaoka, Fig. 25

528. Nagaoka discloses that "[t]he load drive unit 3 includes a TRIAC element TR inserted in the power feed path from the ac power supply AC to the lighting load 1, and a PNP-type transistor Q2 in which an emitter is connected to a gate of the TRIAC element TR and a collector is connected to the ground via a resistor R6. A base of the transistor Q2 is connected to the load controller 5 via resistor R7, and connected to the emitter of the transistor Q2 via a resistor R8. In addition, a parallel circuit of a resistor R9 and a capacitor C5 is connected between one main electrode of the TRIAC element TR and the emitter of the transistor Q2." Nagaoka at ¶ 0125.

529. A person of ordinary skill in the art would have been motivated to combine Nagaoka's light intensity changing based on motion detected by a motion sensing unit with lighting device 1 of Kamii. As discussed above, Kamii and Nagaoka are both references in the same technical area and seek to solve the same problem of providing a lighting device with controls and control signals that adjust the output of the lighting device to optimize its performance based on external controls and inputs. Both Kamii and Nagaoka specifically refer to security as one of the performance characteristics of the disclosed lighting devices.

530. Both Kamii and Nagaoka are directed in the general space of lighting devices with at least two levels of light output that adjust that light output based on inputs received from sensors. The input signal from these sensors is processed by a controller, which then subsequently modifies or controls the lighting load in the lighting device. Both Kamii and Nagaoka disclose lighting devices that have lighting loads controlled by external signals, such as the surrounding illuminance as detected by an illuminance sensor (in both references) and motion (as disclosed in Nagaoka). Both references are generally interested in controlling the loads for optimized performance with increased security being one such performance parameter that both references discuss. Thus, a person of ordinary skill in the art would have been motivated to modify Kamii to add Nagaoka's infrared motion sensor and adjust the lighting levels based on signals received from the infrared motion sensor. Adding Nagaoka's infrared motion sensor would have been a simple modification to obtain predictable results, and a person of ordinary skill in the art would have had a reasonable expectation of success in doing so.

531. Thus, Kamii discloses or renders obvious alone or in combination with Nagaoka this limitation.

k. 1[j] wherein the external control unit is used in at least one of two setting modes respectively for setting illumination characteristics of

one of the first level and the second level illumination; wherein the first setting mode is a manual setting incorporating with the external control unit when the light-emitting unit generates one of the first level and the second level illumination, in which the illumination characteristic of the light-emitting unit is changed directly by operating the external control unit; wherein the second setting mode is a free-running setting, in which the light-emitting unit performs a free-run of one of the first level and the second level illumination by gradually and periodically changing illumination characteristics, wherein the free-run is terminated by operating the external control unit at a time point corresponding to a specific illumination characteristic, such that, following the free-running illumination variation, the illumination characteristics of one of the first level and the second level illumination is set by operating the external control unit at the time point when the light-emitting unit performs the specific illumination characteristic; wherein the light-emitting unit performs one of the first level and the second level illumination characterized by the specific illumination characteristic being set thereof.

532. Kamii discloses or renders obvious that the external control unit is used in at least one of two setting modes respectively for setting illumination characteristics of one of the first level and the second level illumination; wherein the first setting mode is a manual setting incorporating with the external control unit when the light-emitting unit generates one of the first level and the second level illumination, in which the illumination characteristic of the light-emitting unit is changed directly by operating the external control unit; wherein the second setting mode is a free-running setting, in which the light-emitting unit performs a free-run of one of the first level and the second level illumination by gradually and periodically changing illumination characteristics, wherein the free-run is terminated by operating the external control unit at a time point corresponding to a specific illumination characteristic, such that, following the free-running illumination variation, the illumination characteristics of one of the first level and the second level illumination is set by operating the external control unit at the time point when the light-emitting unit performs the specific illumination characteristic; wherein the light-

emitting unit performs one of the first level and the second level illumination characterized by the specific illumination characteristic being set thereof.

533. Kamii discloses that "remote controller 50 is provided with a plurality of buttons. Specifically, remote controller 50 is provided with a 'full turn-on' button 54, a 'light environment control' button 58, a 'turn-off' button 53, a 'night-light' button 51, an 'eco-lighting' button 60, an 'illuminance sensor' button 70, a 'bright' button 55 and a 'dark' button 56 for indicating increase and decrease in dimming ratio, a 'cold color' button 61 and a 'warm color' button 63 for indicating change in color tone from a 'light color' to a 'daylight color' or from the 'daylight color' to the 'light color', a 'brightness turn-up' button 64, a 'favorite 1' button 65, a 'favorite 2' button 72, a 'pre-sleep' button 66, a 'favorite registration 1' button 71, a 'favorite registration 2' button 73, an 'absence timer' button 67, an 'OFF timer' button 74, an 'ON timer' button 75, a 'custom' setting button 62, an 'UP' button 57A and a 'DOWN' button 57B for indicating increment and decrement in numeric value and the like, an 'environment registration' button 69, a 'channel switch' button 77, a 'time setting' button 68, and a 'reset' button 78." Kamii at ¶ 0085.

534. Kamii discloses that "FIG. 9 is a flowchart illustrating the processing in the lighting adjustment mode according to the embodiment of the present invention." Kamii at ¶ 0155.

535. Kamii discloses that "[t]he flow is executed by CPU 22 reading a program stored in memory 29." Kamii at ¶ 0156.

536. Kamii discloses that "[r]eferring to FIG. 9, first, CPU 22 determines whether or not an input instruction is an instruction of input through a dimmer button (step S100). In the present example, dimmer buttons include 'bright' button 55 and 'dark' button 56. When CPU 22

determines that the input instruction is not the instruction of input through the dimmer button such as 'bright' button 55 or 'dark' button 56 (NO in step S100), the process proceeds to step S112." Kamii at ¶ 0157.

537. Kamii discloses that "[i]f the instruction is determined to be an input through 'bright' button 55 or 'dark' button 56 (YES in step S100), CPU 22 then specifies whether the pressed button is 'bright' button 55 or 'dark' button 56 (step S102)." Kamii at ¶ 0158.

538. Kamii discloses that "[w]hen the pressed button is 'bright' button 55 (YES in step S102), CPU 22 increases the current dimming ratio by a predefined ratio (step S104). When the pressed button is 'dark' button 56 (NO in step S102), CPU 22 decreases the current dimming ratio by a predefined ratio (step S106). Then, the process ends (return). Namely, the process returns to step S2." Kamii at ¶ 0159.

539. Kamii discloses that "[s]pecifically, when the user presses 'dark' button 56 in a full lighting state (the dimming ratio of 100%), lighting is set to a half-lighting state (the dimming ratio of 50%). When the user presses 'dark' button 56 in the half-lighting state (the dimming ratio of 50%), lighting is set to a dim-lighting state (the dimming ratio of 30%). When the user presses 'bright' button 55 in the dim-lighting state (the dimming ratio of 30%), lighting is set to the half-lighting state (the dimming ratio of 50%). When the user presses 'bright' button 55 in the half-lighting state (the dimming ratio of 50%), lighting is set to the full lighting state (the dimming ratio of 100%)." Kamii at ¶ 0160.

540. To the extent this limitation is not disclosed by Kamii, it would have been obvious in view of a person of ordinary skill.

541. Thus, Kamii discloses or renders obvious this limitation.

2. <u>Dependent claim 2 - The two-level LED security light according to claim 1, wherein the external control unit is a push button, a touch</u>

panel, an infrared sensor or a wireless remote control device coupled to a pin of the microcontroller of the loading and power control unit; wherein, when the push button, the touch panel, the infrared sensor or the wireless remote control device is operated, a voltage signal is thereby generated to trigger the microcontroller for the manual setting or the free-running setting of the illumination characteristics.

542. As discussed above, Kamii discloses or renders obvious alone or in view of Nagaoka claim 1.

543. Kamii discloses or renders obvious the external control unit is a push button, a touch panel, an infrared sensor or a wireless remote control device coupled to a pin of the microcontroller of the loading and power control unit; wherein, when the push button, the touch panel, the infrared sensor or the wireless remote control device is operated, a voltage signal is thereby generated to trigger the microcontroller for the manual setting or the free-running setting of the illumination characteristics.

544. Kamii discloses that "remote controller 50 is provided with a plurality of buttons. Specifically, remote controller 50 is provided with a 'full turn-on' button 54, a 'light environment control' button 58, a 'turn-off' button 53, a 'night-light' button 51, an 'eco-lighting' button 60, an 'illuminance sensor' button 70, a 'bright' button 55 and a 'dark' button 56 for indicating increase and decrease in dimming ratio, a 'cold color' button 61 and a 'warm color' button 63 for indicating change in color tone from a 'light color' to a 'daylight color' or from the 'daylight color' to the 'light color', a 'brightness turn-up' button 64, a 'favorite 1' button 65, a 'favorite 2' button 72, a 'pre-sleep' button 66, a 'favorite registration 1' button 71, a 'favorite registration 2' button 73, an 'absence timer' button 67, an 'OFF timer' button 74, an 'ON timer' button 75, a 'custom' setting button 62, an 'UP' button 57A and a 'DOWN' button 57B for indicating increment and decrement in numeric value and the like, an 'environment registration'

button 69, a 'channel switch' button 77, a 'time setting' button 68, and a 'reset' button 78." Kamii at ¶ 0085.

545. Kamii discloses "[i]nfrared reception unit 41 of lighting device 1 receives the infrared signal projected from infrared projection unit 87 of remote controller 50. Then, infrared reception unit 41 performs photoelectric conversion of the received infrared signal. Then, signal reception unit 25 outputs to CPU 22, the transmission signal obtained by photoelectric conversion and issued from remote controller 50. As a result of this operation, CPU 22 performs an operation in accordance with the input instruction from remote controller 50." Kamii at ¶ 0122.

546. Kamii discloses that "FIG. 9 is a flowchart illustrating the processing in the lighting adjustment mode according to the embodiment of the present invention." Kamii at ¶ 0155.

547. Kamii discloses that "[t]he flow is executed by CPU 22 reading a program stored in memory 29." Kamii at ¶ 0156.

548. Kamii discloses that "[r]eferring to FIG. 9, first, CPU 22 determines whether or not an input instruction is an instruction of input through a dimmer button (step S100). In the present example, dimmer buttons include 'bright' button 55 and 'dark' button 56. When CPU 22 determines that the input instruction is not the instruction of input through the dimmer button such as 'bright' button 55 or 'dark' button 56 (NO in step S100), the process proceeds to step S112." Kamii at ¶ 0157.

549. Kamii discloses that "[i]f the instruction is determined to be an input through 'bright' button 55 or 'dark' button 56 (YES in step S100), CPU 22 then specifies whether the pressed button is 'bright' button 55 or 'dark' button 56 (step S102)." Kamii at ¶ 0158.

550. Kamii discloses that "[w]hen the pressed button is 'bright' button 55 (YES in step S102), CPU 22 increases the current dimming ratio by a predefined ratio (step S104). When the pressed button is 'dark' button 56 (NO in step S102), CPU 22 decreases the current dimming ratio by a predefined ratio (step S106). Then, the process ends (return). Namely, the process returns to step S2." Kamii at ¶ 0159.

551. Kamii discloses that "[s]pecifically, when the user presses 'dark' button 56 in a full lighting state (the dimming ratio of 100%), lighting is set to a half-lighting state (the dimming ratio of 50%). When the user presses 'dark' button 56 in the half-lighting state (the dimming ratio of 50%), lighting is set to a dim-lighting state (the dimming ratio of 30%). When the user presses 'bright' button 55 in the dim-lighting state (the dimming ratio of 30%), lighting is set to the half-lighting state (the dimming ratio of 50%). When the user presses 'bright' button 55 in the half-lighting state (the dimming ratio of 50%), lighting is set to the full lighting state (the dimming ratio of 100%)." Kamii at ¶ 0160.

552. To the extent this limitation is not disclosed by Kamii, it would have been obvious in view of a person of ordinary skill.

553. Thus, Kamii discloses or renders obvious alone or in view of Nagaoka claim 2.

C. CLAIMS 1 AND 2 ARE RENDERED OBVIOUS BY NAGAOKA ALONE OR IN VIEW OF KAMII

1. Independent claim 1

a. 1 [pre] A two-level LED security light

554. Nagaoka discloses or renders obvious a two-level LED security light.

555. Nagaoka discloses "[a] lighting device receives an output of a power supply phase detector and performs a lighting control of a lighting load by a trigger signal to be output from a load controller to a switching element (a load drive unit) at an arbitrary conduction angle. The

load controller includes a determination unit that turns on the switching element at a phase of a conduction angle of a commercial power supply in which any lighting load (an incandescent lamp, a bulb-type fluorescent lamp, and an LED lamp) can be turned on during a predetermined period after turning on a power supply, so as to determine a type of the lighting load during the period." Nagaoka, Abstract.

556. Nagaoka discloses that "[t]he lighting fixture used, e.g. at a front door, is mostly the only light supply at the periphery thereof. Therefore, by preventing troubles such as a sudden turnoff during night and avoiding a burnt-out lamp, it is possible to enhance convenience for a user so as to maintain security." Nagaoka at ¶ 0149.

557. To the extent the preamble is not disclosed by Nagaoka, it would have been obvious in view of a person of ordinary skill.

558. To the extent the preamble is limiting, Nagaoka discloses it or renders it obvious.

b. 1[a] a light-emitting unit

559. Nagaoka discloses or renders obvious a light-emitting unit.

560. Nagaoka discloses "[a] lighting device receives an output of a power supply phase detector and performs a lighting control of a lighting load by a trigger signal to be output from a load controller to a switching element (a load drive unit) at an arbitrary conduction angle. The load controller includes a determination unit that turns on the switching element at a phase of a conduction angle of a commercial power supply in which any lighting load (an incandescent lamp, a bulb-type fluorescent lamp, and an LED lamp) can be turned on during a predetermined period after turning on a power supply, so as to determine a type of the lighting load during the period." Nagaoka, Abstract.

561. Nagaoka discloses that reference numeral 1, which is depicted in Figures 6, 13, and 29, "represents the lighting load." Nagaoka at ¶ 0097.

562. Nagaoka discloses that: "The present embodiment is described with reference to FIG. 36. The reference numeral la is an incandescent lamp, lb is a bulb-type fluorescent lamp, and lc is an LED bulb." Nagaoka at ¶ 0150.

563. To the extent this limitation is not disclosed by Nagaoka, it would have been obvious in view of a person of ordinary skill.

564. Thus, Nagaoka discloses or renders obvious this limitation.

c. 1[b] a loading and power control unit

565. Nagaoka discloses or renders obvious a loading and power control unit.

566. Nagaoka discloses "[t]he reference numeral 5 represents the load controller, which is composed of an IC such as a microcomputer in order to control an operation of the lighting load 1. The load controller concurrently functions as the load determination unit 5a that receives detection signals from the load current detector 8 and the load voltage detector 9 so as to determine a type of the load." Nagaoka at ¶ 0062.

567. To the extent this limitation is not disclosed by Nagaoka, it would have been obvious in view of a person of ordinary skill.

568. Thus, Nagaoka discloses or renders obvious this limitation.

d. 1[c] a light sensing control unit

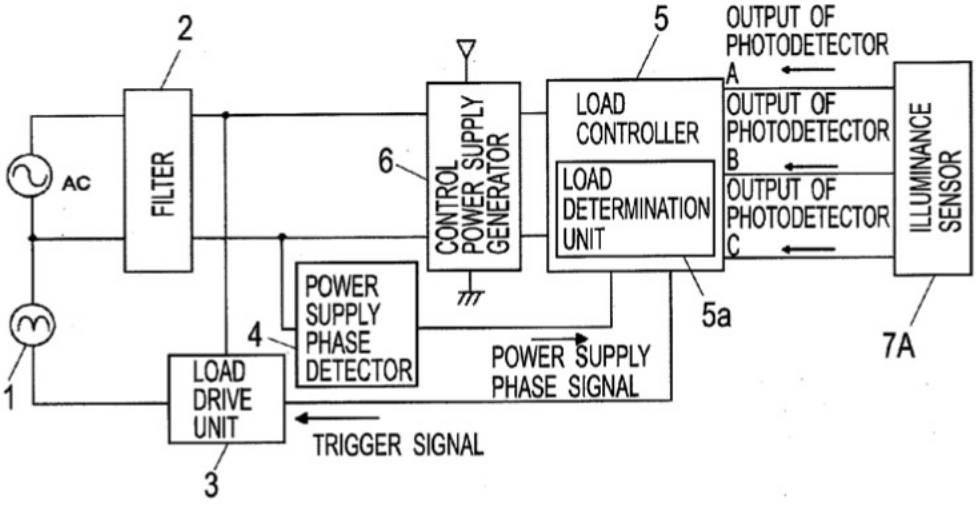
569. Nagaoka discloses or renders obvious a light sensing control unit.

570. Nagaoka discloses "an illuminance sensor 7A for determining a light output of the lighting load 1 is provided and connected to the load controller 5 that concurrently functions as the load determination unit 5a. In this case, the illuminance sensor 7A includes three sets of optical filters and photodetectors, each of the optical filters having a different transparent wavelength, provided inside a photo-detecting surface." Nagaoka at ¶ 0080.

571. Illuminance sensor 7A is depicted in Figure 13, reproduced below.

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FIG. 13

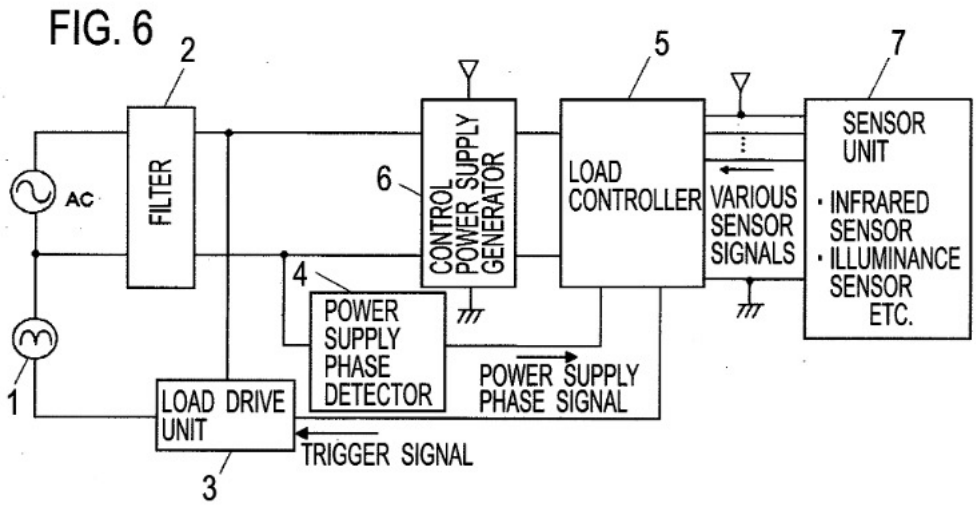


Nagaoka, Fig. 13

572. Nagaoka also discloses "a constitution example of the dimming-control circuit additionally provided with a sensor function. Note that, fundamental operations with regard to lighting of the lighting load are as described above. The load controller 5, to which a sensor unit 7 is connected, determines how and when the lighting load 1 should be turned on according to e.g. logical disjunction/logical conjunction of each sensor signal obtained from a lighting condition setting portion and the sensor unit 7." Nagaoka at ¶ 0008.

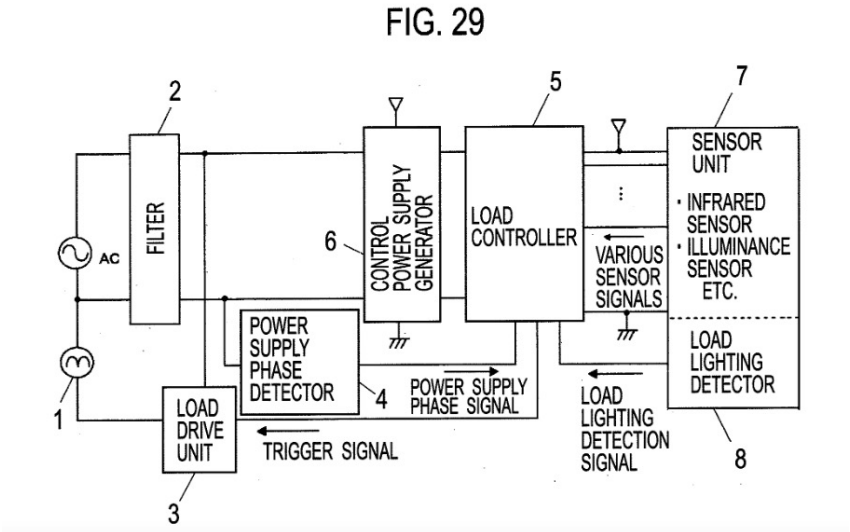
573. An illuminance sensor is depicted as one of the sensors in sensor unit 7 in Figure 6, reproduced below.

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Nagaoka, Fig. 6

574. An illuminance sensor is also depicted as one of the sensors in sensor unit 7 in Figure 29, reproduced below. Nagaoka discloses that "FIG. 29 illustrates a constitution example of a lighting device of the present embodiment. In the present embodiment, the illuminance sensor of the sensor unit 7 concurrently functions as the load lighting detector 8. The load lighting detection is performed by the illuminance sensor in order to detect an illuminance change when the lighting load 1 is turned on, which is different from the embodiment 8." Nagaoka at ¶ 0131.



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Nagaoka, Fig. 29

575. To the extent this limitation is not disclosed by Nagaoka, it would have been obvious in view of a person of ordinary skill.

576. Thus, Nagaoka discloses or renders obvious this limitation.

e. 1[d] a motion sensing unit

577. Nagaoka discloses or renders obvious a motion sensing unit.

578. Nagaoka discloses a lighting fixture with a flange 24, which is "provided with a sensor unit 26 protruded therefrom at a lower portion equipped with an infrared sensor for turning on the lighting load 1 by detecting a movement of a human and an illuminance sensor for a lighting control according to peripheral illuminance, thereby reading changes of lighting into a load controller inside the lighting device." Nagaoka at ¶ 0003.

579. Nagaoka further discloses that "when a value read by the illuminance sensor corresponds to brightness in the daytime, the lighting load is configured to be in an off state regardless of a presence of a human, and when peripheral illuminance becomes arbitrary darkness, the incandescent lamp is controlled to dim with 30% of brightness. Furthermore, when the infrared sensor detects a movement of a human while dimming with 30% of brightness, the incandescent lamp is controlled to light with 100% of brightness. Furthermore, the lighting device has a function to turn off the lighting load again when determining that an arbitrary time has been passed and midnight has come, and to light the lighting load with 100% of brightness only when someone is present." Nagaoka at ¶ 0004.

580. Nagaoka also discloses that "[a] constitution example of a lighting device of the present embodiment is similar to the embodiment 9 (FIG. 29). An infrared sensor of the sensor unit 7 concurrently functions as the load lighting detector 8. The infrared sensor of the sensor

unit 7 includes a pyroelectric sensor for detecting infrared radiated from a human body, for example. Based on an output of the pyroelectric sensor, the presence of a human body is detected." Nagaoka at ¶ 0138.

581. To the extent this limitation is not disclosed by Nagaoka, it would have been obvious in view of a person of ordinary skill.

582. Thus, Nagaoka discloses or renders obvious this limitation.

f. 1[e] a power supply unit

583. Nagaoka discloses or renders obvious a power supply unit.

584. Nagaoka discloses a "commercial ac power supply AC." Nagaoka at ¶ 0059. Commercial ac power supply AC is depicted in Figures 6, 13, and 29.

585. Nagaoka discloses "a lighting device according to the present invention includes: a switching element that turns on/off a commercial power supply supplied as a power supply for a lighting load." Nagaoka at ¶ 0018.

586. Nagaoka discloses that "[t]he reference numeral 6 represents a control power supply generator, which is composed of a diode, the capacitor, a Zener diode, and the like in order to rectify the commercial ac power supply AC so as to convert to a dc voltage." Nagaoka at ¶ 0063.

587. Nagaoka discloses "The control power supply generator 6 includes a first resistor R1 for inhibiting an incoming current, of which both terminals are connected to the ac power supply AC, a series circuit of a first capacitor C1 composed of e.g. a film capacitor and a first diode D1, a series circuit of a second diode D2 and a second capacitor C2 connected to the first diode D1 in parallel, a series circuit of a second resistor R2 and a Zener diode ZD connected to the second capacitor C2 in parallel, and a third capacitor C3 connected to the Zener diode ZD in parallel." Nagaoka at ¶ 0077.

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588. Control power supply generator 6 is depicted in Figures 6, 13, and 29, and its circuitry is depicted in Figures 4, 12, and 27.

589. To the extent this limitation is not disclosed by Nagaoka, it would have been obvious in view of a person of ordinary skill.

590. Thus, Nagaoka discloses or renders obvious this limitation.

g. 1[f] an external control unit, coupled with the loading and power control unit

591. Nagaoka discloses or renders obvious an external control unit, coupled with the loading and power control unit.

592. Nagaoka discloses "[t]he load controller 5, to which a sensor unit 7 is connected, determines how and when the lighting load 1 should be turned on according to e.g. logical disjunction/logical conjunction of each sensor signal obtained from a lighting condition setting portion and the sensor unit 7." Nagaoka at ¶ 0008.

593. Nagaoka discloses "a lighting device according to the present invention includes: a switching element that turns on/off a commercial power supply supplied as a power supply for a lighting load, a power supply phase detector that detects a phase of the commercial power supply so as to perform a phase control for the lighting load, and a load controller that determines a conduction angle of the switching element by receiving an output of the power supply phase detector, in which a signal to be output at an arbitrary conduction angle to the switching element from the load controller performs a lighting control for the lighting load, wherein the lighting device switches operation modes depending on a type of the lighting load according to a result determined by a determination unit for determining a type of the lighting load by a signal from a load lighting detector for detecting whether the lighting load is turned on or not, during a predetermined period after turning on the power supply." Nagaoka at ¶ 0018.

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594. Nagaoka discloses "[a] constitution example of a lighting device of the present embodiment is similar to the embodiment 9 (FIG. 29). An infrared sensor of the sensor unit 7 concurrently functions as the load lighting detector 8. The infrared sensor of the sensor unit 7 includes a pyroelectric sensor for detecting infrared radiated from a human body, for example. Based on an output of the pyroelectric sensor, the presence of a human body is detected." Nagaoka at ¶ 0138.

595. Thus, Nagaoka discloses this limitation.

596. To the extent that Nagaoka does not disclose an external control unit, coupled with the loading and power control unit, it would have been rendered obvious over Nagaoka alone or in combination with Kamii.

597. As discussed above, Nagaoka discloses a sensor unit 7, that includes a motion sensor and an illuminance sensor. Nagaoka also discloses that "[b]y arbitrarily setting a threshold value X with respect to the illuminance detection signal of the illuminance sensor in the load controller, it is possible to control the lighting load by turning off the lighting load when the signal level is above the threshold value X, and by turning on the lighting load when the signal level falls below the threshold value X. For example, by setting the threshold value X to a signal level of nightfall in the illuminance sensor, the lighting load can be automatically turned on at nightfall in every day." Nagaoka at ¶ 0090. Thus, Nagaoka discloses setting threshold values with respect to the illuminance detection signal of the illuminance sensor to control the lighting load based on that threshold value. A person of ordinary skill in the art would understand that such threshold values would be selected by user input via the external control unit.

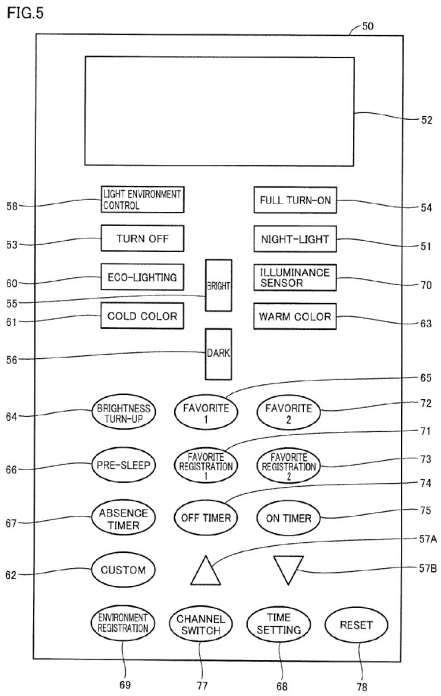
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598. Additionally, a person of ordinary skill in the art would have been motivated by Kamii to modify Nagaoka to add an external control unit.

599. Kamii discloses an external control unit.

600. Kamii discloses "[r]eferring to FIG. 5, remote controller 50 is provided with a liquid crystal panel 52 and various buttons. A display device other than liquid crystal may be used in place of liquid crystal panel 52." Kamii at ¶ 0084.

601. Kamii discloses "[m]oreover, remote controller 50 is provided with a plurality of buttons," Kamii at ¶ 0085, as depicted in Figure 5, reproduced below.

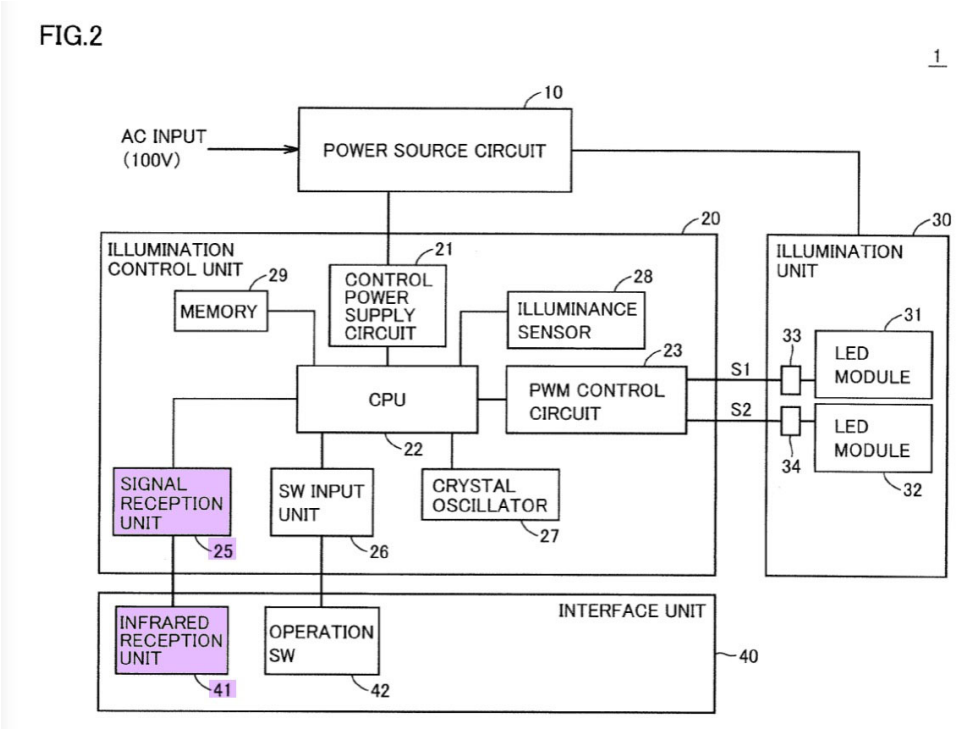


Kamii, Figure 5

602. Kamii also discloses "[i]nfrared reception unit 41 of lighting device 1 receives the infrared signal projected from infrared projection unit 87 of remote controller 50. Then, infrared reception unit 41 performs photoelectric conversion of the received infrared signal. Then, signal reception unit 25 outputs to CPU 22, the transmission signal obtained by photoelectric

conversion and issued from remote controller 50. As a result of this operation, CPU 22 performs an operation in accordance with the input instruction from remote controller 50." Kamii at ¶ 0122.

603. Annotated Figure 2, reproduced below, depicts the infrared reception unit 41 and signal reception unit 25 highlighted in purple.



Kamii, Figure 2

604. A person of ordinary skill in the art would have been motivated to combine the interface unit, the infrared reception unit 41 and signal reception unit 25 of Kamii with Nagaoka.

605. Nagaoka and Kamii are both references in the same technical area and seek to solve the same problem of providing a lighting device with controls and control signals that adjust the output of the lighting device to optimize its performance based on external controls and inputs. Both Nagaoka and Kamii specifically refer to security as one of the performance characteristics of the disclosed lighting devices. Both Nagaoka and Kamii also specifically refer

to adjusting the lighting load based on signals received from external sensors to execute user-inputted settings.

606. For example, Kamii states as background art that "some lighting devices have such a timer function as automatically carrying out turn-on or turn-off." Kamii at ¶ 0004. Kamii additionally discloses that "[f]or example, Japanese Patent Laying-Open No. 2005-78834 (PTL 1) discloses a case where the function can be used for anticrime measures in such a manner as automatically turning a lighting device on at a preset time as if a user were at home. Specifically, PTL 1 proposes a method of changing a start time and the like periodically or randomly for the purpose of enhancing crime prevention." Kamii at ¶ 0005-6.

607. Nagaoka states as background art that "[r]ecently, a lighting fixture equipping a human body detection sensor for lighting by detecting a human and an illuminance sensor for performing a lighting control according to peripheral brightness has been prevailed outside a house and at a side surface of a house for the purpose of saving electricity and security." Nagaoka at ¶ 0002.

608. Both Nagaoka and Kamii are directed in the general space of lighting devices with at least two levels of light output that adjust that light output based on inputs received from sensors and external controls. The input signal from these sensors is processed by a controller, which then subsequently modifies or controls the lighting load in the lighting device. Both references also disclose user-inputted control modes, such as eco mode in Kamii or nighttime turn-on mode in Nagaoka.

609. Both Nagaoka and Kamii disclose lighting devices that have lighting loads controlled by external signals, such as the surrounding illuminance as detected by an illuminance sensor (in both references) and motion (as disclosed in Nagaoka). Both references are generally

interested in controlling the loads for optimized performance with increased security being one such performance parameter that both references discuss. Thus, a person of ordinary skill in the art would have been motivated to modify Nagaoka to add Kamii's interface unit, the infrared reception unit 41 and signal reception unit 25. Adding those components from Kamii would have been a simple modification to obtain predictable results, and a person of ordinary skill in the art would have had a reasonable expectation of success in doing so. A person of ordinary skill would understand that Nagaoka's load controller could easily include external input controls as described in Kamii. Kamii's external control unit would provide a signal to load controller 5 that would send a control command to the LEDs, adjusting the light output from the lighting device. Nagaoka itself discloses both an infrared motion sensor and illuminance sensor together in sensor unit 7, and that threshold settings related to the illuminance sensor can be adjusted. Both the motion sensor and illuminance sensor produce signals that are sent to the Load Controller 5 (microcomputer), which then acts to adjust the lighting level of the lighting device. Therefore, Nagaoka discloses the integration of control signals from external sources, such as sensors.

610. Thus, Nagaoka discloses or renders obvious alone or in combination with Kamii this limitation.

h. 1[g] wherein the light-emitting unit comprises at least one LED

611. Nagaoka discloses or renders obvious that the light-emitting unit comprises at least one LED.

612. Nagaoka discloses that "[t]he present embodiment is described with reference to FIG. 36. The reference numeral 1a is an incandescent lamp, 1b is a bulb-type fluorescent lamp, and 1c is an LED bulb." Nagaoka at ¶ 0150.

613. To the extent this limitation is not disclosed by Nagaoka, it would have been obvious in view of a person of ordinary skill.

614. Thus, Nagaoka discloses or renders obvious this limitation.

i. 1[h] wherein the loading and power control unit comprises a microcontroller electrically coupled with a semiconductor switching device, wherein the semiconductor switching device is electrically connected in series with the power supply unit and the light emitting unit

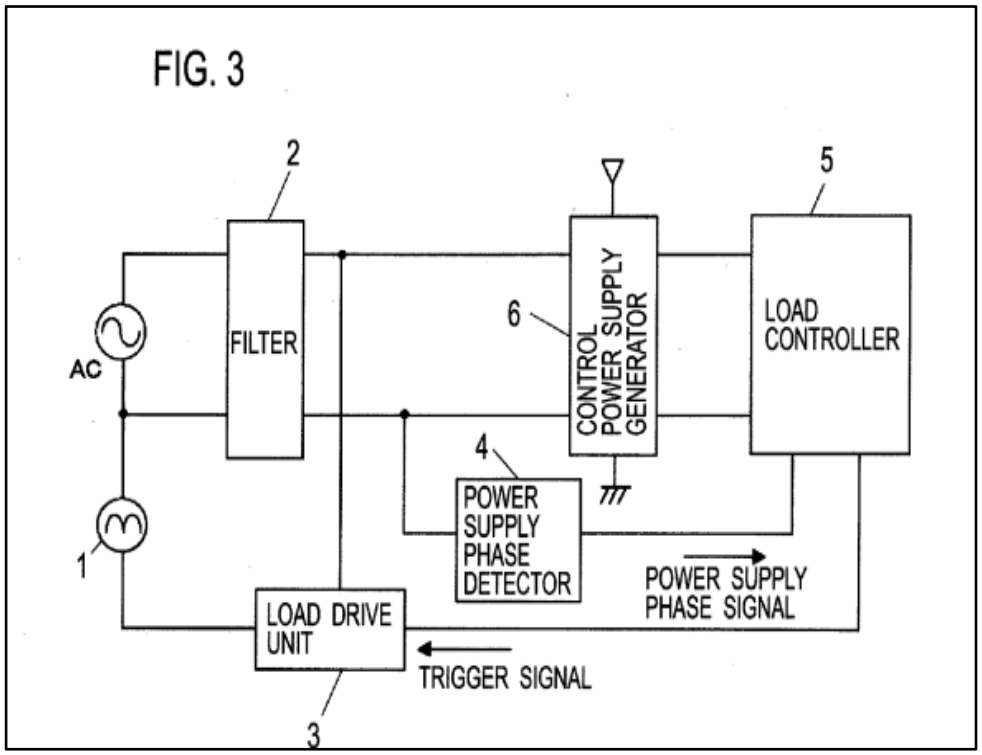
615. Nagaoka discloses or renders obvious that the loading and power control unit comprises a microcontroller electrically coupled with a semiconductor switching device, wherein the semiconductor switching device is electrically connected in series with the power supply unit and the light emitting unit.

616. Nagaoka discloses "[a] lighting device receives an output of a power supply phase detector and performs a lighting control of a lighting load by a trigger signal to be output from a load controller to a switching element (a load drive unit) at an arbitrary conduction angle. The load controller includes a determination unit that turns on the switching element at a phase of a conduction angle of a commercial power supply in which any lighting load (an incandescent lamp, a bulb-type fluorescent lamp, and an LED lamp) can be turned on during a predetermined period after turning on a power supply, so as to determine a type of the lighting load during the period." Nagaoka, Abstract.

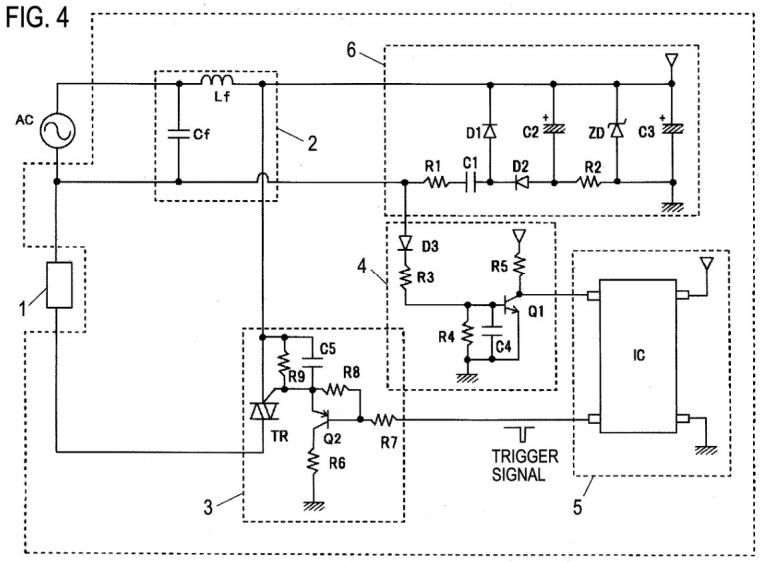
617. Nagaoka discloses that "FIG. 3 illustrates a constitution example of a dimming-control circuit using a switching element used for such a lighting fixture. FIG. 4 illustrates a specific circuit example of FIG. 3. . . . [In FIG. 4, using corresponding reference numerals as in FIG. 3,] a load controller 5 outputs a trigger signal at a predetermined phase angle based on a power supply phase signal detected by a power supply phase detector 4, and a load drive unit 3 configured with a switching element such as a TRIAC element TR is phase-controlled, so as to

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drive the lighting load 1 by a commercial ac power supply AC." Nagaoka at ¶ 0005. FIG. 3 also shows load drive unit 3 in series with the ac power supply AC, the control power supply unit, and lighting load 1 (light emitting unit).



Nagaoka, Figure 3



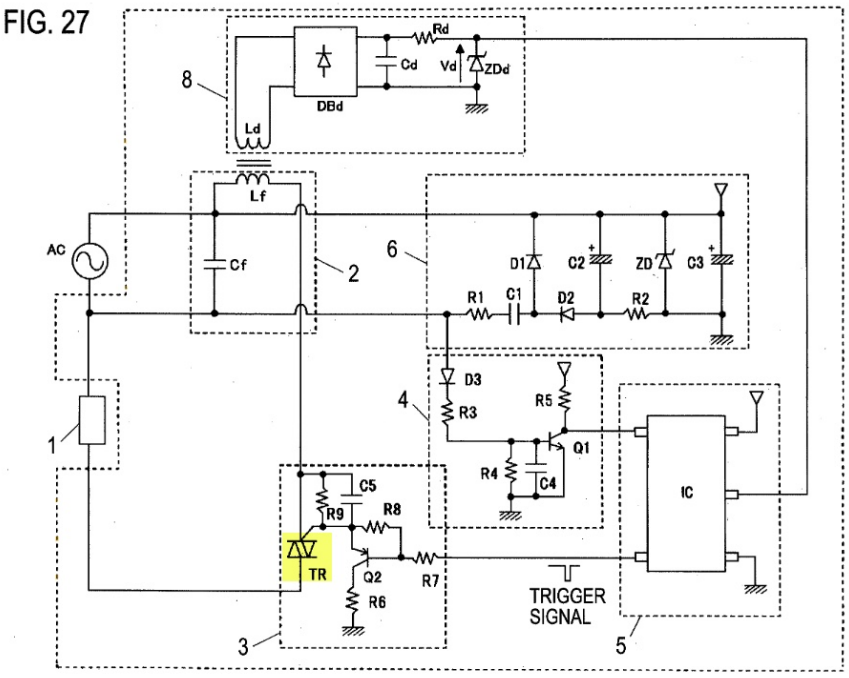
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Nagaoka, Figure 4

618. Nagaoka discloses "The reference numeral 5 represents the load controller, which is composed of an IC such as a microcomputer in order to control an operation of the lighting load 1." Nagaoka at ¶¶ 0062, 0101. Nagaoka further discloses that "The load controller 5 is composed of a microcomputer including an A/D conversion input port, which digitizes a fluctuating analog signal so that a load voltage value and a load current value are read at each arbitrary time interval T." Nagaoka at ¶ 0066.

619. Nagaoka discloses "TRIAC element TR in the switching element (refer to FIG. 27), so that the trigger signal can be a pulse signal with an arbitrary width. In an operation of the TRIAC element, when a gate signal of the TRIAC element is once turned on, the TRIAC element is kept turning on until the power supply voltage becomes zero as long as a current with more than a holding current value is applied to the TRIAC element even if the gate signal is turned off." Nagaoka at ¶ 0117. TRIAC element TR is highlighted below in annotated Figure 27.

FIG. 27



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Nagaoka, Fig. 27

620. Nagaoka discloses "The load drive unit 3 includes a TRIAC element TR inserted in the power feed path from the ac power supply AC to the lighting load 1, and a PNP-type transistor Q2 in which an emitter is connected to a gate of the TRIAC element TR and a collector is connected to the ground via a resistor R6. A base of the transistor Q2 is connected to the load controller 5 via resistor R7, and connected to the emitter of the transistor Q2 via a resistor R8. In addition, a parallel circuit of a resistor R9 and a capacitor C5 is connected between one main electrode of the TRIAC element TR and the emitter of the transistor Q2." Nagaoka at ¶ 0125; *see also* ¶ 0074.

621. To the extent this limitation is not disclosed by Nagaoka, it would have been obvious in view of a person of ordinary skill.

622. Thus, Nagaoka discloses or renders obvious this limitation.

j. 1[i] wherein the microcontroller with program codes outputs a pulse width modulation (PWM) signal to a gate electrode of the semiconductor switching device to control a conduction period (T_{on}) and a cut-off period (T_{off}) of the semiconductor switching device for delivering different average electric currents from the power supply unit to drive the light-emitting unit for generating different illuminations, wherein the microcontroller controls the semiconductor switching device respectively to have a short conduction period (T_{on}) and a long conduction period (T_{on}) such that the light-emitting unit respectively generates a first level and a second level illumination characterized by light intensity and/or color temperature according to the signals received from the light sensing control unit and the motion sensing unit

623. Nagaoka discloses or renders obvious wherein the microcontroller with program codes outputs a pulse width modulation (PWM) signal to a gate electrode of the semiconductor switching device to control a conduction period (T_{on}) and a cut-off period (T_{off}) of the semiconductor switching device for delivering different average electric currents from the power supply unit to drive the light-emitting unit for generating different illuminations, wherein the

microcontroller controls the semiconductor switching device respectively to have a short conduction period (T_{on}) and a long conduction period (T_{on}) such that the light-emitting unit respectively generates a first level and a second level illumination characterized by light intensity and/or color temperature according to the signals received from the light sensing control unit and the motion sensing unit.

624. Nagaoka discloses "[o]perations of the load controller 5 and the load drive unit 3 in an on state of the TRIAC element TR are described with reference to FIG. 5. The load controller 5 normally maintains an output to the load drive unit 3 at an H-level during a condition that the lighting load 1 is not turned on. When the TRIAC element TR is turned on, i.e. the lighting load 1 is turned on, a trigger waveform is configured to be a pulsed L-level from a timing after a predetermined phase period T1 (e.g. 9 milliseconds) since a timing when output of the power supply phase detector 4 is converted from an H-level into an L-level, to a timing after a pulse period T2 (e.g. 500 microseconds). Thus, a transistor Q2 of the load drive unit 3 is turned on, and the TRIAC element TR is turned on by applying a trigger current. Immediately after turning on, the lighting load 1 composed of the incandescent lamp as a resistive load is applied with a sine-wave current." Nagaoka at ¶ 0006.

625. Nagaoka further discloses "[a]s a result, it is possible to perform the dimming-control by controlling the period T1 and the period T2 by the load controller 5. For example, an effective value of an input current of the incandescent lamp as a resistive lighting load is to be proportionally increased by gradually shortening the period T1 and prolonging the period T2. Therefore, the lighting load is turned on by controlling brightness from 0% toward 100%." Nagaoka at ¶ 0007.

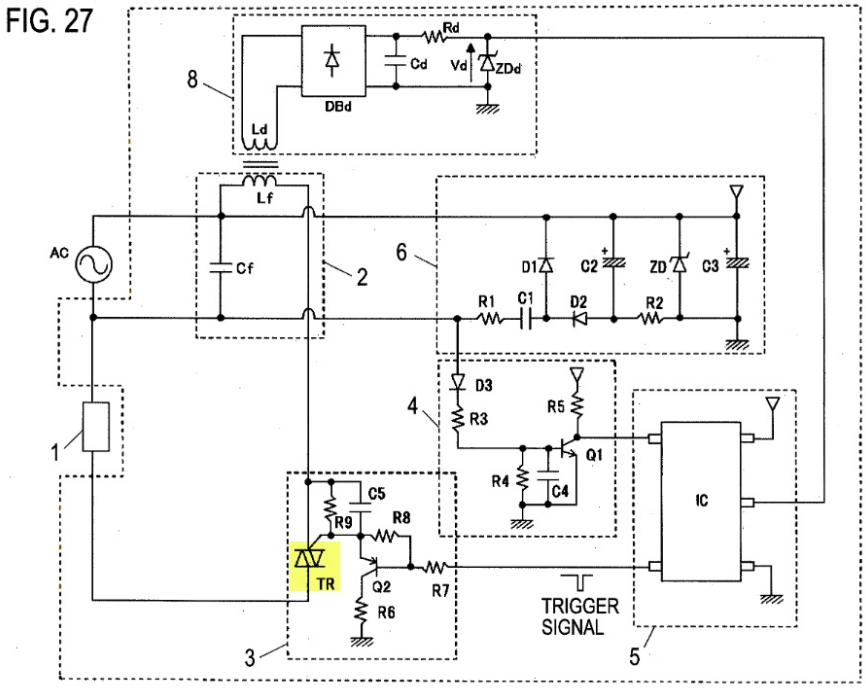
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626. Nagaoka discloses "[t]he reference numeral 3 represents the load drive unit, which is configured by using the switching element such as a TRIAC element in order to drive the lighting load 1 by receiving a trigger signal output from the load controller 5." Nagaoka at ¶ 0060.

627. Nagaoka discloses that "the trigger signal can be a pulse signal with an arbitrary width. In an operation of the TRIAC element, when a gate signal of the TRIAC element is once turned on, the TRIAC element is kept turning on until the power supply voltage becomes zero as long as a current with more than a holding current value is applied to the TRIAC element even if the gate signal is turned off." Nagaoka at ¶ 0117.

628. Nagaoka discloses that "[t]he load drive unit 3 includes a TRIAC element TR inserted in the power feed path from the ac power supply AC to the lighting load 1, and a PNP-type transistor Q2 in which an emitter is connected to a gate of the TRIAC element TR and a collector is connected to the ground via a resistor R6. A base of the transistor Q2 is connected to the load controller 5 via resistor R7, and connected to the emitter of the transistor Q2 via a resistor R8. In addition, a parallel circuit of a resistor R9 and a capacitor C5 is connected between one main electrode of the TRIAC element TR and the emitter of the transistor Q2." Nagaoka at ¶ 0125. TRIAC element TR is highlighted below in annotated Figure 27.

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Nagaoka, Fig. 27

629. Nagaoka discloses that "FIG. 25 illustrates a control operation of the present embodiment. The fundamental operation is the same as the embodiment 5. The present embodiment is different from the embodiment 5 in a control method of the trigger signal at the load lighting detection. A feature of the present embodiment is to use the TRIAC element TR in the switching element (refer to FIG. 27), so that the trigger signal can be a pulse signal with an arbitrary width. In an operation of the TRIAC element, when a gate signal of the TRIAC element is once turned on, the TRIAC element is kept turning on until the power supply voltage becomes zero as long as a current with more than a holding current value is applied to the TRIAC element even if the gate signal is turned off." Nagaoka at ¶ 0117.

630. Nagaoka further discloses "[t]herefore, even if the pulse width has a minimal width according to a property of the TRIAC element (such as approximately 300 μs), for example, the lighting load can be kept lighting. Thus, it is possible to suppress a gate current to a minimum level, thereby saving electricity." Nagaoka at ¶ 0118.

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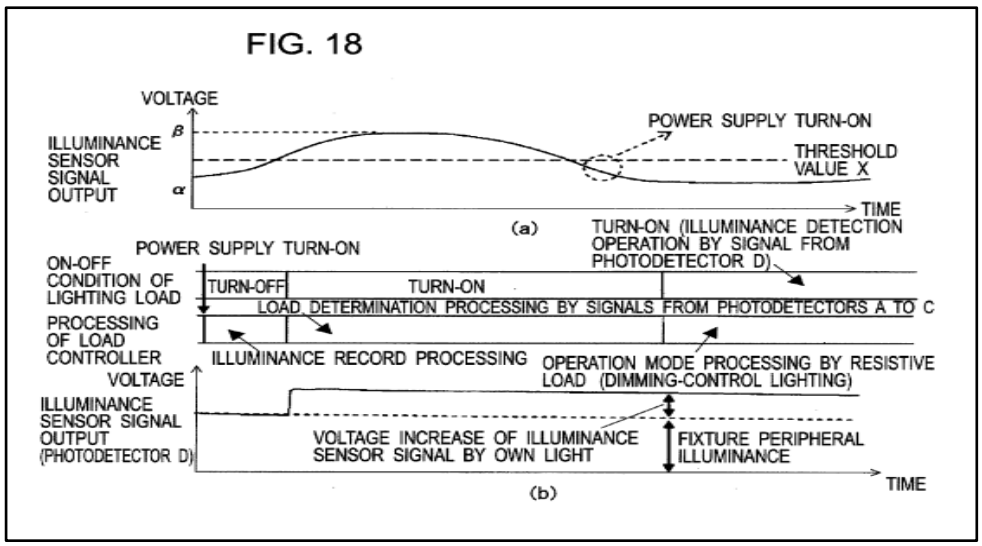
631. Nagaoka discloses that "[i]n FIG. 25, the trigger signal with a width of T5 (such as 300 μs) is applied during a predetermined phase interval. When the lighting load is a resistive load (such as incandescent lamp), the TRIAC element is kept turning on during T6 as illustrated in the figure even after the trigger signal is turned off." Nagaoka at ¶ 0119.

632. Nagaoka additionally discloses that "[f]urthermore, in a treatment after the load determination, the lighting load can be turned on by applying the minimal gate signal even if the lighting control is the same condition, due to the pulse trigger signal as illustrated in FIG. 25 (T5 of the pulse width)." Nagaoka at ¶ 0120.

633. Nagaoka discloses that "FIG. 18(*a*) illustrates a relationship between the signal of the illuminance sensor and the peripheral illuminance of the lighting fixture. An output signal waveform of the illuminance sensor continuously varies within an arbitrary range α to β during a day. The illuminance sensor is composed of a photo IC diode, for example, and outputs a voltage signal with a higher voltage value as the periphery is brighter." Nagaoka at ¶ 0089.

634. Nagaoka further discloses that "[b]y arbitrarily setting a threshold value X with respect to the illuminance detection signal of the illuminance sensor in the load controller, it is possible to control the lighting load by turning off the lighting load when the signal level is above the threshold value X, and by turning on the lighting load when the signal level falls below the threshold value X. For example, by setting the threshold value X to a signal level of nightfall in the illuminance sensor, the lighting load can be automatically turned on at nightfall in every day." Nagaoka at ¶ 0090.

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Nagaoka, Fig. 18

635. To the extent this limitation is not disclosed by Nagaoka, it would have been obvious in view of a person of ordinary skill.

636. Thus, Nagaoka discloses or renders obvious this limitation.

k. 1[j] wherein the external control unit is used in at least one of two setting modes respectively for setting illumination characteristics of one of the first level and the second level illumination; wherein the first setting mode is a manual setting incorporating with the external control unit when the light-emitting unit generates one of the first level and the second level illumination, in which the illumination characteristic of the light-emitting unit is changed directly by operating the external control unit; wherein the second setting mode is a free-running setting, in which the light-emitting unit performs a free-run of one of the first level and the second level illumination by gradually and periodically changing illumination characteristics, wherein the free-run is terminated by operating the external control unit at a time point corresponding to a specific illumination characteristic, such that, following the free-running illumination variation, the illumination characteristics of one of the first level and the second level illumination is set by operating the external control unit at the time point when the light-emitting unit performs the specific illumination characteristic; wherein the light-emitting unit performs one of the first level and the second level illumination characterized by the specific illumination characteristic being set thereof.

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637. Nagaoka discloses or renders obvious that the external control unit is used in at least one of two setting modes respectively for setting illumination characteristics of one of the first level and the second level illumination; wherein the first setting mode is a manual setting incorporating with the external control unit when the light-emitting unit generates one of the first level and the second level illumination, in which the illumination characteristic of the light-emitting unit is changed directly by operating the external control unit; wherein the second setting mode is a free-running setting, in which the light-emitting unit performs a free-run of one of the first level and the second level illumination by gradually and periodically changing illumination characteristics, wherein the free-run is terminated by operating the external control unit at a time point corresponding to a specific illumination characteristic, such that, following the free-running illumination variation, the illumination characteristics of one of the first level and the second level illumination is set by operating the external control unit at the time point when the light-emitting unit performs the specific illumination characteristic; wherein the light-emitting unit performs one of the first level and the second level illumination characterized by the specific illumination characteristic being set thereof.

638. Nagaoka discloses that "[t]he load controller 5, to which a sensor unit 7 is connected, determines how and when the lighting load 1 should be turned on according to e.g. logical disjunction/logical conjunction of each sensor signal obtained from a lighting condition setting portion and the sensor unit 7." Nagaoka at ¶ 0008

639. Nagaoka discloses that "[b]y arbitrarily setting a threshold value X with respect to the illuminance detection signal of the illuminance sensor in the load controller, it is possible to control the lighting load by turning off the lighting load when the signal level is above the threshold value X, and by turning on the lighting load when the signal level falls below the

threshold value X. For example, by setting the threshold value X to a signal level of nightfall in the illuminance sensor, the lighting load can be automatically turned on at nightfall in every day." Nagaoka at ¶ 0090.

640. Nagaoka discloses that "[a]s a result, it is possible to perform the dimming-control by controlling the period T1 and the period T2 by the load controller 5. For example, an effective value of an input current of the incandescent lamp as a resistive lighting load is to be proportionally increased by gradually shortening the period T1 and prolonging the period T2. Therefore, the lighting load is turned on by controlling brightness from 0% toward 100%." Nagaoka at ¶ 0007.

641. Thus, Nagaoka discloses this limitation.

642. To the extent that Nagaoka does not disclose that the external control unit is used in at least one of two setting modes respectively for setting illumination characteristics of one of the first level and the second level illumination, it would have been rendered obvious over Nagaoka alone or in combination with Kamii.

643. As discussed above, Nagaoka discloses a sensor unit 7, that includes a motion sensor and an illuminance sensor. Nagaoka also discloses that "[b]y arbitrarily setting a threshold value X with respect to the illuminance detection signal of the illuminance sensor in the load controller, it is possible to control the lighting load by turning off the lighting load when the signal level is above the threshold value X, and by turning on the lighting load when the signal level falls below the threshold value X. For example, by setting the threshold value X to a signal level of nightfall in the illuminance sensor, the lighting load can be automatically turned on at nightfall in every day." Nagaoka at ¶ 0090. Thus, Nagaoka discloses setting threshold values with respect to the illuminance detection signal of the illuminance sensor to control the

lighting load based on that threshold value. A person of ordinary skill in the art would understand that such threshold values would be selected by user input via the external control unit and that that user input comprises a manual setting incorporating with the external control unit when the light-emitting unit generates one of the first level and the second level illumination, in which the illumination characteristic of the light-emitting unit is changed directly by operating the external control unit.

644. Additionally, a person of ordinary skill in the art would have been motivated by Kamii to modify Nagaoka to add the external control unit is used in at least one of two setting modes respectively for setting illumination characteristics of one of the first level and the second level illumination

645. Kamii discloses this limitation.

646. Kamii discloses that "remote controller 50 is provided with a plurality of buttons. Specifically, remote controller 50 is provided with a 'full turn-on' button 54, a 'light environment control' button 58, a 'turn-off' button 53, a 'night-light' button 51, an 'eco-lighting' button 60, an 'illuminance sensor' button 70, a 'bright' button 55 and a 'dark' button 56 for indicating increase and decrease in dimming ratio, a 'cold color' button 61 and a 'warm color' button 63 for indicating change in color tone from a 'light color' to a 'daylight color' or from the 'daylight color' to the 'light color', a 'brightness turn-up' button 64, a 'favorite 1' button 65, a 'favorite 2' button 72, a 'pre-sleep' button 66, a 'favorite registration 1' button 71, a 'favorite registration 2' button 73, an 'absence timer' button 67, an 'OFF timer' button 74, an 'ON timer' button 75, a 'custom' setting button 62, an 'UP' button 57A and a 'DOWN' button 57B for indicating increment and decrement in numeric value and the like, an 'environment registration'

button 69, a 'channel switch' button 77, a 'time setting' button 68, and a 'reset' button 78." Kamii at ¶ 0085.

647. Kamii discloses that "FIG. 9 is a flowchart illustrating the processing in the lighting adjustment mode according to the embodiment of the present invention." Kamii at ¶ 0155.

648. Kamii discloses that "[t]he flow is executed by CPU 22 reading a program stored in memory 29." Kamii at ¶ 0156.

649. Kamii discloses that "[r]eferring to FIG. 9, first, CPU 22 determines whether or not an input instruction is an instruction of input through a dimmer button (step S100). In the present example, dimmer buttons include 'bright' button 55 and 'dark' button 56. When CPU 22 determines that the input instruction is not the instruction of input through the dimmer button such as 'bright' button 55 or 'dark' button 56 (NO in step S100), the process proceeds to step S112." Kamii at ¶ 0157.

650. Kamii discloses that "[i]f the instruction is determined to be an input through 'bright' button 55 or 'dark' button 56 (YES in step S100), CPU 22 then specifies whether the pressed button is 'bright' button 55 or 'dark' button 56 (step S102)." Kamii at ¶ 0158.

651. Kamii discloses that "[w]hen the pressed button is 'bright' button 55 (YES in step S102), CPU 22 increases the current dimming ratio by a predefined ratio (step S104). When the pressed button is 'dark' button 56 (NO in step S102), CPU 22 decreases the current dimming ratio by a predefined ratio (step S106). Then, the process ends (return). Namely, the process returns to step S2." Kamii at ¶ 0159.

652. Kamii discloses that "[s]pecifically, when the user presses 'dark' button 56 in a full lighting state (the dimming ratio of 100%), lighting is set to a half-lighting state (the

dimming ratio of 50%). When the user presses 'dark' button 56 in the half-lighting state (the dimming ratio of 50%), lighting is set to a dim-lighting state (the dimming ratio of 30%). When the user presses 'bright' button 55 in the dim-lighting state (the dimming ratio of 30%), lighting is set to the half-lighting state (the dimming ratio of 50%). When the user presses 'bright' button 55 in the half-lighting state (the dimming ratio of 50%), lighting is set to the full lighting state (the dimming ratio of 100%)." Kamii at ¶ 0160.

653. As discussed above, a person of ordinary skill in the art would have been motivated to combine the interface unit, the infrared reception unit 41 and signal reception unit 25 of Kamii with Nagaoka.

654. Both Nagaoka and Kamii are directed in the general space of lighting devices with at least two levels of light output that adjust that light output based on inputs received from sensors and external controls. The input signal from these sensors is processed by a controller, which then subsequently modifies or controls the lighting load in the lighting device. Both references also disclose user-inputted control modes, such as "dark" and "bright" mode in Kamii or nighttime turn-on mode in Nagaoka.

655. Both Nagaoka and Kamii disclose lighting devices that have lighting loads controlled by external signals, such as the surrounding illuminance as detected by an illuminance sensor (in both references) and motion (as disclosed in Nagaoka). Both references are generally interested in controlling the loads for optimized performance with increased security being one such performance parameter that both references discuss. Thus, a person of ordinary skill in the art would have been motivated to modify Nagaoka to add the different control modes disclosed in Kamii. Adding those control modes from Kamii would have been a simple modification to obtain predictable results, and a person of ordinary skill in the art would have had a reasonable

expectation of success in doing so. A person of ordinary skill would understand that Nagaoka's load controller could easily include external input controls as described in Kamii. Kamii's external control unit would provide a signal to load controller 5 that would send a control command to the LEDs, adjusting the light output from the lighting device. Nagaoka itself discloses both an infrared motion sensor and illuminance sensor together in sensor unit 7, and that threshold settings related to the illuminance sensor can be adjusted. Both the motion sensor and illuminance sensor produce signals that are sent to the Load Controller 5 (microcomputer), which then acts to adjust the lighting level of the lighting device. Therefore, Nagaoka discloses the integration of control signals from external sources, such as sensors.

656. Thus, Nagaoka discloses or renders obvious alone or in combination with Kamii this limitation.

2. Dependent claim 2 - The two-level LED security light according to claim 1, wherein the external control unit is a push button, a touch panel, an infrared sensor or a wireless remote control device coupled to a pin of the microcontroller of the loading and power control unit; wherein, when the push button, the touch panel, the infrared sensor or the wireless remote control device is operated, a voltage signal is thereby generated to trigger the microcontroller for the manual setting or the free-running setting of the illumination characteristics.

657. As discussed above, Nagaoka discloses or renders obvious alone or in view of Kamii claim 1.

658. Nagaoka discloses or renders obvious the external control unit is a push button, a touch panel, an infrared sensor or a wireless remote control device coupled to a pin of the microcontroller of the loading and power control unit; wherein, when the push button, the touch panel, the infrared sensor or the wireless remote control device is operated, a voltage signal is thereby generated to trigger the microcontroller for the manual setting or the free-running setting of the illumination characteristics.

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659. Nagaoka discloses a lighting fixture with a flange 24, which is "provided with a sensor unit 26 protruded therefrom at a lower portion equipped with an infrared sensor for turning on the lighting load 1 by detecting a movement of a human and an illuminance sensor for a lighting control according to peripheral illuminance, thereby reading changes of lighting into a load controller inside the lighting device." Nagaoka at ¶ 0003.

660. Nagaoka further discloses that "when a value read by the illuminance sensor corresponds to brightness in the daytime, the lighting load is configured to be in an off state regardless of a presence of a human, and when peripheral illuminance becomes arbitrary darkness, the incandescent lamp is controlled to dim with 30% of brightness. Furthermore, when the infrared sensor detects a movement of a human while dimming with 30% of brightness, the incandescent lamp is controlled to light with 100% of brightness. Furthermore, the lighting device has a function to turn off the lighting load again when determining that an arbitrary time has been passed and midnight has come, and to light the lighting load with 100% of brightness only when someone is present." Nagaoka at ¶ 0004.

661. Nagaoka also discloses that "[a] constitution example of a lighting device of the present embodiment is similar to the embodiment 9 (FIG. 29). An infrared sensor of the sensor unit 7 concurrently functions as the load lighting detector 8. The infrared sensor of the sensor unit 7 includes a pyroelectric sensor for detecting infrared radiated from a human body, for example. Based on an output of the pyroelectric sensor, the presence of a human body is detected." Nagaoka at ¶ 0138.

662. Thus, Nagaoka discloses this additional limitation and therefore discloses or renders obvious alone or in view of Kamii claim 2.

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663. To the extent that Nagaoka does not disclose that this limitation, it would have been rendered obvious over Nagaoka alone or in combination with Kamii for the same reasons with respect to limitation 1[j] above.

664. Thus, Nagaoka discloses or renders obvious alone or in combination with Kamii claim 2.

D. LACK OF WRITTEN DESCRIPTION AND ENABLEMENT FOR CLAIMS 1 AND 2 OF THE '362 PATENT

665. Claim 1 of the '362 patent recites that "following the free-running illumination variation, the illumination characteristics of one of the first level and the second level illumination is set by operating the external control unit at the time point when the light-emitting unit performs the specific illumination characteristic." I do not see any clear disclosure of this feature in the '362 patent sufficient to show possession of this limitation. Nor does the specification of the '362 patent provide sufficient disclosure to enable a person of ordinary skill to implement this feature. Thus, claims 1 and 2 lack written description and are not enabled.

[redacted]

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[redacted]

X. THE '564 PATENT

A. DISCLOSURE OF THE CLAIMED INVENTION

671. The '564 patent was filed on September 2, 2016 and issued on December 11, 2018. The face of the document states it was assigned to Chia-Teh Chen. The named inventor is Chia-Teh Chen. I understand Plaintiff has asserted claims 1 and 2.

672. The invention is described as covering " [a] lighting control system using an APP based software technology to operate on line free settings of various operating parameters for a lighting device including setting of manual override timer, setting of detection range of a motion sensor, setting of light-on duration activated by a motion sensor, setting of light intensities for various illumination modes and setting of light color temperature." '564 patent at Abstract.

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1. Background of the Invention and Summary of the Invention

673. The Description of Related Art section of the '564 patent describes how in existing LED designs "auto-illumination in accordance to the background brightness detection, illumination using timer, illumination operation control using motion sensing results (e.g., dark or low luminous power to fully illuminated), and brightness control are often implemented by complex circuitries'" '564 patent at 1:41-46. The '564 patent further notes that "With increasing popularity of mobile devices, there exists a good opportunity to elaborate operating functions of the external control unit installed with the motion sensing security light disclosed in U.S. Pat. No. 9,326,362 B2 by utilizing APP based remote control technology." '564 patent at 1:48-53.

674. The '564 patent purports to address this need by providing a:

> disclosure [that] represents a security light comprising a loading and power control unit connected with a wireless platform wherein system functions of an external control unit and a time setting unit are integrated and implemented by APP based technology to facilitate free setting operating parameters of a security light by a user on a wireless basis, wherein an indicator showing an instantaneous value of capacity operating rate is designed to facilitate the user's selection decision. In fact, the time setting unit disclosed in the U.S. Pat. No. 9,326,362 B2 & etc. as a separate component could have been included in the definition of the external control unit by its nature.

'564 patent at 3:22-35; The '564 patent further discloses that an:

> exemplary embodiment of the present disclosure uses an APP based software technology to operate on line free settings of various operating parameters of a security light. The technology enables a user to observe and thereby arbitrarily select any level of an operating parameter in a designated category within its maximum circuitry capacity on an on line computing basis according to his or her observation by operating a free setting algorithm designed and loaded in a mobile device and the security light.

'564 patent at 3:36-45.

B. The Asserted Claims

675. Below, I have reproduced the asserted claims for reference:

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1. [pre] An online free setting method for setting an operating parameter of a lighting device, comprising:

[a] a user interface APP comprising at least one free setting algorithm preloaded in a mobile device to transform a user's setting decision into at least one operating variable of an operating parameter of the lighting device, wherein the user interface APP is operable on a touch screen panel of the mobile device;

[b] wherein when the user interface APP is activated and concluded with at least one setting decision, the user interface APP manages to transmit via the mobile device at least one wireless instruction signal carrying a message of the operating variable to the lighting device, wherein the operating variable is used for processing a value of the operating parameter of the lighting device; and

[c] a microcontroller of the lighting device, designed with a capacity to interpret the wireless instruction signal received by a wireless signal receiver of the lighting device and accordingly manages to output at least one control signal to control and set the value of at least one operating parameter of the lighting device;

[d] wherein the value of the operating parameter is stored in a memory of the microcontroller for repetitive performance, wherein the stored value of the operating parameter is replaceable by a processing of new operating variable selected by the user;

[e] wherein the operating parameter is used for controlling at least one of various lighting characteristics of the lighting device including timer settings, light intensity settings, color temperature settings or detection sensitivity settings when a photo sensor or a motion sensor is involved;

[f] wherein the free setting algorithm is a capacity scale simulation process implemented by a visual configuration of a free setting operator incorporated with a capacity scale simulator and an indicator of the capacity operating rate to facilitate the user's decision making process in setting a desired level of the operating parameter, wherein when the free setting operator is activated by the user to interact with the capacity scale simulator, the user's interface APP responsively manages to select or compute the value of the capacity operating rate according to the instantaneous state of interaction between the free setting operator and the capacity scale simulator with the indicator of the capacity operating rate simultaneously showing an instantaneous value of the capacity operating rate,

[g] wherein the capacity operating rate shown in the indicator can be an operating percentage, an operating chart or an actual operating value of the relevant operating parameter, wherein when a free setting motion of the free setting operator is ceased, the user interface APP manages to generate the operating variable corresponding to the selection of the capacity operating rate and accordingly operates to transmit a wireless instruction signal carrying a message of the operating variable to the lighting device.

> 2. [a] The on line free setting method according to claim 1, wherein the capacity scale simulator is a virtual track, wherein the free setting algorithm is implemented by a visual configuration of the free setting operator coupled with the virtual track and the indicator of the capacity operating rate, wherein the virtual track is designed on the touch screen panel of the mobile device, wherein the free setting operator is slidable by the user's finger along the virtual track with the indicator of the capacity operating rate simultaneously showing an instantaneous value of the changing capacity operating rate while the sliding motion of the free setting operator is being conducted, wherein the value shown in the indicator of the capacity operating rate can be the operating percentage, the operating chart or the actual operating value of the operating parameter,
>
> [b] wherein the full length of the virtual track represents a simulation of the value of the maximum operating capacity of the operating parameter, wherein the capacity operating rate is determined by a parking location of the free setting operator on the virtual track when the sliding motion stops.

676. As is apparent, the claims describe a lighting system controlled by one or more applications on a mobile device using various conventional interface components.

C. PRIORITY DATE

677. I understand that Plaintiff's outside counsel has represented that it alleges that the priority date of the '564 patent is no earlier than September 2, 2016.

D. PROSECUTION HISTORY

678. During prosecution of the application that led to the '564 patent, the Applicant filed a terminal disclaimer to traverse a double-patenting rejection over U.S. Patent No. 9,560,719. The terminal disclaimer was approved. The Applicant also amended the pending claims to get around the cited prior art. The Patent Office allowed the claims based on this amendment.

679. I discuss the Certificate of Corrections requested in connection with this patent below.

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E. CLAIM CONSTRUCTION

680. I understand that the below terms of the '367 patent have been construed by the Court. D.I. 84 at 4. The relevant claim terms are listed below:

Term	Court's Construction
preloaded in a mobile device	"loaded in a mobile device before the mobile device is purchased or first used"
when a free setting motion of the free setting operator is ceased, the user interface APP manages to generate the operating variable corresponding to the selection of the capacity operating rate and accordingly operates to transmit a wireless instruction signal carrying a message of the operating variable to the lighting device	"as a result of the free setting motion of the free setting operator being ceased, for example, after a user removes their finger from a virtual button, the user interface app generates the operating variable corresponding to the selection of the capacity operating rate and transmits a wireless instruction signal carrying a message of the operating variable to the lighting device"

681. For all terms of the '367 patent not addressed in the chart above, I understand that the term should be defined using its plain and ordinary meaning, which is the meaning that would be understood by a person of ordinary skill in the art of the priority date of the invention.

XI. INVALIDITY ANALYSIS REGARDING THE '564 PATENT

A. OVERVIEW OF PRIOR ART

1. Bora '972

682. U.S. Patent Pub. App. No. 2016/0323972 ("Bora '972") was filed on July 7, 2016 and was published on November 3, 2016. I understand that Bora '972 therefore is prior art to claims 1 and 2 of the '564 patent.

683. Bora '972 is directed to a home automation system for automating and controlling lighting features. Bora particularly notes and describes the following technologies:

> "The present invention provides an easily installed and transferable lighting and home automation solution because special or customized installation is not required. The present invention presents a solution to controlling, programming, and automating lighting devices, such that the color and brightness of any individual light or a group of lights can be manually or automatically controlled

> using a wireless interface. A user has the flexibility to personalize the color, atmosphere, and mood of a room to better fit ones preference, time of day, or occasion at hand. Additionally, since the present invention requires no installation, the solution is fully portable and can be removed and reused in other locations throughout the long life of the lighting device. Automation and dimming of the lighting devices save more energy than is consumed by the additional components of the lighting device. Moreover, using on/off signals having specified cycle times to produce a blended light reduce the current requirements of the lighting device.
>
> The present invention, a wireless lighting control system, consists of methods, apparatuses, and associated software (device application) for controlling, programming, and automating one and/or multiple 'Intelligent Illuminating Devices' (II Device) utilizing a wireless communication protocol executed between one or many wireless devices and one or many II Devices (II Device network). The methods and apparatuses presented here would allow one to adjust and control a single or network of II Devices with high flexibility, user control, and intuitive user interaction, with minimal installation or complexity."

Bora '972 at ¶¶116-117

684. As set forth below, Bora '972 anticipates or renders obvious the asserted claims of the '564 patent.

B. CLAIMS 1 and 2 ARE ANTICIPATED BY BORA '972 OR RENDERED OBVIOUS BY BORA '972 ALONE OR IN VIEW OF HOTELLING

1. Independent claim 1

a. 1[pre] An on line free setting method for setting an operating parameter of a lighting device, comprising:

685. Bora '972 discloses or renders obvious an on line free setting method for setting an operating parameter of a lighting device. Among other examples, Bora '972 allows for brightness, color, and saturation to be changed.

686. For example, Bora '972 discloses its ability to control lighting parameters through a wireless device.

> The present invention provides an easily installed and transferable lighting and home automation solution because special or customized installation is not required. The present invention presents a solution to controlling, programming, and automating lighting devices, such that the color and brightness of any

> individual light or a group of lights can be manually or automatically controlled using a wireless interface. A user has the flexibility to personalize the color, atmosphere, and mood of a room to better fit ones preference, time of day, or occasion at hand. Additionally, since the present invention requires no installation, the solution is fully portable and can be removed and reused in other locations throughout the long life of the lighting device. Automation and dimming of the lighting devices save more energy than is consumed by the additional components of the lighting device. Moreover, using on/off signals having specified cycle times to produce a blended light reduce the current requirements of the lighting device.
>
> The present invention, a wireless lighting control system, consists of methods, apparatuses, and associated software (device application) for controlling, programming, and automating one and/or multiple 'Intelligent Illuminating Devices' (II Device) utilizing a wireless communication protocol executed between one or many wireless devices and one or many II Devices (II Device network). The methods and apparatuses presented here would allow one to adjust and control a single or network of II Devices with high flexibility, user control, and intuitive user interaction, with minimal installation or complexity.
>
> For the purposes of discussing this invention the following terms will be used to describe the primary aspects of the invention. An II Device is a single wirelessly enabled lighting apparatus. A wireless device is a computing device such as a smartphone, computer, tablet, smartTV, remote, etc. A device application is a user facing software application run on the wireless device. A mesh network is a wireless communication protocol used to connect one or many II Devices and/or one or many wireless devices.

Bora '972 at ¶¶ 117-119.

687. Bora '972 additionally discloses additional details about the lighting devices that can be updated.

> An II Device in the context of this invention is a lighting apparatus containing additional electronic circuits and components. In one embodiment, the II Device will produce some measure or effect of luminosity dependent on commands sent wirelessly through a wireless device and associated device application. The II Device can receive wireless communications, take immediate action (in terms of a lighting output) based on the wireless communication, execute a sequence of actions, and store one or more commands to be executed at a specified time in the future or upon a specified condition being met. In addition, one embodiment of the II Device can intelligently relay/transmit wireless communication commands received from a device application (or II Device) to other II Devices

> within proximity. Similarly, one embodiment of the II Device would confirm receipt of the command through a wireless communication back to the wireless device and device application, possibly relaying the confirmation back through other II Devices. The communication means for to execute these processes can be seen in the mesh network section.

Bora '972 at ¶ 0121.

688. Bora '972 also discloses a flow chart describing the general operation of the disclosed method.

> Referring to FIG. 72, instead of a user interacting directly via touch with the application on the controlling device, alternatively a user could use voice commands to execute and control one or many II Devices. The user turns ON the device application for controlling II Device(s) in block 7200, and provides voice commands to the remote controlling device to control II Device(s) in block 7202. Example voice commands can include, but are not limited to, Lights Turn ON, Lights Turn OFF, Lights Dim To certain Percent, Turn ON X Lights, Lights Start Certain Program, Lights Stop certain Program, etc. The voice command can also act as general setting and configurations, executing a program, executing a scene, or setting a schedule those could be default commands with factory settings or user created commands."

Bora '972 at ¶ 0355.

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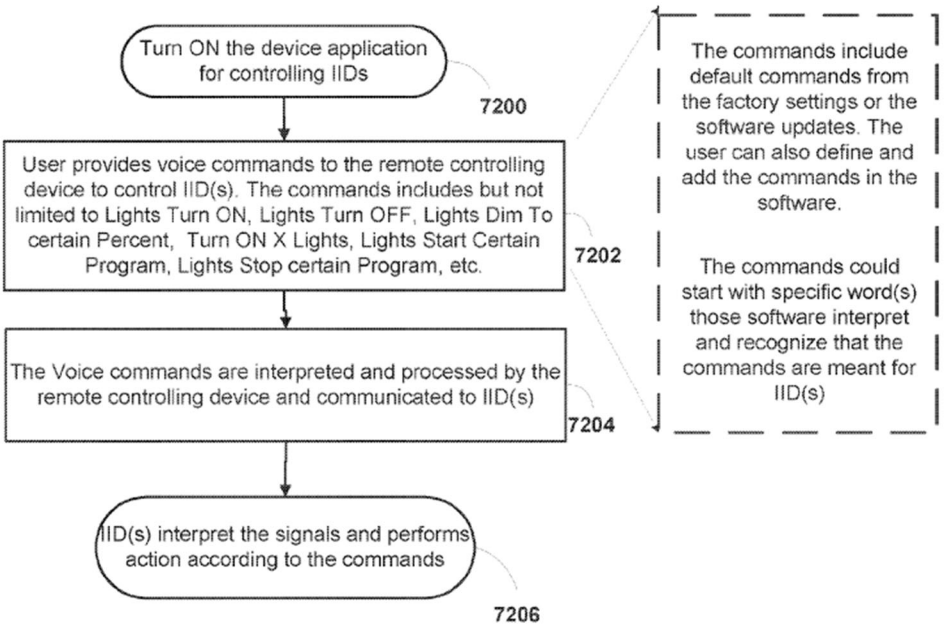


FIG. 72

Bora '972 at Fig. 72

689. Bora discloses that the lights are LEDs (Bora '972 at abstract).

690. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of the knowledge of a person of ordinary skill.

691. Thus, to the extent the preamble is limiting, Bora '972 discloses it or renders it obvious.

b. 1[a] a user interface APP comprising at least one free setting algorithm preloaded in a mobile device to transform a user's setting decision into at least one operating variable of an operating parameter of the lighting device, wherein the user interface APP is operable on a touch screen panel of the mobile device;

692. Bora '972 discloses or renders obvious a user interface APP comprising at least one free setting algorithm preloaded in a mobile device to transform a user's setting decision into at least one operating variable of an operating parameter of the lighting device, wherein the user interface APP is operable on a touch screen panel of the mobile device.

693. The Court construed the term "preloaded in a mobile device" as "loaded in a mobile device before the mobile device is purchased or first used." D.I. 84 at 4. I have applied this interpretation to my analysis.

694. Bora '972 discloses the following example of a user interface app for a lighting device that converts "a user's setting decision into at least one operating variable of an operating parameter of the lighting device" through "an interface APP [that] is operable on a touch screen panel of the mobile device." As shown below the app below can be used to control the operating parameters of a lighting device through a tablet or a smartphone by touching the screen or using gestures.

> Now referring to FIG. 37, a flow chart of a process for executing a default command through an on/off toggle in accordance with one embodiment of the present invention is shown and referred to as 3700. The process begins with block 3702. A user would select the desired II Device(s) and/or group(s) through the device application 3704 and toggles the basic 'on' command related to executing the selection's respective defaults 3706. When toggled 'on' the device application would retrieve the appropriate saved default including the related II Device(s) and their associated light settings 3708. The wireless device would then send an appropriate wireless communication to the II Device(s)/group(s) to execute their respective light setting 3710. Each related II Device would then receive and execute the command 3712, and then it will respond to the wireless device confirming execution of the command 3714 following the appropriate communication methods/processes. The process would end with block 3716. A user could turn off or adjust any running default command through the process outline above, 3700. Referring now to FIGS. 38A-38F, diagrams of various screens on device application in accordance with one embodiment of the present invention are shown. The device application will generally be run on a wireless device such as a smartphone, table, or computer. In these cases, the device application will most likely have the below screens and sections to support user control of the wireless lighting control system. A user could toggle between screens through various human computer interaction methods, dependent on the wireless device, but most commonly will be gestures and/or touch selections.

Bora '972 at ¶ 0259.

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695. Bora '972 additionally discloses that following flow charts for the operation of the application and screenshots showing operation of the disclosed application.

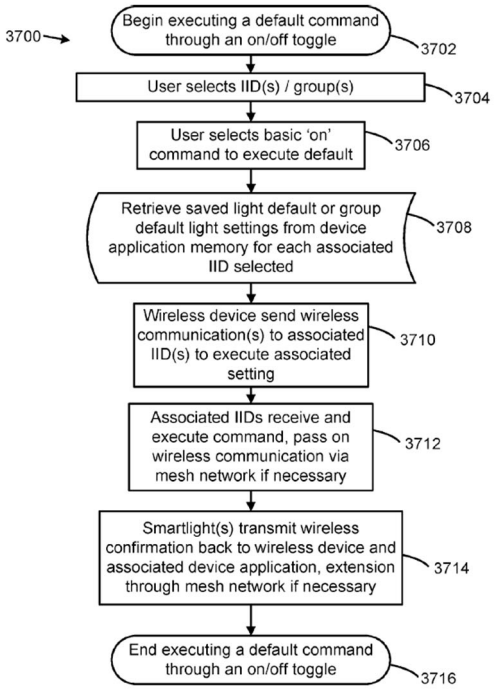
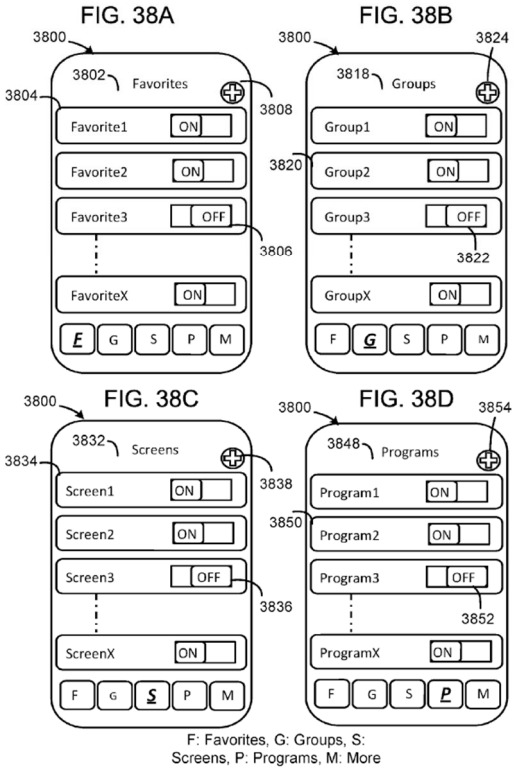
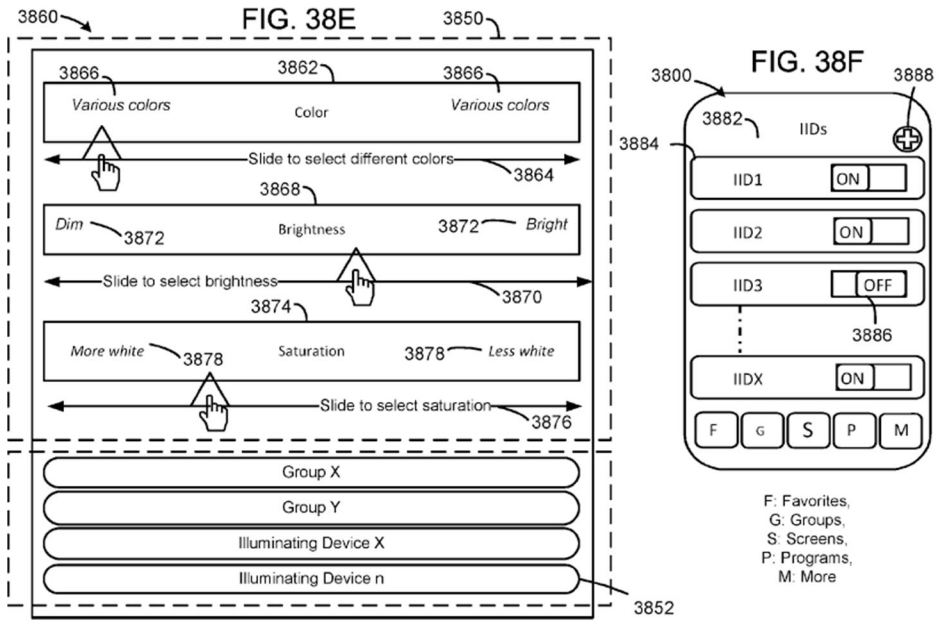


FIG. 37



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Bora '972 at Fig. 37-38E.

696. Bora '972 additionally discloses that "these different wireless devices could be an auxiliary device with some specialized or standardized device application to either perform a specific function or general function in relation to the mesh network." Bora '972 at ¶0226.

697. Bora '972 also discloses that "The wireless device WD1 2550 may also act as a specialized auxiliary wireless device such as an external ambient light sensor and communicate with other wireless devices." Bora '972 at ¶0228.

698. To the extent that Bora '972 does not disclose that an application is preloaded, it would be obvious in view of Bora '972's disclosures. Smartphones regularly included suites of standard utilities or applications preloaded. Apple included its HomeKit home automation framework in its IOS 8 2014.[11] Thus, future Apple devices at that stage would have included the capability to control home devices when sold and released. This confirms to me that well before the filing date of the '564 Patent that persons of ordinary skill understood the value of having

[11] https://www.pcmag.com/news/apple-reveals-ios-8-with-homekit-healthkit

home automation capabilities installed on a device at release. Thus it would have been obvious to include Bora's disclosed applications for lighting controls preloaded in the smartphone of Bora '972. A person of ordinary skill would have been motivated to make that modification or combination to have a device that was "ready to go" at sale and would not require any additional applications for download.

699. Alternatively, as set forth above, Bora '972 discloses the use of a dedicated remote control (Bora '972 at ¶119). A person of ordinary skill would understand that remote controls might include touchscreen controls of the kind that Bora '972 describes for smartphones or alternatively be aware of the availability of dedicated remote controls that have the same functionality as smartphones. A person of ordinary skill would be motivated to combine Bora '972's descriptions of smartphones with its descriptions of dedicated remote controls so as to have a dedicated device for controlling the Bora '972 application with the full functionality disclosed for smartphones in Bora '972, including a touchscreen and associated hardware. Such devices would have the control applications described herein preloaded. A person of ordinary skill would be motivated to have dedicated remote controls to provide redundancy in lighting controls in the event that WiFi or cellular connectivity is not available, the smartphone battery is dead, or the user has misplaced the smartphone. For example, the ecobee3 thermostat sold in 2014 used both a dedicated touchscreen control and allowed for smartphone controls. Alternatively, a cell phone provider or other third party distributor could sell a smartphone or tablet with the system of Bora '972 with the relevant applications preloaded. A person of ordinary skill would be motivated to make this modification/combination so that users could utilize the full functionality disclosed in Bora '972 without having to modify their own personal devices or perform modifications or installation. Such devices might also be useful or preferable

for shared or office settings where the owners do not wish the users to have access on their own devices.

700. The results of such a modification would be predictable and a person of ordinary skill would have a reasonable expectation of success.

701. Alternatively, U.S. Patent No. 9,606,668 to Hotelling *et al* ("Hotelling")[12] describes a dedicated consumer electronics device (5:37-38) that includes a GUI and touchscreen capabilities. Hotelling at 6:62-7:20. A person of ordinary skill in the art would motivated incorporate the teachings of Hotelling *et al* to obtain a dedicated consumer electronics device with a touchscreen interface to use with Bora '972 for the same reasons set forth above and would be capable of doing so with a reasonable expectation of success.

702. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

703. Thus, Bora '972 discloses or renders obvious this limitation.

c. 1[b] wherein when the user interface APP is activated and concluded with at least one setting decision, the user interface APP manages to transmit via the mobile device at least one wireless instruction signal carrying a message of the operating variable to the lighting device, wherein the operating variable is used for processing a value of the operating parameter of the lighting device; and

704. Bora '972 discloses or renders obvious that when the user interface APP is activated and concluded with at least one setting decision, the user interface APP manages to transmit via the mobile device at least one wireless instruction signal carrying a message of the operating variable to the lighting device, wherein the operating variable is used for processing a value of the operating parameter of the lighting device.

[12] Hotelling was filed on August 1, 2012 and issued on March 28, 2017. I understand that Hotelling is therefore prior art to claims 1 and 2 of the '564 patent.

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705. Particularly Bora '972 discloses that a user can modify lighting parameters through a mobile device, which transmits a wireless signal to modify those parameters.

706. Bora '972 discloses a light with a wireless transceiver for receiving commands from a mobile device:

> "The controller/processor 106 processes signals received from the memory 108, the real time clock (RTC) circuit 110, and the wireless transceiver circuit 112. It might also process signals from other components, such as the hard reset circuit 116, the ambient light sensor circuit 118, and other potential added circuits. It also takes action and sends commands to the memory 108, the real time clock (RTC) circuit 110, and the wireless transceiver circuit 112. It might also take action and send signals to other components, such as the ambient light sensor circuit 118 and other potential added circuits. In one embodiment, the computer processor includes a real time clock, processor 106, and memory chip.
>
> The processor 106 processes the signals received by the various other components of the embodiment, computes necessary actions, and sends signals back out to various other components of the embodiment. The processor 106 will vary in terms of power, speed, and size in different embodiments. Additionally, the processor 106 is not limited to the contents listed above and may include other components."

Bora '972 at ¶¶ 0129-30.

707. Figure 1 of Bora '972 shows the disclosed arrangement of structures in the lighting device.

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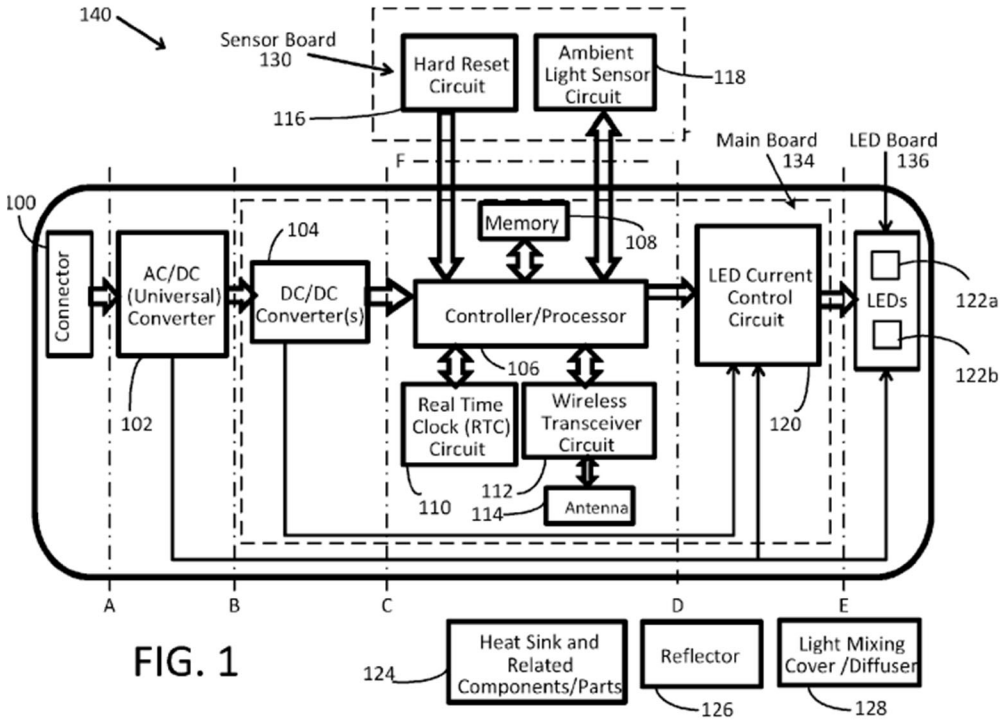


FIG. 1

Bora '972 at Fig.1

708. Bora '972 discloses the claimed functionality for wirelessly controlling a lighting device through the phone and tablet based applications discussed with respect to the previous limitations. A person of ordinary skill would understand that the use of the identified protocols would entail transmitting a wireless signal to the lighting device containing the relevant commands.

> "The wireless transceiver circuit 112 allows the II Device 140 to communicate with other wireless devices and/or other II Devices. The wireless transceiver circuit 112 includes a transmitter and receiver circuit based on established wireless protocols. These protocols could differ based on different II Device embodiments and changing wireless communication standards. Example wireless protocols include but are not limited to Bluetooth, ZigBee, Wi-Fi, and their related variants. The wireless transceiver circuit 112 will be connected to the controller/processor 106 and the antenna 114. In one embodiment, the wireless transceiver circuit 112 is composed of a transmitter and receiver circuit based on Bluetooth protocols. In other embodiments, the wireless transceiver circuit 112 might utilize other protocols including but not limited to ZigBee, WiFi, infrared,

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> WiMax, LTE, ZWave, or other protocols not listed. In other embodiments, the wireless transceiver circuit 112 might include other component parts or circuitry."

Bora '972 at ¶0133.

709. A person of ordinary skill would understand from the above description that a wireless control signal is transmitted from a mobile device to the light.

710. Bora '972 further elaborates on the types of devices that may be remotely controlled through a mobile device, including LED lighting devices.

> "The II Device 140 might take other common embodiments not fully described in this disclosure, but not limited to the following: (a) an II Device integrated into a lighting fixture (e.g., could be installed fixture with all II Device circuitries built in or non-installed fixture such as a plug in lamp); (b) an II Device integrated into a fan (e.g., could be installed fixture with all II Device circuitries built in); (c) an II Device that is solely battery powered and affixed to a surface; (d) an II Device utilizing OLEDs as LEDs; (e) an II Device integrated into directly into surfaces (walls, tables, and ceilings), clothing, appliances, electronics (Displays, music equipment, etc.), musical instruments (pianos, guitars, etc.) and taking power from some source either internally or externally to that integrated part; or (f) an II Device specifically designed for emergency lighting. Considering the control of the II Device, the invention herein provides processes and methods to wirelessly control and/or program one or many II Devices through one or many wireless devices. These processes and methods shown and described provide maximum utility and range with a given communication protocol and a reliable and efficient system."

Bora '972 at ¶0149.

711. Bora '972 discloses with additional detail how a mobile device receives commands from a user and transmits instructions to a light.

> "Now referring to FIG. 23, a flow chart of a communication process from a device to II Device in accordance with one embodiment of the present invention is shown through element 2300. The process begins with block 2301. Given a wireless device (WD) is equipped with hardware and systems to execute wireless communication protocols (Bluetooth, Wi-Fi, ZigBee, or any other wireless protocol) as well as an appropriate device application 2302, a user could send

> a lighting command to an II Device by selecting the command via the device application 2304. Upon the user's selection of a command for a specific II Device, the device application would translate the user's requested command into a light setting command and the specific stored ID for the selected II Device 2306. This light setting command would include instructions for the specified II Device ID to execute such as on/off, color, brightness, or a program. The light setting command would be translated into the appropriate wireless communication protocol and wirelessly sent via the wireless device 2308. The II Device if in range of the wireless communication or mesh network 2309 relay communication would receive the protocol via the II Device's antenna 2310. The transceiver/receiver circuitry would decode the wireless protocol to find the light setting command and send that to the controller/processor 2312. The controller will execute that command with the respective II Device's related components 2314. Upon successful execution, the II Device will respond through the appropriate wireless communication that it has executed the light setting command 2316-2318. The process ends with block 2320."

Bora '972 at ¶ 0213.

712. Figure 23 further illustrates the disclosed process:

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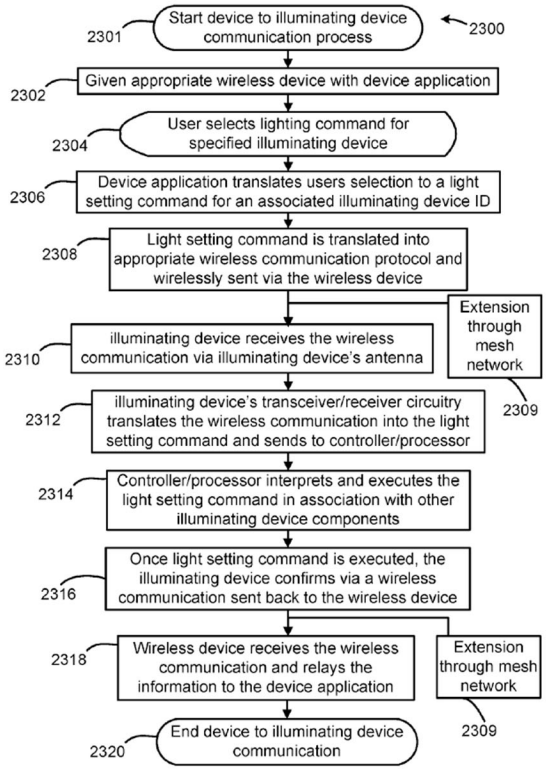


FIG. 23

Bora '972 at Fig. 23.

713. Figure 28 and its associated description further describe how the application of Bora '972 can be used to wirelessly transmit a wireless instruction signal carrying a message of the operating variable to the lighting device, wherein the operating variable is used for processing a value of the operating parameter of the lighting device

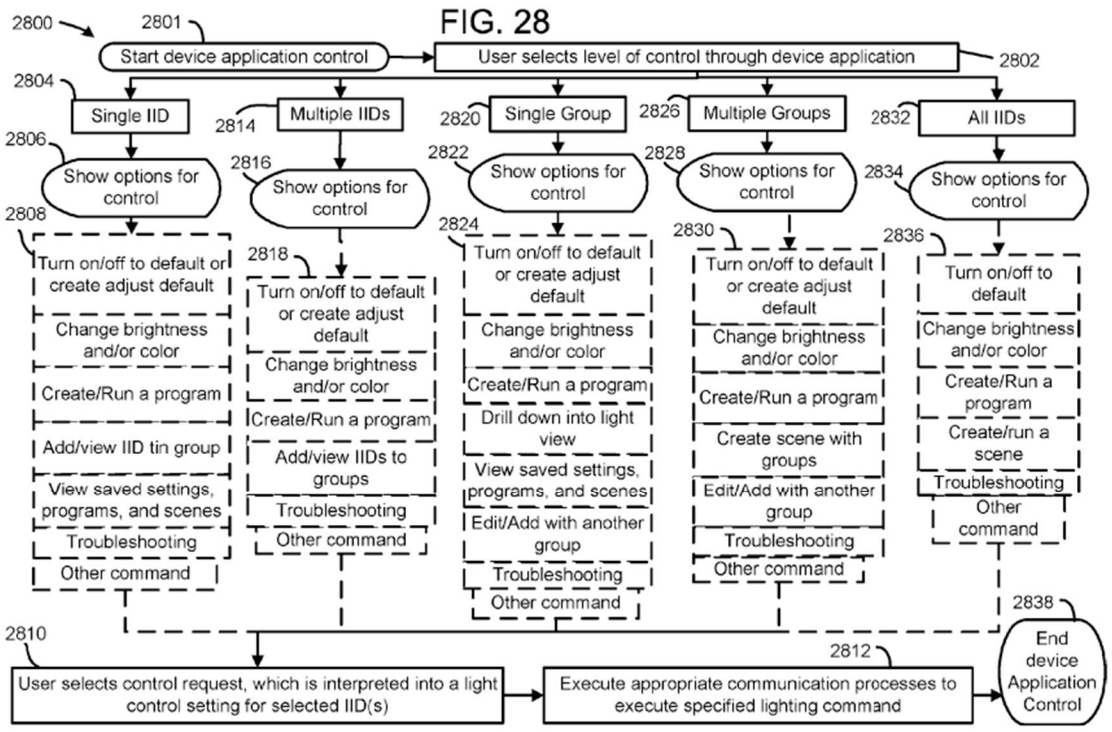
714. Bora '972 discloses

> "Referring now to FIG. 28, a flow chart of basic control areas in accordance with one embodiment of the present invention is shown and represented by element 2800. Using the device application on a number of different wireless devices, a user could communicate and control the wireless lighting system in a number of ways. A user could control a single II Device, a combination of II Devices, a predetermined group of II Devices, multiple groups of II Devices, and the whole set-up of networked II Devices. Control pertains to adjusting brightness, color, running a program, or setting a program to run at a future time or upon some event. All processes begin with

> block 2801 and continue as follows: Controlling a single II Device through the application: (a) a user will navigate through screens on the application to select 2802 an individual II Device (e.g., can arrive by 'drilling down' into a group or selecting the unique II Device to control); (b) once the single II Device is selected 2804, the device application will display potential options for control 2806; (c) potential options for control include but are not limited to the following collectively signified by 2808: (i) turning on/off to default, (ii) changing brightness, saturation, and/or color, and (iii) running a program now or upon some condition such as time. Alternate options for user customization include but are not limited to: (i) adding the II Device to an existing or new group, (ii) viewing the II Device's group assignments, (iii) viewing a hierarchy of programs and scenes that the II Device is included in, and (iv) troubleshooting the II Device. Once a user has selected the option for control, the device application will interpret the selection into a light control setting for the selected II Device 2810 and send a wireless communication via the appropriate processes, represented here collectively by element 2812. As such, once the individual II Device receives the communication, it will then interpret the instructions and execute the command, then relay confirmation back to the wireless device per the appropriate communications processes."

Bora '972 at ¶¶ 0234-35.

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Bora '972 at Fig. 28.

715. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in light of the knowledge of a person of ordinary skill.

716. Thus, Bora '972 discloses or renders obvious this limitation.

d. 1[c] a microcontroller of the lighting device, designed with a capacity to interpret the wireless instruction signal received by a wireless signal receiver of the lighting device and accordingly manages to output at least one control signal to control and set the value of at least one operating parameter of the lighting device;

717. Bora '972 discloses or renders obvious a microcontroller of the lighting device, designed with a capacity to interpret the wireless instruction signal received by a wireless signal receiver of the lighting device and accordingly manages to output at least one control signal to control and set the value of at least one operating parameter of the lighting device.

718. The description of claim elements 1(b) and 1(c) as set forth above describe how a microcontroller of Bora '972 can be used to output a control signal and set the value of the operating parameter of the lighting device. *See* elements 1(b) and 1(c), *supra*, Bora '972 at ¶¶129-130, 133, 149, 213, 234-235, 259, Figures 1, 23, 28, 37 and 38A-F.

719. Bora '972 additionally discloses a microcontroller with the claimed functionality.

> Now referring to FIG. 23, a flow chart of a communication process from a device to II Device in accordance with one embodiment of the present invention is shown through element 2300. The process begins with block 2301. Given a wireless device (WD) is equipped with hardware and systems to execute wireless communication protocols (Bluetooth, Wi-Fi, ZigBee, or any other wireless protocol) as well as an appropriate device application 2302, a user could send a lighting command to an II Device by selecting the command via the device application 2304. Upon the user's selection of a command for a specific II Device, the device application would translate the user's requested command into a light setting command and the specific stored ID for the selected II Device 2306. This light setting command would include instructions for the specified II Device ID to execute such as on/off, color, brightness, or a program. The light setting command would be translated into the appropriate wireless communication protocol and wirelessly sent via the wireless device 2308. The II Device if in range of the wireless communication or mesh network 2309 relay communication would receive the protocol via the II Device's antenna 2310. The transceiver/receiver circuitry would decode the wireless protocol to find the light setting command and send that to the controller/processor 2312. The controller will execute that command with the respective II Device's related components 2314. Upon successful execution, the II Device will respond through the appropriate wireless communication that it has executed the light setting command 2316-2318. The process ends with block 2320.

Bora '972 at ¶ 0213.

720. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

721. Thus, Bora '972 discloses or renders obvious this limitation.

e. 1[d] wherein the value of the operating parameter is stored in a memory of the microcontroller for repetitive performance, wherein

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the stored value of the operating parameter is replaceable by a processing of new operating variable selected by the user;

722. Bora '972 discloses or renders obvious that the value of the operating parameter is stored in a memory of the microcontroller for repetitive performance, wherein the stored value of the operating parameter is replaceable by a processing of new operating variable selected by the user. Particularly, Bora discloses that values for features such as color, saturation, and brightness are updated in memory after user selections in a mobile device.

723. Bora '972 discloses:

> "An II Device in the context of this invention is a lighting apparatus containing additional electronic circuits and components. In one embodiment, the II Device will produce some measure or effect of luminosity dependent on commands sent wirelessly through a wireless device and associated device application. The II Device can receive wireless communications, take immediate action (in terms of a lighting output) based on the wireless communication, execute a sequence of actions, and store one or more commands to be executed at a specified time in the future or upon a specified condition being met. In addition, one embodiment of the II Device can intelligently relay/transmit wireless communication commands received from a device application (or II Device) to other II Devices within proximity. Similarly, one embodiment of the II Device would confirm receipt of the command through a wireless communication back to the wireless device and device application, possibly relaying the confirmation back through other II Devices. The communication means for to execute these processes can be seen in the mesh network section." Bora '972 at ¶0121.

724. Bora '972 discloses the memory structures of the microcontroller, which are illustrated in Figure 1.

> "The memory 108 stores data from factory defined settings and from user defined settings. The controller/processer 106 will read/write data in memory 108. Data might include factory-defined settings, such as communication protocols, identification and security protocols, and other data. Data might also include user-defined settings, such as user profiles, default commands, programs, and other data. The memory 108 could be inside the processor 106

and/or external to the processer 106 as a different integrated circuit or chip(s). The controller/processor 106 and memory 108 circuits might take a number of different technical specifications. In one embodiment, the processor 106 includes a real time clock, processor, and memory chip. The memory 108 receives information from the processor 106 and stores the commands for retrieval by the processor 106."

Bora '972 at ¶0131.

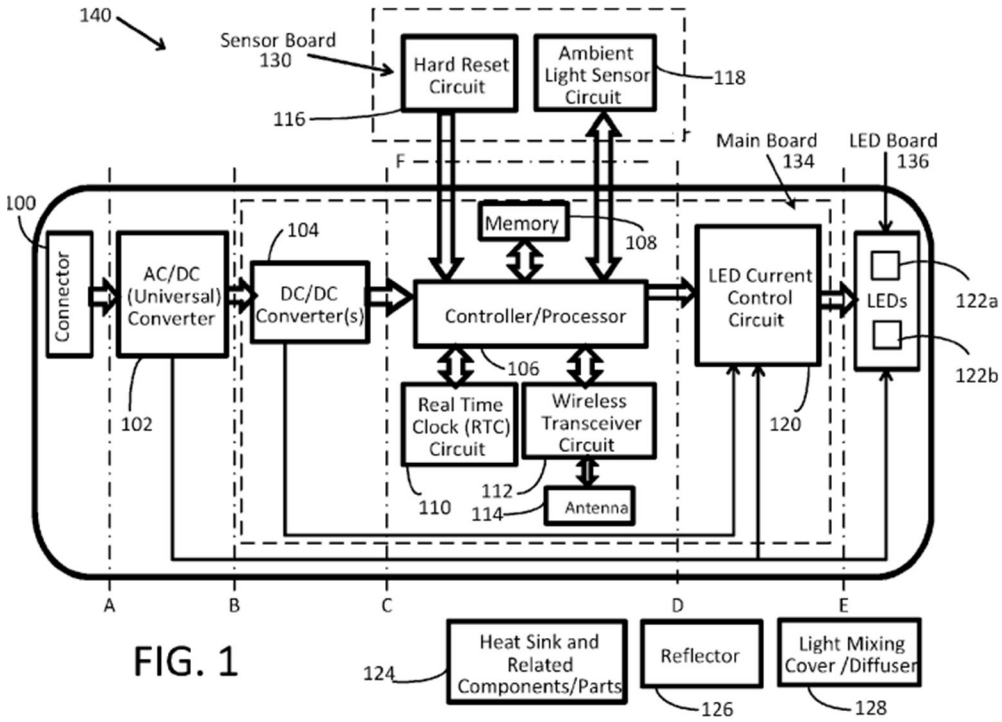


FIG. 1

Bora '972 at Fig. 1.

725. Bora '972 further describes memory structures that meet this limitation.

"The memory 108 stores data from factory defined settings and from user defined settings. The controller/processer 106 will read/write data in memory 108. Data might include factory defined settings such as communication protocols, identification and security protocols, and other data. Data might also include user defined settings such as user profiles, default commands, programs, and other data. The memory 108 could be inside the processor 106 and/or external to the processer 106 as a different IC. The controller/processor 106 and memory 108 circuit might take a number of different technical specifications."

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Bora '972 at ¶0181.

726. Bora '972 further discloses the operation and updating of the disclosed memory in Figure 29 and its associated description.

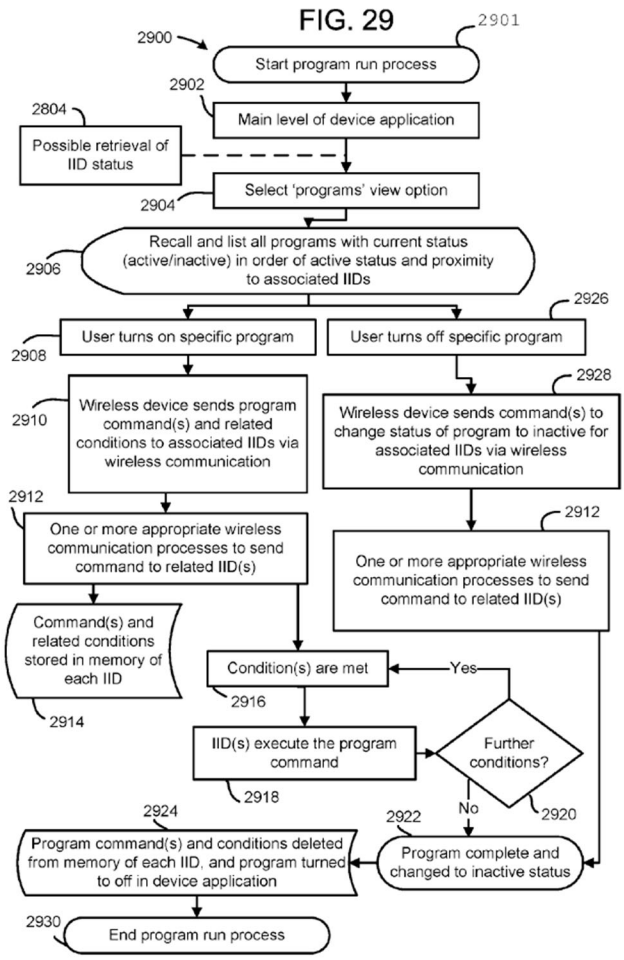
> "Creating a program involves similar processes to basic control. A user selects an II Device, multiple II Devices, group, or multiple groups to run a program. The user then selects a program to be run by the selected II Device(s): (a) there could be predefined suggested programs based on the items selected (e.g., stored in device application memory); (b) the user could create their own program; (c) each program will consist of at least one command to be run when one or more conditions are met, or multiple commands to be run sequentially or upon further conditions being met (e.g., user to set/select condition); (d) the program can be run at that time or saved to run at a future time (e.g., the program can be set to repeat on certain dates/times, such as days of the week, every X days, or any time lapse interval). The command or series of commands is then sent via the wireless network to each associated II Device(s). This is done through the appropriate wireless communication process. Each II Device(s) then interprets the command or series of commands, executes the command, or stores the command in memory to be executed when conditions are met. Similarly, each II Device(s) would confirm the program command via the appropriate communication method process. Now referring to FIG. 29, a flow chart of a programming process in accordance with one embodiment of the present invention is shown and referred to as element 2900. Once a program or programs are saved a user can recall and toggle those programs on/off. The process begins with block 2901. At the main level of the device application 2902, there will be a 'programs' button. When selected 2904 this will display all programs associated with the active profile. Each program will be listed with their current status as active vs. inactive. The programs will be sorted based on active vs. inactive status with active listed first. Secondly, the programs will be sorted based on the proximity of the associated II Devices to each program 2906. When toggled on 2908, the application will send the command or series of commands via the wireless network to each associated II Device(s) 2910 through one or more appropriate communication processes, collectively represented here as 2912. The actual light setting associated with the program might be stored in device application so that the wireless communication is to execute a specific program type command. The

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> actual light setting might also be stored in the II Device itself 2914 so that the device application/wireless device only requests the II Device to run that program. Each II Device(s) then interprets the command or series of commands and their related program conditions, executes the command given a present condition, or stores the command in memory to be executed at a later condition time or event. In the latter case, once the condition is met the II Device(s) will execute the program command 2918. Then if there are further conditional commands within the program 2920, the II Device will continue to monitor for conditions until they are met 2916 and the II Device similarly follows the process to execute the program command 2918. Once no further conditional commands are in the program 2920, the program completes and changes to inactive status 2922 so that the program commands are deleted from the memory of each related II Device, and the program returned to an off status in the device application 2924. Alternately, a program that was set to run can be turned off 2926 so that the wireless device sends a command to the related II Devices to not execute the conditional command prompted by the program 2928. This command would be communicated through one or more appropriate communication processes, collectively represented here as 2912. When received, each II Device would change the program to complete and change it to inactive status 2922 so that the program commands are deleted from the memory of each related II Device, and the program returned to an off status in the device application 2924. The program might still be saved in the device application memory for future use, if a saved program. The program run process ends in block 2930."

Bora '972 at ¶¶ 0242-43.

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Bora '972 at Fig. 29.

727. Bora '972 in Figure 30 and its description provides additional details of how memory can be used to store lighting settings.

> "Through the device application, the user can create a new scene, referred to as element 3000 and beginning in block 3001, by first selecting the option to create a scene in the device application 3002 and selecting any number of II Device(s) and/or group(s), with which to start creating the scene 3004. The user would then select/create the lighting control setting or program for the selected II Device(s) and/or group(s) II Device. Here, the light setting might be a previously user saved configuration, an automated application suggested configuration, or a newly created configuration 3006. Once selected, the user would then have the option to add additional subsets of II Device(s) and/or groups to the scene 3008, which would revert back to a similar configuration process for that selection 3004, 3006. Once the user has configured all the II

> Device(s) and/or group(s) that they wish 3008, the scene, comprised of any combination of II Device(s) and/or group(s), each with a specified light setting or program, will be saved and the user could assign a specified name 3010. This information will be stored in the device application memory 3012 and the process will end in block 3014."

Bora '972 at ¶0248.

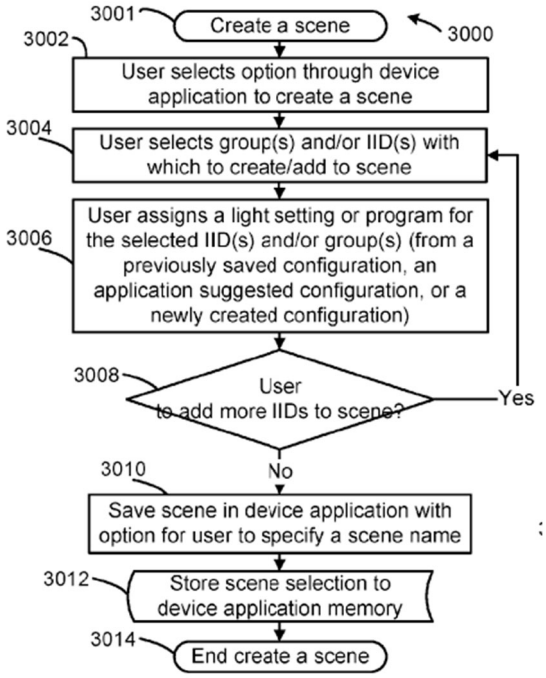


FIG. 30

728. Figure 28 and its associated descriptions provide additional description of how lighting settings may be modified and stored.

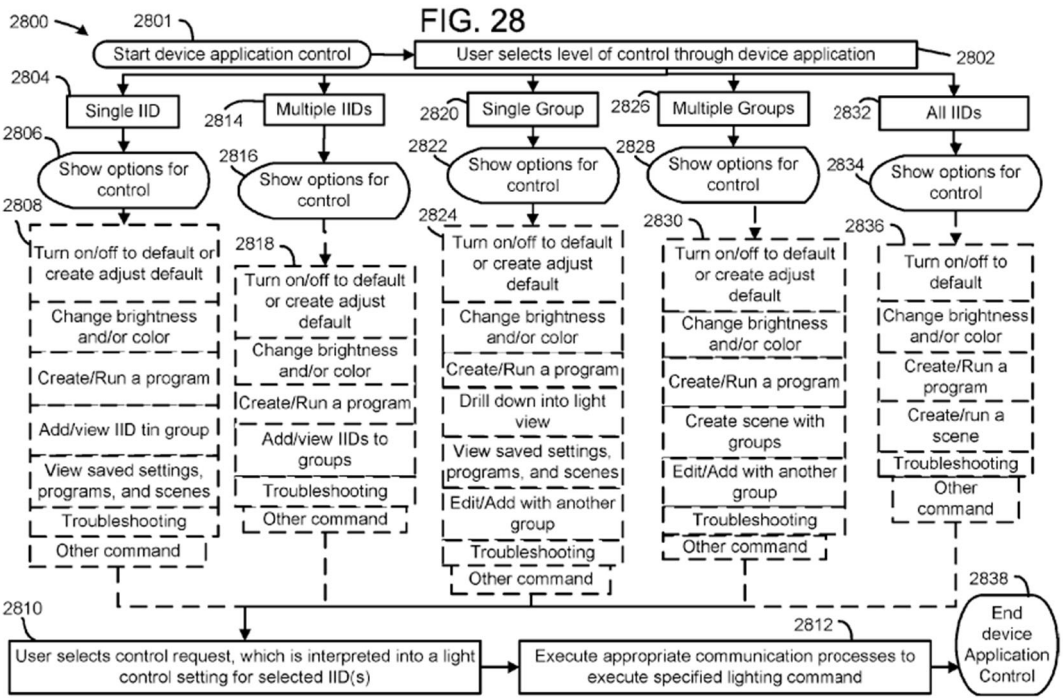
> "A process will now be described for setting, using, and changing default light levels for any number of II Devices (including switching on/off through an external switch, such as a wall switch (see FIG. 62)), so that a user can easily customize, save, and recall their standard lighting preference. Additionally, a process allowing for anyone to turn on the preset default of the II Devices, without using the application will also be described. Each II Device will always have an associated default light level. Each II Device might have multiple related default light levels with the following framework. (i) Manufacturing default—for each II Device the most basic light setting stored in each II Device's internal memory. The manufacturing default light setting will always be stored in the II Device's memory. (ii) Light default—for each II Device, the active

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> default light setting that will be executed when the II Device is turned on directly as in the process steps of 2800 to 2804 to 2838 (not through a group command) or upon power restoration. Each II Device can only have one light default. This default light setting is stored within each II Device's memory until the II Device is reset or the light default is changed. When unassigned, the light default reverts to the manufacturing default. Group default(s)—The light setting that will be executed by each II Device within the selected group when the selected group is turned on through the device application. The group default is stored within the device application related to each group. Each II Device is able to execute multiple group defaults, dependent on which group the user has selected to turn on and their individual commands within the group default. During the set-up process, or any time after installation, a user can change the light default or group default settings through the device application. The manufacturing default will most likely be a standard high output white type of light. This light setting will be programmed into each II Device during the manufacturing process and stored into the II Device's memory. This default will first be executed when the II Device is powered on for the first time. As such, the manufacturing default is independent of the device application. After a light default is assigned, the light default setting will take precedence over the manufacturing default; however the manufacturing default setting will still stay stored within the II Device's memory. When a light is reset to the manufacturing state, either through the hard or soft reset function, the light default will be erased and the II Device will revert back to the manufacturing default acting as the light default."

Bora '972 at ¶¶ 0254-55.

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Bora '972 at Fig. 28

729. Figure 69 and its associated description provide additional detail about how lighting parameters may be updated and stored.

> "Now referring to FIG. 69, a flow chart of scheduling programs for operating a lighting device in accordance with one embodiment of the present invention is shown. The user selects II Device(s) to be programmed with scheduling (lighting programs, effects or configurations) through user interface on a remote wireless device such as wireless controlling device or smartphone in block 6900. For scheduling a single II Device or a group of II Devices, the user enters program(s) with at least one parameter such as date, time to turn II Device ON/OFF or change light output, brightness, saturation, color, duration of the program, number of repeats through user interface on controlling device in block 6902. The programs are created and stored or are already stored in at least one of the memories such as the processor/controller's 106 internal memory, on board memory 108, in the memory of remote wireless device 2548, or any other peripheral device communicating to II Device directly through wires or wirelessly or indirectly through other intermediate devices in block 6904. In case of multiple programs those could conflict light outputs from the same II Device(s), the user can assign priorities to the programs to avoid conflicting situations for II Device(s) light output in block 6906. The user

programs the II Device(s) and II Device(s) run the program(s) in block 6908."

Bora '972 at ¶ 0352.

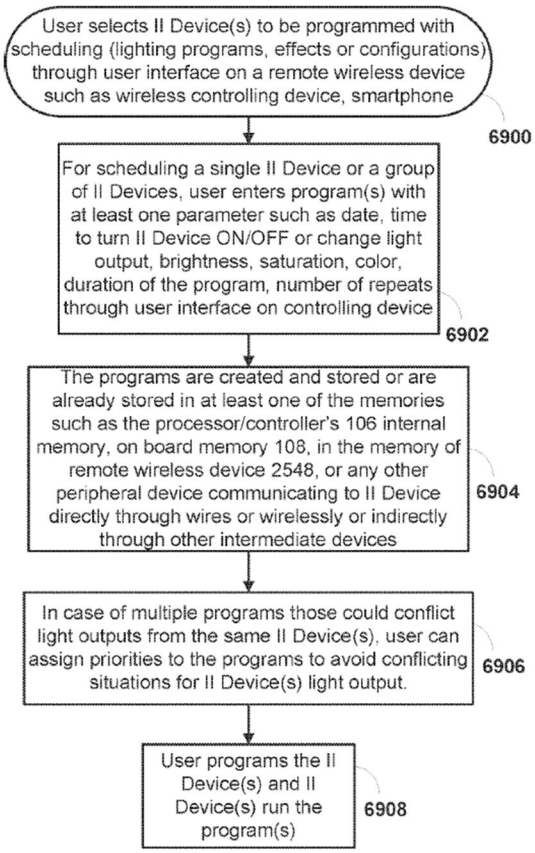


FIG. 69

Bora '972 at Fig. 69

730. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in combination with the knowledge of a person of ordinary skill.

731. Thus, Bora '972 discloses or renders obvious this limitation.

f. 1[e] wherein the operating parameter is used for controlling at least one of various lighting characteristics of the lighting device including timer settings, light intensity settings, color temperature settings or detection sensitivity settings when a photo sensor or a motion sensor is involved;

732. Bora '972 discloses or renders obvious that the operating parameter is used for controlling at least one of various lighting characteristics of the lighting device including timer settings, light intensity settings, color temperature settings or detection sensitivity settings when a photo sensor or a motion sensor is involved.

733. This functionality is described with respect to claim elements 1[b] and 1[d]. Bora '972 at ¶¶`121, 131, Fig. 1, ¶181 ¶¶242, 243, Figs 28-30, ¶¶246, 346, 347,. 248, 254-255, ¶352, Fig. 38E; Figs 67-68; Fig. 69.

734. The above sections and the additional disclosure provided in this section describe how lighting settings may be modified including brightness, color, and saturation. A person of ordinary skill would understand that color and saturation are parameters that are used for controlling a "color temperature setting." Similarly, brightness is a parameter used for controlling intensity.

735. Bora '972 discloses:

> "A process will now be described for setting, using, and changing default light levels for any number of II Devices (including switching on/off through an external switch, such as a wall switch (see FIG. 62)), so that a user can easily customize, save, and recall their standard lighting preference. Additionally, a process allowing for anyone to turn on the preset default of the II Devices, without using the application will also be described. Each II Device will always have an associated default light level. Each II Device might have multiple related default light levels with the following framework. (i) Manufacturing default—for each II Device the most basic light setting stored in each II Device's internal memory. The manufacturing default light setting will always be stored in the II Device's memory. (ii) Light default—for each II Device, the active default light setting that will be executed when the II Device is turned on directly as in the process steps of 2800 to 2804 to 2838 (not through a group command) or upon power restoration. Each II Device can only have one light default. This default light setting is stored within each II Device's memory until the II Device is reset or the light default is changed. When unassigned, the light default reverts to the manufacturing default. Group default(s)—The light

> setting that will be executed by each II Device within the selected group when the selected group is turned on through the device application. The group default is stored within the device application related to each group. Each II Device is able to execute multiple group defaults, dependent on which group the user has selected to turn on and their individual commands within the group default. During the set-up process, or any time after installation, a user can change the light default or group default settings through the device application. The manufacturing default will most likely be a standard high output white type of light. This light setting will be programmed into each II Device during the manufacturing process and stored into the II Device's memory. This default will first be executed when the II Device is powered on for the first time. As such, the manufacturing default is independent of the device application. After a light default is assigned, the light default setting will take precedence over the manufacturing default; however the manufacturing default setting will still stay stored within the II Device's memory. When a light is reset to the manufacturing state, either through the hard or soft reset function, the light default will be erased and the II Device will revert back to the manufacturing default acting as the light default."

Bora '972 at ¶¶ 0254-55.

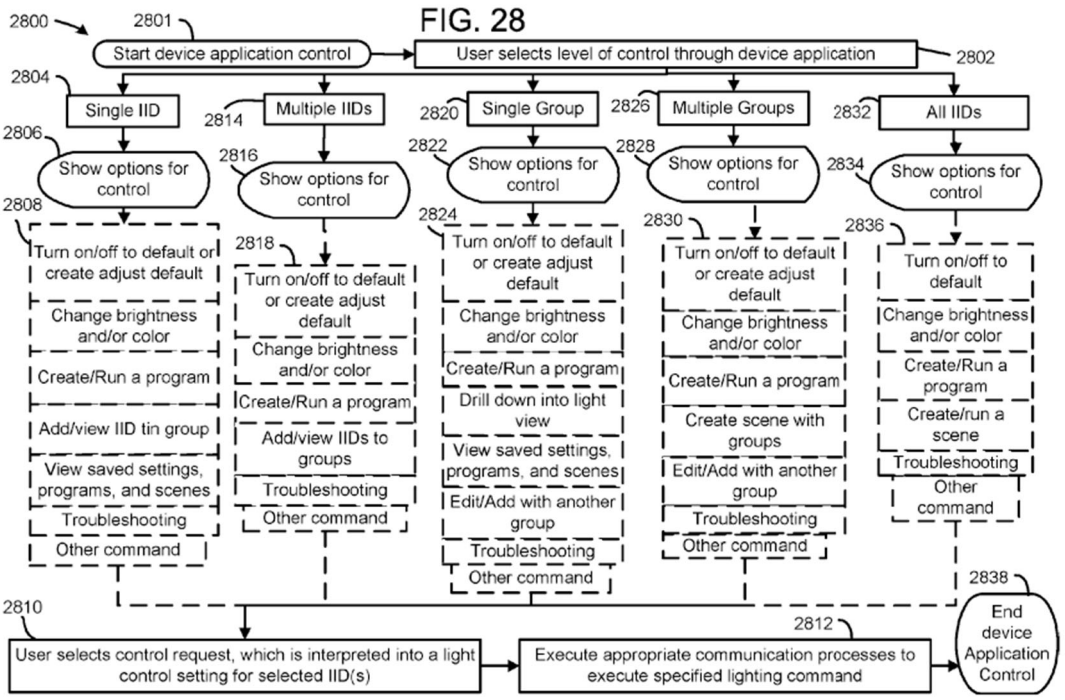
736. Bora '972 additionally discloses :

> "Referring now to FIG. 28, a flow chart of basic control areas in accordance with one embodiment of the present invention is shown and represented by element 2800. Using the device application on a number of different wireless devices, a user could communicate and control the wireless lighting system in a number of ways. A user could control a single II Device, a combination of II Devices, a predetermined group of II Devices, multiple groups of II Devices, and the whole set-up of networked II Devices. Control pertains to adjusting brightness, color, running a program, or setting a program to run at a future time or upon some event. All processes begin with block 2801 and continue as follows: Controlling a single II Device through the application: (a) a user will navigate through screens on the application to select 2802 an individual II Device (e.g., can arrive by 'drilling down' into a group or selecting the unique II Device to control); (b) once the single II Device is selected 2804, the device application will display potential options for control 2806; (c) potential options for control include but are not limited to the following collectively signified by 2808: (i) turning on/off to default, (ii) changing brightness, saturation, and/or color, and (iii) running a program now or upon some condition such as time. Alternate options for user customization include but are not limited

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> to: (i) adding the II Device to an existing or new group, (ii) viewing the II Device's group assignments, (iii) viewing a hierarchy of programs and scenes that the II Device is included in, and (iv) troubleshooting the II Device. Once a user has selected the option for control, the device application will interpret the selection into a light control setting for the selected II Device 2810 and send a wireless communication via the appropriate processes, represented here collectively by element 2812. As such, once the individual II Device receives the communication, it will then interpret the instructions and execute the command, then relay confirmation back to the wireless device per the appropriate communications processes."

Bora '972 at ¶¶ 0234-35.



Bora '972 at Fig. 28

737. Bora '972 additionally discloses the modification timer settings with respect to Figure 92 and its associated description.

> "Now referring to FIG. 92, a flow chart of a sound detection process 9200 for a lighting device in accordance with one embodiment of the present invention is shown. II Devices, such as smart bulbs with sensor circuits containing a sound sensor/detector or microphone as

> well as Real Time Clock or timer, can have specific applications where a user defines the time when the II Device should listen to particular defined sound and trigger an action based on that. For example, an application where a user wants to turn ON/OFF the lights between 10 pm and 8 am every weekday by clapping twice within 2 seconds can be achieved by implementing sound detector and real time clock inside the II Device that is communicably coupled to the processor. In such an II Device, the user can define a program of turning the sound detector functionality of the II Device ON between 10 pm and Sam every weekday and then the II Device triggers the action of turning ON/OFF the bulb based on the clapping sound detected by the sound detector. An example of such a clock and sound detector/microphone process 9200 begins when the sound detector and clock application are launched to create a program in block 9202. The user defines a time when the sound detector can trigger the action using the application in the controller device, such as a smartphone, in block 9204. The user defines an event or pattern of the sound for triggering the action and programs the smart device with such defined parameters in block 9206. Note that the above process can be adapted to work with other sensors, such as light, color, motion or a combination thereof. When the program is running, the processor determines whether the sound detector has detected the defined sound pattern in the vicinity in the defined time in decision block 9208. The defined parameters are not satisfied, as determined in decision block 9208, the program continues to monitor sounds detected by the sound detector during the defined time in block 9210 and loops back to decision block 9208 whenever a sound is detected. If however, the defined parameters are satisfied, as determined in decision block 208, the program triggers the defined event in block 9212."

Bora '972 at ¶ 0406.

738. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of the knowledge of a person of ordinary skill.

739. Thus, Bora '972 discloses or renders obvious this limitation.

g. 1[f] wherein the free setting algorithm is a capacity scale simulation process implemented by a visual configuration of a free setting operator incorporated with a capacity scale simulator and an indicator of the capacity operating rate to facilitate the user's decision making process in setting a desired level of the operating parameter, wherein when the free setting operator is activated by the user to interact with the capacity scale simulator, the user's interface APP responsively manages to select or compute the value of the capacity

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> **operating rate according to the instantaneous state of interaction between the free setting operator and the capacity scale simulator with the indicator of the capacity operating rate simultaneously showing an instantaneous value of the capacity operating rate,**

740. Bora '972 discloses or renders obvious that the free setting algorithm is a capacity scale simulation process implemented by a visual configuration of a free setting operator incorporated with a capacity scale simulator and an indicator of the capacity operating rate to facilitate the user's decision making process in setting a desired level of the operating parameter, wherein when the free setting operator is activated by the user to interact with the capacity scale simulator, the user's interface APP responsively manages to select or compute the value of the capacity operating rate according to the instantaneous state of interaction between the free setting operator and the capacity scale simulator with the indicator of the capacity operating rate simultaneously showing an instantaneous value of the capacity operating rate.

741. As set forth below the mobile and tablet applications disclosed in Bora '972 enable a user to interact with various sliders and controls that allow a user to select color settings, saturation, and brightness for a lighting device that facilitate a user's ability to select and control these settings.

742. These features are set forth with respect to elements 1[b], 1[c], 1[d] and their associated descriptions. *See* elements 1[b]- 1[d], *supra* and Bora '972 at ¶¶129-130, 133, 149, 213, 234-235, 259, Figures 1, 23, 37 and 38A-F.

743. Bora discloses the use of wireless smartphone controls to adjust lighting settings.

> "Generally a condition could be executed through these sources: (a) the wireless device sends a command to any number of II Devices to execute a program given a date/time passing or date/time being met (e.g., simulated sunrise, timer, etc.); (b) the wireless device sends a command to any number of II Devices to execute a program given some other conditionally based input directly available to the II Device (e.g., ambient light sensor program); (c) the wireless device sends a command to any number of II Devices to execute a

> program with the condition being met at that time and the action stored in the II Devices memory (e.g., reset process); (d) the wireless device sends a command to any number of II Devices to execute a program with the condition being met at that time and the action specified through the command (e.g., starry night); (e) the wireless device sends a command to any number of II Devices to execute a program given some other conditionally based input available to the lighting control network is available to said II Devices (e.g., auxiliary ambient light sensor program); (f) the wireless device sends a command to any number of II Devices to execute a program in coordination with wireless communications/commands provided sequentially through the device application (e.g., music sync); (g) the wireless device runs a program to monitor some condition and upon that condition being met sends a command to any number of II Devices to execute a specified command or sequence of commands (e.g., weather alerts); (h) any combination or sequential representation of the above program types."

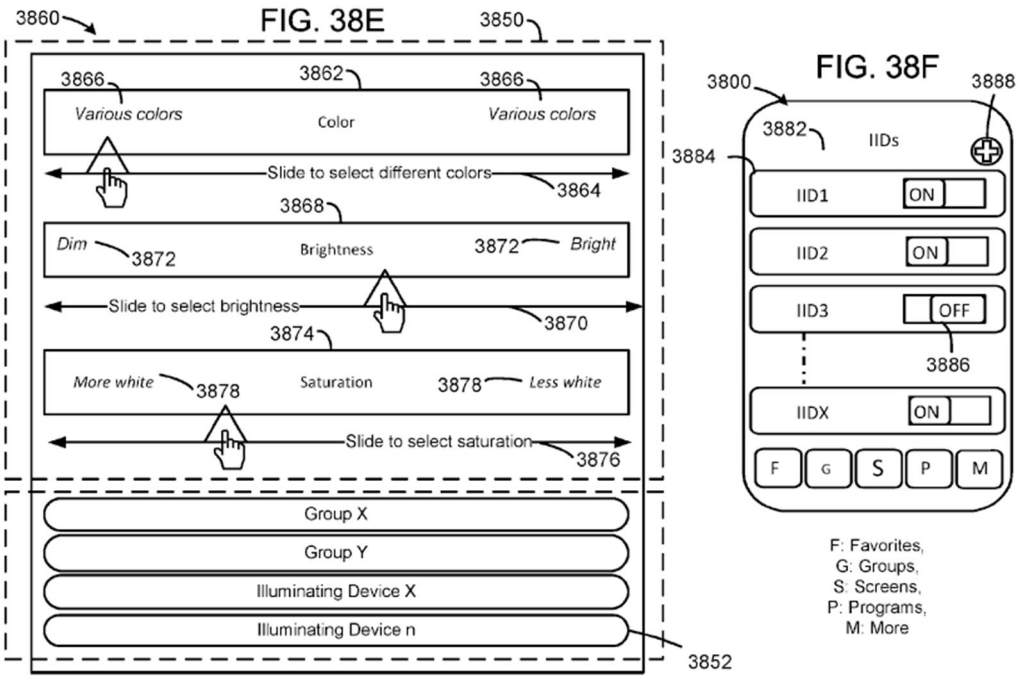
Bora '972 at ¶ 0241.

744. Figure 38E of Bora '972 and its associated description additionally shows a sliding touchscreen interface with the claimed features.

> "As shown in FIG. 38E, a configure screen 3860 is used to adjust the color 3862, brightness 3868, saturation 3874, and other configuration for selections of II Device(s), group(s), program(s), and/or scene(s). The configure screen 3860 might be different depending on the selection and specific type of configuration. In general, the configuration screen 3860 will consist of the three level lighting control interface 3850 and a list of the selection (II Device(s)/group(s)) 3852. There would most likely be related configuration screens for the selection of program conditions, scene creation/editing, and other more complex configurations."

Bora '972 at ¶0264.

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Bora '972 at Fig. 38E

745. For each of the identified adjustments in figure 38 the slider position is itself an "indicator of the capacity operating rate simultaneously showing an instantaneous value of the capacity operating rate" as the position of the slider at any given time shows an indication of the color, brightness, and saturation. Indeed, as the claims do not require operating parameters to be indicated, only the capacity operating rate, the slider position may be itself be a "capacity operating rate" and the indicator is the visual representation of the slider's position. However additional indicators are disclosed.

746. With respect to Figure 38E Bora '972 notes that "color level selection 3862 refers to an input on a user interface that would go to create any number of colors derived from the mixing of the LEDs found in the II Device. The color level could be controlled incrementally or at fixed points, for example a user could select a color level from a color slider 3864. Alternatively, a user could select specific colors from the color level such as blue, green, red, etc. as represented by 3866." Bora '972 at ¶0265. If a user is selecting a color level from a color

slider a person of ordinary skill would understand that the color slider would be adjacent to different colors and allow a user to slide between the different color selections and thus show a "indicator of the capacity operating rate simultaneously showing an instantaneous value of the capacity operating rate" as the color on which the slider was placed.

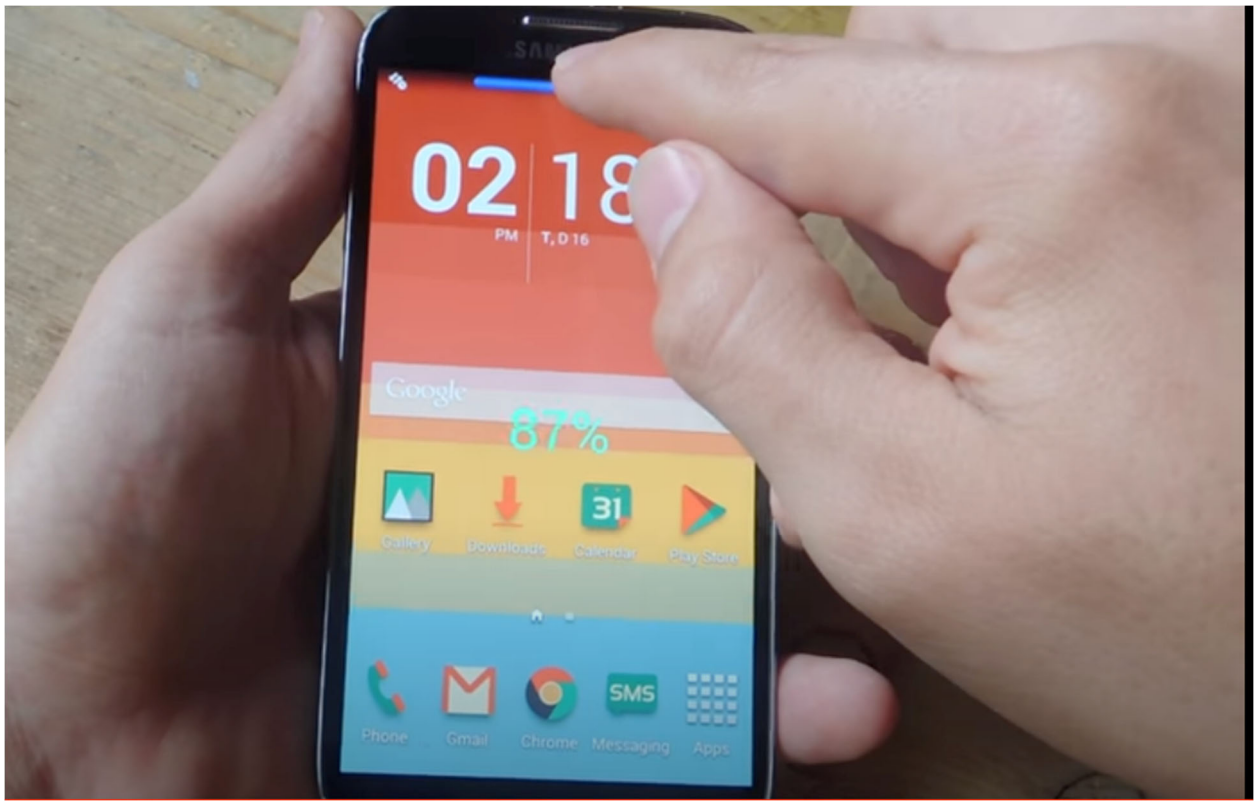
747. Similarly, Bora '972 discloses "Similarly, a brightness level selection 3868 could be controlled incrementally or at fixed points, for example a user could select a brightness level from a slider 3870. Alternatively, a user could select specific brightness levels such as 25%, 50%, dim, bright, etc. as represented by 3872." Bora '972 at ¶266. If a user is selecting a brightness percentage from a brightness slider a person of ordinary skill would understand that the brightness slider would be showing the brightness level as a numerical percentage value as the slider was moved and thus for this additional reason providing an "indicator of the capacity operating rate simultaneously showing an instantaneous value of the capacity operating rate."

748. Similarly Bora '972 discloses "Similarly, the saturation level selection 3874 could be controlled incrementally or at fixed points, for example a user could select a saturation level from a slider 3876. Alternatively, a user could select specific saturation levels such as 25%, 50%, lighter, darker, etc. as represented by 3878." Bora '972 at ¶267. If a user is selecting a saturation level from a saturation slider a person of ordinary skill would understand that the saturation slider would be showing the saturation level as a numerical value as the slider was moved and thus providing an "indicator of the capacity operating rate simultaneously showing an instantaneous value of the capacity operating rate."

749. To the extent that showing an instantaneous percentage value is not disclosed inherently it would be obvious to a person of ordinary skill in view of the disclosure of Bora '972. A person of ordinary skill in the art would be motivated to disclose what percentage values

were being selected by a slider in real time so that a user could make the disclosed selections. Such a modification would be straightforward with a reasonable expectation of success.

750. The use of live percentage indicators for smartphone sliding controls were well known in the art . For example the instructional video at https://www.youtube.com/watch?v=tSjdGFef5_k, published in 2014, shows a sample screen brightness control that provides a live percentage level.



751. To the extent that Bora '972 does not disclose a percentage that it updates when the slider bar is moved, a person of ordinary skill in the art would be motivated to use this well-known feature to achieve Bora '972's goals of allowing a user to set a brightness or saturation percentage. Such a conventional modification would be straightforward and could be performed with a reasonable expectation of success.

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752. Bora '972 discloses in Figure 67 and Figure 68 and their associated descriptions a similar touchscreen control system for controlling color temperature and saturation.

> "Referring to FIG. 67, in terms of representation, the II Devices 140 can be set-up in a representation 6700 similar to that of an overhead view of the space in which the II Devices are installed (i.e., a visual or virtual representation). In this case there can be a user led or automated process to place II Devices in respective locations on the screen. In addition, there might be a user generated or automated process where a user set's up their II Devices within the framework of rooms such as living room 6702 in the figure. Here a user would be prompted to create an approximate representation of the walls of a room then drag or input where the II Devices are related to the room layout 6704. The creation of the walls can be done in multiple ways using direct user input (dragging, using corners, or using predefined shapes) as well as camera functionality and estimation tools. Once a room is defined and II Devices within a room are defined a user can select the room as a whole or drill into individual lights within the room."

Bora '972 at ¶0346.

> "As the II Devices can represent colors as well as variations of white with different saturation levels, the application representation in the controlling device needs to have a similar representation. Referring to FIG. 68, in the application interface (6800, 6802, 6804), this can be represented by having a color area 6806, 6808, a white light amplitude/saturation area 6810 and brightness area 6812. The color area could be a color wheel 6806, 6808 or box representative of the available color combinations, the white area could be a rotating or directional level 6810. When the white light area is at the lowest level 6814, the color area would be fully saturated with bright colors shown as R, G and B. When the white light area is at its highest level 6816, the color area would be almost completely white. In between, incremental increases in the white light level 6820 would have an effect to add less saturation to the color area, looking like a white gradient overlaid on the color area 6818 shown with sB, sG and sR (stands for less saturation of R, G and B). Here if multiple II Devices with differing ranges in color saturation are present, the controlling device will note this and only allow the white light level to reduce to the appropriate level representative of the less flexible II Devices range."

Bora '972 at ¶0349.

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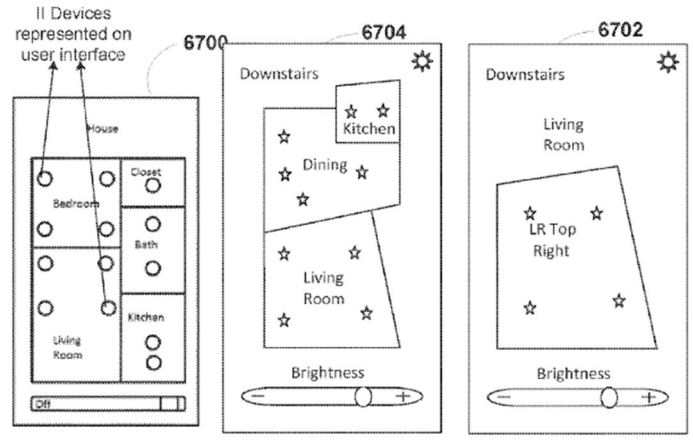


FIG. 67

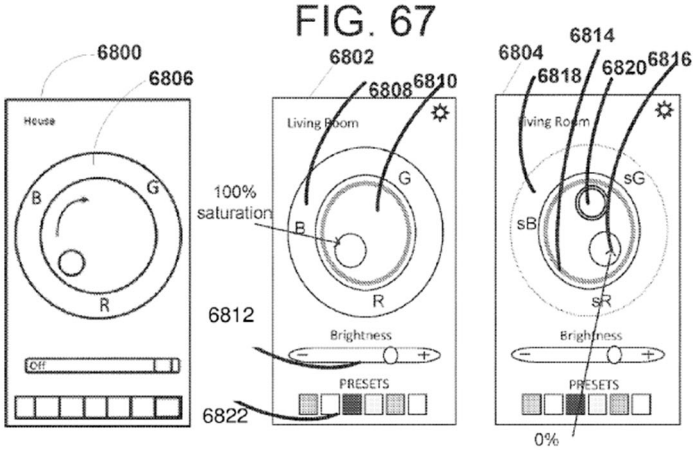


FIG. 68

Bora '972 at Figs. 67 and 68

753. Figure 68 as described above discloses a color wheel and box showing combinations of available colors (6810) and particularly describes "color area 6806" shown above. It notes that "the color area would be fully saturated with bright colors shown as R, G and B. When the white light area is at its highest level 6816, the color area would be almost completely white. In between, incremental increases in the white light level 6820 would have an effect to add less saturation to the color area, looking like a white gradient overlaid on the color area 6818 shown with sB, sG and sR (stands for less saturation of R, G and B)." Bora '972 at ¶ 0349. Accordingly, Bora discloses with respect to the color area an "indicator of the capacity

operating rate simultaneously showing an instantaneous value of the capacity operating rate" in the form of the colors shown in the color area.

754. Bora '972 at Figs. 97 and 98 describes yet another touchscreen calibration process which utilizes the claimed features.

755. Bora '972 discloses:

> "Now referring to FIGS. 97 and 98 an example of a screen 9700 and a flow chart of a user color calibration process 9800 in accordance with one embodiment of the present invention are shown. As explained above, same smart lights can have small differences in the light output in terms of brightness and color even if set for the same color. This is due to the variations in various parameters, such as LEDs bins, locations where they are running that affect the temperature, lifetime usage that degrades the performance of LEDs or overall system in one smartlight as compared to others. In such cases, the temperature compensation or color compensation algorithms can also fall short in maintaining the color output in various smartlights at various times. Color calibration from a user through an application on the controller device such as smartphone directly can solve such issues. Consider a scenario where one smartlight for defined R, G, B, W values is showing a particular color, say purple that matches the user expectations and the color shown on the application. However, another smartlight shows slight variation say, light purple due to the effect of variation in any of above parameters, which doesn't match the user expectations or the color on the application itself. In such scenario, the user can color calibrate the second smartlight to match the first smartlight. The application can set parameters that will alter the R, G, B, W values for the second smartlight to match the color as per user expectation and/or the color on the controller device. These parameters can be stored either in the smartlight itself or the wireless controller. These parameters could be values for particular mathematical equations to control the light output of the smartlight, based on which the colors of both the smartlights now match the user expectations. The screen 9700 includes a first smartlight identifier or label 9702, a color slide bar 9704 and a brightness control bar 9706 for the first smartlight, a second smartlight identifier or label 9708, a color slide bar 9710 and a brightness control bar 9712 for the second smartlight, and a calibrate button 9714. The user color calibration process 9800 is launched in block 9802. A user turns two smartlights ON, one showing expected colors for various combinations and other to be calibrated in block 9804. The user through the application on the

controlling device sets a particular color for both the smartlights in block 9806. This is done by controlling the colors of the both smartlights individually in a special color calibration screen in the controller device so that both the smartlights emits same color visually. Once the smartlights match the colors through color calibration screen in the application, the user presses calibrate on the screen to send calibrate command through the application in block 9808. When the user sends calibration command, the application calculates the parameters and sends those parameters to the second smartlight where they are stored internally in block 9810. The application calculates or tweaks the already present calibration parameters and sends those to the second smartlight where they are stored internally in block 9812. If the user is not satisfied with the overall color matching between the two smartlights, as determined in decision block 9814, the user repeats the process beginning at block 9806 for various other colors and until he is satisfied with overall color matching to send more parameters to the second smartlight or tweak the parameters already sent. If, however, the user is satisfied with the overall color matching between the two smartlights, as determined in decision block 9814, the process stops in block 9818."

Bora '972 at ¶¶ 0421-22.

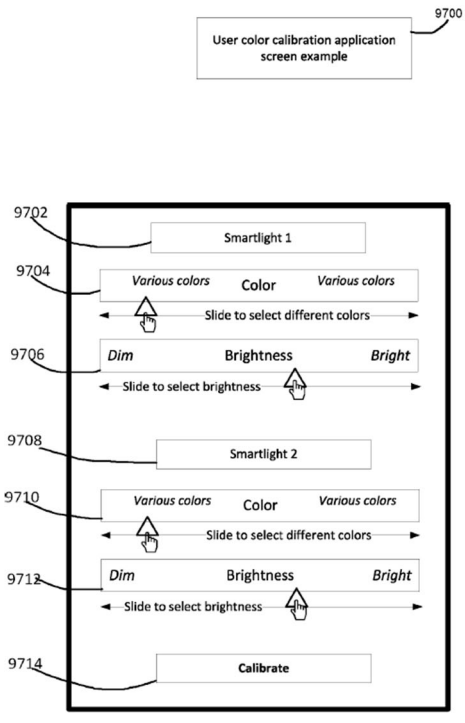


Fig. 97

Bora '972 at Fig. 97.

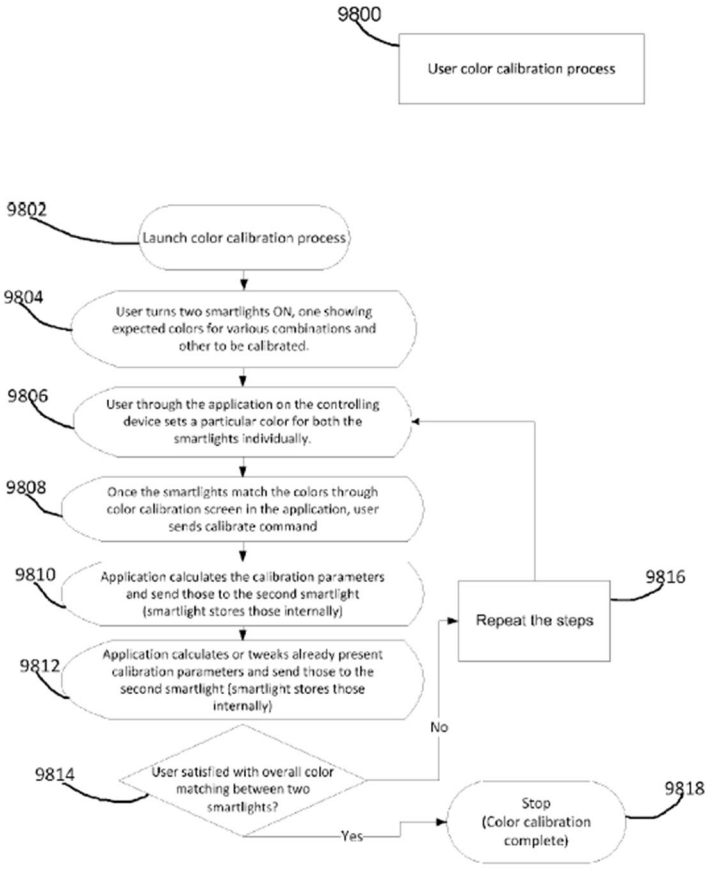


Fig. 98

Bora '972 at Fig. 98.

756. As with the previous embodiments a person of ordinary skill would understand that the color and brightness adjustment sensors would necessarily include an instantaneous numerical value of the brightness measures and that the color selection would be instantaneously displayed because the slider would be positioned adjoining the color that was currently selected.

757. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill in the art.

758. Thus, Bora '972 discloses or renders obvious this limitation.

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h. 1[g] wherein the capacity operating rate shown in the indicator can be an operating percentage, an operating chart or an actual operating value of the relevant operating parameter, wherein when a free setting motion of the free setting operator is ceased, the user interface APP manages to generate the operating variable corresponding to the selection of the capacity operating rate and accordingly operates to transmit a wireless instruction signal carrying a message of the operating variable to the lighting device.

759. Bora '972 discloses or renders obvious that the capacity operating rate shown in the indicator can be an operating percentage, an operating chart or an actual operating value of the relevant operating parameter, wherein when a free setting motion of the free setting operator is ceased, the user interface APP manages to generate the operating variable corresponding to the selection of the capacity operating rate and accordingly operates to transmit a wireless instruction signal carrying a message of the operating variable to the lighting device.

760. The Court construed the term "when a free setting motion of the free setting operator is ceased, the user interface APP manages to generate the operating variable corresponding to the selection of the capacity operating rate and accordingly operates to transmit a wireless instruction signal carrying a message of the operating variable to the lighting device" as "as a result of the free setting motion of the free setting operator being ceased, for example, after a user removes their finger from a virtual button, the user interface app generates the operating variable corresponding to the selection of the capacity operating rate and transmits a wireless instruction signal carrying a message of the operating variable to the lighting device." D.I. 84 at 4.

761. I discuss the presence of the limitation with respect to element 1(f). *See* element 1(f), *supra*; Bora '972 at ¶¶264, 346, 349; Figures 38E, 67, 68, and their disclosures of how the disclosed use of slider and wheel controls causes the claimed actions to occur in response to the user's motion and particularly the location in which the sliders and wheels are stopped.

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762. Bora '972 additionally discloses the transmission of the selected values to a lighting device.

> "Now referring to FIG. 23, a flow chart of a communication process from a device to II Device in accordance with one embodiment of the present invention is shown through element 2300. The process begins with block 2301. Given a wireless device (WD) is equipped with hardware and systems to execute wireless communication protocols (Bluetooth, Wi-Fi, ZigBee, or any other wireless protocol) as well as an appropriate device application 2302, a user could send a lighting command to an II Device by selecting the command via the device application 2304. Upon the user's selection of a command for a specific II Device, the device application would translate the user's requested command into a light setting command and the specific stored ID for the selected II Device 2306. This light setting command would include instructions for the specified II Device ID to execute such as on/off, color, brightness, or a program. The light setting command would be translated into the appropriate wireless communication protocol and wirelessly sent via the wireless device 2308. The II Device if in range of the wireless communication or mesh network 2309 relay communication would receive the protocol via the II Device's antenna 2310. The transceiver/receiver circuitry would decode the wireless protocol to find the light setting command and send that to the controller/processor 2312. The controller will execute that command with the respective II Device's related components 2314. Upon successful execution, the II Device will respond through the appropriate wireless communication that it has executed the light setting command 2316-2318. The process ends with block 2320."

Bora '972 at ¶ 0213.

763. *See also* Figures 23 and 28 and associated descriptions, which are discussed above, which further describe the transmission of a selected value from a mobile device to the lighting device. *See* Figures 23 and 28, Bora '972 at ¶¶213, 235.

764. With respect to "capacity operating rate shown in the indicator can be an operating percentage, an operating chart or an actual operating value of the relevant operating parameter" I discuss with respect to element 1(f) how a slider position can act as a capacity operating rate indicator. *See e.g.* Bora '972 at ¶¶264, 346, 349, 421-422; Figs. 38E, 67, 68, 97,

98. The slider may meet this limitation in several ways. For example, the slider position may itself be a "capacity operating rate." To the extent that "operating chart" is construed as definite, the slider position would be also be an "operating chart" of operating parameters which it is being used to control such as color, saturation, or brightness.

765. I also discuss with respect to 1(f) how a person of ordinary skill would understand a percentage value for brightness and saturation to be disclosed and/or rendered obvious by Bora '972. This disclosure would be a capacity operating rate "operating percentage" limitation for Bora '972.

766. I also discuss with respect to element 1(f) how Bora '972 in several instances will show in real time the color being selected either through a color slider (e.g. Fig. 38E, 97 and descriptions thereof) or the use of circular color and saturation areas (e.g. Figs 67-68 and descriptions thereof) and how these may be capacity rate indicators within the claims. The color being selected would be an "operating value" and/or "operating chart" of the operating parameter of selected color and/or color temperature.

767. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill in the art.

768. Thus, Bora '972 discloses or renders obvious this limitation.

2. <u>Dependent claim 2</u>

a. 2[a] The on line free setting method according to claim 1, wherein the capacity scale simulator is a virtual track, wherein the free setting algorithm is implemented by a visual configuration of the free setting operator coupled with the virtual track and the indicator of the capacity operating rate, wherein the virtual track is designed on the touch screen panel of the mobile device, wherein the free setting operator is slidable by the user's finger along the virtual track with the indicator of the capacity operating rate simultaneously showing an instantaneous value of the changing capacity operating rate while the sliding motion of the free setting operator is being conducted, wherein the value shown in the indicator of the capacity operating rate can be

the operating percentage, the operating chart or the actual operating value of the operating parameter:

769. Bora '972 discloses or renders obvious the on line free setting method according to claim 1, wherein the capacity scale simulator is a virtual track, wherein the free setting algorithm is implemented by a visual configuration of the free setting operator coupled with the virtual track and the indicator of the capacity operating rate, wherein the virtual track is designed on the touch screen panel of the mobile device, wherein the free setting operator is slidable by the user's finger along the virtual track with the indicator of the capacity operating rate simultaneously showing an instantaneous value of the changing capacity operating rate while the sliding motion of the free setting operator is being conducted, wherein the value shown in the indicator of the capacity operating rate can be the operating percentage, the operating chart or the actual operating value of the operating parameter.

770. Bora '972 discloses this feature. Particularly Bora discloses the use of wireless smartphone controls to adjust lighting settings.

> "Generally a condition could be executed through these sources: (a) the wireless device sends a command to any number of II Devices to execute a program given a date/time passing or date/time being met (e.g., simulated sunrise, timer, etc.); (b) the wireless device sends a command to any number of II Devices to execute a program given some other conditionally based input directly available to the II Device (e.g., ambient light sensor program); (c) the wireless device sends a command to any number of II Devices to execute a program with the condition being met at that time and the action stored in the II Devices memory (e.g., reset process); (d) the wireless device sends a command to any number of II Devices to execute a program with the condition being met at that time and the action specified through the command (e.g., starry night); (e) the wireless device sends a command to any number of II Devices to execute a program given some other conditionally based input available to the lighting control network is available to said II Devices (e.g., auxiliary ambient light sensor program); (f) the wireless device sends a command to any number of II Devices to execute a program in coordination with wireless communications/commands provided sequentially through the device application (e.g., music sync); (g)

> the wireless device runs a program to monitor some condition and upon that condition being met sends a command to any number of II Devices to execute a specified command or sequence of commands (e.g., weather alerts); (h) any combination or sequential representation of the above program types."

Bora '972 at ¶ 0241.

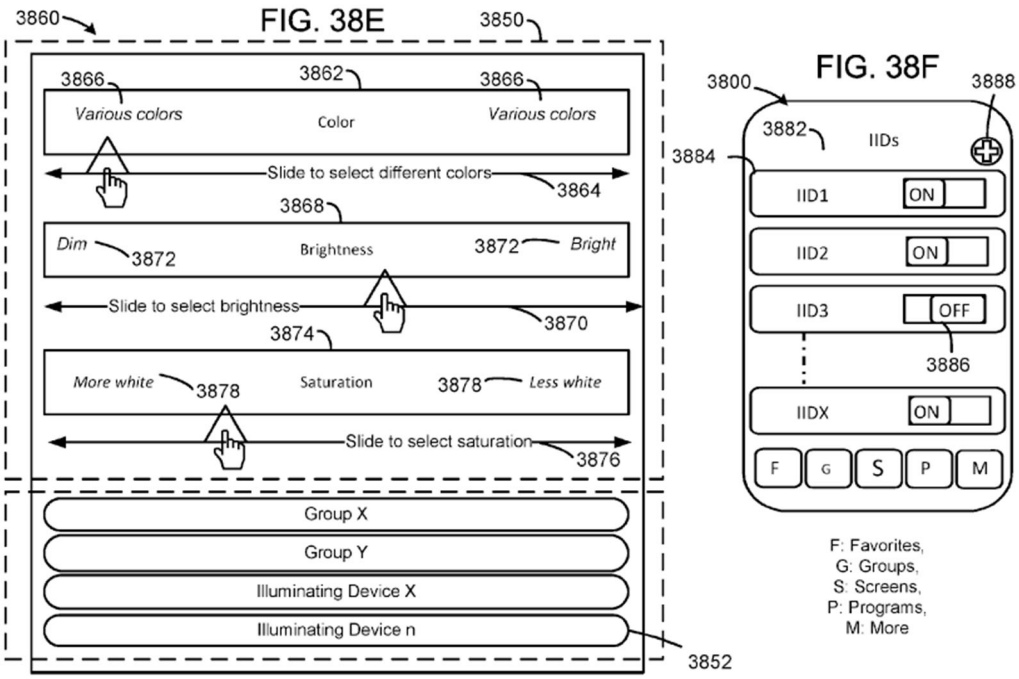
771. Figure 38E of Bora '972 and its associated description additionally shows a sliding touchscreen interface with a slidable track controllable by the user's fingers disclosing the claimed features.

772. Bora '972 discloses:

> "As shown in FIG. 38E, a configure screen 3860 is used to adjust the color 3862, brightness 3868, saturation 3874, and other configuration for selections of II Device(s), group(s), program(s), and/or scene(s). The configure screen 3860 might be different depending on the selection and specific type of configuration. In general, the configuration screen 3860 will consist of the three level lighting control interface 3850 and a list of the selection (II Device(s)/group(s)) 3852. There would most likely be related configuration screens for the selection of program conditions, scene creation/editing, and other more complex configurations."

Bora '972 at ¶ 0264.

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Bora '972 at Fig. 38E

773. Bora '972 discloses in Figure 67 and Figure 68 and their associated descriptions a similar touchscreen control system for controlling color temperature and saturation.

> "Referring to FIG. 67, in terms of representation, the II Devices 140 can be set-up in a representation 6700 similar to that of an overhead view of the space in which the II Devices are installed (i.e., a visual or virtual representation). In this case there can be a user led or automated process to place II Devices in respective locations on the screen. In addition, there might be a user generated or automated process where a user set's up their II Devices within the framework of rooms such as living room 6702 in the figure. Here a user would be prompted to create an approximate representation of the walls of a room then drag or input where the II Devices are related to the room layout 6704. The creation of the walls can be done in multiple ways using direct user input (dragging, using corners, or using predefined shapes) as well as camera functionality and estimation tools. Once a room is defined and II Devices within a room are defined a user can select the room as a whole or drill into individual lights within the room."

Bora '972 at ¶ 0346.

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> "As the II Devices can represent colors as well as variations of white with different saturation levels, the application representation in the controlling device needs to have a similar representation. Referring to FIG. 68, in the application interface (6800, 6802, 6804), this can be represented by having a color area 6806, 6808, a white light amplitude/saturation area 6810 and brightness area 6812. The color area could be a color wheel 6806, 6808 or box representative of the available color combinations, the white area could be a rotating or directional level 6810. When the white light area is at the lowest level 6814, the color area would be fully saturated with bright colors shown as R, G and B. When the white light area is at its highest level 6816, the color area would be almost completely white. In between, incremental increases in the white light level 6820 would have an effect to add less saturation to the color area, looking like a white gradient overlaid on the color area 6818 shown with sB, sG and sR (stands for less saturation of R, G and B). Here if multiple II Devices with differing ranges in color saturation are present, the controlling device will note this and only allow the white light level to reduce to the appropriate level representative of the less flexible II Devices range."

Bora '972 at ¶ 0349.

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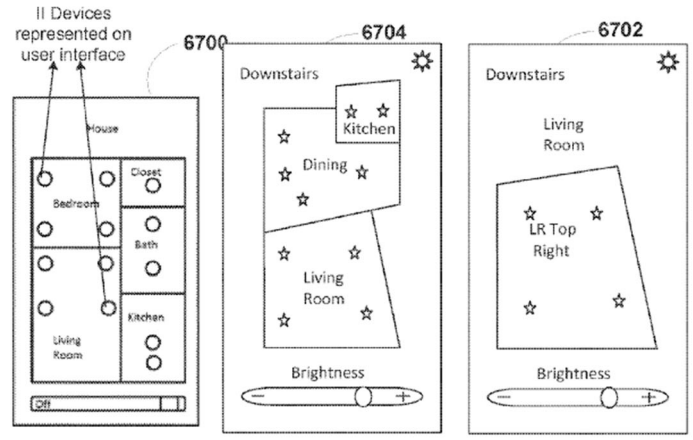


FIG. 67

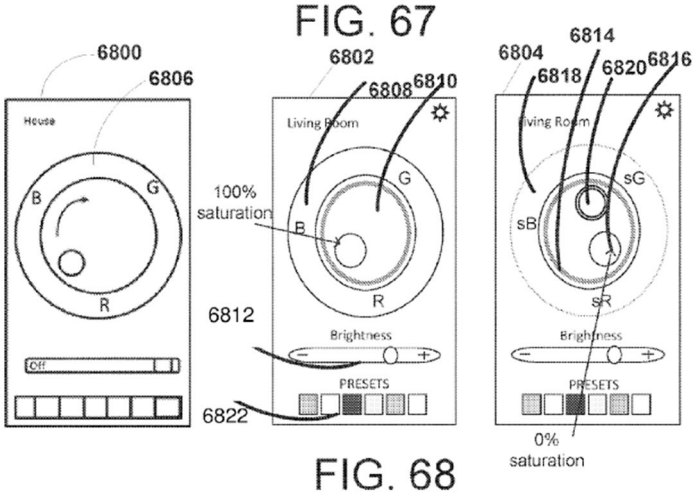


FIG. 68

Bora '972 at Figs. 68 and 69

774. Bora '972 at Figs. 97 and 98 describes yet another touchscreen calibration process which utilizes the claimed features.

775. Bora '972 discloses :

> "Now referring to FIGS. 97 and 98 an example of a screen 9700 and a flow chart of a user color calibration process 9800 in accordance with one embodiment of the present invention are shown. As explained above, same smart lights can have small differences in the light output in terms of brightness and color even if set for the same color. This is due to the variations in various parameters, such as LEDs bins, locations where they are running that affect the temperature, lifetime usage that degrades the performance of LEDs or overall system in one smartlight as compared to others. In such cases, the temperature compensation or color compensation algorithms can also fall short in maintaining the color output in various smartlights at various times. Color calibration from a user

through an application on the controller device such as smartphone directly can solve such issues. Consider a scenario where one smartlight for defined R, G, B, W values is showing a particular color, say purple that matches the user expectations and the color shown on the application. However, another smartlight shows slight variation say, light purple due to the effect of variation in any of above parameters, which doesn't match the user expectations or the color on the application itself. In such scenario, the user can color calibrate the second smartlight to match the first smartlight. The application can set parameters that will alter the R, G, B, W values for the second smartlight to match the color as per user expectation and/or the color on the controller device. These parameters can be stored either in the smartlight itself or the wireless controller. These parameters could be values for particular mathematical equations to control the light output of the smartlight, based on which the colors of both the smartlights now match the user expectations. The screen 9700 includes a first smartlight identifier or label 9702, a color slide bar 9704 and a brightness control bar 9706 for the first smartlight, a second smartlight identifier or label 9708, a color slide bar 9710 and a brightness control bar 9712 for the second smartlight, and a calibrate button 9714. The user color calibration process 9800 is launched in block 9802. A user turns two smartlights ON, one showing expected colors for various combinations and other to be calibrated in block 9804. The user through the application on the controlling device sets a particular color for both the smartlights in block 9806. This is done by controlling the colors of the both smartlights individually in a special color calibration screen in the controller device so that both the smartlights emits same color visually. Once the smartlights match the colors through color calibration screen in the application, the user presses calibrate on the screen to send calibrate command through the application in block 9808. When the user sends calibration command, the application calculates the parameters and sends those parameters to the second smartlight where they are stored internally in block 9810. The application calculates or tweaks the already present calibration parameters and sends those to the second smartlight where they are stored internally in block 9812. If the user is not satisfied with the overall color matching between the two smartlights, as determined in decision block 9814, the user repeats the process beginning at block 9806 for various other colors and until he is satisfied with overall color matching to send more parameters to the second smartlight or tweak the parameters already sent. If, however, the user is satisfied with the overall color matching between the two smartlights, as determined in decision block 9814, the process stops in block 9818."

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Bora '972 at ¶¶ 0421-22.

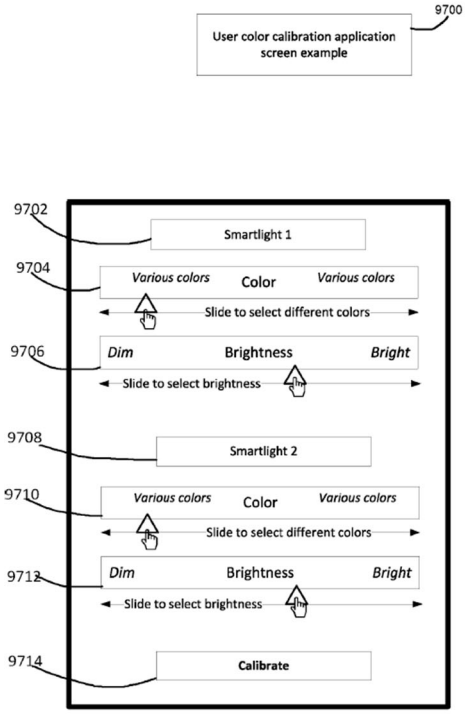


Fig. 97

Bora '972 at Fig. 97.

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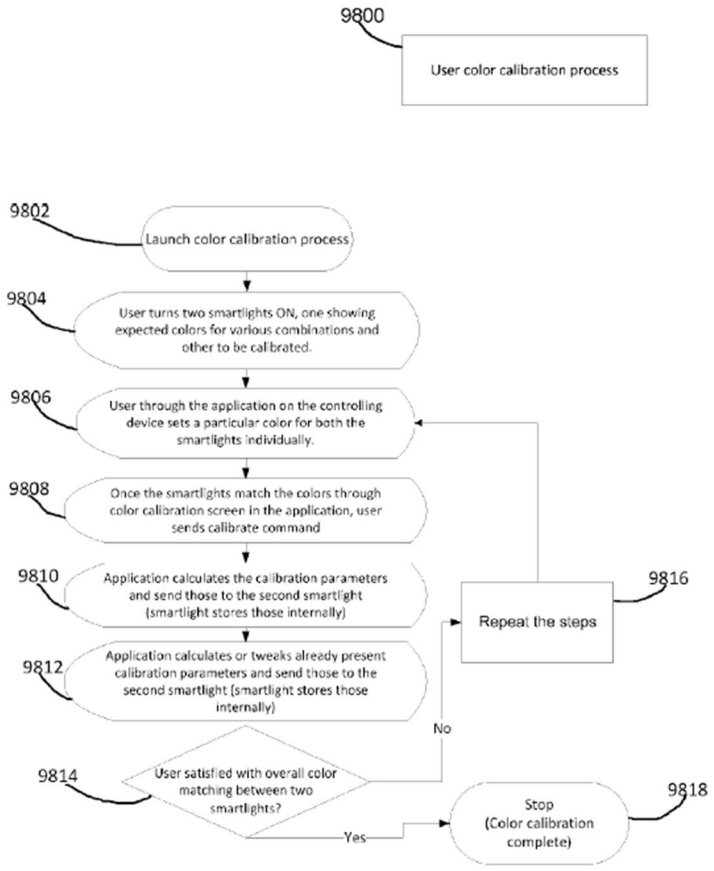


Fig. 98

Bora '972 at Fig. 98.

776. With respect to "simultaneously showing an instantaneous value of the changing capacity operating rate while the sliding motion of the free setting operator is being conducted, wherein the value shown in the indicator of the capacity operating rate can be the operating percentage, the operating chart or the actual operating value of the operating parameter." I discuss these limitations with respect to elements 1(f) and 1(g) and particularly how Bora '972 discloses or renders obvious a percentage display and a live display of color selection. *See* elements 1(f) and 1(g), *supra*; Bora '972 at ¶¶264, 346, 349; Figures 38E, 67, 68, 97, 98.

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777. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of the knowledge of a person of ordinary skill.

778. Thus, Bora '972 discloses or renders obvious this limitation.

b. 2[b] wherein the full length of the virtual track represents a simulation of the value of the maximum operating capacity of the operating parameter, wherein the capacity operating rate is determined by a parking location of the free setting operator on the virtual track when the sliding motion stops.

779. Bora '972 discloses or renders obvious that the full length of the virtual track represents a simulation of the value of the maximum operating capacity of the operating parameter, wherein the capacity operating rate is determined by a parking location of the free setting operator on the virtual track when the sliding motion stops.

780. These features are disclosed with respect to elements 1(f) and 1(g) and the sliding graphical controls discussed therein, in which the capacity operating rate of the various lighting features are determined by the positions of the slider or color controls when they stop and the end of the slider indicates a maximum capacity. *See* elements 1(f) and 1(g), *supra*; Bora '972 at ¶¶264, 346, 349; Figures 38E, 67, 68.

781. As set forth with respect to element 1(a) these operations may be performed on a mobile device with touch operations. *See* element 1(a), *supra,* Bora '972 at ¶059.

782. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of, for example, Hotelling.

783. Hotelling discloses a GUI system for consumer devices, noting: "A user interface method is disclosed. The method includes detecting a touch and then determining a user interface mode when a touch is detected. The method further includes activating one or more GUI elements based on the user interface mode and in response to the detected touch." Hotelling at Abstract .

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784. Hotelling additionally discloses the specifics of the sliding interface.

> "The computer system 50 also includes an input device 70 that is operatively coupled to the processor 56. The input device 70 is configured to transfer data from the outside world into the computer system 50. The input device 70 may for example be used to perform tracking and to make selections with respect to the GUI 69 on the display 68. The input device 70 may also be used to issue commands in the computer system 50. The input device 70 may include a touch sensing device configured to receive input from a user's touch and to send this information to the processor 56. By way of example, the touch-sensing device may correspond to a touchpad or a touch screen. In many cases, the touch-sensing device recognizes touches, as well as the position and magnitude of touches on a touch sensitive surface. The touch sensing means reports the touches to the processor 56 and the processor 56 interprets the touches in accordance with its programming. For example, the processor 56 may initiate a task in accordance with a particular touch. A dedicated processor can be used to process touches locally and reduce demand for the main processor of the computer system. The touch sensing device may be based on sensing technologies including but not limited to capacitive sensing, resistive sensing, surface acoustic wave sensing, pressure sensing, optical sensing, and/or the like. Furthermore, the touch sensing means may be based on single point sensing or multipoint sensing. Single point sensing is capable of only distinguishing a single touch, while multipoint sensing is capable of distinguishing multiple touches that occur at the same time."

Hotelling at 6:33-61.

785. Hotelling further describes the operation of the disclosed graphical touch interface system, noting:

> "FIG. 2 is a multipoint processing method 100, in accordance with one embodiment of the present invention. The multipoint processing method 100 may for example be performed in the system shown in FIG. 1. The multipoint processing method 100 generally begins at block 102 where images are read from a multipoint input device, and more particularly a multipoint touch screen. By way of example, the multipoint touch screen may generally correspond to the multipoint touch screen disclosed in copending U.S. patent application Ser. No. 10/840,862, which is hereby incorporated herein by reference. Although the term "image" is used it should be noted that the data may come in other forms. In most cases, the image read from the touch screen provides magnitude (Z) as a

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function of position (x and y) for each sensing point or pixel of the touch screen. The magnitude may, for example, be reflect the capacitance measured at each point. Following block 102, multipoint processing method 100 proceeds to block 104 where the image is converted into a collection or list of features. Each feature represents a distinct input such as a touch. In most cases, each feature includes its own unique identifier (ID), x coordinate, y coordinate, Z magnitude, angle θ, area A, and the like. By way of example, FIGS. 3A and 3B illustrate a particular image 120 in time. In image 120, there are two features 122 based on two distinct touches. The touches may for example be formed from a pair of fingers touching the touch screen. As shown, each feature 122 includes unique identifier (ID), x coordinate, y coordinate, Z magnitude, angle θ, and area A. More particularly, the first feature 122A is represented by ID1, x1, y1, Z1, θ1, A1 and the second feature 122B is represented by ID2, x2, y2, Z2, θ2, A2. This data may be outputted for example using a multitouch protocol. The conversion from data or images to features may be accomplished using methods described in copending U.S. patent application Ser. No. 10/840,862 which is hereby incorporated herein by reference. As disclosed therein, the raw data is received. The raw data is typically in a digitized form, and includes values for each node of the touch screen. The values may be between 0 and 256 where 0 equates to no touch pressure and 256 equates to full touch pressure. Thereafter, the raw data is filtered to reduce noise. Once filtered, gradient data, which indicates the topology of each group of connected points, is generated. Thereafter, the boundaries for touch regions are calculated based on the gradient data, i.e., a determination is made as to which points are grouped together to form each touch region. By way of example, a watershed algorithm may be used. Once the boundaries are determined, the data for each of the touch regions are calculated (e.g., x, y, Z, θ, A). Following block 104, multipoint processing method 100 proceeds to block 106 where feature classification and groupings are performed. During classification, the identity of each of the features is determined. For example, the features may be classified as a particular finger, thumb, palm or other object. Once classified, the features may be grouped. The manner in which the groups are formed can widely varied. In most cases, the features are grouped based on some criteria (e.g., they carry a similar attribute). For example, the two features shown in FIGS. 3A and 3B may be grouped together because each of these features is located in proximity to each other or because they are from the same hand. The grouping may include some level of filtering to filter out features that are not part of the touch event. In filtering, one or more features may be rejected because they either meet some predefined criteria or because they do not meet some

criteria. By way of example, one of the features may be classified as a thumb located at the edge of a tablet PC. Because the thumb is being used to hold the device rather than being used to perform a task, the feature generated therefrom is rejected, i.e., is not considered part of the touch event being processed. Following block 106, the multipoint processing method 100 proceeds to block 108 where key parameters for the feature groups are calculated. The key parameters may include distance between features, x/y centroid of all features, feature rotation, total pressure of the group (e.g., pressure at centroid), and the like. As shown in FIG. 4, the calculation may include finding the centroid C, drawing a virtual line 130 to each feature from the centroid C, defining the distance D for each virtual line (D1 and D2), and then averaging the distances D1 and D2. Once the parameters are calculated, the parameter values are reported. The parameter values are typically reported with a group identifier (GID) and number of features within each group (in this case three). In most cases, both initial and current parameter values are reported. The initial parameter values may be based on set down, i.e., when the user sets their fingers on the touch screen, and the current values may be based on any point within a stroke occurring after set down. As should be appreciated, blocks 102-108 are repetitively performed during a user stroke thereby generating a plurality of sequentially configured signals. The initial and current parameters can be compared in later steps to perform actions in the system. Following block 108, the process flow proceeds to block 110 where the group is or associated to a user interface (UI) element. UI elements are buttons boxes, lists, sliders, wheels, knobs, etc. Each UI element represents a component or control of the user interface. The application behind the UI element(s) has access to the parameter data calculated in block 108. In one implementation, the application ranks the relevance of the touch data to the UI element corresponding there to. The ranking may be based on some predetermine criteria. The ranking may include producing a figure of merit, and whichever UI element has the highest figure of merit, giving it sole access to the group. There may even be some degree of hysteresis as well (once one of the UI elements claims control of that group, the group sticks with the UI element until another UI element has a much higher ranking). By way of example, the ranking may include determining proximity of the centroid (or features) to the GUI object associated with the UI element. Following block 110, the multipoint processing method 100 proceeds to blocks 112 and 114. The blocks 112 and 114 can be performed approximately at the same time. From the user perspective, in one embodiment, the blocks 112 and 114 appear to be performed concurrently. In block 112, one or more actions are performed based on differences between initial and current parameter values as well as the UI

element to which they are associated. In block 114, user feedback pertaining to the one or more action being performed is provided. By way of example, user feedback may include display, audio, tactile feedback and/or the like. FIG. 5 is a parameter calculation method 150, in accordance with one embodiment of the present invention. The parameter calculation method 150 may, for example, correspond to block 108 shown in FIG. 2. The parameter calculation method 150 generally begins at block 152 where a group of features is received. Following block 152, the parameter calculation method 150 proceeds to block 154 where a determination is made as to whether or not the number of features in the group of features has changed. For example, the number of features may have changed due to the user picking up or placing an additional finger. Different fingers may be needed to perform different controls (e.g., tracking, gesturing). If the number of features has changed, the parameter calculation method 150 proceeds to block 156 where the initial parameter values are calculated. If the number stays the same, the parameter calculation method 150 proceeds to block 158 where the current parameter values are calculated. Thereafter, the parameter calculation method 150 proceeds to block 150 where the initial and current parameter values are reported. By way of example, the initial parameter values may contain the average initial distance between points (or Distance (AVG) initial) and the current parameter values may contain the average current distance between points (or Distance (AVG) current). These may be compared in subsequent steps in order to control various aspects of a computer system. The above methods and techniques can be used to implement any number of GUI interface objects and actions. For example, gestures can be created to detect and effect a user command to resize a window, scroll a display, rotate an object, zoom in or out of a displayed view, delete or insert text or other objects, etc. Gestures can also be used to invoke and manipulate virtual control interfaces, such as volume knobs, switches, sliders, handles, knobs, doors, and other widgets that may be created to facilitate human interaction with the computing system."

Hotelling at at 10:25-12:50.

786. Figure 2 of Hotelling provides an overview of the disclosed process:

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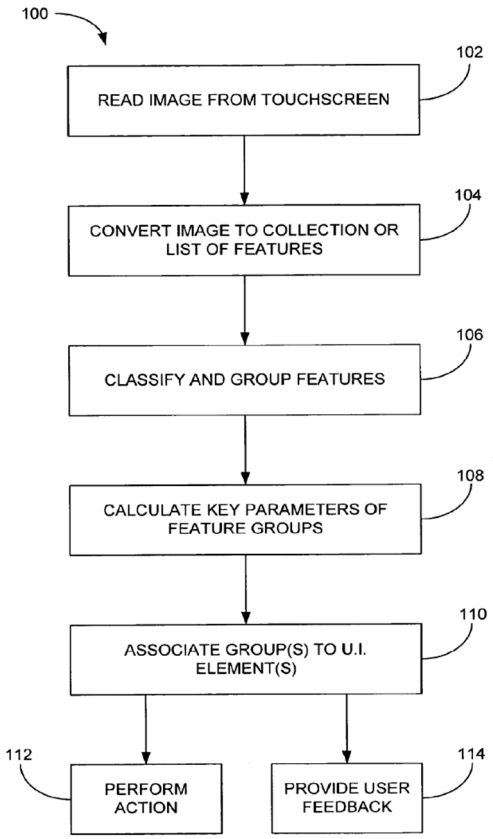


FIG. 2

787. Hotelling further elaborates on the claimed interface noting

> "As shown in FIG. 6G, based on the rotation vector the speaker 192 of the tablet PC 175 increases (or decreases) its output in accordance with the amount of rotation of the fingers 176, i.e., increase the volume by 5% based on rotation of 5 degrees. The display 174 of the tablet PC can also adjust the rotation of the knob 170 in accordance with the amount of rotation of the fingers 176, i.e., the position of the knob 170 rotates five (5) degrees. In most cases, the rotation of the knob occurs simultaneously with the rotation of the fingers, i.e., for every degree of finger rotation the knob rotates a degree. In essence, the virtual control knob follows the gesture occurring on the screen. Still further, an audio unit 194 of the tablet PC may provide a clicking sound for each unit of rotation, e.g., provide five clicks based on rotation of five degrees. Sill yet further, a haptics unit 196 of the tablet PC 175 may provide a certain amount of vibration or other tactile feedback for each click thereby simulating an actual knob."

Hotelling at 13:61-14:11.

788. Thus, to the extent this limitation is not disclosed by Bora '972, it is disclosed or rendered obvious in the interface of Hotelling. A person of ordinary skill would be motivated to combine Bora '972 with Hotelling to improve user interface capabilities and allow more facile controls. Such modifications would be conventional and would be performed with a reasonable expectation of success.

C. INDEFINITENESS OF CLAIMS 1 AND 2 OF THE '564 PATENT

789. For the reasons set forth below, claims 1 and 2 of the '564 patent are invalid as indefinite.

1. An "on line free setting method"

790. I have been advised by counsel that "hybrid" claims that recite both apparatuses and methods for using those apparatuses are indefinite, if those claims do not inform a person of ordinary skill whether the apparatus itself is infringing or if a method must be performed.
In my opinion claims 1 and 2 of the '564 patent are indefinite. Claim 1 recites an "on line free setting method." However, the body of the claim recites two apparatus elements, including a "user interface APP," and a "microcontroller." The claims proceed to recite various capabilities of the microcontroller or APP but do not clearly indicate whether the capabilities must be utilized for infringement. Claim 1 does not specifically recite any method steps. Indeed, I note that the claim elements of claim 1 of the '564 patent are structured the same way as the claim elements of claim 12-15 of the '367 patent (apparatus claims) or the '503 patent (apparatus claims), reciting functions of recited apparatus elements, rather than method steps that must expressly be performed. Thus, a person of ordinary skill would not understand with reasonable certainty whether the claims are infringed by the APP and microcontroller themselves or by the performance of method steps.

791. Thus, in my opinion, claims 1 and 2 are indefinite for at least this reason.

2. "free setting"

792. Separately, the '564 patent does not define the term "free setting," which is not a term of art. Accordingly, a person of ordinary skill in the art would have no idea what makes something "free setting" or not, let alone what a "free setting algorithm" or "free setting operator" is. A person of ordinary skill in the art would not understand with reasonable certainty whether any algorithm or operator is "free setting" and thus these terms are indefinite.

793. Thus, in my opinion, claims 1 and 2 are indefinite for at least this reason.

3. "facilitate the user's decision making process in setting a desired level of the operating parameter"

794. Claim 1 of the '564 patent recites that a "capacity operating rate" will "facilitate the user's decision making process in setting a desired level of the operating parameter." This term lacks any objective indicators of when it is met. Neither the claim language or the specification of the '564 patent give any objective measurement of what it means for a user's decision making process to be facilitated, how one would know such a thing, or the amount of assistance necessary for it to be facilitated. For example, does facilitation depend on the intelligence of a user or is it an objective criteria? The '564 patent provides no guidance regarding this issue. Accordingly, for these reasons, a person of ordinary skill could not ascertain the meaning of this term with reasonable certainty and this term is indefinite.

795. Thus, in my opinion, claims 1 and 2 are indefinite for at least this reason.

4. "operating chart"

796. Claim 1 of the '564 patent recites that "the capacity operating rate shown in the indicator can be an operating percentage, an operating chart or an actual operating value of the relevant operating parameter."

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797. The word "operating chart" does not appear anywhere in the '564 patent specification. Nor is this a term of art in the relevant technical fields of the '564 patent. The specification of the '564 patent describes in several instances two alternatives for the "indicator", an operating percentage and an operating value (*see e.g.,* '564 patent at 4:10-12, 4:36-40; 25-36:40). However, the claims additionally recite an "operating chart." A person of ordinary skill would not have any meaningful indication of what constitutes an "operating chart" let alone reasonable certainty. I note that the term "operating chart" was first added to the claims in a March 16, 2018 amendment. This is consistent with my understanding that this term was not described in the '564 patent as written.

798. Accordingly, for the reasons set forth above claims 1 and 2 of the '564 Patent are indefinite.

[redacted]

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[redacted]

XII. THE '367 PATENT

A. DISCLOSURE OF THE CLAIMED INVENTION

804. The '367 patent was filed on October 29, 2018 and issued on May 26, 2020. The face of the document states it was assigned to Chia-Teh Chen. The named inventor is Chia-Teh Chen. I understand Plaintiff has asserted claims 12, 14, 15, and 24.

805. The invention is described as covering "An on line free setting method for setting an operating parameter of a lighting device." '367 patent at Abstract.

1. Background of the Invention and Summary of the Invention

806. The '367 patent is a continuation of the '564 patent and purports to address the same problems with the same solutions as the '564 patent.

B. THE ASSERTED CLAIMS

807. Below, I have reproduced the asserted claims for reference, as well as claim 13, from which asserted claim 14 depends.

12. [pre] An LED security light, comprising:

[a] a light emitting unit comprising at least a first LED lighting load emitting light with a first color temperature;

[b] a photo sensor;

[c] a motion sensor;

[d] a power supply unit; and

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[e] an external control unit, electrically coupled with the loading and power control unit;

[f] wherein the loading and power control unit comprises a controller and a switching circuitry, wherein the controller is electrically coupled with the photo sensor, the motion sensor and the switching circuitry;
[g] wherein the switching circuitry is electrically coupled between a power source of the power supply unit and the light emitting unit;

[h] wherein the power source is a DC power source;

[i] wherein the switching circuitry comprises at least a first unidirectional semiconductor switching device;

[j] wherein the controller outputs control signals to control the switching circuitry for delivering different electric powers to the light emitting unit such that the light emitting unit respectively generates illuminations of different light intensities for performing different illumination modes activated by the photo sensor, the motion sensor and/or the external control unit;

[k] wherein at dusk when an ambient light detected by the photo sensor is lower than a first predetermined value, the loading and power control unit operates to turn on the light emitting unit to perform a low level illumination mode emitting a light with a low light intensity;

[l] wherein when a motion signal is detected by the motion sensor, the loading and power control unit operates to increase the electric power delivered to the light emitting unit to perform a high level illumination mode emitting the light with a high light intensity for a preset time period before being switched back to the low level illumination mode;

[m] wherein at dawn when the ambient light detected by the photo sensor is higher than a second predetermined value, the light emitting unit is switched off by the loading and power control unit;

[n] wherein the external control unit is a wireless external control signal receiver electrically coupled with the controller to receive, decode and convert at least one wireless instruction signal into at least one value of at least one operating variable interpretable to the controller, wherein the controller is programmed with an APP for the LED security light for processing the at least one value of the at least one operating variable for setting the at least one operating parameter according to the at least one operating variable received from the wireless external control signal receiver,

[o] wherein the at least one operating variable represents a setting decision by a user for choosing at least one capacity operating rate for operating at least one functional performance of the at least one operating parameter of the LED security light set by the user thru a mobile device, wherein the at least one operating parameter is used for controlling at least one of functional performance settings of the LED security light

including timer setting, light intensity setting, color temperature setting, detection sensitivity setting or performance mode switching and setting between two different illumination performance modes featured with different light intensities and different light color temperatures.

13. [a] The LED security light according to claim 12, wherein the LED security light is designed with an on line free setting method for setting at least one operating parameter of the LED security light, comprising:

[b] a user interface APP comprising at least one free setting algorithm preloaded in the mobile device to transform at least one user's setting decision into at least one operating variable;

[c] wherein when the user interface APP is activated and concluded with the at least one user's setting decision, the user interface APP manages to transmit via the mobile device at least one wireless instruction signal carrying at least one message of the at least one operating variable to the LED security light, wherein the at least one operating variable is used for processing or setting the at least one operating parameter of the LED security light.

14. [a] The LED security light according to claim 13, wherein the user interface APP is operable on a touch screen panel of the mobile device,

[b] wherein the free setting algorithm is a capacity scale simulation process implemented by a visual configuration of a fee setting operator incorporated with a capacitor scale simulator and an indicator of the capacity operating rate to facilitate making the at least one user's setting decision in setting at least one desired level of the at least one operating parameter,

[c] wherein when the free setting operator is activated by the user to interact with the capacity scale simulator, the user interface APP responsively manages to gradually adjust a value of the capacity operating rate according to an instantaneous state of interaction between the free setting operator and the capacity scale simulator with the indicator of the capacity operating rate simultaneously showing the instantaneous state of the capacity operating rate, wherein the capacity operating rate shown in the indicator can be an operating percentage, an operating chart or an actual operating value of a relevant operating parameter, wherein when a free setting motion of the free setting operator is ceased with at least one setting decision, the user interface APP manages to generate the at least one operating variable corresponding to a selection of the at least one capacity operating rate and accordingly operates to transmit the at least one wireless instruction signal carrying a message of the operating variable to the LED security light for setting the relevant operating parameter.

15. [a] The LED security light according to claim 14, wherein the capacity scale simulator is a virtual track, wherein the free setting algorithm is implemented by operating the free setting operator to interact with the virtual track and the indicator of the

capacity operating rate, wherein the free setting operator is slidable by the user's finger along the virtual track with the indicator of the capacity operating rate simultaneously showing instantaneous state of a changing capacity operating rate while the sliding motion of the free setting operator is being conducted, wherein the state shown in the indicator of the capacity operating rate can be an operating percentage, an operating chart or an actual operating value of the at least one operating parameter,

[b] wherein the full length of the virtual track represents a simulation of the value of the maximum operating capacity of the at least one operating parameter, wherein the capacity operating rate is determined by a parking location of the free setting operator on the virtual track when the sliding motion stops.

24. The LED security light according to claim 12, wherein the at least one operating parameter is for setting the light intensity of the low level illumination mode or the high level illumination mode.

808. As is apparent, as with the '564 patent, the claims describe a lighting system controlled by one or more applications on a mobile device using various conventional interface components.

C. PROSECUTION HISTORY

809. During prosecution of the application that led to the '367 patent, the Applicant filed a terminal disclaimer to traverse a double-patenting rejection over '564 patent. The terminal disclaimer was approved. However, the Applicant amended the claims thereafter and those amended claims were rejected by the Patent Office over cited prior art. The Applicant amended the pending claims to get around the cited prior art. The Patent Office allowed the claims based on this amendment.

810. I discuss the Certificate of Corrections requested in connection with this patent above.

D. PRIORITY DATE

811. I understand that Plaintiff's outside counsel has represented that it alleges that the priority date of the '367 patent is no earlier than September 2, 2016.

E. CLAIM CONSTRUCTION

812. I understand that the below term of the '367 patent has been construed by the Court. The relevant claim term is listed below:

Term	Court's Construction
preloaded in [the] mobile device[13]	"loaded in a mobile device before the mobile device is purchased or first used"

813. For all terms of the '367 patent not addressed in the chart above, I understand that the term should be defined using its plain and ordinary meaning, which is the meaning that would be understood by a person of ordinary skill in the art of the priority date of the invention.

XIII. INVALIDITY ANALYSIS REGARDING THE '367 PATENT

A. OVERVIEW OF PRIOR ART

1. Bora '972

814. As discussed above, Bora '972 was filed on July 7, 2016 and was published on November 3, 2016. I understand that Bora '972 therefore is prior art to claims 12, 14, 15, and 24 of the '367 patent.

815. As discussed above, Bora '972 is directed to a home lighting system for automating and controlling lighting features.

[13] I understand that as discussed above, the Court construed the term "preloaded in a mobile device" that appears on the '564 patent. It is my understanding that the term "preloaded in the mobile device" should be given the same construction as "preloaded in a mobile device" as the article "the" in this term is used to refer back to the claim element "mobile device" that was introduced in an earlier claim.

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B. CLAIMS 12, 14, 15, AND 24 ARE ANTICIPATED BY BORA '972 OR RENDERED OBVIOUS BY BORA '972 ALONE OR IN VIEW OF BONDY AND/OR HOTELLING

1. Independent claim 12

a. 12[pre] An LED security light

816. Bora '972 discloses or renders obvious an LED security light.

817. Bora '972 discloses "The present invention provides an easily installed and transferable lighting and home automation solution because special or customized installation is not required. The present invention presents a solution to controlling, programming, and automating lighting devices, such that the color and brightness of any individual light or a group of lights can be manually or automatically controlled using a wireless interface. A user has the flexibility to personalize the color, atmosphere, and mood of a room to better fit ones preference, time of day, or occasion at hand." Bora '972 at ¶ 0117.

818. To the extent the preamble is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

819. To the extent the preamble is limiting, Bora '972 discloses it or renders it obvious.

b. 12[a] a light emitting unit comprising at least a first LED lighting load emitting light with a first color temperature

820. Bora '972 discloses or renders obvious a light emitting unit comprising at least a first LED lighting load emitting light with a first color temperature.

821. Bora '972 discloses II Device 140 that "includes a two or more LEDs 122 electrically connected to the LED current control circuit 120." Bora '972 at ¶ 0122. Bora '972 also discloses "at least one of the LEDs 122 may include a series of LEDs, a group of LEDs, an array of LEDs, two or more series-connected LEDs, two or more parallel-connected LEDs or a combination thereof. Typically, the first color LED 122 *a* and the second color LED 122 *b* will

be selected from a red LED, a green LED, a blue LED, a red LED, a white LED, a tri-color LED and a four-color LED." *Id.* A white LED selected as the first color LED 122 *a* has a color temperature.

822. Figure 1 below depicts LED board 136 and LEDs 122a and 122b.

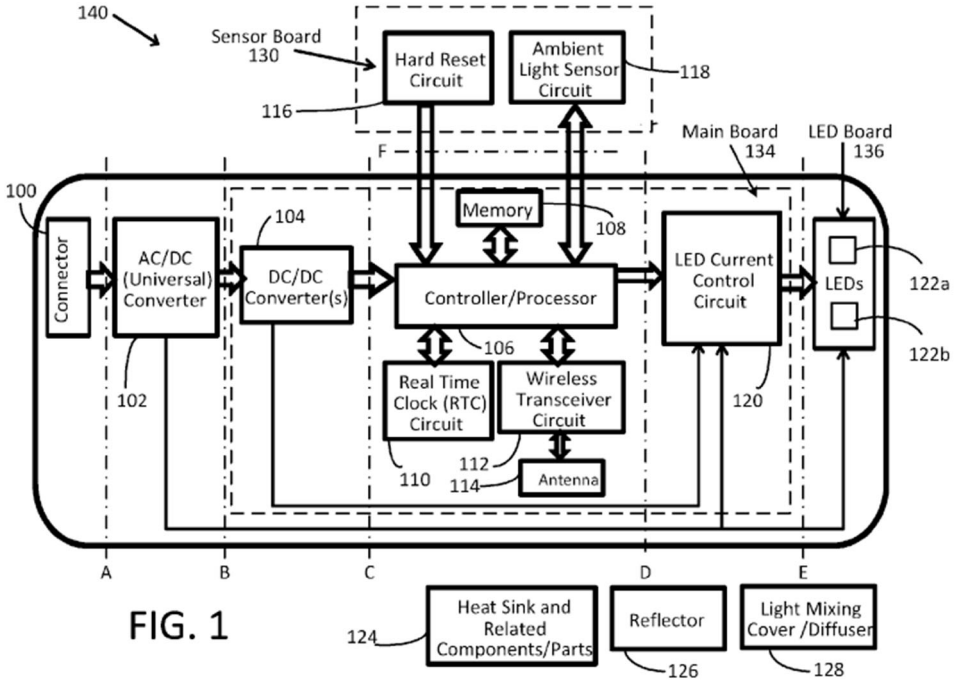


FIG. 1

Bora '972, Figure 1

823. Bora '972 also discloses that "The user can also program the II DEVICE as a function of at least one variable mentioned above and at least one variable as below: 1. Maximum warmness in terms of color temperature, such as light with 2300K color temperature is considered as a warm light; 2. Maximum coolness in terms of color temperature, such as light with 6000K color temperature is considered as a cool light; and/or 3. Sensor input such as that from temperature information from a temperature sensor in a particular room." Bora '972 at ¶ 0380.

824. Thus, Bora '972 discloses or renders obvious this limitation.

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c. 12[b] a loading and power control unit

825. Bora '972 discloses or renders obvious a loading and power control unit.

826. Bora '972 discloses a II Device 140 includes "a controller/processor 106 [and] a light emitting diode (LED) current control circuit 120 communicably coupled to the controller/processor 106." Bora '972 at ¶ 0122. Bora '972 discloses that "[t]he LED current control circuit 120 executes commands from the controller/processor 106 to control the current passed through the LEDs 122." Bora '972 at ¶ 0140. Bora '972 further discloses that "the controller/processor 106 sends commands to LED drivers (208 or 318, 320, 322, 324, or 508), switches or multiplexer (500, 502, 504, 506 or 702), which in turn controls the light output by controlling the average current passed through the LEDs 122." *Id.*

827. Annotated Figure 1 below depicts the controller/processor 106 and the LED current control circuit 120 of the loading and power control unit.

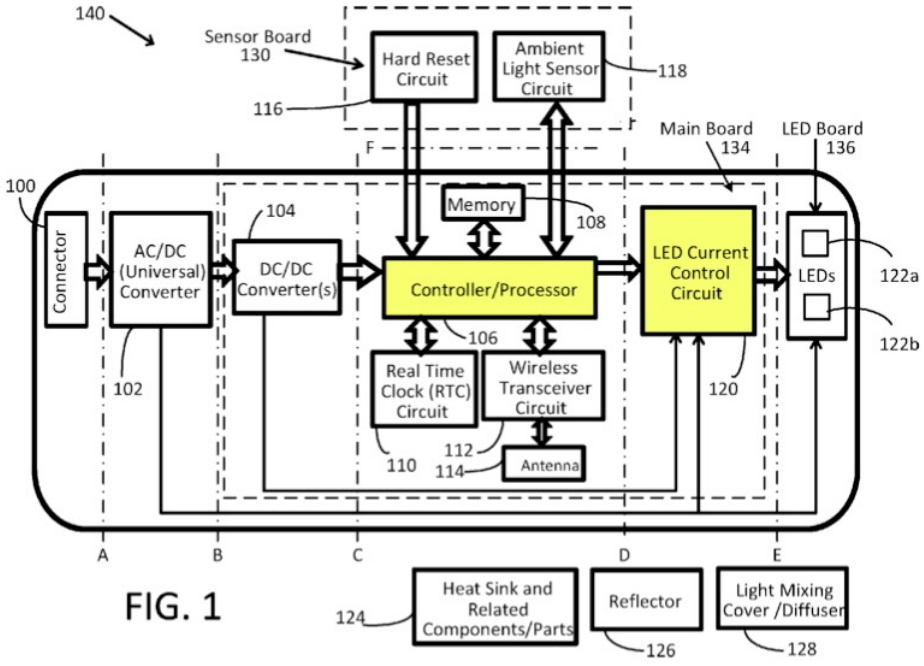


FIG. 1

Bora '972, Figure 1

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828. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

829. Thus, Bora '972 discloses or renders obvious this limitation.

d. 12[c] a photo sensor

830. Bora '972 discloses or renders obvious a photo sensor.

831. Bora '972 discloses that the II Device 140 has "an ambient light sensor circuit 118. The ambient light sensor circuit 118 consists of one or more ambient light sensors (photosensor or similar light detecting component) and supporting circuit. The ambient light sensor(s) in the ambient light sensor circuit 118 detects a level of captured ambient light, converts that level into an analog signal, and sends that data to the controller/processor via an analog to digital (A/D) converter that could be a part of the ambient light sensor circuit 118 or controller/processor 106." Bora '972 at ¶ 0136.

832. Annotated Figure 1 below depicts the ambient light sensor circuit 118.

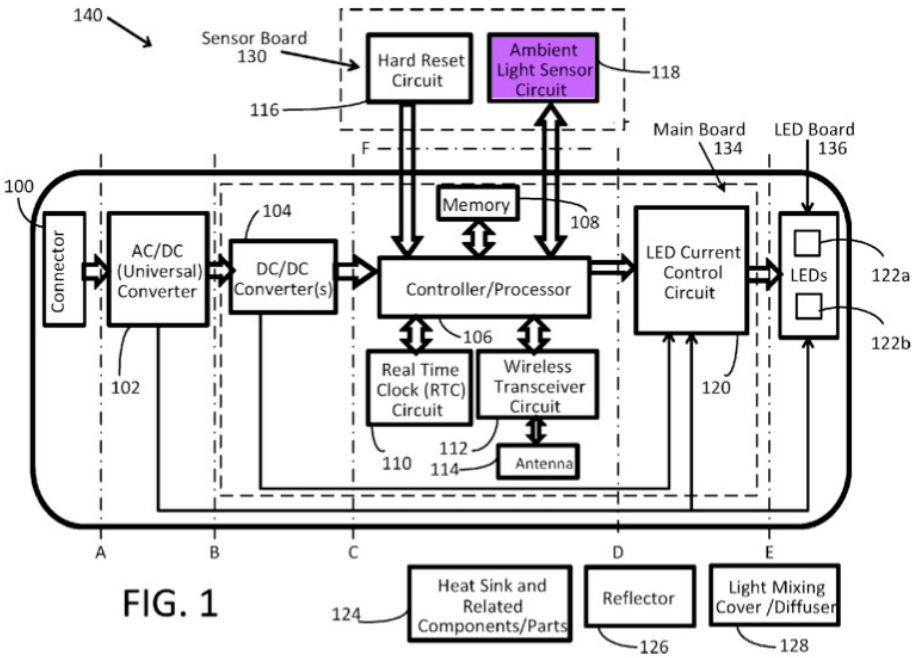


FIG. 1

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Bora '972, Figure 1

833. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

834. Thus, Bora '972 discloses this limitation.

e. 12[d] a motion sensor

835. Bora '972 discloses a motion sensor.

836. Bora '972 discloses that "the devices disclosed herein may include other sensors, such as . . . a motion sensor." Bora '972 at ¶ 0138. Bora '972 further discloses that the controller/processor can be coupled to a motion sensor to detect motion and execute a program accordingly. Bora '972 at ¶ 0406.

837. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

838. Thus, Bora '972 discloses or renders obvious this limitation.

f. 12[e] a power supply unit

839. Bora '972 discloses or renders obvious a power supply unit.

840. Bora '972 discloses that the II Device includes an AC/DC power converter 102. Bora '972 at ¶ 0124. Bora '972 discloses that "The AC to DC converter 102 receives power from the connector 100 and outputs the appropriate DC power to the DC/DC converter 104, the LED current controlling 120 circuit, and LED circuit 122. . . .The exact power input might vary depending on country specific standards or power sources, but as a universal converter, the power output will always be DC voltage such as 12 VDC or 18 VDC or 24 VDC." Bora '972 at ¶ 0127.

841. Annotated Figure 1 below depicts the AC/DC power converter 102.

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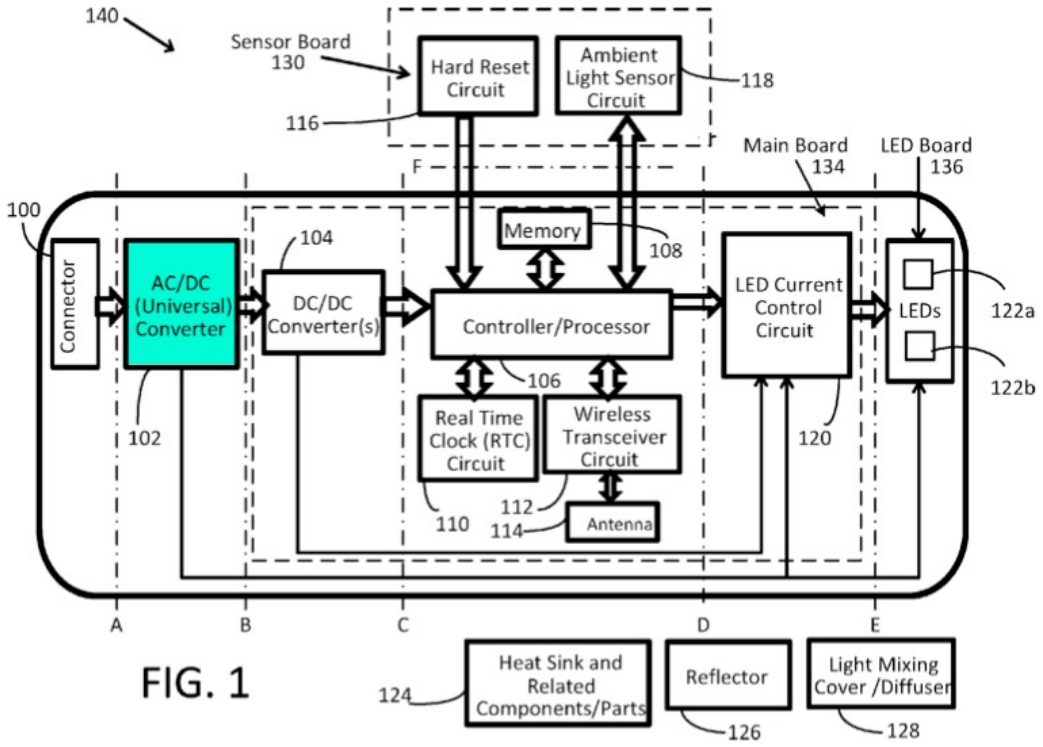


FIG. 1

Bora '972, Figure 1

842. Bora '972 also discloses "For embodiments where multiple LED arms (302, 304, 306, and 308) are present, unique to the presented schemes is a method to maximize the potential current passed through and subsequent luminosity of each LED arm with limited available current from the AC/DC converter 102. This is done by controlling the current passed through by the LED driver (208 or 318, 320, 322, 324, or 508) so that only one LED driver (208 or 318 or 320 or 322 or 324 or 508) can pass through current at a time. This allows each on/off signal to provide a maximum current supplied by the DC/DC power converter to the LED 122. By varying and alternating very short lengths of time that current is passed through different LED arms (302, 304, 306, 308) using LED current control circuit 120, the schemes also allow the multiple LED arms (302, 304, 306, 308) to produce an overall blended light that is capable of various colors, saturation, and brightness. These schemes allow the II Device 140 to provide the highest level of

individual luminosity emitted related to one of the LED arms (302, 304, 306, 308), such as white, red, blue, or green, while also allowing for all combinations of color, brightness, and saturation to be achievable." Bora '972 at ¶ 0141.

843. Annotated Figure 1 below depicts the DC/DC power converter 104.

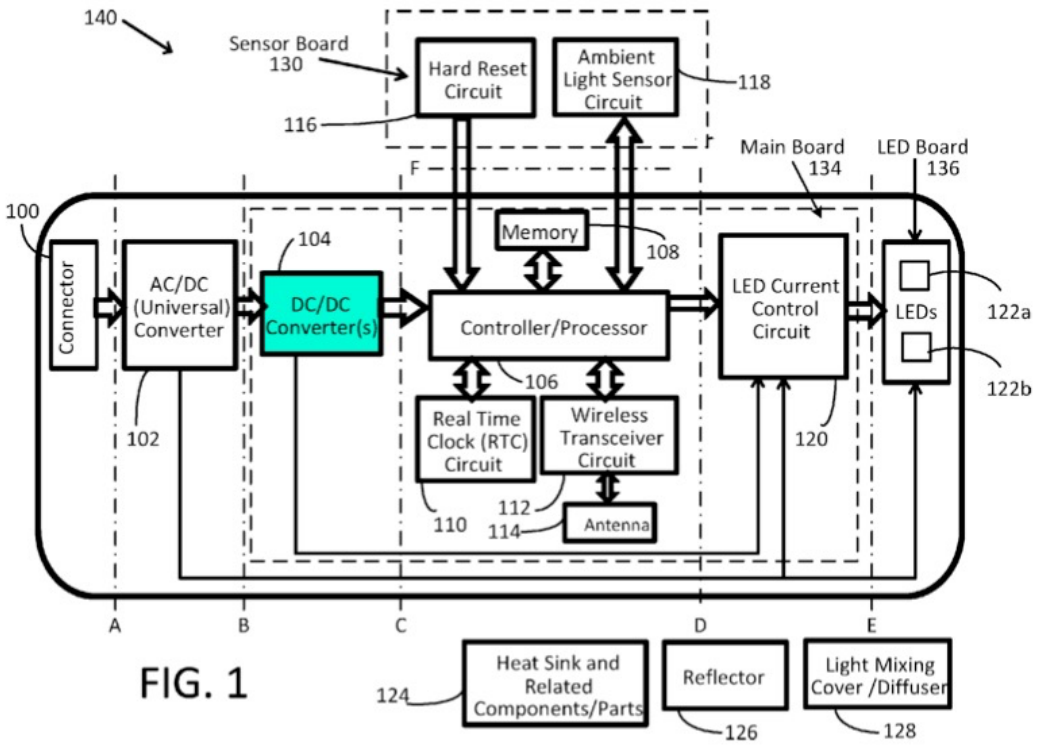


FIG. 1

Bora '972, Figure 1

844. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

845. Thus, Bora '972 discloses or renders obvious this limitation.

g. 12[f] an external control unit, electrically coupled with the loading and power control unit

846. Bora '972 discloses or renders obvious an external control unit, electrically coupled with the loading and power control unit.

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847. Bora '972 discloses that the II Device has a "a wireless transceiver circuit 112 communicably coupled to the controller/processor 106" and "an antenna 114 communicably coupled to the wireless transceiver circuit 112." Bora '972 at ¶ 0124.

848. Bora '972 discloses that "[t]he controller/processor 106 processes signals received from . . . the wireless transceiver circuit 112." Bora '972 at ¶ 0129.

849. Annotated Figure 1 below depicts the wireless transceiver 112 and antenna 114.

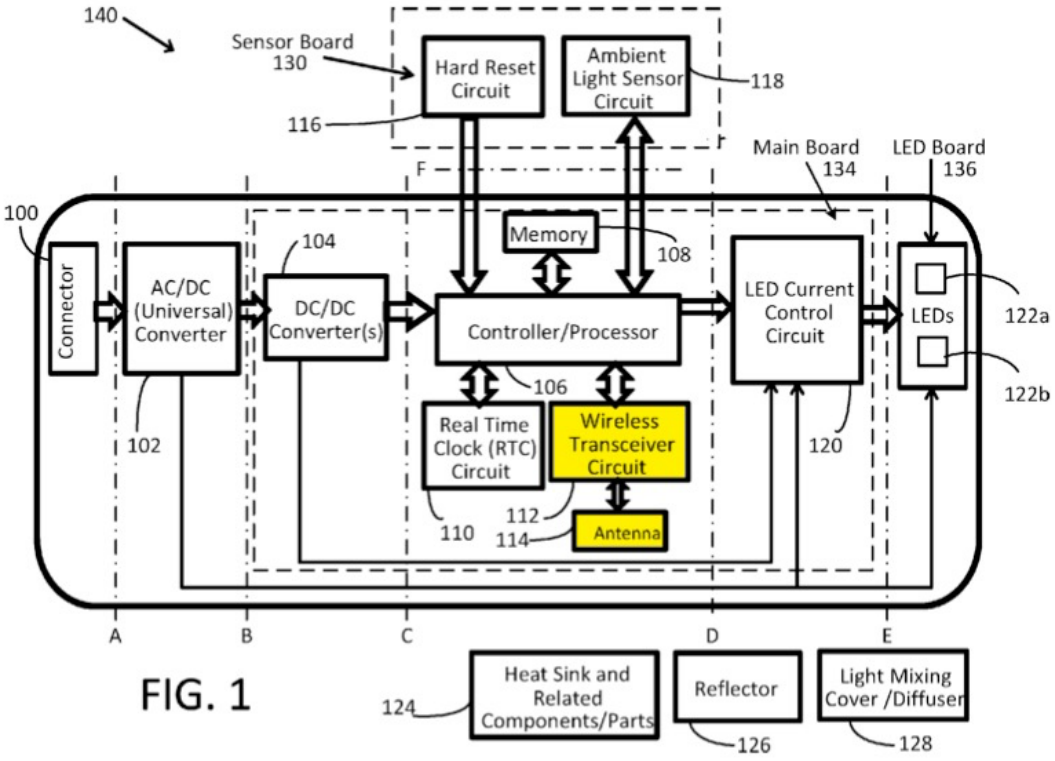


FIG. 1

Bora '972, Figure 1

850. Bora '972 discloses that "a user could send a lighting command to an II Device by selecting the command via the device application 2304. Upon the user's selection of a command for a specific II Device, the device application would translate the user's requested command into a light setting command and the specific stored ID for the selected II Device 2306. This light setting command would include instructions for the specified II Device ID to execute such as

on/off, color, brightness, or a program. The light setting command would be translated into the appropriate wireless communication protocol and wirelessly sent via the wireless device 2308. The II Device if in range of the wireless communication or mesh network 2309 relay communication would receive the protocol via the II Device's antenna 2310. The transceiver/receiver circuitry would decode the wireless protocol to find the light setting command and send that to the controller/processor 2312. The controller will execute that command with the respective II Device's related components 2314." Bora '972 at ¶ 0213.

851. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

852. Thus, Bora '972 discloses or renders obvious this limitation.

h. 12[g] wherein the loading and power control unit comprises a controller and a switching circuitry, wherein the controller is electrically coupled with the photo sensor, the motion sensor and the switching circuitry

853. Bora '972 discloses or renders obvious wherein the loading and power control unit comprises a controller and a switching circuitry, wherein the controller is electrically coupled with the photo sensor, the motion sensor and the switching circuitry.

854. Bora '972 discloses that "[t]he controller/processor 106 processes signals received from . . . the ambient light sensor circuit 118, and other potential added circuits. . . . In one embodiment, the computer processor includes a real time clock, processor 106, and memory chip." Bora '972 at ¶ 129.

855. Bora '972 discloses that "the devices disclosed herein may include other sensors, such as . . . a motion sensor." Bora '972 at ¶ 0138. Bora '972 further discloses that the controller/processor can be coupled to a motion sensor to detect motion and execute a program accordingly. Bora '972 at ¶ 0406.

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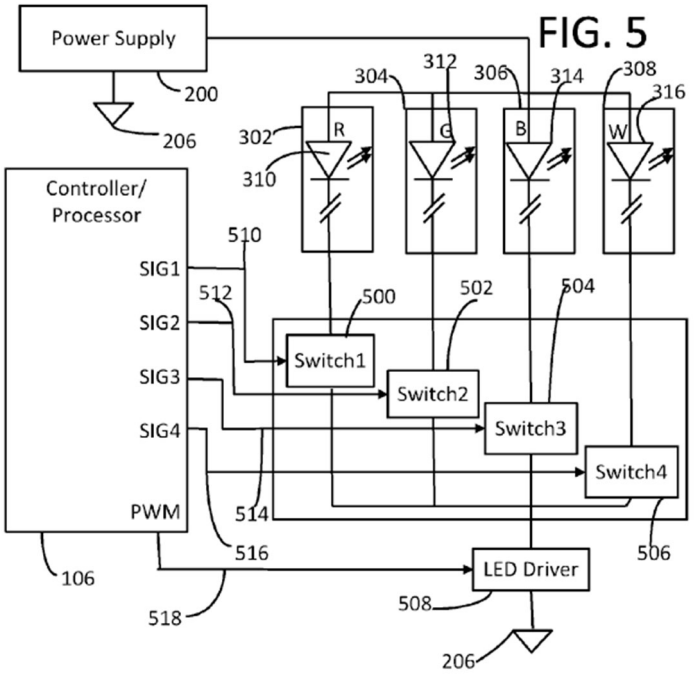
856. Bora '972 further discloses that "[t]he processor 106 processes the signals received by the various other components of the embodiment, computes necessary actions, and sends signals back out to various other components of the embodiment." Bora '972 at ¶ 0130.

857. Bora '972 discloses that "[t]he LED current control circuit 120 executes commands from the controller/processor 106 to control the current passed through the LEDs 122. . . . In general, the controller/processor 106 sends commands to LED drivers (208 or 318, 320, 322, 324, or 508), switches or multiplexer (500, 502, 504, 506 or 702), which in turn controls the light output by controlling the average current passed through the LEDs 122." Bora '972 at ¶ 0140.

858. Bora '972 discloses multiple embodiments of the LED control circuit 120. Similar to the my discussion of Bora '528, I will refer to two of these embodiments respectively as the "Switch Embodiment" and the "LED Driver Embodiment."

859. The Switch Embodiment is depicted in Figure 5, reproduced below. Bora '972 discloses that "referring to FIG. 5, a circuit diagram of switches (500, 502, 504, and 506) and LED driver 508 scheme in accordance with one embodiment of the present invention is shown." Bora '972 at ¶ 0152.

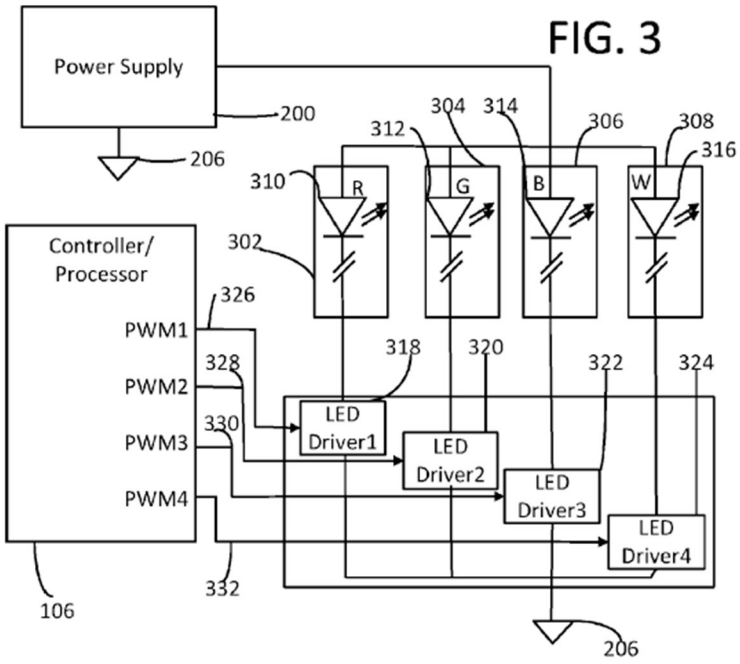
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Bora '972, Figure 5

860. The LED Driver Embodiment is depicted in Figure 3, reproduced below. Bora '972 discloses that "referring to FIG. 3, a circuit diagram of a solely LED Drivers scheme in accordance with one embodiment of the present invention is shown." Bora '972 at ¶ 0153.

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Bora '972, Figure 3

861. Annotated Figure 1 below depicts the controller/processor 106 and the LED current control circuit 120.

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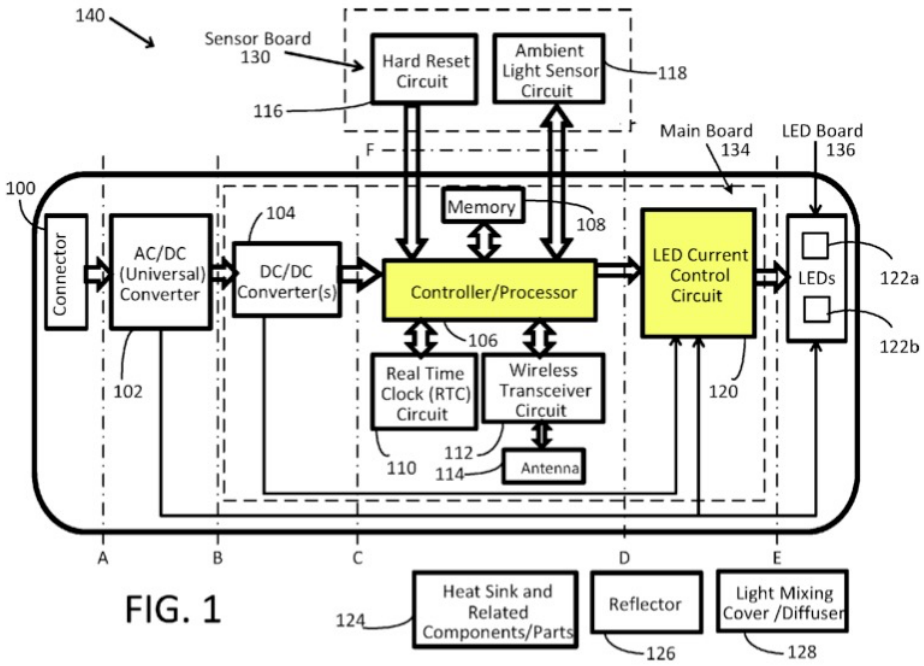


FIG. 1

Bora '972, Figure 1

862. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

863. Thus, Bora '972 discloses or renders obvious this limitation.

i. 12[h] wherein the switching circuitry is electrically coupled between a power source of the power supply unit and the light emitting unit

864. Bora '972 discloses or renders obvious the switching circuitry is electrically coupled between a power source of the power supply unit and the light emitting unit.

865. Figure 5 of Bora '972 depicts a ground/negative terminal 206 of the power supply 200. Bora '972 at ¶ 0152. It also depicts a ground negative/terminal 206 connected to LED Driver 508. The switches are depicted as being electrically connected between the power supply 200 and the LED arms, via the ground/negative terminal 206.

866. Similarly, Figure 3 of Bora '972 depicts a ground/negative terminal 206 of the power supply 200. Bora '972 at ¶ 0152. It also depicts a ground negative/terminal 206

connected to the LED drivers. The drivers are depicted as being electrically connected between the power supply 200 and the LED arms, via the ground/negative terminal 206.

867. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

868. Thus, Bora '972 discloses or renders obvious this limitation.

j. 12[i] wherein the power source is a DC power source

869. Bora '972 discloses or renders obvious that the power source is a DC power source.

870. Bora '972 discloses "Bora '972 discloses that "The AC to DC converter 102 receives power from the connector 100 and outputs the appropriate DC power to the DC/DC converter 104, the LED current controlling 120 circuit, and LED circuit 122. . . .The exact power input might vary depending on country specific standards or power sources, but as a universal converter, the power output will always be DC voltage such as 12 VDC or 18 VDC or 24 VDC." Bora '972 at ¶ 0127.

871. Bora '972 also discloses that the DC/DC converter also provides DC power to the LEDs. It discloses that "[f]or embodiments where multiple LED arms (302, 304, 306, and 308) are present, unique to the presented schemes is a method to maximize the potential current passed through and subsequent luminosity of each LED arm with limited available current from the AC/DC converter 102. This is done by controlling the current passed through by the LED driver (208 or 318, 320, 322, 324, or 508) so that only one LED driver (208 or 318 or 320 or 322 or 324 or 508) can pass through current at a time. This allows each on/off signal to provide a maximum current supplied by the DC/DC power converter to the LED 122. Bora '972 at ¶ 0141.

872. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

873. Thus, Bora '972 discloses or renders obvious this limitation.

k. 12[j] wherein the switching circuitry comprises at least a first unidirectional semiconductor switching device

874. Bora '972 discloses or renders obvious that the switching circuitry comprises at least a first unidirectional semiconductor switching device.

875. Bora '972's Switch Embodiment discloses that "referring to FIG. 5, a circuit diagram of switches (500, 502, 504, and 506) and LED driver 508 scheme in accordance with one embodiment of the present invention is shown. In this scheme, the controller/processor 106 would send a Pulse Width Modulation (PWM) signal to one LED driver 508 which would control the average current flowing through it." Bora '972 at ¶ 0152. Bora '972 further discloses that "there would be a switch for every LED arm between the LED driver 508 and each LED arm (302, 304, 306, and 308). The controller is connected to each switch (500, 502, 504, and 506) and can send an on/off signal for each. Considering an embodiment with four LED arms (302, 304, 306, 308) and subsequently four switches (500, 502, 504, 506), the controller 106 would send a signal to control Switch1 500, Switch2 502, Switch3 504 and Switch4 506, while also sending a PWM signal to the LED driver 508 to allow current to pass through to the switches (500, 502, 504, 506)." *Id.*

876. Bora '972's LED Driver embodiment discloses "referring to FIG. 3, a circuit diagram of a solely LED Drivers scheme in accordance with one embodiment of the present invention is shown. For illustrative purposes, consider here four PWM signals (326, 328, 330, 332) sent from the controller 106 annotated as PWM1 326, PWM2 328, PWM3 330 and PWM4 332 and four associated LED drivers annotated as LED Driver1 318, LED Driver2 320, LED Driver3 322 and LED Driver4 324. In addition, consider four LED arms, LED arm1 302 with red LEDs 310, LED arm2 304 with green LEDs 312, LED arm3 306 with blue LEDs 314, and LED

arm4 308 with white LEDs 316. Based on established color mixing principals, the variation in the luminosity of these four colors could produce all color combinations." Bora '972 at ¶ 0153.

877. Bora '972 discloses "the various logical blocks, modules, and circuits described herein may be implemented or performed with a . . . other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. Bora '972 at ¶ 0439. Thus, a person of ordinary skill in the art would understand that the Switch and LED Driver Embodiments could be implemented with unidirectional semiconductor switching devices such as a diode or insulated gate bipolar transistor (IGBT). Indeed, given that the power source required by the claim is a DC power source, a person of ordinary skill in the art would be motivated to use a unidirectional switch because the voltage will always be either above or below the reference voltage, as opposed to a design where the voltage would be both above or below the reference voltage over time, which would favor a bidirectional switch.

878. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

879. Thus, Bora '972 discloses or renders obvious this limitation.

l. 12[k] wherein the controller outputs control signals to control the switching circuitry for delivering different electric powers to the light emitting unit such that the light emitting unit respectively generates illuminations of different light intensities for performing different illumination modes activated by the photo sensor, the motion sensor and/or the external control unit

880. Bora '972 discloses or renders obvious the controller outputs control signals to control the switching circuitry for delivering different electric powers to the light emitting unit such that the light emitting unit respectively generates illuminations of different light intensities

for performing different illumination modes activated by the photo sensor, the motion sensor and/or the external control unit.

881. Bora '972 discloses that "[t]he LED current control circuit 120 executes commands from the controller/processor 106 to control the current passed through the LEDs 122. . . . In general, the controller/processor 106 sends commands to LED drivers (208 or 318, 320, 322, 324, or 508), switches or multiplexer (500, 502, 504, 506 or 702), which in turn controls the light output by controlling the average current passed through the LEDs 122. The average current would affect the overall luminosity of the II Device 140, such as that at lower average currents passed through the LED driver then the II Device would be dimmer." Bora '972 at ¶ 0140.

882. In Bora '972's Switch Embodiment, "[v]ariation in the average current passing through the LED driver 508 controlled by variations in the PWM sent by the controller would increase or decrease the average current passing through to the subsequent LED arms (302, 304, 306, 308), thus controlling the overall brightness of the LEDs. The switches (500, 502, 504, 506) turning on or off, would be able to create different colors and saturation produced by the light. When a switch (500, 502, 504, and 506) gets high signal from the controller 106, it provides path for current to flow from LEDs in LEDs arms (302, 304, 306, 308) to LED driver 508." Bora '972 at ¶ 0160.

883. In Bora '972's LED Driver embodiment, "the controller 106 could vary and alternate the length of time that the PWM signals (326, 328, 330, 332) are sent to the LED drivers (302, 304, 306, 308). This would create variations in lengths of time when the LED drivers (302, 304, 306, 308) would receive PWM signals (326, 328, 330, 332). The length of time would also allow for a similar control in the overall brightness of the luminosity produced

by the II Device 140 in addition to the control provided by variations of the duty cycle of the PWM signal itself." Bora '972 at ¶ 0153

884. Bora '972 discloses that "[g]iven a wireless device (WD) is equipped with hardware and systems to execute wireless communication protocols (Bluetooth, Wi-Fi, ZigBee, or any other wireless protocol) as well as an appropriate device application 2302, a user could send a lighting command to an II Device by selecting the command via the device application 2304. Upon the user's selection of a command for a specific II Device, the device application would translate the user's requested command into a light setting command and the specific stored ID for the selected II Device 2306. This light setting command would include instructions for the specified II Device ID to execute such as on/off, color, brightness, or a program. The light setting command would be translated into the appropriate wireless communication protocol and wirelessly sent via the wireless device 2308. The II Device if in range of the wireless communication or mesh network 2309 relay communication would receive the protocol via the II Device's antenna 2310. The transceiver/receiver circuitry would decode the wireless protocol to find the light setting command and send that to the controller/processor 2312. The controller will execute that command with the respective II Device's related components 2314." Bora '972 at ¶ 0213.

885. Bora '972 further discloses that "[t]he ambient light sensor 118 can be located to detect an ambient light and a light emitted by the II Device 140 such that the controller/processor 106 adjusts one or more of the on/off signals provided to the LEDs 122." Bora '972 at ¶ 0137.

886. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

887. Thus, Bora '972 discloses or renders obvious this limitation.

m. 12[l] wherein at dusk when an ambient light detected by the photo sensor is lower than a first predetermined value, the loading and power control unit operates to turn on the light emitting unit to perform a low level illumination mode emitting a light with a low light intensity

888. Bora '972 discloses or renders obvious that at dusk when an ambient light detected by the photo sensor is lower than a first predetermined value, the loading and power control unit operates to turn on the light emitting unit to perform a low level illumination mode emitting a light with a low light intensity.

889. Bora '972 discloses that "[t]he ambient light sensor circuit 118 consists of one or more ambient light sensors (photosensor or similar light detecting component) and supporting circuit. The ambient light sensor(s) in the ambient light sensor circuit 118 detects a level of captured ambient light, converts that level into an analog signal, and sends that data to the controller/processor via an analog to digital (A/D) converter that could be a part of the ambient light sensor circuit 118 or controller/processor 106. The ambient light sensor circuit 118 would consist of one or more ambient light sensors per one or multiple II Devices." Bora '972 at ¶ 0136.

890. Bora '972 further discloses that "[t]he ambient light sensor 118 can be located to detect an ambient light and a light emitted by the II Device 140 such that the controller/processor 106 adjusts one or more of the on/off signals provided to the LEDs 122." Bora '972 at ¶ 0137.

891. Bora '972 additionally discloses that the "ambient light sensor . . . can detect the light levels present within an area, relay that information to the II Device's controller, which could be interpreted as a program input resulting in a change in the lighting brightness and/or color. Various programs are possible to utilize the II Device sensor's information as an input to causing some output in terms of a change in the brightness and/or color of one or more II Devices. In one program example, a user will select a preferred light level for II Device(s) or

group(s) through the device application. . . . When selected, the device application will then send a request through the controlling device to each II Device that the user has selected through the program, asking for each II Device's related ambient light sensor information. The device application upon receiving the light sensor information will store the default settings in the application or device's memory relative to each II Device. . . . The user can then at any other time activate an automatic adjustment program. Upon activation, the device application will send a communication to each II Device associated with the program. The communication will instruct each II Device to compare the current II Device sensor information against that associated with the preferred lighting level." Bora '972 at ¶ 0305.

892. Bora '972 discloses that after that comparison, "[t]he II Device would then adjust its brightness and/or color depending on the light sensor data's relationship between the current and preferred lighting level. Simplified, if the current light sensor showed less luminosity than the preferred level, then the II Device would increase its own brightness. Alternately, if the current light sensor showed more luminosity than the preferred level, then the II Device would decrease its own brightness. The relationship between the difference in current and preferred light received will not be an equal or absolute relationship to the change in the brightness of the light. Alternatively, it will be some functional relationship dependent on the absolute and respective levels of light. The program and/or II Devices themselves would repeat this process for the duration that the program is active." Bora '972 at ¶ 0306.

893. Bora '972 discloses that an "eco mode" that "would be geared towards optimizing efficiency with regards to energy usage." Bora '972 at ¶ 0390. Bora '972 further discloses that "other applications like proximity, sunset/sunrise monitoring, ambient light sensing, and other information could be used to create an eco footprint." *Id.*

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894. Bora '972 further discloses that "when a user selects the eco mode option, it can set a reduced energy usage 8502 for the related II Devices that would be lower than the overall maximum energy usage 8503. The lowered energy usage here could be attributed and associated with a reduction in light output, wireless strength, or light qualities such as CRI or color temperature. In addition, the lowered maximum energy usage might be variable over time 8504 with respect to the general maximum energy usage 8503. This variable energy usage 8504 could be related to an additional condition such as time of day, seasonality, available sunlight, as a proportion of the general energy usage, or with respect to other conditions 8506." Bora '972 at ¶ 0391.

895. To the extent that Bora '972 does not disclose this limitation, it would have been rendered obvious over Bora '972 alone or in combination with Bondy.[14] A person of ordinary skill in the art would have been motivated by Bora '972's disclosure of adjustable lighting controls based on ambient light and its disclosure of sunset/sunrise monitoring to modify the invention disclosed in Bora '972 so that the loading and power control unit would turn on the light emitting unit to a low level illumination mode at dusk when a certain level of ambient light is detected and would have had a reasonable expectation success of doing so. A person of ordinary skill in the art would understand that it would be desirable for an outdoor light to be illuminated at a low level at dusk to provide exterior lighting, once the amount of daylight falls below a certain level. Sunset/dusk lighting as an exterior light feature was well known and widely adopted in the art at the time of the filing of the '367 patent. The use of an ambient light

[14] U.S. Patent Pub. App. No. 2011/0062888 ("Bondy") was filed on April 9, 2010 and published on March 17, 2011. I understand Bondy is therefore prior art to claims 12, 14, 15, and 24 of the '367 patent.

sensor to trigger the low level illumination mode at dusk would have been routine in security lights available at the time of the filing of the '367 patent.

896. Accordingly, a person of ordinary skill in the art would have been motivated to implement a low-level light mode at dusk in view of the disclosure in Bora '972, the state of the prior art at the time of the filing of the '367 patent, and the knowledge of a person of ordinary skill in the art.

897. Additionally, a person of ordinary skill in the art would have been motivated by Bondy to modify Bora '972 to add a dusk low-level light mode.

898. Bondy discloses at dusk when an ambient light detected by the photo sensor is lower than a first predetermined value, the loading and power control unit operates to turn on the light emitting unit to perform a low level illumination mode emitting a light with a low light intensity.

899. Bondy discloses "Photocell FIG. 17-219," which is "A 3-wire switched supply photo electric device which can be placed to detect a semi-continuous level of ambient light, and which is calibrated to accurately detect the presence of daylight or other light. The photocell may be located at the power supply or at each individual luminaire." Bondy at ¶ 0193

900. Bondy further discloses "Photocell with V.O.C. (variable output capacity) FIG. 30-223," which is an "electrically powered camera lens or photo-electric cell with a means of input connection, which has a means of detecting ambient light, and further a means of detecting a range of ambient light, and with a variable range of output voltage and means of connection by leads with a connector." Bondy at ¶ 0194.

901. Bondy discloses "[t]The 0.5 Sentinel Control Module FIG. 16-211 provides an economical means of decentralizing lamp control from the power supply source to the individual

luminaires, and to any number of required zones. The zones may then be set up for energy efficiency. . . . [T]he photocell FIG. 17-219 may be utilized to actuate low energy dusk to dawn beacons FIG. 41-304 all via the control assembly FIG. 17-241." Bondy at ¶ 0244.

902. Bondy additionally discloses that "[t]he Sentinel Advanced Control Module FIG. 25-200 will provide for programming capacity for color output and luminous intensity control with dimming for a primary lamp A FIG. 23-272, and a secondary lamp B FIG. 23-277 which is also dimmable, to provide precisely what is required or desired for . . . functional lighting for paths or areas which may be wide angle motion detector FIG. 30-222 actuated, or dusk till dawn via photocell with V.O.C. (variable output capacity) FIG. 30-223. The photocell with V.O.C. FIG. 30-223 can be utilized to create a program such that, as dusk is followed by night, the luminous intensity is reduced to provide a similar effect and energy saving." Bondy at ¶ 0280.

903. A person of ordinary skill in the art would have been motivated to combine the dusk low-level light mode of Bondy with the II Device of Bora '972. Bora '972 and Bondy are both references in the same technical area and seek to solve the same problem of providing a lighting device with controls and control signals that adjust the output of the lighting device to optimize its performance based on external controls and inputs. Both Bora '972 and Bondy specifically refer to dusk/dawn setting to reduce energy use.

904. For example, Bora '972 discloses that an "eco mode" that "would be geared towards optimizing efficiency with regards to energy usage." Bora '972 at ¶ 0390. Bora '972 also discloses that "sunset/sunrise monitoring . . . could be used to create an eco footprint." *Id.*

905. Bondy likewise discloses that "[t]he photocell with V.O.C. FIG. 30-223 can be utilized to create a program such that, as dusk is followed by night, the luminous intensity is reduced to provide a similar effect and energy saving." Bondy at ¶ 0280.

906. Both Bora '972 and Bondy are directed in the general space of lighting devices with at adjustable levels of light output that adjust that light output based on inputs received from sensors. The input signal from these sensors is processed by a controller, which then subsequently modifies or controls the lighting load in the lighting device. Both Bora '972 and Bondy specifically disclose the use of an ambient light/photo sensor that detects the level of ambient light around or light directed at the sensor on the lighting device, as discussed above. Both Bora '972 and Bondy disclose lighting devices that have lighting loads controlled by external signals, such as the surrounding illuminance as detected by an illuminance sensor (in both references). Both references are generally interested in controlling the loads for optimized performance with energy saving being one such performance parameter that both references discuss. Thus, a person of ordinary skill in the art would have been motivated to modify Bora '972 to add Bondy's dusk low-light level mode. Adding Bondy's dusk low-level light mode would have been a simple modification to obtain predictable results, and a person of ordinary skill in the art would have had a reasonable expectation of success in doing so.

907. Thus, Bora '972 discloses or renders obvious alone or in combination with Bondy this limitation.

n. 12[m] wherein when a motion signal is detected by the motion sensor, the loading and power control unit operates to increase the electric power delivered to the light emitting unit to perform a high level illumination mode emitting the light with a high light intensity for a preset time period before being switched back to the low level illumination mode;

908. Bora '972 discloses or renders obvious that when a motion signal is detected by the motion sensor, the loading and power control unit operates to increase the electric power delivered to the light emitting unit to perform a high level illumination mode emitting the light

with a high light intensity for a preset time period before being switched back to the low level illumination mode.

909. Bora '972 discloses that "the devices disclosed herein may include other sensors, such as . . . a motion sensor." Bora '972 at ¶ 0138. Bora '972 further discloses that the controller/processor can be coupled to a motion sensor to detect motion and execute a program accordingly. Bora '972 at ¶ 0406.

910. Bora '972 discloses that "II Devices, such as smart bulbs with sensor circuits containing a sound sensor/detector or microphone as well as Real Time Clock or timer, can have specific applications where a user defines the time when the II Device should listen to particular defined sound and trigger an action based on that. For example, an application where a user wants to turn ON/OFF the lights between 10 pm and 8 am every weekday by clapping twice within 2 seconds can be achieved by implementing sound detector and real time clock inside the II Device that is communicably coupled to the processor. In such an II Device, the user can define a program of turning the sound detector functionality of the II Device ON between 10 pm and Sam every weekday and then the II Device triggers the action of turning ON/OFF the bulb based on the clapping sound detected by the sound detector. . . . The user defines an event or pattern of the sound for triggering the action and programs the smart device with such defined parameters in block 9206." Bora '972 at ¶ 0406. Bora '972 further discloses that "the above process can be adapted to work with other sensors, such as light, color, motion or a combination thereof." *Id.*

911. Bora '972 additionally discloses that the "ambient light sensor . . . can detect the light levels present within an area, relay that information to the II Device's controller, which could be interpreted as a program input resulting in a change in the lighting brightness and/or

color. Various programs are possible to utilize the II Device sensor's information as an input to causing some output in terms of a change in the brightness and/or color of one or more II Devices. In one program example, a user will select a preferred light level for II Device(s) or group(s) through the device application. . . . When selected, the device application will then send a request through the controlling device to each II Device that the user has selected through the program, asking for each II Device's related ambient light sensor information. The device application upon receiving the light sensor information will store the default settings in the application or device's memory relative to each II Device. . . . The user can then at any other time activate an automatic adjustment program. Upon activation, the device application will send a communication to each II Device associated with the program. The communication will instruct each II Device to compare the current II Device sensor information against that associated with the preferred lighting level." Bora '972 at ¶ 0305.

912. To the extent that Bora '972 does not disclose this limitation, it would have been rendered obvious over Bora '972 alone or in combination with Bondy. A person of ordinary skill in the art would have been motivated by Bora '972's disclosure of adjustable lighting controls based on motion sensor input and ambient light detection to modify the invention disclosed in Bora '972 so that the loading and power control unit would turn on the light emitting unit to a high level illumination mode when a motion signal is detected by the motion sensor and would have had a reasonable expectation success in doing so. A person of ordinary skill in the art would understand that it would be desirable for an outdoor light to be illuminated at a high level when motion is detected, before switching back to a low level illumination mode after a predetermined period of time. Such two-level lighting was well-known and widely adopted in the art at the time of the filing of the '367 patent, as discussed above in section V. The use of a

motion sensor to trigger the high level illumination mode when a motion signal is detected would have been routine in security lights available at the time of the filing of the '367 patent.

913. Accordingly, a person of ordinary skill in the art would have been motivated to implement a high-level illumination mode upon detection of a motion signal in view of the disclosure in Bora '972, the state of the prior art at the time of the filing of the '367 patent, and the knowledge of a person of ordinary skill in the art.

914. Additionally, a person of ordinary skill in the art would have been motivated by Bondy to modify Bora '972 to add the claimed high level illumination mode based on detected motion.

915. Bondy discloses when a motion signal is detected by the motion sensor, the loading and power control unit operates to increase the electric power delivered to the light emitting unit to perform a high level illumination mode emitting the light with a high light intensity for a preset time period before being switched back to the low level illumination mode.

916. Bondy discloses that "In addition, we disclose in this document a means of energy saving aesthetic light actuation of the 20 primary lamp/luminaires via sensitive wide angle motion detectors FIG. 30-222 and a ramping speed which may be quite subtle. The lamps/luminaires are set for the chosen effect, and this is regarded as 100%. A second setting is chosen for interim periods, as for example 50% of the above chosen output. This will be the 'ready' luminous intensity. When persons are detected approaching the lighted area, the microcontroller with programmable CPU FIG. 39-242 is triggered to ramp up the luminous intensity to 100%, resulting in the full enjoyment of the aesthetic lighting. Once the persons have passed the illuminated area, the microcontroller with programmable CPU FIG. 39-242 will again

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ramp the full ON luminous intensity back down to 'ready' at 50% luminous intensity." Bondy at ¶ 0352.

917. Bondy further discloses that "[t]he described system makes possible dusk to dawn staging area illumination. This allows for wide angle motion detector FIG. 30-222 actuation in each staging area. Staging area illumination will often be of low energy demand because it is, in the main, of limited dimensional area. When motion is detected, the pre-programmed luminaires are energized to provide needed light for function or pathway lighting." Bondy at ¶ 0364.

918. Bondy additionally discloses "An additional and optional narrow angle variable long range motion detector FIG. 43-229, FIG. 22-229 differs from the wide angle motion detector FIG. 30-222 located on the front shell FIG. 30-215 of the Sentinel Advanced Control Module FIG. 25-200. It serves the following potential purposes:

i. It allows the Sentinel Advanced Control Module FIG. 25-200 to be directed into the property for security, and makes possible a longer range for the purpose of energy saving. A low level standby light output can be maintained and programmed for a slow ramping up when persons are detected approaching the property.

ii. For described staging areas leading to pathways, a nearby motion detector may be logistically difficult to place.

iii. Thus a more distant narrow angle variable long range motion detector FIG. 43-229, FIG. 22-229, once correctly aimed, could serve the purpose of actuating via the microcontroller with programmable CPU FIG. 172-242 the energization of the path or area luminaires.

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iv. Street lamps, park pathways, etc., could be set to accurately serve the end purposes from item (ii)." Bondy at ¶ 0375-79.

919. Bondy further discloses that "FIG. 45 illustrates a scene where all beacons 304 are ON from dusk to dawn. The system is ready for a guest but will count time with pathway luminaires 309 energized ON at low output, and with more time lapsed will brighten. Movement off the path to the side, where most people would consider inappropriate, will cause all luminaires/lamps to be energized to 50 percent. Then, 20 seconds after this, luminaires/lamps will be energized to 80 percent, and after another 20 seconds, to 100 percent. . . . Note that this is only an example of how the security system could be programmed, if equipped, and many variations are possible." Bondy at ¶ 0720.

920. A person of ordinary skill in the art would have been motivated to combine the high level illumination mode based on detected motion of Bondy with the II Device of Bora '972. Bora '972 and Bondy are both references in the same technical area and seek to solve the same problem of providing a lighting device with controls and control signals that adjust the output of the lighting device to optimize its performance based on external controls and inputs. Both Bora '972 and Bondy specifically refer to energy saving modes based on inputs from external sensors.

921. For example, Bora '972 discloses that an "eco mode" that "would be geared towards optimizing efficiency with regards to energy usage." Bora '972 at ¶ 0390. Bora '972 also discloses a turn-on mode based on detected sound or motion. Bora '972 at ¶ 0406. It further discloses modifying the brightness of the II Device based on detected ambient light levels. Bora '972 at ¶ 0305.

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922. Bondy likewise discloses "a means of energy saving aesthetic light actuation of the 20 primary lamp/luminaires via sensitive wide angle motion detectors FIG. 30-222 and a ramping speed which may be quite subtle." Bondy at ¶ 0352.

923. Both Bora '972 and Bondy are directed in the general space of lighting devices with at adjustable levels of light output that adjust that light output based on inputs received from sensors. The input signal from these sensors is processed by a controller, which then subsequently modifies or controls the lighting load in the lighting device. Both Bora '972 and Bondy specifically disclose the use of a motion sensor, as discussed above. Both Bora '972 and Bondy disclose lighting devices that have lighting loads controlled by external signals, such as the surrounding illuminance as detected by an illuminance sensor and the motion of approaching individuals as detected by a motion sensor. Both references are generally interested in controlling the loads for optimized performance with energy saving being one such performance parameter that both references discuss. Thus, a person of ordinary skill in the art would have been motivated to modify Bora '972 to add Bondy's high level illumination mode based on detected motion. Adding Bondy's high level illumination mode based on detected motion would have been a simple modification to obtain predictable results, and a person of ordinary skill in the art would have had a reasonable expectation of success in doing so. As discussed above in section V, two-level lighting was well known for decades by the time of the filing of the '367 patent, as embodied in, for example, the two HeathCo patents discussed *supra*.

924. Thus, Bora '972 discloses or renders obvious alone or in combination with Bondy this limitation.

o. 12[n] wherein at dawn when the ambient light detected by the photo sensor is higher than a second predetermined value, the light emitting unit is switched off by the loading and power control unit;

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925. Bora '972 discloses or renders obvious that at dawn when the ambient light detected by the photo sensor is higher than a second predetermined value, the light emitting unit is switched off by the loading and power control unit.

926. Bora '972 discloses that "[t]he ambient light sensor circuit 118 consists of one or more ambient light sensors (photosensor or similar light detecting component) and supporting circuit. The ambient light sensor(s) in the ambient light sensor circuit 118 detects a level of captured ambient light, converts that level into an analog signal, and sends that data to the controller/processor via an analog to digital (A/D) converter that could be a part of the ambient light sensor circuit 118 or controller/processor 106. The ambient light sensor circuit 118 would consist of one or more ambient light sensors per one or multiple II Devices." Bora '972 at ¶ 0136.

927. Bora '972 further discloses that "[t]he ambient light sensor 118 can be located to detect an ambient light and a light emitted by the II Device 140 such that the controller/processor 106 adjusts one or more of the on/off signals provided to the LEDs 122." Bora '972 at ¶ 0137.

928. Bora '972 additionally discloses that the "ambient light sensor . . . can detect the light levels present within an area, relay that information to the II Device's controller, which could be interpreted as a program input resulting in a change in the lighting brightness and/or color. Various programs are possible to utilize the II Device sensor's information as an input to causing some output in terms of a change in the brightness and/or color of one or more II Devices. In one program example, a user will select a preferred light level for II Device(s) or group(s) through the device application. . . . When selected, the device application will then send a request through the controlling device to each II Device that the user has selected through the program, asking for each II Device's related ambient light sensor information. The device

application upon receiving the light sensor information will store the default settings in the application or device's memory relative to each II Device. . . . The user can then at any other time activate an automatic adjustment program. Upon activation, the device application will send a communication to each II Device associated with the program. The communication will instruct each II Device to compare the current II Device sensor information against that associated with the preferred lighting level." Bora '972 at ¶ 0305.

929. Bora '972 discloses that after that comparison, "[t]he II Device would then adjust its brightness and/or color depending on the light sensor data's relationship between the current and preferred lighting level. Simplified, if the current light sensor showed less luminosity than the preferred level, then the II Device would increase its own brightness. Alternately, if the current light sensor showed more luminosity than the preferred level, then the II Device would decrease its own brightness. The relationship between the difference in current and preferred light received will not be an equal or absolute relationship to the change in the brightness of the light. Alternatively, it will be some functional relationship dependent on the absolute and respective levels of light. The program and/or II Devices themselves would repeat this process for the duration that the program is active." Bora '972 at ¶ 0306.

930. Bora '972 discloses that an "eco mode" that "would be geared towards optimizing efficiency with regards to energy usage." Bora '972 at ¶ 0390. Bora '972 further discloses that "other applications like proximity, sunset/sunrise monitoring, ambient light sensing, and other information could be used to create an eco footprint." *Id.*

931. Bora '972 further discloses that "when a user selects the eco mode option, it can set a reduced energy usage 8502 for the related II Devices that would be lower than the overall maximum energy usage 8503. The lowered energy usage here could be attributed and associated

with a reduction in light output, wireless strength, or light qualities such as CRI or color temperature. In addition, the lowered maximum energy usage might be variable over time 8504 with respect to the general maximum energy usage 8503. This variable energy usage 8504 could be related to an additional condition such as time of day, seasonality, available sunlight, as a proportion of the general energy usage, or with respect to other conditions 8506." Bora '972 at ¶ 0391.

932. To the extent that Bora '972 does not disclose this limitation, it would have been rendered obvious over Bora '972 alone or in combination with Bondy. A person of ordinary skill in the art would have been motivated by Bora '972's disclosure of adjustable lighting controls based on ambient light and its disclosure of sunset/sunrise monitoring to modify the invention disclosed in Bora '972 so that the loading and power control unit would turn off the light emitting unit at dawn and would have had a reasonable expectation success of doing so. A person of ordinary skill in the art would understand that it would be desirable for an outdoor light to be turned off at dawn to save energy, once the amount of daylight rises above a certain level. Sunrise turn-off as an exterior light feature was well known and widely adopted in the art at the time of the filing of the '367 patent. The use of an ambient light sensor to trigger the dawn turn-off feature would have been routine in security lights available at the time of the filing of the '367 patent.

933. Accordingly, a person of ordinary skill in the art would have been motivated to implement a dawn turn-off mode in view of the disclosure in Bora '972, the state of the prior art at the time of the filing of the '367 patent, and the knowledge of a person of ordinary skill in the art.

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934. Additionally, a person of ordinary skill in the art would have been motivated by Bondy to modify Bora '972 to add a dawn turn-off mode.

935. Bondy discloses that at dawn when the ambient light detected by the photo sensor is higher than a second predetermined value, the light emitting unit is switched off by the loading and power control unit.

936. Bondy discloses "Photocell FIG. 17-219," which is "A 3-wire switched supply photo electric device which can be placed to detect a semi-continuous level of ambient light, and which is calibrated to accurately detect the presence of daylight or other light. The photocell may be located at the power supply or at each individual luminaire." Bondy at ¶ 0193

937. Bondy further discloses "Photocell with V.O.C. (variable output capacity) FIG. 30-223," which is an "electrically powered camera lens or photo-electric cell with a means of input connection, which has a means of detecting ambient light, and further a means of detecting a range of ambient light, and with a variable range of output voltage and means of connection by leads with a connector." Bondy at ¶ 0194.

938. Bondy discloses "[t]The 0.5 Sentinel Control Module FIG. 16-211 provides an economical means of decentralizing lamp control from the power supply source to the individual luminaires, and to any number of required zones. The zones may then be set up for energy efficiency. . . . [T]he photocell FIG. 17-219 may be utilized to actuate low energy dusk to dawn beacons FIG. 41-304 all via the control assembly FIG. 17-241." Bondy at ¶ 0244.

939. Bondy additionally discloses that "[t]he Sentinel Advanced Control Module FIG. 25-200 will provide for programming capacity for color output and luminous intensity control with dimming for a primary lamp A FIG. 23-272, and a secondary lamp B FIG. 23-277 which is also dimmable, to provide precisely what is required or desired for . . . functional lighting for

paths or areas which may be wide angle motion detector FIG. 30-222 actuated, or dusk till dawn via photocell with V.O.C. (variable output capacity) FIG. 30-223. The photocell with V.O.C. FIG. 30-223 can be utilized to create a program such that, as dusk is followed by night, the luminous intensity is reduced to provide a similar effect and energy saving." Bondy at ¶ 0280.

940. Bondy discloses "the beacon(s) FIG. 41-304 dusk to dawn operation is controlled by the photocell with V.O.C. (variable output capacity) FIG. 30-223, when used with a Sentinel Advanced Control Module FIG. 25-200, or a photocell 219 when used with a 0.5 Sentinel Advanced Control Module FIG. 16-211." Bondy at ¶ 0307.

941. Bondy discloses that "[b]y accepting variable input from the photocell with V.O.C. (variable output capacity) FIG. 30-223 . . . to the Sentinel Advanced Control Module's FIG. 25-200 microcontroller with programmable CPU FIG. 39-242, the desired or required illumination may be chosen relative to the ambient light from dusk until dawn." Bondy at ¶ 0402.

942. A person of ordinary skill in the art would have been motivated to combine the dawn turn-off mode of Bondy with the II Device of Bora '972. Bora '972 and Bondy are both references in the same technical area and seek to solve the same problem of providing a lighting device with controls and control signals that adjust the output of the lighting device to optimize its performance based on external controls and inputs. Both Bora '972 and Bondy specifically refer to dusk/dawn setting to reduce energy use.

943. For example, Bora '972 discloses that an "eco mode" that "would be geared towards optimizing efficiency with regards to energy usage." Bora '972 at ¶ 0390. Bora '972 also discloses that "sunset/sunrise monitoring . . . could be used to create an eco footprint." *Id.*

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944. Bondy likewise discloses that "[t]he photocell with V.O.C. FIG. 30-223 can be utilized to create a program such that, as dusk is followed by night, the luminous intensity is reduced to provide a similar effect and energy saving." Bondy at ¶ 0280.

945. Both Bora '972 and Bondy are directed in the general space of lighting devices with at adjustable levels of light output that adjust that light output based on inputs received from sensors. The input signal from these sensors is processed by a controller, which then subsequently modifies or controls the lighting load in the lighting device. Both Bora '972 and Bondy specifically disclose the use of an ambient light/photo sensor that detects the level of ambient light around or light directed at the sensor on the lighting device, as discussed above. Both Bora '972 and Bondy disclose lighting devices that have lighting loads controlled by external signals, such as the surrounding illuminance as detected by an illuminance sensor (in both references). Both references are generally interested in controlling the loads for optimized performance with energy saving being one such performance parameter that both references discuss. Thus, a person of ordinary skill in the art would have been motivated to modify Bora '972 to add Bondy's dawn turn-off mode. Adding Bondy's dawn turn-off mode would have been a simple modification to obtain predictable results, and a person of ordinary skill in the art would have had a reasonable expectation of success in doing so.

946. Thus, Bora '972 discloses or renders obvious alone or in combination with Bondy this limitation.

p. 12[o] wherein the external control unit is a wireless external control signal receiver electrically coupled with the controller to receive, decode and convert at least one wireless instruction signal into at least one value of at least one operating variable interpretable to the controller, wherein the controller is programmed with an APP for the LED security light for processing the at least one value of the at least one operating variable for setting the at least one operating parameter

according to the at least one operating variable received from the wireless external control signal receiver

947. Elements 12(o) and 12(p) and claims 13-15 of the '367 patent recite elements recited in claims 1-2 of the '564 patent. I incorporate my analysis of the '564 patent for these elements. While I have relied on certain portions and certain citations herein, I reserve the right to rely on any portion of my '564 patent analysis to invalidate the elements below.

948. Bora '972 discloses or renders obvious that the external control unit is a wireless external control signal receiver electrically coupled with the controller to receive, decode and convert at least one wireless instruction signal into at least one value of at least one operating variable interpretable to the controller, wherein the controller is programmed with an APP for the LED security light for processing the at least one value of the at least one operating variable for setting the at least one operating parameter according to the at least one operating variable received from the wireless external control signal receiver.

949. Bora '972 discloses that the II Device has a "a wireless transceiver circuit 112 communicably coupled to the controller/processor 106" and "an antenna 114 communicably coupled to the wireless transceiver circuit 112." Bora '972 at ¶ 0124.

950. Bora '972 discloses that "[t]he controller/processor 106 processes signals received from . . . the wireless transceiver circuit 112." Bora '972 at ¶ 0129.

951. Bora '972 discloses that "a user could send a lighting command to an II Device by selecting the command via the device application 2304. Upon the user's selection of a command for a specific II Device, the device application would translate the user's requested command into a light setting command and the specific stored ID for the selected II Device 2306. This light setting command would include instructions for the specified II Device ID to execute such as on/off, color, brightness, or a program. The light setting command would be translated into the

appropriate wireless communication protocol and wirelessly sent via the wireless device 2308. The II Device if in range of the wireless communication or mesh network 2309 relay communication would receive the protocol via the II Device's antenna 2310. The transceiver/receiver circuitry would decode the wireless protocol to find the light setting command and send that to the controller/processor 2312. The controller will execute that command with the respective II Device's related components 2314." Bora '972 at ¶ 0213.

952. Bora '972 discloses "[t]he memory 108 stores data from factory defined settings and from user defined settings. The controller/processer 106 will read/write data in memory 108. Data might include factory-defined settings, such as communication protocols, identification and security protocols, and other data. Data might also include user-defined settings, such as user profiles, default commands, programs, and other data. . . . In one embodiment, the processor 106 includes a real time clock, processor, and memory chip. The memory 108 receives information from the processor 106 and stores the commands for retrieval by the processor 106." Bora '972 at ¶ 0131.

953. I understand that Vaxcel has alleged that this element does not require "programming" beyond the provision of lighting settings. I do not agree that the claim should be read so broadly, but I have applied Vaxcel's interpretation for my invalidity analysis. As I discuss with respect to elements 1[b], 1[c], and 1[e] of the '564 patent this limitation is disclosed or rendered obvious by Bora '972. *See* '564 Patent analysis at elements 1[b], 1[c], and 1[e], *supra*. *See* Bora '972 at ¶¶0129-30, Fig.1, ¶0133, ¶0149, ¶0213, Fig. 23, ¶¶ 0234-35, Fig. 28, ¶¶129-130, 133, 149, 213, 234-235, 259, Figs. 1, 23. 37, 38A-F, ¶0213, ¶0121, ¶0131, Fig .1, ¶0181, ¶¶ 0242-43, Fig. 29, ¶0248, ¶¶0254-55, Fig. 28, ¶0352, and Fig. 69.

q. 12[p] wherein the at least one operating variable represents a setting decision by a user for choosing at least one capacity operating rate for

operating at least one functional performance of the at least one operating parameter of the LED security light set by the user thru a mobile device, wherein the at least one operating parameter is used for controlling at least one of functional performance settings of the LED security light including timer setting, light intensity setting, color temperature setting, detection sensitivity setting or performance mode switching and setting between two different illumination performance modes featured with different light intensities and different light color temperatures.

954. Bora '972 discloses or renders obvious the at least one operating variable represents a setting decision by a user for choosing at least one capacity operating rate for operating at least one functional performance of the at least one operating parameter of the LED security light set by the user thru a mobile device, wherein the at least one operating parameter is used for controlling at least one of functional performance settings of the LED security light including timer setting, light intensity setting, color temperature setting, detection sensitivity setting or performance mode switching and setting between two different illumination performance modes featured with different light intensities and different light color temperatures.

955. As I discuss with respect to elements 1 [a] and 1[e] of the '564 patent, this limitation is disclosed or rendered obvious by Bora '972. *See* '564 patent analysis at elements 1[a] and 1[e], *supra*. *See* Bora '972 at ¶0259, ¶0226, ¶0228, ¶119, ¶¶ 0254-55, Fig. 28, and ¶0406.

2. <u>Dependent claim 13</u>

a. 13[a] The LED security light according to claim 12, wherein the LED security light is designed with an on line free setting method for setting at least one operating parameter of the LED security light, comprising

956. As I discuss with respect to the preamble of '564 patent, this limitation is disclosed or rendered obvious by Bora '972. *See* '564 patent analysis at preamble, *supra*. *See* Bora '972 at ¶¶117-119, ¶0121, and ¶0355.

b. 13[b] a user interface APP comprising at least one free setting algorithm preloaded in the mobile device to transform at least one user's setting decision into at least one operating variable

957. As I discuss with respect to element 1[a] of the '564 patent this limitation is disclosed or rendered obvious by Bora '972. *See* '564 patent analysis at element 1[a], *supra*. *See* Bora '972 at ¶0259, ¶0226, ¶0228, and ¶119.

c. 13[c] wherein when the user interface APP is activated and concluded with the at least one user's setting decision, the user interface APP manages to transmit via the mobile device at least one wireless instruction signal carrying at least one message of the at least one operating variable to the LED security light, wherein the at least one operating variable is used for processing or setting the at least one operating parameter of the LED security light

958. As I discuss with respect to element 1[b] of the '564 Patent this limitation is disclosed or rendered obvious by Bora '972. *See* '564 Patent analysis at element 1[b], *supra*. *See* Bora '972 at ¶¶ 0129-30, Fig.1, ¶0133, ¶0149, ¶0213, Fig. 23, ¶¶0234-35, and Fig. 28.

3. <u>Dependent claim 14</u>

a. 14[a] The LED security light according to claim 13, wherein the user interface APP is operable on a touch screen panel of the mobile device

959. As I discuss with respect to element 1[a] of the '564 Patent this limitation is disclosed or rendered obvious by Bora '972. *See* '564 Patent analysis at element 1[a], *supra. See* Bora '972 at ¶ 0259, ¶ 0228, and ¶ 0119.

b. 14[b]] wherein the free setting algorithm is a capacity scale simulation process implemented by a visual configuration of a free setting operator incorporated with a capacitor scale simulator and an indicator of the capacity operating rate to facilitate making the at least one user's setting decision in setting at least one desired level of the at least one operating parameter, wherein when the free setting operator is activated by the user to interact with the capacity scale simulator, the user interface APP responsively manages to gradually adjust a value of the capacity operating rate according to an instantaneous state of interaction between the free setting operator and the capacity scale simulator with the indicator of the capacity

operating rate simultaneously showing the instantaneous state of the capacity operating rate

960. As I discuss with respect to elements 1[d] and 1[f] of the '564 Patent this limitation is disclosed or rendered obvious by Bora '972. *See* '564 Patent analysis at elements 1[d] and 1[f], *supra. See* Bora '972 at ¶0121, ¶0131, Fig. 1, ¶ 0181, ¶¶ 0242-43, Fig. 29, ¶ 0248, ¶¶ 0254-55, Fig. 28, ¶0352, Fig. 69, ¶¶ 0254-55, Fig. 28, and ¶ 0406.

c. 14[c] wherein the capacity operating rate shown in the indicator can be an operating percentage, an operating chart or an actual operating value of a relevant operating parameter, wherein when a free setting motion of the free setting operator is ceased with at least one setting decision, the user interface APP manages to generate the at least one operating variable corresponding to a selection of the at least one capacity operating rate and accordingly operates to transmit the at least one wireless instruction signal carrying a message of the operating variable to the LED security light for setting the relevant operating parameter

961. As I discuss with respect to elements 1[f] and 1[g] of the '564 patent this limitation is disclosed or rendered obvious by Bora '972. *See* '564 patent analysis at elements 1[f] and 1[g], *supra. See* Bora '972 at ¶¶129-130, 133, 149, 213, 234-235, 259, Figures 1, 23. 37 and 38A-F, ¶0241, ¶0264, Fig. 38E, [0265], ¶266, ¶267, ¶0346, ¶0349, Figs. 67 and 68, ¶0349, ¶¶ 0421-22, Fig. 9, Fig. 98, ¶¶ 0264, 0346, 0349, ¶ 0213, ¶¶ 0213, and ¶ 0235.

4. <u>Dependent claim 15</u>

a. 15[a] The LED security light according to claim 14, wherein the capacity scale simulator is a virtual track, wherein the free setting algorithm is implemented by operating the free setting operator to interact with the virtual track and the indicator of the capacity operating rate, wherein the free setting operator is slidable by the user's finger along the virtual track with the indicator of the capacity operating rate simultaneously showing instantaneous state of a changing capacity operating rate while the sliding motion of the free setting operator is being conducted, wherein the state shown in the indicator of the capacity operating rate can be an operating percentage, an operating chart or an actual operating value of the at least one operating parameter

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962. As I discuss with respect to elements 1[f], 1[g], and 2[a] of the '564 Patent this limitation is disclosed or rendered obvious by Bora '972. *See* '564 Patent analysis at element 1[f], 1[g], 2[a], *supra. See* Bora '972 at ¶¶129-130, 133, 149, 213, 234-235, 259, Figures 1, 23. 37 and 38A-F, ¶0241, ¶0264, Fig. 38E, [0265], ¶266, ¶267, ¶0346, ¶0349, Figs. 67 and 68, ¶0349, ¶¶ 0421-22, Fig. 9, Fig. 98, ¶¶264, 346, 349, ¶ 0213, ¶¶213, 235, ¶ 0241, ¶ 0264, Fig. 38E, ¶ 0346, ¶ 0349, Figs. 68 and 69, ¶¶ 0421-22, Fig. 97, Fig. 98, ¶¶264, 346, 349; and Figs. 38E, 67, 68.

b. 15[b] wherein the full length of the virtual track represents a simulation of the value of the maximum operating capacity of the at least one operating parameter, wherein the capacity operating rate is determined by a parking location of the free setting operator on the virtual track when the sliding motion stops

963. As I discuss with respect to elements 1[f], 1[g], and 2[b] of the '564 Patent this limitation is disclosed or rendered obvious by Bora '972 and additionally rendered obvious by Bora '972 in view of Hoteling. *See* '564 Patent analysis at elements 1[f], 1[g], and 2[b], *supra.* *See* Bora '972 at at ¶¶129-130, 133, 149, 213, 234-235, 259, Figures 1, 23, 37 and 38A-F, ¶0241, ¶0264, Fig. 38E, [0265], ¶266, ¶267, ¶0346, ¶0349, Figs. 67 and 68, ¶0349, ¶¶ 0421-22, Fig. 9, Fig. 98, ¶¶264, 346, 349, ¶ 0213, ¶¶213, 235, ¶¶264, 346, 349; and Figs. 38E, 67, 68 ; Hotelling at 6:33-61; 10:25-12:50; 13:61-14:11.

5. <u>Dependent claim 24 - The LED security light according to claim 12, wherein the at least one operating parameter is for setting the light intensity of the low level illumination mode or the high level illumination mode.</u>

964. As discussed above, Bora '972 discloses or renders obvious, alone or in combination with Bondy, claim 12.

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965. Bora '972 discloses or renders obvious wherein the at least one operating parameter is for setting the light intensity of the low level illumination mode or the high level illumination mode.

966. Bora '972 discloses that " a light will be connected or equipped with an ambient light sensor that can detect the light levels present within an area, relay that information to the II Device's controller, which could be interpreted as a program input resulting in a change in the lighting brightness and/or color. Various programs are possible to utilize the II Device sensor's information as an input to causing some output in terms of a change in the brightness and/or color of one or more II Devices. In one program example, a user will select a preferred light level for II Device(s) or group(s) through the device application. Each II Device can have a different setting, giving the user to select any number of unique combinations. Selecting the preferred level might also be done through the user defined defaults for each II Device. When selected, the device application will then send a request through the controlling device to each II Device that the user has selected through the program, asking for each II Device's related ambient light sensor information. The device application upon receiving the light sensor information will store the default settings in the application or device's memory relative to each II Device. Alternatively, the II Device itself will record the sensor information in its own memory. The user can then at any other time activate an automatic adjustment program. Upon activation, the device application will send a communication to each II Device associated with the program. The communication will instruct each II Device to compare the current II Device sensor information against that associated with the preferred lighting level. This information would either stored in the II Device's memory or relayed via the device application's communication." Bora '972 at ¶ 0305.

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967. The II Device would then adjust its brightness and/or color depending on the light sensor data's relationship between the current and preferred lighting level. Simplified, if the current light sensor showed less luminosity than the preferred level, then the II Device would increase its own brightness. Alternately, if the current light sensor showed more luminosity than the preferred level, then the II Device would decrease its own brightness. The relationship between the difference in current and preferred light received will not be an equal or absolute relationship to the change in the brightness of the light. Alternatively, it will be some functional relationship dependent on the absolute and respective levels of light. The program and/or II Devices themselves would repeat this process for the duration that the program is active." Bora '972 at ¶ 0305.

968. The II Device would then adjust its brightness and/or color depending on the light sensor data's relationship between the current and preferred lighting level. Simplified, if the current light sensor showed less luminosity than the preferred level, then the II Device would increase its own brightness. Alternately, if the current light sensor showed more luminosity than the preferred level, then the II Device would decrease its own brightness. The relationship between the difference in current and preferred light received will not be an equal or absolute relationship to the change in the brightness of the light. Alternatively, it will be some functional relationship dependent on the absolute and respective levels of light. The program and/or II Devices themselves would repeat this process for the duration that the program is active." Bora '972 at ¶ 0306.

969. To the extent this limitation is not disclosed by Bora '972, it would have been obvious in view of a person of ordinary skill.

970. Thus, Bora '972 discloses or renders obvious this limitation.

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C. INDEFINITENESS OF CLAIMS 12, 14, 15, AND 24 OF THE '367 PATENT

1. "low level illumination mode emitting a light with a low light intensity" / "high level illumination mode emitting the light with a high light intensity for a preset time period before being switched back to the low level illumination mode"

971. Claim 12 of the '367 patent recites a "low level illumination mode emitting a light with a low light intensity" and a "high level illumination mode emitting the light with a high light intensity."

972. These terms are not defined in the specification and a person of ordinary skill would not have any guidance as to the boundaries of what constitutes a "high level" of intensity and a "low level" of light intensity. These are not terms of art with clearly defined boundaries. Although the '367 patent gives some examples of what would constitute a "high" and "low" level illumination mode but it does not clearly define whether a "low" or "high" level intensity is coextensive. I understand that Vaxcel has argued that "low" light intensity" should be 0-50 percent of a light's capacity and "high" light intensity should be 50-100 percent of a light's maximum capacity. In my opinion such an interpretation is contrary to the plain meaning of "light intensity" which is an absolute measurement. Under Vaxcel' s interpretation a very powerful light could have a "low" light intensity with very high lumen output. Similarly, under Vaxcel' s construction a very weak light would have a "high" intensity with low Lumen output. Thus, I do not think that high and low light intensities can be characterized solely in reference to the maximum capacity of a light. Additionally, intensity is itself and angular measurement so depending on the beam angle or shape, a lighting device may have different intensities for a fixed level of the light. [redacted]

Personal Deposition Tr. at 245-248. This is consistent with my understanding that these terms are not clearly bounded and instead dependent on context (which the '367 patent does not provide). The '367 patent does not provide any such context a person of ordinary skill could not ascertain the meaning of these terms with reasonable certainty. Accordingly for these reasons, it my opinion that claims 1, 12, 14, and 25 of the '367 patent are indefinite.

2. "free setting"

973. Claims 14 and 15 the '367 patent are indefinite because of claim 14's recitation of various "free setting" terms such as a "free setting operator" and "free setting algorithm" for the same reasons I have set forth with respect to claims 1 and 2 of the '564 patent.

3. "facilitate the user's decision making process in setting a desired level of the operating parameter"

974. Claims 14 and 15 of the '367 patent are indefinite for because of claim 14's recitation of "a capacitor scale simulator and an indicator of the capacity operating rate to facilitate making the at least one user's setting decision." This term is indefinite for the reasons set forth with respect to the '564 patent.

4. "operating chart"

975. Claims 14 and 15 of the '367 patent are indefinite for claim 14's recitation of "the capacity operating rate shown in the indicator can be an operating percentage, an operating chart or an actual operating value of the relevant operating parameter" for the reasons I set forth above for the '564 Patent.

[redacted]

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[redacted]

XIV. REPRESENTATIONS MADE IN CERTIFICATE OF CORRECTION

981. I understand that Vaxcel filed Requests for Certificates of Correction (the "Requests") with the USPTO in the '367 and '564 patents. In these Requests Vaxcel made certain arguments regarding the feasibility of preloading an application for lighting control on a mobile phone. I do not agree with these statements.

982. For example, the Requests say describe "preloading an APP" is an "impossibility." I do not believe that this is correct. Mobile phones may include various utilities preinstalled. While preloading an application on a mobile device is very different in many ways than installing it after purchase, it is not "an impossibility" as the Requests allege.

983. The Requests also state that a user would not "have any clue" how to download an application without purchasing a security light first. While the most common use case for a security light application is to download it with purchase of a lighting device and this is a very significant difference between a loaded and preloaded application, it is not true that a user would be unable to locate an application and download it without purchasing an associated lighting product. A lighting control application could be "preloaded" by the manufacturer. Second, a consumer could search for and download lighting controls applications without purchasing a product (though in such a circumstance the application would not be preloaded).

984. For example, searching for "lighting control" at the iOS app store produces a number of commercial applications which can be downloaded.

985. Additionally, searching for "Vaxcel" produces three results, a "Wifi Security" application called SMART LIGHTING, a "DualuxBT" application, and a "Robbie Led" application. All these applications can be downloaded and installed without the purchase of a lighting product.

986. Finally, the Requests argue that there is no way to test and activate an application to ensure that the applications work without purchasing a light first. While an application cannot be tested with a light that is not present, this would not preclude the application from being downloaded and launched nor would it preclude it from being preloaded or render it an impossibility.

XV. ENSNAREMENT

987. I understand in this matter that Vaxcel has alleged that the '564 patent claims and the '367 patent claims that recite that an APP or algorithm "preloaded" is infringed by certain HeathCo products and their associated application. I also understand that a party may not assert infringement under the doctrine of equivalents if a hypothetical claim with literal scope sufficient

to capture the accused product would be anticipated or rendered obvious by the prior art. I have been advised that Vaxcel has not put forward such hypothetical claims for the claims for which it is asserting infringement under the doctrine of equivalents. However, in my opinion any such hypothetical claims would necessarily be anticipated or rendered obvious by the prior art discussed herein for the same reasons that this prior art anticipates or renders obvious the actual asserted claims. I reserve the right to further supplement this opinion should Vaxcel articulate any such hypothetical claims.

XVI. MISCELLANEOUS COMMENTS

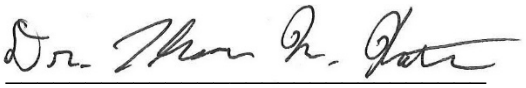
988. My opinions are subject to change based on additional information provided or positions taken by Plaintiff or its experts, or based on additional work I may perform.

989. I have not yet selected or prepared any exhibits for use at trial in this matter. I may use this report, its exhibits, and documents and information identified herein in support of or as a summary of my testimony. In addition, I may use demonstrative devices, including audio or visual aids and schematic representations, animated or otherwise, to illustrate the technology at issue, or any other technology such as that described in documents referred to herein. I may further rely on analogies concerning elements of the patents, the accused products, the prior art referenced in this report, or any related technologies.

990. In connection with my anticipated testimony in this action, I may use as exhibits various documents produced in this case that refer or relate to the matters discussed in this report. I have not yet selected the particular exhibits that might be used. In addition, I may create or assist in the creation of certain demonstrative evidence to assist me in testifying, and I reserve the right to do so.

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DATED: April 7, 2022



Thomas M. Katona