

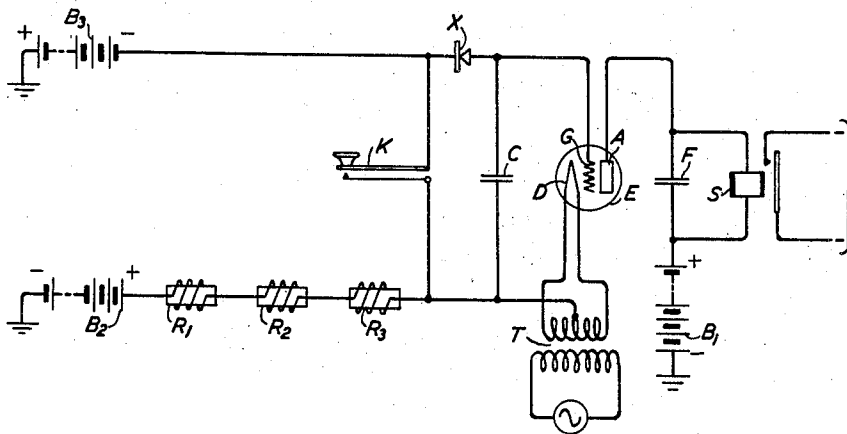
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ELECTRICAL TIMING ARRANGEMENT

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ELECTRICAL TIMING ARRANGEMENT

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This invention relates to electroresponsive devices and particularly to the control of the responding interval of an electromagnetic device, such as a relay for instance, from a time delay circuit of the electron discharge type.

It is an object of this invention to provide a circuit arrangement of the electron discharge type which, in response to the application of a signal to the circuit, delays the operation of an electroresponsive device, as for instance a relay or equivalent structure.

Several methods are available for controlling the delay in the response of a relay, some depending on the construction of the relay itself and others depending on the characteristics of the circuits with which the relay is associated. The present invention, which is of the latter general class, provides circuit means whereby the operation of a relay, in response to control signals, may be regulated, in that the relay will function at any predetermined time after signals are first applied, will hold its position so long as the signals continue and will return to its original condition at a predetermined time after the signals cease.

One of the features of this invention is the use of a copper-oxide rectifier, or similar surface contact device, to control the time during which the potential of the grid element of thermionic device will be raised by the application of a signal to the value necessary to cause said device to discharge and thus permit the plate circuit thereof to respond and operate the relay in the circuit thereof. Ordinarily the potential of the grid element of a thermionic device is controlled by circuit networks comprising inductances, resistances and capacities arranged in various combinations depending upon the nature of the circuit and the character of the control to be exercised upon the grid. However, by taking advantage of the unidirectional character of a copper-oxide rectifier, complicated circuit networks to control the potential of the grid can be avoided and the same results obtained with the use of the rectifier.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawing which represents an embodiment of my invention.

Referring to the drawing, E is an electron discharge device having the plate or anode A, the cathode D and the grid G. The anode A is con-

nected to the relay S bridged by a condenser F, the whole terminating at the positive pole of a suitable source of positive current supply B₁. The filament D is bridged across the secondary of the step-down transformer T, the primary of which is connected to a source of alternating current, the filament being heated to incandescence by the current produced in the secondary winding of said transformer. The mid-point of the primary of the transformer is connected to the positive side of battery B₂ through choke coils R₁, R₂, R₃, the purpose of which is to prevent oscillating currents from getting into the battery B₂. Bridged across the mid-point of the secondary of transformer T and the grid G is condenser C in parallel with copper-oxide rectifier X which terminates in a source of negative potential B₃ and has its conducting direction away from the grid. A key K is connected between the side of the rectifier furthest from the grid and the mid-point of the secondary winding of transformer T.

Having described the arrangement of the elements of my invention, I will now describe the manner in which it operates.

When key K is in an unoperated position, the condenser C is charged very quickly in the circuit which extends from positive battery B₂, coils R₁, R₂ and R₃, condenser C, rectifier X to negative battery B₃. This charging circuit biases the grid G of the tube below the breakdown point. On operating the key K, which is the conventionalized representation of means for transmitting a signal to the circuit network, the condenser C discharges slowly through the rectifier X in the high resistance direction and after a time interval determined by the value of this resistance and the capacity of the condenser C, the bias of the grid is eventually reduced to the point where the tube flashes, establishing a circuit between the filament D and the plate A and completing the circuit through the winding of relay S to positive battery B₁. Relay S operates and closes its contacts to control an outside circuit.

Thus the measurement of small time intervals, as evidenced by the time interval between the closure of key K and the operation of relay S, can be varied and otherwise controlled by altering the value of the capacity of condenser C and the resistance characteristics of rectifier X, the relatively larger interval being produced by the larger capacity and the larger resistance and vice versa.

What is claimed is:

1. The combination of an electrical valve having a cathode, an anode and a grid for controlling the transmission of current between the cathode

- and anode thereof, current supply means, a surface contact rectifying device and a condenser connected in series with said current supply means and with their junction connected to said grid for charging said condenser and said grid to a potential which blocks the current flow between said cathode and said anode, said charging current flowing in the low resistance direction of said surface contact rectifying device, and means for closing a discharge path for said condenser through said contact rectifying device in its high resistance direction whereby the potential on said grid is reduced to allow current to flow between said cathode and said anode.
2. A timing arrangement comprising an electrical valve having a cathode, an anode and a control electrode the potential on which is regulated to control the flow of current between said cathode and said anode, a source of current, a surface contact rectifier and a condenser, said condenser being connected in series with said surface contact rectifier and with said source of current and in parallel to the space discharge path be-

tween said electrode and said cathode whereby said condenser is normally charged in the low resistance direction through said rectifier for applying potential to said electrode to block the current flow between said cathode and said anode, and means for discharging said condenser in the high resistance direction through said rectifier whereby the potential on said electrode is reduced to allow current to flow between said cathode and said anode.

3. A timing arrangement comprising an electron discharge tube having a cathode, an anode and a control electrode, means for applying an operating potential to said anode, means including a normally charged condenser for applying a biasing potential to said control electrode to block the conductivity of said tube, a rectifier, and means for reducing the bias on said control electrode to render said tube conducting comprising a discharge path for said condenser in the high resistance direction through said rectifier.

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