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(71) Applicants:
- **Cao, Dengming**
  Lianyungang, Jiangsu 222000 (CN)
- **Zheng, Min**
  Zhejiang 310000 (CN)

(72) Inventors:
- **Cao, Dengming**
  Lianyungang, Jiangsu 222000 (CN)
- **Zheng, Min**
  Zhejiang 310000 (CN)

(74) Representative: **Zenz Patentanwälte Partnerschaft mbB**
Rüttenscheider Straße 2
45128 Essen (DE)

(54) LIGHT FOR DECORATIVE LIGHTING, LIGHT STRING, AND LIGHT STRING DISPLAY STATE CONTROL METHOD

(57) Embodiments of the present application provide a light and a light string for decorative lighting, and a method for controlling a display state of a light string, wherein the light comprises a cap, a light bulb, and an LED integrated lighting source. The light bulb is connected with the cap to form a sealed cavity. The LED integrated lighting source is disposed in the cavity, and both ends of the LED integrated lighting source are electrically connected to the cap via a wire. The LED integrated lighting source comprises at least one LED light string, and each LED light string comprises at least one LED light. Since each LED light has a small rated power and operating voltage, the strip-like LED integrated lighting source in the above-mentioned solution also has relatively small power and voltage, and is more energy-saving and more environmentally friendly than the prior art while satisfying the same lighting effect.

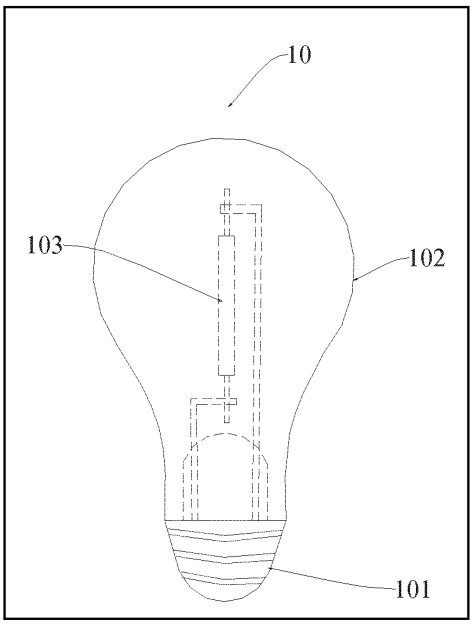

FIG. 1

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Description

Technical Field

[0001] The present application relates to the technical field of lighting, and in particular to a light and a light string for decorative lighting, and a method for controlling a display state of a light string.

Background Art

[0002] With the development of human society, there are more and more abundant ways for people to have social gatherings. Taking a party among the social gatherings as an example, in order to create a party atmosphere, various props required for the party come into being accordingly. Particularly in a party held at night, lighting control is especially important for the creation of the party atmosphere, and therefore party lights are also used more and more widely.

[0003] At present, some of the party lights available on the market are traditional incandescent lights, and this type of lights are gradually replaced by LED lights due to potential safety hazards. However, most of the prior LED party lights are LED products with high power and high voltage. The energy consumption produced during the use of the party lights is too high, which is not environmentally friendly.

Summary

[0004] In view of this, embodiments of the present application provide a light and a light string for decorative lighting, and a display state control method, for solving the technical problem that the prior LED party lights have high energy consumption and are not environmentally friendly.

[0005] In a first aspect, an embodiment of the present application provides a light for decorative lighting, comprising: a cap, a light bulb, and an LED integrated lighting source;
wherein the light bulb is connected with the cap to form a sealed cavity;
the LED integrated lighting source is disposed in the cavity, and each of two ends of the LED integrated lighting source is electrically connected with the cap via a conducting wire; and
the LED integrated lighting source comprises at least one LED light string, and each LED light string comprises at least one LED light.

[0006] Optionally, in the present embodiment, when the LED integrated lighting source comprises one LED light string, the LED light string is provided with a preset number of LED lights connected in series.

[0007] Optionally, in the present embodiment, when the LED integrated lighting source comprises multiple LED light strings, the multiple LED light strings are connected in parallel, and each LED light string is connected with a same number of LED lights.

[0008] Optionally, in the present embodiment, the LED integrated lighting source is in form of a strip.

[0009] Optionally, in the present embodiment, the LED integrated lighting source has an operating voltage ranging from 3 to 36 V.

[0010] In a second aspect, an embodiment of the present application further provides a light string for decorative lighting, the light string comprising a power supply line, a light base connected in series on the power supply line, and a light for decorative lighting fixed to the light base;
wherein the light comprises: a cap, a light bulb, and an LED integrated lighting source;
the light bulb is connected with the cap to form a sealed cavity;
the LED integrated lighting source is disposed in the cavity, and each of two ends of the LED integrated lighting source is electrically connected with the cap via a conducting wire;
the LED integrated lighting source comprises at least one LED light string, and each LED light string comprises at least one LED light; and
the light base comprises a light base mounting hole for accommodating the cap.

[0011] Optionally, in the present embodiment, when the LED integrated lighting source comprises one LED light string, the LED light string is provided with a preset number of LED lights connected in series.

[0012] Optionally, in the present embodiment, when the LED integrated lighting source comprises multiple LED light strings, the multiple LED light strings are connected in parallel, and each LED light string is connected with a same number of LED lights.

[0013] Optionally, in the present embodiment, the LED integrated lighting source is in form of a strip.

[0014] Optionally, in the present embodiment, the cap is detachably accommodated in the light base mounting hole.

[0015] Optionally, in the present embodiment, the cap is provided with a thread, a side wall of the light base mounting hole is provided with a thread, and the cap is detachably connected with the light base mounting hole by means of the threads.

[0016] Optionally, in the present embodiment, the power supply line has an input voltage ranging from 3 to 36 V.

[0017] Optionally, in the present embodiment, one end of the power supply line is connected with an adapter, and the adapter comprises an electrical signal conversion circuit;
the electrical signal conversion circuit comprises a rectifying unit, a filtering unit, and a voltage stabilizing unit which are electrically connected with one another;
the rectifying unit is electrically connected with the power supply line, and is configured to rectify an alternating current signal supplied in the power supply line into an unidirectional electrical signal;
the filtering unit is connected with an output terminal of

the rectifying unit, and is configured to filter out an alternating current component from the unidirectional electric signal that is already rectified by the rectifying unit; and the voltage stabilizing unit is electrically connected with the filtering unit, and is configured to stabilize a voltage of a filtered electrical signal so as to output the voltage-stabilized electrical signal for allowing an operation of the light.

[0018] Optionally, in the present embodiment, the filtering unit is an LC-π type filter which comprises a first capacitor, a second capacitor, and a first inductor, wherein the first capacitor is connected between positive and negative electrodes of the output terminal of the rectifying unit, and the second capacitor is connected in series with the first inductor and then connected in parallel with the first capacitor.

[0019] Optionally, in the present embodiment, the voltage stabilizing unit comprises a transformer, a positive-electrode input terminal of a primary side of the transformer is connected between the first inductor and the second capacitor, a negative-electrode input terminal of the primary side of the transformer is connected with a feedback network in which an output voltage of a secondary side of the transformer is used as an input, a positive-electrode output terminal of the secondary side of the transformer serves as a positive-electrode output terminal of the electrical signal conversion circuit through a first diode and a second diode, and a negative electrode of the secondary side of the transformer is grounded and then serves as a negative-electrode output terminal of the electrical signal conversion circuit.

[0020] In a third aspect, an embodiment of the present application further provides a method for controlling a display state of a light string, which is applicable to a light string for decorative lighting described in the second aspect, comprising steps of:

adjusting an inputted electrical signal;

converting the adjusted electrical signal into a direct current signal to supply power to lights in the light string; and

causing the lights to display based on the converted direct current signal.

[0021] In the present embodiment, the step of causing the light to display based on the converted direct current signal comprises steps of:

causing the lights to switch to (go into) a dimming state based on the converted direct current signal when the amplitude of the direct current signal varies;

causing the lights to switch to an always-on state based on the converted direct current signal when the amplitude of the direct current signal remains unvaried; and

causing the lights to switch to a flashing state based on the converted direct current signal when the direct current signal is a pulse signal.

[0022] Compared with the prior art, the embodiments of the present application have the following beneficial effects:

The embodiments of the present application provide a light and a light string for decorative lighting, and a method for controlling a display state of a light string, wherein the light comprises a cap, a light bulb, and an LED integrated lighting source; the light bulb is connected with the cap to form a sealed cavity; the LED integrated lighting source is disposed in the cavity, and each of the two ends of the LED integrated lighting source is electrically connected with the cap via a conducting wire; the LED integrated lighting source comprises at least one LED light string, and each LED light string comprises at least one LED light. Since each LED light has a small rated power and operating voltage, the strip-like LED integrated lighting source in the above-mentioned solution also has relatively small power and voltage, and is more energy-saving and more environmentally friendly than the prior art at the premise of satisfying demands of the same lighting effect.

Brief Description of Drawings

[0023] In order to illustrate technical solutions of embodiments of the present application more clearly, drawings required for use in the embodiments will be introduced briefly below. It is to be understood that the drawings below are merely illustrative of some embodiments of the present application, and therefore should not be considered as limiting its scope. It would be understood by those of ordinary skill in the art that other relevant drawings could also be obtained from these drawings without any inventive effort.

FIG. 1 is a structural schematic diagram of a light for decorative lighting according to an embodiment of the present application;

FIG. 2 is a structural schematic diagram of an LED integrated lighting source according to an embodiment of the present application;

FIG. 3 is another structural schematic diagram of an LED integrated lighting source according to an embodiment of the present application;

FIG. 4 is a structural schematic diagram of a light string for decorative lighting according to an embodiment of the present application;

FIG. 5 is another structural schematic diagram of a

light string for decorative lighting according to an embodiment of the present application;

FIG. 6 is a schematic diagram of a possible electrical signal conversion circuit according to an embodiment of the present application; and

FIG. 7 is a schematic flowchart of a method for controlling a display state of a light string according to an embodiment of the present application.

Detailed Description of Embodiments

[0024] The technical solutions of the embodiments of the present application will be described below clearly and completely with reference to the drawings of the embodiments of the present application. It is apparent that the embodiments to be described are some, but not all of the embodiments of the present application. Generally, the components of the embodiments of the present application, as described and illustrated in the figures herein, may be arranged and designed in a wide variety of different configurations.

[0025] Thus, the following detailed description of the embodiments of the present application, as represented in the figures, is not intended to limit the scope of the present application as claimed, but is merely representative of selected embodiments of the present application. All the other embodiments obtained by those skilled in the art in light of the embodiments of the present application without inventive efforts would fall within the scope of the present application as claimed.

[0026] It should be noted that similar reference numerals and letters refer to similar items in the following figures, and thus once a certain item is defined in one figure, it may not be further defined or explained in the following figures. Moreover, in the description of the present application, terms such as "first" and "second" are used for distinguishing the description only, and should not be understood as an indication or implication of relative importance.

[0027] Referring to FIG. 1, which is a structural schematic diagram of a light 10 for decorative lighting according to an embodiment of the present application, the light 10 comprises a cap 101, a light bulb 102, and an LED integrated lighting source 103.

[0028] The light bulb 102 is connected with the cap 101 to form a sealed cavity. In the present embodiment, the cap 101 is made of a metal material, and the light bulb 102 is made of a material having a relatively good light-transmitting property (e.g., glass). The connection mode between the light bulb 102 and the cap 101 may be bonding or other fixed connection modes, and the specific connection mode thereof is not limited here, as long as the light bulb 102 and the cap 101 can to form a cavity for accommodating the LED integrated lighting source 103 by the connection therebetween.

[0029] The LED integrated lighting source 103 is disposed in the cavity, and each of two ends of the LED integrated lighting source 103 is electrically connected with the cap 101 via a metal conducting wire. In the present embodiment, the LED integrated lighting source 103 may be of any shape, and preferably, in the present embodiment, the LED integrated lighting source is in shape of a strip.

[0030] In the present embodiment, the LED integrated lighting source 103 is obtained by an integration using at least one LED light string, wherein each LED light string comprises at least one LED light.

[0031] In a first implementation of the present embodiment, referring to FIG. 2, when the LED integrated lighting source 103 comprises one LED light string, the LED light string is provided with a preset number of LED lights connected in series. Still taking FIG. 2, in which 12 LED lights are connected in series, as an example, the entire LED integrated lighting source 103 has an operating voltage of 36 V assuming that each LED light has an operating voltage of 3 V. Optionally, a user may select the number of LED lights to be connected in series according to his/her own needs. FIG. 2 is only an example for illustrating the present solution, and should not be construed as limiting the present solution.

[0032] In a second implementation of the present embodiment, referring to FIG. 3, when the LED integrated lighting source 103 comprises multiple LED light strings, the multiple LED light strings are connected in parallel, and each LED light string is provided with the same number of LED lights connected thereon. Taking the connection mode of LED light strings in FIG. 3 as an example, three LED light strings are included in total, and each LED light string is provided with a same number (i.e., four) of LED lights connected in series, and the entire LED integrated lighting source has an operating voltage of 12 V assuming that each LED light has an operating voltage of 3 V. Optionally, the user may select the number of LED lights of each LED light string according to his/her own needs, as long as it is ensured that each LED light string has the same number of LED lights. In the present embodiment, the operating voltage of the LED integrated lighting source 103 is at low voltage, and specifically, the operating voltage of the LED integrated lighting source 103 is in a range of 3 to 36 V.

[0033] Referring to FIG. 4 and FIG. 5, an embodiment of the present application further provides a light string 1 for decorative lighting. The light string 1 comprises a power supply line 30, light bases 20 connected in series on the power supply line 30, and lights 10 for decorative lighting which are fixed to the light bases 20 respectively. In the present embodiment, the number of the light bases 20 connected in series on the power supply line 30 is equal to or greater than one, and the number of the lights 10 corresponds to the number of the light bases 20. A spacing distance between adjacent light bases 20 may be set at 25 to 100 cm.

[0034] In the present embodiment, the structure of the lights 10 has been previously introduced, and will not be

described redundantly in detail here. Each of the light bases 20 comprises a light base mounting hole for accommodating the respective cap 101. Each cap 101 is detachably mounted in the respective light base mounting hole. Optionally, each cap 101 may be detachably mounted in respective the light base mounting hole in such a manner that it is detachably mounted by means of threads. Specifically, each cap 101 is provided with a thread, and a side wall of the respective light base mounting hole is provided with a thread matching therewith. It will be evidently understood that only one implementation of the detachable connection between each cap 101 and the respective light base mounting hole has been given above, and in the present embodiment, each cap 101 may be detachably connected with the respective light base mounting hole by other means or structures.

[0035] In the present embodiment, one end of the power supply line is connected to an adapter 40, the minimum power of each of the LED integrated lighting sources may be 0.3 W, and the maximum power of each of the LED integrated lighting sources is equal to the maximum rated power of the adapter 40 which supplies power. The adapter 40 outputs a constant voltage, and the voltage outputted by the adapter 40 ranges from 3 to 36 V. The adapter 40 supplies an adapted current for allowing the operation of the lights 10, based on a different number or coupling mode of the lights 10 coupled to the power supply line 30.

[0036] In the present embodiment, the lights 10 coupled to the power supply line 30 may comprise LED integrated lighting sources 103 of the same configuration, or may comprise LED integrated lighting sources 103 of different configurations. Here, the mentioned LED integrated lighting sources 103 of the same configuration refer to LED integrated lighting sources 103 in which the number and the connection relations of LED light strings are the same. The LED integrated lighting sources 103 of different configurations refer to LED integrated lighting sources 103 in which at least one of the number and the connection relations of LED light strings is different. That is to say, if the lights 10 corresponding to the LED integrated lighting sources 103 of different configurations are named as different models, and lights of different models may be connected to the light string in the present embodiment.

[0037] In the present embodiment, the adapter 40 comprises an electrical signal conversion circuit, referring to FIG. 6, which is a schematic diagram of a possible electrical signal conversion circuit according to an embodiment of the present application.

[0038] The electrical signal conversion circuit is configured to convert an electrical signal into a direct current signal to energize the lights 10. Referring again to FIG. 6, the electrical signal conversion circuit comprises a rectifying unit 411, a filtering unit 412, and a voltage stabilizing (regulating) unit 413 which are electrically connected.

[0039] The rectifying unit 411 is electrically connected with the power supply line 30, and is configured to rectify an alternating current signal supplied in the power supply line 30 into a unidirectional electrical signal.

[0040] The filtering unit 412 is connected with an output terminal of the rectifying unit 411, and is configured to filter out an alternating current component from the unidirectional electric signal that is already rectified by the rectifying unit 411.

[0041] The voltage stabilizing unit 413 is electrically connected with the filtering unit 412, and is configured to stabilize a voltage of the filtered electrical signal to output a voltage-stabilized electrical signal for allowing the operation of the lights 10.

[0042] In the present embodiment, the filtering unit 412 is an LC-π type filter, and the filtering unit 412 comprises a first capacitor C1, a second capacitor C2, a first inductor L1, a second inductor L2, a resistor R10, and a resistor R11. The first capacitor C1 is connected between positive and negative electrodes of the output terminal of the rectifying unit 411, and the first inductor L1, the second capacitor C2, and the second inductor L2 are connected in series and then connected to two ends of the first capacitor C1. The resistor R10 is connected in parallel with the first inductor L1, and the resistor R11 is connected in parallel with the second inductor L2. The second inductor L2, the resistor R10, and the resistor R11 are optional elements, and the second inductor L2, the resistor R10, and the resistor R11 may be omitted in the present embodiment.

[0043] In the present embodiment, the voltage stabilizing unit 413 comprises a transformer T1, and a positive-electrode input terminal of a primary side of the transformer T1 is connected between the first inductor L1 and the second capacitor C2. A negative-electrode input terminal of the primary side of the transformer is connected with a feedback network in which an output voltage of a secondary side of the transformer is used as an input, a positive-electrode output terminal of the secondary side of the transformer serves as a positive-electrode output terminal of the electrical signal conversion circuit after a diode D1, and a negative-electrode output terminal of the secondary side of the transformer is grounded and then serves as a negative-electrode output terminal of the electrical signal conversion circuit.

[0044] In the present embodiment, optionally, in the feedback network, the positive-electrode output terminal of the secondary side of the transformer T1 is connected with a positive electrode of a diode D2, a negative electrode of the diode D2 is connected with a first pin of U1 via a resistor R12, and the negative-electrode output terminal of the secondary side of the transformer T1 is grounded. One end of a resistor R2 is connected between the diode D2 and the resistor R12, and the other end of the resistor R2 is grounded via a resistor R3. A second pin of U1 is connected between the resistor R2 and the resistor R3, and a capacitor C7 is connected in parallel with the resistor R3. A negative electrode of the capacitor C3 is grounded, and a positive electrode of the capacitor

C3 is connected between the first inductor L1 and the positive-electrode input terminal of the primary side of the transformer T1 via a resistor R5 and a resistor R4. A resistor R7, a capacitor C4, and a diode D3 are connected in series and then connected between the two electrode input terminals of the primary side of the transformer T1, and a resistor R6 is connected in parallel with the capacitor C4 and the resistor R7. The positive-electrode input terminal of the primary side of the transformer T1 is grounded via a capacitor CY1. Fifth and sixth pins of U1 are connected to the negative-electrode input terminal of the primary side of the transformer T1, wherein the first pin of U1 is an enabling terminal, the second pin of U1 is an input terminal, and the fifth and sixth pins of U1 each act as an output terminal (control terminal). A voltage stabilizing effect is achieved by feeding back the voltage of the secondary side of the transformer T1 to the negative-electrode input terminal of the primary side of the transformer T1. In the present embodiment, the resistor R12, the resistor R7, and the capacitor C7 are optional elements, which may be omitted in other implementations.

[0045] A capacitor C5 and a resistor R9 are connected between the diode D1 and the positive-electrode output terminal, wherein a positive electrode of the capacitor C5 is connected between a negative electrode of the diode D1 and the positive-electrode output terminal, a negative electrode of the capacitor C5 is connected between the negative-electrode output terminal of the secondary side of the transformer T1 and the negative-electrode output terminal of the electrical signal conversion circuit, and the resistor R9 is connected in parallel with the capacitor C5.

[0046] In the present embodiment, the adapter 40 converts an electrical signal into a direct current signal and then energizes the lights 10 via the power supply line 30.

[0047] Referring to FIG. 7, an embodiment of the present application further provides a display state control method, which is applicable to the light string for decorative lighting described above. The method comprises following steps:

Step S710, adjusting an electrical signal in the power supply line 30.

[0048] The electrical signal in the power supply line 30 is adjusted by varying an electrical signal inputted in the adapter 40. The adjustment to the electrical signal in the adapter 40 may be automatically controlled by software, and the electrical signal may be controlled by means of varying the amplitude of the electrical signal, varying a waveform shape of the electrical signal, or the like.

[0049] Step S720, converting the adjusted electrical signal into a direct current signal to supply power to the lights in the light string 1.

[0050] The adapter 40 is configured to convert the electrical signal in the power supply line 30 into a direct current signal. Since the electrical signal in the power supply line varies, the direct current signal obtained after conversion by the adapter 40 also varies accordingly, and the converted direct current signal is supplied to the lights 10 so that the light 10 operates.

[0051] Step S730, causing the lights 10 to display based on the converted direct current signal.

[0052] In the present embodiment, the light state of each of the lights 10 will vary based on different direct current signals. Specifically, the variations comprise:

the lights 10 switching to a dimming state based on the direct current signal when the amplitude of the direct current signal changes;

the lights 10 switching to an always-on state based on the direct current signal when the amplitude of the direct current signal remains unvaried; and

the lights 10 switching to a flashing state based on the direct current signal when the direct current signal is a pulse signal.

[0053] Evidently, the above-mentioned manner is only an example for illustrating a change of display state of the lights caused by the change of electric signal in the present embodiment. In other implementations of the present application, the lights may also have other display states, which can provide different display experiences and create different atmospheres for the user.

[0054] The embodiments of the present application provide a light and a light string for decorative lighting, and a method for controlling a display state of a light string, wherein the light comprises a cap, a light bulb, and an LED integrated lighting source; the light bulb is connected with the cap to form a sealed cavity; the LED integrated lighting source is disposed in the cavity, and each of two ends of the LED integrated lighting source is electrically connected to the cap via a conducting wire; the LED integrated lighting source comprises at least one LED light string, and each of the at least one LED light string comprises at least one LED light. Since each LED light has a small rated power and operating voltage, the strip-like LED integrated lighting source in the above-mentioned solution also has relatively small power and voltage, and is more energy-saving and more environmentally friendly than the prior art at the premise of satisfying demands of the same lighting effect. Moreover, a display state of each of the light string can vary via variation of an electrical signal, which provides different displays to improve the user experience in use.

[0055] The above description is merely illustrative of preferred embodiments of the present application and is not intended to limit the present application. It will be understood by those skilled in the art that various modifications and variations can be made to the present application. Any modifications, equivalent substitutions, improvements and so on made within the spirit and principle of the present application are to be covered by the scope of protection of the present application.

Industrial Applicability

[0056] With a light and a light string for decorative lighting, and a method for controlling a display state of a light string according to the embodiments of the present application, a low-power and environmentally friendly decorative lighting can be provided, and moreover different lamplight display states can be provided based on the varying electrical signal so as to improve the user experience in use.

Claims

1. A light for decorative lighting, **characterized by** comprising: a cap, a light bulb, and an LED integrated lighting source,

   wherein the light bulb is connected with the cap to form a sealed cavity;
   the LED integrated lighting source is disposed in the cavity, and each of two ends of the LED integrated lighting source is electrically connected to the cap via a conducting wire; and
   the LED integrated lighting source comprises at least one LED light string, and each LED light string comprises at least one LED light.

2. The light for decorative lighting according to claim 1, wherein when the LED integrated lighting source comprises one LED light string, the LED light string is provided with a preset number of LED lights connected in series.

3. The light for decorative lighting according to claim 1, wherein when the LED integrated lighting source comprises multiple LED light strings, the multiple LED light strings are connected in parallel, and each LED light string is connected with a same number of LED lights.

4. The light for decorative lighting according to any one of claims 1 to 3, wherein the LED integrated lighting source is in form of a strip.

5. The light for decorative lighting according to any one of claims 1 to 3, wherein the LED integrated lighting source has an operating voltage ranging from 3 to 36 V.

6. A light string for decorative lighting, **characterized by** comprising a power supply line, light bases connected in series on the power supply line, and lights for decorative lighting fixed to the light bases respectively,

   wherein each of the lights comprises: a cap, a light bulb, and an LED integrated lighting source;
   the light bulb is connected with the cap to form a sealed cavity;
   the LED integrated lighting source is disposed in the cavity, and each of two ends of the LED integrated lighting source is electrically connected with the cap via a conducting wire;
   the LED integrated lighting source comprises at least one LED light string, and each LED light string comprises at least one LED light;
   each of the light bases comprises a light base mounting hole for accommodating the respective cap; and
   the power supply line has an input voltage ranging from 3 to 36 V.

7. The light string according to claim 6, wherein when the LED integrated lighting source comprises one LED light string, the LED light string is provided with a preset number of LED lights connected in series.

8. The light string according to claim 6, wherein when the LED integrated lighting source comprises multiple LED light strings, the multiple LED light strings are connected in parallel, and each LED light string is connected with a same number of LED lights.

9. The light string according to claim 6, wherein the LED integrated lighting source is in form of a strip.

10. The light string according to claim 6, wherein the cap is detachably accommodated in the respective light base mounting hole.

11. The light string according to claim 6, wherein the cap is provided with a thread, a side wall of the light base mounting hole is provided with a thread, and the cap is detachably connected with the light base mounting hole by means of the threads.

12. The light string according to any one of claims 6 to 11, wherein the power supply line has an input voltage ranging from 3 to 36 V.

13. The light string according to any one of claims 6 to 11, wherein one end of the power supply line is connected with an adapter, and the adapter comprises an electrical signal conversion circuit;

    the electrical signal conversion circuit comprises a rectifying unit, a filtering unit, and a voltage stabilizing unit which are electrically connected;
    the rectifying unit is electrically connected with the power supply line, and is configured to rectify an alternating current signal supplied in the power supply line into a unidirectional electrical signal;
    the filtering unit is connected with an output terminal of the rectifying unit, and is configured to

filter out an alternating current component from the unidirectional electric signal that is already rectified by the rectifying unit; and
the voltage stabilizing unit is electrically connected with the filtering unit, and is configured to stabilize a voltage of a filtered electrical signal to output a voltage-stabilized electrical signal for allowing an operation of the lights.

14. The light string according to claim 13, wherein the filtering unit is an LC-π type filter which comprises a first capacitor, a second capacitor, and a first inductor, the first capacitor is connected between positive and negative electrodes of an output terminal of the rectifying unit, and the second capacitor is connected in series with the first inductor and then connected in parallel with the first capacitor.

15. The light string according to claim 14, wherein the voltage stabilizing unit comprises a transformer, a positive-electrode input terminal of a primary side of the transformer is connected between the first inductor and the second capacitor, a negative-electrode input terminal of the primary side of the transformer is connected to a feedback network in which an output voltage of a secondary side of the transformer is used as an input, a positive-electrode output terminal of the secondary side of the transformer serves as a positive-electrode output terminal of the electrical signal conversion circuit through a first diode and a second diode, and a negative electrode of the secondary side of the transformer is grounded and then serves as a negative-electrode output terminal of the electrical signal conversion circuit.

16. A display state control method for use in the light string for decorative lighting according to any one of claims 5 to 15, **characterized by** comprising steps of:

adjusting an inputted electrical signal;
converting an adjusted electrical signal into a direct current signal to power the lights in the light string; and
causing the lights to display based on a converted direct current signal.

17. The display state control method according to claim 16, wherein the step of causing the lights to display based on the converted direct current signal comprises steps of:

causing the lights to switch to a dimming state based on the direct current signal when an amplitude of the converted direct current signal varies;
causing the lights to switch to an always-on state based on the direct current signal when the amplitude of the converted direct current signal remains unvaried; and
causing the lights to switch to a flashing state based on the converted direct current signal when the converted direct current signal is a pulse signal.

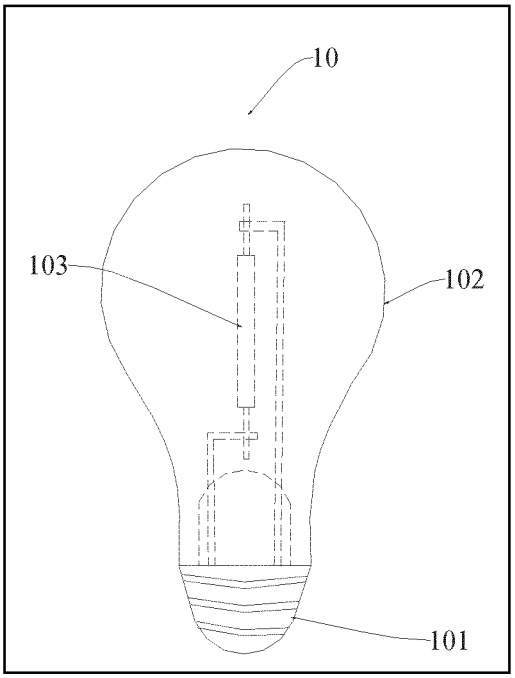

FIG. 1

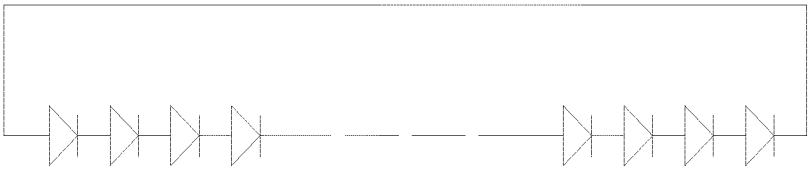

FIG. 2

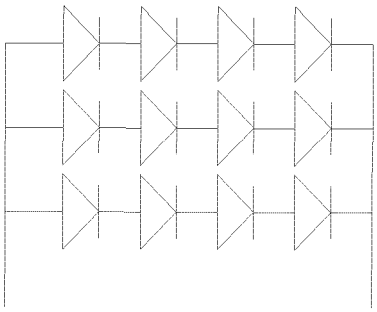

FIG. 3

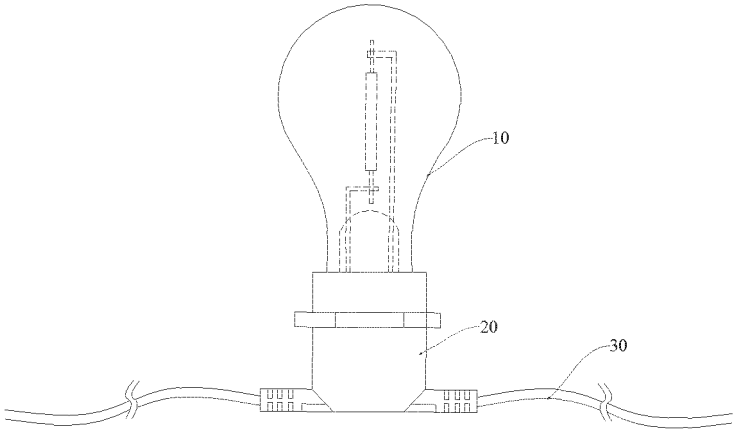

FIG. 4

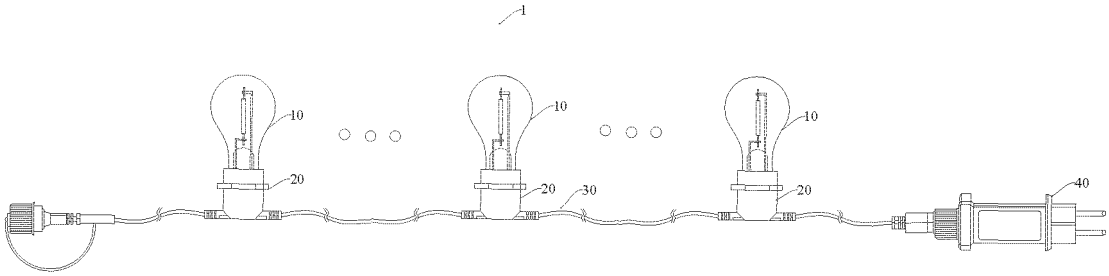

FIG. 5

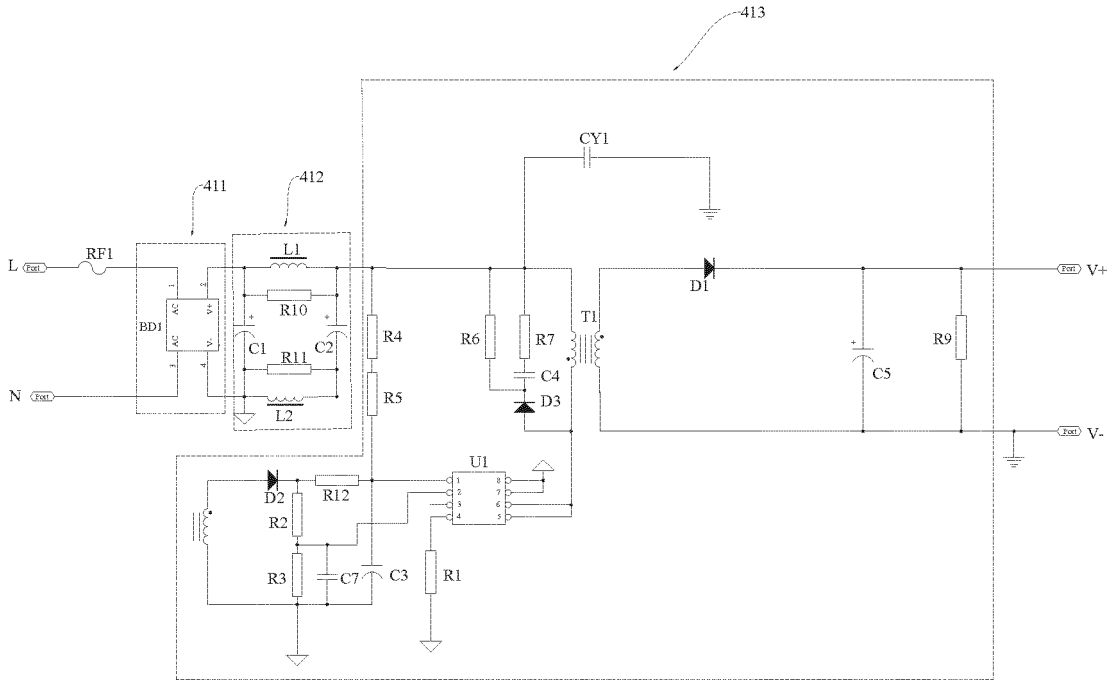
413
411
412
CY1
L
RF1
L1
R10
BD1
C1
C2
R11
L2
R4
R5
R6
R7
C4
D3
T1
D1
V+
V-
C5
R9
N
U1
D2
R12
R2
R3
C7
C3
R1

FIG. 6

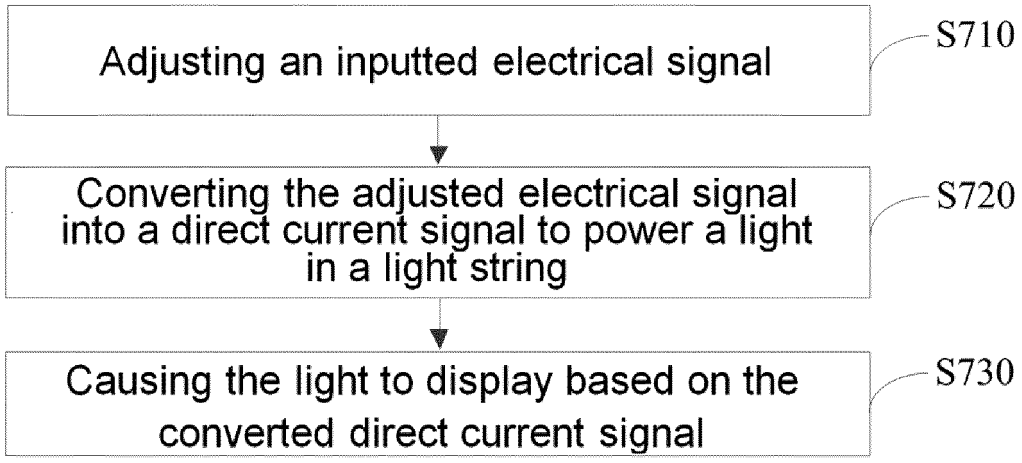
Adjusting an inputted electrical signal
S710
Converting the adjusted electrical signal into a direct current signal to power a light in a light string
S720
Causing the light to display based on the converted direct current signal
S730

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2018/095450

A. CLASSIFICATION OF SUBJECT MATTER

F21K 9/232(2016.01)i; F21V 3/02(2006.01)i; F21K 9/20(2016.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F21

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNPAT, CNKI, WPI, EPODOC: 灯串, 灯, 灯泡, 串联, 并联, 灯头, 灯座, 螺旋, 适配器, 滤波, 稳压, 整流, lamp, string, series, parallel???, adapter, filter, stabiliz???, rectifi+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 207065142 U (CAO, DENGMING) 02 March 2018 (2018-03-02) description, paragraphs [0017]-[0019], and figures 1-3	1-17
Y	CN 205979221 U (SHANGHAI LEAD LIGHTING TECH CO., LTD.) 22 February 2017 (2017-02-22) description, paragraphs [0045], [0046], and [0052], and figures 3 and 4	1-17
Y	CN 206481227 U (DONGGUAN WAHHING ELECTRICAL APPLIANCE CO., LTD.) 08 September 2017 (2017-09-08) description, paragraphs [0002] and [0025]-[0033], and figures 1 and 2	13-17
A	KR 200466870 Y1 (FUTURENURI CO., LTD.) 10 May 2013 (2013-05-10) entire document	1-17
A	CN 205065426 U (CAO, DENGMING) 02 March 2016 (2016-03-02) entire document	1-17
A	CN 201599618 U (ZHAO, HUANXING) 06 October 2010 (2010-10-06) entire document	1-17

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 March 2019	**28 March 2019**
Name and mailing address of the ISA/CN **State Intellectual Property Office of the P. R. China (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088** **China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2018/095450

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 207065142 U	02 March 2018	None	
CN 205979221 U	22 February 2017	None	
CN 206481227 U	08 September 2017	None	
KR 200466870 Y1	10 May 2013	None	
CN 205065426 U	02 March 2016	WO 2017049787 A1	30 March 2017
CN 201599618 U	06 October 2010	DE 202010010174 U1	14 October 2010

Form PCT/ISA/210 (patent family annex) (January 2015)