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3,147,928

LIGHTING DEVICE

Filed April 26, 1962

Fig. 1

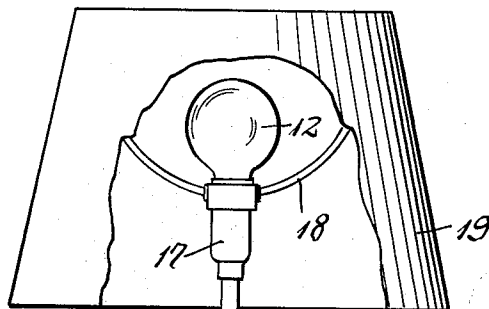


Fig. 2

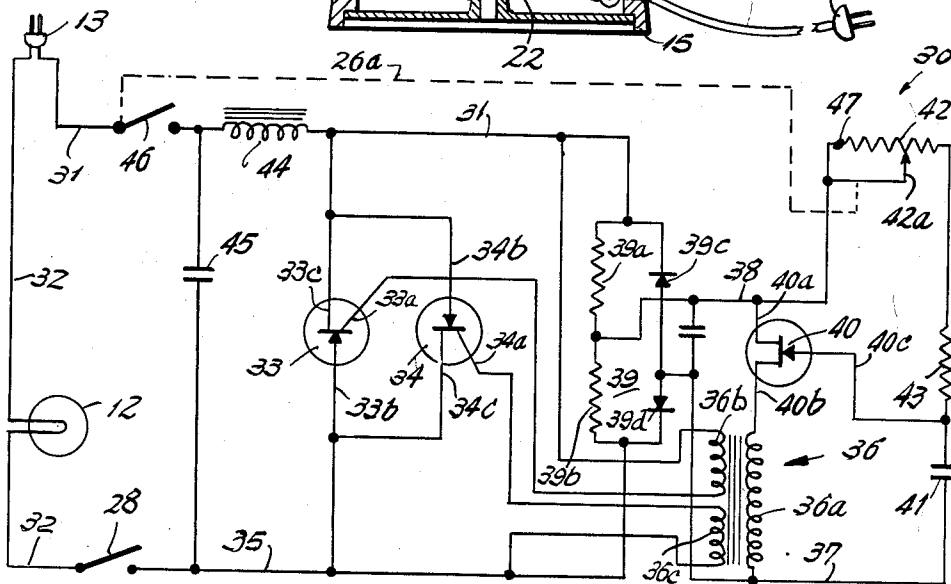
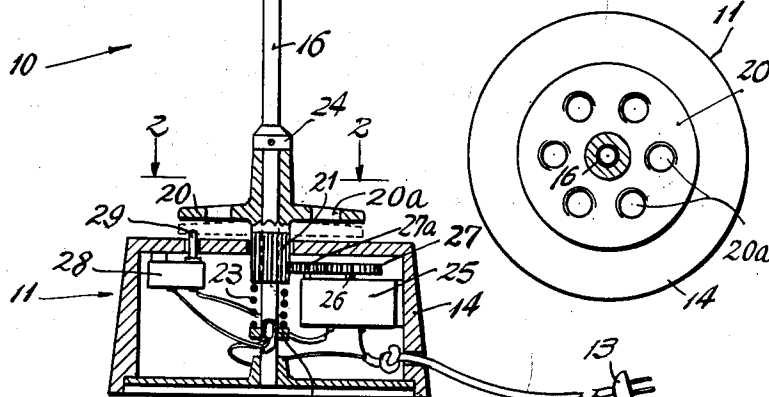


Fig. 3

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3,147,928

LIGHTING DEVICE

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1 Claim. (Cl. 240—123)

The present invention relates to a lighting device or fixture and more particularly to such a device for domestic, commercial and industrial use and which constitutes a self-contained lighting unit.

Devices of this type generally are referred to as lamps and in the specific embodiment of the present invention include an incandescent bulb and a base on which the bulb is mounted so that merely plugging in the usual wire from the lamp to the ordinary household electric current socket provides for electrical energization and subsequent luminosity of the bulb.

While such lamps are generally provided with an on-off control switch, the need for providing various degrees of luminosity of the bulb has become established as indicated by the conventional three-way switch and bulb structure. While this provides some control over the luminosity it is not completely satisfactory and thus efforts have been made to provide a substantially greater number of degrees of luminosity so that the brilliance of the lamp may be adjusted from zero to maximum without perceptible steps. Such devices, however, prior to the present invention have not been completely satisfactory for numerous reasons, one of which is the difficulty as with resistors, etc. in producing heat within the lamp which apply to other devices and may apply to resistors also include not providing sufficient number of degrees of luminosity, being large and cumbersome, and/or being quite heavy. Thus these latter structural requirements of devices for controlling the luminosity have limited the usage of a control means in addition to greatly restricting the shape of the lamp and hence its aesthetic value.

It is accordingly an object of the present invention to provide in a lighting device having an incandescent lamp and a base for control means which overcomes the above-noted objects and yet enables adjustment of the luminosity of the incandescent bulb from zero to maximum in substantially stepless increments.

Another object of the present invention is to provide a lamp having a luminosity regulating device for achieving the above objects in which the regulating device is relatively minute placing little, if any, restrictions on the lamp shape yet reliable in use and may be economically mass produced.

A further object of the present invention is to provide in a lamp having an incandescent bulb for control means which enables the lamp to be electrically disconnected from and connected to the source of electrical energy at one degree of luminosity of the bulb and yet also permits electrical disconnection from and connection to the electric source at any degree of luminosity of the bulb.

In carrying out the present invention, there is provided a lamp base in which an incandescent bulb is supported. The base is preferably made hollow to have mounted thereon a substantially heatless regulating device that includes at least one semiconductor element of the type having an anode, cathode and gate and is sometimes re-

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ferred to as a silicon controlled rectifier or SCR. The regulating device further includes a manually operable control part that projects from the base so that movement of the control part provides for the change in luminosity of the bulb. The regulating means, as specifically hereinafter set forth, includes a variable resistance capacitance network and by changing the value of the resistance by the control part, the duration of the conduction of each of the SCR's during each one-half cycle of alternating current is accordingly also adjusted thereby regulating the power to the incandescent bulb and hence its luminosity.

The control part moreover is mounted to have two movements; one is rotational which specifically causes the changes in the luminosity and the other is axial. The axial movement is employed to operate a switch which electrically connects and disconnects the lamp from a source of alternating current at any rotational position of the control means while the control means at the zero position of luminosity also has a switch for electrically disconnecting the lamp from the source.

Other features and advantages will hereinafter appear.

In the drawing:

FIGURE 1 is an elevation, partly in section, of a lighting device according to the present invention.

FIG. 2 is a section taken on the line 2—2 of FIG. 1.

FIG. 3 is an electrical schematic diagram of the electrical connections of the lamp of the present invention.

Referring to the drawing, the lighting device of the present invention is generally indicated by the reference numeral 10 and includes a stand 11 and an incandescent bulb 12, such as a tungsten filament type. The lighting device 10, as shown, is that which is commonly referred to as a table lamp in that it is a unitary structure which requires no other connection for operation except the plugging in of an electrical plug 13 to the usual household socket. It is also contemplated that the present invention includes other unitary devices such as floor lamps, wall and ceiling supported fixtures having integral control means and which may have one or more incandescent lamps.

Referring specifically to the lighting device 10, there is provided a somewhat cylindrical base 14 that is hollow and has a bottom support 15. Secured on the base is an upright 16 having mounted at its end a conventional incandescent bulb socket 17 into which the bulb 12 is screwed. Further, the upright 16 supports a shade bracket 18 and a shade 19 which may be of any desired construction.

The present invention provides for controlling the degree of luminosity of the bulb 12 and to this end has a manipulatable or control part 20 rotatably and axially mounted on the upright 16 and including a geared portion 21 that projects within the base 14. The control part 20 if desired may have finger holes 20a. For urging the control part upwardly an abutment 22 is secured on the upright forming a stop for a spring 23 with a stop 24 for the control part also being secured on the upright 16. Thus the control part may be rotated and also be moved axially.

For causing rotational movement of the control part to be translated into changes in the luminosity of the bulb 12 there is provided an enclosure 25 having a projecting shaft 26 provided with a gear 27 which through another gear 27a is coupled to the geared portion 21

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such that rotational movement of the control part 20 rotates the shaft 26. Moreover, within the base there is mounted a switch 28 of the single pole single throw type having an operating arm 29 which projects beyond the base 14 to be engaged by axial downward movement of the control part.

It will thus be appreciated that the incandescent bulb 12 may have its luminosity adjusted by the rotation of the control part 20 while downward movement actuates the switch 28 which, as will be hereinafter apparent, electrically disconnects and connects the lamp from the source connected to the plug 13 at any rotative position of the control part 20.

For achieving the above results, reference is made to FIG. 3 in which is shown the electrical schematic diagram of the structure mounted within the enclosure 25 and is generally referred to as the regulating device or means 30. The plug 13 is adapted to be connected to the usual household electrical socket of 110 volts A.C. and has a pair of leads 31 and 32. Connected across the two leads is a pair of silicon controlled rectifiers 33 and 34 with the rectifiers being mounted for conduction in opposite directions. It will accordingly be understood that there is current conduction from lead 31 through SCR33 for alternate one-half cycles of alternating current and current conduction through the SCR34 for the remaining one-half cycles of alternating current with both currents passing through the lead 35 to the switch 28, incandescent bulb 12, and the lead 32. Control of the current conduction through the SCR elements 33 and 34 will thereby enable control of the power to the bulb 12 and hence its degree of luminosity.

Each of the SCR elements 33 and 34 is of the semiconductor type and has a gate 33a and 34a respectively. Upon a signal of sufficient magnitude on the gate the SCR is rendered forwardly conducting from its anode 33b to its cathode 33c and for the SCR34, anode 34b to cathode 34c. Current conduction in the reverse direction is prevented by the blocking characteristics of the elements 33 and 34. For providing a signal on the gates 33a and 34a which is timed with the alternating current one-half cycles of each, to cause conduction of the amount of current and hence luminosity of the bulb 12 that is desired, there is provided a transformer 36 having a primary winding 36a and a pair of secondary windings 36b and 36c. The secondary winding 36b is connected between the lead 31 and the gate 33a while the secondary winding 36c is connected between the gate 34a and the lead 35. The primary winding 36a is connected across a pair of leads 37 and 38 that are the output from a resistance rectifier bridge 39 having resistance elements 39a and 39b in a pair of adjacent legs and one-way valve or diodes 39c and 39d in the other pair of legs. In series with the primary winding 36 there is connected a base 40a and another base 40b of a unijunction transistor 40 with the emitter 40c of the transistor 40 being connected through a condenser 41 to the lead 37. The base 40a is connected to the emitter 40c through a variable resistance 42 and a fixed resistance 43. The resistance 42 is connected to be operated by the shaft 26, as indicated by the dotted line 26a and hence by the control part 20.

With this electrical structure, the resistances 42 and 43 and condenser 41 provide a resistance capacitance network in which the charging rate of the capacitor 41 is determined basically by the adjusted resistance of the resistor 42 until the capacitor 41 is charged to a preselected level which is sufficient to fire the unijunction transistor 40 to provide a signal through the primary winding 36a which in turn is produced in the secondary windings 36b and 36c and is applied to the gates 33a and 34a, only one signal of course being an effective signal to cause conduction of its associated SCR.

It will be appreciated that by varying the charging rate that the time in each one-half cycle at which the signal appears in the winding 36a may thus be varied and by vary-

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ing such time the amount of power conducted by the SCR's 33 and 34 in each half cycle to the lamp is accordingly varied.

In order to prevent the possibility of producing interference, there is provided a radio interference choke 44 and condenser 45.

The shaft 26a that is connected to the variable resistor 42 is also connected to a switch 46 such that movement of the arm 42a of the variable resistance 42 from the off position indicated by the point 47, closes the switch 46 and maintains it closed for operation at luminosity levels thereafter.

The elements in the schematic diagram with the exception of the plug 13, its leads 31 and 32, switch 28 and bulb 12 may conveniently by reason of their small size be mounted in a conventional electrical outlet box or other enclosure of substantially similar size. Thus by reason of their small size and also as the elements are light, there is minimum limitations on the design of the lamp and hence it may be made to have that shape which is most aesthetically appealing. Moreover, by reason of the lack of any substantial heat produced by the electrical elements, the present invention is extremely safe to use and again there are removed limitations on the lamp design which would be present if a cooling area was required. The control of the power to the lamp 12 by the SCR circuit herein disclosed provides for substantially infinite resolution of the luminosity of the bulb thereby obviating perceptible steps.

It will accordingly be appreciated that there has been disclosed a lighting unit which is integral in itself and which includes within a hollow base a regulating means for controlling the amount of power to an incandescent bulb and hence for controlling the luminosity thereof. The control is easily changed by operation of a control part which is readily accessible by being outside of the base and connected through the base to the regulating means. Moreover, as the control part is capable of movement in two directions, the present invention provides for electrically disconnecting the lamp from the source in one position, i.e. the lowest luminosity level setting of the control part and regulating means, and provides for electrically disconnecting the lamp from the source at any level of luminosity. Thus a lamp of the present invention may have its luminosity varied from zero to maximum, may be electrically disconnected at zero or may be if after desired setting of luminosity has been found electrically disconnected and then connected without changing the desired luminosity setting.

Variations and modifications may be made within the scope of the claim and portions of the improvements may be used without others.

I claim:

A lighting device having a body formed to provide a base on which the lighting device is self-supporting and an incandescent lamp mounted on said body, an adjustable electric power regulating means mounted within said body and electrically connected to said lamp for varying the electric power to said lamp from a source of electrical energy and thereby its illuminating intensity, said regulating means including two semiconductor elements connected in parallel to be oppositely conductive with each element having an anode, cathode and gate, circuit means including an adjustable control means for varying the conduction of each element by signals applied to the gate of each element, a manipulatable part mounted on the base for both rotational and axial movement, means connecting the manipulatable part to the adjustable control means for adjusting the control means by rotative movement of the manipulatable part, first switch means electrically connected between said source and said lamp and having a first operating arm, means mounting the first arm for operation by the manipulatable part at one rotative position thereof for electrically disconnecting the lamp and the source, second switch means electrically

connected between said source and said lamp and having a second operating arm and means mounting the second operating arm for operation by axial movement of the manipulatable part for electrically connecting and disconnecting the lamp from the source at any rotative position of the manipulatable part.

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