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TOUCH RESPONSIVE LAMP OR THE LIKE

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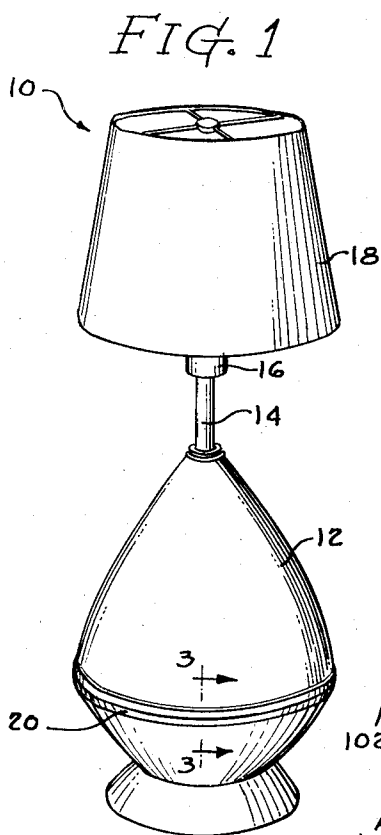


FIG. 3

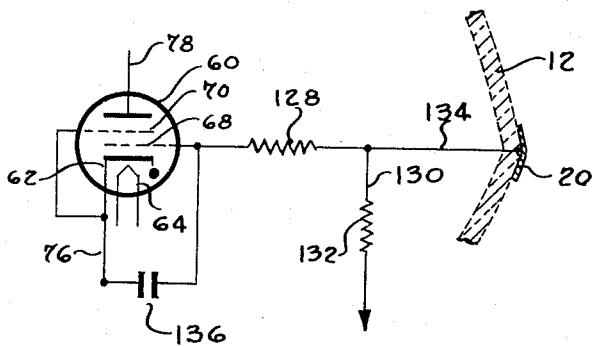


FIG. 2



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TOUCH RESPONSIVE LAMP OR THE LIKE

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4 Claims. (Cl. 317-149)

This invention relates to devices, such as lamps or the like, adapted to be controlled by the touch of a human hand or some other part of the human body thereto.

One principal object of the present invention is to provide a lamp or the like that may be controlled in a new and improved manner, merely by touching an electrode or the like on the lamp.

A further object is to provide a new and improved touch responsive device which is positive in operation and is not subject to spurious operation.

Another object is to provide a new and improved touch responsive device which is reasonably simple in construction and low in cost.

Further objects and advantages of the present invention will appear from the following description, taken with the accompanying drawing, in which:

Fig. 1 is a perspective view of a touch responsive table lamp constituting an illustrated embodiment of the present invention.

Fig. 2 is a circuit diagram of the lamp.

Fig. 3 is a fragmentary sectional view taken generally along a line 3-3 in Fig. 1, the view also showing a portion of the circuit diagram of Fig. 2.

As already indicated, Fig. 1 illustrates an exemplary table lamp 10 having a hollow base 12. Extending upwardly from the base 12 is a tubular column 14 which supports a lamp socket 16 and a lamp shade 18. The base is provided with an electrode 20 which may be touched to control the energization of the lamp socket 16. In this instance the electrode 20 takes the form of a ring, made of metal or other conductive material, and extending around the outside of the base 12. The ring 20 may be formed separately from metal and mounted on the base, or may be applied as a conductive coating to the base 12. In order to insulate the ring 20, the base 12 is made of insulating material, at least in the region immediately adjacent the ring 20. It will be understood that the electrode 20 may assume a variety of forms, other than the one illustrated.

The ring electrode 20 constitutes one element of a touch responsive control device 22 which is housed within the hollow base 12. To energize the lamp socket 16 and the control device 22, the lamp 10 is equipped with a power cord 24 or the like, comprising power line wires 26 and 28 adapted to be connected to an ordinary alternating current source, such as household electric mains delivering power at 117 volts and 60 cycles per second, or any other suitable voltage and frequency.

The illustrated control device 22 comprises a relay 30 adapted to control the energization of the lamp socket 16. As shown, the relay 30 comprises a winding 32 adapted to actuate a set of contacts 34. Any desired contact arrangement may be employed according to the functions to be performed by the contacts. If it is desired to employ the lamp 10 with a two-filament bulb adapted to provide three levels of light intensity, the contacts may be arranged accordingly. However, the illustrated lamp socket 16 is of the simple, one circuit type,

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adapted to receive a single filament lamp bulb 36. Correspondingly, the contact set 34 comprises simply a pair of spring contacts 38 and 40 adapted to be opened and closed. More specifically, the contacts 38 and 40 are normally open, but are adapted to be closed by flexure of the contact 38 toward the contact 40. It will be seen that the lamp socket 16 and the contacts 38 and 40 are connected in series across the line wires 26 and 28 by means of a circuit that may be traced from the line wire 26 through a lead 42, the contacts 38 and 40, a lead 44, the lamp socket 16, and a lead 46 to the line wire 28.

The relay 30 is arranged to operate the contacts 34 to each of their successive positions in turn, in response to successive cycles of energization and deenergization of the winding 32. Various means may be provided for this purpose, such as the illustrated ratcheting mechanism 48. It will be seen that the winding 32 actuates an armature 50 connected to a ratchet pawl 52. The armature 50 is yieldably biased in one direction, by gravity or a spring (not shown), and is adapted to be moved in the opposite direction by the winding 32. The pawl 52 is engageable with a ratchet wheel 54 and is adapted to advance the wheel in a step-by-step manner. In this instance, the ratchet wheel 54 is advanced 90 degrees for each cycle of energization and deenergization of the winding 32. A pawl or dog 56 prevents retrograde rotation of the ratchet wheel 54.

To operate the contacts 38 and 40, a two-lobed cam 58 is connected to the ratchet wheel 54 for rotation therewith. It will be seen that the cam 58 is adapted to move the contact 38 against the contact 40 in two of the four positions of the cam, the contacts 38 and 40 being open for the other two positions of the cam. Thus, the contacts 38 and 40 are alternately closed and opened by successive intervals of energization of the winding 32.

The relay 32 is arranged to be energized by an amplifying device shown as an electron discharge tube 60, preferably of the type containing an ionizable gas or vapor. The illustrated gaseous tube 60 is provided with a cathode 62, a heater filament 64 for heating the cathode to an electron emitting temperature, an anode 66, a control electrode or "grid" 68, and a second control electrode 70 which serves primarily as a shielding element and is connected directly to the cathode 62.

The cathode 62, the anode 66, and the relay winding 32 are connected in a series anode-cathode circuit 72 that may be traced between the line wires 26 and 28 through a first filtering resistor 74, a lead 76, the cathode 62, the anode 66, a lead 78, the winding 32, a lead 80, and a second filtering resistor 82. The filtering resistors 74 and 82 inhibit the transmission of high frequency spurious currents from the line wires 26 to the touch responsive control device 22 and thereby tend to prevent such currents from interfering with the normal operation of the control device, and from causing spurious operation. Thus, the resistors 74 and 82 may be of a low value, such as 68 ohms, for example.

It will be seen that a filtering capacitor 84 is shunted across the relay winding 32 so as to smooth the direct current through the relay winding and thereby inhibit chattering or noisy operation of the relay. A suitable value for the capacitor 84 is ten microfarads, for example.

To energize the heater 64 and supply biasing voltage, the control device 22 is equipped with a transformer 86 having a primary winding 88 connected across the line wires 26 and 28 through the resistors 74 and 82 and leads 90 and 92. The transformer 86 also has a secondary winding 94 which is connected to the heater 64. More specifically, one side of the secondary winding 94 is connected to the lead 90, in common with one side of the primary winding 88 and thence through the cathode lead 76 and the lead 96 to one side of the heater. The

other side of the secondary winding 94 is connected to the heater through a lead 98.

To supply the biasing voltage, the control device 22 is equipped with a bias supply 100 which is energized from the transformer secondary winding 94. It will be seen that the bias supply includes a rectifier 102 for supplying direct current from the alternating current source, and a filter 104 for smoothing the direct current. More specifically, the rectifier 102 is of the half-wave type. One terminal of the rectifier 102 is connected to one side of the transformer secondary winding 94 by a lead 106. The filter 104 includes a filtering capacitor 108, connected between the other terminal of the rectifier 102 and the other side of the secondary winding 94 by means of leads 110 and 112. The capacitor 108 may be of fairly high value, such as ten microfarads, for example. Connected across the capacitor 108 is a voltage divider 114 comprising resistors 116 and 118 connected in series by means of leads 120, 122 and 124. Suitable values for the resistors 116 and 118 are 220,000 and 333,000 ohms, for example.

In this instance, the junction lead 122 and the end lead 124 serve as output terminals of the bias supply 100. The negative voltage developed between the leads 122 and 124 is applied between the control electrode 68 and the cathode 62 by means of an input circuit 126. Starting from the control electrode 68, the input circuit 126 may be traced to the cathode 62 through a resistor 128, a lead 130, a second resistor 132, the lead 122, the resistor 118, the lead 124, and the cathode lead 76. The resistors 128 and 132 may be of a fairly high value, such as one megohm each, so that the input circuit will have a high impedance. In this instance, a lead 134 is connected between the touch receiving electrode or ring 20 and the lead 130. Through the resistor 128, the touch receiving electrode 20 is connected to the control electrode 68 of the electron discharge tube 60.

In the illustrated arrangement, a filtering capacitor 136 is connected between the control electrode 68 and the cathode 62 so as to bypass high frequency currents and thereby prevent spurious operation of the control device 22. The capacitor 136 may be of a fairly low value, such as .001 microfarad. A capacitor 138 is connected between the cathode 62 and the conductive chassis or base on which the components of the control device 22 are mounted, the chassis being represented at 140 by the ground symbol. A suitable value for the capacitor 138 is .005 microfarad, for example.

In the operation of the touch responsive lamp 10, the heater 64 of the gaseous electron discharge tube 60 is energized whenever the line wires 26 and 28 are connected to a source of alternating current. The energization of the heater 64 conditions the tube 60 for operation. Under normal conditions, when the ring electrode 20 is not being touched by anyone, the gaseous tube 60 is maintained non-conductive by the negative biasing voltage provided by the bias supply 100. However, when the hand or any other part of the body is brought into contact with the electrode 20, the gaseous tube 60 is rendered conductive. More specifically, touching the electrode 20 has the effect of partially grounding the control electrode 68 and thereby reducing the effective biasing voltage between the control electrode and the cathode 62. Moreover, touching the electrode 20 has the effect of producing an alternating voltage between the control electrode 68 and the cathode 62. This is due to the fact that the cathode 62 is connected directly to one side of the power line, while the body is capacitively related to both sides of the power line and hence tends to assume an intermediate potential. This alternating potential, due to body capacity, is not dissipated by the high impedance input circuit 126 and hence is transmitted to the control electrode 68.

When the gaseous tube 60 is rendered conductive by touching the electrode 20, current flows in the anode-

cathode circuit 72 and is effective to energize the relay winding 32. Accordingly, the pawl 52 is actuated and the ratchet wheel 54 is advanced one step. In this way, the contacts 34 are actuated to the next position in their sequence. Successive intervals of energization are effective to actuate the contacts to each of their positions in turn. More specifically, the illustrated contacts are alternately closed and opened by successive applications of the hand to the electrode 20.

The filtering resistors 74 and 82 tend to prevent high frequency currents from travelling from the power line to the control device. Thus the control device is isolated from the spurious effects of such interfering currents. Moreover, the capacitor 136 tends to bypass high frequency interference between the control electrode 68 and the cathode 62.

The touch responsive control device provides an extremely convenient arrangement for controlling the lamp. It is an easy matter to locate the lamp in the dark and place the hand against the control electrode so as to turn on the lamp. Moreover, the operation of the lamp is virtually effortless. Furthermore, the operation of the lamp by touch alone gives the lamp an attractive air of mystery. Thus the lamp is easy to sell and satisfying to the purchaser.

Various other modifications, alternative constructions and equivalents may be employed without departing from the true spirit and scope of the invention as exemplified in the foregoing description and defined in the following claims.

I claim:

1. In a touch responsive device for controlling an electrical circuit, the combination comprising a relay having an actuating coil, a set of contacts, and a ratcheting mechanism operable by said coil and effective to operate said contacts to successive positions in a cyclical manner responsive to successive intervals of energization of said coil, an electron discharge device containing an ionizable gas and including a cathode, an anode and a control electrode, first and second supply lines for direct connection to a source of household alternating current, an output circuit connected between said supply lines and connecting said cathode, said anode, and said coil in series therebetween, a transformer having a primary winding connected across said lines, said transformer having a secondary winding, a bias supply energized from said secondary winding and including a rectifier for supplying a direct voltage and a filter for smoothing said direct voltage into a biasing voltage, a touch receiving electrode adapted to be contacted by a portion of a human body, a first resistor of high value connected between said touch receiving electrode and said control electrode of said electron discharge device, said bias supply having positive and negative output terminal elements for delivering said biasing voltage, said positive terminal element being connected to said cathode, means including a second resistor of high value for applying said biasing voltage from said negative terminal element to said touch receiving electrode, said biasing voltage thereby being applied between said control electrode and said cathode of said electron discharge device, and a capacitor of small value connected between said control electrode and said cathode for bypassing high frequency interference, said capacitor having a substantial impedance with respect to the value of said first capacitor at the frequency of the alternating current source, said first resistor and said capacitor thereby affording small attenuation at the frequency of said source while affording progressively increasing attenuation with increasing frequency so that high frequency interference will be highly attenuated, said electron discharge device being normally maintained non-conductive by said biasing voltage but being rendered conductive by application of a portion of a human body to said touch receiving electrode.

2. A touch responsive device comprising a relay in-

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cluding a winding, a set of contacts operable to a plurality of positions, and means for actuating said contacts to each of said positions in turn in response to successive intervals of energization of said winding, a gaseous electron discharge tube including a cathode, a cathode heater, an anode, and a control electrode, a pair of power lines adapted to be connected directly to a household alternating current source, means connecting said winding, anode and cathode in a series anode-cathode circuit between said power lines, a transformer having a primary winding connected to said power lines and a secondary winding connected to said heater, a bias supply having input means connected to said secondary winding for energization therefrom, a rectifier for supplying a direct voltage, a filter for smoothing said direct voltage into a biasing voltage, and negative and positive output terminal elements for delivering said biasing voltage, said positive terminal element being connected to said cathode, a touch receiving electrode, means including a resistor of high value for applying said biasing voltage from said negative terminal element to said touch receiving electrode, a second resistor of high value connected between said touch receiving electrode and said control electrode of said tube, and a capacitor of small value connected between said control electrode and said cathode for bypassing high frequency interference, said capacitor having a substantial impedance with respect to the value of said second resistor at the frequency of the alternating current source, said second resistor and said capacitor thereby affording small attenuation at the frequency of said source while affording progressively increasing attenuation with increasing frequency so that high frequency interference will be highly attenuated, said tube normally being maintained non-conductive by said biasing voltage but being rendered conductive by application of a portion of a human body to said touch-receiving electrode.

3. A touch-responsive device comprising a relay having a set of contacts and a winding for operating said contacts, a gaseous electron discharge tube, including a cathode, an anode and a control electrode, a pair of power lines adapted to be connected to an alternating current source, means connecting said winding, anode and cathode in a series anode-cathode circuit between said power lines, biasing means for supplying negative biasing voltage, a high impedance input circuit for applying said negative biasing voltage between said control electrode and said cathode to inhibit conduction between said anode and said cathode, a touch-receiving electrode, a resistor of high value connected between said touch-receiving electrode and said control electrode, and a capacitor of small value connected between said control electrode and said cathode for by-passing high frequency

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interference, said capacitor having a substantial impedance with respect to the value of said resistor at the frequency of the alternating current source, said resistor and said capacitor thereby affording small attenuation at the frequency of said source while affording progressively increasing attenuation with increasing frequency so that high frequency interference will be highly attenuated, said tube normally being maintained non-conductive by said biasing voltage but being rendered conductive by application of a portion of a human body to said touch-receiving electrode.

4. A touch-responsive device, comprising a relay having a set of contacts and a winding for operating said contacts, a gaseous electron discharge tube including a cathode, an anode and a control electrode, a pair of power lines adapted to be connected directly to a household alternating current source, means connecting said winding, anode and cathode in a series anode-cathode circuit between said power lines, a bias supply connected to said power lines for energization therefrom and including means for supplying a uni-directional negative biasing voltage, a high impedance input circuit for applying said negative voltage between said control electrode and said cathode to inhibit conduction between said anode and said cathode, a touch-responsive electrode, a resistor of high value connected between said touch-responsive electrode and said control electrode, and a capacitor of small value connected between said control electrode and said cathode for by-passing high frequency interference, said capacitor having a substantial impedance with respect to the value of said resistor at the frequency of the alternating current source, said resistor and said capacitor thereby affording small attenuation at the frequency of said source while affording progressively increasing attenuation with increasing frequency so that high frequency interference will be highly attenuated, said tube normally being maintained non-conductive by said biasing voltage but being rendered conductive by the touch of a person upon said touch-responsive electrode.

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