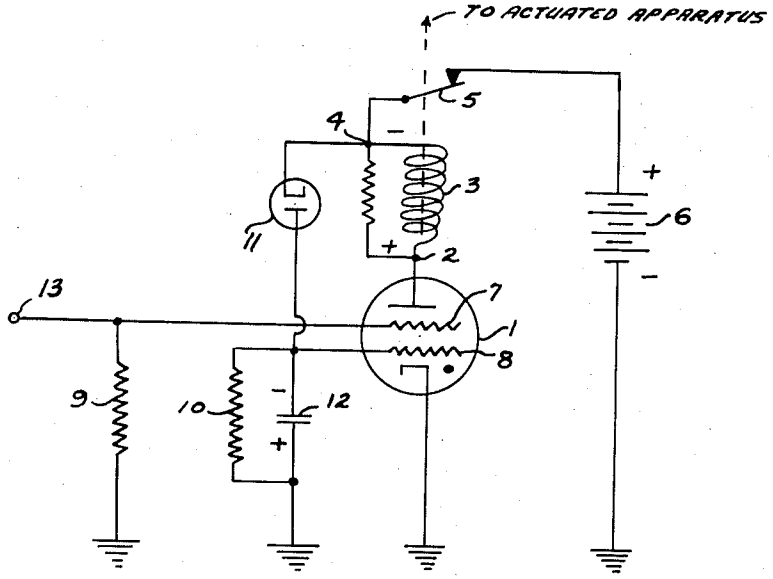
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SOLENOID TRIGGERING CIRCUIT

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SOLENOID TRIGGERING CIRCUIT

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1 Claim. (Cl. 317—149)

The purpose of this invention is to provide a circuit that will operate to energize and deenergize a solenoid only once during a predetermined period of time. The solenoid may be that of a relay, stepping switch, etc.

The circuit employs a shield grid thyratron having its cathode connected to one terminal of a source of current and its anode connected through the solenoid winding and a normally closed set of contacts actuated by the solenoid to the other terminal of the current source. The solenoid is energized by a positive pulse or step voltage applied to the control grid. Energization of the solenoid opens the above mentioned contacts breaking the circuit to the current source and deenergizing the solenoid. The decaying flux in the solenoid induces a large voltage in the coil in such direction as to prolong the current flow in the thyratron. In the short interval before the above mentioned contacts reclose a switching diode controlled by the induced coil voltage causes the prolonged current flow to negatively charge a condenser in the shield grid circuit. The resulting negative potential on the shield grid operates after the contacts have reclosed to prevent firing of the thyratron by a positive voltage on its control grid until the condenser has discharged.

A more detailed description of the invention will be given with reference to the specific embodiment thereof illustrated in the accompanying drawing.

Referring to the drawing, thyratron **1** has its anode connected to terminal **2** of solenoid **3** the other terminal **4** of which is connected through normally closed contacts **5** to the positive terminal of direct current source **6**.

The cathode of the thyratron and the negative terminal of source **6** are connected to ground to complete the energizing circuit of the solenoid. The control grid **7** and shield grid **8** are connected to ground through resistors **9** and **10**, respectively, and are consequently at ground potential. The construction and operation of shield grid thyratrons are well known in the art and described in the literature, for example, on pages 472–473 of Theory and Applications of Electron Tubes, Reich, second edition, 1944, McGraw-Hill. Diode **11** and condenser **12** operate in accordance with the invention to prevent multiple firings of the thyratron during a predetermined interval in a manner that will be explained later.

In the ready state of the circuit points **4** and **2** and the anode of the thyratron are all of the same positive potential (that of source **6**) relative to ground. The potentials of grids **7** and **8**, however, are sufficiently low to prevent firing of the thyratron. Further the cathode of diode **11** is positive relative to its anode so that the diode represents an open circuit. The circuit is triggered by application of a positive pulse or step voltage to terminal **13**. This raises the potential of control grid **7** and causes the thyratron to fire and current to flow from source **6** through contacts **5**, solenoid coil **3** and thyratron **1** to ground. Energization of the solenoid causes contacts **5** to open breaking the circuit to source **6**. Upon the opening of contacts **5** the rapidly decaying flux in coil **3** induces a voltage in the winding in such direction as to oppose the decrease in current. The polarity of terminals **2** and **4** due to this induced voltage is therefore as indicated in the drawing. Further, the induced voltage is of relatively large magnitude so that point **4** falls considerably below ground potential and diode **11** becomes conductive. Therefore, prior to reclosure of contacts **5**, the induced voltage prolongs the current flow through the thyratron which now passes upward through condenser **12** and diode **11** to point **4**, charging this condenser negatively relative to ground, until the thyratron is extinguished. Contacts **5** eventually reclose restoring positive potential to the anode of the thyratron. However, because of the negative potential now on shield grid **8**, the solenoid can not again be actuated by a positive voltage on terminal **13** until the charge on condenser **12** has been dissipated to a certain level. This time required for this to take place may be controlled by the size of resistor **10** through which the condenser discharges. Therefore, only one actuation of solenoid **3** can take place during an interval determined by the time constant of condenser **12** and resistance **10**.

I claim:

A solenoid triggering circuit comprising a thyratron having an anode, a cathode, a control grid and a shield grid, a source of direct current, a set of normally closed contacts actuated by said solenoid, means connecting one terminal of said solenoid to said anode, means connecting the other terminal of said solenoid through said contacts to the positive terminal of said source, means connecting said cathode to the negative terminal of said source, a capacitor and a resistance connected in parallel between said shield grid and said cathode, a diode having its anode connected to said shield grid and its cathode connected to said other terminal of said solenoid, and means for applying a positive triggering voltage between said control grid and said cathode.

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