

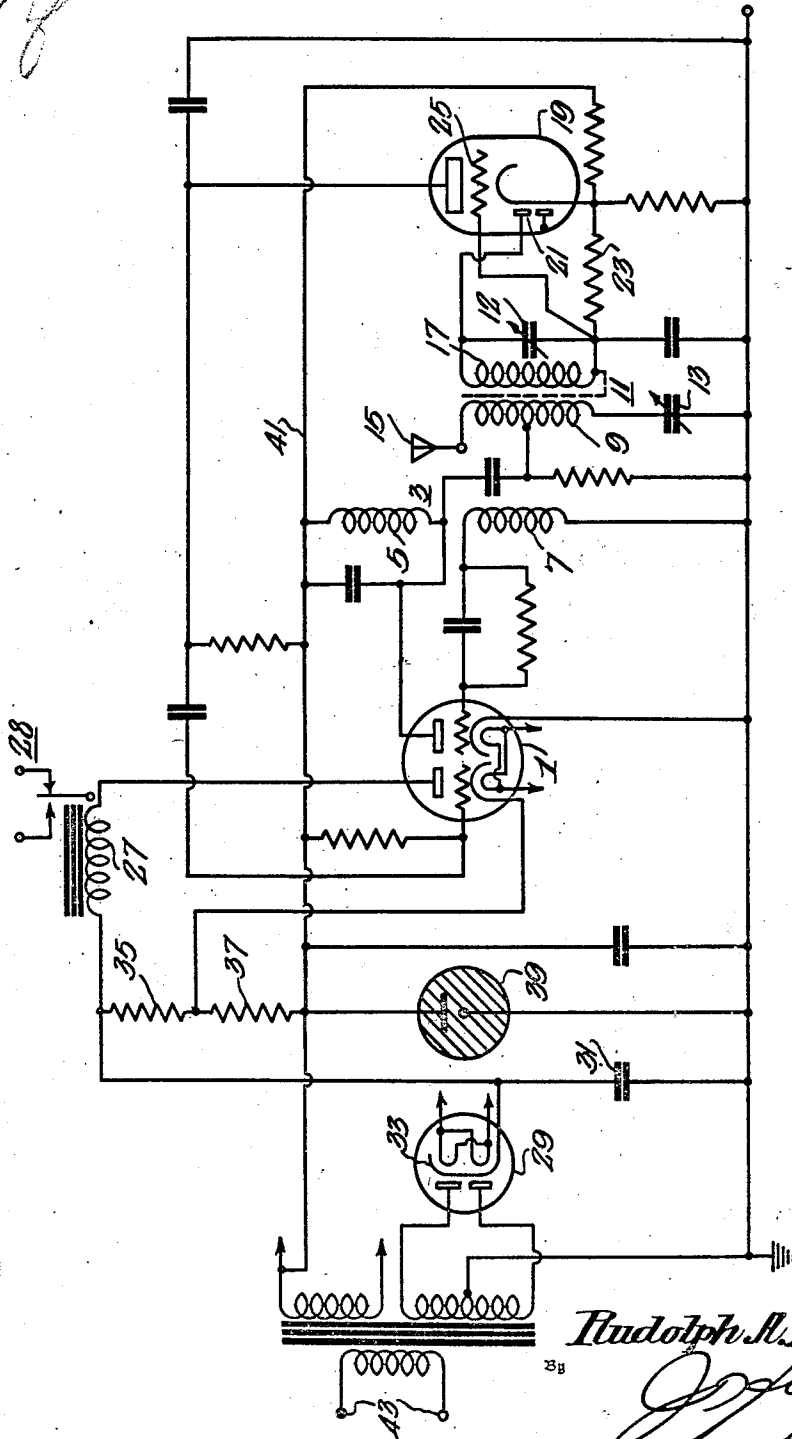
March 2, 1943.

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2,312,306

INDICATOR OR RELAY SYSTEM

Filed July 28, 1939



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INDICATOR OR RELAY SYSTEM

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Application July 28, 1939, Serial No. 287,039

4 Claims. (Cl. 179—171)

This invention relates to electronic indicator or delay systems, and more particularly to indicators of the type which are utilized to sound an alarm or operate a device in response to the presence of a person or object within a particular region.

I am aware of various indicator or relay systems in which a small change of capacity, for example, actuates a relay which may be used to control any suitable device, either to sound an alarm or to set in operation automatically a sequence of events designed to be seen by the person actuating the relay. Such a system is illustrated in U. S. Patent No. 1,701,975, issued February 12, 1929, to Ross Gunn, for example.

One disadvantage common to the known systems of the prior art is that the relay may be operated by the momentary failure of the source of power. Practically all electronic devices are operated from the commercial power lines, and it is well known that there are occasional momentary interruptions in the power during electrical storms and the like. While it is true that a complete failure of the power supply is unlikely to operate the relay mechanism, because the power required to sound the alarm fails simultaneously, I have found that, when the power returns to normal, a momentary transient impulse is generated which frequently operates the relay. Now this may not be serious in many applications, but where, for example, the device is to be operated as a burglar alarm, it is essential that a momentary failure of power in the small hours of the morning be not mistaken for a prowling intruder.

Briefly, the system herein proposed accomplishes the desired result by connecting a voltage limiting regulator, such as a gas discharge tube, across the source of potential which is to be used to operate the indicator. The regulator will hold the operating voltage at a constant value so long as the line voltage remains above the predetermined minimum value necessary to sustain its operation. The sensitivity of the relay is then made proportional to the current through the regulator tube, so that the relay cannot operate unless the line voltage is normal. Transients developed by the return of the line voltage after an interruption do not affect the device since, when they occur, the line voltage is low, the regulator tube has been extinguished, and the relay is inoperative.

It is, therefore, a principal object of this invention to provide an improved indicator or alarm system. Further objects of this invention in-

clude the provision of means for rendering an indicator insensitive to fluctuations in line voltage; the provision of an improved voltage regulating system for an indicator; and the provision of means for preventing an indicator from giving a false alarm when its power supply fails. Other objects of this invention as well as the details of its construction and operation will appear from a consideration of the following specification when considered in connection with the accompanying drawing. The figure of the drawing illustrates a preferred embodiment of my invention.

The particular indicator illustrated is a capacity operated device. One portion of a double triode 1 is connected to an oscillation transformer 3 having plate and grid windings 5 and 7, respectively. The oscillator output is connected to the center tap of the primary 9 of a balanced transformer 11. One end of the primary is connected to ground through a variable capacitor 13 while the opposite end is connected to an antenna 15, which is, for example, a suspended wire or a metal plate located in the region which is to be guarded. The secondary 17 of transformer 11 is tuned by a capacitor 12 and is connected to a rectifier anode 21 which is included in a diode-triode tube 19. The rectified voltage developed across the diode load resistor 23 is impressed on the grid 25 of the triode section of tube 19, which is, therefore, a direct current amplifier.

A second amplifier may be used, if desired, and in the present instance a resistance-capacitance coupled amplifier is employed which includes the remaining triode section of the tube 1. Indicating means which is, for example, the relay actuating coil 27 for the relay 28, is included in the anode circuit of the last amplifier.

The indicator is adjusted for operation by tuning the secondary of transformer 11 to resonance by means of capacitor 12. Capacitor 13 is then adjusted until the current flowing to ground through the lower half of the primary 9 is equal to the current which normally flows to ground from the antenna 15. Assuming the primary center tap to be accurately located and the secondary to be equally coupled to both halves of the primary, no voltage will be induced in the secondary winding. In practice the capacitor 13 is adjusted to minimize the secondary voltage to take care of small errors in the balance of the transformer.

Any person or object moving into the vicinity

of the antenna 15 will increase its capacity, with the result that the balanced condition in transformer 11 is upset and a voltage appears across the secondary 17. The rectified impulse which results makes the grid of amplifier 19 negative, and its anode potential increases. A positive impulse is impressed on the grid of the output amplifier which increases its anode current and operates the relay.

The system illustrated is essentially free from difficulties due to slow changes in the temperature of the device, or slow changes in humidity, since the voltage impressed on the grid of the output amplifier is proportional to the rate of change of the plate voltage of amplifier 19.

It is to be noted that the various tubes are energized by a conventional direct voltage source such as the rectifier 29, filter 31 system, and that the cathode 33 of the rectifier 29 is connected to ground through a path which includes a pair of resistors 35 and 37 and a gaseous regulator or limiter tube 39. As is well known, when a voltage is applied to the electrodes of such a regulator, current flows through the tube and the voltage drop across the tube tends to remain constant, provided the applied voltage is of sufficient amplitude to break down or ionize the gas.

Also note that the anode potentials for the oscillator and the direct current amplifier 19 are controlled by this regulator tube since line 41 to which both anodes are returned is connected directly to the regulator tube. However, the output amplifier, comprising a portion of the double triode 1, has its grid returned to line 41, its cathode connected to the junction of resistors 35 and 37, and its plate returned to the cathode of rectifier 29. That is, the output amplifier derives its operating potentials from the voltage drop in resistors 35 and 37. This voltage drop is present only when the tube is operating to control the voltage, since at other times it is non-conductive. Consequently, when the line voltage at the line input terminals 43 is normal and the regulator tube is in operation, the current through the regulator also flows through the resistors and normal operating potentials are applied to the output amplifier electrodes so that it is sensitive to changes in its grid potential, but, when the applied line voltage drops below the point necessary to sustain the glow of the regulator tube, no current flows through the resistors, no voltage drop is developed and the output amplifier becomes insensitive, and its anode current is insufficient to operate the relay notwithstanding the amplitude of any transient impulse which may be impressed on its grid during this period.

It is apparent that, when the line voltage is normal, or nearly so, the device is stabilized by the regulator tube, but, when the regulator tube is no longer able to maintain a constant operating voltage, the sensitivity of the relay is immediately reduced. When the line voltage fails, therefore, the relay is not operated, and, when the line voltage returns to normal, the sudden surge of voltage cannot operate the relay, since the relay output amplifier remains insensitive until normal operating conditions have been established.

While this invention has been illustrated by means of multiple purpose tubes, separate tubes may be used without departing from the spirit of my invention, the scope of which is limited only by the appended claims.

I claim as my invention:

1. An electronic relay comprising a plurality of vacuum tubes, a source of energizing voltage for said tubes, a gaseous voltage limiting tube connected to said source for maintaining constant the amplitude of the voltage applied to one of said tubes so long as said source voltage exceeds the breakdown voltage of said limiting tube, impedance means in series circuit with said limiting tube for producing a voltage difference only as long as said limiting tube is operating, means for utilizing said voltage difference to energize the other vacuum tube so that said other tube becomes inoperative when said source voltage is no longer controlled by said limiting tube, and indicator means in operative circuit connection with said other tube.

2. An electronic relay comprising a first thermionic tube connected in a change responsive circuit, a second thermionic tube connected in circuit with a change responsive indicator and said first tube, a source of energizing voltage for said first tube, a gas filled voltage limiter tube connected to said source for controlling the amplitude of the voltage applied to said first tube as long as the voltage of said source exceeds the breakdown voltage of said gas filled tube, and means for deriving an energizing voltage for said second tube which maintains said second tube in an operative condition as long as said voltage limiter is operating.

3. An electronic relay comprising a first thermionic tube connected in a change responsive circuit, a second thermionic tube connected in circuit with a change responsive indicator and said first tube, a source of energizing voltage for said first tube, a gas filled voltage limiter tube connected to said source for controlling the amplitude of the voltage applied to said first tube as long as the voltage of said source exceeds the breakdown voltage of said gas filled tube, and impedance means in series circuit with said voltage limiter tube for deriving an energizing voltage for said second tube which maintains said second tube in an operative condition as long as said voltage limiter is operating.

4. The combination comprising a first discharge device connected in a change responsive circuit, a second discharge device connected in circuit with a change responsive indicator and said first device, a source of energizing voltage, impedance means and a voltage regulator tube serially connected across said source, means for applying the controlled voltage across said regulator tube to said first discharge device, and means for applying the voltage developed across said impedance means to said second discharge device to cause said device to be operative only as long as said voltage regulator tube is operative, whereby said indicator is made inoperative when said voltage source falls below a value sufficient to be maintained constant by said regulator tube.

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