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3,521,049

SELF-LUMINOUS JEWELRY

Filed Sept. 27, 1967

2 Sheets-Sheet 1

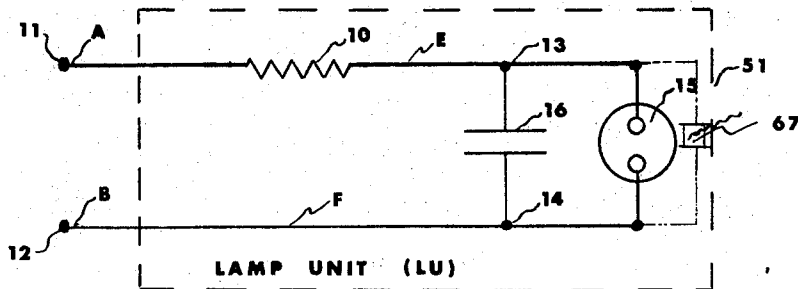


FIG. 1

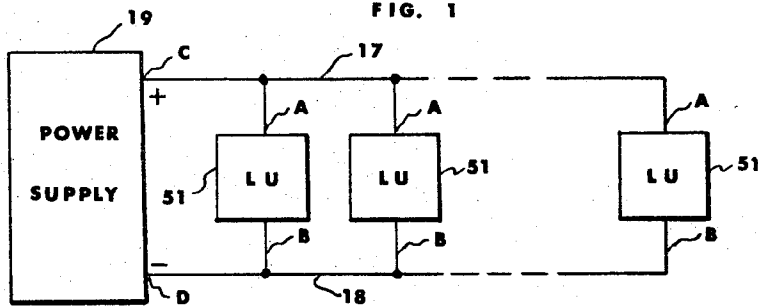


FIG. 2

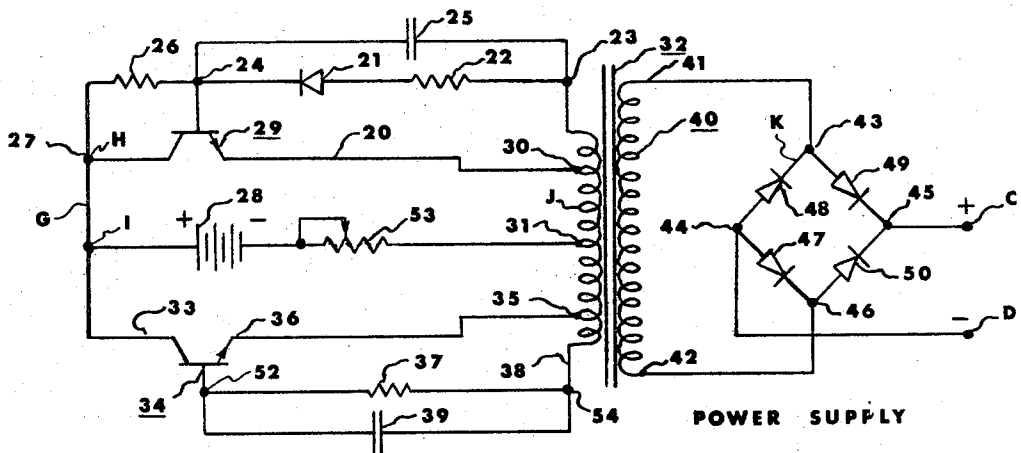


FIG. 3

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2 Sheets-Sheet 2

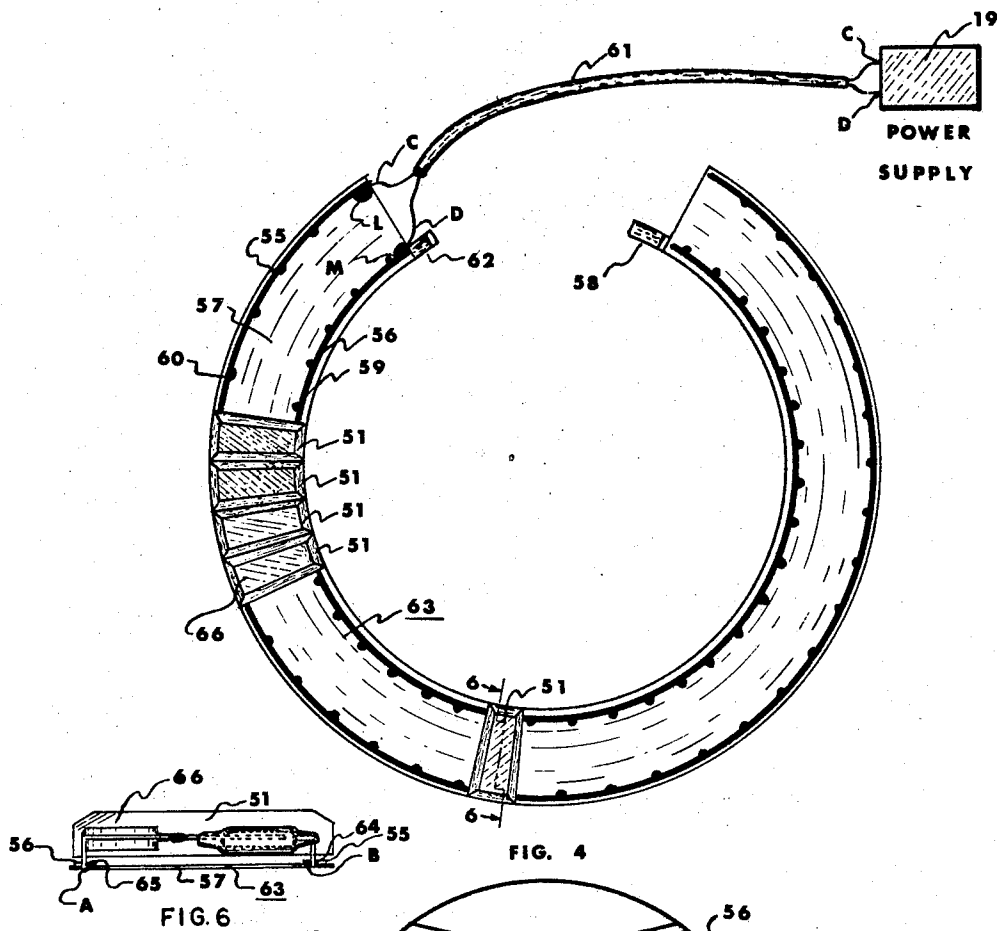


FIG. 4

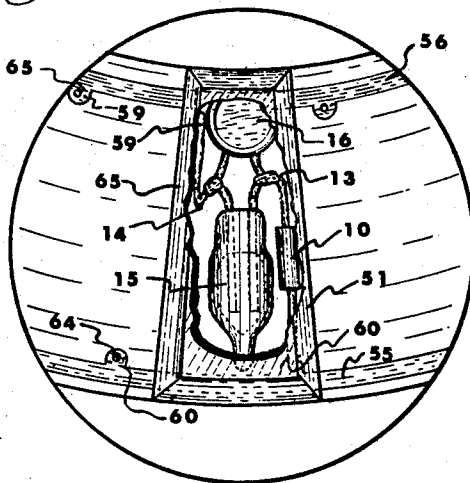


FIG. 5

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SELF-LUMINOUS JEWELRY

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7 Claims

ABSTRACT OF THE DISCLOSURE

Individual lamps operated by flashers and powered by a battery supply for providing intermittent glows or flashes of light in various locations in the jewelry and in accordance with the parameters of the circuit selected. The lights comprise gas-filled bulbs such as neon tubes, separate ones of which include flasher units such as resistance capacitance circuits. The flashers with the bulbs are encased in simulated "gems" which are spaced apart in some desired orientation and connected in parallel to the power supply. Such connection, in a preferred form of the invention, comprises a printed circuit having a flexible insulated base which is adapted to conform to the contour of the wearer, to suit and/or dress design, and so forth.

The present invention relates to the illuminated jewelry and, more particularly, to new and improved jewelry such as necklaces, brooches, and the like, wherein individual jewelry elements self-contain electrically powered electrical means such as gas discharge tubes; more particularly, the present invention provides individual "gem" elements to self-contain electrical means for giving desired luminescence to the elements at intermittent and preferably random times.

Accordingly, a principal object of the present invention is to provide self-luminous jewelry, wherein the individual gem elements therein either self-contain or are closely associated with illuminating elements such as lights and their respective circuits.

A further object of the invention is to provide self-luminous jewelry having "gems" comprising translucent elements in which have been imbedded luminous electrical components.

A further object of the invention is to provide illuminated jewelry that is readily adaptable for flexible, printed circuit construction.

A further object is to provide self-luminous jewelry comprising a series of parallel flasher-type circuits or their equivalent which are connected to a common battery supply of miniaturized form and yet possess sufficient voltage to operate the illuminating tubes or elements used.

An additional object is to provide in jewelry a plurality of lighting means which will illuminate at intermittent times.

The features of the present invention which are believed to be novel are set forth with particularly in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in connection with the accompanying drawing in which:

FIG. 1 is a schematic diagram of a flasher or lamp unit which may be incorporated in the circuit of the present invention.

FIG. 2 is a schematic diagram illustrating the manner in which a plurality of lamp units, as shown in FIG. 1, are connected in parallel to the power supply used.

FIG. 3 is a schematic diagram of a power supply which may be used in the present invention, wherein the same takes the form of a direct-current to direct-current con-

verter supplying at the output side of a bridge rectifier a direct-current operating voltage of increased magnitude relative to the battery supply terminal voltage.

FIG. 4 is a plan view of a necklace incorporating the circuitry of FIGS. 1-3 in physical form, and is constructed so that the individual gems self-contain the individual lamp or flasher units, which are connected parallel to the power supply as heretofore indicated.

FIG. 5 is an enlarged detail of a representative gem, is partially broken away for purposes of clarity, and illustrates the physical construction of the same.

FIG. 6 is a transverse section taken along line 6-6, further illustrating the construction of the individual gem elements.

In FIG. 1, representative flasher or lamp unit LU is shown and includes terminals 11 and 12. Lead A connects terminal 11 to the left side of resistor 10, whereas lead E connects the right side of resistor 10 and also to junction 13. Lead F interconnects input terminal 12 and junction terminal 14. Capacitor 16 is interposed between terminals 13 and 14 as indicated. Connected across capacitor 16 at terminals 13 and 14 is a gas discharge tube 15. By way of illustration, gas discharge tube 15 may be constituted by neon tube NE-2D manufactured by the General Electric Company of the United States, having a firing potential of approximately 85 volts, and extinguishing potential of 60 volts. Obviously, other types of gas-filled discharge tubes may be used. The only requirement is, of course, that the tube's breakdown be visible as illumination. By way of illustration, resistor 10 can have a value of twenty-two megohms and capacitor 16, .02 microfarad. For convenience throughout the rest of the discussion, the lamp or flasher unit LU shall be designated as unit 51, i.e., the dashed block in which the lamp unit LU is placed.

FIG. 2 illustrates that power supply 19 includes terminals C and D and across which are connected several ones of the lamp units LU. The latter are disposed in parallel, as indicated. Practically, the only limit to the number of lamp units which can be connected in parallel across the power supply terminal CD will be the limit imposed upon the power output of power supply 19.

FIG. 3 illustrates a representative power supply which can be used to supply power to the circuit of FIG. 2. FIG. 3 illustrates a Class B operated, direct-current to direct-current converter. Common lead or bus G includes two junction terminals H and I which are respectively connected to the collector of transistor 29 and to the positive side of battery 28 in the manner indicated. Junction H is also connected to one side of resistor 26 and to the collector of transistor 29, whereas junction I is connected to the collector of transistor 34 by lead 33. The emitters of transistors 29 and 34 are connected by leads 20 and 36, respectively, to taps 30 and 35 on primary winding J of transformer 32. The negative side of battery 28 is coupled through potentiometer 33 to center tap 31 on primary J. Coupled between junctions 23 and 24 is the series combination of diode 21 and resistor 22, the latter being shunted by capacitor 25. Coupled between junctions 54 and 52 is the parallel combination of the resistor-and-capacitor combination 37 and 39. Lead 38 interconnects the lower side of the primary winding J of the transformer with junction 54.

Secondary winding 40 of transformer 32 is connected at its opposite ends by leads 41 and 42 across full-wave bridge rectifier K. The same is composed of conventionally connected diodes 47-50 and conventionally interspersed junction points 43-46. The junction points of terminals 43 and 46 are coupled across the secondary winding 40 of transformer 32, whereas the junction points 44 and 45 are connected directly to the output terminals C and D of

the power supply, which terminals correspond to the output terminals C and D in FIG. 2.

The secondary winding circuit of the power supply is strictly conventional and merely constitutes a means for accomplishing full-wave rectification from the secondary of the transformer to supply full-wave, rectified direct current potential; i.e., pulsating direct current potential across terminals C and D of the output side of the power supply.

As to the circuit associated with primary winding J of transformer 32 the following discussion will appertain. Power supply 28 may comprise a rechargeable nickel-cadmium battery of 12 volts potential, and having ten individual cells; and the latter supplies current potential across the collectors of transistors 29 and 34. When the potential is initially applied, transistor 29 will be biased by resistor 26 and diode 21 such that the latter begins to conduct current through primary winding J of transformers 32 between the junction points 30 and 31. When this occurs, a voltage is also induced between point 31 and 38 of primary winding J, which begins to turn transistor 34 off. Simultaneously with this operation, a voltage is induced between junction points 30 and 23 of transformer 32, which acts to turn transistor 29 on. This effect also induces a voltage in secondary 40 of transformer 32 which, when rectified through the full-wave bridge, produces the pulsating direct-current output. As transistor 29 begins to turn on, transistor 34 is biased such that it begins to turn off more fully. This action continues until transistor 29 is completely turned on and transistor 34 is completely off. At this time, transistor 34, because of the action of capacitor 39, now begins to turn off. This induces a voltage between points 30 and 23 of primary winding J, which begins to turn transistor 29 back off. The same action induces a voltage between terminal points 35 and 38. This assists in turning transistor 34 more completely on. This action carries on until, once again, transistor 29 is fully off and transistor 34 is fully on. This action of one transistor turning on and the other turning off repeats itself in alternate manner on the order of several thousand times a second. Resistor 26 and diode 21 are used as a biasing network in order to be sure that when power is supplied to the circuit, one transistor will be turned on and the other off in order to initiate proper switching action. Capacitors 25 and 39 facilitate production of a square-wave output, where desired, of its power supply.

Resistors 22 and 37 serve to limit the current into respective transistors 29 and 34 during the time the associated transistor is turned on, in order to prevent damage to the transistor base junction. Variable resistor 52 serves to limit the current from battery 28 into the power supply circuit in order to control the output voltage occurring at terminal C and D. The purpose of this variation in output voltage is to control the flashing repetition rate of the lamp units, i.e., to provide a pleasing and desirable variation. The end result of the operation of the power supply shown in FIG. 3 is that transistors 29 and 34 convert the direct current from battery 28 to pulsating, full-wave rectifier direct current potential at terminals C and D. The entire effect is to raise the low-voltage potential of battery 28 to a sufficiently high voltage to operate the lamp units in this design. An example of the turns ratios for transformer 32 would be a ratio of 1 turn between terminals 23 and 30 of the primary winding J to three turns between terminals 30 and 31 of the primary winding J, to three turns between terminals 31 and 35, to one turn between terminals 35 and 38. Secondary winding 40 has then a ratio number of approximately 30 turns. Primary winding J then has a total number of 8 turns vs. 30 turns on secondary winding 40. If battery 28 has a voltage of 12 volts, then upon conduction of the transistors, 12 volts will be applied between points 30 and 31 of primary winding J, which then provides a voltage output of approximately 120 volts across the ends 41 and 42 of secondary winding 40.

In FIG. 4, power supply 19 is shown in its correct,

miniaturized form and includes the output terminals C and D, as shown in FIG. 2. There may likewise be supplied, in effect, an extension cord for the power supply; such an extension cord may take the form of cord 61 in FIG. 4, having corresponding output terminals C and D. These latter are soldered to arcuate conductive strips 55 and 56 which are disposed upon a clothlike, flexible, insulative, Mylar base 57, the combination forming a flexible printed circuit strip 63. The conductive strip 56 includes a plurality of mounting ears 59 having respective, contact-receiving apertures 65. Correspondingly, conductor strip 55 includes a plurality of mounting ears 60 which are respectively provided with mounting apertures 64. The composite Mylar strips 63 may be formed by conventional photo-etch process which is standard in the production of printed circuits. Lamp units 51 (LU of FIG. 2), see FIG. 5, are preferably individually encased in suitable plastic (or other suitable material) "gems," i.e., gem or simulated-gem bodies 66. These are preferably injection molded as independent units, with all of the circuitry of FIG. 1 contained therein and including the output leads (see FIG. 6) at A and B. These output leads or terminals A and B are thrust through the corresponding apertures 65 and 64 in FIG. 6 and, when all of the gem units, i.e., light units 51, are so placed, then the entire necklace assembly may be wave soldered for convenience of final assembly. This eliminates, then, the necessity of soldering each connection and 65 and 64 independently.

Interlocking clasp 58 and 62 in FIG. 4 completes instruction and may be any one of several sizes.

Leads C and D of the right-hand side of the extension cord 61 may form simply a plug-in prong which is inserted into the battery unit. This would serve as a convenient on-off connection.

It will be seen that the necklace unit as illustrated in FIGS. 4 and 5 is a physical embodiment of the block diagram shown in FIG. 2, with all of the light units (LU) 51 being disposed in parallel across the power supply terminals C and D. Slight differences in exact parameters relative to the values of resistor 10 and capacitor 16, and also slightly differing in electrical characteristics relative to the gas discharge tubes 15 will tend toward a random nature in the flashing of the gas discharge units in this regard.

The plastic encasements for the various light units 51 may be frosted or otherwise treated to provide any aesthetic effect desired. If desired, the gas tube light units as at 15 and 51 may be internally coated with a desired phosphor material to obtain the color required. The tubes themselves will be filled with mercury vapor or neon, argon, or other suitable gas. In addition, and where desired, an electro-luminescent element 67, as shown in phantom lines in FIG. 1, may be shunted across gas-discharge tube 15 in FIG. 1, to be activated by the electrical impulse produced by firing of the gas-discharge tube.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects, and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. Self-luminous jewelry including, in combination, plural, electrically-activated luminous means, plural individual circuit means respectively coupled to individual ones of said luminous means for activating said luminous means intermittently, a plurality of separate, simulated gem translucent bodies encapsulating respective ones of said luminous means with their respective individual circuit means, and a power supply coupled to said plural, individual circuit means, and wherein said power supply includes an elongate printed circuit having a pair of flexible conductors disposed on a flexible base, said gem bodies including electrical contacts protruding therefrom, engag-

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ing said conductors, and secured to respective ones of said circuit means.

2. Self-luminous jewelry including, in combination, plural, electrically-activated luminous means, plural individual circuit means respectively coupled to individual ones of said luminous means for activating, independently of the motion and disposition of the wearer, said luminous means intermittently, and a power supply coupled to said plural, individual circuit means, and wherein said individual circuit means comprise serially-connected, resistance-capacitance circuits each electrically coupled in parallel across said power supply, said luminous means each comprising respective, gas-discharge tubes shunted across respective ones of said capacitances and, wherein said luminous means comprise individual gas-filled bulbs and said power supply comprises a battery, and a voltage changing, direct-current to direct-current converter coupled to said battery.

3. Self-luminous jewelry including, in combination, plural, electrically-activated luminous means, plural individual circuit means respectively coupled to individual ones of said luminous means for activating, independently of the motion and disposition of the wearer, said luminous means intermittently, and a power supply coupled to said plural, individual circuit means, and, wherein said individual circuit means comprise serially-connected, resistance-capacitance circuits each electrically coupled in parallel across said power supply, said luminous means each comprising respective, gas-discharge tubes shunted across respective ones of said capacitances, and wherein said power supply comprises a battery, and a voltage changing, direct-current to direct-current converter coupled to said battery, and wherein said converter comprises converter means for producing a pulsating output voltage for respective ones of said individual circuits coupled thereto.

4. Self-luminous jewelry including, in combination, plural, electrically-activated luminous means, plural individual circuit means respectively coupled to individual

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ones of said luminous means for activating, independently of the motion and disposition of the wearer, said luminous means intermittently, a power supply coupled to said plural, individual circuit means, a flexible printed circuit member having spaced, conductor strips affixed to an insulative, flexible base, said individual circuit means being electrically connected across said conductor strips.

5. Structure according to claim 4 wherein each of said conductor strips include mounting apertures, said circuits including end terminals fixedly disposed in the apertures of respective ones of said conductor strips.

6. Structure according to claim 4 wherein said flexible printed circuit member includes intercooperating securement means at opposite extremities thereof for securing said printed circuit member about a portion of the body of the wearer.

7. Structure according to claim 4 wherein individual ones of said circuits with respective ones of said luminous means are encased in respective, translucent, simulated gem bodies, said circuits including terminals protruding from said bodies, said terminals being electrically connected to respective ones of said conductive strips.

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U.S. Cl. X.R.

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