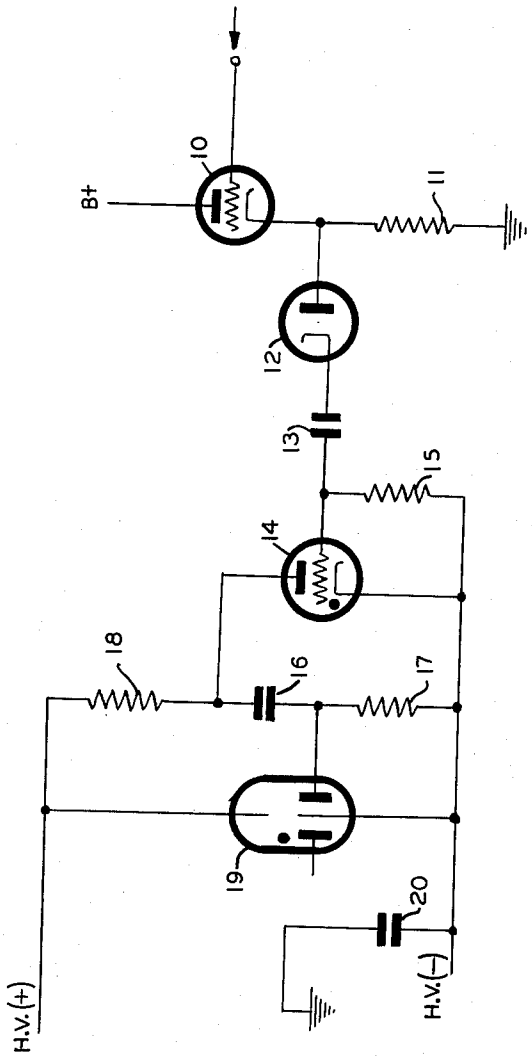
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HIGH SPEED PHOTOGRAPHIC LIGHT CIRCUIT

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INVENTOR.
ROBERT B. HARTMAN II
BY John H. Lewis Jr.
Harry E. Braddock

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HIGH SPEED PHOTOGRAPHIC LIGHT CIRCUIT

Robert B. Hartman II, Bridgeport, Conn., assignor to Remington Arms Company, Inc., Bridgeport, Conn., a corporation of Delaware

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This invention relates to the field of high speed electrical photoflash lamps. More particularly this invention involves a novel improved high speed trip circuit for a high speed photoflash lamp for use primarily in ballistics testing and measurements for firearms and ammunition.

It is an object of this invention to provide an improved high speed trip circuit for a high speed photoflash lamp which is simple and economical in construction, efficiently and reliable in operation.

It is another object of this invention to provide an improved photoflash system which has very rapidly-operating trigger pulse and an extremely short firing time.

Other objects and advantages will appear from the following specifications and claims taken with the accompanying drawings in which:

The single figure is a diagrammatic view of circuits and apparatus arranged and constructed according to one embodiment of the invention.

Referring to the figure by characters of reference, the circuit includes a triode **10**, connected as a cathode follower for low impedance output, the grid of which receives the positive pulse of input voltage to trigger the photoflash function. Connected to the cathode of triode **10** is a high voltage diode **12** preferably a IB3 and a high voltage condenser **13** which are in turn connected to the grid of thyratron tube **14** which is preferably a hydrogen thyratron 4C35. The anode of thyraton **14** is connected to a positive high voltage source through ground resistor **18** and its cathode is connected both to ground condenser **20** and directly to a negative high voltage source. A flash tube **19**, preferably a Mullard LDS2, of the gas-filled type capable of producing an intense light when an electric discharge is passed between anode and cathode terminals, is connected across the high voltage leads HV(+) and HV(—) as indicated. A trigger or igniting electrode is provided to be energized to initiate the discharge. The igniting electrode of the flash tube is connected through condenser **16** to the plate or output of thyratron **14**. Resistor **17** between the cathode of the flash tube and its trigger electrode prevents the flash tube from functioning by maintaining the trigger electrode at flash tube cathode potential until a trigger pulse is received through condenser **16** from thyratron **14**. Resistor **15** is connected between the grid and cathode of thyratron **14** and in like manner prevents thyratron **14** from generating a pulse until it is triggered by triode **10** through diode **12** and condenser **13**.

In operation when a high D.C. voltage is applied across leads HV(+) and HV(—), condenser **16** will charge up to the full high voltage value through resistors **17** and **18**. In a similar manner, condenser **13** will charge up to the voltage difference between the negative side of the high voltage supply and the cathode voltage of the cathode follower through resistor **15** and diode **12**. When a positive voltage pulse is applied to the grid of triode **10** the similar power pulse appears on the cathode of this [illegible] is transmitted to the grid of thyratron **14** through diode **12** and condenser **13**. This pulse is of such an amplitude to cause the thyratron **14** to fire, causing a very high voltage drop across resistors **17** and **18**. Since the voltage across a condenser can not be changed instantaneously, the voltage change across resistor **17** is transmitted through condenser **16** to the igniter electrode of the flash tube **19** causing the flash tube to conduct and emit the light pulse. Thyratron **14** may be considered as a short circuit on firing so that the junction of resistor **18** and condenser **16** changes from the positive high voltage potential HV(+) to the negative potential of the high voltage supply HV(—). Since the voltage across the condenser **16** may not change instantaneously, the junction of condenser **16** and resistor **17** which is directly connected to the ignition electrode of the flash tube **19**, is driven below the negative high voltage value, i.e. becomes negative with respect to the adjacent electrode by the amount of the entire high voltage supply [HV(+)+HV(—)]. This in effect, in my preferred embodiment, applies a voltage differential of about 7500 volts between the igniter terminal and the negative electrode of flash tube **19** to initiate its flash action, when HV(+) is +3750 and HV(—) is —3750 volts.

The negative source of high voltage need not be grounded for this circuit to operate so long as condenser **13** and the series diode **12** can withstand the differential of voltage between the triode cathode and the negative value of the high voltage supply. In the case of a split high voltage supply where the voltage is half positive and half negative, on firing the flash tube **19**, the negative source of high voltage is very rapidly returned toward ground value or to the de-ionizing potential of the flash tube due to the relatively high impedance of the high voltage supply. This obviously generates a high voltage pulse with respect to ground which will try to return to the triode through condenser **13**. However, the pulse is in a "positive-going" direction and is effectively blocked by the diode **12** in series with condenser **13**. If the negative terminal of the high voltage supply is grounded, the diode may be eliminated.

The driving source impedance for the grid of the thyratron **14** must be low. Therefore a cathode follower arrangement with tube **10** was chosen to transfer this pulse. If the cathode of the thyratron **14** is grounded, the apparent source impedance will be as low as is necessary. However, if the negative terminal of the high voltage power supply is not directly grounded, it is essential that the low impedance path be provided for the triggering pulse for the thyratron **14**. In the circuit shown, the complete load path on the cathode follower is through the diode **12**, condenser **13**, resistor **15** and condenser **20** to ground.

While I have fully described a preferred embodiment of my invention in accordance with the patent statutes, modifications will occur to those skilled in the art and all such are considered to fall within the spirit and scope of this invention as defined in the appended claims.

What is claimed is:

1. An electrical very high intensity short duration light flash producer system comprising in combination, a normally non-conducting high voltage luminescent-discharge lamp having a principal positive electrode and a principal negative electrode between which a discharge may pass when the lamp is conducting to produce light and an initiator electrode adjacent to said principal negative electrode and operative when energized to render the lamp conducting, means for connecting the principal electrodes to a high voltage power supply means to cause energy from the source to discharge between the principal electrodes through the lamp when the lamp is conducting to produce a very high intensity flash of light

of very short duration, a first condenser and a second condenser, means for connecting the initiator electrode through said first condenser and a first resistor to the positive side of the power supply means, said second condenser connecting the negative side of said power supply to ground, means for connecting the initiator electrode to the negative side of the power supply means through a second resistor, switching means connected in parallel across said first condenser and said second resistor for selectively connecting said first condenser to said negative side of said high voltage power source to cause said initiator electrode instantaneously to become a different potential with respect to said principal negative electrode and render said lamp conducting to enable a discharge to pass between said principal electrodes and produce a very high intensity flash of light of extremely short duration.

2. A high speed high intensity light flash producer system comprising in combination a source of supply of high voltage direct current, a flash lamp having an anode, a cathode and a control grid, means connecting said

source to said anode and said cathode, a first resistor and a first condenser arranged in series and connected in parallel across said anode and said control grid, a second resistor connected in parallel across said control grid and said cathode, switch means in series with said first resistor responsive to a triggering voltage pulse to connect said condenser to said cathode to change instantaneously said cathode potential with respect to the potential of the control grid to cause the flash lamp to function, and a second condenser connected between ground and the negative side of said source of power.

3. The system of claim 2 in which said switch means comprises a normally non-conductive grid-controlled electric discharge device actuated by and coupled to means producing the triggering voltage pulse by a third condenser and a high voltage diode.

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