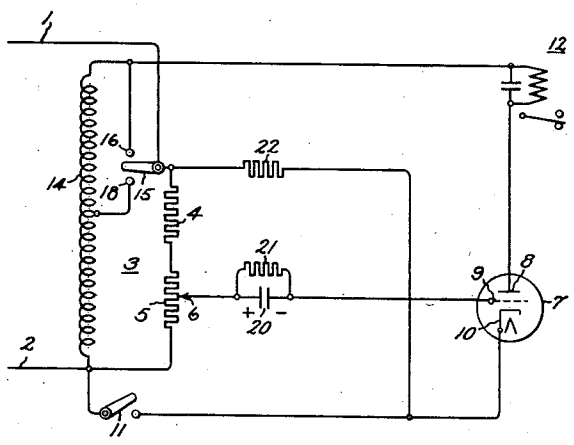
Aug. 29, 1939. E. D. SCHNEIDER 2,171,347

TIME DELAY RELAY

Filed July 24, 1937



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Patented Aug. 29, 1939

2,171,347

UNITED STATES PATENT OFFICE

2,171,347

TIME DELAY RELAY

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Application July 24, 1937, Serial No. 155,518

7 Claims. (Cl. 250—27)

My invention relates to time delay relays of the type wherein the delay is determined by the time required for a capacitor to lose a certain amount of charge. It has for its object the provision of an improved relay of this character which is simple in construction, efficient in operation, and inexpensive to manufacture.

My invention will be better understood from the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

In the single figure of the drawing which is a circuit diagram illustrating an embodiment of my invention, 1, 2 represent the leads of a source of alternating current supply which, for example, may be a 60 cycle, lighting circuit at either 110 volts or 220 volts. Connected across the source is the voltage divider 3 which is shown as comprising the resistor 4 whose resistance may, for example, be 12,500 ohms and the potentiometer 5 having the adjustable contact 6 and having a resistance, for example, of 10,000 ohms. The electron discharge device 7 having the anode 8, the control grid 9 and the cathode 10 is arranged to be energized from the source 1, 2. The cathode 10 may be connected directly with the lead 2 through the single pole single throw switch 11. The anode connects through the winding of the relay 12 either directly or indirectly with the other lead 1 of the source, provision being shown for supplying to the anode-cathode circuit either the voltage of the source or a higher voltage. This is accomplished by the use of the autotransformer 14 and the two pole switch 15, the contacts 16 and 18 of which connect respectively with the upper end of the transformer 14 and with an intermediate or midpoint thereof. Thus, if the supply voltage is 220 volts, the switch will be put on contact 16, but if the supply voltage is 110 volts, the switch will be put on contact 18, the voltage applied to the anode-cathode circuit in either case being 220 volts.

The grid 9 connects with the movable contact 6 of the potentiometer through the capacitor 20, which capacitor is shunted by the resistor 21, forming a leakage path through which the capacitor may lose its charge at a predetermined rate. The capacitor 20 may have a value, for example, of 2 mf. and the resistor 21 may have a value, for example, of 10 megohms. The cathode 10 in addition to its connection with the lead 2 through the switch 11 has a permanent connection with the lead 1 through the resistor 22, whose resistor may, for example, be 0.1 megohm.

Assuming the switch 15 to be on either contact 16 or 18 and the switch 11 to be in its open circuit position as illustrated, in which case no current flows in the anode-cathode circuit of the discharge device 7 and the relay 12 is deenergized, there will be a grid current flow during those half-cycles which, for convenience, will be termed the negative half-cycles at which the lead 1 is negative with respect to the lead 2. This grid current, namely the electron flow which takes place during the negative half cycles from the lead 1 through the resistor 22, to the cathode, to the grid and to the adjacent plate of the capacitor, is that due to the potential difference between the potentiometer contact 6 and the lead 1 and charges the capacitor 20 in such a manner that the terminal thereof which connects with the grid is negative, it being noted that the only connection of the cathode with the source at this time is that through the resistor 22 to the lead 1. Thus, while the switch 11 is open, the negative half-cycles of the supply voltage keep the capacitor 20 in a charged condition.

When the switch 11 is closed, the anode-cathode circuit of the device 7 is closed, whereby the device may function to pass current during the positive half cycles to operate the relay 12 under the control of the grid 9. Closing of the switch 11 also serves to effectively transfer the connection of the cathode 10 from the lead 1 to the lead 2, it being noted that the connection of the cathode with the lead 2 is of negligible resistance. The charge formerly given to the capacitor 20 maintains the grid 9 sufficiently negative to prevent current flow through the device 7 until the charges on the two plates of the capacitor have had time to equalize through the resistor 21 or, at least to become reduced to such a value that the device 7 will pass current sufficient to cause an operation of the relay 12. This relay may be of any desired type and its external circuit may be used to control various other devices, as desired. After the operation of relay 12, the switch 11 may be opened when the relay 12 will move to open circuit position and the capacitor 20 will again become charged by the grid current of the device 7 during the negative half-cycles.

It will be noted that the operation of the apparatus which I have described above and illustrated on the drawing is adapted to be controlled by the switch 11 which is of very simple form, namely, a single pole single throw switch, and that after the closing of this switch the relay 12 will be operated only after the lapse of a predetermined time interval. The duration of this interval depends upon various factors such as the

value of the capacitor, the value of the resistor and the setting of the potentiometer contact 6. Movement of the latter provides a convenient method of varying the time interval as desired. As pointed out above, the switch 15 controls the voltage applied to the anode-cathode circuit and is employed to adapt the apparatus for use with a supply voltage of either 110 volts or 220 volts.

I have chosen the particular embodiment described above as illustrative of my invention, and it will be apparent that various modifications may be made without departing from the spirit and scope of my invention which modifications I aim to cover by the appended claims.

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

1. A time delay relay comprising a voltage-divider arranged to be connected across a source of alternating voltage, a grid controlled electron discharge device having its anode and cathode connected to be supplied from said source, a switch in said cathode connection, a capacitor connected between said grid and an intermediate point of said divider and a resistor connected between said cathode said said divider at a point thereof on the opposite side of said capacitor connection from said first mentioned cathode connection.

2. A time delay relay comprising a voltage divider arranged to be connected across a source of alternating voltage, a grid-controlled electron discharge device having its anode and cathode connected to be supplied from said source, a switch in said cathode connection, a resistor connecting said cathode with a point on said divider and a resistance-shunted capacitor connecting said grid with said divider at a pont thereof between said first mentioned point and said cathode connection.

3. A time delay relay comprising a source of alternating voltage, a grid-controlled electron discharge device having its anode and cathode connected to be supplied from said source, a switch in said cathode connection, means connected with said cathode and grid and operable when said switch is open for producing a grid current during the negative half-cycles of the supplied voltage and a capacitor in series with said grid arranged to be charged by said grid current.

4. A time delay relay comprising a voltage divider arranged to be connected across a source of alternating voltage, an electron discharge device having an anode, a cathode, and a grid, a capacitor connecting said grid with said divider at an intermediate point thereof, a switch connecting said cathode with said divider at a point thereof at one side of said intermediate point, a resistor connecting said cathode with said divider at a point thereof at the other side of said intermediate point, and means connecting said anode with said divider at a point thereof also at said other side of said intermediate point.

5. A time delay relay comprising a grid-controlled electron discharge device arranged to be energized from a source of alternating current, an anode-cathode circuit for said device including said source of alternating current, a capacitor connected with said grid and arranged to be charged by the grid current of said device and a single pole single throw switch in said anode-cathode circuit of said device for simultaneously closing said circuit and reducing the voltage applied to said capacitor.

6. A time delay relay comprising a source of alternating current supply, a voltage divider connected across said source, an electron discharge device having an anode, a cathode and a control grid, a contact relay connected between said anode and one end of said divider, a resistor connecting said cathode with said divider at said end thereof, a switch connecting said cathode with the other end of said divider, and a capacitor having a high resistance in shunt therewith connected between said grid and an intermediate point of said divider.

7. A time delay relay comprising a voltage divider arranged to be connected across a source of alternating current supply, a grid controlled electron discharge device having its anode and cathode connected with spaced points of said divider, a switch in said cathode connection, a capacitor connected between said grid and point of said divider intermediate the connections of said anode and cathode, and a resistor connected between said cathode and said divider at a point thereof on the opposite side of said capacitor connection from said first mentioned cathode connection.

ELBERT D. SCHNEIDER.

CERTIFICATE OF CORRECTION.

Patent No. 2,171,347. August 29, 1939.

ELBERT D. SCHNEIDER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 25, claim 1, for "said said" read and said; line 37, claim 2, for "pont" read point; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of October, A. D. 1939.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)