

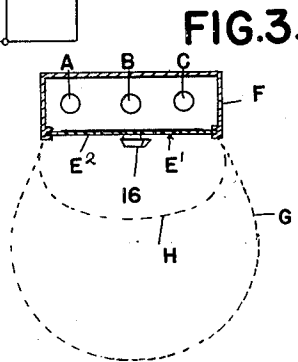
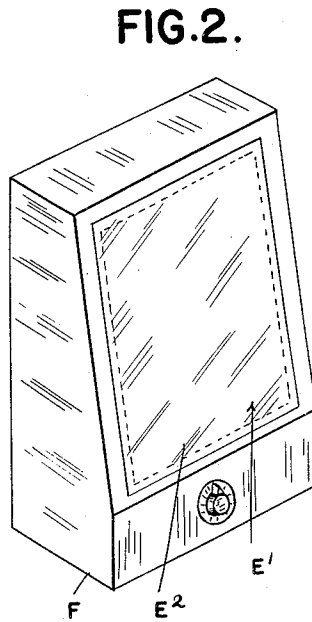
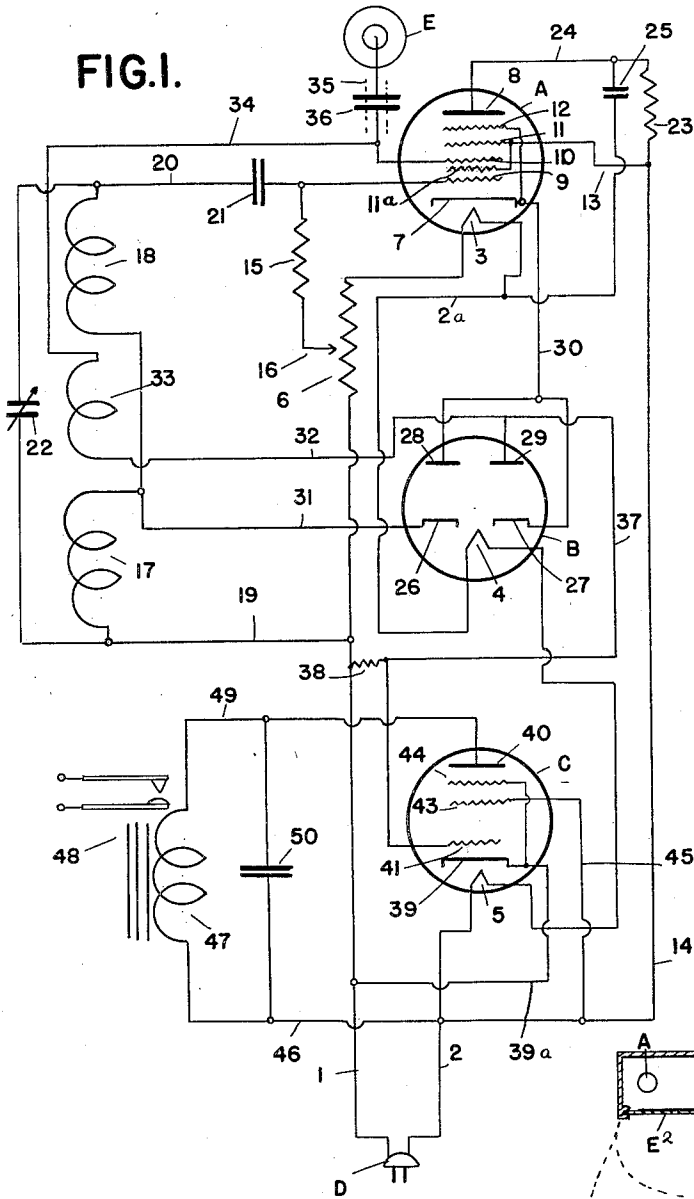
Feb. 6, 1940.

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2,188,973

AUTOMATIC ELECTRICAL CONTROL DEVICE

Filed March 15, 1937



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UNITED STATES PATENT OFFICE

2,188,973

AUTOMATIC ELECTRICAL CONTROL DEVICE

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Application March 15, 1937, Serial No. 131,086

3 Claims. (Cl. 250—36)

The invention relates to electrical control devices of that type sensitive to the presence of a person or object in its vicinity. Certain constructions belonging to this type are operated by the interruption of a beam of light which is normally focused on a light sensitive electric cell. This necessitates the mounting of the source of light and the sensitive cell at spaced points so positioned that the controlling persons or objects may pass therebetween. There are, however, many uses for an automatic control where it would be difficult to make such an installation. Also, such constructions are costly and are easily thrown out of order.

It is the object of the present invention to obtain an electrical control, the sensitive element of which is operable by the presence of a person or object within a predetermined distance therefrom or, if desired, only within predetermined limiting angles. It is a further object to obtain a construction which differentiates between certain objects and others having different capacities, and more particularly one which is sensitive to the proximity of a human being, but is unaffected by an inanimate object or an animal of a different species having a capacity differing from that of a human being. A further important object of the invention is to obtain a construction which while utilizing electrical oscillations, will not interfere with radio apparatus in its vicinity. Still further it is an object to obtain a comparatively inexpensive construction and one which is composed of elements of standard construction. With these and other objects in view, the invention consists in the construction as hereinafter set forth.

In the drawing:

Figure 1 is a diagram illustrating the electrical instruments and circuits constituting our improved control;

Figure 2 is a perspective view of a casing in which the control may be located;

Figure 3 is a plan view of the construction shown in Figure 2 indicating in dotted lines the extent of the field of responsiveness.

In the present state of development in the radio art certain standard constructions of tubes and other elements are available for various uses. These include tubes which in connection with the proper hook-up will generate electrical oscillations of predetermined frequencies; also, tubes for relatively low frequencies or what is generally known as audio-frequency. There are further, tubes which may be used as either half-wave or full-wave rectifiers. Making use of such tubes

and other standard parts of radio equipment, we have devised an apparatus which is normally in an inactive condition, but which is affected by a change in capacitance due to the presence of a person within a given range of a predetermined point to start an electrical oscillation and to thereby operate a relay.

As specifically shown in Figure 1, our improved apparatus includes a pentagrid mixer tube A, a rectifying tube B and a pentode amplifying tube C, together with cooperating elements and electrical circuits as follows:

D is the service connection from which a pair of conductors 1 and 2 lead to the heaters 3, 4, and 5 respectively of the tubes A, B and C and which are in series with each other and with a resistor 6. The tube A has a cathode 7, a plate 8 and the intermediate grids 9, 10, 11, 11a and 12. The grids 11 and 11a are screen grids and are connected to the conductor 2 through the medium of conductors 13 and 14. The grid 12 is a conventional suppressor grid and is connected to the cathode 7. The grid 9 is connected to the conductor 1 through the medium of a potentiometer including the resistor 15 and contact 16 movable with respect to the resistor 6. 17 and 18 are inductances in series, one terminal being connected by a conductor 19 with the conductor 1 and the other through a conductor 20 with a blocking condenser 21 intermediate the same and the grid 9. A tuning condenser 22 is connected in parallel with the inductances 17 and 18 to the conductors 19 and 20. The plate 8 is connected to the conductor 14 through a loading resistor 23 and conductor 24, and also through a blocking condenser 25 with the conductor 2a intermediate the heaters 3 and 4.

The rectifying tube B is of the full-wave type having the cathodes 26 and 27 and plates 28 and 29. The plate 28 and cathode 27 are connected by a conductor 30 with the cathode 7 of the tube A. The cathode 26 is connected through a conductor 31 to a center tap between the inductances 17 and 18. The plate 29 is connected by a conductor 32 with an inductance 33 which might be termed a floating inductance and the other terminal of which is connected through a conductor 34 with the control grid 10 of the tube A. There is further a connection 35 including a blocking condenser 36 between the conductor 34 and a trip plate E. The grid 12 in the tube A is connected to the cathode 7. The plate 29 of the tube B has an output conductor 37 and this is connected by a dropping resistor 38 with the conductor 1.

The output from the tube A is taken from the

cathode 7 instead of from the plate, as in ordinary practice, and is impressed upon the full wave rectifier tube B which produces a positive voltage and a negative voltage. In detail, the tube elements 26 and 28 produce a positive voltage which is sent through the conductor 31 and the tuned circuit comprising the condenser 22 and the inductances 17 and 18 to the control grid 9 of the tube A. The tube elements 27 and 29 of the tube B produce a negative voltage which is applied to the inductance 33 and the control grid 10 of the tube A through the conductor 32, and to the grid 41 of the tube C through the conductor 37. When capacitance is added to the circuit including the inductance 33 by reason of the approach of a body within the field of a trip plate E, the impedance of this circuit is changed, effecting a decrease in negative voltage to the grid 41 of the tube C or, in other words, causing the grid 41 to become more positive with respect to the cathode, thereby enabling current to flow through the tube C to operate the relay 48. At the same time, the increased flow through tube A is progressively increased by reason of the feed back to the control grid 9 of this tube through the tuned circuit containing the condenser 22 and the inductances 17 and 18, insuring a continued operation of the relay as long as the body remains in the field of the trip plate E.

The introduction of capacitance into the circuit containing inductance 33 changes the tuning of this circuit, and inasmuch as the two circuits are inductively coupled, the circuits automatically become tuned to each other at a new balance point.

Any suitable means for amplifying the current may be used, but as shown we employ a pentode tube C having a cathode 39, plate 40 and intermediate grids 41, 43 and 44. The cathode 39 is connected to the conductor 1 through the conductor 39a. The conductor 37 from the rectifying tube B is connected with the grid 41. The grid 44 is connected to the cathode 39 and the grid 43 is connected through the medium of a conductor 45 and conductor 14 with the conductor 2. A conductor 46 connects the conductor 2 to the coil 47 of a relay 48, the opposite terminal of said coil being connected by a conductor 49 with the plate 40. A condenser 50 is also placed parallel to the coil 47 between the conductors 46 and 49. Thus in operation the output from the plate 29 of the tube B is conveyed through the conductor 37 to the grid 41 causing electronic discharge from the cathode 39 to the plate 40, and thus amplifying the current through the conductor 49, coil 47 and conductor 46. This current is sufficient in volume to operate the relay.

The trip plate E may be formed of any conductive surface connected to the circuits as described. One construction illustrated in Figures 2 and 3 is a glass plate having a light film of silver deposited thereon, or what is known as an invisible mirror. This may be arranged either immediately adjacent to the tubes as indicated in Figures 2 and 3 or at a more or less remote point. By suitably adjusting the condensers 22 and 36 the circuits may be properly balanced with the trip plate so that under normal conditions the tubes are substantially inactive with insufficient current passing through the coil of the relay to operate the same. When, however, any person comes within a certain distance of the trip plate the balance will be destroyed causing the tubes A, B and C to function and operate the relay.

An important feature of our improvement is that not only are the circuits normally balanced so that the tubes are inactive, but also after the

destroying of this balance a new balance is effected which maintains the electronic discharge in the tubes and the current through the relay substantially constant as long as the increased capacitance is maintained. In brief, change in capacitance affecting the trip plate E destroys one balance, but establishes another. Another feature is that by adjusting the movable contact 16 of the potentiometer the field of sensitiveness extending from the trip plate may be enlarged or diminished. Thus if it is desired to have the device respond only to a person quite close to the plate such adjustment can be made. On the other hand, if a greater distance of response is desired this also can be obtained by suitable adjustment. Thus, as shown in Figures 2 and 3, the trip plate E' has a silver film on the back of a glass plate E² which forms the front of the cabinet F within which the instrument is located. This cabinet is either made of metal or is provided with a metallic screen shielding the side and rear walls thereof so that the field of response is almost entirely in front of the glass E². By adjusting the potentiometer this field may be extended as indicated by the dotted line G, or if desired may be limited as indicated by the dotted line H. It is, of course, unnecessary that the trip plate should be closely associated with the tubes and other elements of the instrument, but where separated therefrom it is desirable to also shield the connecting conductor.

As previously described, it is very important that the control device should not produce interference with the operation of radio instruments in its vicinity. This is accomplished primarily by keeping the frequency of oscillation below a predetermined point and also by limiting the electrical energy employed. An exceedingly small amount of electrical energy and a frequency of less than 50 kilocycles will be sufficient for satisfactory operation.

Some of the uses for which our improved control mechanism is adapted are:

- (1) To actuate advertising devices using invisible mirrors;
- (2) To light up showcases or display cabinets;
- (3) As a burglar alarm;
- (4) To turn out porch lights, room lights, etc.;
- (5) To illuminate sign boards;
- (6) To start and stop any motor driven appliance;
- (7) To start and stop motor driven window displays;
- (8) To count persons passing a given point;
- (9) For safety devices;

What we claim as our invention is:

1. An electrical discharge control device comprising a valve tube, a gridless second tube having pairs of cathodes and plates in opposed relation, a service connection to the plate of said first tube having a loading resistor therein, a connection between the cathode of said first tube and one of the plates and one of the cathodes of said gridless tube, an oscillation circuit between the other of said cathodes and one of the grids of said first tube, said circuit including a pair of inductances and a capacitance normally tuned to a frequency within the audio range, a second oscillation circuit connected to the other plate of said gridless tube and extending to another grid of said first tube, said second circuit including an inductance in inductive relation to the aforesaid inductances, a potentiometer connected to the grid of said first circuit for placing a variable voltage thereon, a blocking condenser between

said potentiometer connection and said first circuit, and a trip member connected to said second circuit responsive to a capacitance when moved within a predetermined field area thereof.

- 5 2. A capacity controlled electrical circuit comprising an electron tube having a pair of control grids, an oscillation circuit connected to one of said control grids, a second oscillation circuit connected to the other of said control grids and inductively coupled to said first oscillation circuit, a full wave rectifier tube connected to the output of said first mentioned tube and having its positive voltage output impressed upon one of said oscillation circuits and its negative voltage output impressed upon the other oscillation circuit, and a trip member connected to one of said oscillation circuits and adapted to change its capacity upon the approach of a body, thereby effecting a change in the tuning of said oscillation circuits and increasing the output of said electron tube and said rectifier tube.
- 10 15 20

3. A capacity controlled electrical circuit comprising an electron tube having a pair of control grids, a plate, and a cathode, a full wave rec-

tifier tube having a pair of plates and a pair of cathodes, means connecting the cathode of said electron tube with one of the plates and one of the cathodes of the rectifier tube, a voltage supply connected to the plate of said electron tube, an oscillation circuit having inductance and capacitance connected to the other cathode of said rectifier tube and to one of the control grids of said electron tube, a second oscillation circuit having inductance connected to the other plate of said rectifier tube and to the other of said control grids, said oscillation circuits being inductively coupled, a device to be operated operatively connected to the last mentioned plate of the rectifier tube, and a trip member connected to said second mentioned oscillation circuit and adapted to change its capacity upon the approach of a body, thereby effecting a change in the tuning of said oscillation circuits and increasing the output of the electron tube and the rectifier tube and operating the device to be operated.

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