

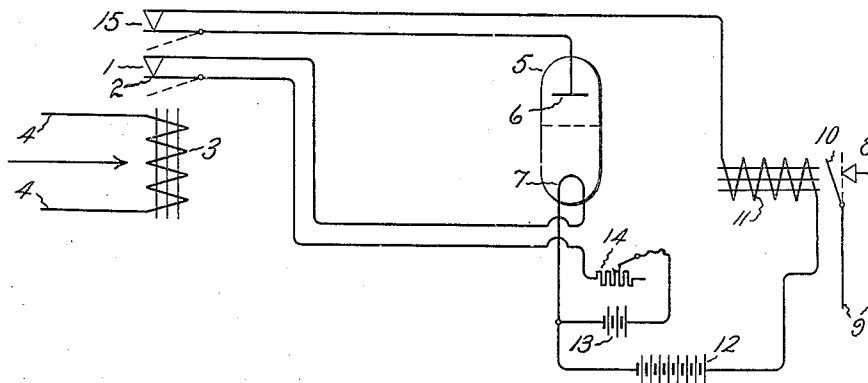
March 18, 1930.

A. WALTEMATH

1,751,374

CONTROL APPARATUS

Filed Oct. 9, 1926



Inventor:
Adolf Waltemath,
by *Alexander S. Lane*
His Attorney.

UNITED STATES PATENT OFFICE

ADOLF WALTEMATH, OF OBERSCHONEWEIDE, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

CONTROL APPARATUS

Application filed October 9, 1926, Serial No. 140,667, and in Germany September 3, 1925.

My invention relates to apparatus for controlling the connections of electrical circuits, and has for its principal object the provision of an improved circuit control apparatus wherein an operating characteristic of an electron discharge device is utilized to produce a predetermined time delay between different switching operations.

It is known that a certain time interval is required for the plate or anode current of an electron discharge device to reach a predetermined value after current is first supplied to the cathode heating circuit of the device. The duration of this time interval is dependent on several factors such as the cathode construction, the materials of which the cathode is made, and the voltage applied between the cathode and anode of the device. For any given device, however, the time lag between energization of the cathode heating circuit and the production of a predetermined value of anode current is substantially constant so long as the operating conditions of the device are unchanged. In accordance with my invention, this characteristic of the electron discharge device is utilized to produce a predetermined time delay between different switching operations.

My invention will be better understood from the following description when considered in connection with the accompanying drawings and its scope will be pointed out in the appended claims.

Referring to the drawing, the single figure thereof shows a control apparatus wherein my invention has been embodied.

The figure shows a switch 1 comprising a movable contact 2 which is biased to its closed position and is provided with an operating coil 3 supplied with current through suitable means shown as supply leads 4. An electron discharge device 5 comprising an anode 6 and a cathode 7 is provided for producing a predetermined time delay between operation of the switch 1 and a switch 8 which is connected in a circuit 9 and is provided with a movable contact 10 and an operating coil 11. It will be observed that the anode 6 and cathode 7 are connected through the operating coil 11 to a source of current 12 and that

heating current is supplied to the cathode 7 from a source 13 through an adjustable control device 14 and the switch 1.

With these connections, current is transmitted through the operating coil 11 and the switch 8 is maintained in its open position so long as the operating coil 3 is deenergized. Upon energization of the coil 3, however, the cathode heating circuit of the device 5 is interrupted. The time interval between deenergization of the coil 3 and closure of the switch 8 is dependent on such factors as the structure and composition of the cathode and the voltages of the sources 12 and 13. It will be apparent that the cathode 7 may be an oxide cathode or any other type of cathode suitable for producing the desired time delay between operation of the switches 1 and 8, upon closure of the switch 1.

A switch 15 connected in the anode circuit of the device 5 is arranged to be operated by the coil 3 which also operates the switch 1. Under these conditions, the switch 8 is instantaneously deenergized upon energization of the circuit 4 and is energized at a predetermined time after deenergization of this circuit. The switch 8 is thus closed instantaneously and opened with a predetermined time delay.

The embodiments of the invention illustrated and described herein have been selected for the purpose of clearly setting forth the principles involved. It will be apparent, however, that the invention is susceptible of being modified to meet the different conditions encountered in its use and I therefore aim to cover by the appended claims all modifications within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. The combination of a plurality of circuits, an electron discharge device comprising a cathode and an anode, means connected between said cathode and anode for changing the connections of one of said circuits, a switch operable upon energization and deenergization of another of said circuits to open and close the heating circuit of said cathode, and means arranged to interrupt the connection

between said cathode and anode only when said switch is opened.

2. The combination of an electrical circuit, an electron discharge device provided with anode and cathode heating circuits, electro-responsive means connected in said anode circuit for controlling the connections of said electrical circuit, and means associated with said anode and cathode heating circuits for instantaneously deenergizing said electro-responsive means and for energizing said electro-responsive means only after a predetermined interval of time.

In witness whereof, I have hereunto set my hand this 17th day of September, 1926.
ADOLF WALTEMATH.

20

25

30

35

40

45

50

55

60

65