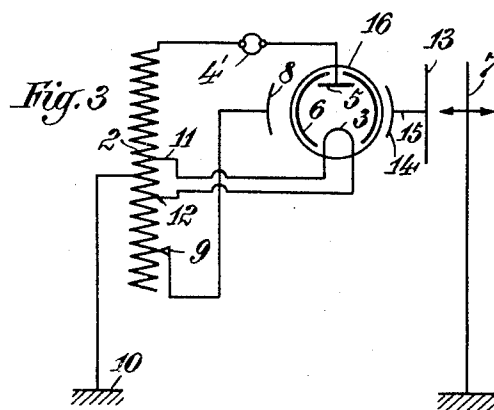
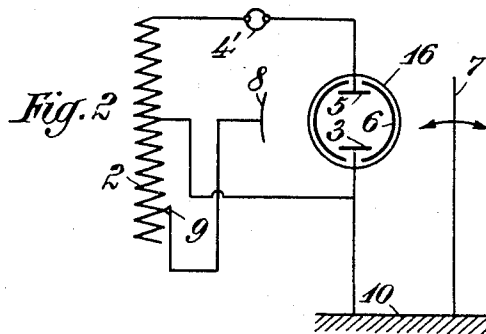
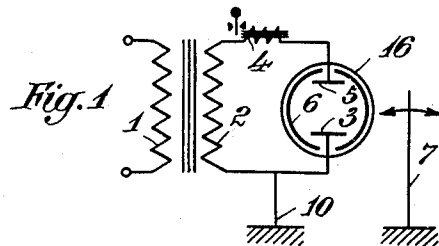


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ELECTRIC CONTROL APPARATUS

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ELECTRIC CONTROL APPARATUS

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Michel, Augsburg, GermanyApplication December 10, 1931, Serial No. 580,208
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7 Claims. (Cl. 250—27)

Our invention relates to electric control apparatus of the type in which the current in an electric circuit is varied by varying the distance of a conductor from the circuit and such variation is utilized for influencing an appliance in the circuit which may be the apparatus to be controlled, such as a signalling, indicating, alarm, registering, advertising, or any other apparatus, or a relay for operating the apparatus.

It is an object of our invention to provide a control apparatus of the type set out above which is simple, very sensitive to variations in the distance of the conductor, exactly adjustable, of constant and strong effect, and not influenced by moderate variations in the voltage of the circuit.

To this end we provide a source of voltage in electric connection to the appliance to be controlled, and a gas discharge or glow discharge tube which undergoes a variation of its discharge if the distance of a body outside the tube from the tube is varied.

In the accompanying drawing three types of apparatus embodying our invention are illustrated diagrammatically by way of example.

In the drawing

Fig. 1 is a diagram of the simplest type,

Fig. 2 is a diagram of an apparatus with a screen, and

Fig. 3 is a diagram of an apparatus with a screen, a heated cathode, and an intermediate conductor.

Referring now to the drawing, 2 is the secondary winding of a transformer which is connected to an alternating-current system, not shown, 1 is its primary winding which is shown only in Fig. 1, 3 is a cathode in a gas-discharge tube 16, 5 is the anode, also in the tube 16, and 6 is a surface conductor which must be perfectly insulated and is here shown as a metal layer in the tube. The cathode 3 is connected to one end of the secondary 2, and the wire connecting it to the secondary is grounded at 10. The anode 5 is connected to the other end of the secondary, and in the connecting wire is provided a relay 4, Fig. 1, or an indicating apparatus of any suitable type, 4', Figs. 2 and 3, 7 is a grounded conductor the distance of which from tube 16 may be varied as indicated by the double-pointed arrow.

If the conductor 7 is at a given distance from the tube 16 there will be no discharge in the tube and the relay 4, or the indicating apparatus 4', as the case may be, is not excited. If the conductor 7 moves nearer to the tube 16 a discharge will occur and the relay will be excited and

operate the apparatus connected to it, or, in the case of Figs. 2 and 3, the apparatus 4' itself will be operated.

The conductor 7 may be grounded or not. Its potential may be equal, or substantially equal, to that of one of the electrodes, preferably the cathode 3, in the tube 16. For instance, the cathode or the terminal of the supply of current may be grounded and the conductor 7 may also be grounded, as shown in Fig. 1.

Under certain conditions the effect is improved if the potential of conductor 7 is different from that of both electrodes 3 and 5. Or one of the electrodes, say the cathode 3, may be grounded and the conductor 7 may be insulated from ground, or, conversely, the circuit of the tube 16 may be insulated from ground, and the conductor 7 grounded.

As described the discharge in the tube 16 begins when the distance of the conductor 7 understeps a certain limit. However, the disposition may be modified so that the discharge ceases when the conductor moves nearer to the tube, and is restarted when it moves further away. By varying the distance of the conductor from the tube, the current in the tube circuit may be varied also.

The movable conductor 7 may be carried by a person or by a vehicle, or may be the person or the vehicle itself. It is not necessary that the conductor should be movable and the tube fixed, but the tube and its system may be movable with respect to a fixed conductor, or both may be movable with respect to each other.

The surface conductor 6 is preferably provided as it improves the effect. It may be a metal layer on the inner wall of the tube 16 and need not be connected to its electrodes 3 and 5.

Referring to Fig. 2, the parts are arranged substantially as described with reference to Fig. 1 but here the ground 10 is not connected to one end of the secondary 2 but to a point between its ends, and the lower portion of the secondary is equipped with a contact slide 9 connected to a screen 8. The screen 8 is so arranged that the discharge which would normally occur, is suppressed by it but is released when the conductor 7 moves nearer to the tube 16, and ceases when it is moved further away from it. By reversing the polarity of the portion of secondary 2 which supplies the screen 8 with current, the system may be modified so that the screen 8 brings about the discharge which would not occur were the screen not present, the discharge ceasing when the conductor moves nearer to

the tube 16, and restarting when it moves further away.

If desired the conductor 7 may be arranged between the screen 8 and the tube 16.

3 The potential of the screen 8 which is regulated by the slide 9, has the same periodicity as the anode 3. By suitably selecting the position and the form of the screen 8—which need not be an arched plate as shown but might, for instance, be a wire wound about the tube 16—the
10 sensitivity of the apparatus to variations in the voltage of the source of current, and its inertia may be reduced. "Inertia" here stands for the difference between the two distances of the movable conductor 7 at which discharge begins or,
15 in the opposite direction of movement of the conductor, ceases. "Sensitivity" is the distance of the conductor 7 and the tube at which the discharge starts. This sensitivity varies very
20 much with the anode voltage, because the small difference between the constant ignition voltage and the anode voltage, on the amount of which the effect is based, varies very much for a small percentage of variation in the anode voltage.
25 Variation of the screen potential at constant anode potential also influences the sensitivity, but in the opposite direction, and as in the arrangement of Fig. 2 the anode and screen potentials vary together the two influences balance each
30 other. This effects a great constancy of the apparatus.

The potential of the screen or auxiliary conductor 8 may be dephased or opposite to the potential of the anode 3 of the tube 16, as shown in
35 Fig. 2.

Another advantage of the screen or auxiliary conductor 8 is the very fine regulation by slide 9 or any other suitable means.

Referring now to Fig. 3, the cathode 3 is a
40 filament and supplied with current from two taps 11 and 12 at the secondary 2. By these means the intensity of the discharge current is increased, as is known in the art. The ground 10 is connected to the secondary 2 between the
45 tappings 11 and 12.

13 is an intermediate conductor between the movable conductor 7 and the tube 16. 14 is an outer electrode and 15 is a wire connecting the conductor 13 to the outer electrode. The outer
50 electrode 14 must be within the range of the tube but the intermediate conductor 13 and the movable conductor 7 may be at any distance from the tube, as the intermediate conductor 13 is not bound to the immediate vicinity of the
55 tube.

As mentioned, we are not limited to a fixed tube 16 and a movable conductor 7 but the conductor may be fixed and the tube movable, or both may be movable with respect to each other.

60 Our invention may also be modified in various other ways without departing from the gist thereof.

It has a very wide range of usefulness. Signalling etc. have already been mentioned. Other
65 possibilities are its application to safety devices against unauthorized persons, whose approach is

indicated by the apparatus, or for warning persons that they must not enter a certain room or the like because it is dangerous. For railways, it may be used for registering trains passing a given point, or for signalling the approach of a train
5 toward a station or level crossing. It may also be used for operating automatic devices, for instance a door-opener, a cigar lighter etc., which become active as a person approaches.

We claim:

10 1. An electric control system comprising a gas discharge tube, a source of voltage arranged to produce a discharge current between electrodes within said tube, a conductor outside said tube and forming with at least one internal electrode
15 thereof a loose capacity coupling with a large stray field, a source of voltage arranged to maintain the field of said capacity coupling and by means of said internal electrode controlling the discharge current in the tube, and means for indicating
20 discharge current variations due to disturbance of the field.

2. An electric control system according to claim 1 comprising also means for adjusting the potential applied between the electrodes of the
25 loose capacity coupling.

3. A system according to claim 1 in which the source of voltage is an alternating source.

4. An electric control system comprising a gas
30 discharge tube, a source of alternating voltage arranged to produce a discharge between electrodes within said tube, a conductor outside said tube and forming with at least one internal electrode thereof a loose capacity coupling with a
35 large stray field, a source of alternating voltage for producing the field of said capacity coupling, this voltage being about 180° out of phase with respect to the voltage of the first mentioned alternating source and by means of said internal
40 electrode controlling the discharge in the tube, and means responsive to discharge current through the tube.

5. A system according to claim 4 in which one of the electrodes of the tube is a thermionic
45 electrode.

6. An electric control system comprising a gas
50 discharge tube with a plurality of internal electrodes including an anode and a cathode, a source of voltage connected to the anode and cathode, means responsive to discharge current through the tube, a conductor external to the tube cooperating with an internal electrode thereof to form
55 therewith a loose capacity coupling, and connections for applying potential to said capacity coupling, to control the passage of discharge current.

7. A system according to claim 6 in which the voltages applied to the anode, cathode and loose capacity coupling electrodes are taken from an alternating source, and the discharge producing
60 voltage is out of phase by about 180° with the voltage between the electrodes of said capacity coupling.

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