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[12] Utility Model Patent Specification

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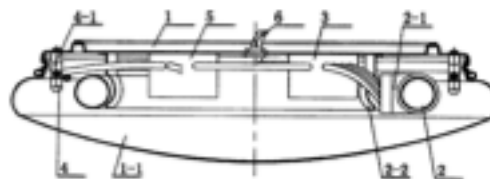
Claims 1 page Specification 6 pages Figures 10 pages

**[54] Title of Utility Model**

Multiple Light Source Lighting Device

**[57] Abstract**

This utility model relates to a multiple light source lighting device. The LED light source assembly built in the lamp housing and the ballast of the fluorescent tube light source are connected to the switching controller, and the LED light source assembly and the fluorescent tube light source can be switched as needed. The power supply enters the switching controller, and the switching controller outputs two circuits to control the LED light source assembly and the fluorescent tube light source, respectively. When the power is turned on, the switching controller sets the combined circuit of the LED light source with low power to work. When high illuminance lighting is required, the switching controller is switched to the high-power fluorescent tube light source to work by turning off the power supply for a short time and then turning it on. When powered on, it can operate the specific infrared, ultrasonic, and electromagnetic wave remote controller, and the switching controller can be controlled via the receiver, so as to satisfy the reasonable needs of energy saving and practicality.



1. A multiple light source lighting device, comprising a lamp housing (1), a fluorescent tube light source (2) installed on it, and a ballast (3) for controlling the fluorescent tube light source (2), characterized in that the lamp housing (1) is equipped with an LED light source assembly (4) and a switching controller (5); the power supply is divided into two circuits through the switching controller (5), and each circuit is connected to the LED light source assembly (4) and the ballast (3) respectively.
2. A multiple light source lighting device according to claim 1, characterized in that the switching controller (5) comprises an AC-DC converter (5-1), a bistable controller (5-2), a control triggering signal circuit (5-3), an LED light source assembly driver (5-4), a fluorescent tube assembly driver (5-5); the AC-DC converter (5-1) outputs DC to the bistable controller (5-2), the LED light source assembly driver (5-4) and the fluorescent tube assembly driver (5-5), and the control triggering signal circuit (5-3); the signal of the control triggering signal circuit (5-3) is divided into two sub-circuits through the bistable controller (5-2) to control the LED light source assembly driver (5-4) and the fluorescent tube assembly driver (5-5), respectively.
3. A multiple light source lighting device according to claim 1 or 2, characterized in that the AC-DC converter (5-1) in the switching controller (5) uses a transformer to step down and then rectify and filter the current.
4. A multiple light source lighting device according to claim 1 or 2, characterized in that the AC-DC converter (5-1) in the switching controller (5) uses a capacitor to step down and then rectify and filter the current.
5. A multiple light source lighting device according to claim 1 or 2, characterized in that the fluorescent tube assembly driver (5-5) is a transistor-driven micro-relay; the LED light source assembly driver (5-4) is a constant current source circuit composed of transistors.
6. A multiple light source lighting device according to claim 1 or 2, characterized in that the control triggering signal circuit (5-3) uses the power supply as an input signal to control the LED light source assembly (4) and energize the light bulb, or switch to a fluorescent tube light source (2) and energize the light bulb.
7. A multiple light source lighting device according to claim 1 or 2, characterized in that the control triggering signal circuit (5-3) is sequentially connected with a remote control triggering signal circuit (5-3a) and a remote control signal receiver (5-3b); after the power is turned on, the remote control signal transmitter (5-3c) transmits a signal, and the LED light source assembly (4) is energized and illuminated through the remote control signal receiver (5-3b) and the remote control triggering signal circuit (5-3a), or switches a fluorescent tube light source (2) to energize and illuminate the light, or turns off the light.
8. A multiple light source lighting device according to claim 7, characterized in that infrared or ultrasonic or electromagnetic wave signals are used for signal transmission between the remote control signal receiver (5-3b) and the remote control signal transmitter (5-3c).
9. A multiple light source lighting device according to claim 1 or 2, characterized in that in the control program:  
(A) when the power is turned on for the first time, the LED light source assembly (4) is energized and illuminated;  
(B) subsequently, if the power supply is cut off for 0.5 seconds to 2 seconds and then turned on (or there is an interval between sending out the second remote control signal), it will switch to energize and illuminate the fluorescent tube light source (2);  
(C) if the power is cut off for more than 3 seconds, then turned on (or there is an interval between sending out the second remote control signal), process (A) above will be repeated.

## Multiple Light Source Lighting Device

### Technological Field

The present utility model relates to a lighting fixture and a control method thereof.

### Background Art

At present, residential lighting is mainly based on a single fluorescent lamp, and the control method is one switch to control one lamp or one switch to control multiple lamps. The lighting environment is single. If a dimmable fluorescent lamp is used, the cost is high, the power is low, and the operation is unstable. If a dimmable incandescent lamp is used, the efficiency is low. If a single LED light source is used to achieve high illumination intensity, the cost is relatively high and the total lighting efficiency is low. If multiple lamps and switches are used, the wiring will be complicated and there will be many lamps, which will affect the visual environment. If only one switch is used to control three groups of incandescent lamps through a thyristor controller, it is only suitable for multi-head chandeliers, not for controlling fluorescent lamps, and the operation is also cumbersome.

### Content

In order to meet the lighting needs of people at home, it is best to combine the lamps needed for security lighting, sleep lighting, and high illuminance lamps for other activities. It requires controlling the assembly of LED light sources and fluorescent tube light sources to work alternately according to the needs of daily life. It can adjust the illumination intensity, and use the existing lighting power lines. This is easy to implement, thereby bringing convenience to users.

The purpose of this utility model is achieved by the following technical solution. This utility model is composed of the following parts: lamp housing 1, fluorescent tube light source 2, ballast 3, LED light source assembly 4, and switching controller 5. The power supply is connected to the switching controller 5 through an external switch and a power line 6. The output of the switching controller 5 is divided into two circuits. One circuit is connected to the LED light source assembly 4, and the other circuit is connected to the ballast 3 of the fluorescent tube light source.

The switching controller 5 in this utility model includes an AC-DC converter 5-1, a bistable controller 5-2, a control triggering signal circuit 5-3, an LED light source assembly driver 5-4, and a fluorescent tube assembly driver 5-5. The power flows into the AC-DC converter 5-1 through power cord 6. The AC-DC converter 5-1 outputs DC to the bistable controller 5-2, the LED light source assembly driver 5-4, the fluorescent tube assembly driver 5-5 and the control triggering signal circuit 5-3. The signal from the control triggering signal circuit 5-3 is output through two circuits of the bistable controller 5-2 to control the LED light source assembly driver 5-4 and the fluorescent tube assembly driver 5-5, thereby switching the power output.

The AC-DC converter 5-1 in the switching controller 5 uses a rectification and filter circuit after step-down by a transformer, or a rectification and filter circuit after step-down by a capacitor.

The fluorescent tube combined driver 5-5 is a transistor-driven miniature relay. The LED light source assembly driver 5-4 is a constant current source circuit made up of transistors.

The LEDs in the LED light source assembly 4 can be multiple white, yellow, green, blue and other high-efficiency LED light sources.

The ballast 3 can be an electronic ballast matched with a fluorescent tube, or an inductance ballast.

The bistable controller 5-2 can be composed of dual transistors, resistors and capacitors, or an integrated circuit JK flip-flop or D flip-flop.

The control triggering signal circuit 5-3 uses power supply as an input signal. A remote control triggering signal circuit 5-3a and its remote control signal receiver 5-3b (infrared, or ultrasonic, or electromagnetic wave) can be added. After the power is turned on, the remote control signal transmitter 5-3c transmits a signal, and the LED light source assembly 4 is energized and illuminated through the remote control signal receiver 5-3b and the remote control triggering signal circuit 5-3a, or switches a fluorescent tube light source 2 to energize and illuminate the light, or turns off the light.

When the power is turned on for the first time, the LED light source assembly 4 is energized and illuminated. If the power supply is cut off for 0.5 seconds to 2 seconds and then turned on (or there is an interval between sending out

the second remote control signal), it will switch to energize and illuminate the fluorescent tube light source 2. If the power supply is cut off for more than 3 seconds and then turned on (or there is an interval between sending out the second remote control signal), it will repeat the first process mentioned above.

Compared with the prior art, this utility model can reduce energy consumption and is more convenient to use. One light can meet the needs of two lighting environments at home.

An overview of several common lighting scenarios:

(1) Fluorescent lighting: composed of a fluorescent tube and a ballast in the lamp housing, and an external switch. The switch is connected to the power supply of the ballast, and the fluorescent tube light source is controlled through the ballast output. The light environment in this scenario is single.

(2) Full LED dimmable lighting: composed of a controller, an AC to DC regulated power supply and an LED light source in the lamp housing, and an external dimming controller. The external dimming controller turns on and off the AC power to convert it into a DC regulated power supply, and at the same time connects the signal to the controller, and the controller adjusts the lighting brightness of the LED light source. In this scenario, the circuit is complicated, the cost is high, and the lighting efficiency is low.

(3) Dimmable fluorescent lighting: composed of a fluorescent tube and a dimmable ballast inside the lamp housing, and an external dimming controller. The external dimming controller turns on and off the power supply of the fluorescent light source and adjusts output power voltage to the dimmable ballast. The dimmable ballast adjusts the fluorescent tube current according to the input voltage to control the lighting brightness of the fluorescent tube. In this scenario, the circuit is complicated, the cost is high, and it is unstable when working with low power.

(4) Dimmable incandescent lighting: composed of a light bulb installed on the lamp holder, and an external dimming controller. The external dimming controller turns the power on and off and adjusts the lamp voltage to control the brightness of the light bulb. This scenario is prone to generate harmonics to disturb the grid, and the service life is short.

(5) Incandescent lighting: composed of a light bulb installed on the lamp holder, and an external switch. The light bulb is connected to the power supply through the switch. In this scenario, the efficiency is low and the service life is short.

The following is a table of performance comparison between the above-mentioned common lighting device scenarios and the lighting solution of this utility model:

Assuming that the light bulb is installed on the top, the daily low power lighting is 0.2–2 Lx, 4 hours a day, and the high power lighting is 80-150 Lx, 1 hour a day. The installation of the lamp is ceiling-mounted, the installation height is 2.8 m, and the electricity fee is RMB 1.00/KWh.

| Parameters<br>Lighting Method | Total Power (W) | Low Power Usage (W) | High Power Usage (W) | Comprehensive Service Life (h) | Estimated Cost (RMB yuan) | Estimated Annual Lighting Electricity Cost (RMB yuan) | Estimated Comprehensive Cost of Lighting for Five Years (RMB yuan) | Estimated Energy Consumption for Five Years (KWh) |
|-------------------------------|-----------------|---------------------|----------------------|--------------------------------|---------------------------|-------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------------|
| Fluorescent                   | 40              | 40                  | 40                   | ~5,000                         | ~35.0                     | 73                                                    | 430                                                                | 365                                               |
| Full LED Dimmable             | 100             | 1.5                 | 100                  | ~80,000                        | ~350.00                   | 38.69                                                 | 543.45                                                             | 193.45                                            |
| Dimmable Fluorescent          | 40              | 10                  | 40                   | ~4,500                         | ~150.0 with dimmer        | 29.2                                                  | 326                                                                | 146                                               |
| Dimmable Incandescent         | 150             | 10                  | 150                  | ~800                           | ~40.0 with dimmer         | 69.35                                                 | 431.75                                                             | 346.75                                            |
| Incandescent                  | 150             | 100                 | 150                  | ~8,000                         | ~9.0                      | 273.75                                                | 1,422.75                                                           | 1,368.75                                          |
| This Utility Model            | 40.8            | 0.8                 | 40.8                 | ~85,000                        | ~90.0                     | 15.77                                                 | 168.84                                                             | 78.84                                             |

Note: 1. It is estimated that a 40W fluorescent light tube is about RMB 15.00, and a 150W incandescent light bulb is about RMB 5.00.

2. See Example 1 for the lighting device of this utility model mentioned in the above table.

### Description of Figures

A more detailed description of the present utility model is provided below in conjunction with figures and examples.

Figure 1: Appearance of Example 1

Figure 2: Block Diagram of Electrical Connections

Figure 3: Main Sectional View of Example 1

Figure 4: A-direction View of Example 1

Figure 5: Electrical Schematic Diagram of the Switching Controller 5

Figure 6: Waveform Diagram of the Measurement Points on the Switching Controller 5

Figure 7: Schematic Diagram of the Remote Control for the Switching Controller 5

Figure 8: Schematic Diagram of the Receiver of Example 6

Figure 9: Schematic Diagram of the Transmitter of Example 6

Figure 10: Main Sectional View of Example 2

Figure 11: Sectional View of Example 2

Figure 12: Main Sectional View of Example 3

Figure 13: Main Sectional View of Example 4

Figure 14: Main Sectional View of Example 5

Figure 15: Schematic Diagram of the Receiver of Example 7

Figure 16: Schematic Diagram of the Transmitter of Example 7

Figure 17: Block Diagram of the Electrical Connection of the Remote Control

Note: 1 lamp housing, 1-1 lampshade, 1-2 reflector, 1-3 support rod, 1-4 electrical box, 1-5 base, 1-6 bottom plate, 1-7 counterweight, 1-8 lower support rod, 2 fluorescent tube light source, 2-1 connector, 2-2 fluorescent tube holder, 3 ballast, 4 LED light source assembly, 4-1 LED light source insulation seat, 5 switching controller, 5-1 AC-DC conversion, 5-2 bistable controller, 5-3 control triggering signal circuit, 5-3a remote control triggering signal circuit, 5-3b remote control signal receiver, 5-3c remote control signal transmitter, 5-4 LED light source assembly driver, 5-5 fluorescent tube combined driver, 6 power cords, 7 fixing screws, 8 switch, a, b, c, d waveform measurement points, U voltage, t1 and t2 power-off delay interval (t1 = 0.5–2 seconds, t2 ≥ 3 seconds).

### Preferred Embodiments

#### Example 1

This utility model is further described in detail in conjunction with Figures 1, 3 and 4. This is a ceiling-mounted multiple light source lighting device. The lamp housing 1 is a ceiling-mounted metal base. The fluorescent tube light source 2 is clamped on the lamp housing 1 with the fluorescent tube holder 2-2. The ballast 3, the LED light source assembly 4 and the switching controller 5 are fixed on the lamp housing 1 with the fixing screws 7. The translucent plastic lampshade 1-1 is clamped on the lamp housing 1. The fluorescent tube light source 2 is a 40W annular fluorescent tube connected to the output of the ballast 3 through a connector 2-1. The ballast 3 is an electronic ballast. The ballast 3 is connected to the fluorescent tube circuits P and N through the switching controller 5. The LED light source assembly 4 is 8 D5 white LEDs with the same electrical parameters, which are uniformly arranged in a ring. Every 4 LEDs are connected in series into two groups, and these two groups are connected to the sub-circuits L1 and L2 and the common terminal G in the LED circuit of the switching controller 5. The LED light source assembly 4 is evenly placed on the lamp housing 1 through the insulating seat 4-1. Both the LED light source assembly 4 and the fluorescent tube light source 2 can emit uniform light through the lampshade 1-1. The switching controller 5 is connected to the power supply through the power cord 6.

As shown in Figures 2, 5 and 6, and the switching controller 5, wherein the AC-DC converter 5-1 adopts a capacitor to step down the voltage and to rectify and filter the current. C1 is a 0.68 UF/400 VAC step-down capacitor, R1 and R2 are the discharge resistors for C1, D1-D4 is a bridge rectifier circuit, D5 is a diode, R3 is a 100 A/1 W current limiting resistor, DW1 is a 13 V/1 W voltage regulator tube, and C2 is a filter capacitor. The bistable controller 5-2 uses Part a of the integrated circuit IC, and the IC model is CD4013. The control triggering signal circuit 5-3 is

composed of R4 and C3. The LED light source assembly driver 5-4 is a constant current circuit composed of transistors BG2, BG3, R6 and R7. After the LED load is connected, adjust the resistance of R7 to make the current on R7 reach 40 mA, and R8 and R9 evenly flow into two sub-circuits of L1 and L2 of the LED circuit. Each sub-circuit supplies power to 4 LED light sources connected in series. The fluorescent light source assembly driver 5-5 is a miniature relay Type XJ driven by R5, D6 and transistor BG1, and the power supply to the fluorescent tube ballast is turned on and off by the normally open contact P on the relay Type XJ. The shell of the switching controller 5 is a flame-retardant plastic box. The AC-DC converter 5-1 outputs 13V DC to the bistable controller 5-2, the LED light source assembly driver 5-4 and the fluorescent light source assembly driver 5-5, and controls the triggering signal circuit 5-3. The signal from the control triggering signal circuit 5-3 is output through two circuits (one positive and one negative) of the bistable controller 5-2 to control the LED light source assembly driver 5-4 and the fluorescent tube assembly driver 5-5. Figure 6 is a voltage U and time waveform diagram of the measuring points on the switching controller 5. The power-off delay interval t1 value is adjusted by adjusting the resistance value of R4 and the capacity value of C3. The power-off delay interval t2 value is adjusted by adjusting the capacity value of C2.

When the power is turned on for the first time, the LED light source assembly 4 is energized and illuminated. If the power supply is cut off for 0.5 seconds to 2 seconds and then turned on, it will switch to energize and illuminate the fluorescent tube light source 2. If the power supply is cut off for more than 3 seconds and then turned on, it will repeat the first process mentioned above.

This utility model example makes full use of the existing fluorescent ceiling lamp and the existing lighting power line, and achieves the purpose of multiple light source switching by adding an LED light source assembly 4, a switching controller 5 and some connecting wires, thereby reducing energy consumption and meeting the needs of the lighting environment.

#### Example 2

This utility model is further described in detail in conjunction with Figures 10 and 11. This is a ceiling-mounted or suspended multiple light source lighting device. The difference from Example 1 is that the lamp housing 1 is a fluorescent tube holder; the lamp housing 1 is equipped with a special reflector 1-2; the fluorescent tube light source 2 is a straight tube; it is equipped with a corresponding connector 2-1 and a U-shaped transparent lampshade 1-1; the LED light source assembly 4 is arranged in two straight rows. Other aspects of this example are the same as Example 1.

#### Example 3

This utility model is further described in detail in conjunction with Figure 12. This is a suspended multiple light source lighting device. The difference from Example 1 is that the lamp housing 1 is a spherical cover bracket; the fluorescent tube light source 2 and the ballast 3 are integrated; the lampshade 1-1 is a milky white translucent spherical cover. The lampshade 1-1 is installed on the lamp housing 1 with fixing screws 7, and the connector 2-1 on the lamp housing 1 is a screw lamp base. The LED light source assembly 4 is evenly and circularly arranged on the lamp housing 1 through the insulating seat 4-1. The switching controller 5 is installed in electrical box 1-4. The lamp housing 1 is connected with the electrical box 1-4 with a support rod 1-3. The support rod 1-3 is a hollow tube. The interior of this hollow tube passes through the power cord that connects to the power supply. The base plate 1-6 on the electrical box 1-4 is the fixing plate for the whole device. Other aspects of this example are the same as Example 1.

#### Example 4

This utility model is further described in detail in conjunction with Figure 13. This is a desktop multiple light source lighting device. The difference from Example 1 is that the switching controller 5 and the ballast 3 are installed in the base 1-5. The power is led to the switching controller 5 by the power cord 6 through the switch 8. The lamp housing 1 is connected with the base 1-5 with a support rod 1-3. The support rod 1-3 is a hollow tube. The interior of this hollow tube passes through the power cord that connects to the power supply. The bottom plate 1-6 under the base 1-5 is the support plate of the whole device, which is used to stably place the whole device. The counterweight 1-7 is placed in the base 1-5. Other aspects of this example are the same as Example 1.

#### Example 5

This utility model is further described in detail in conjunction with Figure 14. This is a floor multiple light source lighting device. The difference from Example 1 is that the switching controller 5 and the ballast 3 are installed in the electric box 1-4. The power supply is connected to the switching controller 5 by the power cord 6 through the switch 8. The lamp housing 1 is connected with the electrical box 1-4 with a support rod 1-3. The electrical box 1-4 is connected with the base 1-5 with the lower supporting rod 1-8. The support rod 1-3 and the lower supporting rod 1-8 are hollow tubes. The interior of these hollow tubes passes through the power cord that connects to the power supply. The bottom plate 1-6 under the base 1-5 is the support plate of the whole device, which is used to stably place the whole device. The counterweight 1-7 is placed in the base 1-5. Other aspects of this example are the same as Example 1.

#### Example 6

This utility model is further described in detail in conjunction with Figures 1, 2, 3, 6, 7, and 17. This is a remote-controlled ceiling-mounted multiple light source lighting device. The difference between the switching controller 5 in this example and that of Example 1 is that the AC-DC converter 5-1 adopts a transformer BT to step down the voltage and rectify and filter the current. The control triggering signal circuit 5-3 is composed of R4 and C3. In addition, there is a remote control triggering signal circuit 5-3a. It consists of Part b of another bistable controller IC, the resistor R10 and diodes D7, D8 and D9 in the integrated circuit. The input terminal Cin of Part b of the integrated circuit IC receives the high-level pulse of the remote control signal receiver 5-3b (infrared, or ultrasonic, or electromagnetic wave), and turns off the output from the LED light source assembly driver 5-4 and the fluorescent light source assembly driver 5-5 through D8 and D9. After receiving the next high-level pulse, it turns on the output from the LED light source assembly driver 5-4 and the fluorescent light source assembly driver 5-5. In addition, R10 and D7 reverse the output state of Part a of the integrated circuit IC through the control triggering signal circuit 5-3, and switch the output from the LED light source assembly driver 5-4 and the fluorescent light source assembly driver 5-5. E+ and G are the power input terminals of the remote control signal receiver 5-3b. Other aspects of this example are the same as Example 1.

An infrared remote control signal receiver 5-3b is shown in Figure 8. The infrared receiving tube VD1 receives the infrared intermediate frequency signal, which is pre-amplified by the low-frequency filter composed of triodes GB4 and GB5, resistors R11 and R12, and capacitor C4. After the amplified signal is frequency-selected by the ceramic filter SB1, the signal is further amplified by a direct coupling amplifier circuit composed of transistors BG6 and BG7, resistors R13, R14, R15, R16 and R17, and capacitor C6. The amplified signal is detected by capacitors C5 and C7, diodes D10 and D11, and resistor R18. The detected signal is amplified by the field effect transistor BG8 and the resistor R19, and the Cin terminal is connected to the remote control triggering signal circuit 5-3a for remote control.

An infrared remote control signal transmitter 5-3c is shown in Figure 9. It uses battery GB. After pressing button S, transistors GB9 and GB10, resistors R20, R21, R22 and R23, capacitor C8, and ceramic filter SB2 perform frequency selection and then output the signal to the oscillator. The output intermediate frequency signal is amplified by the current through triode GB11, and drives the infrared transmitting tube VD2 to transmit the infrared intermediate frequency signal.

The infrared remote control signal transmitter as shown in Figures 8 and 9 is used in combination with the infrared remote control signal receiver. The working wavelengths of the infrared transmitting tube VD2 and the infrared receiving tube VD1 must be consistent. The performance parameters of the ceramic filters SB1 and SB2 are the same. When using the remote control infrared transmitter, the infrared transmitting tube faces the remote control signal receiver, and the infrared remote control works within a distance of 6–8 m.

When the power is turned on for the first time, the LED light source assembly 4 is energized and illuminated. If the power supply is cut off for 0.5 seconds to 2 seconds and then turned on (or there is an interval between sending out the second remote control signal), it will switch to energize and illuminate the fluorescent tube light source 2. If the power supply is cut off for more than 3 seconds and then turned on (or there is an interval between sending out the second remote control signal), it will repeat the first process mentioned above.

### Example 7

A voice control circuit is shown in Figures 15, 16 and 17. An ultrasonic remote control signal receiver 5-3b is shown in Figure 15. The ultrasonic receiver SB3 receives ultrasonic signals. Transistors BG12 and BG13, resistors R24, R25, R26, R27 and R28, and capacitor C10 form a direct coupling amplifier circuit to further amplify the signal, and the amplified signal is detected by capacitors C9 and C11, diodes D12 and D13, and resistor R29. The detected signal is amplified by the field effect transistor BG14 and the resistor R30, and the Cin terminal is connected to the remote control triggering signal circuit 5-3a for remote control. Other aspects of the control device are the same as those in Example 6.

An ultrasonic remote control signal transmitter 5-3c is shown in Figure 16. It uses battery GB1. After pressing button S1, transistors GB15 and GB16, resistors R31, R32, R33 and R34, capacitors C12 and C13, and ultrasonic transmitter SB4 perform frequency selection and then output the signal to the oscillator. The ultrasonic transmitter SB4 outputs ultrasonic waves of a certain wavelength. After the power flows through the resistor R35 and the light-transmitting diode D14, it indicates the state of the button.

The ultrasonic remote control signal transmitter as shown in Figures 15 and 16 is used in combination with the ultrasonic remote control signal receiver. The working wavelengths of the ultrasonic receiver SB3 and the ultrasonic transmitter SB4 must be consistent. When using a remote-controlled ultrasonic transmitter, the ultrasonic transmitter needs to be aimed at the receiver, and the ultrasonic remote control can work within a distance of 6–8 m.

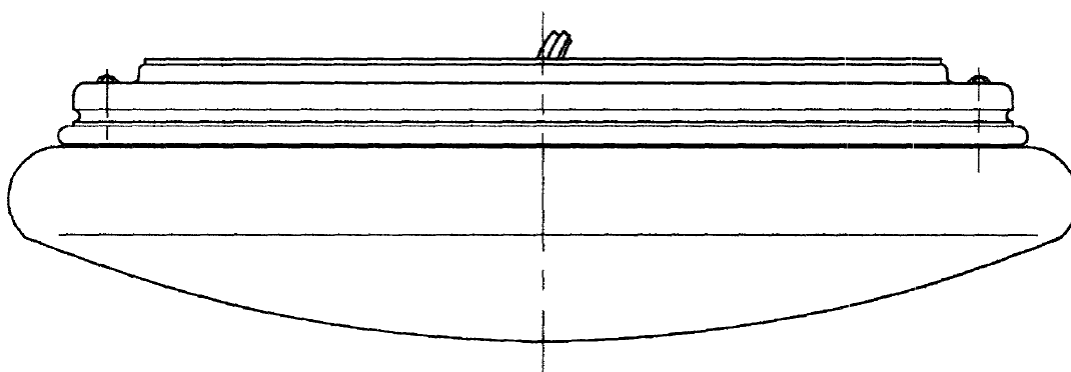


Fig. 1

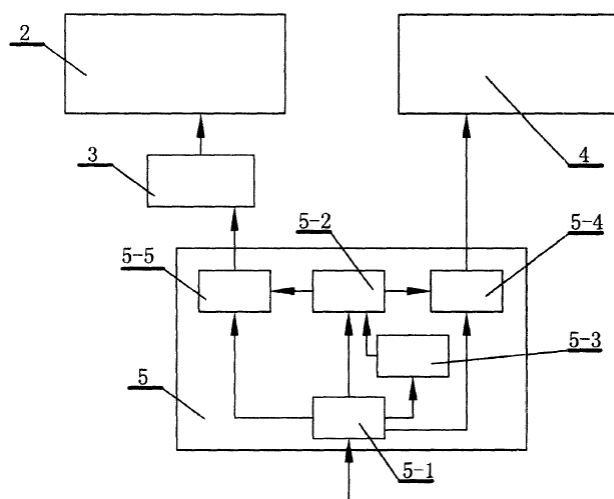


Fig. 2

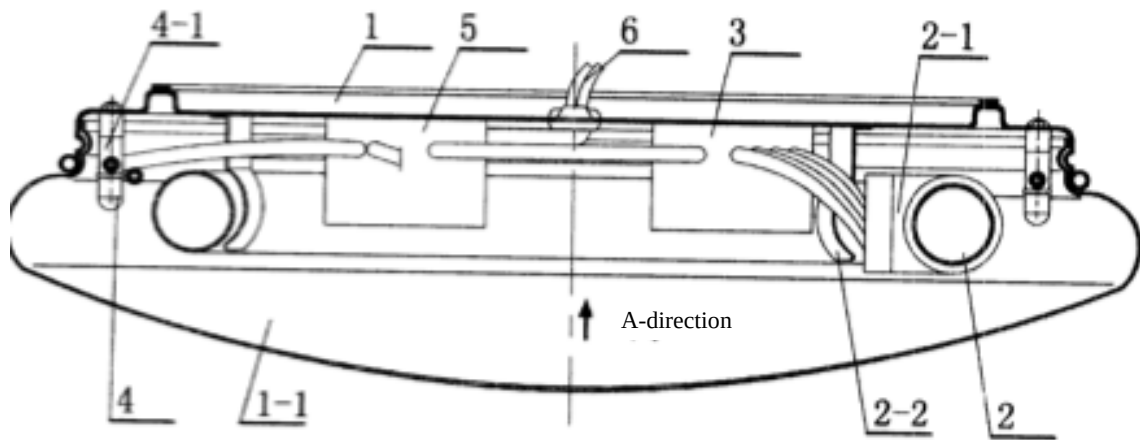


Fig. 3

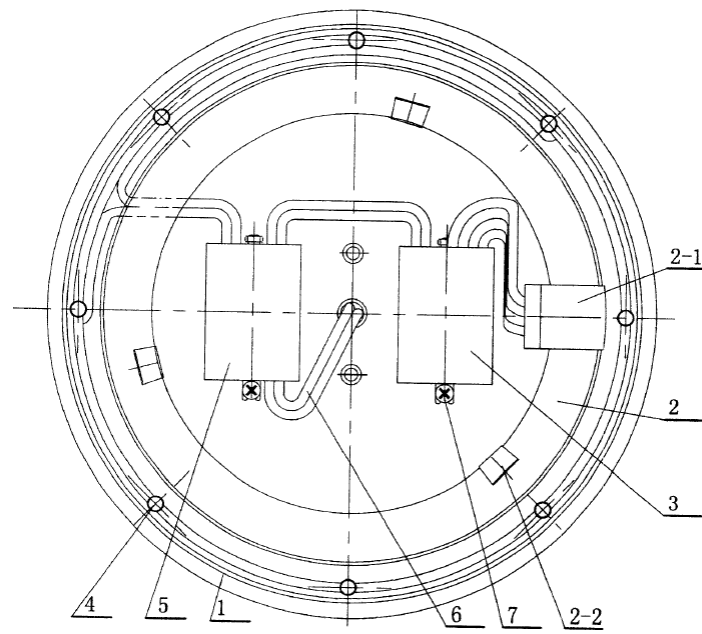


Fig. 4



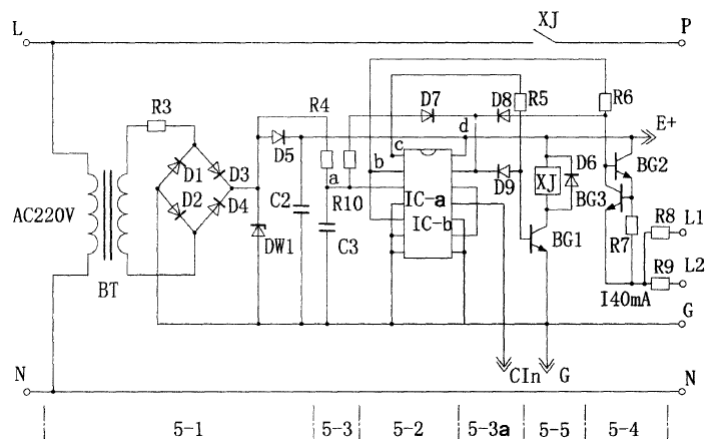


Fig. 7

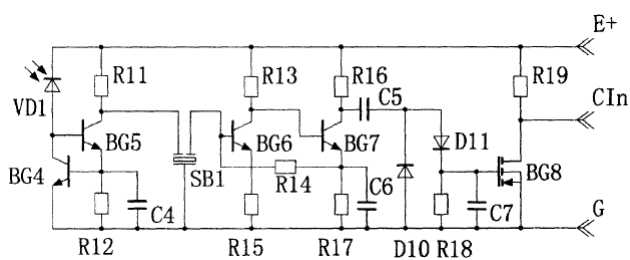


Fig. 8

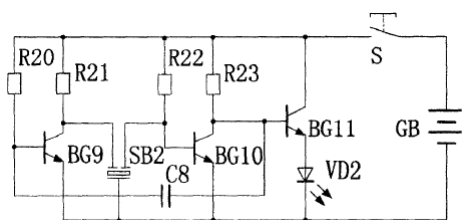


Fig. 9

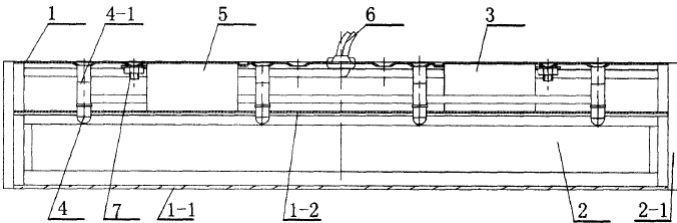


Fig. 10

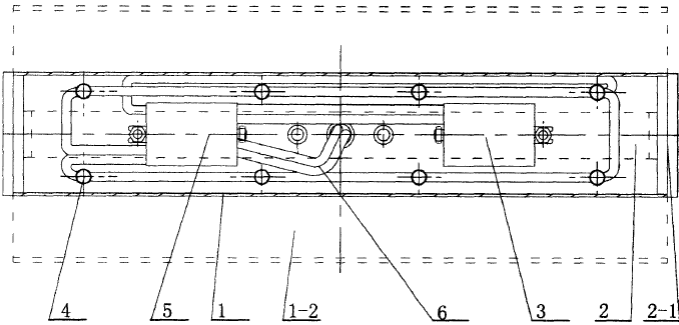


Fig. 11

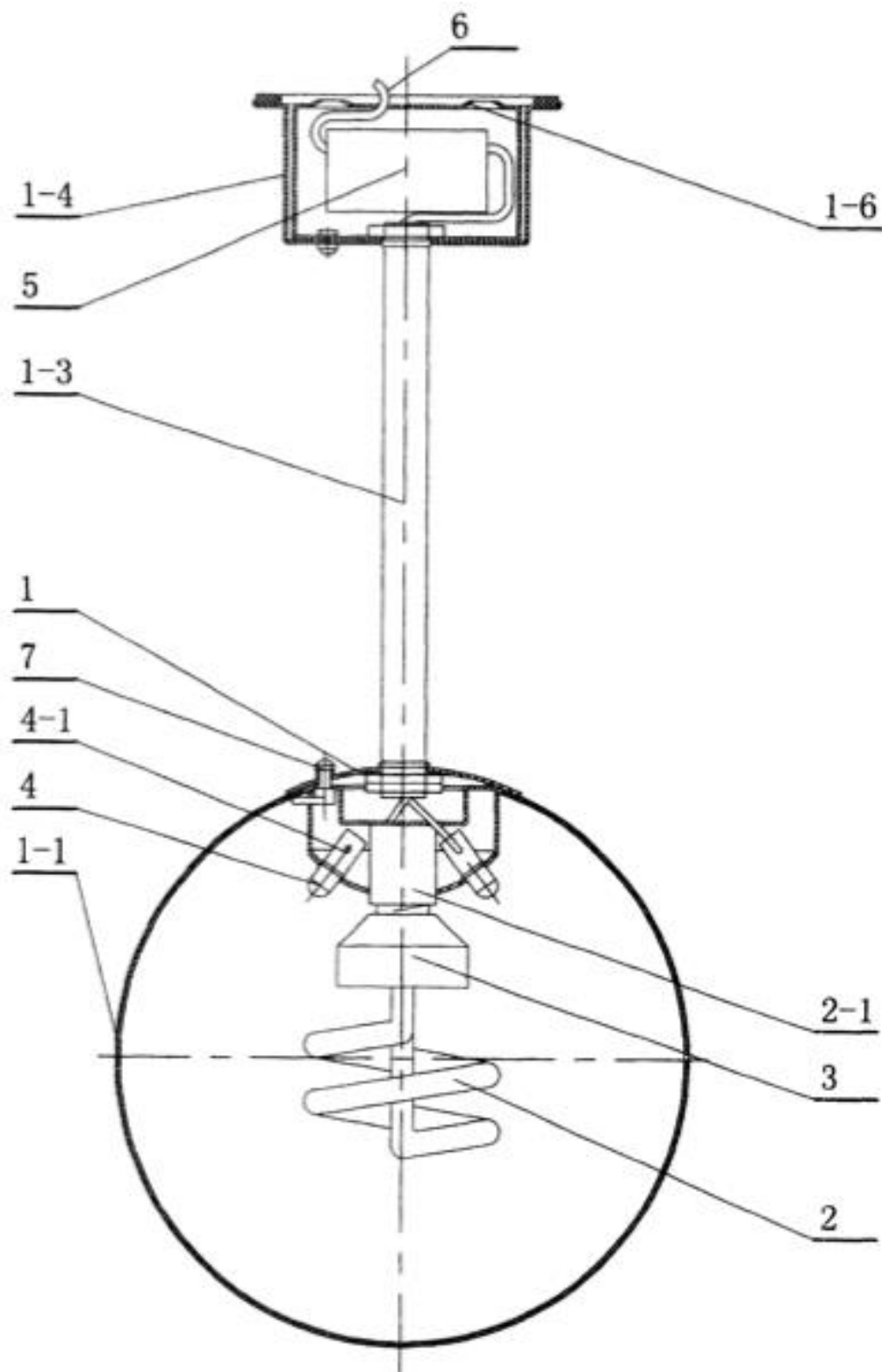


Fig. 12

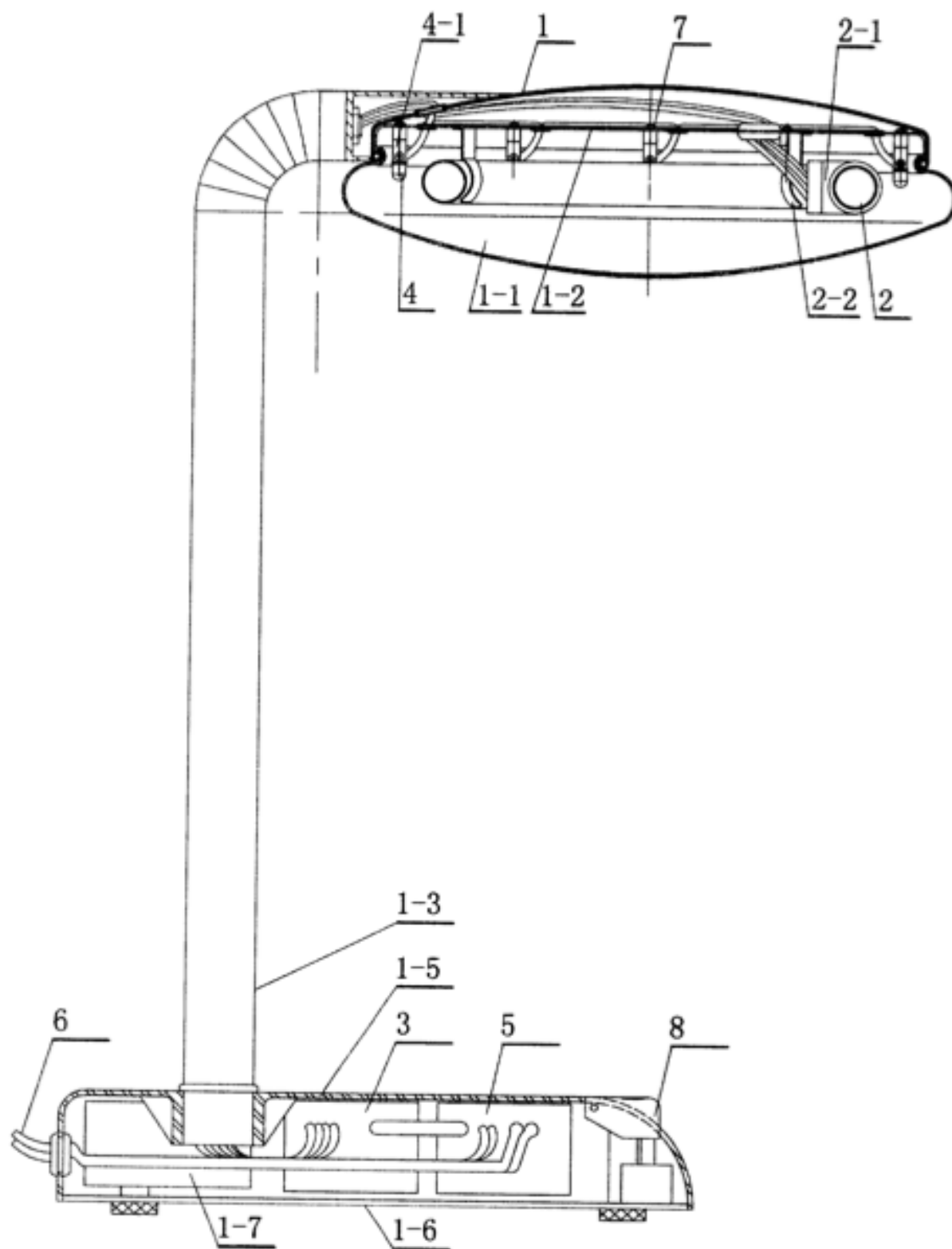


Fig. 13

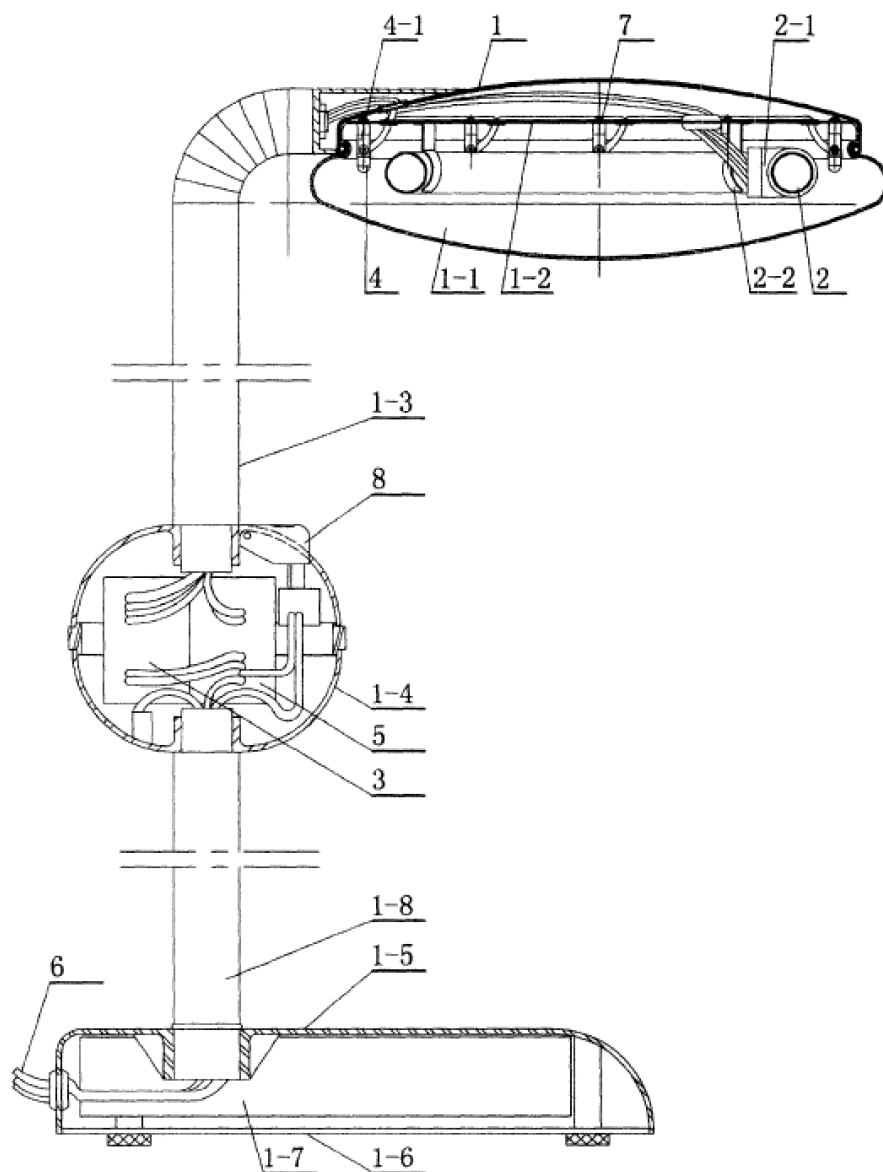


Fig. 14

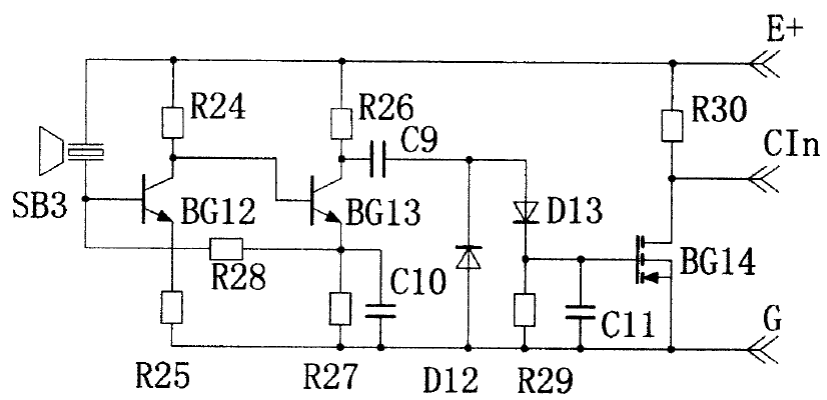


Fig. 15

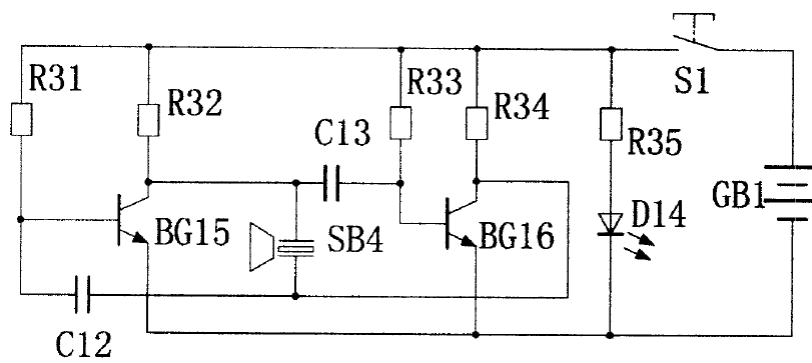


Fig. 16

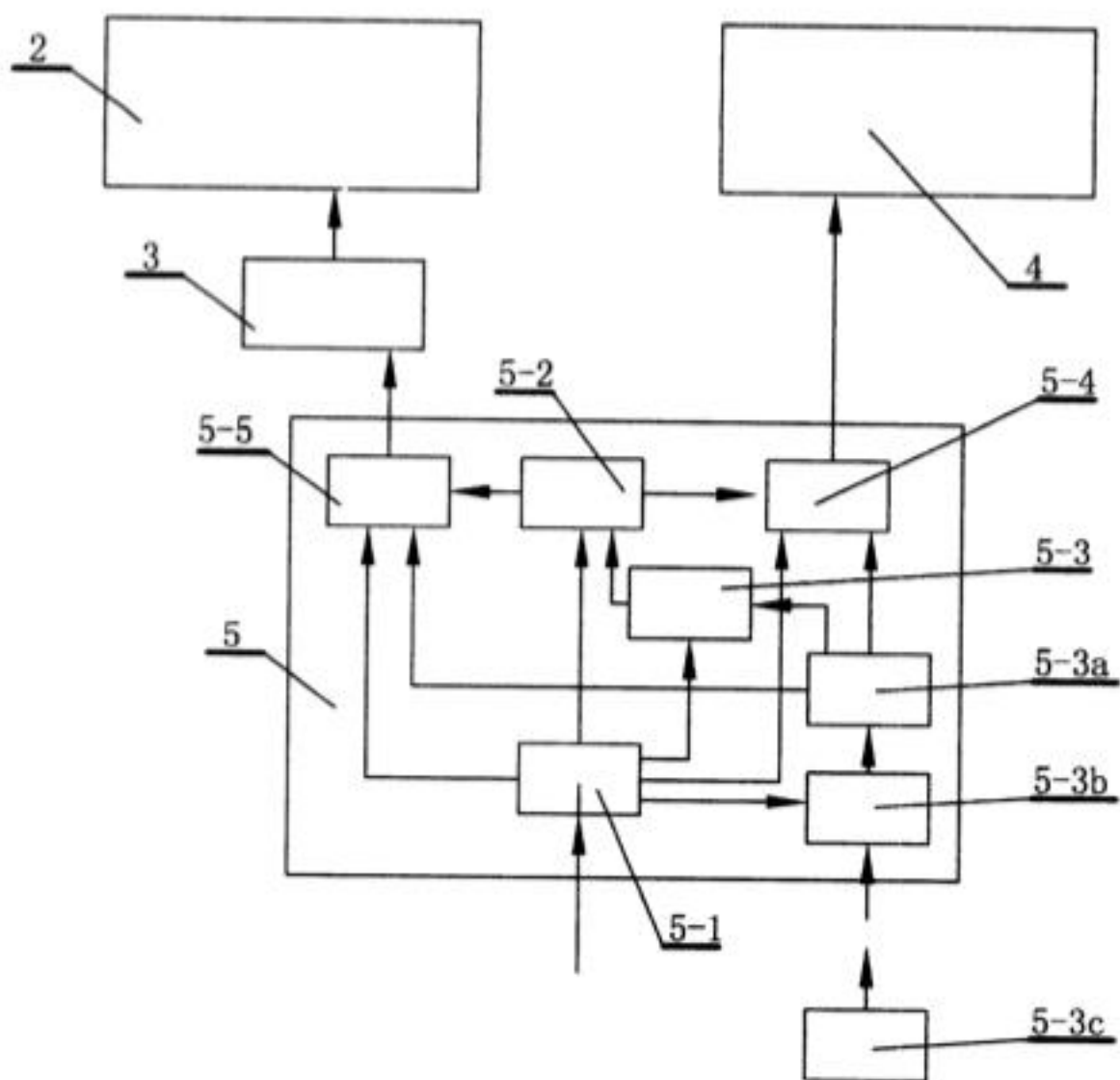


Fig. 17

## TRANSLATION CERTIFICATION

Date: 11/17/2022

To whom it may concern:

This is to certify that the attached translation from Chinese into English is an accurate representation of the documents received by this office.

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Signature of Translator

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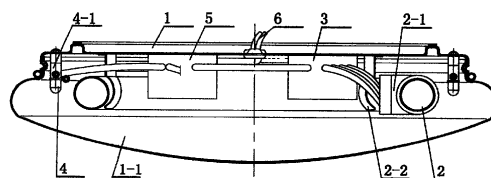
权利要求书 1 页 说明书 5 页 附图 10 页

[54] 实用新型名称

多光源照明装置

[57] 摘要

本实用新型为一种多光源照明装置，灯具壳体内置 LED 光源组合、荧光管光源的镇流器联接在转换控制器上，可根据需要进行 LED 光源组合、荧光管光源切换；电源进入转换控制器，由转换控制器输出二路，分别控制 LED 光源组合和荧光管光源；接通电源时，转换控制器置功率小的 LED 光源组合回路工作；在需要高照度照明时，通过电源短时关断后接通，使转换控制器切换至功率大的荧光管光源工作；在通电的情况下，可通过操作特定的红外线、声波、电磁波遥控器，经接收器控制转换控制器工作，达到节能和实用的合理需求。



- 1、 一种多光源照明装置，包括灯具壳体（1）、安装其上的荧光管光源（2）和控制荧光管光源（2）的镇流器（3）组成；其特征在于灯具壳体（1）上还装有 LED 光源组合（4）以及转换控制器（5）；电源经转换控制器（5）分二路，分别连接 LED 光源组合（4）、镇流器（3）。
- 2、 根据权利要求 1 所述的多光源照明装置，其特征在于转换控制器（5）包括交直流变换器（5-1）、双稳态控制器（5-2）、控制触发信号电路（5-3）、LED 光源组合驱动器（5-4）、荧光管组合驱动器（5-5）；交直流变换器（5-1）输出直流至双稳态控制器（5-2）、LED 光源组合驱动器（5-4）和荧光管组合驱动器（5-5）及控制触发信号电路（5-3）；控制触发信号电路（5-3）的信号，经双稳态控制器（5-2）分二路输出，分别控制 LED 光源组合驱动器（5-4）、荧光管组合驱动器（5-5）。
- 3、 根据权利要求 1 或 2 所述的多光源照明装置，其特征在于转换控制器（5）内的交直流变换器（5-1）采用变压器降压后整流及滤波。
- 4、 根据权利要求 1 或 2 所述的多光源照明装置，其特征在于转换控制器（5）内的交直流变换器（5-1）采用电容降压后整流及滤波。
- 5、 根据权利要求 1 或 2 所述的多光源照明装置，其特征在于荧光管组合驱动器（5-5）为晶体管驱动微型继电器；LED 光源组合驱动器（5-4）为晶体管组成的恒流源电路。
- 6、 根据权利要求 1 或 2 所述的多光源照明装置，其特征在于控制触发信号电路（5-3）由电源为输入信号，控制 LED 光源组合（4）通电照明，或切换成荧光管光源（2）通电照明，。
- 7、 根据权利要求 1 或 2 所述的多光源照明装置，其特征在于控制触发信号电路（5-3）顺序联接有遥控触发信号电路（5-3a）、遥控信号接收器（5-3b）；在接通电源后由遥控信号发射器（5-3c）发射信号，通过遥控信号接收器（5-3b）、遥控触发信号电路（5-3a）控制 LED 光源组合（4）通电照明，或切换成荧光管光源（2）通电照明，或关闭照明。
- 8、 根据权利要求 7 所述的多光源照明装置，其特征在于遥控信号接收器（5-3b）与遥控信号发射器（5-3c）之间的信号传递用红外线或超声波或电磁波信号。
- 9、 根据权利要求 1 或 2 所述的多光源照明装置，其特征在于控制程序：
  - A） 首次接通电源时，LED 光源组合（4）通电照明；
  - B） 而后若将电源进行 0.5 秒~2 秒切断后接通（或发射二次遥控信号的间隔），切换成荧光管光源（2）通电照明；
  - C） 切断电源超过 3 秒后接通（或发射二次遥控信号的间隔），重复上述 A）。

## 多光源照明装置

### 技术领域

本实用新型涉及一种照明灯具及其控制方式。

### 背景技术

目前居家照明：以单一的荧光灯为主，控制方式为一个开关控制一盏灯或一个开关控制多盏灯的方式，照明光环境单一；若采用可调光的荧光灯，成本高，低功率工作时不稳定；若采用白炽灯调光，效率低；若采用单一的 LED 光源照明，要达到较高的照度时，相对成本较高，照明总效率低；若采用多灯多开关，线路复杂，灯多而影响视觉环境；若采用一开关经可控硅控制器来控制三组白炽灯，只适用于多头吊灯，不适用于控制荧光灯，操作也烦琐。

### 发明内容

为满足人们居家的实际照明需要，将安全照明、睡眠照明的灯具与进行其它活动所需高照度的灯具合而为一；根据生活所需控制 LED 光源组合与荧光管光源交替工作，调节照明照度；使用现有的照明电源线路，易于实施，从而方便用户。

本实用新型的目的在于通过下述技术方案来实现：本实用新型包括灯具壳体 1、荧光管光源 2、镇流器 3、LED 光源组合 4、转换控制器 5 等；电源经外接开关、电源线 6 连接到转换控制器 5，转换控制器 5 输出分二路，一路接 LED 光源组合 4，一路接荧光管光源的镇流器 3。

本实用新型中的转换控制器 5 包含交直流变换器 5-1、双稳态控制器 5-2、控制触发信号电路 5-3、LED 光源组合驱动器 5-4、荧光管组合驱动器 5-5；电源由电源线 6 引入交直流变换器 5-1，交直流变换器 5-1 输出直流至双稳态控制器 5-2、LED 光源组合驱动器 5-4 和荧光管组合驱动器 5-5 及控制触发信号电路 5-3；控制触发信号电路 5-3 的信号，经双稳态控制器 5-2 二路输出，控制 LED 光源组合驱动器 5-4 和荧光管组合驱动器 5-5 切换输出。

转换控制器 5 内的交直流变换器 5-1 采用变压器降压后、整流及滤波电路，也可采用电容降压后、整流及滤波电路；

荧光管组合驱动器 5-5 为晶体管驱动微型继电器；LED 光源组合驱动器 5-4 为晶体管组成的恒流源电路。

LED 光源组合 4 中的 LED 可为多个白色、黄色、绿色、兰色等各种高光效 LED 光源。

镇流器 3 可为与荧光管相配用的电子镇流器、或电感镇流器。

双稳态控制器 5-2 可由双晶体管与电阻、电容组成，也可选用集成电路 JK 触发器或 D 触发器。

控制触发信号电路 5-3 用电源为输入信号；可增加遥控触发信号电路 5-3a 和其遥控信号接收器 5-3b（红外线、或超声波、或电磁波），在接通电源后，由相应的遥控信号发射器 5-3c 发出信号，通过遥控信号接收器 5-3b 的输出经遥控触发信号电路 5-3a，来控制 LED 光源组合 4 通电照明、或切换成荧光管光源 2 通电照明以及关闭照明。

首次接通电源，LED 光源组合 4 进行照明工作；在 0.5~2 秒的电源切断再接通（或发射并接收二次遥控信号的间隔），切换至荧光管光源 2 进行照明工作。超过 3 秒的电源切断再接通（或发射并接收二次遥控信号的间隔），重复上述首次过程。

本实用新型与现有情况相比，降低耗能使用量，使用方便，一盏灯满足居家二种照明光环境的需要。

常见几种照明方式的概述：

- 1) 荧光灯照明，灯具壳体内装有荧光管和镇流器，外置开关；开关接通镇流器电源，镇流器输出及控制荧光管照明，光环境单一。
- 2) 全 LED 可调光照明，灯具壳体内装有控制器，交流转直流稳压电源及 LED 光源，外置调光控制器；外置调光控制器开关交流转直流稳压电源的电源，同时有信号联接控制器，由控制器调节 LED 光源的照明亮度，线路复杂成本高，光效低。
- 3) 荧光灯可调光照明，灯具壳体内装有荧光管和可调光镇流器，外置调光器；外置调光器开关荧光灯电源及调整输出电压至可调光镇流器，可调光镇流器根据所输入电压来控制荧光管电流，达到控制荧光管的照明亮度，线路复杂成本高，低功率工作时不稳定。
- 4) 白炽灯可调光照明，灯泡安于灯头上，外置调光器；外置调光器开关电源及调整灯泡电压，控制灯泡的照明亮度，易产生谐波干扰电网，寿命低。
- 5) 白炽灯照明，灯泡安于灯头上，外置开关；灯泡通过开关连接电源，效率低，寿命低。

以下为上述几种常见照明装置与本实用新型照明装置性能效果对比表：

假设以顶部照明安装，日常低功率照明 0.2~2Lx 每天 4 小时，高功率照明 80~150Lx1 小时，灯具安装为吸顶式，安装高度 2.8m，电费 1 元/KWh。

| 参数<br>照明<br>方式 | 总功<br>率<br>(W) | 低使用<br>功 率<br>(W) | 高使用<br>功 率<br>(W) | 综合使<br>用 寿 命<br>(h) | 概算<br>成本(元)    | 一 年 概<br>算 照 明<br>电 费<br>(元) | 五 年 概<br>算 照 明<br>综 合 费<br>用 (元) | 五 年 概<br>算 耗 能<br>(KWh) |
|----------------|----------------|-------------------|-------------------|---------------------|----------------|------------------------------|----------------------------------|-------------------------|
| 荧光灯            | 40             | 40                | 40                | ~5000               | ~35.0          | 73                           | 430                              | 365                     |
| 全 LED<br>可调光   | 100            | 1.5               | 100               | ~80000              | ~350.0         | 38.69                        | 543.45                           | 193.45                  |
| 荧 光 灯<br>可 调 光 | 40             | 10                | 40                | ~4500               | ~150.0<br>含调光器 | 29.2                         | 326                              | 146                     |
| 白 炽 灯<br>调 光   | 150            | 10                | 150               | ~800                | ~40.0<br>含调光器  | 69.35                        | 431.75                           | 346.75                  |
| 白炽灯            | 150            | 100               | 150               | ~8000               | ~9.0           | 273.75                       | 1422.75                          | 1368.75                 |
| 本实用<br>新型      | 40.8           | 0.8               | 40.8              | ~85000              | ~90.0          | 15.77                        | 168.84                           | 78.84                   |

注：1、预计 40W 荧光灯约 15 元/根，150W 白炽泡约 5 元/个。

2、上表中实用新型照明装置见实施例 1

## 附图说明

下面结合附图和实施例对本实用新型进一步说明。

- 图 1: 实施例一的外观图
- 图 2: 电气联接方框图
- 图 3: 实施例一的主剖视图
- 图 4: 实施例一的 A 向视图
- 图 5: 转换控制器 5 电气原理图
- 图 6: 转换控制器 5 测点波形图
- 图 7: 转换控制器 5 遥控电气原理图
- 图 8: 实施例六的接收器原理图
- 图 9: 实施例六的发射器原理图
- 图 10: 实施例二的主剖视图
- 图 11: 实施例二的剖视图
- 图 12: 实施例三的主剖视图
- 图 13: 实施例四的主剖视图
- 图 14: 实施例五的主剖视图
- 图 15: 实施例七的接收器原理图
- 图 16: 实施例七的发射器原理图
- 图 17: 遥控电气联接方框图

注: 1 灯具壳体, 1-1 灯罩, 1-2 反射器, 1-3 支承杆, 1-4 电器盒, 1-5 底座, 1-6 底板, 1-7 配重块, 1-8 下支承杆, 2 荧光灯光源, 2-1 接头, 2-2 荧光灯支架, 3 镇流器, 4 LED 光源组合, 4-1 LED 光源绝缘座, 5 转换控制器, 5-1 交直流变换器, 5-2 双稳态控制器, 5-3 控制触发信号电路, 5-3a 遥控触发信号电路, 5-3b 遥控信号接收器, 5-3c 遥控信号发射器, 5-4 LED 光源组合驱动器, 5-5 荧光灯组合驱动器, 6 电源线, 7 固定螺钉, 8 开关, a、b、c、d 波形测试点, U 电压,  $t_1$ 、 $t_2$  断电延时间隔 ( $t_1=0.5\sim 2$  秒,  $t_2\geq 3$  秒)。

## 具体实施方式

### 实施例一

结合图 1、3、4 对本实用新型进一步详细描述, 一种吸顶式多光源照明装置, 灯具壳体 1 为吸顶式金属底盘, 用荧光灯支架 2-2 将荧光灯光源 2 卡在灯具壳体 1 上, 用固定螺钉 7 将镇流器 3、LED 光源组合 4 和转换控制器 5 在灯具壳体 1 上, 半透明塑胶灯罩 1-1 卡在灯具壳体 1 上; 荧光灯光源 2 为 40W 环型荧光灯通过接头 2-1 联接在镇流器 3 的输出上, 镇流器 3 为电子式镇流器, 镇流器 3 接在转换控制器 5 的荧光灯回路 P、N 上, LED 光源组合 4 为 8 个电参数相同的 D5 白色 LED, 环形均匀排列, 每 4 个 LED 串联成二组后接在转换控制器 5 LED 回路的支路 L1、L2、共用端 G 上; LED 光源组合 4 通过绝缘座 4-1 均匀地安置在灯具壳体 1 上, LED 光源组合 4 和荧光灯光源 2 均能通过灯罩 1-1 发出较均匀的光线, 转换控制器 5 通过电源线 6 联接电源。

如图 2、5、6 所示的转换控制器 5, 其中交直流变换器 5-1 采用电容降压式整流滤波电路, C1 为 0.68UF/400VAC 降压电容, R1、R2 为 C1 的放电电阻, D1~D4 为桥式整流电路, D5 为二极管, R3 为 100  $\Omega$ /1W 限流电阻, DW1 为 13V/1W 稳压管, C2 为滤波电容; 双稳态

控制器 5-2 使用集成电路 IC-a 部分, IC 型号为 CD4013; 控制触发信号电路 5-3 为 R4、C3 组成; LED 光源组合驱动器 5-4 为晶体管 BG2、BG3、R6、R7 组成的恒流电路, LED 负载联接好后通过调整 R7 的阻值使 R7 上的电流为 40mA, 由 R8、R9 匀流成 LED 回路的 L1、L2 二支路, 每路带动 4 个串联的 LED 光源; 荧光管组合驱动器 5-5 为 R5、D6 和晶体管 BG1 驱动微型继电型 XJ, 由继电型 XJ 的常开触点 P 开关荧光管镇流器电源, 转换控制器 5 外壳为阻燃塑胶盒; 交直流变换器 5-1 输出 13V 直流至双稳态控制器 5-2、LED 光源组合驱动器 5-4 和荧光管组合驱动器 5-5 及控制触发信号电路 5-3; 控制触发信号电路 5-3 的信号, 经双稳态控制器 5-2 的正、反相二路输出, 控制 LED 光源组合驱动器 5-4 和荧光管组合驱动器 5-5; 图 6 为转换控制器 5 的测点电压 U 与时间波形图, 断电延时间隔  $t_1$  值通过调整 R4 阻值、C3 容量值进行调整, 断电延时间隔  $t_2$  值通过调整 C2 容量值进行调整。

首次接通电源, LED 光源组合 4 进行照明工作; 在 0.5~2 秒的电源切断再接通, 切换至荧光管光源 2 进行照明工作。超过 3 秒的电源切断再接通, 重复上述首次过程。

本实用新型实例, 充分利用现有荧光吸顶灯, 利用现有照明线路, 增加 LED 光源组合 4、转换控制器 5 及联接导线, 达到多光源切换降低耗能和满足光环境需求的照明目的。

#### 实施例二

结合图 10、11 对本实用新型进一步详细的描述, 一种吸顶、吊挂式多光源照明装置, 与实施例一不同的是灯具壳体 1 为荧光支架, 灯具壳体 1 上装有专用的反射器 1-2, 荧光管光源 2 为直型管及相应的接头 2-1、U 型透明的灯罩 1-1, LED 光源组合 4 为两列直排; 其余同实施例一。

#### 实施例三

下面结合图 12 对本实用新型进一步详细的描述, 一种吊挂式多光源照明装置, 与实施例一不同的是灯具壳体 1 为球型罩支架, 荧光管光源 2 与镇流器 3 为一体式, 灯罩 1-1 为乳白色半透明球型罩, 灯罩 1-1 用固定螺钉 7 安装在灯具壳体 1 上, 灯具壳体 1 上的接头 2-1 为螺旋灯头, LED 光源组合 4 通过绝缘座 4-1 均匀地环形安置在灯具壳体 1 上, 转换控制器 5 安在电器盒 1-4 内, 灯具壳体 1 与电器盒 1-4 用支承杆 1-3 进行连接, 支承杆 1-3 为空心管, 内穿电气联接的电线, 电器盒 1-4 上的底板 1-6 为整个装置固定板; 其余同实施例一。

#### 实施例四

下面结合图 13 对本实用新型进一步详细的描述, 一种台式多光源照明装置, 与实施例一不同的是转换控制器 5 与镇流器 3 安在底座 1-5 内, 电源由电源线 6 经开关 8 引至转换控制器 5, 灯具壳体 1 与底座 1-5 用支承杆 1-3 进行连接, 支承杆 1-3 为空心管, 内穿电气联接的电线, 底座 1-5 下的底板 1-6 为整个装置支承板, 为整个装置的放置稳定, 底座 1-5 内装有配重块 1-7; 其余同实施例一。

#### 实施例五

下面结合图 14 对本实用新型进一步详细的描述, 一种落地式多光源照明装置, 与实施例一不同的是转换控制器 5 与镇流器 3 安在电器盒 1-4 内, 电源由电源线 6 经开关 8 引至转换控制器 5, 灯具壳体 1 与电器盒 1-4 用支承杆 1-3 进行连接, 电器盒 1-4 与底座 1-5 用下支承杆 1-8 进行连接, 支承杆 1-3、下支承杆 1-8 为空心管, 内穿电气联接的电线, 底座 1-5 下的底板 1-6 为整个装置支承板, 为整个装置的放置稳定, 底座 1-5 内装有配重块 1-7; 其余同实施例一。

## 实施例六

下面结合图 1、2、3、6、7、17 对本实用新型作进一步详细的描述，一种遥控吸顶式多光源照明装置，其中转换控制器 5 与实施例一不同的是交直流变换器 5-1 采用变压器 BT 降压式整流滤波电路，控制触发信号电路 5-3 为 R4、C3 组成，另有遥控触发信号电路 5-3a，由集成电路的另一个双稳态控制器 IC-b 部分、电阻 R10 和二极管 D7、D8、D9 组成，集成电路 IC-b 部分的输入端 Cin 接收到遥控信号接收器 5-3b（红外线、声控或电磁波）的高电平脉冲，通过 D8、D9 关闭 LED 光源组合驱动器 5-4 和荧光管组合驱动器 5-5 的输出，接收到下一个高电平脉冲后，允许 LED 光源组合驱动器 5-4 和荧光管组合驱动器 5-5 的输出，同时 R10 和 D7 通过控制触发信号电路 5-3 使集成电路 IC-a 部分输出状态翻转，切换 LED 光源组合驱动器 5-4 和荧光管组合驱动器 5-5 的输出，E+、G 为遥控信号接收器 5-3b 的电源接入端；其余同实施例一。

如图 8 所示的一种红外线遥控信号接收器 5-3b，红外接收管 VD1 接收到红外线中频信号，经三极管 GB4、GB5 及电阻 R11、R12、电容 C4 组成的低频滤波前置放大，通过陶瓷滤波器 SB1 选频后，由三极管 BG6、BG7 和电阻 R13、R14、R15、R16、R17 及电容 C6 组成直接耦合放大电路对信号进一步放大，放大的信号由电容 C5、C7 和二极管 D10、D11、电阻 R18 进行检波，检波后信号经场效应管 BG8 和电阻 R19 放大，由 Cin 端接遥控触发信号电路 5-3a 进行遥控；

如图 9 所示的一种红外线遥控信号发射器 5-3c，电池 GB，按下按钮 S，三极管 GB9、GB10 及电阻 R20、R21、R22、R23，电容 C8 及陶瓷滤波器 SB2 组成的选频自激振荡器工作，输出中频信号由三极管 GB11 电流放大后，推动红外发射管 VD2 发射红外中频信号。

图 8、9 中的红外线遥控信号发射器与红外线遥控信号接收器配套使用，红外发射管 VD2 与红外接收管 VD1 的工作波长要一致，陶瓷滤波器 SB1、SB2 的性能参数相同，使用遥控红外线发射器时，红外发射管对着遥控信号接收器，在 6~8m 距离内能达到红外线遥控的目的。

首次接通电源，LED 光源组合 4 进行照明工作；在 0.5~2 秒的电源切断再接通（或发射并接收二次遥控信号的间隔），切换至荧光管光源 2 进行照明工作。超过 3 秒的电源切断再接通（或发射并接收二次遥控信号的间隔），重复上述首次过程。

## 实施例七

如图 15、16、17 所示的一种声控电路，图 15 超声波遥控信号接收器 5-3b，超声波接收器 SB3 接收超声波信号，经三极管 BG12、BG13 和电阻 R24、R25、R26、R27、R28 及电容 C10 组成直接耦合放大电路对信号进一步放大，放大的信号由电容 C9、C11 和二极管 D12、D13、电阻 R29 进行检波，检波后信号经场效应管 BG14 和电阻 R30 放大，由 Cin 端接遥控触发信号电路 5-3a 进行遥控；其余控制原理参见实施例六。

图 16 超声波遥控信号发射器 5-3c，电池 GB1，按下按钮 S1，三极管 GB15、GB16 及电阻 R31、R32、R33、R34，电容 C12、C13 及超声波发射器 SB4 组成的选频自激振荡器工作，超声波发射器 SB4 输出一定波长的超声波，同时电源流经电阻 R35、发光二极管 D14，指示按钮状态。

图 15、16 中的超声波遥控发射器与超声遥控接收器配套使用，超声波接收器 SB3 与超声波发射器 SB4 的工作波长要一致，使用遥控超声波发射器时，超声波发射器对着接收器，在 6~8m 距离内能达到超声波遥控的目的。

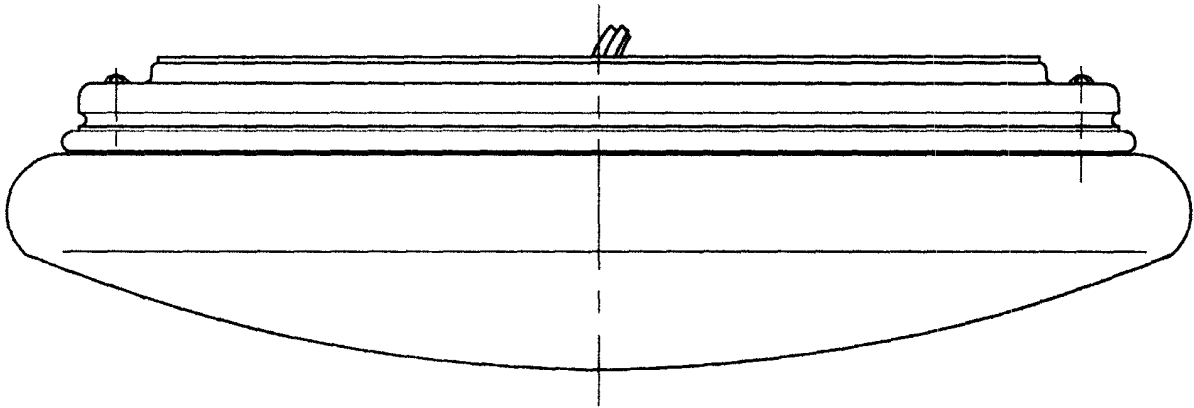


图1

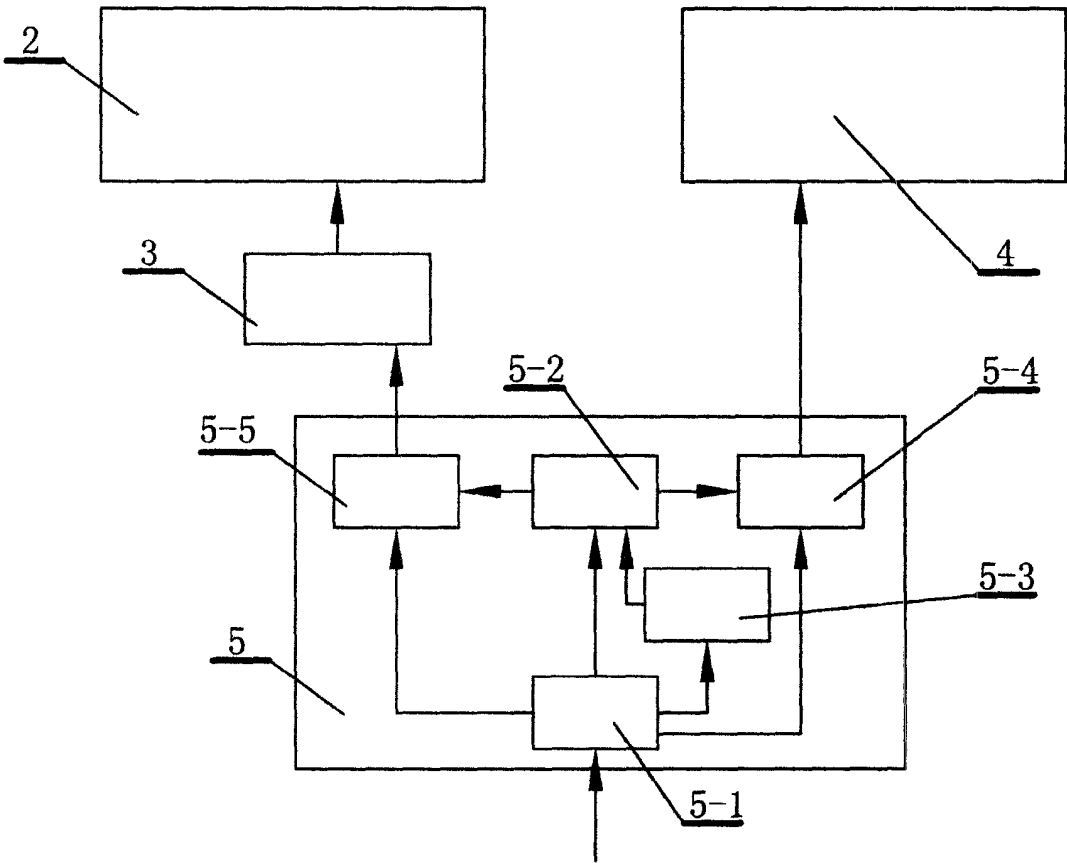


图2

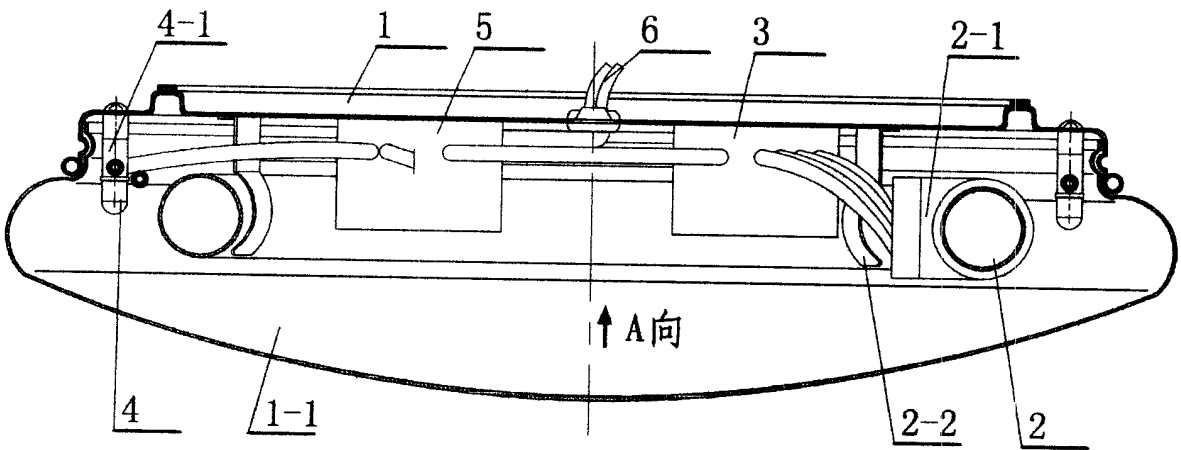


图3

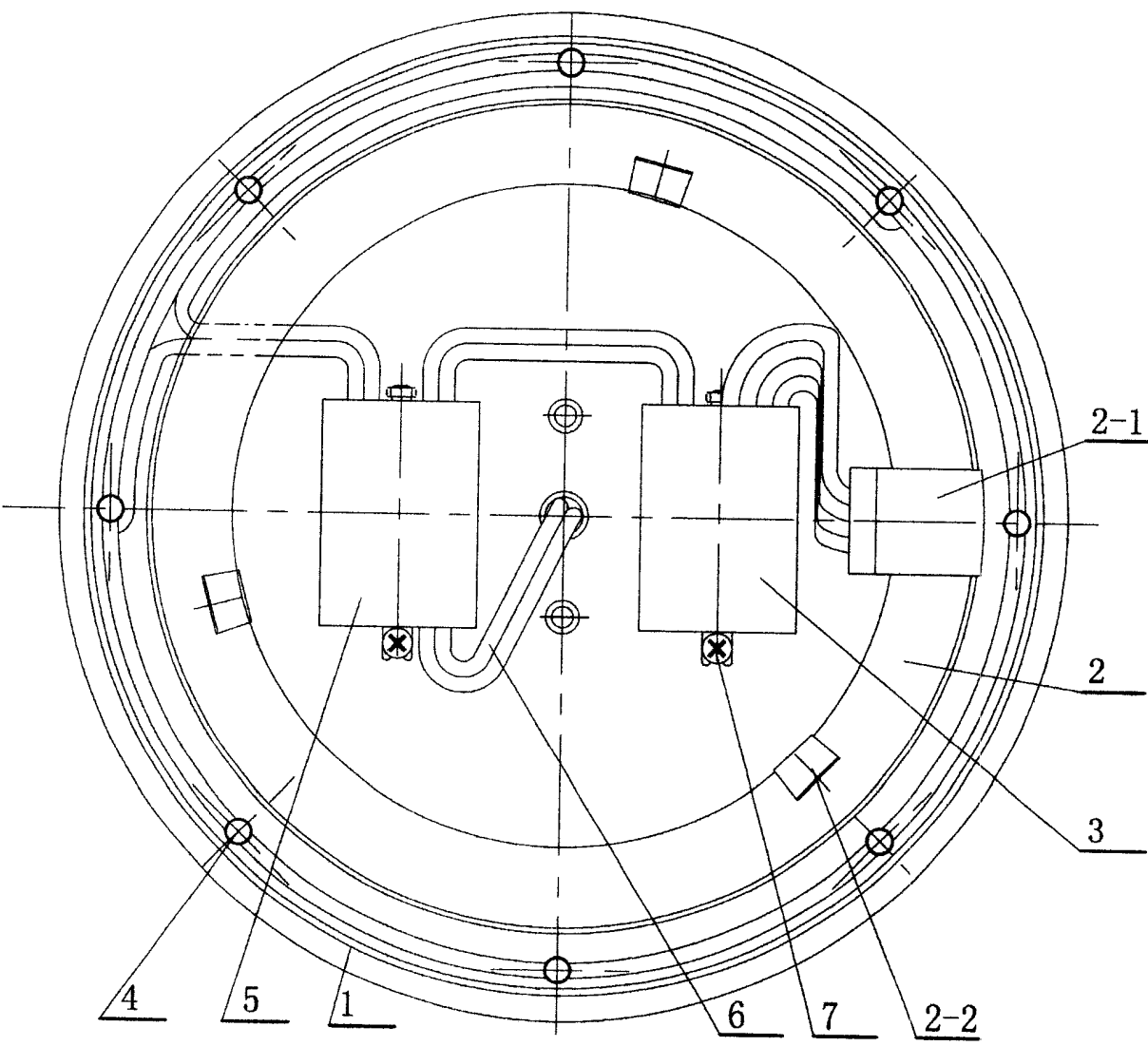


图4

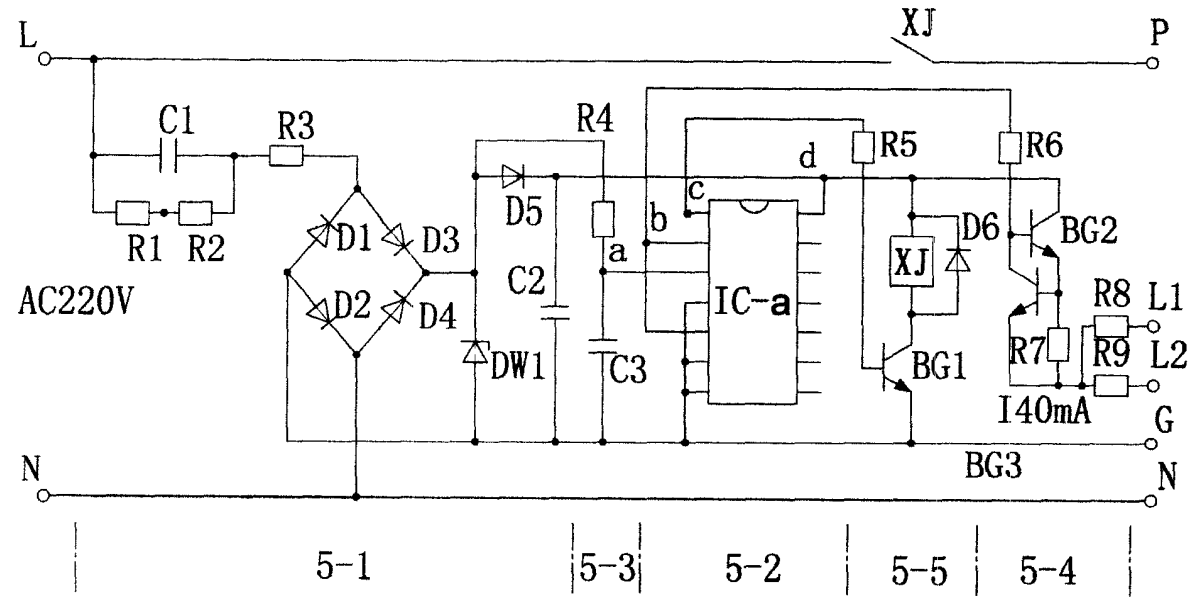


图5

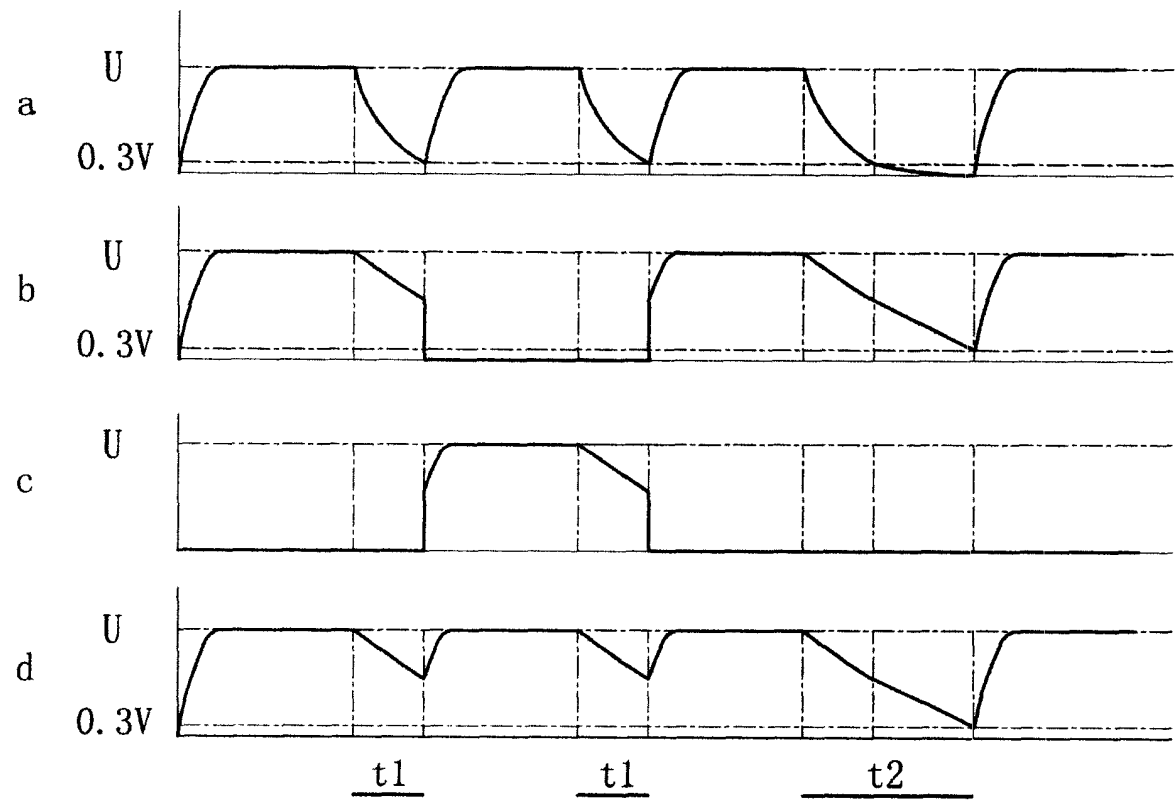


图6



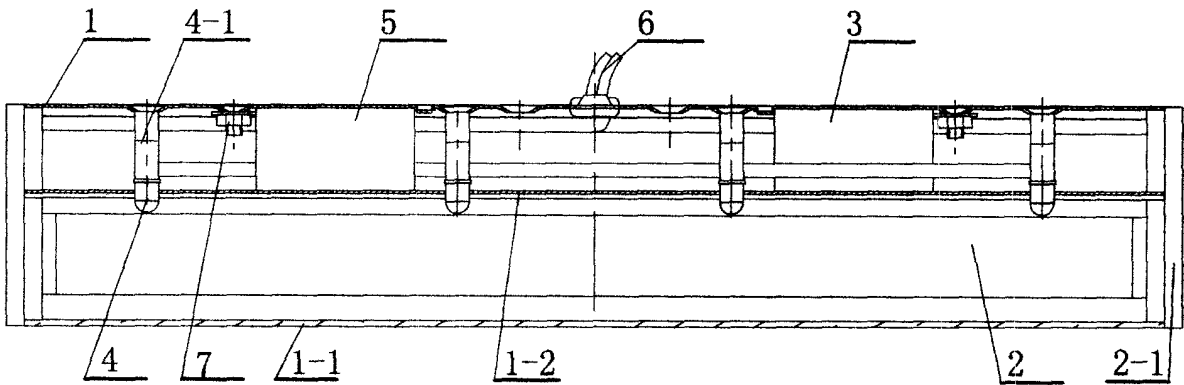


图10

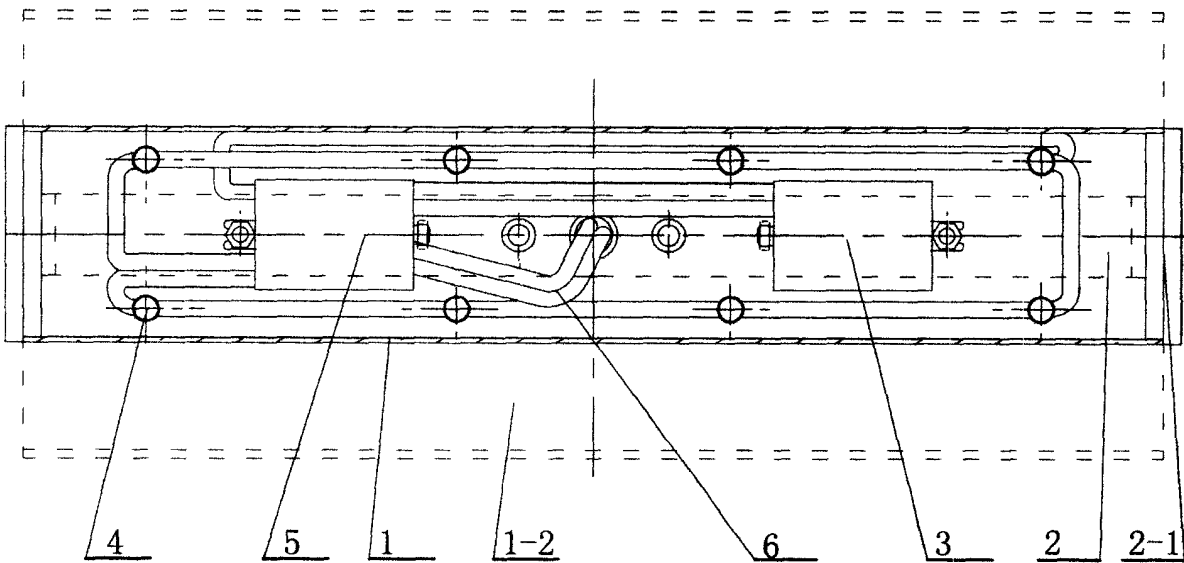


图11

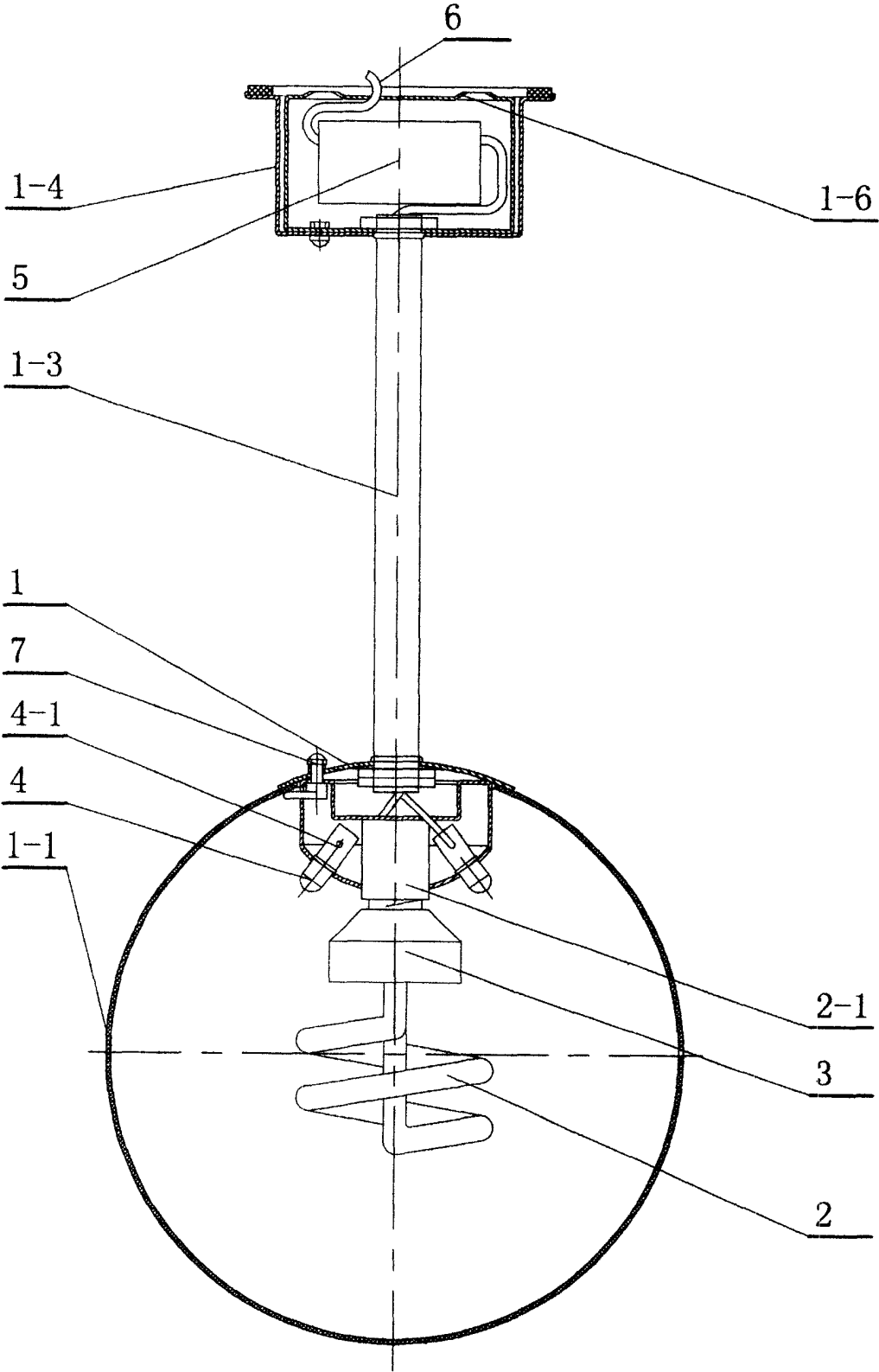


图12

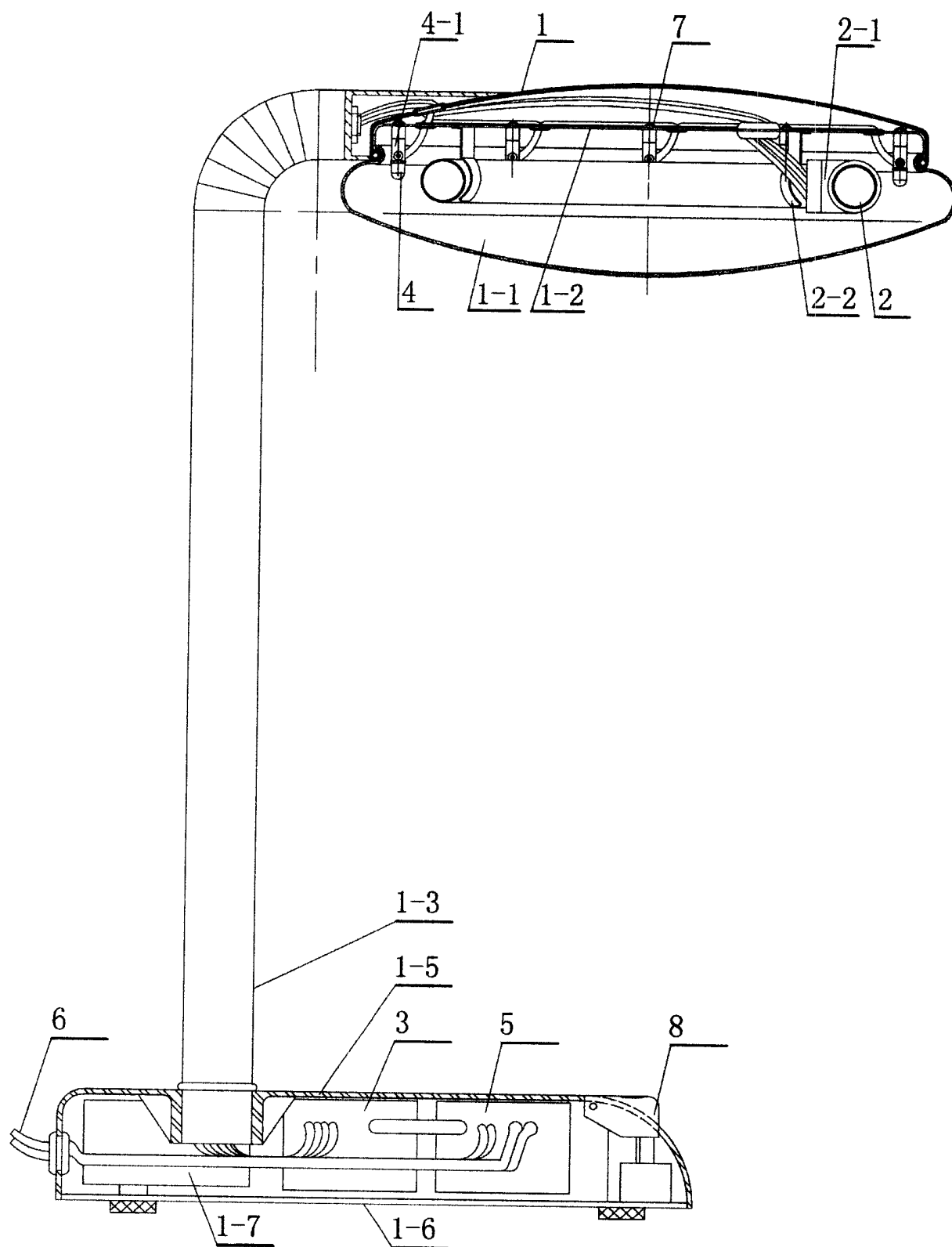


图13

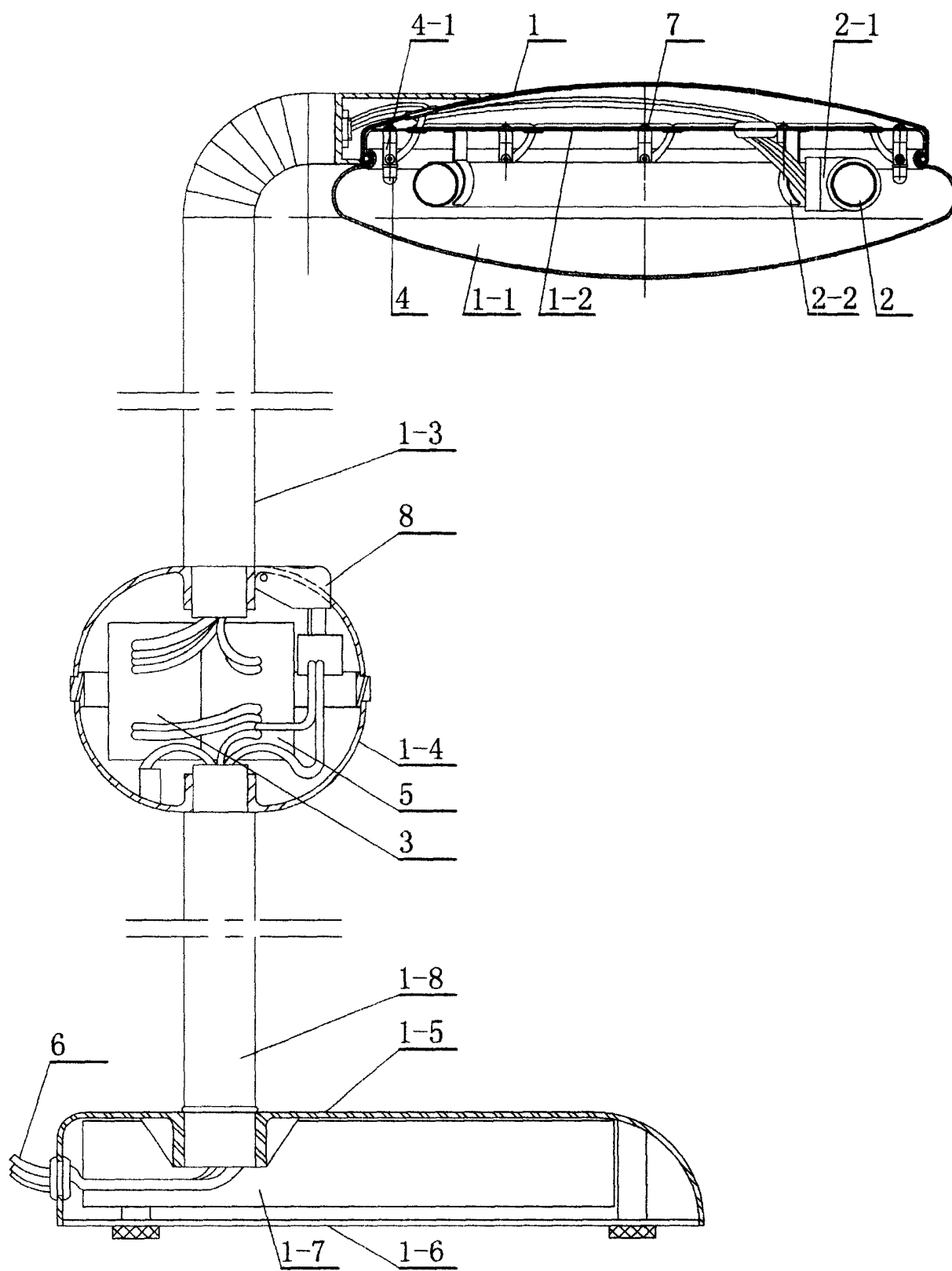


图14

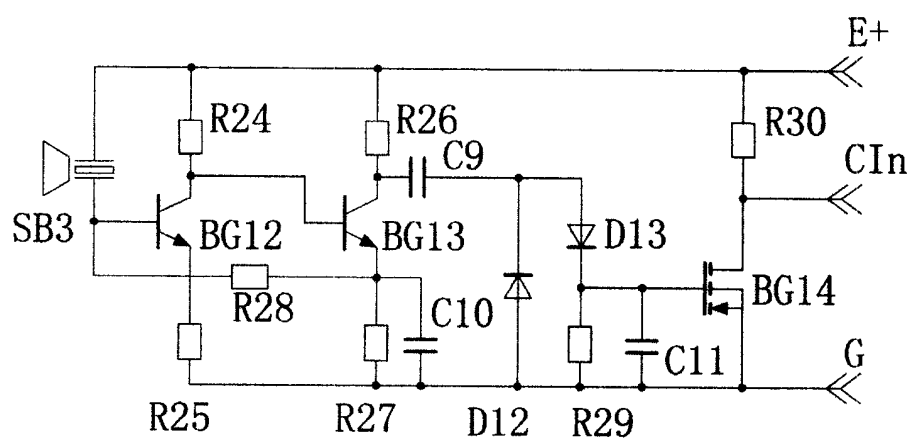


图15

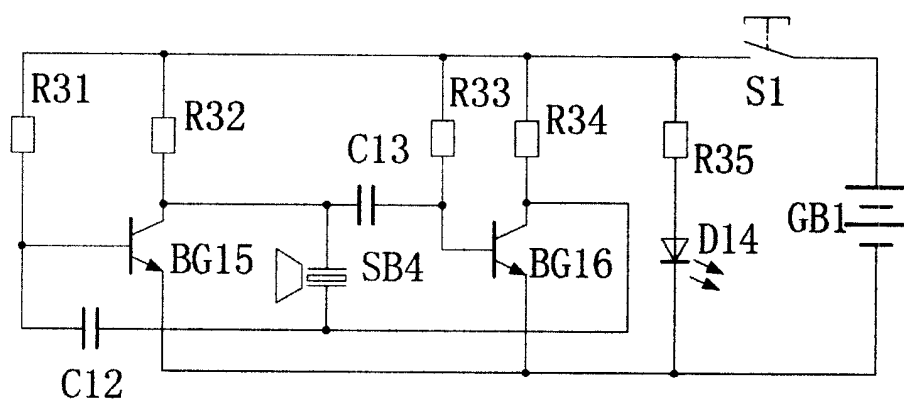


图16

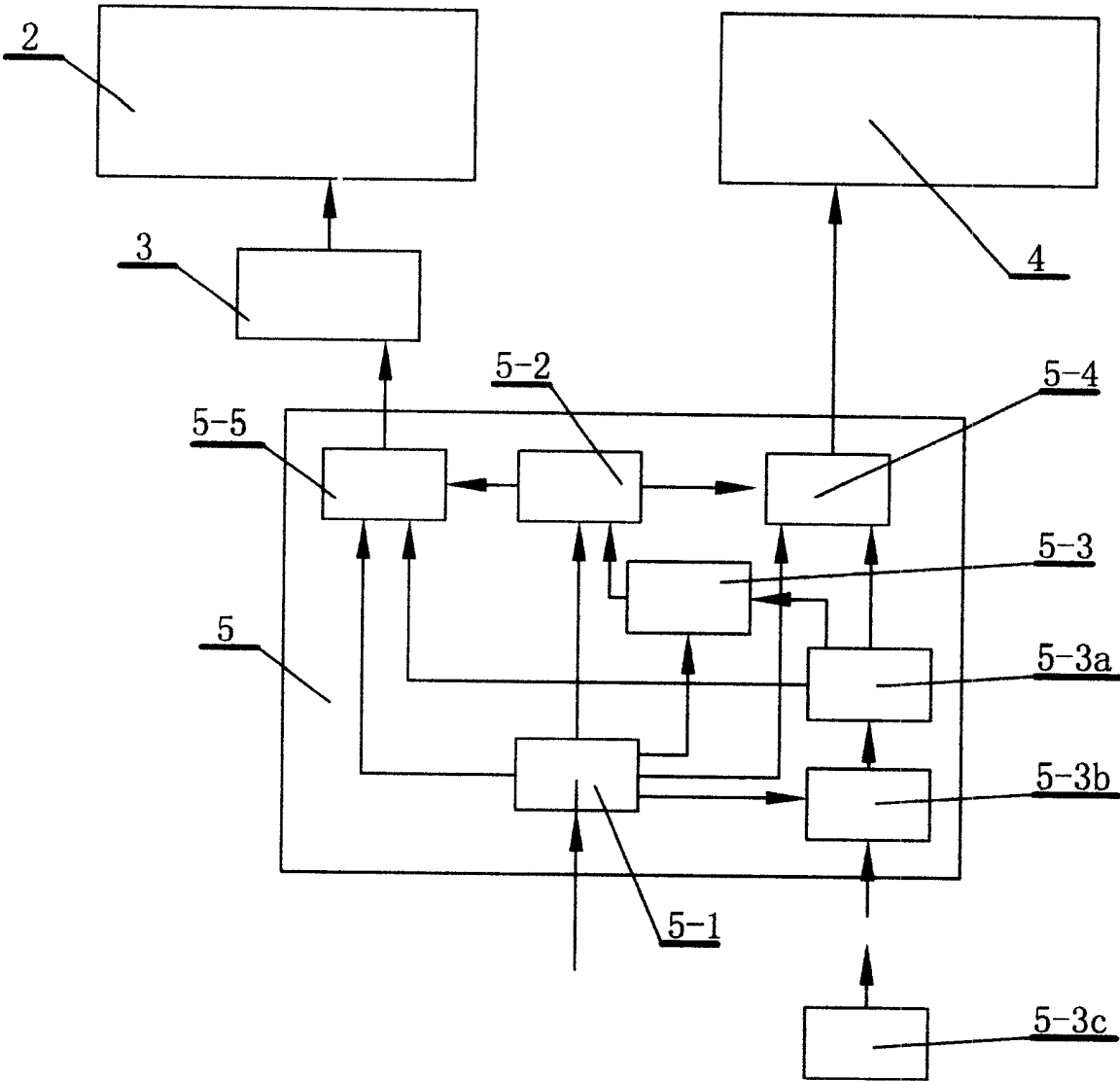


图17