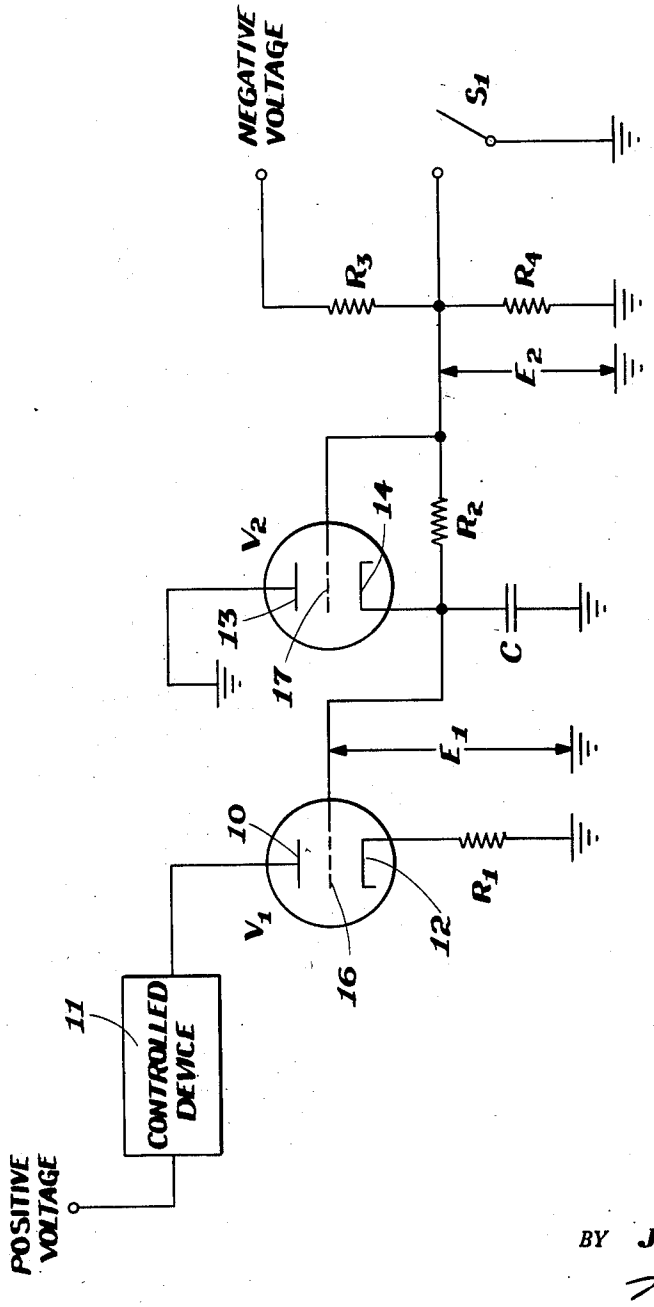
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TIMING CIRCUIT

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TIMING CIRCUIT

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This invention relates in general to timing circuits and in particular to control apparatus which has a release time different from the connect time.

It becomes desirable at times to control apparatus such that the starting time does not equal the releasing time. For example, it may be desirable to energize a relay instantaneously upon the closing of a switch and have it remain energized for a predetermined time after the switch is opened. With this arrangement after the relay has once been energized, a very short interruption of the actuating switch will not cause the relay to drop out. Many other applications exist wherein this type of control is desired.

It is an object of this invention, therefore, to provide an apparatus which has a differential between the energization and the deenergization times.

Another object of this invention is to provide an improved timing device which minimizes the load on the electron valves of the apparatus.

Still another object of this invention is to provide an improved fast acting control circuit.

A feature of this invention is found in the provision for a pair of electron valves which are connected such that the closing of a control switch causes instantaneous operation of the controlled device and the opening of the switch causes disengagement of the controlled apparatus after a pre-determined time.

Further features, objects, and advantages of this invention will become apparent from the following description and claims when read in view of the drawings, in which;

The figure illustrates a circuit of this invention.

With reference to the drawing, a first electron valve V_1 has its plate **10** connected in series with a controlled device **11** to a positive direct current voltage. The control device might be, for example, a current sensitive relay with its actuating coil connected in series between the plate **10** and the positive voltage. The cathode **12** of valve V_1 is connected in series with a resistor R_1 to ground.

A second electron valve V_2 has its plate **13** connected to ground and its cathode **14** is connected to the grid **16** of valve V_1. A condenser C is connected between the cathode **14** and ground.

The grid **17** of valve V_2 is connected to a resistor R_2 which has its opposite side connected to the cathode **14**. The grid **17** is also connected to the junction of a pair of resistors, R_3 and R_4.

The opposite side of R_3 is connected to a negative direct current voltage and the opposite side of resistor R_4 is connected to ground. A switch

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S_1 has one side connected to ground and a terminal **18** is connected to the grid **17**, so that the grid may be connected and disconnected to ground when the switch S_1 is closed and opened, respectively.

The values of components might be:

R_1	ohms	1,000
R_2	do	1,000,000
R_3	do	100,000
R_4	do	100,000
C	microfarad	1

The positive voltage connected to the plate **10** through the control device **11** is 250 volts direct current. The negative voltage connected to R_3 is 40 volts direct current.

In operation, suppose that switch S_1 has been open for a relatively long time. Then the voltage E_2 across the resistor R_4 will be 20 volts negative, and the voltage E_1, across condenser C will be almost 20 volts negative. Since the grid **16** of valve V_1 is negative, V_1 will have minimum current or be cut off completely, depending on the tube characteristics. The tube V_2 will also have minimum current and the grid **17** and cathode **14** will be at substantially the same potential. In this condition the control device **11** will have minimum current passing through it and will therefore be unactuated.

Assume that switch S_1 is closed. The grid **17** of tube V_2 is immediately connected to ground potential thus becoming positive relative to the cathode **14**. This causes the tube V_2 to act as a diode thus very quickly discharging the condenser C to ground potential. The grid **16** of tube V_1 is connected to the condenser C and thus its voltage rapidly goes to ground potential thus allowing the current through tube V^1 to increase almost instantaneously when switch S_1 is closed. The controlled device **11** is actuated. Tube V_1 will continue to conduct as long as the switch S_1 is closed.

Assume that the switch S_1 has just been opened. The tube V_2 will immediately be cut off or have minimum current for the reason that the negative control voltage connected to R_3 will immediately cause E_2 to become negative. The tube V_1, however, will continue to conduct until the condenser C has charged sufficiently to cut it off. The time constant for charging C is determined by the product R_2 C, and since this time constant is chosen to be relatively large, the tube V_1 may continue to conduct for three or four seconds, for example, after the opening of switch S_1. It the switch S_1 is re-closed during this interval the

controlled device 11 will not be de-actuated during the open period of switch S_1. Thus, with a temporary failure of power which is quickly resumed, the controlled device 11 will not be de-energized.

Although the invention has been described with respect to a preferred embodiment thereof, it is not to be so limited as changes and modifications may be made therein which are within the full intended scope of the invention as defined by the appended claims.

I claim:

1. Control means for a controlled device comprising, a first electronic valve which has its plate connected in series with the controlled device to a positive direct current voltage and its cathode connected in series with a first resistor to ground, a second electronic valve with its plate connected to ground and its cathode connected to the grid of the first electronic valve, the grid of the first electronic valve connected to one side of a condenser which has its opposite side connected to ground, a grid leak resistor connected between the grid and cathode of the second electronic valve, a voltage divider comprising third and fourth resistors connected in series between ground and a negative direct current voltage, the grid of the second electronic valve connected to the connection point between said third and fourth resistors, and switching means for connecting said connection point to ground.

2. Control means for obtaining a fast attack time and a slow release time in a controlled device comprising, a first electron valve with the controlled device connected in its plate circuit in series with a positive direct current voltage, a second electron valve with its cathode connected to the grid of the first electron valve, a capacitor connected to the cathode of the second electron valve and its opposite side connected to ground, a grid leak resistor connected between the grid of the second electron valve and the cathode, a voltage divider comprising a pair of resistors connected in series between ground and a negative direct current voltage, the grid of said second electron valve connected to the mid-point between said first and second pair of resistors, a controlling switch connected to ground and movable to connect the mid-point between the pair of resistors to ground.

3. A control circuit for instantaneously energizing a controlled device and de-energizing said controlled device only after a pre-determined time comprising, a first electron valve with its plate connected in series with said controlled device to a positive direct current voltage, a first resistor connected between ground and the cathode of the first electron valve, a second electron valve with its plate connected to ground and its cathode connected to the grid of the first electron valve, a capacitor connected to the cathode of said second electron valve and its opposite side connected to ground, a second resistor connected between the grid and cathode of the second electron valve, third and fourth resistors connected in series between a negative direct current voltage and ground, the grid of the second electron valve connected to the junction between the third and fourth resistors, and switching means with a movable throw arm connected to ground and movable to engage the junction point between the third and fourth resistors.

4. A control device with a fast attack time and a slow release time for a controlled device comprising, a first electron valve, a second electron valve with its cathode connected to the control grid of the first electron valve, a charging circuit comprising a resistor and condenser connected to the cathode of said second electron valve, a voltage divider comprising a pair of resistors connected between a negative direct current voltage and ground, the grid of said second electron valve connected to said voltage divider, switching means for connecting the mid-point between said pair of resistors to ground, and said first and second electron valves having minimum current when said switching means is open and maximum conduction when said switch is closed.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,277,098	Haines	Mar. 24, 1942
2,503,835	Montgomery	Apr. 11, 1950