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Riddell

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[54] **SELF-POWERED ILLUMINATED ORNAMENTAL DEVICE**

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[52] **U.S. Cl.** **315/53,** 315/58, 340/344, 240/6.4

[51] **Int. Cl.** **H01j 7/44**

[58] **Field of Search** 315/53, 58, 1; 240/344, 240/6.4, 10.1, 9

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Attorney, Agent, or Firm—Martin P. Hoffman; James H. Ewing; Donald M. Sandler

[57] **ABSTRACT**

Gas-discharge tubes, such as neon lamps, are operated from a D.C. power supply which is loacted inside of an ornamental device. The supply may be a plurality of batteries or a D.C.-to-D.C. converter powered by a battery. R-C circuits couple the supply to the discharge tubes to provide intermittent gas discharge in the tubes and a flashing effect. The gas-discharge tubes may be disposed within an ornamental device with the power supply, or they may be outside of the device in convenient locations and connected to the device and power supply by wires and connectors. In the latter case, the R-C circuits are contained in the bases into which the tubes are placed for operation. In one embodiment, individual batteries are disposed in the tube bases and connected in series to provide the discharge voltage. To conserve battery charge, a photoelectric circuit turns the device off during times when ambient light exceeds a predetermined intensity.

10 Claims, 8 Drawing Figures

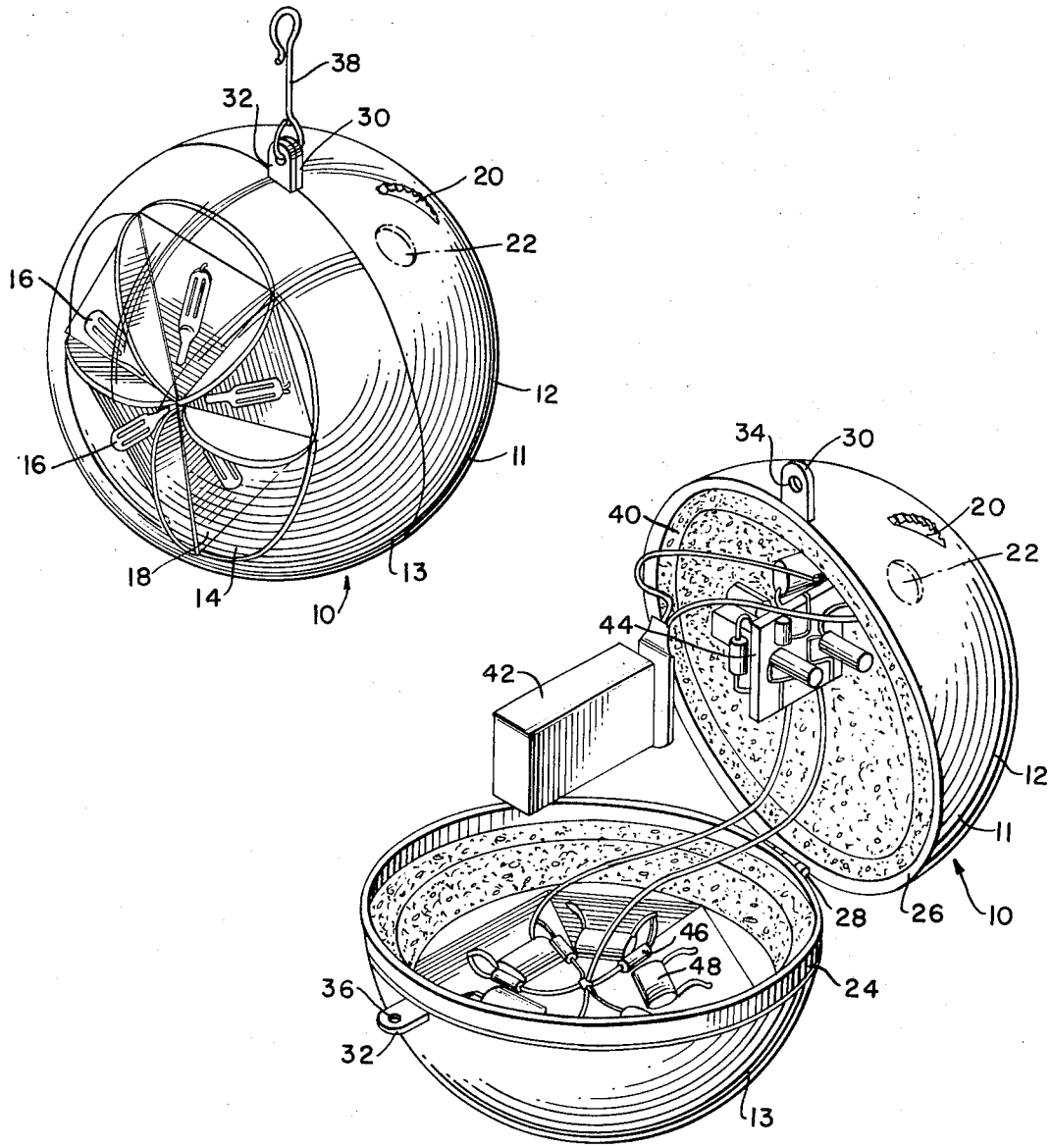


FIG. 1.

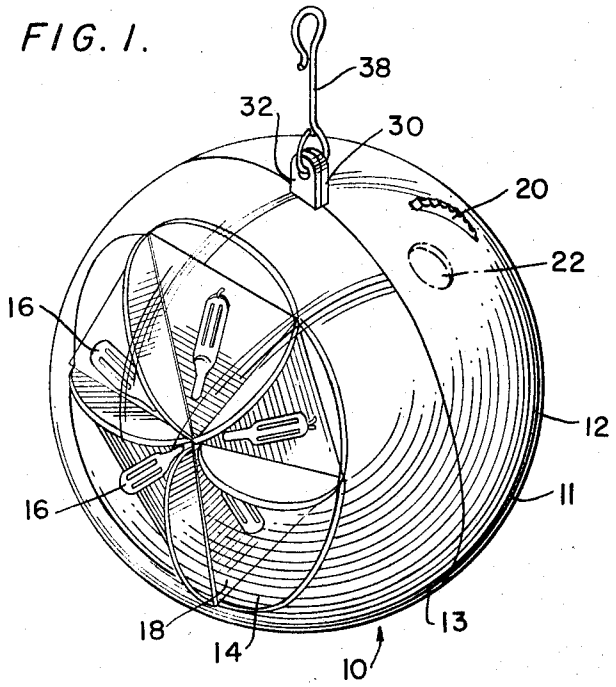


FIG. 2.

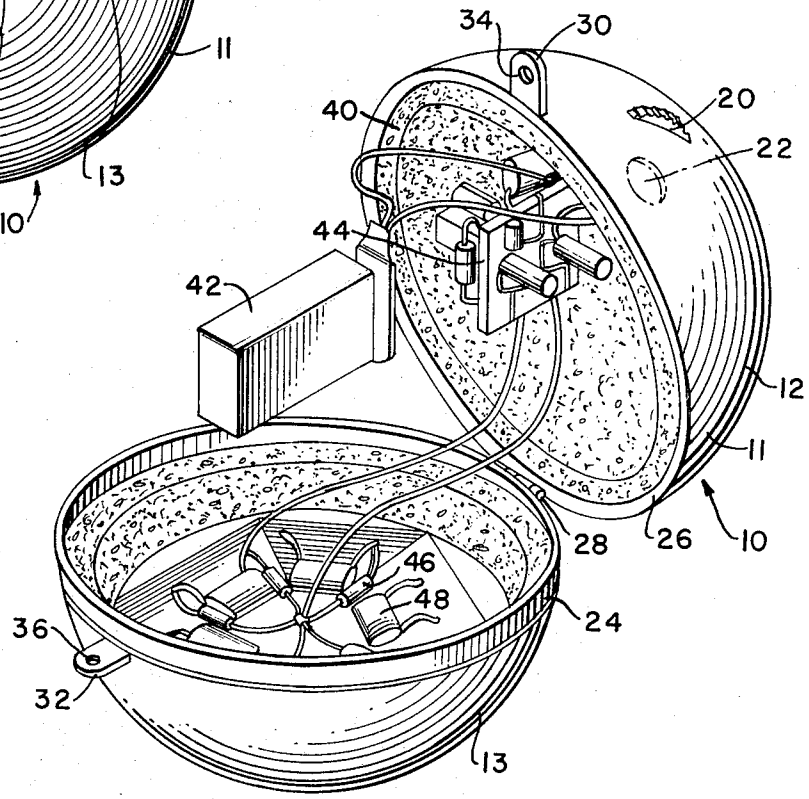


FIG. 3.

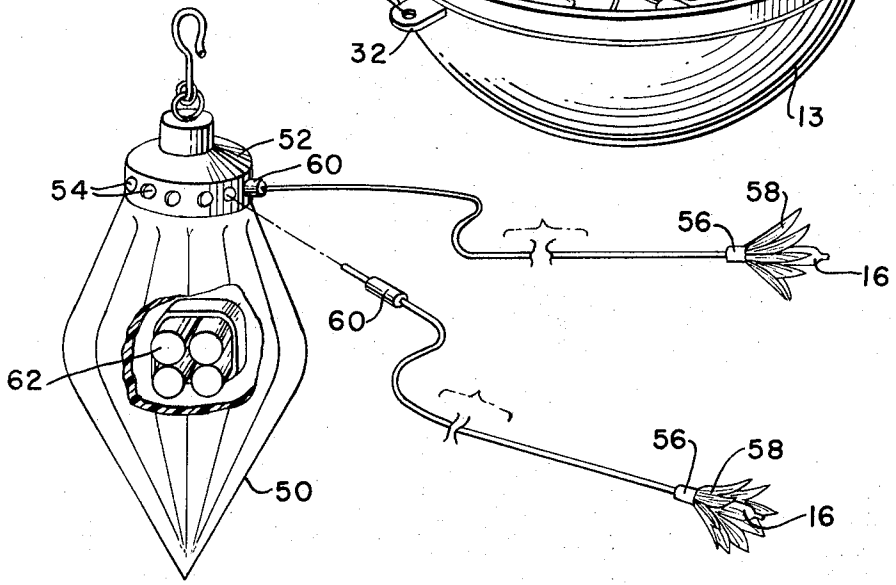


FIG. 4.

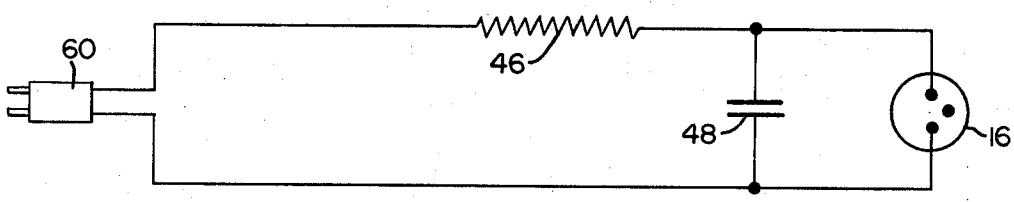


FIG. 5.

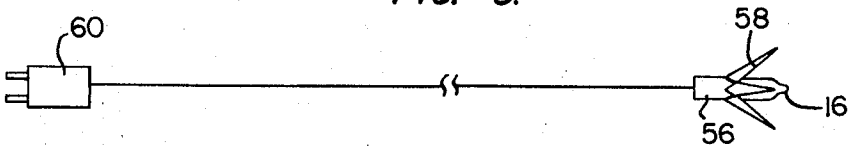


FIG. 6.

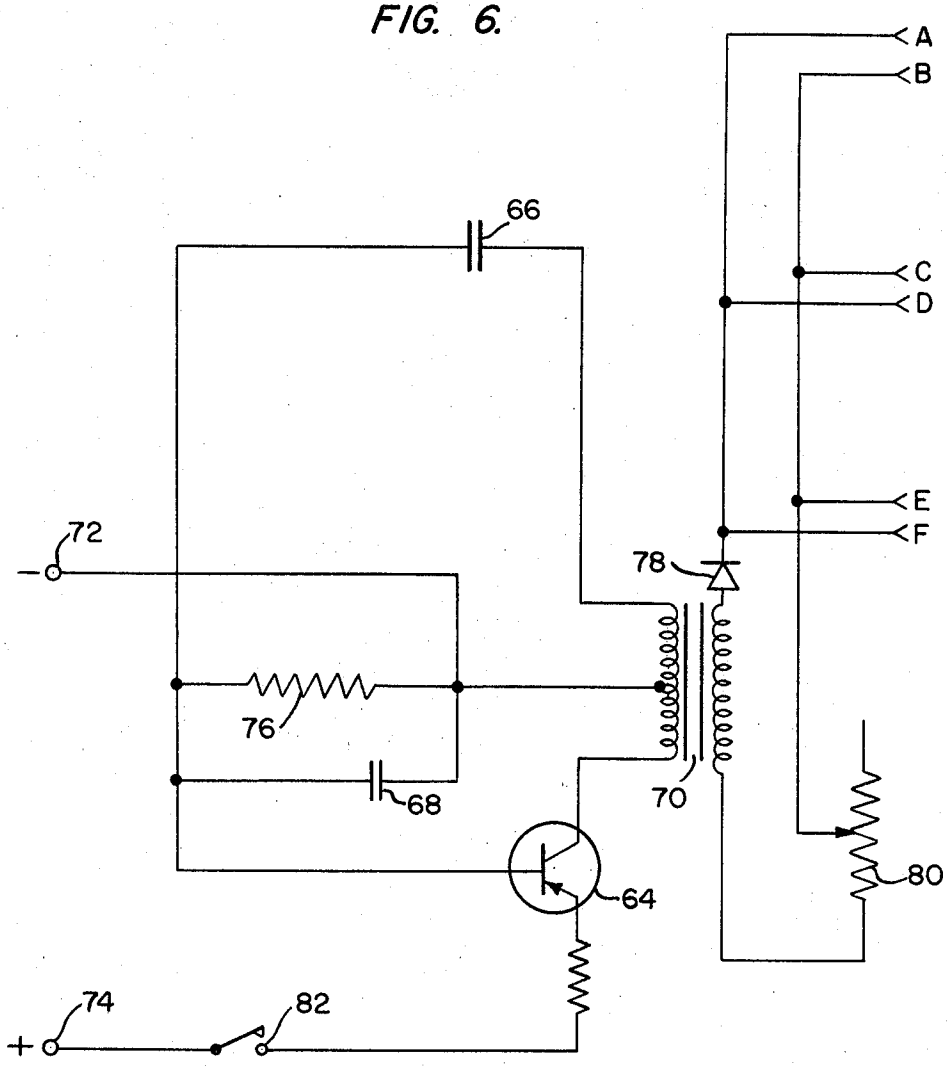


FIG. 7.

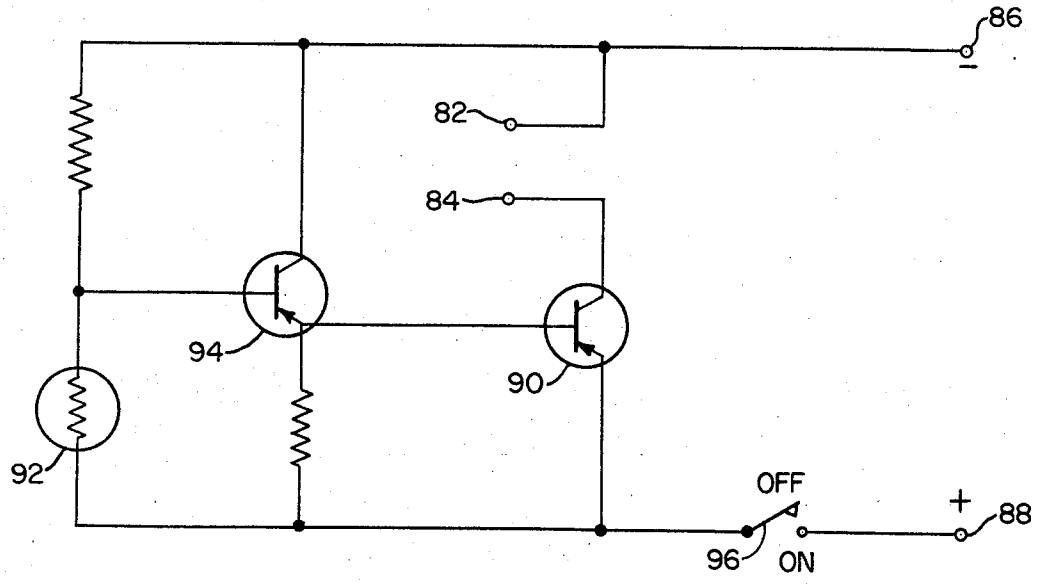
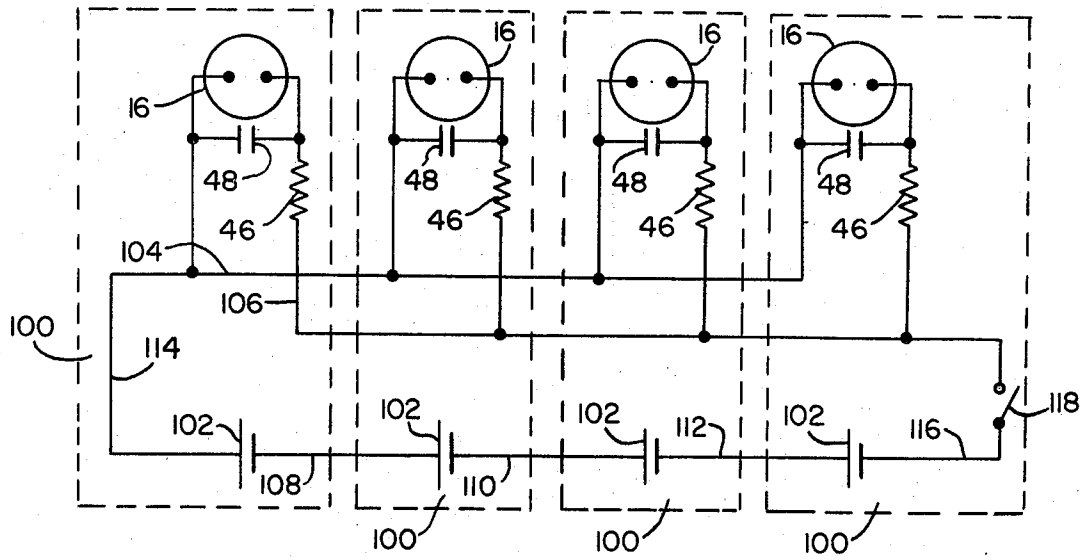

86
82
84
94
90
92
OFF
+
88
96
ON

FIG. 8.


16
48
46
104
106
100
114
102
108
110
112
116
118

SELF-POWERED ILLUMINATED ORNAMENTAL DEVICE

BACKGROUND OF THE INVENTION

The present invention relates generally to the field of illuminated ornaments, and more specifically to self-powered illuminated ornaments for holiday decorations.

There are many types of illuminated ornamental devices presently available to the public. They operate from a conventional A.C. outlet, thereby requiring the use of unsightly wires and consuming energy which could be better used for productive purposes. The 120 volt A.C. also presents a shock hazard to persons handling the ornaments.

These and other evident disadvantages of prior art illuminated ornaments have led to the development of the present invention, which retains most of the advantages of prior art illuminated ornaments while having none of the disadvantages.

SUMMARY OF THE INVENTION

In accordance with the present invention, an illuminated ornament is provided with a self-contained power supply. The illuminating elements are gas-discharge tubes, such as neon tubes, and are coupled to the power supply by a resistor-capacitor circuit to cause the tubes to flash. The power supply can be either a plurality of series-connected batteries or a battery-powered D.C.-to-D.C. converter. Either way, voltage high enough to ionize the gas in the tube is applied to the tubes through the R-C circuit. The gas-discharge tubes can be mounted in the ornament to be visible through a transparent section thereof, or outside of the ornament, either on the outer surface of the ornament or elsewhere in the vicinity of the ornament and connected to it by wires and connectors.

Therefore, it is an object of the present invention to provide an illuminated ornament which does not present a shock hazard to children or when used on metallic stands, such as artificial trees.

It is another object of the present invention to provide an illuminated ornament in which the lights do not get hot and therefore do not present either a fire hazard or a burn hazard for children.

It is still another object of the present invention to provide an illuminated ornament having light clusters which would be easy to string and which does not need an extension cord.

It is a further object of the present invention to provide an illuminated ornamental device which can be used outdoors without using energy generated by means of scarce fuels.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects, advantages, and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings, in which like reference numerals designate like parts throughout the figures thereof, and wherein:

FIG. **1** shows a view of an ornament which comprises one embodiment of the invention.

FIG. **2** shows another view of the ornament of FIG. **1.**

FIG. **3** shows a view of an ornament which comprises a second embodiment of the invention.

FIG. **4** shows the circuit elements involved in one light.

FIG. **5** shows a physical embodiment of the elements of FIG. **4.**

FIG. **6** shows the circuit diagram of a D.C.-to-D.C. converter for supplying the lights from a low voltage battery.

FIG. **7** shows a photoelectric control circuit used to conserve battery life.

FIG. **8** shows a third embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. **1** and **2,** a spherical ornament **10** has a hollow housing **12** with a light transmissive part **14.** Inside the housing are a plurality of gas-discharge tubes **16.** The tubes are placed so as to be visible through light transmissive part **14.** Light reflecting surfaces **18** support the tubes as well as increase the light emitted from the ornament. A switch member **20** in the shape of a serrated disk protrudes from the housing to enable the power to the tubes to be turned on or off manually. A photoelectric cell **22** of conventional design is mounted with its photosensitive surface viewing the environment outside the housing. The cell **22** may be mounted either through an aperture in the housing or within the housing adjacent a transparent section. The external surface of housing **12** may have ornamentation of any suitable type thereon, or the ornament may rely entirely on the gas-discharge tubes for its ornamental effect. As will be described below, the tubes are caused to flash individually, and various gas mixtures may be used in the tubes to achieve different colored lights.

The housing **12** comprises two matable parts, **11** and **13.** Part **13** has a lip portion **24** which is of smaller diameter than the mating edge **26** of part **11** so that when the two parts are mated, lip portion **24** fits inside of and frictionally engages edge **26.** To facilitate opening and closing of the ornament, and to keep the two parts aligned, a conventional hinge **28** is provided. Tabs **30** and **32,** located at the mating edges of parts **11** and **13,** respectively, have holes **34** and **36** therein. The tabs are located with respect to each other such that the holes **34** and **36** are aligned when the two parts of the ornament are mated. The aligned holes can then be used to hang, or otherwise mount the ornament, as, for example, by means of hook **38,** as well as for locking the two parts of the ornament together.

Referring now specifically to FIG. **2,** a power supply and electrical components are mounted within the housing to provide the power to cause the gas-discharge tubes to flash. A layer **40** of solid foam-type material is used to hold the power supply in place. The power supply comprises a battery **42** of a readily available low voltage type, such as a 9 volt battery. Shown generally is D.C.-to-D.C. converter **44,** which will be described in detail below. The converter can be made of conventional components encapsulated in epoxy, or can be an integrated circuit module. Resistors **46** and capacitors **48** couple the power supply to the gas-discharge tubes.

Referring now to FIGS. **3–5,** ornament **50** has a cap **52** which has a plurality of sockets **54** disposed around its periphery. The gas-discharge tubes **16** are con-

nected into bases **56.** The tubes are surrounded at the bases by ornamentation **58.** The bases are connected to plugs **60** which are adapted to fit into sockets **54** to form therewith electrical connectors. A plurality of batteries **62** are mounted within the ornament **50** and connected to sockets **54.** A resistor **46** and a capacitor **48** for providing a flashing effect are disposed within each base **56,** which may also be of ornamental design.

While the invention has been shown with the D.C.-to-D.C. converter inside of ornament **10** of FIGS. **1** and **2,** and the plurality of batteries inside of ornament **50** of FIG. **3,** it should be clear that this is merely illustrative. Either type of power supply can be used with either type of ornament; i.e., the D.C.-to-D.C. converter can be used in ornament **50** and a plurality of batteries can be used in ornament **10.** In addition, the plurality of batteries can be replaced by a single battery of sufficiently high voltage to ionize the gas-discharge tubes.

The basic electrical circuit used in the invention is shown in FIG. **4.** The gas-discharge tube **16** comprises an element in a relaxation oscillator circuit. The tube **16** is in parallel with capacitor **48,** the parallel combination being in series with resistor **46.**

When a D.C. source is applied to the circuit via plug **60,** the capacitor begins to charge up through the resistor to the source voltage. The gas-discharge tube represents an open circuit until the capacitor voltage exceeds the ionization potential of the gas in the tube, at which time the gas ionizes and provides a discharge path for the capacitor. The tube remains lit until the capacitor is discharged to a voltage well below the ionization potential, at which time the gas deionizes and the capacitor begins to recharge. The rate of flash is determined by the values of the resistor and capacitor, which can be chosen to provide a wide range of flash rates. The D.C. source must provide a value of voltage greater than the ionization potential of the gas-discharge tube.

The power supply can be a relatively high voltage battery, such as a 90 volt battery, a series combination of a plurality of lower voltage batteries, or a low voltage battery with a voltage step-up device. The latter power supply is illustrated in FIG. **6,** in which transistor **64,** capacitors **66** and **68,** and transformer **70** comprise a conventional oscillator. The oscillator receives a low voltage D.C. at terminals **72** and **74** and generates an alternating current which is stepped up by transformer **70.** Resistor **76** serves to bias the transistor to the proper operating point. The voltage on the secondary winding of transformer **70** is half-wave rectified by diode **78** to provide a D.C. voltage having a value greater than the ionization potential of the particular gas-discharge tubes being utilized. Rheostat **80** allows some control over the flash rates since it is in series with all of the individual flash circuits. A switch **82** provides an on-off control and, in the embodiment of FIGS. **1** and **2,** is mechanically connected to the disk **20.** The generated voltage is connected to the individual tubes via output lines A and B, C and D, E and F, etc. Although only three output wire pairs are shown, one output wire pair is needed for each tube used in the FIG. **3** embodiment. All of the tube units are in parallel.

A photosensitive circuit for controlling the application of power to the gas-discharge tubes is shown in FIG. **7.** When used in conjunction with FIG. **6,** the terminals **72** and **74** are connected to terminals **82** and **84,** and the battery is connected to terminals **86** and **88.** A transistor **90** is connected in series with terminals **82** and **84.** The base of transistor **90** is connected to the emitter of transistor **94,** the base of transistor **94** being connected to photosensitive device **92.** In operation, the resistance of the photosensitive device **92,** which may be a conventional Cds photocell, varies inversely with the intensity of the light striking it. When the photocell resistance is low, as in daylight, the transistor **94** is biased so as to be non-conducting. In the dark, the photocell resistance is high, and transistor **94** is biased to be conducting. The conduction of transistor **94** biases transistor **90** into conduction, thus applying the battery voltage from terminals **86** and **88** to terminals **82** and **84.** Transistor **90** acts as a switch whose state of conduction (on or off) is controlled by the resistance of photocell **92,** which is in turn controlled by the intensity of the light striking it. Thus, the photosensitive circuit extends battery life by shutting off the power during daylight hours or other periods when ambient light intensity is high. A manual switch **96** is optionally provided to override the photocell.

FIG. **8** shows an embodiment in which a plurality of substantially identical, individual physical units **100** shown within dashed lines, are wired together to form an illuminated ornament. Each unit **100** comprises one gas-discharge tube **16,** one R-C circuit **46** and **48,** and one battery **102.** The gas-discharge tube and R-C circuits are connected in parallel across the D.C. voltage source by conductors **104** and **106.** The batteries are connected in series by conductors **108, 110** and **112.** The voltage across the series combination appears on conductors **114** and **116** which connect the source to the illumination circuits. The number of units **100** connected together depends upon the ionization potential of the particular gas-discharge tubes being used and the number of batteries needed to provide a voltage on conductors **114** and **116** which exceeds the ionization potential. An on-off switch **118** is provided on line **116.** In the physical realization of this circuit, the battery, capacitor, and resistor are contained in a decorative tube base. Thus, a plurality of lights with bases are wired together to form an illuminated ornament which requires no outside power source. In an illustrative case, the tubes are neon lights having an ionization potential of approximately **60** volts, and **15** units, each having a **6** volt battery, are wired together as shown, thus providing a D.C. source of **75** volts. Obviously, other units not having batteries in them could be connected to conductors **104** and **106** to operate from the power supply. Gas-discharge tubes with different ionization potentials can be used in the same string of lights as long as the highest ionization potential of any of the gas-discharge tubes is exceeded by the total series battery voltage.

The many advantages of the present invention over prior illuminated ornaments should now be clear. The self-contained power supply is shared by approximately **12** to **15** tubes which can be either clustered around the ornament, as in the embodiment of FIG. **3,** or actually be a part of it, as in the embodiment of FIGS. **1** and **2.** It is not necessary to connect the lights to A.C. power lines. This is a very important aspect of the invention since the illuminated ornaments of the invention would not be subject to resrictions on the use of outdoor lighting imposed by the Government to conserve energy during the present energy crisis. Therefore, the illuminated ornaments of the present invention can be used

in circumstances where prior art ornaments cannot. The low power used to energize the gas discharge insures that the ornament does not present a shock hazard, as do the prior art illuminated ornaments. Because the lights are flashing, they do not stay on long enough to get hot and thereby do not present a burn or fire hazard. The light clusters resulting from the use of the FIGS. **3** and **8** embodiments are very easy to string, which is particularly important when the ornament is hung on a tree. In addition, no extension cords, or other unsightly wiring, is needed to provide power to the gas-discharge tubes.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A self-powered illuminated ornamental device, comprising:

a hollow housing having ornamentation on at least part of its outer surface, said housing being separable into at least two parts;

a power supply disposed within said housing;

a plurality of gas-discharge tubes; and,

a plurality of individual circuit means respectively coupling individual ones of said gas-discharge tubes to said power supply for causing intermittent discharge in said tubes.

2. The ornamental device of claim **1** wherein:

said gas-discharge tubes have a predetermined ionization potential; and,

said power supply comprises a plurality of batteries connected together in series such that the total voltage exceeds said predetermined ionization potential.

3. The ornamental device of claim **1** wherein said power supply comprises:

a battery; and,

a D.C.-to-D.C. converter powered by said battery and having its output terminals connected to said circuit means.

4. The ornamental device of claim **3** wherein said power supply further comprises:

means for switchably connecting said battery to said converter; and,

a photosensitive device mounted on said housing with its photosensitive surface viewing the exterior of said housing and coupled to said battery connecting means so as to control its switching state.

5. The ornamental device of claim **3** wherein:

at least a portion of said housing is light transmissive; and,

said gas-discharge tubes are disposed within said housing adjacent said light transmissive portion so as to be visible from outside the housing.

6. The ornamental device of claim **5** wherein said housing consists of two matable parts connected together by a hinge, each part also having a tab with an aperture therethrough, said tabs being so disposed that when the parts are mated, the apertures are in line with each other.

7. The ornamental device of claim **1** wherein said tubes are disposed exteriorly of said housing, and further including electrical connector means for connecting through said housing said tubes to said power supply.

8. The ornamental device of claim **7** wherein said electrical connector means comprises a plurality of plug and socket combinations, the number of combinations being the same as the number of gas-discharge tubes, and further including a base for each tube, each base being of ornamental design and containing within it an individual circuit means.

9. A self-powered, illuminated ornamental device comprising:

a plurality of separated physical units wherein each unit includes a gas-discharge tube, circuit means for causing said tube to discharge intermittently, and a battery, said tube and said circuit means constituting an electrical subunit;

means for connecting said batteries in series, whereby the sum of the battery voltages constitutes the operating voltage; and,

means for connecting said electrical subunits in parallel across said operating voltage, the number of units in the device being such that the operating voltage exceeds the ionization potential of the gas-discharge tubes.

10. The ornamental device of claim **9** wherein a physical unit comprises:

a gas-discharge tube; and,

a hollow ornamental base, containing a circuit means and a battery, to which the tube is detachably connected.

* * * * *