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Rosenberg

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[54] ELECTRONIC FLASH CIRCUIT FOR PHOTOGRAPHY

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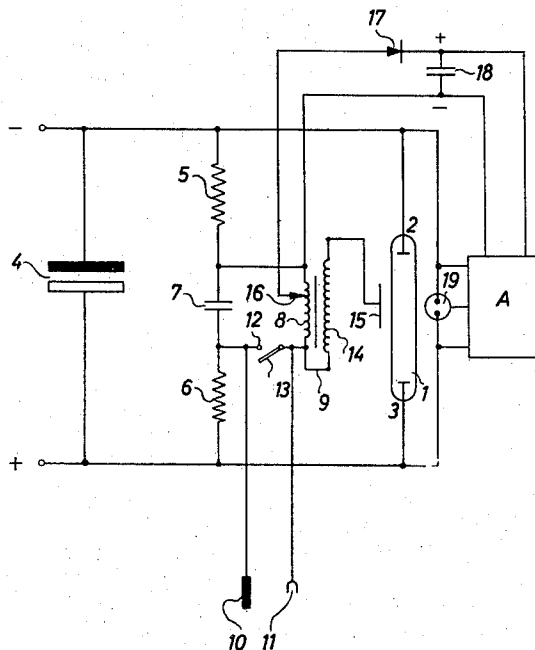
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[57] ABSTRACT

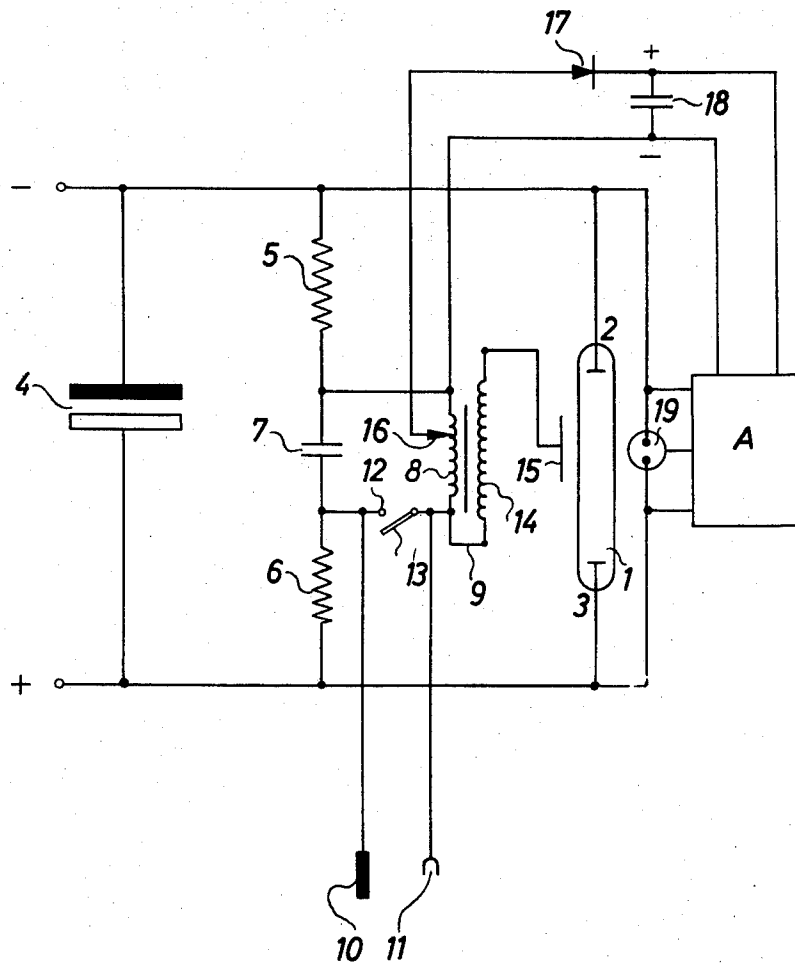
An electronic flash unit has a flash tube ignited through an ignition circuit, and a control circuit with a photoelectric element for receiving the light utilized during a photographic process and terminating the light flash after the light has reached a desired value. The operating voltage for the control circuit is furnished from the ignition circuit of the flash tube by connecting one end of the primary winding of the ignition transformer and a tap on said transformer to the control circuit in such a way that the voltage between the two points constitutes the operating voltage for the control circuit.

6 Claims, 1 Drawing Figure



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ELECTRONIC FLASH CIRCUIT FOR PHOTOGRAPHY

BACKGROUND OF THE INVENTION

This invention relates to an electronic flash unit used for example in conjunction with photographic cameras. In particular, it relates to the type of flash unit which has an automatic control circuit having a light sensitive element for the automatic control of the amount of light furnished by the electronic flash.

Electronic flash units are known, wherein a quench tube is used for controlling the amount of light generated in the electronic flash tube. The quench tube is connected in parallel to the electronic flash tube. After the quench tube has been ignited, it furnishes a lower impedance parallel path to the flash tube, thus causing the energy to be transferred to the quench tube. The flash tube is thus extinguished. The time instant at which the quench tube is ignited, thus terminating the flash, is determined by means of a timing circuit which comprises a capacitor and a light sensitive resistance. The ignition time for the quench tube is thus determined by intensity of light falling on the photoresistance, for example the intensity of the light reflected by the object to be photographed. In known electronic flash units of the type described, the operating voltage for both the flash tube and the control circuit is furnished by separate direct current sources. Other units are known, in which the operating voltage for the control circuit is furnished by means of a voltage generated in the discharge circuit of the electronic flash tube.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a circuit wherein the operating voltage for the control circuit is derived in a manner different from those set forth above.

It is a further object of this invention that the operating voltage be furnished to the control circuit without the necessity of additional elements, as are required in the circuits set forth above.

The present invention thus comprises a flash tube for generating a light flash, said flash tube having an ignition electrode. It comprises an ignition circuit connected to said ignition electrode and a control circuit for furnishing a terminating signal for terminating the light flash. The control circuit requires an operating voltage. The invention further comprises connecting means which connect a first and second point of differing potential in the ignition circuit to the control circuit in such a manner that the potential difference between the first and second points constitutes the operating voltage for the control circuit.

This arrangement has the advantage, that the operating voltage is supplied to the control circuit at the latest upon ignition of the flash tube. It has the further advantage that the ignition transformer which must be present in any case, is also used to supply the operating voltage for the control circuit. A further advantage is that the discharge circuit loses only a very small amount of energy to the control circuit.

In a preferred embodiment of the present invention, the first and second points are points on the primary winding of the ignition transformer.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

The FIGURE is a circuit diagram showing one embodiment of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A preferred embodiment of the invention will now be discussed with reference to the FIGURE.

The electronic flash tube 1, has a first electrode 2, connected to the negative terminal of the main voltage supply and a second electrode 3, connected with the positive terminal of the main power supply. The main power supply is here indicated to be a storage capacitor 4, which has been previously charged through a circuit which is not illustrated. In parallel to the storage capacitor 4, is a series circuit comprising a resistance 5, the ignition capacitor 7, and a resistance 6. The ignition capacitor 7 is a part of the ignition circuit of the flash tube. Further components in the ignition circuit are the primary winding 8 of the ignition transformer 9, the synchronizing contact 10/11, which synchronizes the flash with the operation of the camera, as well as a manually operable pair of switching contacts 12/13 which are in parallel with the synchronous contact 10/11. The ignition transformer 9, in addition to the primary winding 8, has a step-up secondary winding 14 which is connected to the ignition electrode 15 of the flash tube 1. A quench tube 19 is connected parallel to the electronic flash tube 1, as is the control circuit denoted by A in the FIGURE. Such a control circuit is, for example, disclosed in U.S. Pat. No. 3,350,604. The operating voltage for the control circuit A is the damped oscillation generated by the oscillating circuit comprising the ignition capacitor 7 and the primary winding, 8, of the ignition transformer 9, after rectification by the diode 17. A further capacitor 18, connected in parallel with the control circuit A following the diode 17, serves as a storage condenser for the control circuit A.

When the electronic flash unit is ready for operation, both the storage capacitor 4 and the ignition capacitor 7 are charged. If either the contacts 10/11 or 12/13 are closed, the ignition capacitor 7 discharges over primary winding 8 of the ignition transformer 9. Thus a voltage is induced in the secondary winding 14 which causes the ignition of the electronic flash tube 1. Simultaneously, a part of the voltage appearing across the primary winding 8 is supplied to the control circuit storage condenser 18. The photosensitive element (not illustrated) contained within the control circuit A receives light reflected from the object to be photographed. This light will vary in quantity in dependence on a number of factors, at least one of these being the distance of the object to be photographed from the electronic flash unit. Within the control circuit A, the resistance value of the photosensitive element and the

capacitance of a capacitor which is not shown, determine the time at which the quench tube 19 is ignited, thus causing the termination of the light flash generated in the electronic flash tube 1. Thus, the ignition transformer 9 is used in a simple fashion both as a source of operating voltage for the control circuit, and, as is conventional, for the ignition of the electronic flash tube.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. Electronic flash unit comprising, in combination, a flash tube for generating a light flash, said flash tube having an ignition electrode; an ignition transformer having a secondary winding connected to said ignition electrode, and a primary winding; ignition energy storage means; control circuit means connected to said flash tube for terminating said flash, said control circuit means operating only upon application of an operating voltage; additional storage means connected to said primary winding and said control circuit for furnishing said operating voltage to said control circuit upon occurrence of a determined change of voltage across at least a part of said primary winding; and switch means

having a first and second stage for connecting said additional storage means and said primary winding to said ignition storage means upon external activation from said first to said second state, thereby creating said determined change of voltage and for disconnecting said additional storage means and said primary winding from said ignition storage means when in said first state.

2. An electronic flash unit as set forth in claim 1, wherein said ignition storage means comprise an ignition capacitor.

3. An electronic flash unit as set forth in claim 1, wherein said additional storage means comprise a control storage capacitor.

4. An electronic flash unit as set forth in claim 3, further comprising unidirectional conducting means connected in series with said control storage capacitor, thereby forming a series circuit; and wherein said series circuit is connected in parallel with at least a part of said primary winding of said ignition transformer means.

5. An electronic flash unit as set forth in claim 4, wherein said unidirectional conducting means is connected to said primary winding and said control storage capacitor in such a manner that current flows to said control storage capacitor substantially simultaneously with closing of said switching means.

6. An electronic flash unit as set forth in claim 5, wherein said unidirectional conducting means comprise a diode.

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