

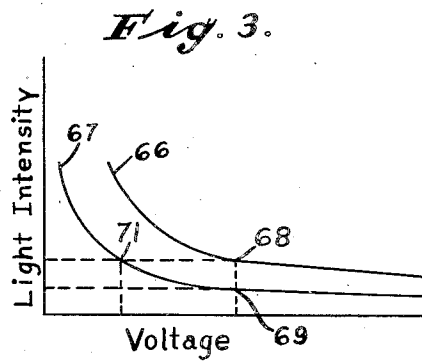
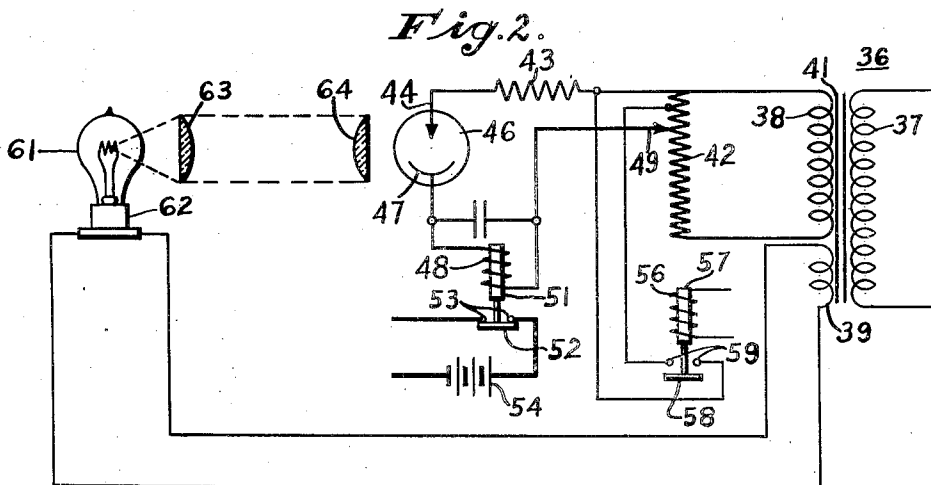
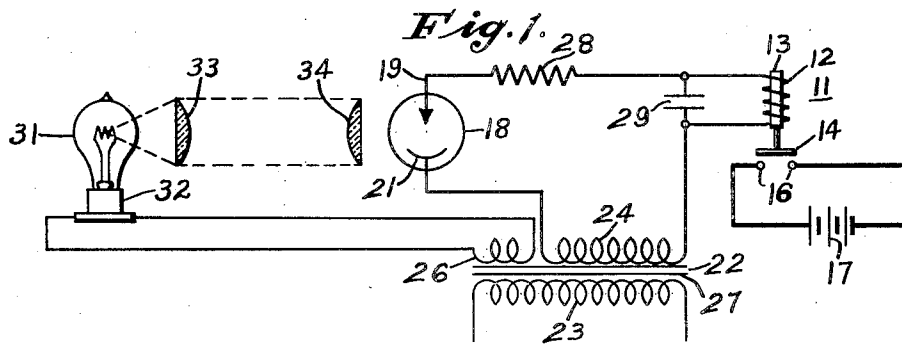
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LIGHT RELAY SYSTEM

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LIGHT-RELAY SYSTEM

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My invention relates to control systems and more particularly to lock-out systems embodying a photo glow tube.

An object of my invention is to provide a relatively simple and easily operated lock-out system embodying an electromagnetic relay and an actuating means therefor.

In practicing my invention, I provide an electromagnetic relay and photo glow tube for controlling the energization of the relay and a light source for normally energizing the photo glow tube.

In a single sheet of drawings:

Figure 1 is a schematic diagram of connections of a system embodying my invention;

Fig. 2 is a diagram of connections of a modified form of the system embodying my invention; and

Fig. 3 is a view showing two characteristic curves of a photo glow tube.

Referring to Fig. 1 of the drawings, I have there shown an electromagnetic relay 11 comprising an actuating coil 12, a core 13, a contact bridging member 14 and a pair of fixed contact members 16. The latter are connected in circuit with a source of supply 17 of electric energy and constitute a work circuit. It is to be understood that any mechanical or electrical effect usually obtainable may be controlled by the circuit embodying the supply 17, the contact members 16 and the bridging member 14.

Means for controlling the energization of the coil 12 comprises a photo glow tube 18 of usual construction and embodying in addition to a transparent casing an anode 19 and a cathode 21. As the construction of a photo glow tube is quite well known, it is not believed necessary to further describe the tube.

A transformer 22 comprises a primary winding 23, a secondary winding 24, an auxiliary secondary winding 26 and a suitable core 27. One terminal of the secondary winding 24 is connected to the cathode 21 while the other terminal thereof is connected to one terminal of the coil 12. The other terminal of the coil 12 is connected to a limiting resistor 28 whose other terminal is con-

nected to the anode 19. A condenser 29 is connected in shunt circuit relation to the coil 12 in order to smooth out the ripple in the current traversing the coil of the relay.

A source of radiant energy adapted to affect the photo glow tube 18 comprises a suitable incandescent lamp 31 mounted in a socket 32, the terminals of the connecting portions of the socket being connected to the auxiliary secondary winding 26. A lens 33 is associated with the light source 31 and a lens 34 is associated with the photo glow tube 18.

Referring more particularly to Fig. 2 of the drawings, I have there illustrated a modified form of system embodying my invention. A transformer 36 comprises a primary winding 37, a main secondary winding 38 and an auxiliary secondary winding 39, together with a core 41.

The main secondary winding 38 is connected to a resistor 42. One terminal of the resistor 42 is connected through a limiting resistor 43 with an anode 44 of a photo glow tube 46 of the same general type as hereinbefore set forth in connection with the tube 18 shown in Fig. 1 of the drawings. A cathode 47 of the tube 46 is connected to one terminal of an actuating coil 48, the other terminal of the coil being connected through an adjustable or movable contact member 49 to the resistor 42.

The actuating coil 48 is adapted to energize a core member 51 having operatively associated therewith a contact bridging member 52 which is adapted to engage or be disengaged from stationary contact members 53 connected in series-circuit relation with a source of supply of electric energy here represented generally by a battery 54.

Means for varying the voltage applied to the photo glow tube 46 comprises an actuating coil 56 for energizing a core 57 which has operatively associated therewith a contact bridging member 58. This member is adapted to be engaged with or be disengaged from fixed contact members 59. One of the fixed contact members 59 is connected by a suitable conductor to the junction point between the resistor 42 and the limiting resistor 43.

The other fixed contact member 59 is connected to a point on the resistor 42 intermediate between the end connected to the resistor 43 and the point of connection of the contact member 49.

Means for energizing the photo glow tube by radiant energy comprises a lamp 61 mounted in a base 62, the contact terminals in the base 62 being connected by suitable conductors to the auxiliary secondary winding 39 of the transformer 36. A lens 63 is operatively associated with the light source 61 and a lens 64 is operatively associated with the photo glow tube 46.

The characteristic curve of a photo glow tube between the voltage applied to the electrodes of the photo glow tube and the light intensity, is indicated by the two curves 66 and 67 shown in Fig. 3 of the drawings. Curve 66 indicates the relation which exists between the intensity of the light impinging on the photo glow tube and the voltage applied to the electrodes of the tube, at which the tube becomes conducting. Curve 67 indicates the relation between the light intensity and the voltage at which the tube becomes non-conducting. The break-down curve 66 shows that a value of light intensity which lies above the point 68 of the curve at a voltage corresponding to the point 68 and the scale of voltage to which the curve is drawn, will cause the tube to become conducting. At a light intensity slightly lower than this value, while the voltage remains the same, the tube will still be conducting and will continue to be conducting until the light intensity reaches the value indicated by the point 69, and at a value below this, the tube will become non-conducting. In other words, if the light intensity has been such as to have a value lying above the curve 66, the tube is conducting for a given voltage and the tube will remain conducting until the light intensity is reduced to a value below that given by the curve 67 for that voltage.

If on the other hand, the light intensity be maintained constant, as, for instance at the value corresponding to point 68, and the voltage be reduced, the tube will continue to be conducting until a value of voltage is reached corresponding to point 71 and any further reduction to a voltage value below that indicated by curve 67 will result in the tube becoming non-conducting.

It is sometimes highly desirable, and, in fact, necessary to have a system which will remain in a predetermined operative condition during normal operating conditions, which will change to another condition upon the occurrence of abnormal operating conditions, but will not return to the initial conditions even though normal operating conditions are restored. A photo glow tube when employed in the manner shown in the drawings and to be hereinafter described in

detail will provide such an automatically operative lock-out control system.

Let it be assumed first that the light intensity impinging on the photo glow tube is to be varied, while the voltage applied to the photo glow tube is to remain substantially constant, the system and circuit will then be so adjusted that the light intensity for a voltage corresponding to the points 68 and 69 will be at a value intermediate the two curves 66 and 67. It may be necessary to momentarily increase the light intensity to a value above that indicated at the point 68 for that predetermined voltage in order to render the tube electric conducting, but the light intensity should then be reduced to a value below that given by the curve 66 for that predetermined voltage.

Suppose now that the intensity of the beam of light impinging on the tube 18 be reduced in some manner by an abnormal operating condition to a value below that indicated by curve 67. This may for instance be caused by a puff of smoke and will result in the tube becoming nonconducting and the coil 12 will be deenergized, the contact bridging member 14 will engage the terminal 16 and the work circuit controlled thereby will be energized.

Referring more particularly to Fig. 2 of the drawings, I have there illustrated means for varying the voltage applied to the photo glow tube. Let it be supposed that the circuit embodying the coil 56 be controlled in such manner that the coil 56 will be energized upon the occurrence of some predetermined abnormal operating condition. The contact bridging member 58 will then be caused to engage the contact terminals 59 and a portion of the resistor 42 will be short circuited and the voltage applied to the photo glow tube electrodes will be reduced.

This would result for instance in the voltage applied to the tube being reduced from a value slightly below that indicated by the point 68 on the curve 66 to a point below the point 71 on the curve 67, it being understood, of course, that the adjustments are made to obtain this result. Here also the photo glow tube would become non-conducting and even though the voltage applied to the tube terminals were to be returned to the original normal value, the tube would still remain non-conducting.

It is, of course, obvious that the intensity of the beam of radiant energy emitted by lamp 61 could be simultaneously controlled in a similar manner.

When the tube 46 becomes non-conducting, the coil 48 is deenergized and the normally closed work circuit embodying the source 54 is also deenergized and a suitable signal audible or otherwise may be actuated or some control step may be effected in a manner well known in the art.

The device and system embodying my in-

vention thus provides a relatively simple means for indicating at normal operating conditions and provides also an automatically operative lock-out means for preventing the return to the initial conditions of the system itself even though outside operating conditions may be returned to their original normal conditions.

Various modifications may be made in the method embodying my invention without materially departing from the spirit and scope thereof and I desire, therefore, that only such limitations shall be placed thereon as are imposed by the prior art or are set forth in the appended claims.

I claim as my invention:

1. In an electric circuit, a normally energized electromagnetic relay, a source of radiant energy normally emitting a beam of energy of a predetermined intensity, and means for deenergizing said relay upon momentary reduction in the intensity of radiant energy emitted by said source and maintaining it deenergized upon return of the intensity to its normal value comprising a light-sensitive glow tube in electric circuit with said relay and having an appreciable difference between the value of radiant energy at which it becomes conductive and the value at which it becomes non-conductive, the intensity of the beam affecting the glow tube being maintained at a value below that at which the tube becomes conductive.

2. In an electric circuit, an electromagnetic relay and automatically operative lock-out means for deenergizing said relay upon abnormal conditions and maintaining it deenergized upon return of normal conditions, said means comprising a light-sensitive glow tube connected in electric circuit with the relay and having an appreciable difference between the value of light intensity at which it becomes conductive and the value at which it becomes non-conductive, and a source of light providing an intensity of light affecting said glow tube which is intermediate of said limiting values of the tube.

3. In an electric circuit, an electromagnetic relay, and means for maintaining it in a predetermined condition during normal operating conditions, said means comprising a light-sensitive glow tube connected in circuit with and controlling the energization of the relay and having an appreciable difference between that value of energization at which it becomes conductive and that value at which it becomes non-conductive, and means for normally energizing the glow tube to a degree below that at which it becomes conductive.

4. In an electric circuit, an electromagnetic relay, and means for maintaining it in a predetermined condition during normal operating conditions, for changing said predetermined condition to a second condition upon the occurrence of momentary abnormal

operating conditions and for precluding the return to said first predetermined condition upon return of normal operating conditions, said means comprising a light-sensitive glow tube connected in circuit with and controlling the energization of the relay and having an appreciable difference between that value of energization at which it becomes conductive and that value at which it becomes non-conductive and means for normally energizing the glow tube to a degree intermediate said two values.

5. In an electric circuit, an electromagnetic relay, and means for maintaining the relay in a predetermined condition during normal operating conditions for changing the relay condition to a second condition upon the occurrence of momentary abnormal operating conditions and for precluding a return to said first predetermined condition upon return of normal operating conditions, said means comprising a light-sensitive glow tube connected in series-circuit relation with the relay, said tube having a predetermined characteristic curve of light intensity and voltage at which it becomes conducting and another predetermined characteristic curve of light intensity and voltage at which it becomes non-conducting and a source of alternating current energy connected to the relay and the tube and a light source affecting said tube, the tube being energized thereby to a degree intermediate said two characteristic curves.

In testimony whereof, I have hereunto subscribed my name this 6th day of November, 1928.

JOHN V. BREISKY.