US008525440B1

(12) **United States Patent**
**Mika et al.**

(10) **Patent No.: US 8,525,440 B1**
(45) **Date of Patent: *Sep. 3, 2013**

(54) **LED LIGHTING FIXTURE**

(75) Inventors: **Jason R. Mika**, Austin, TX (US); **Christopher Varrin**, Los Gatos, CA (US); **Jeremy R. Hochman**, Austin, TX (US); **Matthew E. Ward**, Philadelphia, PA (US)

(73) Assignee: **Barco, Inc.**, Duluth, GA (US)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/533,825**

(22) Filed: **Jun. 26, 2012**

**Related U.S. Application Data**

(63) Continuation of application No. 12/074,969, filed on Mar. 7, 2008, now Pat. No. 8,207,678.

(60) Provisional application No. 60/894,117, filed on Mar. 9, 2007.

(51) **Int. Cl.**
***H05B 37/02*** (2006.01)

(52) **U.S. Cl.**
USPC ..... **315/291**; 315/250; 315/312

(58) **Field of Classification Search**
USPC ..... 315/178–184, 185 R, 185 S, 250, 315/291, 294, 297, 312; 362/227, 564–566, 362/640, 644, 652–654, 806
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

| | | | | |
|---|---|---|---|---|
| 5,300,864 | A | 4/1994 | Allen, Jr. | |
| 5,559,393 | A * | 9/1996 | Nilssen | 315/58 |
| 6,072,280 | A | 6/2000 | Allen | |
| 6,472,823 | B2 | 10/2002 | Yen | |
| 6,659,622 | B2 * | 12/2003 | Katogi et al. | 362/219 |
| 6,676,284 | B1 | 1/2004 | Wilson | |
| 6,857,924 | B2 | 2/2005 | Fu et al. | |
| 6,860,007 | B1 | 3/2005 | Liu et al. | |
| 7,053,557 | B2 | 5/2006 | Cross et al. | |
| 7,067,992 | B2 | 6/2006 | Leong et al. | |
| 7,329,024 | B2 | 2/2008 | Lynch et al. | |
| 7,377,802 | B2 | 5/2008 | Allen | |
| 7,401,946 | B2 | 7/2008 | Laukhuf | |
| 7,489,086 | B2 | 2/2009 | Miskin et al. | |
| 7,513,640 | B2 * | 4/2009 | Hendrikus | 362/219 |
| 7,737,643 | B2 | 6/2010 | Lys | |
| 2002/0012258 | A1 | 1/2002 | Nagai et al. | |
| 2004/0141293 | A1 | 7/2004 | Chun | |
| 2007/0153517 | A1 | 7/2007 | Sloan et al. | |
| 2007/0217209 | A1 | 9/2007 | Wong | |

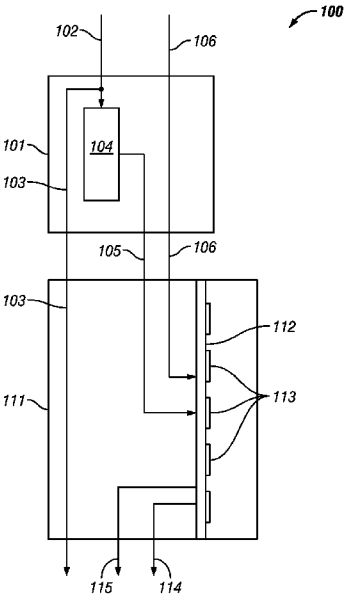
* cited by examiner

*Primary Examiner* — Tung X Le
(74) *Attorney, Agent, or Firm* — Aka Chan LLP

(57) **ABSTRACT**

An LED lighting system includes a power supply module, a data input line routed through the power supply module, an AC power input, and an LED fixture. The power supply module includes a power supply unit and an AC power cable. The AC power input is electrically connected to the power supply unit and the AC power cable. The LED fixture is electrically connected to an output of the power supply unit and the data input cable, and includes one or more LED assemblies disposed on a circuit board, a data signal output, and a power output. The AC power cable may be routed through the LED fixture.

**40 Claims, 8 Drawing Sheets**



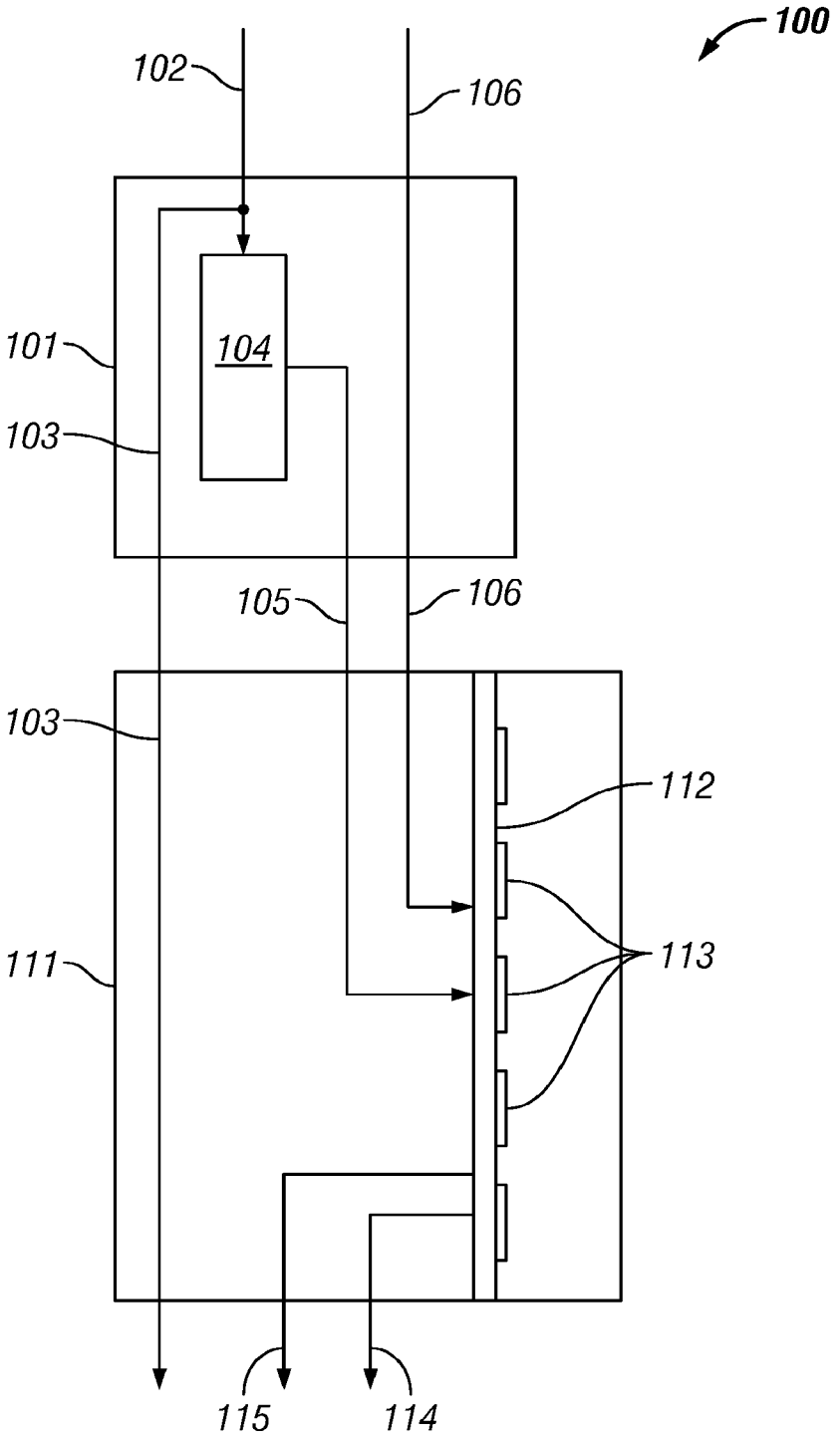



FIG. 1

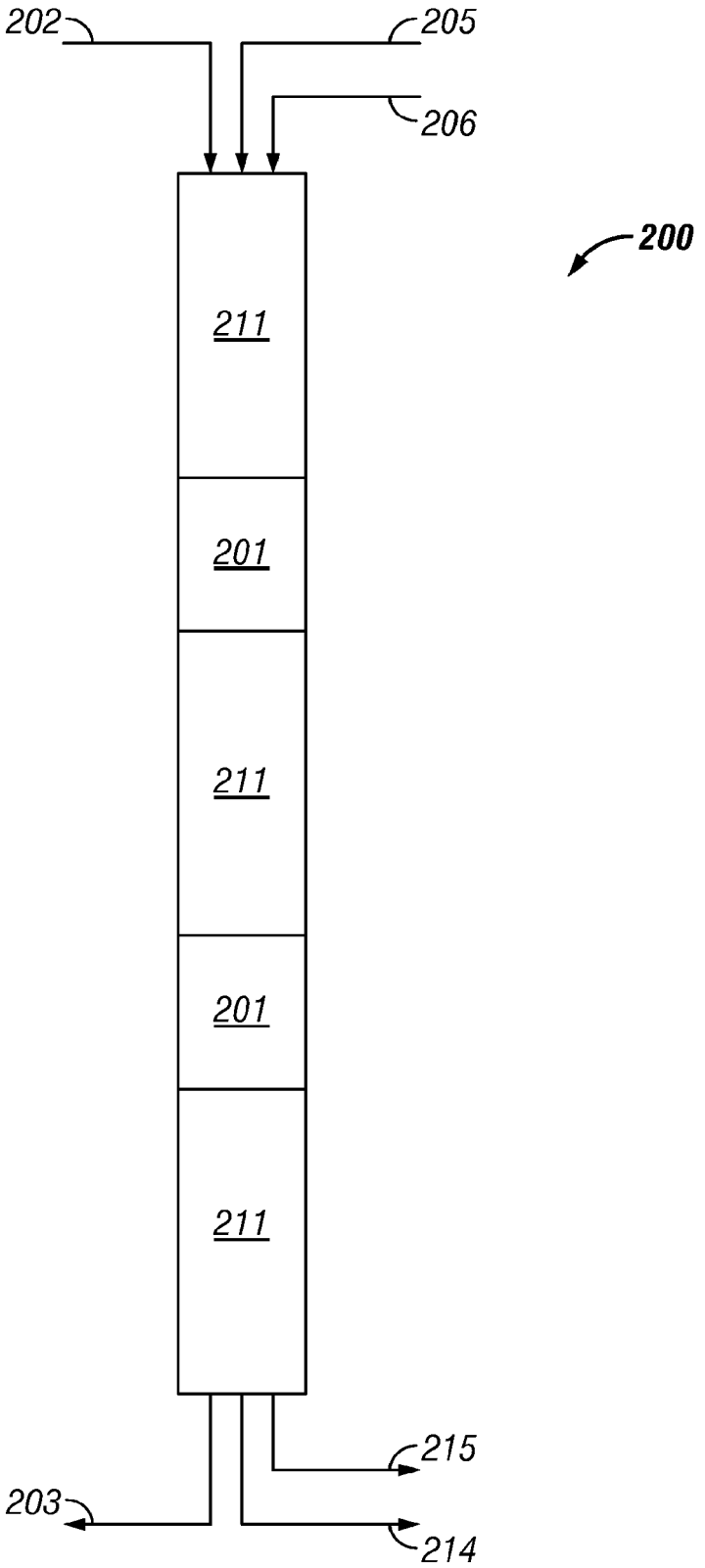



FIG. 2

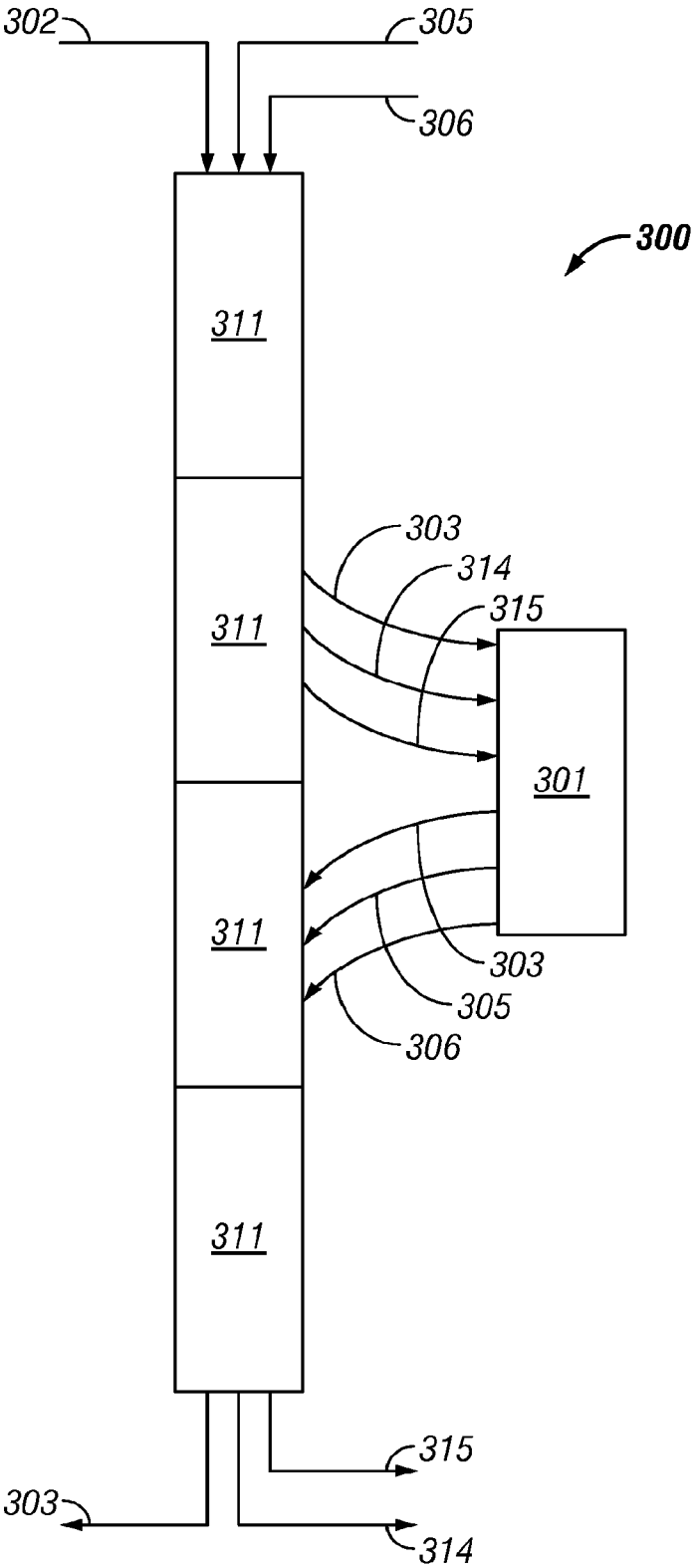

302
305
306
300
311
311
311
311
303
314
315
301
303
305
306
315
303
314

FIG. 3

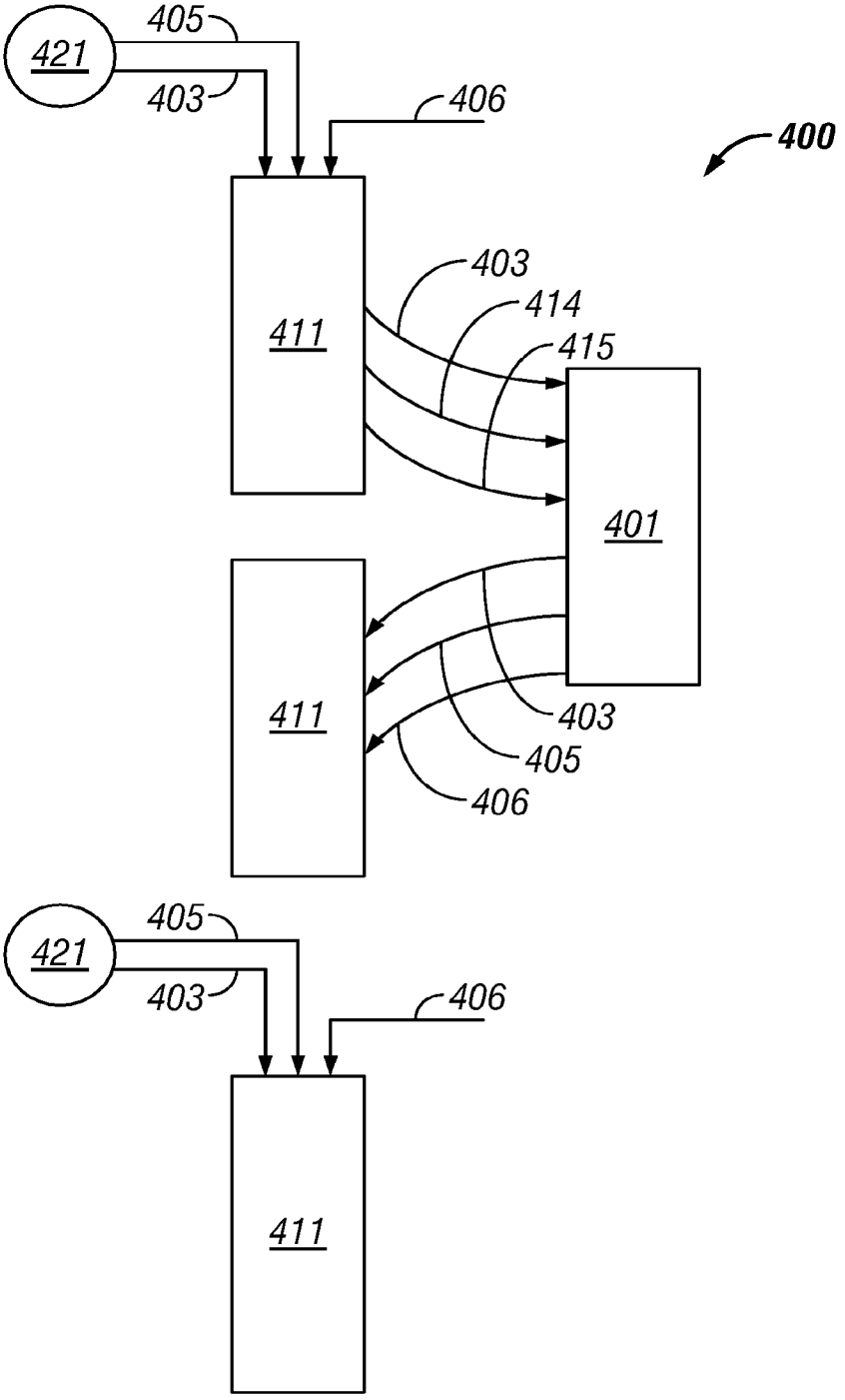

421
405
403
406
400
411
403
414
415
401
411
403
405
406
421
405
403
406
411

FIG. 4

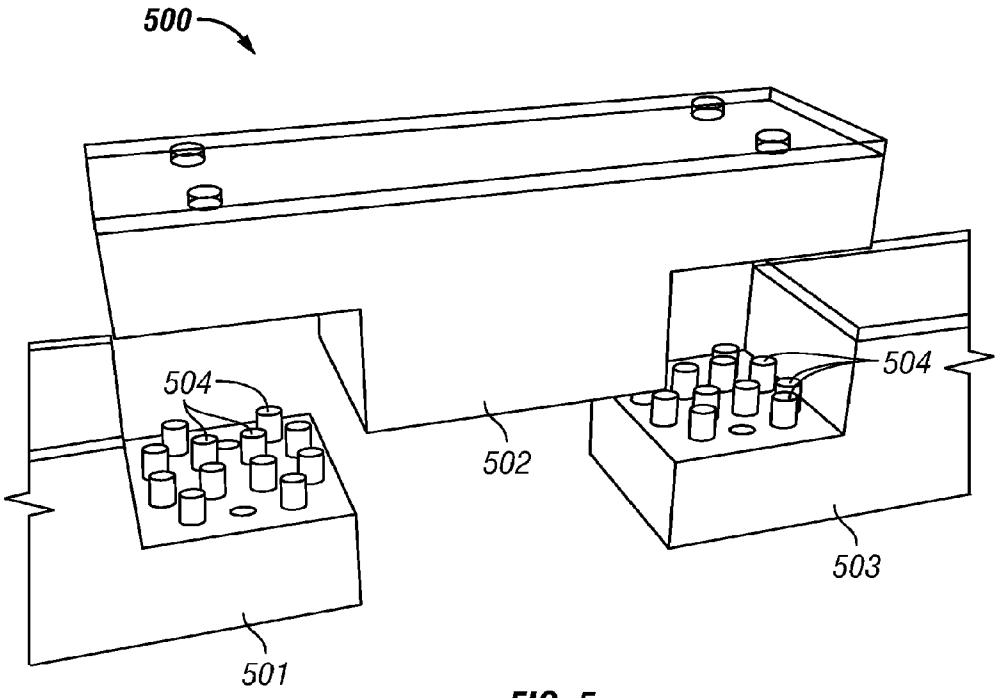



FIG. 5

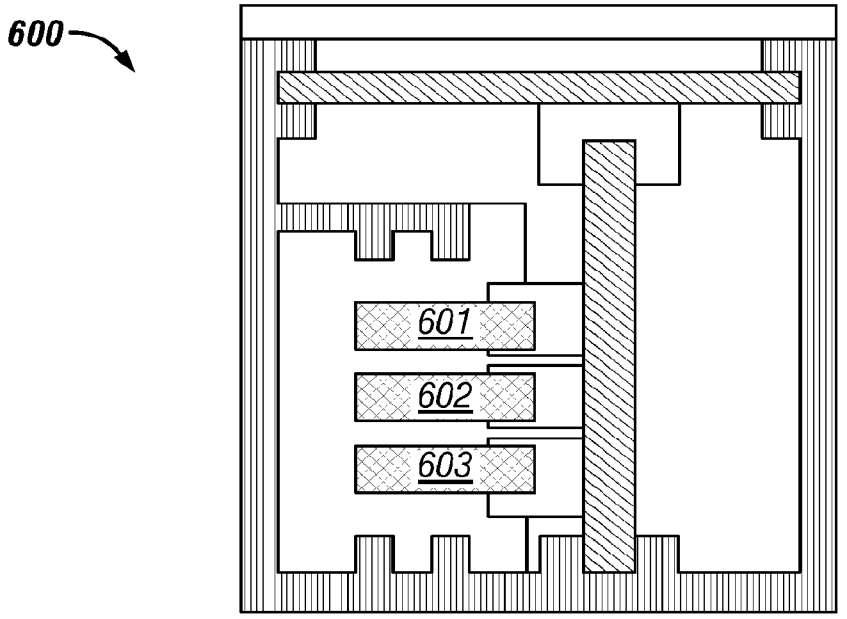



FIG. 6

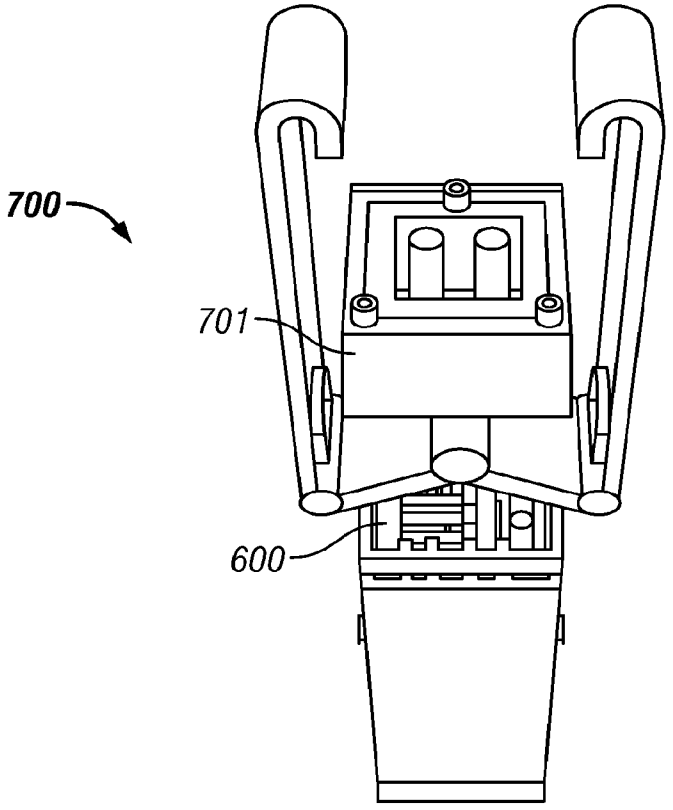



FIG. 7

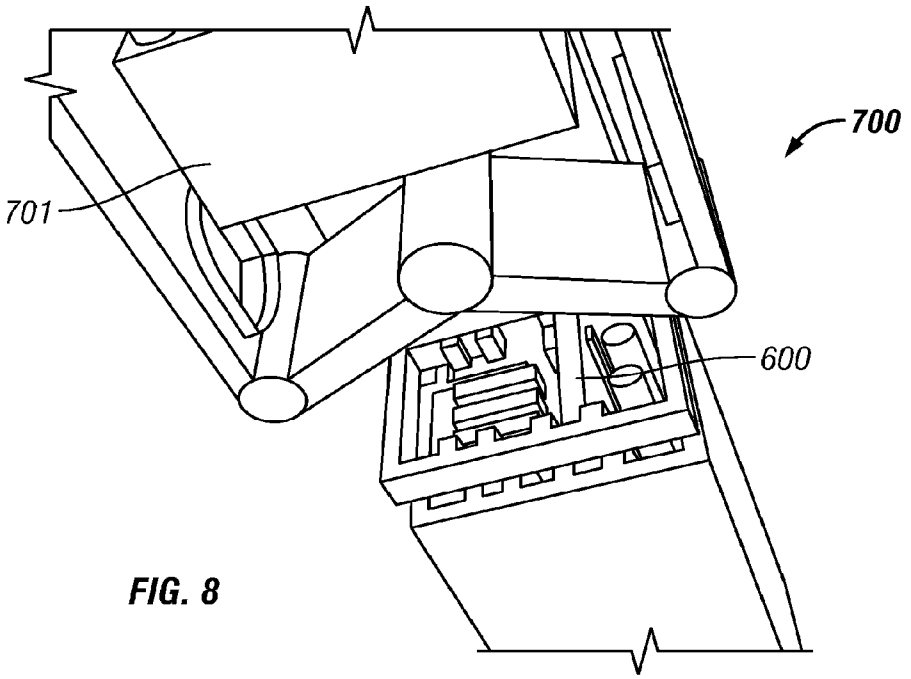



FIG. 8

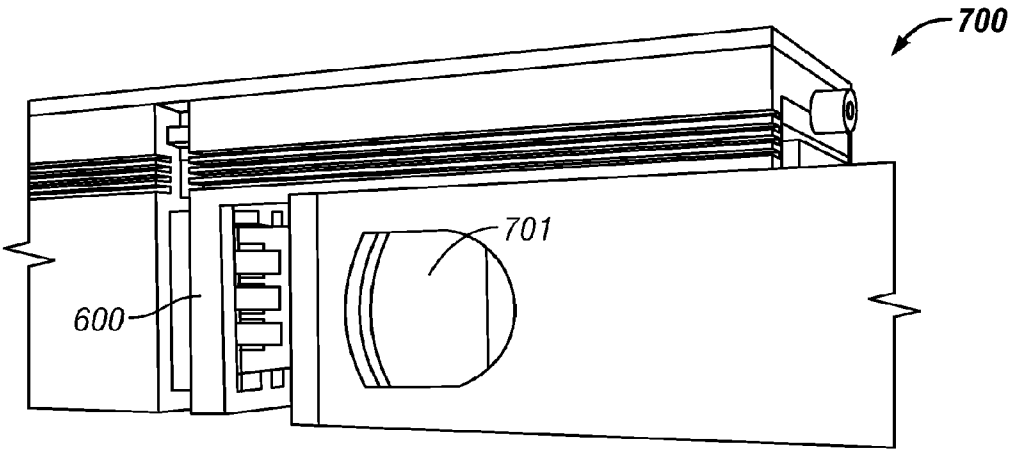



FIG. 9

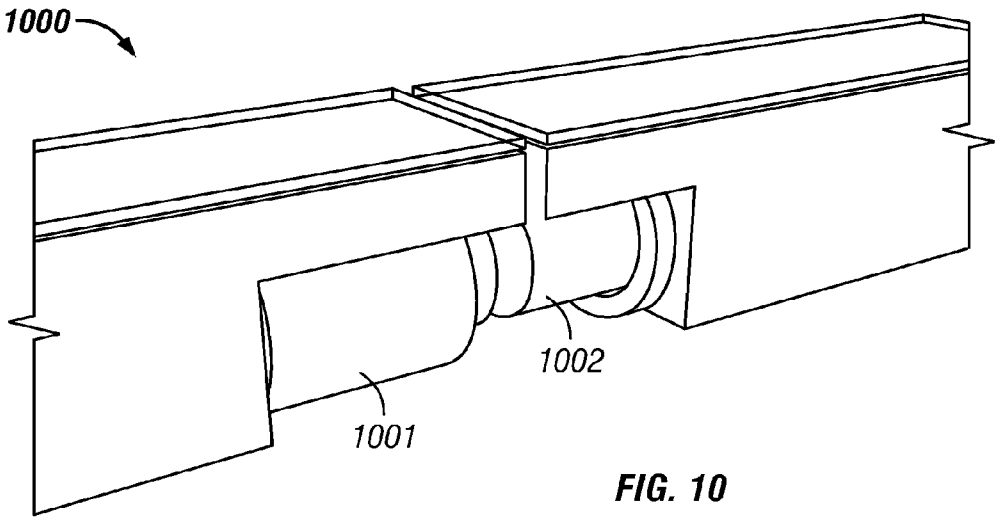



FIG. 10

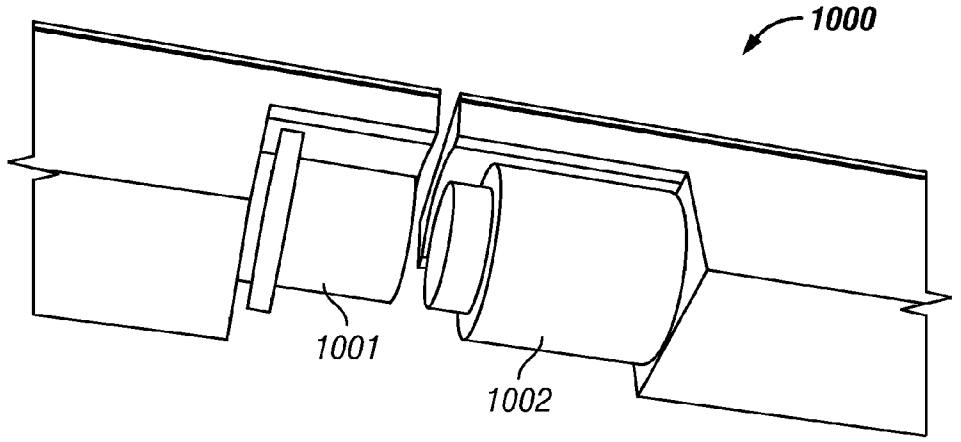



FIG. 11

# LED LIGHTING FIXTURE

## CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 12/074,969, filed Mar. 7, 2008, issued as U.S. Pat. No. 8,207,678 on Jun. 26, 2012, which claims priority to U.S. patent application 60/894,117, filed Mar. 9, 2007, which are incorporated by reference in their entirety along with all other references cited in this application.

## BACKGROUND OF THE INVENTION

Embodiments disclosed herein generally relate to lighting systems. More specifically, embodiments disclosed herein relate to an improved system and method for distributing power and data signals in a lighting system.

Display units for entertainment, architectural, and advertising purposes have commonly been constructed from numbers of light emitting elements, such as light emitting diodes (LEDs) or incandescent lamps. The light emitting elements may be selectively turned on and off to create patterns, graphics, and video displays for both informational and aesthetic purposes. It is well known to construct tubular lighting and display devices using LEDs and various methods have been used for distributing data and power signals through such devices.

U.S. Pat. No. 6,472,823, issued to George Yen, uses a daisy-chain system where control and power enters one end of a tube fixture, is carried through the tube, and leaves the other end to connect to the next fixture. The power supply is at one end of the chain so that the system may be limited by the number of tubes that are connected in the chain by the capacity of that power supply. U.S. Pat. No. 6,857,924, issued to Ta-Hao Fu, and U.S. Pat. No. 6,860,007, issued to Li-wen Liu, are also similarly used.

U.S. Pat. No. 7,053,557, issued to Robert Cross, describes supplying power in parallel to multiple LED tube fixtures but does not disclose doing so in a way that allows multiple power supplies to be used or means to economically distribute and protect the cabling systems. In addition the low voltage power supplies are contained within the tube where heat management could be problematic.

U.S. Pat. No. 7,067,992, issued to Susan Leong, describes another method for connecting power to an LED tube fixture but does not explain how data signals may also be connected.

U.S. Pat. No. 6,676,284, issued to Wynne Willson, describes an LED tube fixture system with multiple power supplies and a data signal path but does not teach means for connecting the power supplies and routing the cables to minimize fixture size.

LED tube fixtures of this type are often used in architectural situations where it is a requirement to maintain a clean and tidy appearance for the fixture with hidden cabling and seamless joins between fixtures. Another requirement is that the power supplies are mounted in such a way that access for installation and maintenance is simple. Finally, it would be advantageous to provide protection for power and data cabling without the need to run separate cable conduits or trunking adjacent to the fixtures.

This invention seeks to provide means for distributing power and data signals in an LED lighting or display fixture that may minimize the size of the fixture and eliminate the need to run alternating current (AC) power in a separate cable alongside the fixture.



## BRIEF SUMMARY OF THE INVENTION

In one aspect of one or more embodiments, an LED lighting system includes a power supply module, a data input line routed through the power supply module, an AC power input, and an LED fixture. The power supply module includes a power supply unit and an AC power cable. The AC power input is electrically connected to the power supply unit and the AC power cable. The LED fixture is electrically connected to an output of the power supply unit and the data input cable, and includes one or more LED assemblies disposed on a circuit board, a data signal output, and a power output. The AC power cable may be routed through the LED fixture.

In another aspect of one or more embodiments, a method of transmitting data and power within an LED lighting system includes receiving an AC power input and a data input signal at a power supply module, splitting the AC power input into an AC power cable and an AC power signal, connecting the AC power signal to a power supply unit disposed within the power supply module, generating a low voltage power signal from the AC power signal with the power supply unit, connecting the AC power cable, the low voltage power signal, and the data input signal to an LED fixture, receiving the low voltage power signal and the data input signal at a circuit board disposed within the LED fixture, wherein the circuit board comprises an LED assembly disposed thereon, and powering and controlling the LED assembly with the low voltage power signal and the data signal.

In yet another aspect of one or more embodiments, a method of transmitting data and power within an LED lighting system includes receiving an AC power input, a low voltage power signal, and a data signal at a power supply module, connecting the AC power input and the low voltage power signal to a power supply unit disposed within the power supply module, splitting the AC power input into an AC power cable and an AC power signal, powering the power supply unit with the AC power signal, amplifying the low voltage power signal with the power supply unit, connecting the AC power cable, the low voltage power signal, and the data signal to an LED fixture, receiving the low voltage power signal and the data signal at a circuit board disposed within the LED fixture, wherein the circuit board comprises an LED assembly disposed thereon, and powering and controlling the LED assembly with the low voltage power signal and the data signal.

Further, in yet another aspect of one or more embodiments, an LED lighting system includes a first LED fixture electrically connected to a low voltage power input and a data signal input, a power supply module, and a second LED fixture. The first LED fixture includes a first AC power cable routed through the first LED fixture, thereby providing a first AC power output, a first low voltage power output, and a first data signal output. The power supply module includes a power supply unit electrically connected to the first AC power output, and provides a second low voltage power output, a second AC power cable electrically connected to the first AC power output, thereby providing a second AC power output, and a data input line electrically connected to the first data signal output and routed through the power supply module, thereby providing a second data signal output. The second LED fixture is electrically connected to the second low voltage power output and the second data signal output and includes a third AC power cable electrically connected to the second AC power output and routed through the second LED fixture, thereby providing a third AC power output, a third low voltage power output, and a third data signal output.

Other objects, features, and advantages of the present invention will become apparent upon consideration of the following detailed description and the accompanying drawings, in which like reference designations represent like features throughout the figures.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of an LED light system in accordance with embodiments disclosed herein.

FIG. **2** is a block diagram of an LED light system in accordance with embodiments disclosed herein.

FIG. **3** is a block diagram of an LED light system in accordance with embodiments disclosed herein.

FIG. **4** is a block diagram of an LED light system in accordance with embodiments disclosed herein.

FIG. **5** shows a perspective view of an LED light system in accordance with embodiments disclosed herein.

FIG. **6** shows a top view of a connector used in accordance with embodiments disclosed herein.

FIG. **7** shows a perspective view of a connection used in accordance with embodiments disclosed herein.

FIG. **8** shows a perspective view of a connection used in accordance with embodiments disclosed herein.

FIG. **9** shows a perspective view of a connection used in accordance with embodiments disclosed herein.

FIG. **10** shows a perspective view of a connection used in accordance with embodiments disclosed herein.

FIG. **11** shows a perspective view of a connection used in accordance with embodiments disclosed herein.

## DETAILED DESCRIPTION OF THE INVENTION

Specific embodiments of the present disclosure will now be described in detail with reference to the accompanying figures. Like elements in the various figures may be denoted by like reference numerals for consistency. Further, in the following detailed description of embodiments of the present disclosure, numerous specific details are set forth in order to provide a more thorough understanding of the invention. However, it will be apparent to one of ordinary skill in the art that the embodiments disclosed herein may be practiced without these specific details. In other instances, well-known features have not been described in detail to avoid unnecessarily complicating the description.

Embodiments of the claimed invention are directed towards a light emitting diode (LED) light system that eliminates the necessity for separate power and data cables being run alongside the system. The LED light system may include LED fixtures and power supply modules. The LED fixtures serve to actually generate light to create patterns, graphics, and video displays for both informational and aesthetic purposes, whereas the power supply modules serve as a stable source of power for LED fixtures. Generally, there is a main source of alternating current (AC) power for the entire LED light system, but each of the LED fixtures may run on a low voltage DC power signal. Embodiments of the claimed invention may allow a cable carrying AC power to route through the LED light system itself in order to keep the cable out of sight. Data signal cables and low voltage supply cables may also be similarly routed through the system.

Referring to FIG. **1**, a block diagram of an LED light system **100** in accordance with embodiments disclosed herein is shown. The system **100** includes an LED fixture **111** and a power supply module **101**. The power supply module **101** includes an AC power input **102** and a data signal line **106** as inputs. Within the power supply module **101**, an AC power input **102** may be split between an AC power signal and an AC power cable **103**. The AC power signal is electrically connected to a power supply unit **104**, also contained within the power supply module **101**.

After being split from the AC power input **102**, the AC power cable **103** is then routed through the LED fixture **111** exiting as AC power **103**. AC power cable **103** may be insulated within the LED fixture **111**, but LED fixture **111** provides routing and protection for the AC power cable **103**. Further, within the LED fixture **111**, AC power cable **103** may be electrically isolated and separated from low voltage areas and cables using internal barriers within the LED fixture **111** or using insulation on AC power cable **103**.

The data signal line **106** passes through the power supply module **101**, exits the module, and connects to the LED fixture **111**. In this embodiment, the data signal line **106** is insulated, or isolated, from the power supply module **101**, but power supply module **101** provides routing and protection for the data signal line **106**. In an alternate embodiment, not shown in the figures, the data signal line **106** may connect to the power supply module **101**. In this case, the power supply module **101** may amplify, or boost, a data signal transmitted on the data signal line **106**. In this embodiment data signal line **106** would not be an output, and there would be an additional data signal output from the power supply module **101** that may be transmitted to either a second power supply module or the LED fixture **111**.

The power supply unit **104** accepts the AC power signal split from the AC power input **102**, and generates a low voltage supply signal **105**. The low voltage supply signal **105** may, for example, be a DC power supply signal suitable for driving the LED fixture **111**. The power supply signals suitable for directly driving the LED fixture **111** are generally not suitable for being transmitted over long distances. Thus, the power supply unit **104** serves to refresh the low voltage supply signal for use in the subsequent LED fixture **111**.

LED fixture **111** accepts an AC power cable **103**, low voltage supply signal **105**, and data signal line **106** as inputs. As discussed above, the AC power cable **103** may be insulated from other components and pass straight through the LED fixture **111** to be used in further modules. The LED fixture **111** further includes a circuit board **112** and LED assemblies **113**. The LED assemblies **113** may include individual LEDs or arrays of LEDs. Further, each individual LED may be a typical light emitting diode, a polymer light emitting diode (PLED), an organic light emitting diode (OLED), or any other LED known in the art. The LED fixture may include, for example, an extrusion LED tube fixture, or any other LED fixture known in the art.

The circuit board **112** and LED assemblies **113** may be powered by the low voltage supply input **105** to produce light controlled based on information transmitted over the data signal line **106**. Hence, the circuit board **112** and LED assemblies **113** serve to display light from the LED lighting system **100**. Outputs from the LED fixture **111** include the AC power cable **103**, data signal output **114**, and low voltage supply output **115**. While the data signal output **114** and low voltage supply output **115** are shown to originate from the circuit board **112**, the outputs **114**, **115** may also be tied directly to the corresponding inputs **106**, **105**.

Referring to FIG. **2**, a block diagram of an LED light system **200** in accordance with embodiments disclosed herein is shown. In this arrangement, three LED fixtures **211** are connected in series with two power supply modules **201** therebetween. This arrangement may be used to refresh the low voltage supply inputs for each of the LED fixtures **211**. Inputs to the topmost LED fixture include an AC power input

202, data signal line 205, and a low voltage supply input 206. Subsequently, the outputs from the topmost LED fixture are fed directly into the topmost power supply module through a connection between the two. A power supply module 201 may then refresh the low voltage supply power for the next LED fixture in the series, using the AC power cable routed through the previous LED fixture for power.

Alternatively, multiple LED fixtures 211 may be connected together in series between power supply modules 201. However, the length such a series of LED fixtures 211 is limited based on the power supplied by the original AC power input 202 and the power consumed in each of the LED fixtures 211. The number of fixtures between power supply modules 201 may be similarly limited based on the low voltage supply power. The final LED fixture 211 shows an AC power cable output 203, a data signal line output 214, and a low voltage supply signal output 215. These outputs may be used to drive further power supply modules 201 or LED fixtures 211. However, if the LED fixture is the last in a chain, they may not be used at all, and the connections may be terminated.

Referring to FIG. 3, a block diagram of an LED light system 300 in accordance with embodiments disclosed herein is shown. In this arrangement, four LED fixtures 311 are connected in series with a single power supply module 301 in parallel. This arrangement may be used to refresh the low voltage supply inputs for each of the bottom two LED fixtures 311. Inputs to the topmost LED fixture include an AC power input 302, data signal line 305, and a low voltage supply input 306. Each of the four LED fixtures is directly connected to the next in the series. External connections for the AC power cable 303, the data signal line output 314, and the low voltage supply output 315 are disposed on the second LED fixture from the top to connect to the power supply module 301. The power supply module 301 may then refresh the low voltage supply input 305 that is in turn fed into the third LED fixture from the top, as well as AC cable 303 and data signal line input 306.

The final LED fixture 311 shows an AC power cable output 303, a data signal line output 314, and a low voltage supply signal output 315. These outputs may be used to drive further power supply modules 301 or LED fixtures 311. However, if the LED fixture is the last in a chain, they may not be used at all, and the connections may be terminated.

Advantageously, this arrangement allows power supply modules 311 to be placed along the series of LED fixtures 301 as often as necessary. For example, the power provided may be sufficient for a chain of three or more LED fixtures 301 to be connected in series before an external power supply module 311 is needed to refresh the low voltage supply. As discussed above, this is limited by the AC power input, the power drawn from the LED fixtures, and any undesired power dissipation.

Referring to FIG. 4, a block signal and power flow diagram that includes features to isolate an LED lighting system 400 at the points where the system connects to house power is shown. At the start a LED fixtures 411 is a connection between the LED fixtures 411 and a house power distribution point 421. These power distribution points 421 may be inserted as often as desired. In some cases, it may be desirable to use frequent power distribution points to minimize the impact of failure by any single distribution point. In this example, the first house power distribution point 421 powers two LED fixtures 411, with one power supply module 401 to refresh the low voltage supply input to the second LED fixture 411. A second house power distribution point 422 powers a new series of LED fixtures below. At any point in a series, an additional house power distribution point may be added. A transformer may be included within a house power distribution point so as to supply both the AC power input 403 and the low voltage supply input 405.

Referring to FIG. 5, a perspective view of an LED lighting system 500 in accordance with embodiments disclosed herein are shown. LED fixtures 501, 503 are connected to power supply module 502 at each end through connections 504. Alternatively, each of the sections 501, 502, and 503 may comprise either a LED fixture or a power supply module. Connections 504 may include, but are not limited to the AC power inputs or outputs, data signal line inputs or outputs, and low voltage supply signal inputs or outputs, as discussed above with respect to various other embodiments disclosed herein. Further, connections capable of mating with connections 504 may be included on the end portions of power supply module 502. Advantageously, using the housings and connections shown, the connections between various modules may be completely hidden from view.

Referring to FIG. 6, an end view of a first mating connection 600 used in accordance with embodiments disclosed herein is shown. The mating connection 600 includes contact points 601, 602, and 603, for positive, ground, and negative connections. Referring to FIG. 7, a perspective view of a connection within a LED lighting system 700 shows a second mating connection 701 connecting to first mating connection 600 in accordance with embodiments disclosed herein. First mating connection 600 and second mating connection 701 are capable of joining to form electrical connections. These electrical connections may include, but are not limited to the AC power inputs or outputs, data signal line inputs or outputs, and low voltage supply signal inputs or outputs, as discussed above with respect to various other embodiments disclosed herein. Further, first and second mating connections 600, 701 may be examples of the connections 504 shown in FIG. 5. Finally, referring to FIGS. 8 and 9, two alternative perspective views of the connection within a LED lighting system 700 show a first mating connection 600 mating with a second mating connection 701 as they are used in accordance with embodiments disclosed herein.

Referring to FIGS. 10 and 11, two perspective views of an LED lighting system 1000 show a first mating connection 1001 mating with a second mating connection 1002 as they are used in accordance with embodiments disclosed herein. First and second mating connections 1001, 1002 are alternative embodiments of the first and second mating connections 600, 701 discussed above with respect to FIGS. 6-9. First mating connection 1001 and second mating connection 1002 are capable of joining to form electrical connections. These electrical connections may include, but are not limited to the AC power inputs or outputs, data signal line inputs or outputs, and low voltage supply signal inputs or outputs, as discussed above with respect to various other embodiments disclosed herein. Further, first and second mating connections 1001, 1002 may be examples of the connections 504 shown in FIG. 5.

Embodiments disclosed herein may provide for one or more of the following advantages. First, the present disclosure may provide for an LED lighting system that does not require that separate data or power cables be run alongside the system. Because the system is directed towards displaying patterns, graphics, and video displays for both informational and aesthetic purposes, keeping data and power cables out of sight may provide for a better visual experience. Next, the present disclosure may provide for protection of data and power cables, because the data and power cables are run through the housing of the system itself. Finally, the present disclosure may provide for minimizing the number of power

supply modules in an LED lighting system, because the embodiments disclosed herein allow for power supply modules to be inserted between, or alongside, LED fixtures as often as necessary.

This description of the invention has been presented for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form described, and many modifications and variations are possible in light of the teaching above. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications. This description will enable others skilled in the art to best utilize and practice the invention in various embodiments and with various modifications as are suited to a particular use. The scope of the invention is defined by the following claims.

The invention claimed is:

**1**. A method of transmitting data and power within an LED lighting system comprising:
- receiving an AC power input and a data input signal at a power supply module;
- splitting the AC power input into an AC power cable and an AC power signal;
- connecting the AC power signal to a power supply unit disposed within the power supply module;
- generating a low voltage power signal from the AC power signal with the power supply unit;
- connecting the AC power cable, the low voltage power signal, and the data input signal to an LED fixture;
- receiving the low voltage power signal and the data input signal at a circuit board disposed within the LED fixture, wherein the circuit board comprises an LED assembly disposed thereon; and
- powering and controlling the LED assembly with the low voltage power signal and the data signal.

**2**. The method of claim **1** comprising:
- amplifying the data signal with the power supply unit; and
- transmitting the data signal to another power supply module.

**3**. The method of claim **1** comprising:
- amplifying the data signal with the power supply unit; and
- transmitting the data signal to another LED fixture.

**4**. The method of claim **1** comprising:
- routing the AC power cable through the LED fixture; and
- connecting the AC power cable to another power supply module.

**5**. The method of claim **1** comprising:
- routing the AC power cable through the LED fixture; and
- connecting the AC power cable to another LED fixture.

**6**. The method of claim **1** comprising:
- enclosing the power supply module in a first enclosure; and
- enclosing the circuit board comprising the LED assembly circuit board in a separate enclosure, separate from the first enclosure.

**7**. The method of claim **1** wherein there is no visible cabling between the power supply module and the LED assembly.

**8**. A method of transmitting data and power within an LED lighting system comprising:
- receiving an AC power input, a low voltage power signal, and a data signal at a power supply module;
- connecting the AC power input and the low voltage power signal to a power supply unit disposed within the power supply module;
- splitting the AC power input into an AC power cable and an AC power signal;
- powering the power supply unit with the AC power signal;
- amplifying the low voltage power signal with the power supply unit;
- connecting the AC power cable, the low voltage power signal, and the data signal to an LED fixture;
- receiving the low voltage power signal and the data signal at a circuit board disposed within the LED fixture, wherein the circuit board comprises an LED assembly disposed thereon; and
- powering and controlling the LED assembly with the low voltage power signal and the data signal.

**9**. The method of claim **8** comprising:
- passing the data signal through LED fixture unaltered.

**10**. The method of claim **8** comprising:
- enclosing the power supply module in a first enclosure that is separate from a second enclosure of the LED fixture.

**11**. The method of claim **10** comprising:
- coupling the first enclosure to the second enclosure without using cabling between the enclosures.

**12**. The method of claim **10** wherein the first enclosure comprises output connections for the AC power cable, low voltage power signal, and data signal that couple to corresponding input connections of the second enclosure.

**13**. The method of claim **8** wherein the AC power cable is electrically isolated from the circuit board, the low voltage power signal, and the data signal.

**14**. The method of claim **8** wherein the data signal is electrically isolated from the power supply unit and the AC power cable.

**15**. The method of claim **8** comprising:
- connecting the AC power cable, the low voltage power signal, and the data signal to a second LED fixture;
- receiving the low voltage power signal and the data signal at a second circuit board disposed within the second LED fixture, wherein the second circuit board comprises a second LED assembly disposed thereon; and
- powering and controlling the second LED assembly with the low voltage power signal and the data signal.

**16**. The method of claim **15** wherein the low voltage power signal is connected to the first and second LED fixtures without passing through any LEDs.

**17**. The method of claim **15** wherein the low voltage power output is DC power.

**18**. The method of claim **8** wherein the LED fixture is an extrusion LED tube fixture.

**19**. The method of claim **8** wherein there are at least two LED fixtures.

**20**. The method of claim **8** wherein the power supply module and the LED fixture are electrically coupled.

**21**. A system of transmitting data and power within an LED lighting system comprising:
- a power supply module having an AC power input and a data input signal,
- wherein the AC power input is split into an AC power cable and an AC power signal,
- the AC power signal is connected to a power supply unit disposed within the power supply module, and
- the power supply unit generates a low voltage power signal from the AC power signal;
- an LED fixture connected to the AC power cable, the low voltage power signal, and the data input signal; and
- a circuit board, having the low voltage power signal and the data input signal disposed within the LED fixture, wherein the circuit board comprises an LED assembly disposed thereon, and
- the low voltage power signal and the data signal power control the LED assembly.

**22**. The system of claim **21** wherein the power supply unit amplifies the data signal and

the data signal is transmitted to another power supply module.

**23**. The system of claim **21** wherein the power supply unit amplifies the data signal and

the data signal is transmitted to another LED fixture.

**24**. The system of claim **21** wherein the AC power cable is routed through the LED fixture and connected to another power supply module.

**25**. The system of claim **21** wherein the AC power cable is routed through the LED fixture and connected to another LED fixture.

**26**. The system of claim **21** wherein

the power supply module is enclosed in a first enclosure; and

the circuit board comprising the LED assembly circuit board is enclosed in a separate enclosure, separate from the first enclosure.

**27**. The system of claim **21** wherein there is no visible cabling between the power supply module and the LED assembly.

**28**. A system of transmitting data and power within an LED lighting system comprising:

an AC power input;

a low voltage power signal;

a data signal at a power supply module;

a power supply unit, disposed within the power supply module, connected to the AC power input and the low voltage power signal;

an AC power cable;

an AC power signal wherein the AC power input is split into the AC power cable and the AC power signal,

the power supply unit is powered with the AC power signal, and

the low voltage power signal is amplified with the power supply unit; and

an LED fixture connected to the AC power cable, the low voltage power signal, and the data signal comprising:

receiving the low voltage power signal and the data signal at a circuit board disposed within the LED fixture, wherein the circuit board comprises an LED assembly disposed thereon, and

powering and controlling the LED assembly with the low voltage power signal and the data signal.

**29**. The system of claim **28** comprising:

passing the data signal through the LED fixture unaltered.

**30**. The system of claim **28** comprising:

a first enclosure encloses the power supply module; and

a second enclosure, separate from the first enclosure, encloses the LED fixture.

**31**. The system of claim **30** wherein the first enclosure is coupled to the second enclosure without using cabling between the enclosures.

**32**. The system of claim **30** wherein the first enclosure comprises output connections for the AC power cable, low voltage power signal, and data signal that couple to corresponding input connections of the second enclosure.

**33**. The system of claim **28** wherein the AC power cable is electrically isolated from the circuit board, the low voltage power signal, and the data signal.

**34**. The system of claim **28** wherein the data signal is electrically isolated from the power supply unit and the AC power cable.

**35**. The system of claim **28** comprising:

a second LED fixture connected to the AC power cable, the low voltage power signal, and the data signal; and

a second circuit board disposed within the second LED fixture receives the low voltage power signal and the data signal, wherein the second circuit board comprises a second LED assembly disposed thereon, and

the low voltage power signal and the data signal powers and controls the second LED assembly.

**36**. The system of claim **35** wherein the low voltage power signal is connected to the first and second LED fixtures without passing through any LEDs.

**37**. The system of claim **35** wherein the low voltage power output is DC power.

**38**. The system of claim **28** wherein the LED fixture is an extrusion LED tube fixture.

**39**. The system of claim **28** wherein there are at least two LED fixtures.

**40**. The system of claim **28** wherein the power supply module and the LED fixture are electrically coupled.

* * * * *