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(54) **LED driving apparatus and method of driving LED**

LED-Ansteuerungsvorrichtung und Verfahren zur LED-Ansteuerung

Appareil de commande de DEL et procédé de commande de DEL

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a LED driving apparatus and a method of driving an LED, capable of being applied to a driving system driven by a PWM scheme and able to appropriately set a reference current according to a driving voltage varied at the time of changing the LED when the reference current according to the driving voltage is previously set.

Description of the Related Art

[0002] Applications of light emitting diodes (LEDs) LEDhave been expanded such as uses in a display, a lighting device, and the like.

[0003] An LED module including a plurality of LEDs generally has driving power applied thereto through a DC-DC converter that converts DC power from a power supply device (for example, SMPS) into driving power.

[0004] Meanwhile in an LED lighting device using the LED module, a driver having voltage or current of the LED module fedback thereto performs a control operation to supply a constant voltage or constant current to the LED module.

[0005] According to an analog scheme of the related art, the LED driver needs to use a separately designed reference circuit at the outside so as to control voltage or current and is set to a predefined reference value to meet LED lighting device output conditions.

[0006] However, in the LED driver of the related art, there may be a need to change a design of the reference circuit when the output conditions of the LED lighting device are different, such that it may be difficult to use products commonly used together.

[0007] For example in developing an LED lighting device of 50W when there are (1) products having output specifications of a voltage of 50V and current 1A and (2) products having output conditions of a voltage of 25V and current 2A, different reference values are required according to the specifications of the output current such that a design of a circuit should be changed.

[0008] Types of LED lighting are gradually being increased as the LED lighting market is gradually expanded. Therefore, a need exists for a technology capable of appropriately controlling various types of LED lighting as well as a technology capable of being applied to various kinds of LED lighting devices while diversifying wattage and controlled voltage/current according to the usage of the LED lighting and an LED light source.

EP 1517588 A1 discloses a lighting method for connecting a lighting head, having one or more LEDs arranged in an optional pattern, to a power supply and lighting the one or more LEDs up by using a power supply having one rating irrespective of the different specifications of the lighting heads.

US 2010/039046 A1 discloses an LED reading light connected to a power supply unit, an LED light means for giving off light with a desired light intensity, and a coding component which is connected to at least one power supply connection.

EP 1517588 A1 and US 2010/039046 A1 both describe conventional LED driving apparatuses that "read" a label of an LED lamp. This brings about the technical problem of current setting for different types of LED lamps by using a single driving apparatus. One of the advantageous effect of the present invention is its ability to overcome the foregoing technical problem.

SUMMARY OF THE INVENTION

[0009] An aspect of the present invention provides an LED driving apparatus and a method of driving an LED, capable of being applied to a driving system driven by a PWM scheme and appropriately setting a reference current according to driving voltage varied at the time of changing the LED when the reference current according to the driving voltage is previously set, and being applied to various types of LEDs.

[0010] According to an aspect of the present invention, there is provided an LED driving apparatus including: a voltage detection unit detecting a driving voltage supplied from a driving unit for a light emitting unit having a plurality of LEDs; a current detection unit detecting a driving current flowing in the light emitting unit; and a control unit setting a reference current according to a detected voltage from the voltage detection unit and controlling the driving unit according to the reference current and the detected current from the current detection unit, wherein the control unit includes a reference current setting part setting a reference current corresponding to a level of the detected voltage from the voltage detection unit, an A/D converter converting the detected current from the current detection unit into a digital detected current; and a switching controller generating a gate signal according to an error between the reference current and the digital detected current and providing the generated gate signal to the driving unit, and wherein the reference current setting part includes an A/D converter converting the detected voltage from the voltage detection unit into the digital detected voltage; a memory storing a V/I lookup table in which a current level corresponding to each voltage level is preset; and a V/I converter retrieving the current corresponding to the level of the digital detected voltage from the A/D converter from the memory to set the retrieved current as the reference current.

[0011] The driving unit may be a DC-DC converter including a switch device operated in response to the gate signal.

[0012] The gate signal may be a PWM gate signal.

[0013] According to another aspect of the present invention, there is provided a method of driving an LED, comprising: detecting a detected voltage corresponding

to a driving voltage provided from a driving unit for a light emitting unit having a plurality of LEDs; detecting a detected current corresponding to a driving current flowing in the light emitting unit; and setting a reference current according to the detected voltage and controlling the driving unit according to the reference current and the detected current, wherein the controlling of the driving unit includes setting the reference current corresponding to a level of the detected voltage; converting the detected current into a digital detected current and generating a gate signal according to an error between the reference current and the digital detected current and providing the generated gate signal to the driving unit, and wherein the setting of the reference current includes converting the detected voltage into the digital detected voltage and converting the digital detected voltage into a corresponding current and setting the converted current as the reference current by using a previously provided V/I lookup table.

[0014] The driving unit may be a DC-DC converter including a switch device operated in response to a PWM gate signal.

[0015] The gate signal may be the PWM gate signal.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The above and other aspects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a block diagram of an LED driving apparatus according to an embodiment of the present invention;

FIG. 2 is a diagram showing a variation example of a reference current setting part according to an embodiment of the present invention;

FIG. 3 is a diagram showing another variation example of the reference current setting part according to the embodiment of the present invention;

FIG. 4 is a diagram showing a variation example of a V/I lookup table of a memory according to the embodiment of the present invention;

FIG. 5 is a flow chart of a method of driving an LED according to another embodiment of the present invention;

FIG. 6 is a flow chart of a light emission drive controlling process according to another embodiment of the present invention;

FIG. 7 is a diagram showing a variation example of a reference current setting process according to another embodiment of the present invention; and

FIG. 8 is a diagram showing another variation example of a reference current setting process according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0017] Embodiments of the present invention will now be described in detail with reference to the accompanying drawings.

[0018] The present invention should not be limited to the embodiments set forth herein and the embodiments may be used to assist in understanding the technical idea of the present invention. Like reference numerals designate like components having substantially the same constitution and function in the drawings of the present invention.

[0019] FIG. 1 is a block diagram of an LED driving apparatus according to an embodiment of the present invention.

[0020] Referring to FIG. 1, an LED driving apparatus according to an embodiment of the present invention may include a voltage detection unit 100 detecting a driving voltage Vdrv supplied from a driving unit 10 for a light emitting unit 20 having a plurality of LEDs, a current detection unit 200 detecting a driving current Idrv flowing in the light emitting unit 20, and a control unit 300 setting a reference current Iref according to detected voltage Vd from the voltage detection unit 100 and controlling the driving unit 10 according to the reference current Iref and the detected current Id from the current detection unit 200.

[0021] In this configuration, the driving unit 10 may convert an input voltage Vin into a predetermined voltage to provide the driving voltage Vdrv to the light emitting unit 20. In this case, the light emitting unit 20 may include at least one of channels in which the plurality of LEDs are connected with one another in series.

[0022] In this case, the voltage detection unit 100 may detect the driving voltage Vdrv supplied from the driving unit 10 of the light emitting unit 20 having the plurality of LEDs and provide the detected driving voltage Vdrv to the control unit 300.

[0023] The current detection unit 200 may detect the driving current Idrv flowing in the light emitting unit 20 and provide the detected driving current Idrv to the control unit 300.

[0024] Further, the control unit 300 may set the reference current Iref according to the detected voltage Vd from the voltage detection unit 100 and may control the driving unit 10 according to the reference current Iref and the detected current Id from the current detection unit 200.

[0025] As an example, the control unit 300 may include a reference current setting part 310 setting the reference current Iref corresponding to a level of the detected voltage Vd from the voltage detection unit 100, an A/D converter 320 converting the detected current Id from the current detection unit 200 into a digital detected current Ida, and a switching controller 330 generating a gate signal SG according to an error between the reference current Iref and the digital detected current Ida and providing the generated gate signal SG to the driving unit 10.

[0026] In this case, the reference current setting part 310 may set the reference current Iref corresponding to the level of the detected voltage Vd from the voltage detection unit 100.

[0027] The A/D converter 320 may convert the detected current Id from the current detection unit 200 into the digital detected current Ida.

[0028] Further, the switching controller 330 may generate a gate signal SG according to the error between the reference current Iref and the digital detected current Ida and provide the generated gate signal SG to the driving unit 10, thereby controlling the driving unit 10.

[0029] Meanwhile, the driving unit 10 may include a DC-DC converter including a switch device operated in response to the gate signal SG. In this case, the gate signal SG may be a PWM gate signal that undergoes pulse width modulation.

[0030] That is, the DC-DC converter may convert the input voltage Vin into a predetermined voltage according to the PWM gate signal from the control unit 300.

[0031] FIG. 2 is a diagram showing a variation example of a reference current setting part according to an embodiment of the present invention.

[0032] Referring to FIGS. 1 and 2, the reference current setting part 310 may include an A/D converter 311 converting the detected voltage Vd from the voltage detection unit 100 into the digital detected voltage Vda, and an V/I converter 313 converting the digital detected voltage Vda from the A/D converter 311 into a corresponding current and providing the converted current as the reference current Iref.

[0033] In this case, the A/D converter 311 may convert the detected voltage Vd from the voltage detection unit 100 into the digital detected voltage Vda and provide the converted detected voltage Vda to the V/I converter 313.

[0034] Further, the V/I converter 313 may convert the digital detected voltage Vda from the A/D converter 311 into a current corresponding to the level thereof and provide the converted current as the reference current Iref.

[0035] FIG. 3 is a diagram showing another variation example of the reference current setting part according to the embodiment of the present invention.

[0036] Referring to FIGS. 1 and 3, the reference current setting part 310 may include the A/D converter 311 converting the detected voltage Vd from the voltage detection unit 100 into the digital detected voltage Vda, a memory 312 storing a V/I lookup table of which a current level corresponding to each voltage level is preset, and a V/I converter 313 setting the digital detected voltage Vda from the A/D converter 311 as the reference current by retrieving the current corresponding to the level from the memory 312.

[0037] In this case, the A/D converter 311 may convert the detected voltage Vd from the voltage detection unit 100 into the digital detected voltage Vda and provide the converted detected voltage Vda to the V/I converter 313.

[0038] The memory 312 may store the V/I lookup table in which the current level corresponding to each voltage level is preset, thereby providing the current level corresponding to the voltage level.

[0039] Further, the V/I converter 313 may convert the digital detected voltage Vda from the A/D converter 311 as the reference current Iref by retrieving the current corresponding to the level from the memory 312.

[0040] FIG. 4 is a diagram showing a variation example of a V/I lookup table of a memory according to the embodiment of the present invention.

[0041] Referring to FIG. 4, the V/I lookup table stored in the memory 312 may include reference currents Vref stored therein which are respectively and differently preset according to the level of the digital detected voltage Vda.

[0042] For example, in a case in which desired required output is 25 W, when the digital detected voltage Vda is 25V, the reference current Vref may be set to be 1A, when the digital detected voltage is 50V, the reference current Vref may be set to be 500 mA, and when the digital detected voltage Vda is 100V, the reference current Vref may be set to be 250 mA.

[0043] FIG. 5 is a flow chart of a method of driving an LED according to another embodiment of the present invention.

[0044] Referring to FIGS. 1 and 5, the method of driving an LED according to another embodiment of the present invention may include detecting a detected voltage Vd corresponding to a driving voltage Vdrv supplied from the driving unit 10 for the light emitting unit 20 having a plurality of LEDs (S100), detecting a detected current Id corresponding to the driving current Idrv flowing in the light emitting unit 20 (S200), and setting a reference current Iref according to the detected voltage Vd and controlling the driving unit 10 according to the reference current Iref and the detected current Id (S300).

[0045] In this case, the detected voltage Vd corresponding to the driving voltage Vdrv supplied from the driving unit 10 of the light emitting unit 20 having the plurality of LEDs may be detected by the voltage detection unit 100 shown in FIG. 1 (S100).

[0046] In addition, the detected current Id corresponding to the driving current Idrv flowing in the light emitting unit 20 may be detected by the current detection unit 200 shown in FIG. 1 (S200).

[0047] Further, by the control unit 300 shown in FIG. 1, the reference current Iref may be set according to the detected voltage Vd and the driving unit 10 may be controlled according to the reference current Iref and the detected current Id (S300).

[0048] Meanwhile, when the entire processing procedures have an end thereof during performing the process described above, the process may end, or otherwise, the above-mentioned process may be repeatedly performed (S400).

[0049] FIG. 6 is a flow chart of a light emission drive controlling process according to another embodiment of the present invention.

[0050] Referring to FIGS. 1 and 6, the controlling of

the driving unit 10 (S300) may include setting the reference current Iref corresponding to the level of the detected voltage Vd
(S310), converting the detected current Id into the digital detected current Ida (S320), and generating a gate signal SG according to the errors between the reference current Iref and the digital detected current Ida and providing the generated gate signal SG to the driving unit 10 (S330).

[0051] In this case, the reference current Iref corresponding to the level of the detected voltage Vd may be set by the control unit 300 shown in FIG. 1 (S310). The detected current Id may be converted into the digital detected current Ida (S320).

[0052] Further, the gate signal SG according to the error between the reference current Iref and the digital detected current Ida may be generated and may be provided to the driving unit 10 (S330).

[0053] Meanwhile, as described above, the driving unit 10 may include a DC-DC converter including a switch device operated in response to the gate signal SG. In this case, the gate signal SG may be the PWM gate signal.

[0054] That is, the DC-DC converter may convert the input voltage Vin into the predetermined voltage according to the PWM gate signal from the control unit 300.

[0055] FIG. 7 is a diagram showing a variation example of a reference current setting process according to another embodiment of the present invention.

[0056] Referring to FIGS. 1 and 7, the setting of the reference current (S310) may include converting the detected voltage Vd from the voltage detection unit 100 into the digital detected voltage Vda and converting the digital detected voltage Vda into the corresponding current and providing the current as the reference current Iref (S312).

[0057] In this case, the detected voltage Vd from the voltage detection unit 100 may be converted into the digital detected voltage Vda by the control unit 300 shown in FIG. 1 (S311). Further, the digital detected voltage Vda may be converted into a corresponding current, which may be in turn provided as the reference current Iref (S312).

[0058] FIG. 8 is a diagram showing another variation example of a reference current setting process according to another embodiment of the present invention.

[0059] Referring to FIGS. 1 and 8, the setting of the reference current (S310) may include converting the detected voltage Vd into the digital detected voltage Vda (S311) and converting the digital detected voltage Vda into a corresponding current and setting the converted current as the reference current by using a previously provided V/I lookup table (S313).

[0060] In this case, the detected voltage Vd may be converted into the digital detected voltage Vda by the control unit 300 shown in FIG. 1 (S311). Further, the digital detected voltage Vda may be converted into a corresponding current, and then may be set as the reference current, by using the previously provided V/I lookup table (S313).

[0061] As set forth above, the embodiments of the present invention may be applied to the driving system driven by the PWM scheme, may appropriately set the reference current according to the driving voltage varied at the time of changing the LED when the reference current according to the driving voltage is previously set, and may be applied to various types of LEDs.

[0062] Further, according to the embodiments of the present invention, the circuits may be simplified by embedding the external circuits in the microcontroller and may be applied to several models without modifying the circuits by allowing the microcontroller to internally vary the reference current and to store several time constant values in the memory and to selectively use the time constant values, or the like.

[0063] While the present invention has been shown and described in connection with the embodiments, it will be apparent to those skilled in the art that modifications and variations may be made without departing from the scope of the invention as defined by the appended claims.

Claims

1. An LED driving apparatus, comprising:

a voltage detection unit (100) detecting a driving voltage supplied from a driving unit (10) for a light emitting unit (20) having a plurality of LEDs;
a current detection unit (200) detecting a driving current (Idrv) flowing in the light emitting unit (20); and
a control unit (300) setting a reference current (Iref) according to detected voltage (Vd) from the voltage detection unit (100) and controlling the driving unit (10) according to the reference current (Iref) and the detected current (Id) from the current detection unit (200),
wherein the control unit (300) includes,
a reference current setting part (310) setting a reference current (Iref) corresponding to a level of the detected voltage (Vd) from the voltage detection unit (100);
an A/D converter (320) converting the detected current (Vd) from the current detection unit (200) into a digital detected current (Ida); and
a switching controller (330) generating a gate signal (SG) according to an error between the reference current (Iref) and the digital detected current (Ida) and providing the generated gate signal (SG) to the driving unit (10), and
wherein the reference current setting part (310) includes,
an A/D converter (311) converting the detected voltage (Vd) from the voltage detection unit (100) into the digital detected voltage (Vda);
a memory (312) storing a V/I lookup table in

which a current level corresponding to each voltage level is preset; and
a V/I converter (313) retrieving the current corresponding to the level of the digital detected voltage (Vda) from the A/D converter (311) from the memory to set the retrieved current as the reference current (Iref).

2. The apparatus of claim 1, wherein the driving unit (10) is a DC-DC converter including a switch device operated in response to the gate signal (SG).

3. The apparatus of claim 2, wherein the gate signal (SG) is a PWM gate signal.

4. A method of driving an LED, comprising:

detecting a detected voltage corresponding to a driving voltage provided from a driving unit for a light emitting unit having a plurality of LEDs (S100);
detecting a detected current corresponding to a driving current flowing in the light emitting unit (S200); and
setting a reference current according to the detected voltage and controlling the driving unit according to the reference current and the detected current (S300),
wherein the controlling of the driving unit includes
setting the reference current corresponding to a level of the detected voltage (S310);
converting the detected current into a digital deteched current (S320) and
generating a gate signal according to an error between the reference current and the digital detected current and providing the generated gate signal to the driving unit (S330), and
wherein the setting of the reference current includes
converting the detected voltage into the digital detected voltage (S311) and
converting the digital detected voltage into a corresponding current and setting the converted current as the reference current by using a previously provided V/I lookup table (S313).

5. The method of claim 4, wherein the driving unit is a DC-DC converter including a switch device operated in response to a PWM gate signal.

6. The method of claim 5, wherein the gate signal is the PWM gate signal.

Patentansprüche

1. LED-Ansteuerungsvorrichtung, Folgendes umfassend:

eine Spannungserfassungseinheit (100), die eine von einer Ansteuerungseinheit (10) für eine Lichtemissionseinheit (20) mit mehreren LEDs bereitgestellte Ansteuerspannung erfasst;
eine Stromerfassungseinheit (200), die einen in die Lichtemissionseinheit (20) fließenden Ansteuerstrom (Idrv) erfasst; und
eine Steuereinheit (300), die einen Referenzstrom (Iref) gemäß einer erfassten Spannung (Vd) von der Spannungserfassungseinheit (100) einstellt und die Ansteuerungseinheit (10) gemäß dem Referenzstrom (Iref) und dem erfassten Strom (Id) von der Stromerfassungseinheit (200) steuert,
wobei die Steuereinheit (300) Folgendes enthält,
ein Referenzstrom-Einstellungsteil (310), das einen Referenzstrom (Iref) gemäß einem Pegel der erfassten Spannung (Vd) von der Spannungserfassungseinheit (100) einstellt;
einen A/D-Wandler (320), der den erfassten Strom (Vd) von der Stromerfassungseinheit (200) in einen digitalen erfassten Strom (Ida) umwandelt; und
eine Umschaltsteuereinheit (330), die ein Gatesignal (SG) gemäß einem Fehler zwischen dem Referenzstrom (Iref) und dem digitalen erfassten Strom (Ida) erzeugt und das erzeugte Gatesignal (SG) an die Ansteuerungseinheit (10) bereitstellt, und
wobei das Referenzstrom-Einstellungsteil (310) Folgendes enthält,
einen A/D-Wandler (311), der die erfasste Spannung (Vd) von der Spannungserfassungseinheit (100) in die digitale erfasste Spannung (Vda) umwandelt;
einen Speicher (312), der eine V/I-Zuordnungstabelle speichert, in der für jeden Spannungspegel eine Stromstärke voreingestellt ist; und
einen V/I-Wandler (313), der den Strom gemäß dem Pegel der digitalen erfassten Spannung (Vda) von dem A/D-Wandler (311) aus dem Speicher abruft, um den abgerufenen Strom als den Referenzstrom (Iref) einzustellen.

2. Vorrichtung nach Anspruch 1, wobei die Ansteuerungseinheit (10) ein Gleichspannungswandler mit einer Umschaltvorrichtung ist, die als Reaktion auf das Gatesignal (SG) betrieben wird.

3. Vorrichtung nach Anspruch 2, wobei das Gatesignal (SG) ein PWM-Gatesignal ist.

4. Verfahren zum Ansteuern einer LED, Folgendes umfassend:

Erfassen einer erfassten Spannung gemäß einer Ansteuerspannung, die von einer Ansteuerungseinheit für eine Lichtemissionseinheit mit mehreren LEDs bereitgestellt wird (S100);
Erfassen eines erfassten Stroms gemäß einem Ansteuerstrom, der in die Lichtemissionseinheit fließt (S200); und
Einstellen eines Referenzstroms nach der erfassten Spannung und Steuern der Ansteuerungseinheit gemäß dem Referenzstrom und dem erfassten Strom (S300),
wobei das Steuern der Ansteuerungseinheit Folgendes enthält:

Einstellen des Referenzstroms gemäß einem Pegel der erfassten Spannung (S310);
Umwandeln des erfassten Stroms in einen digitalen erfassten Strom (S320) und
Erzeugen eines Gatesignals gemäß einem Fehler zwischen dem Referenzstrom und dem digitalen erfassten Strom und Bereitstellen des erzeugten Gatesignals an die Ansteuerungseinheit (S330), und
wobei ein Einstellen des Referenzstroms Folgendes enthält:

Umwandeln der erfassten Spannung in die digitale erfasste Spannung (S311) und
Umwandeln der digitalen erfassten Spannung in einen entsprechenden Strom und Einstellen des umgewandelten Stroms als den Referenzstrom durch Verwenden einer zuvor bereitgestellten V/I-Zuordnungstabelle (S313).

5. Verfahren nach Anspruch 4, wobei die Ansteuerungseinheit ein Gleichspannungswandler mit einer Umschaltvorrichtung ist, die als Reaktion auf ein PWM-Gatesignal betrieben wird.

6. Verfahren nach Anspruch 5, wobei das Gatesignal das PWM-Gatesignal ist.

Revendications

1. Appareil d'attaque de DEL, comprenant :

une unité de détection de tension (100) détectant une tension d'attaque fournie par une unité d'attaque (10) pour une unité électroluminescente (20) comportant une pluralité de DEL;
une unité de détection de courant (200) détectant un courant d'attaque (Idrv) circulant dans l'unité électroluminescente (20) ; et
une unité de commande (300) établissant un courant de référence (Iref) selon une tension détectée (Vd) par l'unité de détection de tension (100) et commandant l'unité d'attaque (10) selon le courant de référence (Iref) et le courant détecté (Id) par l'unité de détection de courant (200),
dans lequel, l'unité de commande (300) inclut,
une partie d'établissement de courant de référence (310) établissant un courant de référence (Iref) correspondant à un niveau de la tension détectée (Vd) par l'unité de détection de tension (100) ;
un convertisseur A/N (320) convertissant le courant détecté (Vd) par l'unité de détection de courant (200) en un courant détecté numérique (Ida) ; et
un organe de commande de commutation (330) générant un signal de grille (SG) selon une erreur entre le courant de référence (Iref) et le courant détecté numérique (Ida) et fournissant le signal de grille généré (SG) à l'unité d'attaque (10), et
dans lequel la partie d'établissement de courant de référence (310) inclut,
un convertisseur A/N (311) convertissant la tension détectée (Vd) par l'unité de détection de tension (100) en la tension détectée numérique (Vda) ;
une mémoire (312) stockant une table de consultation V/I dans laquelle un niveau de courant correspondant à chaque niveau de tension est préétabli ; et
un convertisseur V/I (313) retrouvant le courant correspondant au niveau de la tension détectée numérique (Vda) par le convertisseur A/N (311) dans la mémoire pour établir le courant retrouvé comme le courant de référence (Iref).

2. Appareil selon la revendication 1, dans lequel l'unité d'attaque (10) est un convertisseur continu-continu incluant un dispositif de commutateur actionné en réponse au signal de grille (SG).

3. Appareil selon la revendication 2, dans lequel le signal de grille (SG) est un signal de grille à modulation d'impulsions en durée.

4. Procédé d'attaque d'une DEL, comprenant :

la détection d'une tension détectée correspondant à une tension d'attaque fournie par une unité d'attaque pour une unité électroluminescente comportant une pluralité de DEL (S100) ;
la détection d'un courant détecté correspondant à un courant d'attaque circulant dans l'unité électroluminescente (S200) ; et
l'établissement d'un courant de référence selon la tension détectée et la commande de l'unité d'attaque selon le courant de référence et le courant détecté (S300),
dans lequel la commande de l'unité d'attaque

inclut
l'établissement du courant de référence correspondant à un niveau de la tension détectée (S310) ;
la conversion du courant détecté en un courant détecté numérique (S320) et
la génération d'un signal de grille selon une erreur entre le courant de référence et le courant détecté numérique et la fourniture du signal de grille généré à l'unité d'attaque (S330), et
dans lequel l'établissement du courant de référence inclut
la conversion de la tension détectée en la tension détectée numérique (S311) et
la conversion de la tension détectée numérique en un courant correspondant et l'établissement du courant converti en tant que courant de référence par l'utilisation d'une table de consultation V/I fournie antérieurement (S313).

5. Procédé selon la revendication 4, dans lequel l'unité d'attaque est un convertisseur continu-continu incluant un dispositif de commutateur actionné en réponse à un signal de grille à modulation d'impulsions en durée.

6. Procédé selon la revendication 5, dans lequel le signal de grille est le signal de grille à modulation d'impulsions en durée.

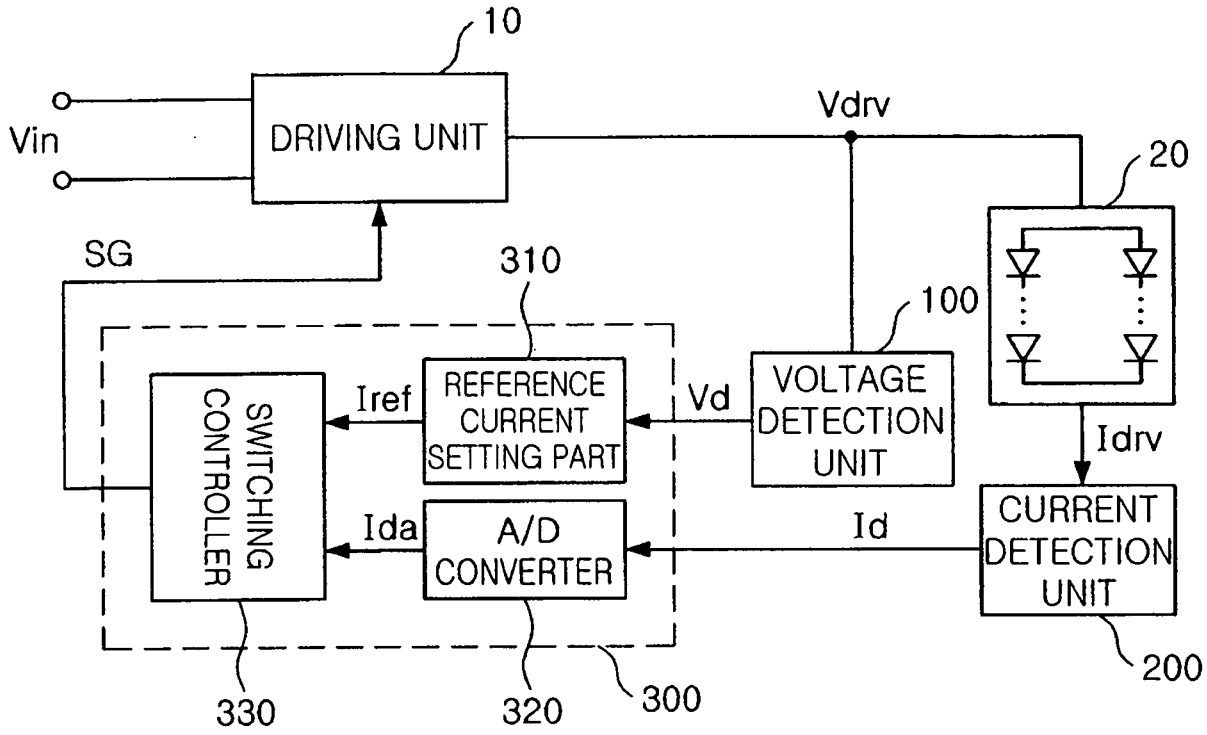
10
Vin
DRIVING UNIT
Vdrv
20
SG
310
100
SWITCHING CONTROLLER
Iref
REFERENCE CURRENT SETTING PART
Vd
VOLTAGE DETECTION UNIT
Idrv
Ida
A/D CONVERTER
Id
CURRENT DETECTION UNIT
330
320
300
200

FIG. 1

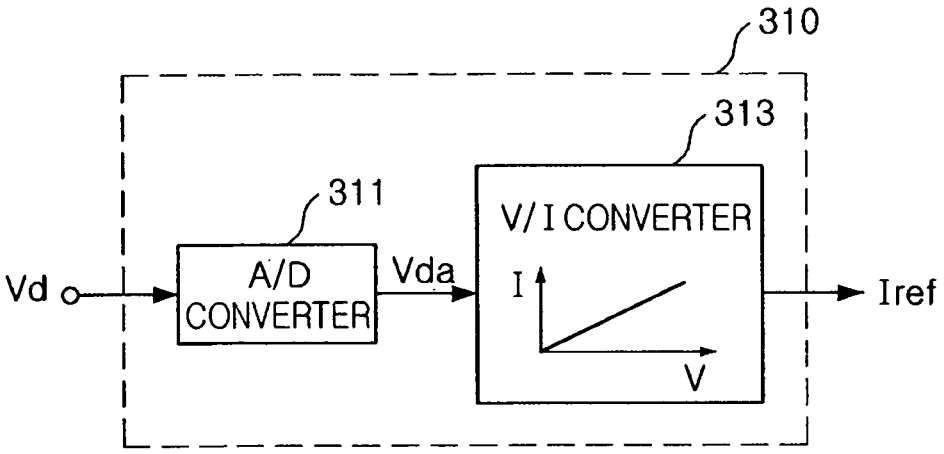
310
313
311
V/I CONVERTER
Vd
A/D CONVERTER
Vda
I
V
Iref

FIG. 2

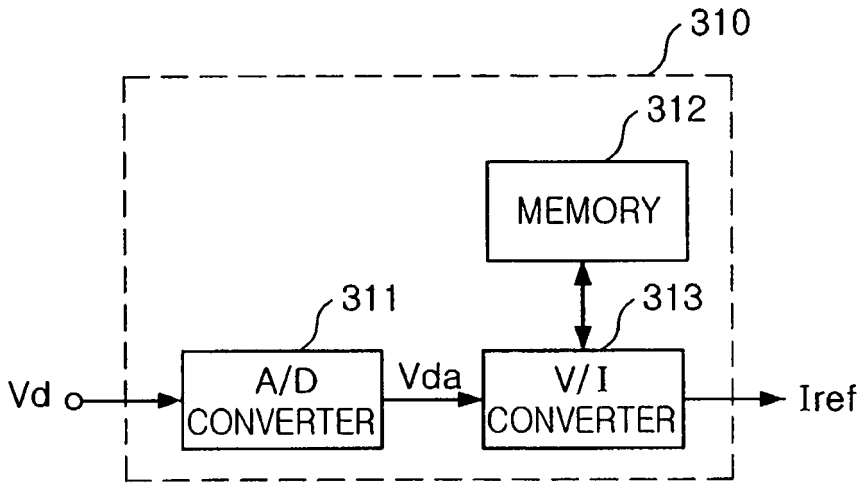

FIG. 3

OUTPUT	25W		
Vda	1(25V)	2(50V)	3(100V)
Iref	1(1A)	2(500mA)	3(250mA)

FIG. 4

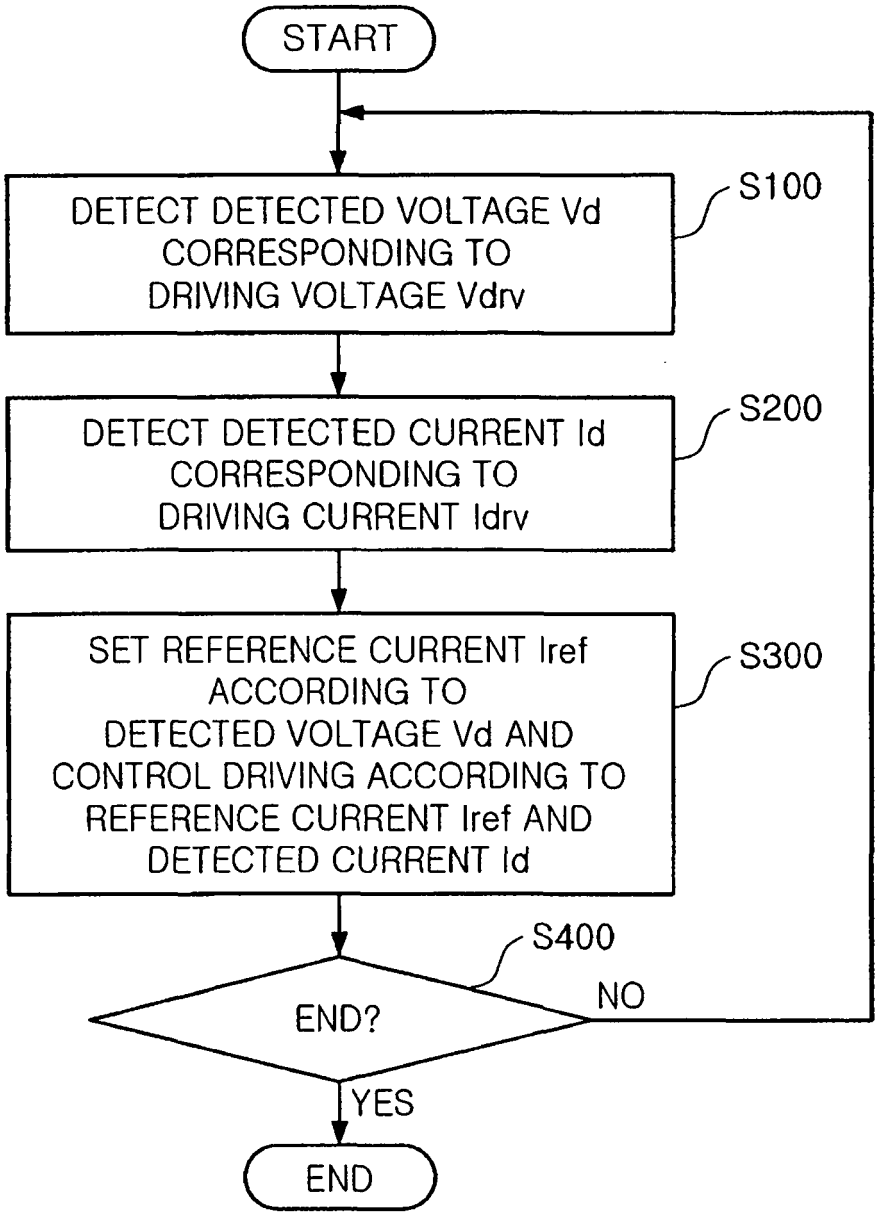
START
DETECT DETECTED VOLTAGE Vd CORRESPONDING TO DRIVING VOLTAGE Vdrv
S100
DETECT DETECTED CURRENT Id CORRESPONDING TO DRIVING CURRENT Idrv
S200
SET REFERENCE CURRENT Iref ACCORDING TO DETECTED VOLTAGE Vd AND CONTROL DRIVING ACCORDING TO REFERENCE CURRENT Iref AND DETECTED CURRENT Id
S300
S400
END?
NO
YES
END

FIG. 5

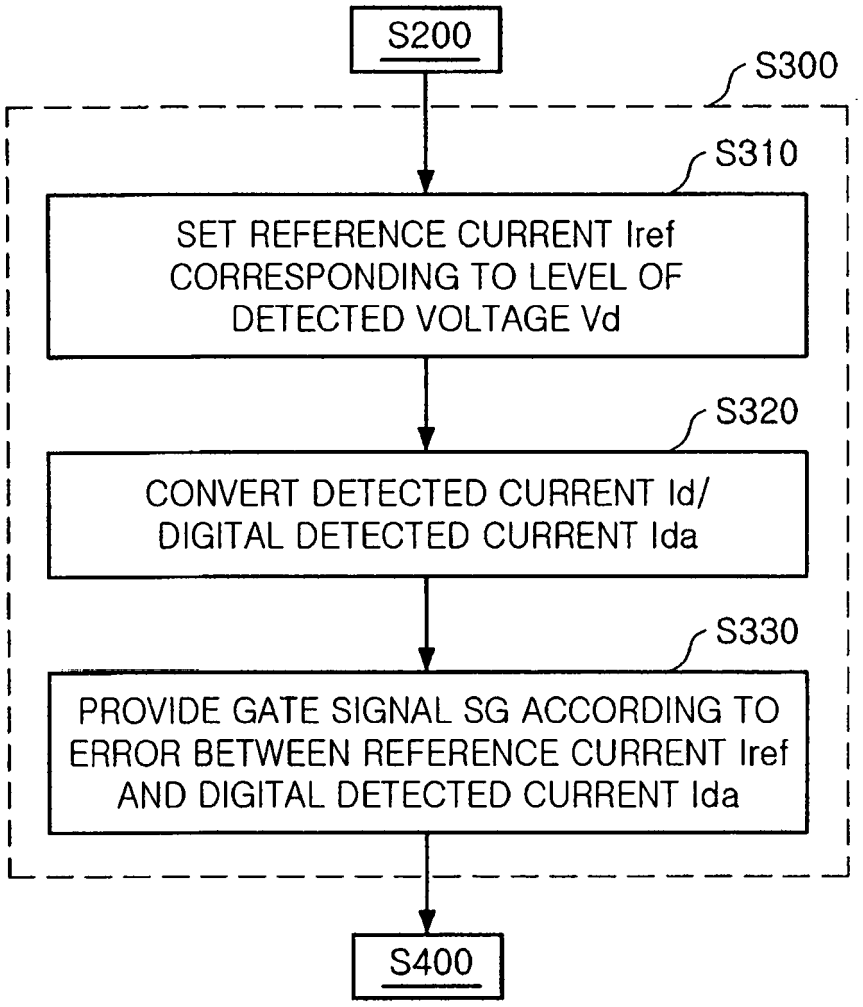
S200
S300
S310
SET REFERENCE CURRENT Iref CORRESPONDING TO LEVEL OF DETECTED VOLTAGE Vd
S320
CONVERT DETECTED CURRENT Id/ DIGITAL DETECTED CURRENT Ida
S330
PROVIDE GATE SIGNAL SG ACCORDING TO ERROR BETWEEN REFERENCE CURRENT Iref AND DIGITAL DETECTED CURRENT Ida
S400

FIG. 6

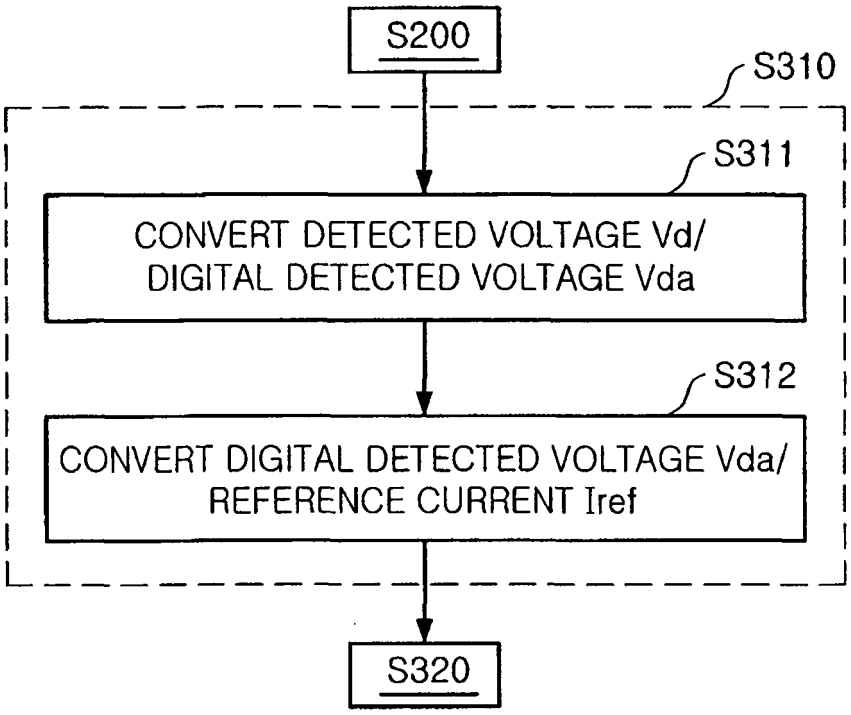
S200
S310
S311
CONVERT DETECTED VOLTAGE Vd/
DIGITAL DETECTED VOLTAGE Vda
S312
CONVERT DIGITAL DETECTED VOLTAGE Vda/
REFERENCE CURRENT Iref
S320

FIG. 7

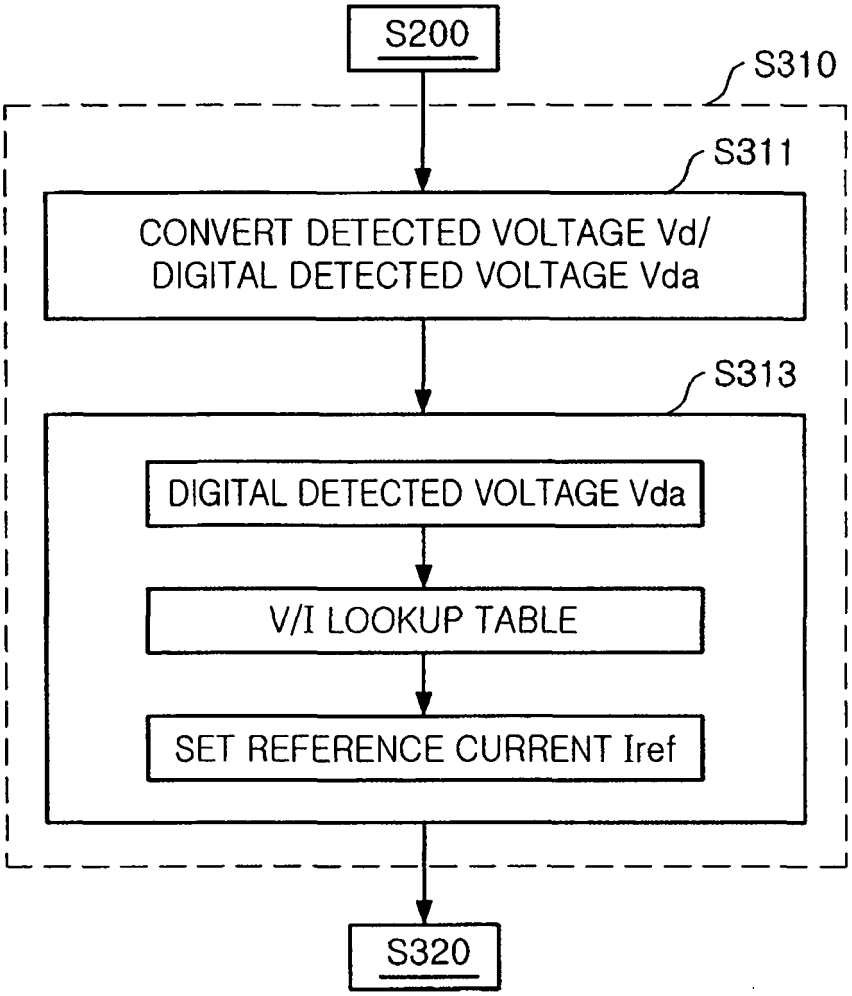
S200
S310
S311
CONVERT DETECTED VOLTAGE Vd/
DIGITAL DETECTED VOLTAGE Vda
S313
DIGITAL DETECTED VOLTAGE Vda
V/I LOOKUP TABLE
SET REFERENCE CURRENT Iref
S320

FIG. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1517588 A1 **[0008]**
- US 2010039046 A1 **[0008]**