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(54) **LED car lamp apparatus**

(57) A light emitting diode car lamp apparatus includes a light emitting module coupled to a power supply unit and having a plurality of light emitting diode units connected in parallel with each other, and each light emitting diode unit includes a plurality of light emitting diodes connected in series with each other, and the light emitting

diode car lamp apparatus also includes a control circuit installed between the power supply unit and the light emitting module and setting a tolerance, and the control circuit detects the light emitting module to obtain a detected value, such that the control circuit will disconnect the power supply of the light emitting module, if the detected value does not match the tolerance.

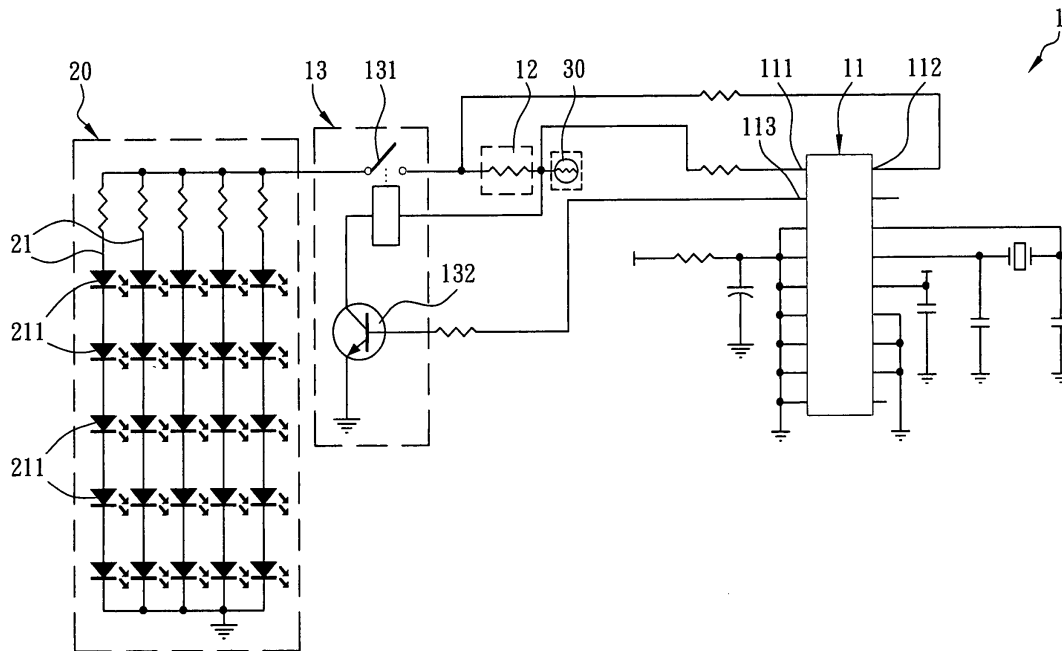


FIG. 3

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Description

FIELD OF THE INVENTION

[0001] The present invention generally relates to car lamps, and more particularly to a light emitting diode (LED) car lamp apparatus having a control circuit capable of discovering the variation of electrical properties of a light emitting module while at least one LED unit fails and then forcing the rest of the LED units to lose all of their power supply.

BACKGROUND OF THE INVENTION

[0002] As our living advances and the pace of science and technology development becomes fast, people in a city usually use motor vehicles as a transportation means for going to work or out for fun. There are many cars driving on the same road, and drivers must follow existing laws and inheriting rules established in the society to avoid accidents and maintain traffic order. To avoid drivers having unclear concepts and incorrect ideas about the roads that will jeopardize our life or damage our properties, car lamps are installed to these transportation means, so that drivers on the roads can base on the lighting condition of a tail lamp of the car in the front to determine the next move of the car in the front will take, and then drivers can take proper actions according to the information given by the signal lights or car lamps to protect drivers as well as motor vehicles.

[0003] Referring to FIG. 1 for a car lamp installed in a general transportation means, a lamp driving circuit 4 includes a controller 40 coupled to a plurality of LED lamp strings 41 connected in parallel with each other for controlling the light emitting status of the LED lamp strings 41, and each LED lamp strings 41 is comprised of a plurality of light emitting diodes (LEDs) 410 connected in series with each other. Since manufacturers generally take the consideration of the LED 410 that will break down after being used for a while or by other reasons, the design of a car lamp usually keeps the rest of the LED lamp strings 41 working and shows a specific brightness, if any one of the LED 410 fails, and only the failed LED 410 of its respective LED lamp string 41 will go out. Therefore, drivers still can continue driving the motor vehicle until all of the rest of the LED lamp strings 41 break down or go out or the coverage of the light no longer meets the safe driving requirements, and then the drivers will replace the failed LED lamp strings 41.

[0004] Although the rest of the LED lamp strings 41 still provide light before all of the LED lamp strings 41 go out or the coverage of the light no longer meets the driving requirements, the brightness of the light has lost its original brightness and thus may jeopardize the safety of driving. If this situation occurs in a tail lamp, the insufficient brightness of the tail lamp cannot give enough warning to the car at the back, and thus designing a light emitting diode car lamp apparatus for drivers to conveniently

and easily identify the brightness of the emitting lights in order to determine whether or not the light emitting diode car lamp apparatus is working properly becomes an important issue for manufacturers to solve.

SUMMARY OF THE INVENTION

[0005] In view of the shortcomings of the prior art, the inventor of the present invention based on years of experience in the related industry to conduct extensive researches and experiments, and finally invented a light emitting diode car lamp apparatus in accordance with the present invention to help drivers to determine the emitting light brightness conveniently and easily, so as to control the timing of replacing the car lamps.

[0006] Therefore, it is a primary objective of the present invention to provide a light emitting diode, car lamp apparatus that comprises a control circuit and a light emitting module, and the control circuit is coupled separately to a power supply unit and the light emitting module. The light emitting module includes a plurality of LED units connected in parallel with each other, and each LED unit is comprised of a plurality of light emitting diodes connected in series with each other. The control circuit sets a tolerance, and the control circuit detects the light emitting module to obtain a detected value. If the LED unit fails and the control circuit discovers that the detected value does not match the tolerance, then the control circuit will force the rest of the LED units to lose all of their power supply, and thus drivers do not have to determine visually whether or not it is necessary to replace the LED unit, and the invention provides a convenient, simple and easy way to identify whether or not the light emitting diode car lamp apparatus is operating properly, so as to timely maintain or replace the car lamp.

[0007] The above and other objects, features and advantages of the present invention will become apparent from the following detailed description taken with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is a schematic block diagram of a prior art;
FIG. 2 is a schematic block diagram of the invention;
and
FIG. 3 is a circuit diagram of a preferred embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] Referring to FIG. 2 for a light emitting diode car lamp apparatus of the invention, the light emitting diode car lamp apparatus 1 comprises a control circuit 10 and a light emitting module 20 (such as a tail lamp module), and the control circuit 10 with a tolerance (such as a

conditional content) is coupled separately to a power supply unit 30 (such as a battery) and the light emitting module 20. The light emitting module 20 detects a detected value (such as a current value or a voltage different value), and the light emitting module 20 includes a plurality of LED units 21 (such as LED lamp strings), and the LED units 21 are connected in parallel and jointly connected to the control circuit 10 in series. If the LED unit 21 fails and loses its light emitting characteristic, the detected value of the light emitting module 20 will change. If the LED unit 21 breaks down and the control circuit 10 discovers that the detected value does not match the tolerance, the control circuit 10 will force the rest of the LED units 21 to lose all of their power supply as well as the light emitting characteristic, so that users can easily determine that the LED units 21 in the light emitting diode car lamp apparatus 1 have lost their light emitting effect.

[0010] Referring to FIG. 2 for the present invention, the control circuit 10 is divided into a controller unit 11, an induced resistor 12 and a relay unit 13, wherein the controller unit 11 is coupled to the power supply unit 30 and sets a tolerance for a current value or a voltage difference value of a current passing through the light emitting module 20 when several or all of the LED units 21 emit lights, and the induced resistor 12 is coupled separately to the controller unit 11 and the relay unit 13 for detecting the light emitting module 20 to obtain the detected value, and the relay unit 13 is coupled to the light emitting module 20. If any one of the LED units 21 fails and cannot emit light, the controller unit 11 will compare the detected value obtained by the induced resistor 12 with the tolerance. If the detected value does not match the tolerance, the relay unit 13 will disconnect the power supply of the light emitting module 20, so that the light emitting module 20 and the control circuit 10 form a break circuit, and all of the LED units 21 lose their light emitting characteristic.

[0011] Referring to FIG. 3 for a preferred embodiment of the present invention, the controller unit 11 is a micro-controller unit having a plurality of pins connected externally, wherein the pins include a first pin 111, a second pin 112, and a third pin 113, and the first pin 111 is coupled to the power supply unit 30, and the first pin 111 and second pin 112 are coupled to both ends of the induced resistor 12 for transmitting back an input value and an output value respectively and comparing the input value and output value from the first pin 111 and second pin 112 to obtain the detected value. If the controller unit 11 finds out that the detected value obtained from both ends of the induced resistor 12 does not match the tolerance, the controller unit 11 will drive the relay unit 13 to disconnect the power supply of the light emitting module 20, so that the light emitting module 20 and the control circuit 10 form a break circuit, and all of the LED units 21 lose their light emitting characteristic.

[0012] The third pin 113 is coupled to the relay unit 13 for noticing the relay unit 13 to disconnect the power supply of the light emitting module 20. Referring to FIG. 3

again, the relay unit 13 includes a relay switch 131 and a loop control element 132, and the relay switch 131 is installed between the light emitting module 20 and the induced resistor 12, and the loop control element 132 is coupled separately to the relay switch 131 and the third pin 113, and the loop control element 132 can receive a notice from the third pin 113 to issue a start signal to the relay switch 131 to drive the light emitting module 20 and the control circuit 10 to form a break circuit.

[0013] In this embodiment, the light emitting module 20 includes five sets of LED units connected in parallel with each other and each LED unit 21 includes five light emitting diodes (LEDs) 211 such as LED bulbs connected in series with each other. If any LED 211 of an LED unit 21 breaks down and goes out, then the LED 211 of its respective LED unit 21 will not work anymore and lose its light emitting characteristic. By then, the controller unit 11 will compare the current value (which is the detected value) transmitted back from the first pin 111 and the second pin 112 with a current value (which is the tolerance) of a current passing through the light emitting module 20, if not all of the LED units 21 emit light, and the controller unit 11 will send a start signal from the third pin 113 through the loop control element 132 to enable the relay switch 131, so that the relay switch 131 will disconnect the power supply of the light emitting module 20, and the rest four set of LED units 21 connected in parallel with each other will lose their light emitting characteristic as well.

[0014] Assumed that the brightness of the three LED units 21 out of the five sets of LED units 21 connected in parallel with each other of the light emitting module 20 according to the embodiment as shown in FIG. 3 meets the safe driving requirements, or the light emitting module 20 has any two sets of failed LED units 21, the rest three sets of LED units 21 still can continue working, and thus providing a brightness in compliance with the safe driving requirements. Therefore, it is not necessary to replace the LED units 21 immediately. If any one of the LED units 21 goes out, the rest four sets of the LED units 21 will be forced to lose their light emitting characteristic. Therefore, another preferred embodiment of the invention is disclosed further to overcome the inflexible arrangement of the previous embodiment. In FIG. 2, the tolerance can be set as a current value or a voltage difference value of a current passing through the light emitting module 20 when a specific quantity of LED units 21 emit light, and the specific quantity is the quantity required for the brightness in compliance with the safe driving requirements, and thus the detected valued obtained by the controller unit 11 from both ends of the induced resistor 12 does not match the tolerance, and the third pin 113 will send the start signal to the relay unit 13 to disconnect the power supply of the light emitting module 20. For example, if any two of the LED units 21 breaks down and cannot emit light, the detected value will remain within the range of the tolerance. In other words, the controller unit 11 still will not drive the relay unit 13 to disconnect the power

supply of the light emitting module 20. Therefore, the present invention just needs to identify whether or not the light emitting diode car lamp apparatus 1 emits light to determine a proper operation of the light emitting diode car lamp apparatus 1, so as to provide a convenient and easy way to determine the light brightness and timely maintain or replace the car lamp.

[0015] It is worth pointing out that the present invention can be applied to a tail lamp of a transportation means, such that if a small quantity of LED units 21 of the tail lamp breaks down, the whole tail lamp will be forced to stop its operating function, and thus providing drivers a convenient and easy way to determine whether or not the light emitting diode car lamp apparatus 1 is working properly. The control circuit 10 is only a general conceptual name used in the invention, and any measure or element used for detecting the change of the power supply of the light emitting module 20 to force the light emitting module 20 to lose their light emitting function is covered by the scope of the claims of this invention.

[0016] While the invention has been described by means of specific embodiments, numerous modifications and variations could be made thereto by those skilled in the art without departing from the scope and spirit of the invention set forth in the claims.

Claims

1. A light emitting diode car lamp apparatus, comprising:

a light emitting module, coupled to a power supply unit and having a plurality of light emitting diode units connected in parallel with each other, and said each light emitting diode unit including a plurality of light emitting diodes connected in series with each other; and

a control circuit, installed between said power supply unit and said light emitting module and set therein a tolerance for detecting said light emitting module and obtaining a detected value, said control circuit will disconnect the power supply of said light emitting module if said detected value does not match said tolerance.

2. The light emitting diode car lamp apparatus of claim 1, wherein said control circuit comprises:

an induced resistor, installed in said control circuit, for detecting said light emitting module to obtain said detected value;

a relay unit, coupled separately to said induced resistor and said light emitting module and capable of disconnecting the power supply of said light emitting module to form a break circuit between said light emitting module and said control circuit; and

a controller unit, coupled separately to said power supply unit and said induced resistor, and setting a tolerance, and comparing a detected value obtained by said induced resistor with said tolerance, and if said detected value does not match said tolerance, then said relay unit will form a break circuit between said light emitting module and said control circuit.

3. The light emitting diode car lamp apparatus of claim 2, wherein said controller unit is a microcontroller unit having a plurality of externally connected pins, and said pin comprising:

a first pin, coupled to said power supply unit and a first end of said induced resistor for transmitting an input value back to said first end;

a second pin, coupled to a second end of said induced resistor for transmitting an output value back to said second end; and

a third pin, coupled to said relay unit for noticing said relay unit to form a break circuit between said light emitting module and said control circuit.

4. The light emitting diode car lamp apparatus of claim 3, wherein said relay unit comprises:

a relay switch, installed between said light emitting module and said induced resistor for forming a break circuit between said light emitting module and said control circuit after obtaining a start signal; and

a loop control element, coupled separately to said relay switch and said third pin, for sending said start signal to said relay switch when a notice is received from said third pin.

5. The light emitting diode car lamp apparatus of claim 4, wherein said controller unit compares said input value and said output value to produce said detected value.

6. The light emitting diode car lamp apparatus of claim 5, wherein said input value, said output value and said detected value are current values.

7. The light emitting diode car lamp apparatus of claim 5, wherein said input value, said output value and said detected value are voltage difference values.

8. The light emitting diode car lamp apparatus of claim 6, wherein said tolerance is a current value of a current passing through said light emitting module when all of said LED units emit light.

9. The light emitting diode car lamp apparatus of claim 7, wherein said tolerance is a voltage difference val-

ue of a current passing through said light emitting module when all of said LED units emit light.

10. The light emitting diode car lamp apparatus of claim 6, wherein said tolerance is a current value of a current passing through said light emitting module when a plurality of LED units do not emit light. 5

11. The light emitting diode car lamp apparatus of claim 7, wherein said tolerance is a voltage difference of a current passing through said light emitting module when a plurality of LED units do not emit light. 10

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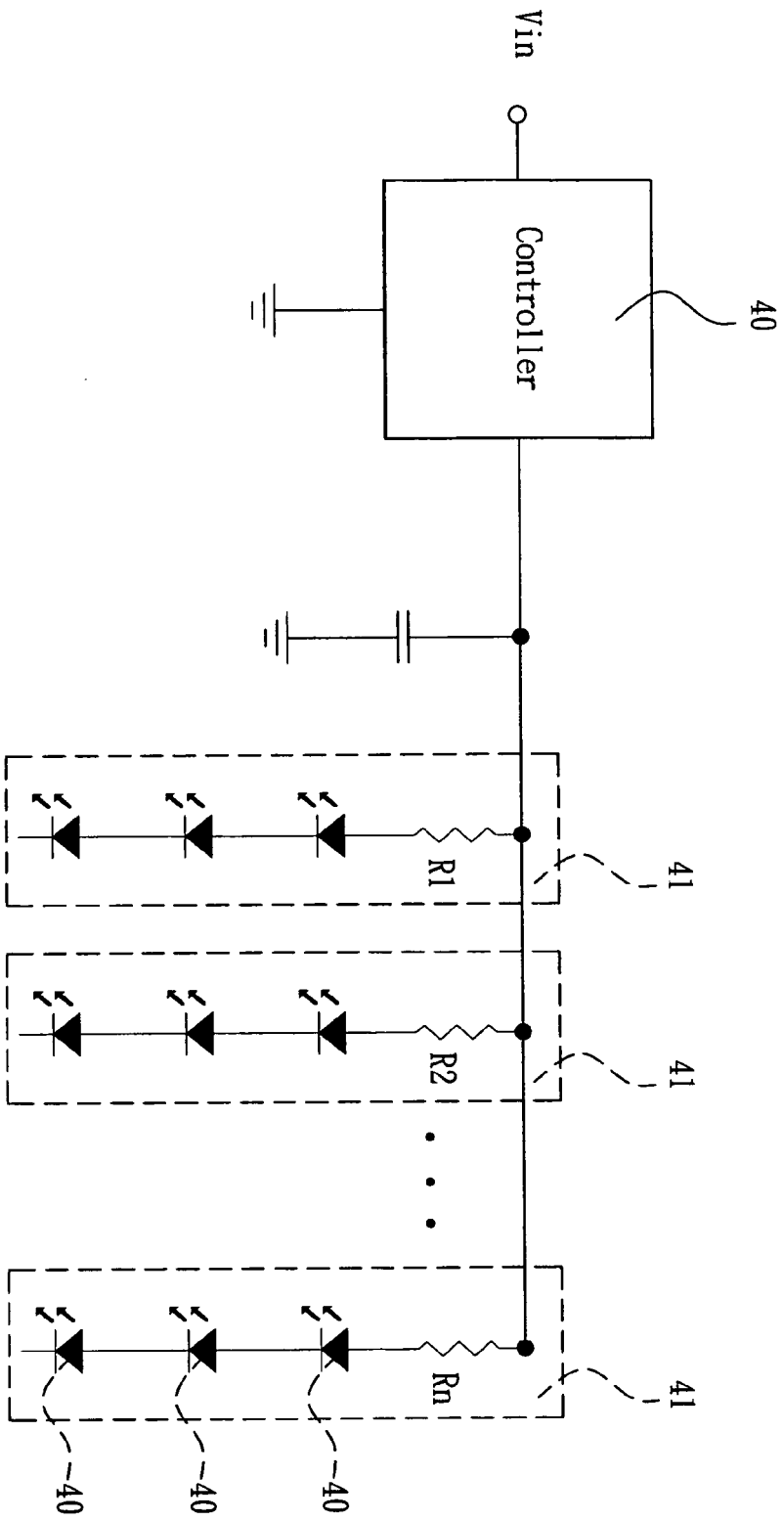


FIG. 1 (Prior Art)

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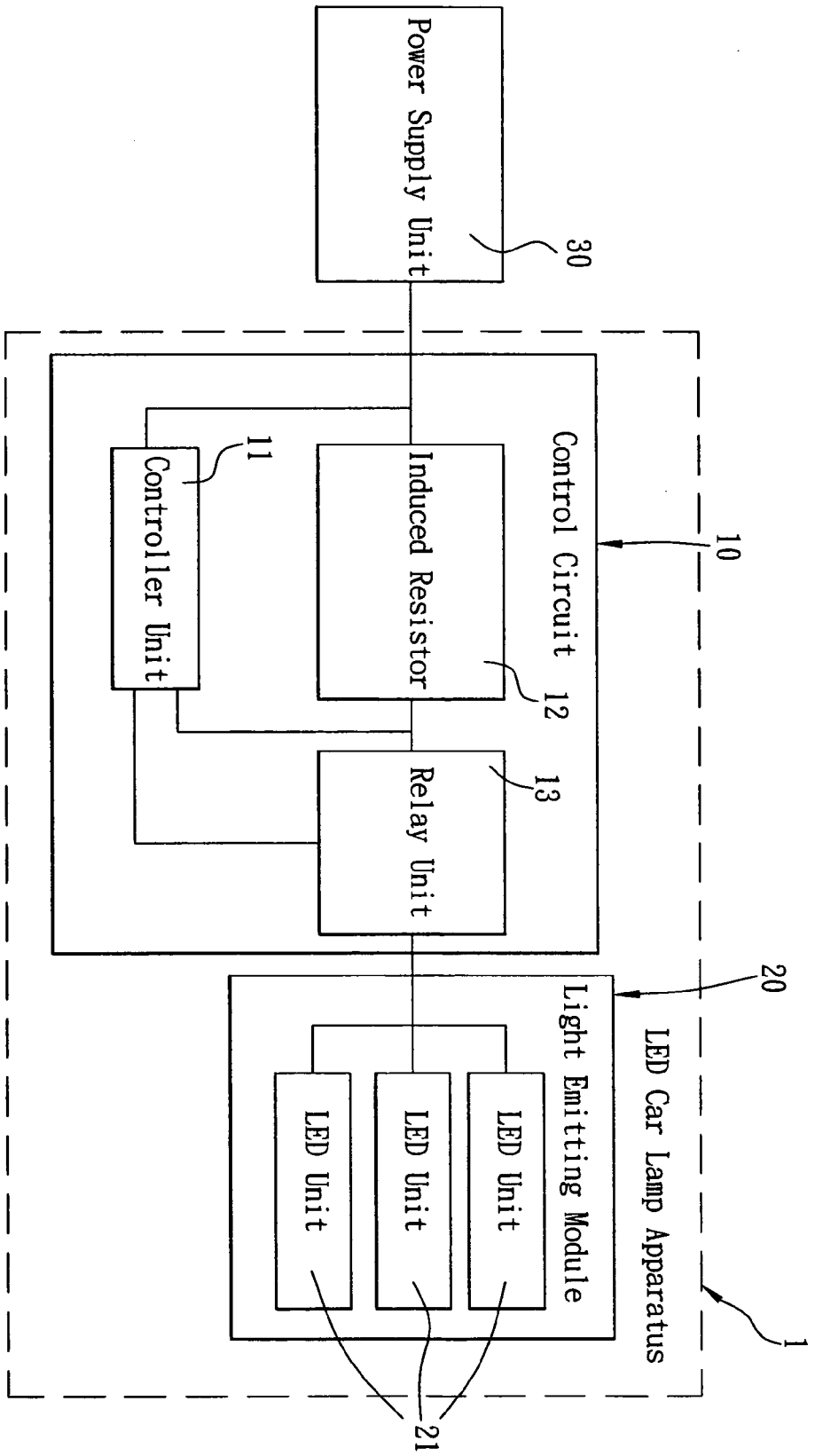


FIG. 2

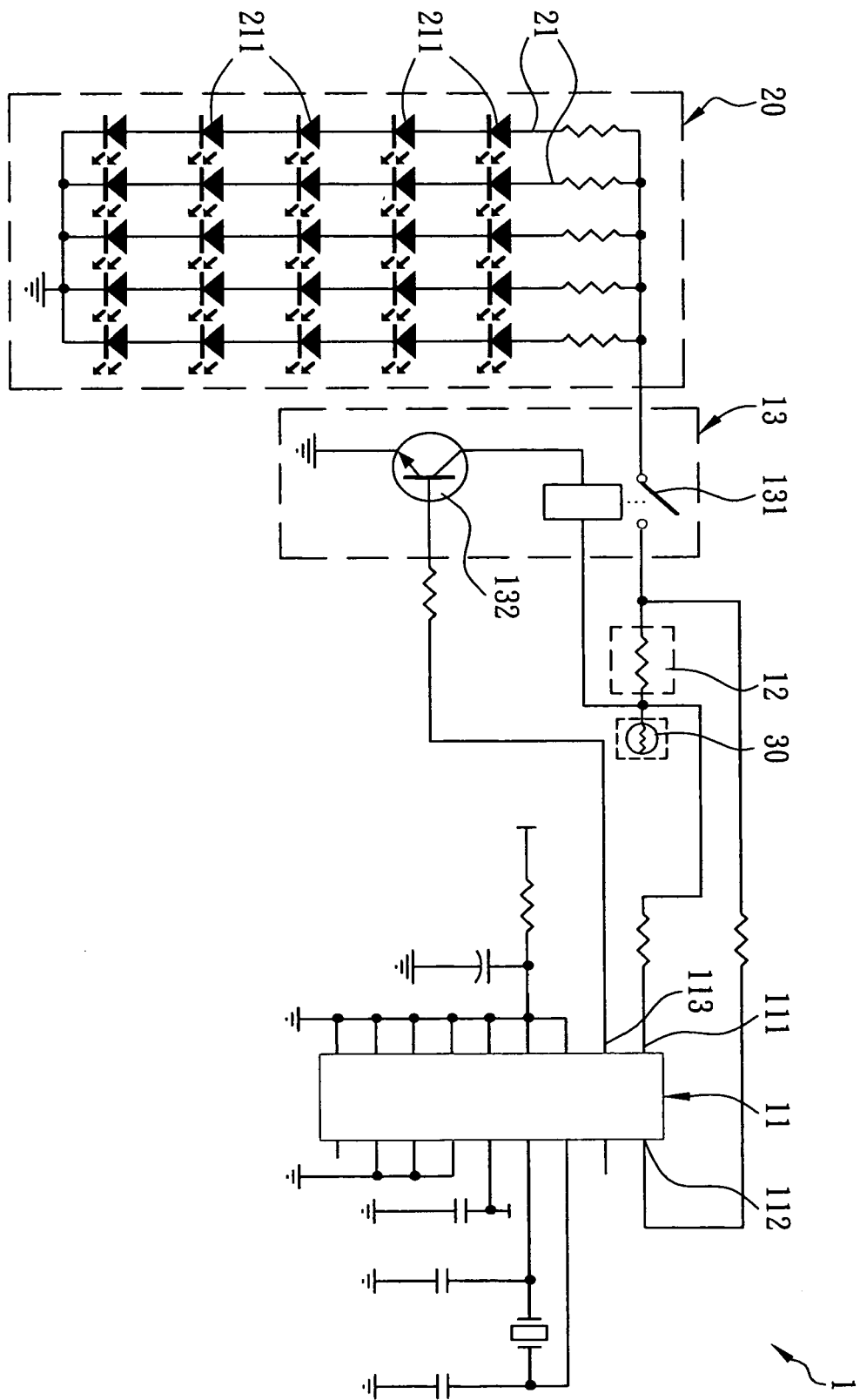


FIG. 3



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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 September 2006	Examiner Maicas, Jes s
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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ANNEX TO THE EUROPEAN SEARCH REPORT
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