Oct. 13, 1970 S. J. SKIRPAN 3,534,242

MODULAR CONTROL UNITS FOR LIGHT INTENSITY CONTROL SYSTEMS

Filed Aug. 21, 1968 2 Sheets-Sheet 1

FIG. 1

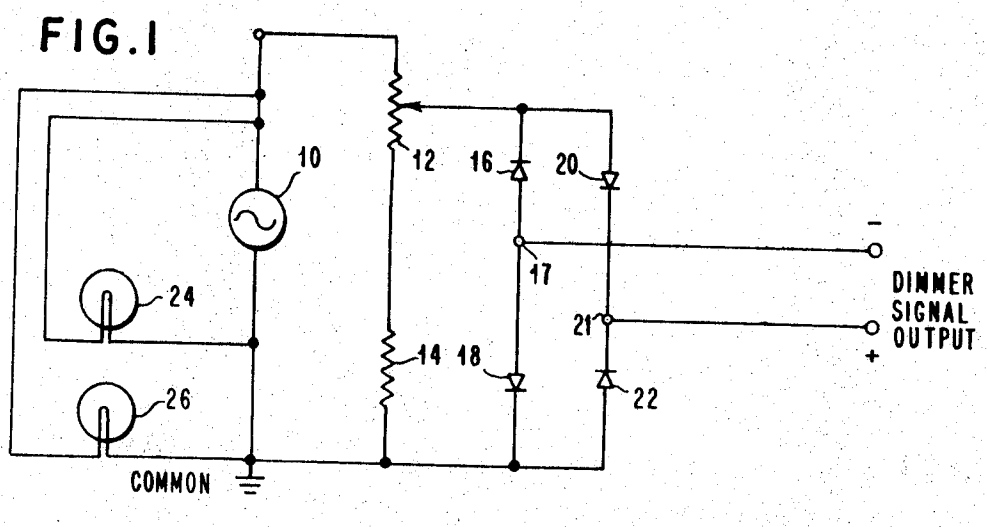



FIG. 2

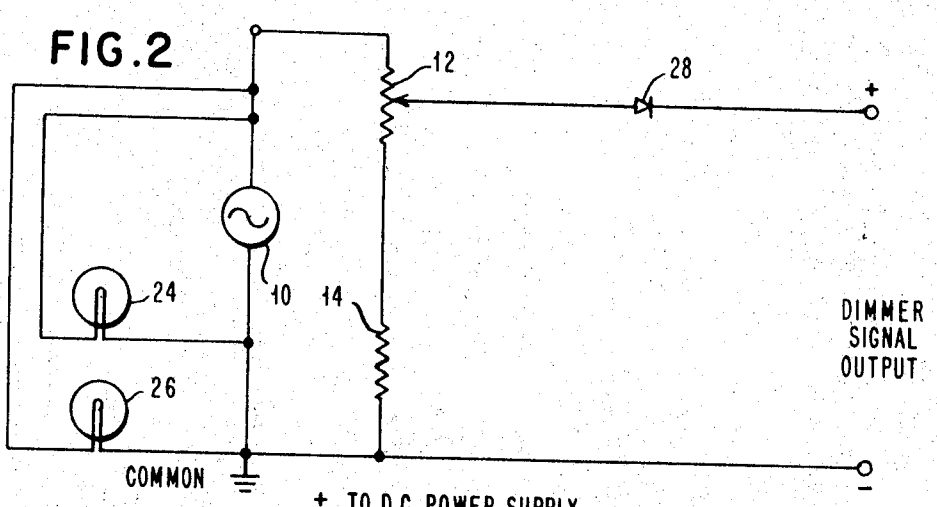
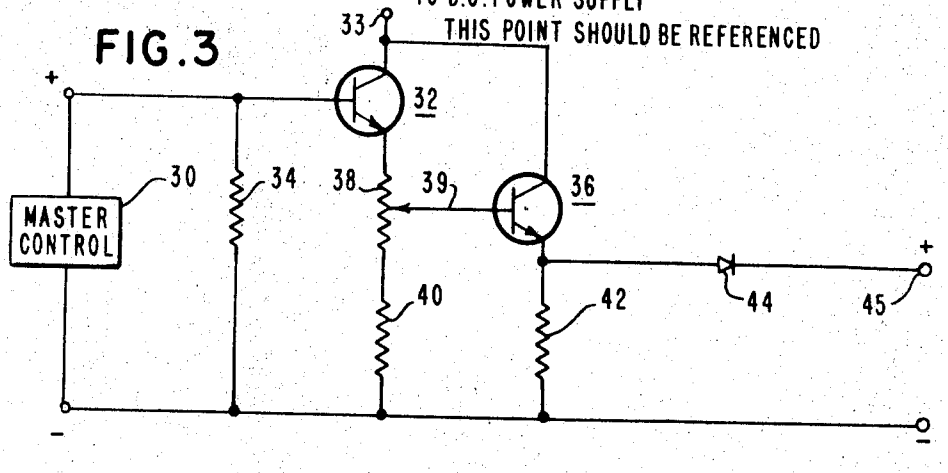



FIG. 3



Oct. 13, 1970 S. J. SKIRPAN 3,534,242

MODULAR CONTROL UNITS FOR LIGHT INTENSITY CONTROL SYSTEMS

Filed Aug. 21, 1968 2 Sheets-Sheet 2

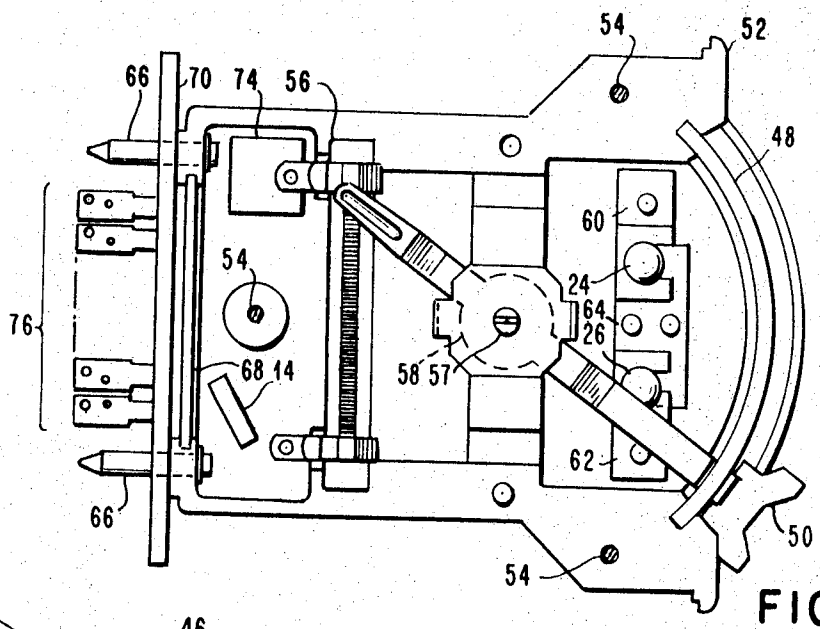



FIG.5

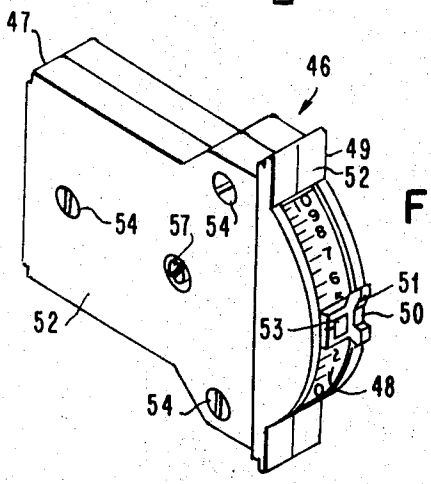



FIG.4

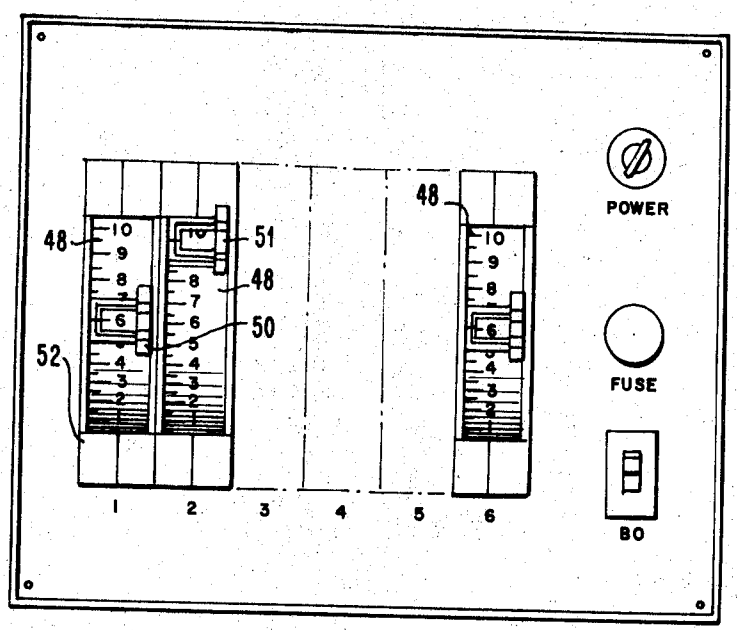



FIG.6

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3,534,242

# MODULAR CONTROL UNITS FOR LIGHT INTENSITY CONTROL SYSTEMS

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Int. Cl. H02m 7/04; H02b 9/00; H01g 5/02
U.S. Cl. 321—16 4 Claims

## ABSTRACT OF THE DISCLOSURE

A linearly actuated control potentiometer device is set forth, which can be easily operated between extreme positions in one continuous, smooth action. A stationary linearly engraved scale is provided for setting the device at intermediate positions between limits. To enable the single continuous motion, a knob and lever assembly is provided associated with the potentiometer which can be smoothly moved along the potentiometer; means being provided whereby the torque required to move the assembly is externally adjustable to suit operator preference. The device is suitably mounted in a molded plastic housing, whereby the total device is a plug in, friction held apparatus which may be easily removed for service or replacement without tools.

## BACKGROUND OF THE INVENTION

This invention relates to electrical control devices. More particularly, it relates to an improved device for adjustably controlling light intensity.

In the control of light intensity of large lamp loads in theatres, television studios, display areas, and the like, it has become the known practice to employ electronic dimmers to control the intensity of such large loads. A suitable example of such dimmers is the one disclosed in Pat. No. 3,397,344 to Stephen J. Skirpan, for Lighting Control Apparatus, issued Aug. 13, 1968 and assigned to the assignee of this invention. The output of these dimmers are, in turn, adjusted by remotely located miniature potentiometers which provide a low-level control signal to the dimmers.

The miniature potentiometers referred to above generally take the form of commercially available rotary potentiometers. The use of the latter type of potentiometers presents many disadvantages. For example, in their use, it is necessary for an operator to slowly, smoothly and accurately rotate the potentiometer from one extreme position to the other extreme position to effect light intensity changes between maximum illumination and no illumination, i.e., "blackout." A typical rotary potentiometer adapted to be angularly moved substantially the full 360 degrees is awkwardly manipulated by an operator between limits in one smooth movement. To overcome this deficiency, it has been attempted to reduce the angular traverse of the rotary potentiometer. However, such changing has not been effective in obviating the difficulty, since the control is rendered oversensitive thereby, with a consequent reduction in adjustability length.

Accordingly, it is an important object of this invention to provide an improved light intensity controller in the form of a linearly actuated control potentiometer.



It is another object of this invention to provide a potentiometer in accordance with the preceding object which may be easily operated between extreme positions in one continuous smooth action.

It is a further object to provide a potentiometer, as defined in the preceding objects, which enables the setting of the control at intermediate positions between limits.

## SUMMARY OF THE INVENTION

Generally speaking, and in accordance with the invention, there is provided a light intensity controller comprising a circuit for rectifying an alternating current potential applied thereto, the circuit including a potentiometer, and a knob and lever assembly having a knob portion and a lever portion operatively associated with the potentiometer as a slider therefor for moving the assembly in electrical contact along the potentiometer between chosen portions thereon in a single smooth movement.

For a better understanding of the invention, together with other and further objects thereof, reference is made to the following description, taken in conjunction with the accompanying drawings and its scope is pointed out in the appended claims.

In the drawings:

FIG. 1 shows an illustrative embodiment of a rectifying circuit containing a control potentiometer in accordance with the invention;

FIG. 2 shows an embodiment of another rectifying circuit containing a control potentiometer according to the invention;

FIG. 3 is a depiction of a further embodiment of a circuit containing a control potentiometer, according to the invention;

FIG. 4 is a three dimensional view of the controller unit of the invention;

FIG. 5 is a view of the interior of the contents of the light controller unit shown in FIG. 4; and

FIG. 6 is a depiction of an arrangement of a bank of the controller units shown in FIG. 4.

## DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to FIG. 1, there is shown therein a circuit constructed in accordance with the principles of the invention. In this circuit, the voltage from an AC source, **10**, which may suitably be 24 v. AC, 24 ma., is developed across the series arrangement of a variable resistance, **12**, and a resistor, **14**, resistor **12** being an adjustable potentiometer. Resistance **12** may suitably have a range of from 0 to 1000 ohms and resistor **14** which functions as a bias resistor may suitably have a value of 100 ohms. The adjustable AC voltage provided by the series arrangement is full-wave rectified by a rectifier comprising diodes, **16**, **18**, **20** and **22**. The negative rectified voltage output to the dimmer is taken from the junction, **17**, of the anodes of diodes **16** and **18**, and the positive rectified voltage output of the dimmer is taken from the junction, **21**, of the cathodes of diodes **20** and **22**. A pair of internal pilot lamps, **24** and **26**, are provided connected as shown, for providing scale illumination to an operator in dimly lit areas. The output to the dimmer may be from 1 to 21 v. DC.

In FIG. 2, there is shown a control circuit similar to that shown in FIG. 1, but which provides a half-wave rectified output through the action of a diode **28**.

The circuits shown in FIGS. 1 and 2 are advantageously utilized in most intensity control application for smoothly controlling one dimmer. However, in the situation of very large control systems which contain a very great quantity of controllers and dimmers, such as about 3000 controllers and 500 dimmers, such great quantity of controllers requires a relatively huge total input current which, in turn, requires a large master control, such as a variable autotransformer. In addition, in connection with the circuit shown in FIGS. 1 and 2, if a large number of dimmers are switched for control by a single controller, the control voltage will vary depending upon the load. Consequently, as a practical matter, only one dimmer may be accurately controlled from one controller, using the circuits depicted in FIGS. 1 and 2.

The control circuit shown in FIG. 3 is advantageously employed in large control systems without requiring a large master control and enables the controlling of a multiplicity of dimmers from one controller.

In the latter circuit, the control voltage for an NPN transistor, **32**, is provided from a master control, **30**, which may be another potentiometer and associated circuitry which may be used to master many controllers and developed across a resistor, **34**. The controller electrode positive potentials for transistor **32** and an NPN transistor, **36**, may suitably be derived from a standard DC power supply. Transistor **32** is connected as an emitter follower and its output is produced across the arrangement of a variable resistance **38**, i.e., the potentiometer controlled by the operator, and a fixed resistor, **40**. The voltage taken from slider is applied as an input to transistor **36**, which is also connected as an emitter follower, the output of transistor **36** being provided across a resistor, **42**. A diode, **44**, is included to insure that only positive voltage appears at the positive terminal **45**, to the dimmer. The NPN transistors **32** and **36** receive their collector positive potentials from the positive terminal **33** of a DC power supply. The circuit of FIG. 3 has two inputs. One of these inputs is a constant value DC power supply provided at point **33**. The other input is provided from master control **30** which is a variable DC input and which may be employed to master a quantity of controllers while still being miniature in size.

With the circuit shown in FIG. 3, the power amplification provided by transistor **32** enables the reduction of control current from master control **30** by a substantial factor, a suitable design application being a ratio of 15:1, so that large quantities of individual controllers may be mastered by a similar small controller. With the inclusion of transistor **36**, there is effected an insensitivity to loading change, a suitable design application being one where transistor **36** is insensitive to loading change in a ratio of 10:1.

FIG. 4 shows a three dimensional view of the controller constructed according to the invention. The controller comprises a housing, **46**, preferably of plastic, which comprises a portion, **47**, of generally parallelepiped configuration, and a flared portion, **49**, whose end is arcuate. The arcuate end of flared portion **49** contains a linear dial, **48**, suitable ranging from 0 to 10, with readily readable intermediate graduations, and a knob and lever arrangement, **50**, which an operator can readily move along the dial, thereby moving the potentiometer from one extreme to the other. Housing **46** may suitably comprise two like side plates, **52**, which are bolted together, as by bolts, **54**. The circuitry is contained within housing **46** and the pins for making connection to the circuitry extend from the appropriate circuit points through the end of portion **47**. The internal illuminating lamps, such as lamps **24** and **26**, shown in FIGS. 1 and 2, are suitably disposed within housing **46** to provide illumination at the upper and lower ends, respectively, of dial **48**. It is noted that the knob of knob-and-lever assembly has a projecting portion, **51**, for ready manipulation by the operator and an open, window-like, rectangular panel, **53**, through which the scale-setting on dial **48** is readily ascertained.



FIG. 5 shows the controller of FIG. 4, with one side of side plates **52** removed, to indicate the internal arrangement therein. In this device, **56** is the variable resistor assembly which the knob and lever ararngement **50** traverses to provide control, contact washers being contained in section **58**. Brackets, **60** and **62**, are for mounting the internal illuminating lamps, such as lamps **24** and **26** shown in FIGS. 1 and 2. Structure, **64**, is a light contact plate. Pins **66**, are guide pins for properly inserting the controller in the socket. Strip, **68**, functions as a contact strip and strip, **70**, is operative as an outer contact strip. Lamps **24** and **26** are disposed as shown. Structure **14** is a bias resistor, such as resistor **14** shown in FIGS. 1 and 2, respectively, and structure, **74**, includes the rectifier, such as the full-wave rectifier and half-wave rectifier shown in FIGS. 1 and 2, respectively. The pins, generally designated by the numeral **76** are those connected to the appropriate circuit terminals.

FIG. 6 depicts the packaging of a bank of controllers according to the invention.

To summarize the above, it is seen that the light intensity controller according to the invention includes:

(1) A linear activated control potentiometer which may be easily operated between the extreme positions in one continuous smooth action by virtue of the operation of knob and lever assembly **50**.

(2) A linear activated control potentiometer with a stationary linear scale **48** for setting the control at intermediate points between limits.

(3) A linear activated potentiometer with a rear illuminated scale for operation in places where subdued illumination is necessary, by the use of lamps **24** and **26**.

(4) A linear activated control potentiometer with a novel control knob, whereby the scaler setting appears through window **53**.

(5) A linear activated control potentiometer with an internal solid state rectifier to provide an adjustable direct current signal suitable to control a remote electronic dimmer with an alternating current input supplied to the potentiometer.

(6) A linear activated control potentiometer mounted in a plastic enclosure, whereby the entire unit is a plug-in, friction-held apparatus which may be easily removed for service or replacement without the need for the use of tools.

With the aid of screw **57** (FIGS. 4 and 5), an adjustment may be made by the operator whereby the torque or force required to move assembly **50** may be reduced and is externally adjustable to suit operator's preference.

While FIG. 5 does not show the inclusion of the circuit of FIG. 3, it is, of course, to be realized that it is contemplated to be within the spirit and scope of the invention to effect such inclusion.

While there have been described what are considered to be preferred embodiments of this invention, it will be obvious to those skilled in the art that various modifications and changes may be made therein, without the exercise of any inventive ingenuity and within the spirit and scope of the invention. It is intended, therefore, to cover in the appended claims all such changes and modifications.

What is claimed:

**1.** In a light intensity controller including an adjustable potentiometer for providing an adjustable output voltage from an input voltage coupled thereacross an improved potentiometer mounting and indicator and contact means comprising the combination of spaced generally rectangular front and rear panels having relatively short top and bottom edges and a pair of elongated generally vertical side edges, elongated top and bottom walls connecting said spaced top and bottom edges and a pair of side walls connecting said front and rear panel

side edges whereby said panels and said walls form a hollow casing with a relatively deep and high cavity, electrical coupling means on the rear panel for releasably engaging a control panel, said front panel having a forwardly extending arcuate surface comprising an indicator panel, an elongated resistor positioned in the rear portion of said cavity, a contactor having a conductive portion slidably engaging said resistor, said contactor being pivotally mounted in said cavity intermediate said resistor and said indicator panel and having a contact knob at its forward end positioned to move in an arcuate path along said indicator panel to provide an output voltage indicator.

2. The controller as claimed in claim 1 in which said indicator panel is light permeable and said contact knob includes a light permeable panel viewing aperture.

3. The controller as claimed in claim 1 in which said pivoted contactor mounting includes externally accessible means for adjusting the force required to move said knob along said indicator panel.



4. The controller as claimed in claim 1 which further comprises rectifier means mounted in said cavity and connected to said resistors.


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U.S. Cl. X.R.

317—101; 321—8; 323—94; 338—165, 184