

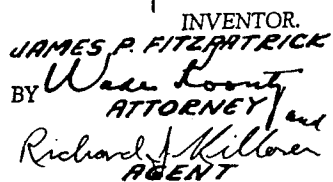
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TIME DELAY CIRCUIT FOR CAMERA

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TIME DELAY CIRCUIT FOR CAMERA

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4 Claims. (Cl. 317-141)

This invention relates to a variable time delay circuit for delaying the closing of a shutter in a camera wherein the shutter control mechanism consists of a spring loaded device which operates to close the shutter when a latch is released through the motion of the armature of an electromagnet. It is sometimes desirable to provide for longer exposure times in cameras of this type which have normal exposure times of $\frac{1}{25}$, $\frac{1}{50}$ and $\frac{1}{100}$ of a second and still leave the camera so that it can be used as originally intended.

Accordingly, one object of the invention is to provide a circuit for increasing the time delay introduced into the shutter control circuit of a camera without modifying the shutter trip control mechanism.

This and other objects will be more fully understood with reference to the following detailed description taken in connection with the drawings wherein:

Fig. 1 is a circuit schematic partially in block form of a timer circuit according to the invention;

Fig. 2 shows the current through the coil of the trip magnet for various time delays; and

Fig. 3 shows the overlap time for the relays of Fig. 1.

Referring more particularly to the drawing, reference numeral 10 refers to the coil of the trip magnet, the armature of which acts to close the shutter of the camera when the current through the coil decreases from a steady state value from about 20 milliamps to a certain predetermined level as shown in Fig. 2. The armature and shutter are not shown since they do not constitute a part of this invention.

A first circuit which maintains the steady state current of about 20 milliamps through coil 10 includes a power supply 11, a trip control unit switch 12, manual control switch 13 and relay contacts 14. A second circuit through relay coil 10 includes the energizing coil for relay 15 and a plurality of condensers C-1 through C-10 which may be selectively included in the circuit by means of a switch 16. The condensers C-1 through C-10 are for the purpose of varying the time delay introduced into the timing circuit for delaying the closing of the shutter. As can be seen from the circuit there will be no current flow through said second circuit during steady state conditions. However, when the trip control unit switch 12 opens the first circuit the condensers 1 through 10, which are connected in the circuit at that time, will discharge through the coil and the inherent resistance in this circuit in the manner shown in the curves of Fig. 2. The particular curve of Fig. 2 which the current follows will depend upon the setting of the switch 16. When the current through the coil reaches a level as indicated at points b, c, and d which correspond to the delay times t_x , t_y and t_z respectively, the armature of the magnet is released and the shutter is closed. The steady state value of current through the coil is indicated at a, in Fig. 2.

Since the trip control unit 12 is open for only a limited time additional means must be provided to maintain an open circuit between the power supply 11 and the coil 10 so that the time delay circuit will have time to operate.

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This is accomplished by means of an auxiliary circuit which is controlled by relay 15. When steady state current is flowing through the coil 10 there is no current flow through the coil of relay 15. However, when switch 12 is opened and current starts to flow in said second circuit relay 15 operates to close contacts 20 which allows current to flow in the circuit through power supply 21 condenser C-11 and the coil of relay 22. When current starts to flow through relay 22 relay contacts 14 are opened thus keeping the circuit between power supply 11 and coil 10 open even though switch 12 closes. Relay 22 also closes relay holding contacts 23 to maintain current flow through the coil of relay 22. The relay 22 remains operative until the current through the auxiliary circuit decreases to a certain predetermined value due to the build-up charge on the condenser C-11. The time for charging this condenser to a value such that relay 22 is released should be great enough to hold said first circuit open for the maximum time delay of said second circuit. When relay 22 is deenergized thereby opening holding contacts 23 and closing contacts 14 the circuit is returned to its original state, after the condensers C-1 through C-10 again acquired their maximum charge and condenser C-11 is discharged through the resistance R-1.

To insure that relay 22 will not operate during the charging time of condensers C-1 through C-10 and to insure the operation of relay 22 during the discharge time of these condensers a definite overlap time for operation of the relays must be built into the apparatus. In Fig. 3, t_b represents the closing time for contacts 20 of relay 15 and t_d represents the opening time. The opening time for contacts 14 of relay 22 is indicated at t_c and the closing time is indicated at t_e . As can be seen, both relays are energized during the time from t_c to t_d so as to insure the operation of relay 22.

The circuit for the charging current for condensers C-1 through C-10 includes power supply 11, trip control switch 12, manual switch 13, relay contacts 14, relay 15 and switch 16. It can be seen that the charging current for condensers C-1 through C-10 does not flow through the coil 10. The charging time for these condensers is therefore shorter than the discharge time through coil 10 and the contacts 20 of relay 15 will open before relay 22 becomes operative. The relative operating times for the relay contacts are shown along the current versus time curve for coil 10 although this curve does not show the current flow in all portions of the circuit.

There is thus provided a circuit for increasing the time delay introduced into the shutter control circuit of a camera which makes it unnecessary to modify the shutter trip control mechanism of the camera.

While one specific embodiment of the invention has been described in some detail it is to be understood that numerous changes may be made without departing from the general principles and scope of the invention.

I claim:

1. A timing circuit for controlling the operation of an electromagnetically controlled shutter camera comprising a first circuit including a power supply, the coil for said electromagnet, a camera trip control switch, a manual control switch and an additional switch, a second circuit including said coil and a first relay, a plurality of capacitive elements, means for selectively connecting said capacitive elements in said second circuit, an auxiliary circuit including a second power supply, a second relay, a normally discharged condenser, a first switch controlled by said first relay for closing the circuit through the second power supply, said second relay and said normally discharged condenser, a second switch controlled by said second relay in parallel with said first switch, means for opening said additional switch of said first circuit when said second relay is energized, and means for discharging

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the condenser in said auxiliary circuit when said second relay is deenergized.

2. A timing circuit for controlling the operating time of a camera shutter which is controlled by an electromagnet, comprising: a first circuit including a first power supply, a coil for the electromagnet, a camera trip control switch and at least one additional switch; a second circuit including said coil; a plurality of capacitive elements; means for selectively connecting said capacitive elements into said second circuit to thereby provide a time delay for the operation of said shutter; a third circuit including a second power supply and an auxiliary timing device; a relay controlled by said auxiliary timing device for opening a said additional switch in said first circuit; and means responsive to current flow in said second circuit for closing the circuit through said second power supply, said auxiliary timing device and said relay to thereby set said auxiliary timing device into operation.

3. A timing circuit according to claim 2 wherein said auxiliary timing device is a capacitive element.

4. A timing device for controlling the operating time of a camera shutter which is controlled by an electromagnet, comprising: a first circuit including a first power

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supply, a trip control switch, the coil for said electromagnet and at least one additional switch; a second circuit including the coil for said electromagnet and a first relay; a plurality of capacitive elements; means for selectively connecting said capacitive elements in said second circuit to thereby provide a time delay for the operation of said shutter; a third circuit including a second power supply, an auxiliary timing device, a second relay controlled by said auxiliary timing device and a pair of switch contacts for said first relay whereby said third circuit is closed in response to current flow in said second circuit; said second relay being operatively connected to a said additional switch in said first circuit, whereby said first circuit is held open by current flowing in said third circuit.

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