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(54) **ILLUMINATING APPARATUS AND METHOD THEREOF**

(75) Inventors: **SHIH-NENG TAI**, TAOYUAN COUNTY (TW); **CHIA-TIN CHUNG**, MIAOLI COUNTY (TW)

(73) Assignee: **PARAGON SEMICONDUCTOR LIGHTING TECHNOLOGY CO., LTD.**, Taoyuan County (TW)

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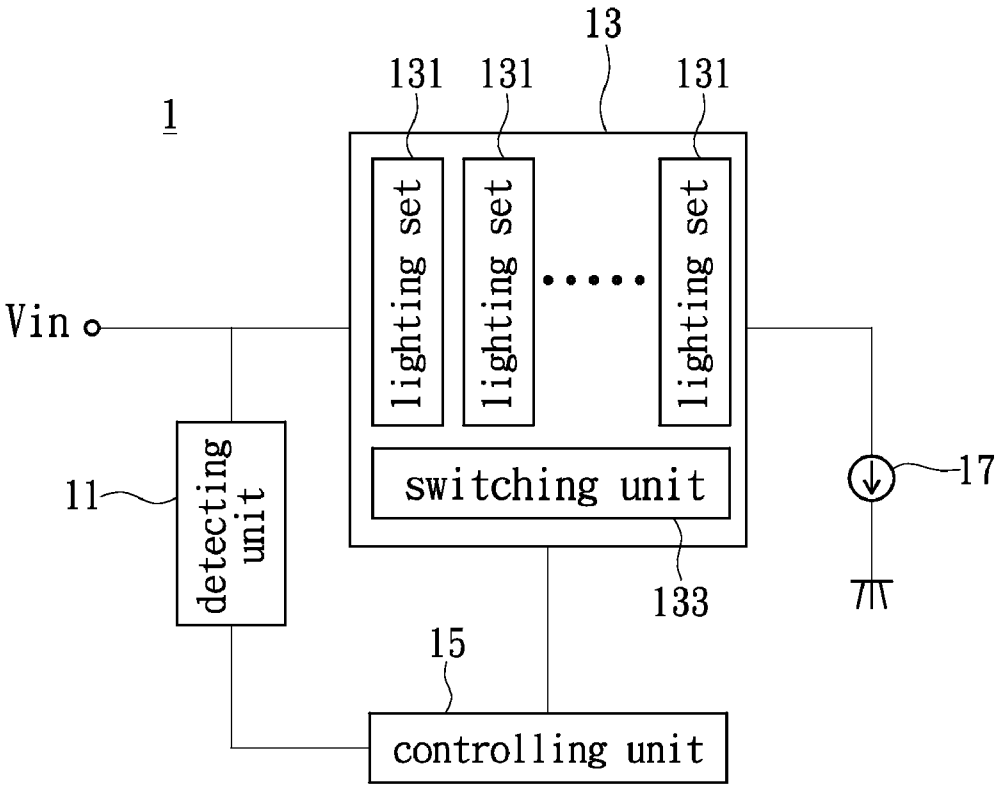
(57) **ABSTRACT**

An illuminating apparatus adapted to receive an input power which is a pulse DC includes a lighting unit, a detecting unit and a controlling unit. The lighting unit includes a plurality of lighting sets and a switching unit. The switching unit may be used to cause the lighting sets interconnected in a serial fashion and/or in a parallel manner. The detecting unit detects a state of the input power. The control unit couples the detecting unit and the lighting unit, and controls the switching unit according to the detecting unit detecting the state of the input power. As such, the turn-on voltages of the lighting unit may adjust at different stages of the input power.



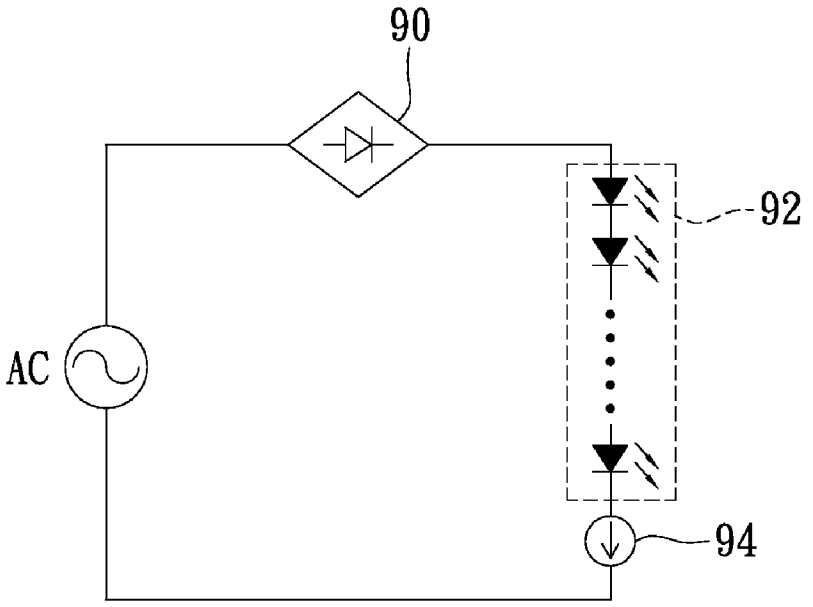


FIG. 1
PRIOR ART

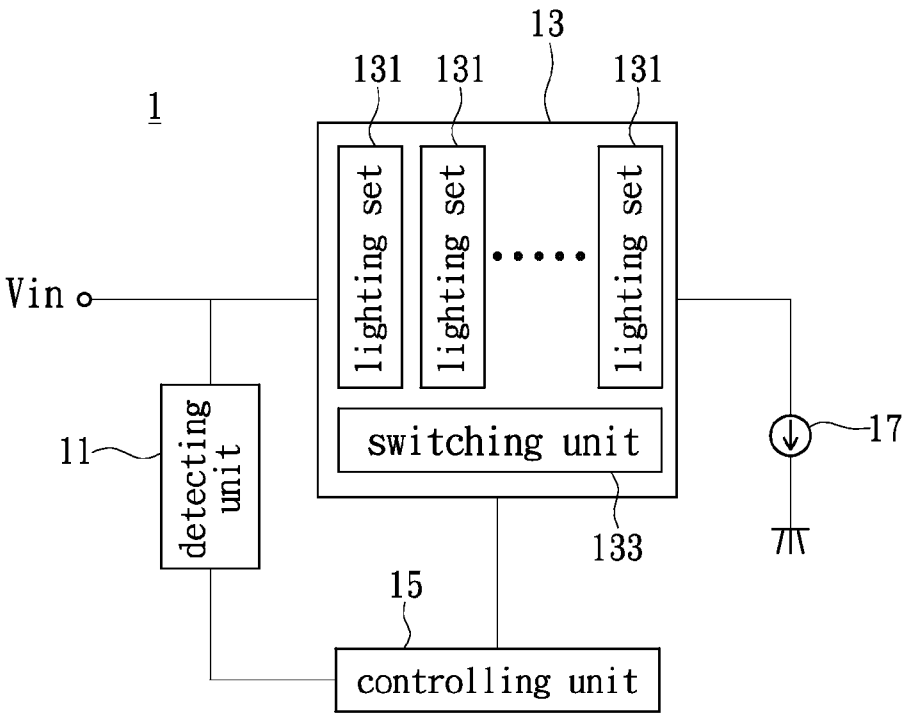

13
131
131
131
1
lighting set
lighting set
lighting set
Vin
11
detecting unit
switching unit
17
133
15
controlling unit

FIG. 2

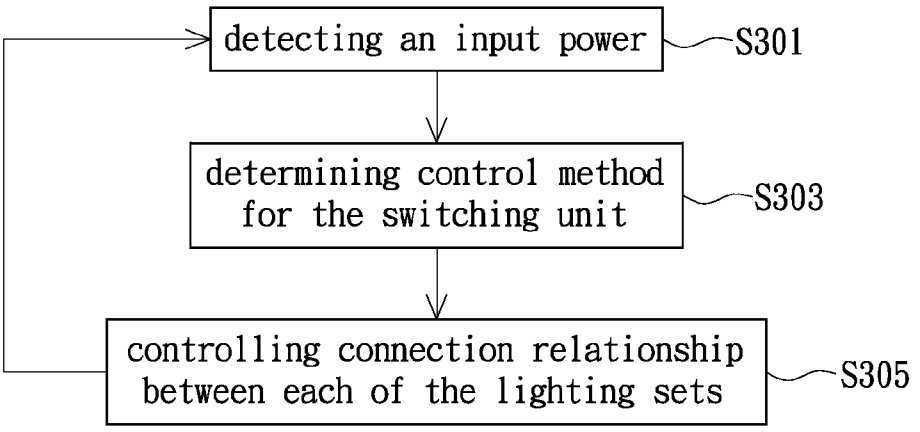

detecting an input power
S301
determining control method for the switching unit
S303
controlling connection relationship between each of the lighting sets
S305

FIG. 3

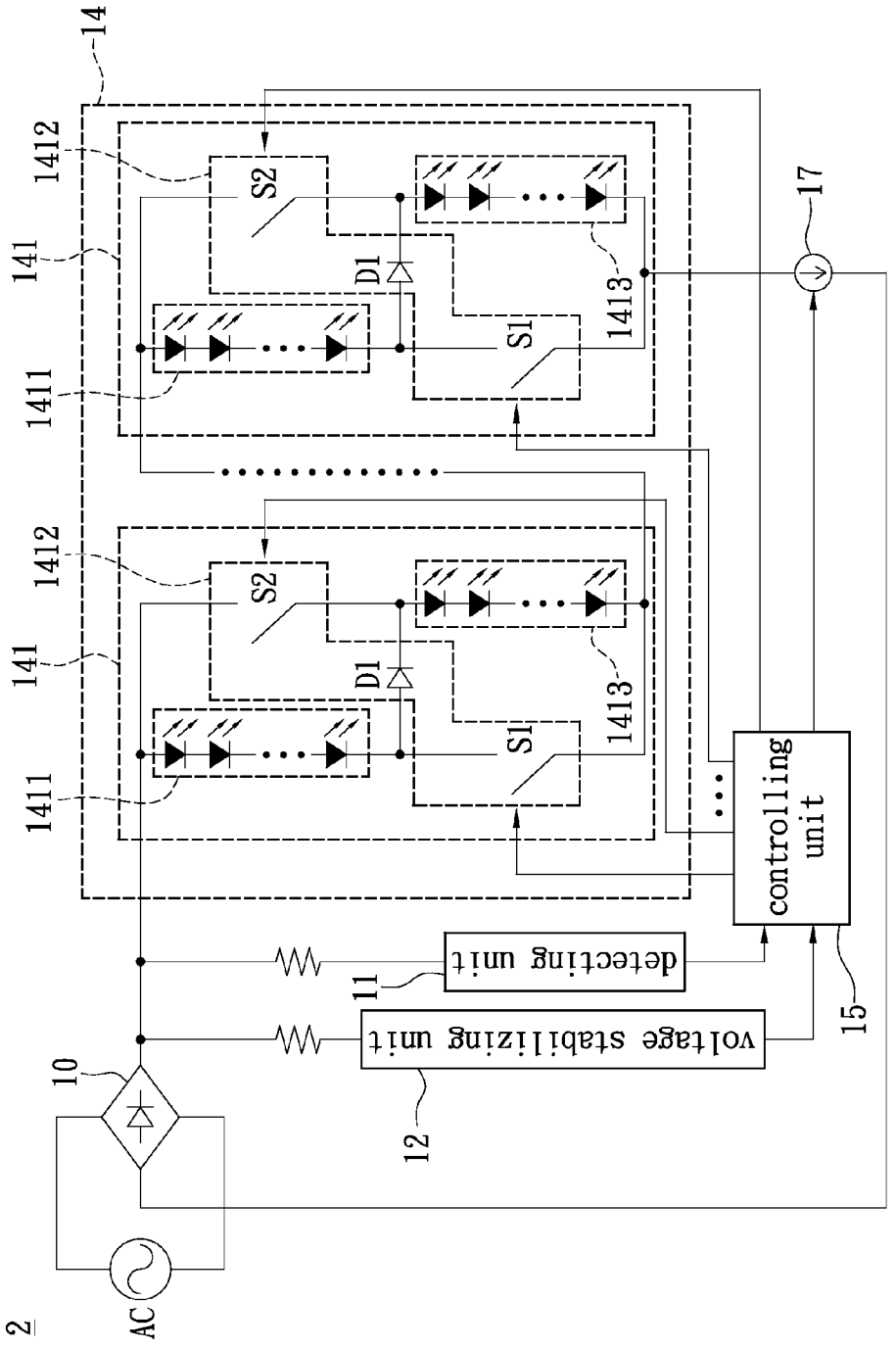

14
1412
141
1411
S2
D1
S1
1413
17
controlling unit
detecting unit
voltage stabilizing unit
11
12
15
10
AC
2

FIG. 4

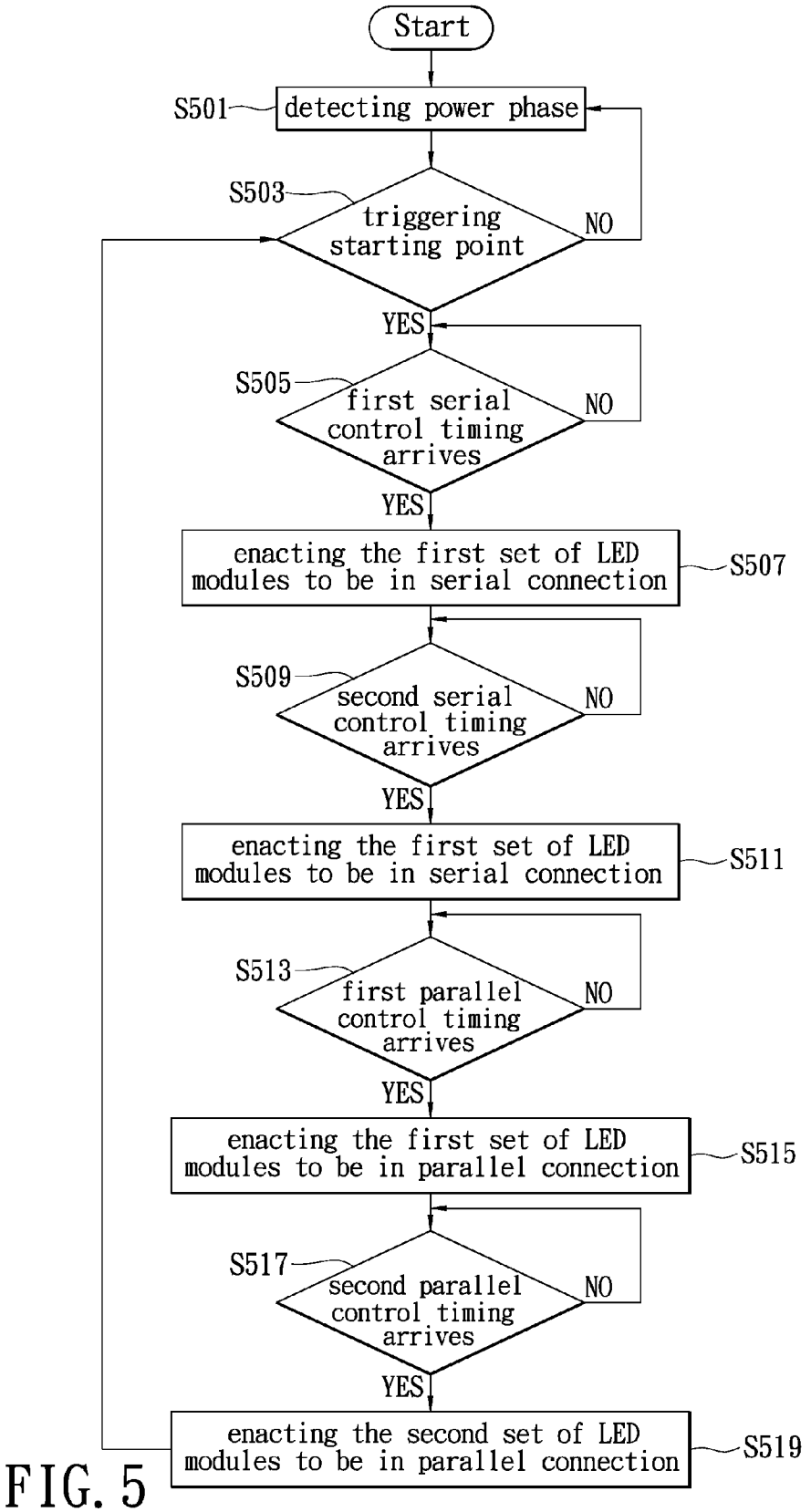

Start
S501
detecting power phase
S503
triggering starting point
NO
YES
S505
first serial control timing arrives
NO
YES
enacting the first set of LED modules to be in serial connection
S507
S509
second serial control timing arrives
NO
YES
enacting the first set of LED modules to be in serial connection
S511
S513
first parallel control timing arrives
NO
YES
enacting the first set of LED modules to be in parallel connection
S515
S517
second parallel control timing arrives
NO
YES
enacting the second set of LED modules to be in parallel connection
S519

FIG. 5

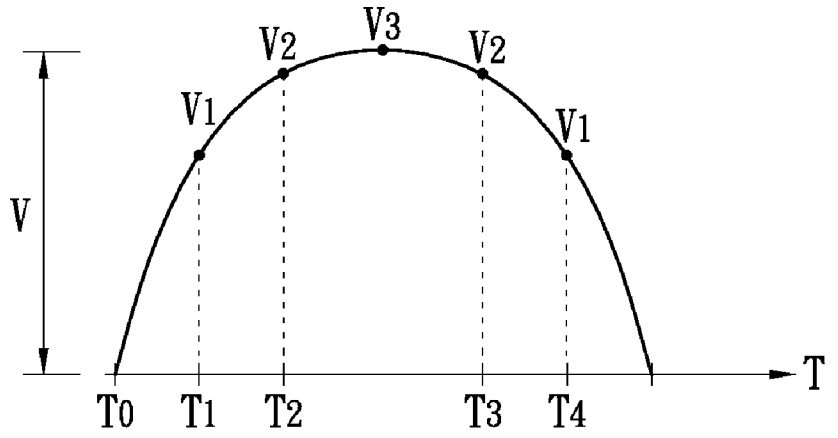


FIG. 6

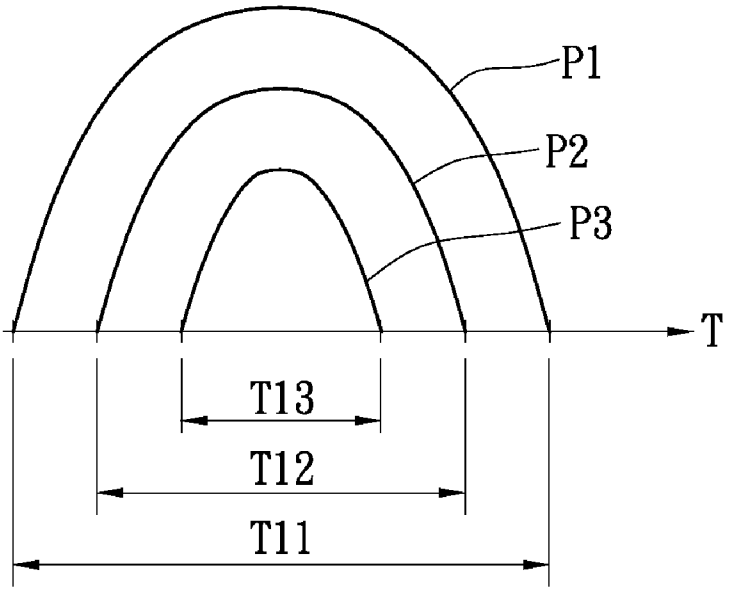


FIG. 7

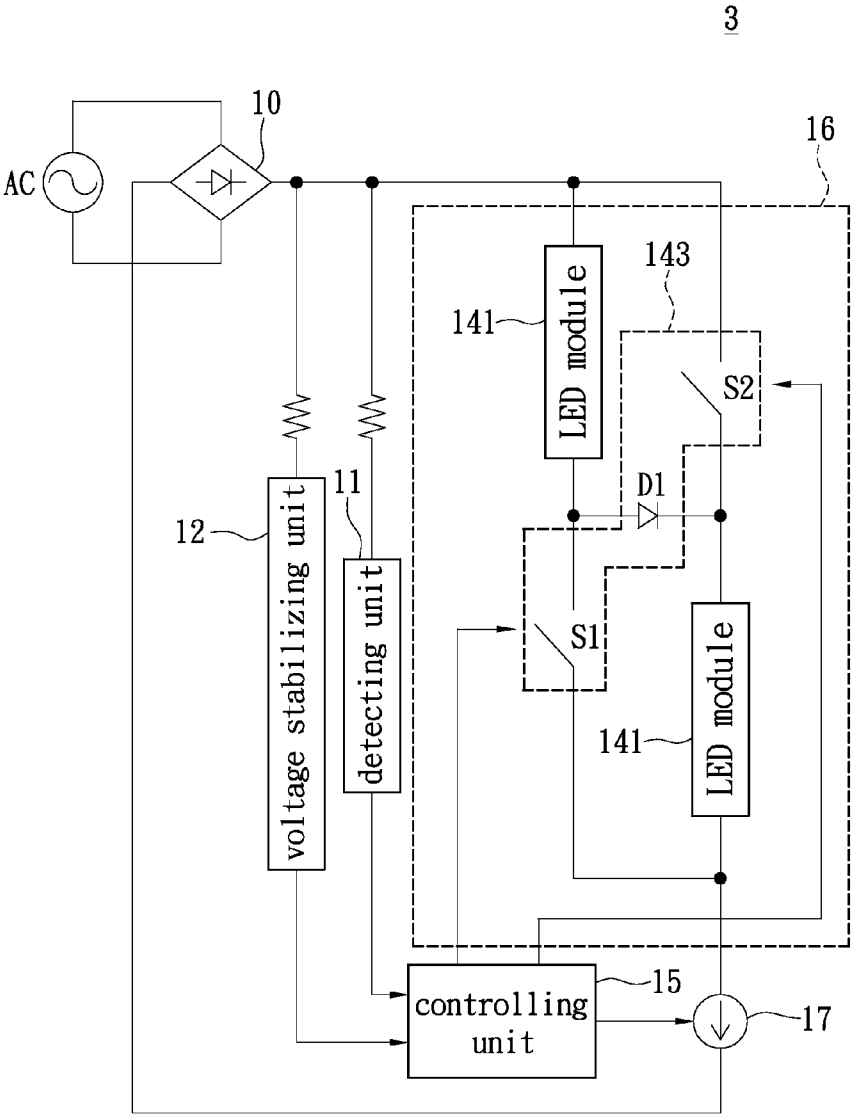

3
10
16
AC
143
141
LED module
S2
D1
11
12
voltage stabilizing unit
detecting unit
S1
141
LED module
15
controlling unit
17

FIG. 8

ILLUMINATING APPARATUS AND METHOD THEREOF

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to an illuminating apparatus and method thereof; in particular, to a light emitting diode (LED)-based illuminating apparatus and method thereof.

[0003] 2. Description of Related Art

[0004] Thanks for characteristics of low power consumption, high brightness, and long duration associated with LEDs, the LEDs are gradually applicable to various lighting means. Please refer to FIG. **1**, which is a schematic diagram of a conventional illuminating means. The conventional illuminating means includes a rectifying circuit **90**, a lighting set **92** and a current source **94**. The illuminating means further includes a plurality of LEDs in serial connection. In one implementation, the rectifying circuit **90** is a full-wave rectifying circuit for converting an alternating current (AC) current into a direct current (DC), which serves as an input power for the LEDs. When the serial-connected LEDs are turned on, the current source **94** provides a steady current for each of the LEDs in the lighting set **92**.

[0005] For improving brightness of the lighting means, conventionally, a plurality of LEDs are serial-connected, however, correspondingly increasing a turn-on voltage of the lighting set **92**. With the increased turn-on voltage of the lighting set **92**, such lighting set **92** is conducted only when a voltage level of the input power is larger than the turn-on voltage. Therefore, a flashing effect associated with the lighting set **92** would be more significant.

SUMMARY OF THE INVENTION

[0006] The object of the present invention is for providing an illuminating apparatus and method thereof to address the issue of the foregoing drawbacks.

[0007] According to one embodiment, an illuminating apparatus is provided to receive a pulse DC as an input power being comprises a lighting unit, a detecting unit and a controlling unit. The lighting unit comprises a plurality of lighting sets and a switching unit, the switching unit is adapted to cause the lighting sets to be connected with each other serially or in parallel. The detecting unit is adapted to detect state of the input power. And the controlling unit is coupled to the detecting unit and switching unit, and bases upon the detecting unit detecting the state of the input power controls the switching unit.

[0008] Another embodiment of the present invention is for providing an illuminating apparatus having a lighting unit, a detecting unit and a control unit. The lighting unit comprises a plurality of inter-coupled LED modules, and each of the LED modules includes a first lighting set, a second lighting set and a switching circuit. The first lighting set is composed of a plurality of first LEDs in a serial connection. The second lighting set is composed of a plurality of second LEDs in a serial connection. The switching circuit coupled between the first lighting sets and the second lighting set is for causing changes to connection relationship between the first lighting set and the second lighting set. The detecting unit is adapted for detecting the state of the input power. The controlling unit is coupled to the detecting unit and the switching circuit, and base upon the detecting unit detecting the state of the input power controls the switching circuit to cause the changes to the connection relationship between the first lighting sets and the second lighting sets.

[0009] Still another embodiment of the present invention is for providing an illuminating method including detecting the state of the input power and controlling the switching unit according to detecting the state of the input power.

[0010] Hence, according to the disclosures of the foregoing embodiments, improvements can be made as such: For the illuminating apparatus, its turn-on voltage can be adjusted so as to extend turn-on time of the lighting unit within a period time of the input power, and thus reducing the flashing of the lighting unit during the lighting.

[0011] In order to further the understanding regarding the present invention, the following embodiments are provided along with illustrations to facilitate the disclosure of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. **1** shows a schematic diagram of a conventional illuminating means;

[0013] FIG. **2** shows a simplified block diagram of the illuminating apparatus according to an embodiment of the present invention;

[0014] FIG. **3** shows a flow chart of the illuminating method according to an embodiment of the present invention;

[0015] FIG. **4** shows a simplified block diagram of the illuminating apparatus according to one embodiment of the present invention integrating with a power supply;

[0016] FIG. **5** shows a flow chart of an illuminating method according to one embodiment of the present invention;

[0017] FIG. **6** shows a schematic diagram showing the input power waveform plot for the input power and the turn-on voltage of the illuminating apparatus according to the present invention;

[0018] FIG. **7** shows a schematic diagram illustrating a comparison of periods during which the illuminating apparatus according to the present invention and the conventional illuminating apparatus are turned on, respectively;

[0019] FIG. **8** shows a simplified block diagram of the illuminating apparatus according to another embodiment of the present invention;

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] The present invention relates to an illuminating apparatus and method thereof. The illuminating apparatus refers to a lighting array having a plurality of lighting LEDs, and by means of serial/parallel connections between the LEDs, the turn-on voltage for the lighting array may be adjustable. For example, when the input power fails to turn on all of the serially connected LEDs, some or all of the LEDs may be adapted to be in a parallel connection to reduce the turn-on voltage of the lighting array, so as to extend a time period during which the illuminating apparatus is turned on.

[0021] Please refer to FIG. **2**, which is a simplified block diagram for the illuminating apparatus according to an embodiment of the present invention. An illuminating apparatus **1** includes a detecting unit **11**, a lighting unit **13** and a controlling unit **15** coupled between the detecting unit **11** and the lighting unit **13**.

[0022] The detecting unit **11** is adapted for detecting a state of an input power Vin applied to the lighting unit **13**. For

example, the detecting unit **11** may sense a phase variation or a voltage variation of the input power Vin. As such, the detecting unit **11** may be a phase detecting circuit or a voltage detecting circuit but not limited thereto. The input power may be a pulse DC, for example, which is a product of a rectified AC power. Furthermore, the pulse DC may be a full-waved or half-waved pulse DC. And the following description adopts full-waved pulse DC as the input power for the illustration purposes.

[0023] The lighting unit **13** includes a plurality of lighting sets **131** and a switching unit **133**. The lighting sets **131** may include a plurality of LEDs with connections between the lighting sets **131** adjustable according to the state of the input power. The switching unit **133**, meanwhile, includes a plurality of switching devices and/or related circuit device (such as a unilateral-conducting device).

[0024] The switching unit **133** may be adapted to cause a serial connection or a parallel connection between the lighting sets **131**. For example, under the control of the switching unit **133**, one of the lighting units **131** may be connected in the serial connection or alternatively in the parallel connection with another one or other lighting sets **131**. In another implementation, the lighting sets **131** may be divided into a plurality of groups and each of the groups may include a plurality of lighting sets **131** inter-connected with each other serially or in parallel, and the groups themselves may be further interconnected with each other serially or in parallel. The control unit **15** controls the switching unit **133** according to the detecting unit **11** detecting the state of the input power to adjust the connection between the lighting sets **131** of the lighting unit **13**. For example, when the detecting unit **11** detects a voltage of the input power Vin is larger than the turn-on voltage of one set of the lighting sets **131** or the turn-on voltages of a plurality of lighting sets **131** in the serial connection, the controlling unit **15** may thus operate to control the switching unit **133** to cause the lighting sets **131** to be connected serially or in parallel. In one implementation, the detecting unit **11** may be configured to detect the state of the input power at predetermined points within a time period of the input power waveform (e.g., the time period of the pulse DC). In another implementation, the detecting unit **11** may be configured to detect the voltage of the input power before determining whether the voltage of the input power has reached predetermined voltage levels.

[0025] The illuminating apparatus **1** may further include a current source **17** coupled to the lighting unit **13** and capable of providing a steady current when the lighting sets **131** in the lighting unit **13** are turned on. The current source **17** may also provide an adjustable current under the control of the controlling unit **15**. More specifically, when the turn-on voltage of the lighting sets **131** is smaller, indicative of the lighting sets **131** may be connected with each other in parallel, a larger turn-on current may become necessary, prompting the adjustable current source **17** to offer a corresponding larger current to the lighting sets **131**. On the other hand, when the turn-in voltage of the lighting sets **131** is larger, which indicates the lighting sets **131** may be in the serial connection among themselves and thus necessities a corresponding smaller turn-in current for the lighting sets **131**, the current source **17** may be adjusted to provide the current of the smaller value with the lighting sets **131**.

[0026] In conjunction with FIG. **2**, please refer to FIG. **3**, which relates to a flow chart for the illuminating method according to an embodiment of the present invention.

[0027] The control unit **15** detects the state of the input power via the detecting unit **11** (step S**301**) so as to determine the state of the input power. In one implementation, the state of the input power may be a phase a waveform of the input power. In another implementation, the state of the input power may be in terms of predetermined time values counting from the zero phase of the input power waveform. According to the detecting unit **11** detecting the state of the input power, the control unit **15** may determine whether the predetermined time values have been reached (step S**303**). When the predetermined time values have been reached, the control unit **15** bases upon the predetermined time values, all of which may correspond to their respective turn-on voltages of the lighting unit **13**, may control the switching unit **133** to manipulate connection relationships between each lighting unit **13** (step S**305**), so that each of the lighting sets **131** may be turned on uninterruptedly with this particular turn-on voltage. It is worth noting that the aforementioned steps may be performed repeatedly.

[0028] Please refer to FIG. **4**, which relates to a simplified block diagram of the illuminating apparatus according to another embodiment of the present invention integrating with a power supply. An illuminating apparatus **2** includes a rectifying unit **10**, a detecting unit **11**, a voltage stabilizing unit **12**, a lighting unit **14**, a controlling unit **15** and a current source **17**. The rectifying unit **10** is coupled to the detecting unit **11**, the voltage stabilizing unit **12**, and the lighting unit **14**. The controlling unit **15** is coupled to the detecting unit **11**, the voltage stabilizing unit **12** and the lighting unit **14**.

[0029] In one implementation, the rectifying unit **10** may be a full-wave rectifying circuit, for rectifying an AC power waveform into an input power source adapted for the lighting unit **14**, which may require a full-wave pulse DC as its input power. What is noteworthy is the rectifying unit **10** is not limited thereto, which may be implemented by a half-wave rectifying circuit.

[0030] The detecting unit **11** is adapted to detect the state of the input power. As previously mentioned, the detecting unit **11** may be also a phase detection circuit or a voltage detection circuit.

[0031] The voltage stabilizing unit **12** is adapted to stabilize the input power in order to output a DC current source with a steady voltage value to serve the control unit **15**.

[0032] The lighting unit **14**, meanwhile, includes a plurality of LED modules which are connected serially with each other, and each of the LED modules **141** further includes a plurality of lighting sets and a switching circuit **1412**. In one implementation, the LED module **141** may include two lighting sets having a first lighting set **1411** and a second lighting set **1413**. The first lighting set **1411** and the second lighting set **141** each includes LEDs which are inter-connected in serial and equal in the number. And each of the lighting sets is adapted to receive the input power and is turned on when the voltage of the input power exceeds the turn-on voltage of the lighting set.

[0033] The switching circuit **1412** further includes a first switching device S**1**, the second switching device S**2** and a unilateral-conducting device D**1**. The first switching device S**1** may be coupled to one side of the first lighting set **1411**, the second switching device S**2** may be coupled to one side of the second lighting set **1413**, and the unilateral-conducting device may be coupled between the first lighting set **1411** and the second lighting set **1413**. The first switching device S**1** and the second switching device S**2** may be a machinery

switch or an electronic switch. When the first switching device S1 and the second switching device S2 are the electronic switches, they may be implemented in terms of a Darlington circuit. The unilateral-conducting device D1 may be a diode.

[0034] When both the first switching device S1 and the second switching device S2 are both non-conducted, the first lighting set **1411**, the unilateral-conducting device D1 and the second lighting set **1412** are serially connected. And when both the first switching device S1 and the second switching device S2 are conducted, the first lighting set **1411** and the second lighting set **1413** are connected in parallel with the unilateral-conducting device D1 non-conducted.

[0035] More specifically, the first lighting set **1411** and the second lighting set **1413** may be connected in the serial manner or in the parallel manner and the connection relationship between the first lighting set **1411** and the second lighting set **1413** may be determined by the switching circuit **1412**. In other words, the switching circuit **1412** that is controlled by the controlling unit **15** may be configured to switch the first lighting set **1411** and the second lighting set **1412** so that the turn-on voltage of the lighting unit **14** may range between a lowest turn-on voltage when the first lighting set **1411** and the second lighting set **1413** are connected in parallel and a highest turn-on voltage when the first lighting set **1411** and the second lighting set **1413** are serially connected. For example, in view of the lighting unit **14** illustrated in FIG. **4**, when the first lighting set **1411** and the second lighting set **1413** of each of the LED modules **141** are connected in parallel, the lowest turn-on voltage of the lighting unit **14** is "n" times the turn-on voltage for the single lighting set, where "n" refers to the amount of the LED module **141** in the lighting unit **14**. The highest turn-on voltage of the lighting unit **14** is "2n" times the turn-on voltage drop of the lighting set with n referring to the amount of the LED module **141** in the lighting unit **14**.

[0036] The state of the input power may dictate the connection relationship between the first lighting set **1411** and the second lighting set **1413**. For example, at least one voltage level may be set and when the input power has reached any particular voltage level the switching circuit **1412** may switch on the first switching device S1 and the second switching device S2 in all of the LED modules **141**. In another implementation, when the input power reaches another predetermined voltage level the switching circuit **1412** may switch on the first switching device S1 and the second switching device S2 in some of the LED modules **141**. In doing so, the controlling unit **15** may ensure the input power regardless of the state thereof may be sufficient to turn on all the lighting sets that are switched on by the switching circuit **1412**.

[0037] In another aspect, when the control unit **15** adjusts the turn-on voltage of the lighting unit **14** via the switching circuit **1412**, a current volume for the current source **17** of the lighting unit **14** may be simultaneously adjusted.

[0038] Please refer to FIG. **5**, which relates to a flow chart of an illuminating method according to one embodiment of the present invention. Please also refer to FIG. **4** and FIG. **6** in conjunction with FIG. **5**. For the illustration purpose, in FIG. **4***the* LED modules **141** each includes two lighting sets and the detecting unit **11** is implemented by the phase detecting circuit.

[0039] FIG. **6** is a schematic diagram showing the input power waveform and turn-on voltages of the illuminating apparatus according to the present invention. The illuminating apparatus **2** is adapted to detect via the phase detecting circuit or bases upon specifications of the input power (such as voltage or frequency) to determine the input power is a periodical signal and thus set up predetermined time values within a time period of the periodical input power. The predetermined time values may be determined based on the turn-on voltages of the lighting unit **14** (such as V**1**, V**2**), each of which may correspond to the time values of the input power waveform (such as T**1**, T**2**, T**3**, T**4**). Therefore, when the time values are reached the switching circuit **1412** in the lighting unit **14** may in turn adjust the serial/parallel connection of the first lighting set **1411** and the second lighting set **1413** to ensure that the corresponding turn-on voltages associated with the time values are sufficient enough to turn on the lighting sets connected with each other in corresponding ways.

[0040] For the illustration purposes, the initial connection relationship between the first lighting set and the second lighting set in each of the LED module **141** is in parallel.

[0041] The phase detecting circuit the controlling unit **15** detects the phase of the input power (step S**501**). According to detection result in S**501**, the controlling unit determines whether to trigger the determination of the predetermined time values are reached (step S**503**). In one implementation, to trigger such determination is when the input power waveform is at the zero phase thereof such as T**0**.

[0042] When step S**503** determines that the input power waveform is at its zero phase, the controlling unit **15** starts counting from T**0** before determining whether T**1** has been reached (step S**505**). When T**1** is reached, the controlling unit **15** causes the first lighting set **1411** and the second lighting set **1413** of the first LED module **141** to be in the serial connection by switching off the first switching device S1 and the second switching device S2 (step S**507**). And then the turn-on voltage of the lighting unit **14** having the first lighting set **1411** and the second lighting set **1413** of the first Led module serially connected may be V**1**.

[0043] The controlling unit **15** further determines whether another predetermined time value T**2** has been reached (step S**509**). If so, the controlling unit **15** may further cause the first lighting set **1411** and the second lighting set **1412** of another LED module **141** (e.g., a second LED module) to be in the serial connection (step S**511**) by switching off the first and second switching devices S1 and S2. And then the turn-on voltage of the lighting unit **14** having the first lighting set **1411** and the second lighting set **1413** of the second LED module in the serial connection may be at V**2**.

[0044] The controlling unit **15** may be configured to further determine whether another predetermined time value T**3** has been reached (step S**513**). If so, the controlling unit **15** may be configured to cause the first lighting set **1411** and the second lighting set **1413** in the first LED module **141** to be in the parallel connection by switching on the first and second switching devices S1 and S2 in the first LED module **141** (step S**515**). And the turn-on voltage of the lighting unit **14** having the first lighting set **1411** and the second lighting set **1413** of the first LED module **141** that is in the parallel connection may be at V**2**.

[0045] Additionally, the controlling unit **15** determines whether another predetermined time value T**4** has been reached (step S**517**). If so, the controlling unit **15** may be configured to cause the first lighting set **1411** and the second lighting set **1413** of the second LED module **141** to be in the parallel connection by switching on the first and second switching devices S1 and S2 in the second LED module **141**

(step S519). And the turn-on voltage of the lighting unit **14** having the first lighting set **1411** and the second lighting set **1413** of the second LED module **141** may be at V1.

[0046] The foregoing S501~S519 illustrate operations of the controlling unit **15** in a single time period of the input power waveform and may be repeatedly performed in the subsequent time periods of the input power waveform.

[0047] Plus, when S507 and S511 are executed, the controlling unit **15** may simultaneously control the current source **17** to reduce the current that is provided with the lighting unit **14** so that the minimum requirement sufficient to cause the lighting unit **14** to illuminate may be met. And while S515 and S519 are executed, the controlling unit **15** may simultaneously control the current source **17** to provide another current of an increased value that is at the minimum requirement for the lighting unit **14** to illuminate.

[0048] Hence, according to FIG. **5**, before the input power waveform reaches a peak V3 thereof the number of the first lighting set **1411** and the second lighting set **1413** that are in the serial connection increases, resulting in the increased turn-on voltage for the lighting unit **14**. On the other hand, after the input power reaches the peak of V3 the number of the first lighting set **1411** and the second lighting set **1413** in the lighting unit **14** that are connected in parallel may increase as well, decreasing the required turn-on voltage of the lighting unit **14**.

[0049] Additionally, in the foregoing description for FIG. **5**, whether to cause the serial/parallel connections between the first lighting set **1411** and the second lighting set **1412** in each of the LED module **141** is determined on basis of whether the predetermined time values relative to the zero phase of the input power waveform has been reached. In another implementation, the controlling unit **15** may be configured to cause the changes to the connection relationship between the first lighting set **1411** and the second lighting set **1412** in all lighting units **141**. When the controlling unit **15** detects the voltages of the input power waveform reach the predetermined voltage levels associated with the predetermined time values T1-T4, the connection relationship between the first lighting set **1141** and the second lighting set **1143** may be altered.

[0050] Please refer to FIG. **7**, which relates to a comparison of periods during which the illuminating apparatus according to the present invention and the conventional illuminating apparatus are turned on, respectively. Assume the present invention illuminating apparatus and the conventional illuminating apparatus include LEDs of the same number with the LEDs in the conventional apparatus connected with each other serially. The waveform P1 stands for the waveform of the input power in a single time period T11, the waveform P2 is associated with the illuminating apparatus according to the present invention while the waveform P3 corresponds to the conventional illuminating apparatus. More specifically, the waveforms P2 and P3 indicate that the period during which the illuminating apparatus could be turned on (T12) within the time period of the input power waveform (i.e., T11) is larger and earlier than the period during which the conventional illuminating apparatus could be turned on (T13) within the same time period of the input power.

[0051] Please refer to FIG. **8**, which relates to a simplified block diagram for the illuminating apparatus according to another embodiment of the present invention. The difference between the illuminating apparatus illustrated in FIG. **8** and the illuminating apparatus illustrated in FIG. **4** is the switching circuit **143** may be coupled between the LED modules **141** when the LED modules **141** are in the serial or parallel connection.

[0052] To sum up, by adjusting the connection relationship between the lighting sets of the lighting unit at different stages of the input power the turn-on voltage of the lighting unit may be adjusted and the period during which the lighting unit is turned on may extend, effectively minimizing the flash phenomenon associated with the conventional illuminating apparatus.

[0053] The descriptions illustrated supra set forth simply the preferred embodiments of the present invention; however, the characteristics of the present invention are by no means restricted thereto. All changes, alternations, or modifications conveniently considered by those skilled in the art are deemed to be encompassed within the scope of the present invention delineated by the following claims.

What is claimed is:

1. A illuminating apparatus, adapted to receive an input power which is a pulse DC, comprising:

a lighting unit, having a plurality of lighting sets and a switching unit for interconnecting the lighting sets in a serial manner or in a parallel manner;

a detecting unit, for detecting a state for the input power inputted to the lighting unit; and

a controlling unit, coupled to the detecting unit and the switching unit, for controlling the switching unit according to the detecting unit detecting the state of the input power in order to adjust a turn-on voltage of the lighting unit according to the input power.

2. The illuminating apparatus according to claim **1**, wherein each one of the lighting set comprises a plurality of serial-connected LEDs.

3. The illuminating apparatus according to claim **2**, wherein the controlling unit receives time period information of the input power indicative of a time period of the input power via the detecting unit, and sets up a plurality of predetermined time values within the time period, each of which corresponds to the state of the input power, and the controlling unit causes the switching unit to operate when the predetermined time values have been reached.

4. The illuminating apparatus according to claim **2**, wherein the controlling unit detects a voltage of the input power via the detecting unit and when determining the voltage of the input power has reached a predetermined level the detecting unit causes the switching unit to operate according to the predetermined level of the input power.

5. The illuminating apparatus according to claim **2**, further comprising:

a current source, coupled to the lighting unit, for providing a steady current when the lighting unit is turned on for illuminating.

6. The illuminating apparatus according to claim **5**, wherein the controlling unit controls the current provided by the current source according to the turn-on voltage of the lighting unit and the current of the current source adapted to be reversely proportional to the turn-on voltage.

7. A illuminating apparatus, adapted to receive an input power which is a pulse DC, comprising:

a lighting unit, having a plurality of inter-coupled LED modules, and each of the LED modules comprising:

a first lighting set having a plurality of first LEDs serially interconnected;

a second lighting set having a plurality of second LEDs serially interconnected; and

a switching circuit, coupled between the first lighting set and the second lighting set, for causing the first lighting set and the second lighting set to be interconnected in a serial manner or in a parallel manner;

a detecting unit, for detecting a state of the input power inputted to the lighting unit; and

a controlling unit, coupled between the detecting unit and the switching circuit, for controlling the switching circuit based upon the detecting unit detecting the state of the input power so as to adjust a turn-on voltage of the lighting unit according to a variation in the input power.

8. The illuminating apparatus according to claim **7**, wherein the detecting unit is a phase detecting circuit, the controlling unit receives a time period information indicative of a time period of the input power via the detecting unit, and sets up a plurality of predetermined time values within the time period, and the controlling unit controls the switching unit to operate when the time values have been reached.

9. The illuminating apparatus according to claim **7**, wherein the controlling unit is a voltage detecting circuit and detects a voltage of the input power via the detecting unit and determines whether the voltage of the input power meets a predetermined voltage level, before causing the switching unit to operate according to whether the input power has reached the predetermined voltage level.

10. The illuminating apparatus according to claim **7**, wherein the switching circuit further comprises:

a first switching device, coupled to the first lighting set;

a second switching device, coupled to the second lighting set; and

a unilateral-conducting unit, coupled between the first switching device and the second switching device;

wherein when the first switching device and the second switching device are both conducted, the first lighting set and the second lighting set are connected in the parallel manner, and wherein when the first switching device and the second switching device are disconnected, the first lighting set and the second lighting set are connected in the serial manner and the unilateral-conducting unit is conducted.

11. The illuminating apparatus according to claim **7**, further comprising:

a current source, coupled to the lighting unit, for providing a steady current when the lighting unit is turned on for illuminating.

12. The illuminating apparatus according to claim **11**, wherein the controlling unit controls the current of the current source according to the turn-on voltage of the lighting unit and the current of the current source is adjusted to be reversely proportional to the turn-on voltage.

13. The illuminating apparatus according to claim **7**, further comprising a switching circuit coupled between the LED modules, for controlling the LED modules to be connected in the serial manner or in the parallel manner.

14. A illuminating method for controlling a lighting unit having a plurality of lighting sets and a switching unit for causing the lighting sets to be connected in a serial manner or in a parallel manner, comprising:

detecting a state of an input power of the lighting unit, wherein the input power is in a form of a pulse DC; and

controlling the switching unit according to detecting the state of the input power to adjust a turn-on voltage of the lighting unit.

15. The illuminating method according to claim **14**, further comprising:

determining whether predetermined time values of a time period of the input power have been reached before causing the switching unit to operate according to the corresponding time values.

16. The illuminating method according to claim **14**, further comprising:

determining whether a voltage of the input power has reached a predetermined voltage level before causing the switching unit to operate.

17. The illuminating method according to claim **14**, further comprising:

adjusting a current value of a current provided by a current source according to detecting the state of the input power.

18. The illuminating method according to claim **17**, further comprising:

adjusting the current for the current source to be reversely proportional to the turn-on voltage of the lighting unit.

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