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ELECTRICAL FLASH LAMP SYSTEM

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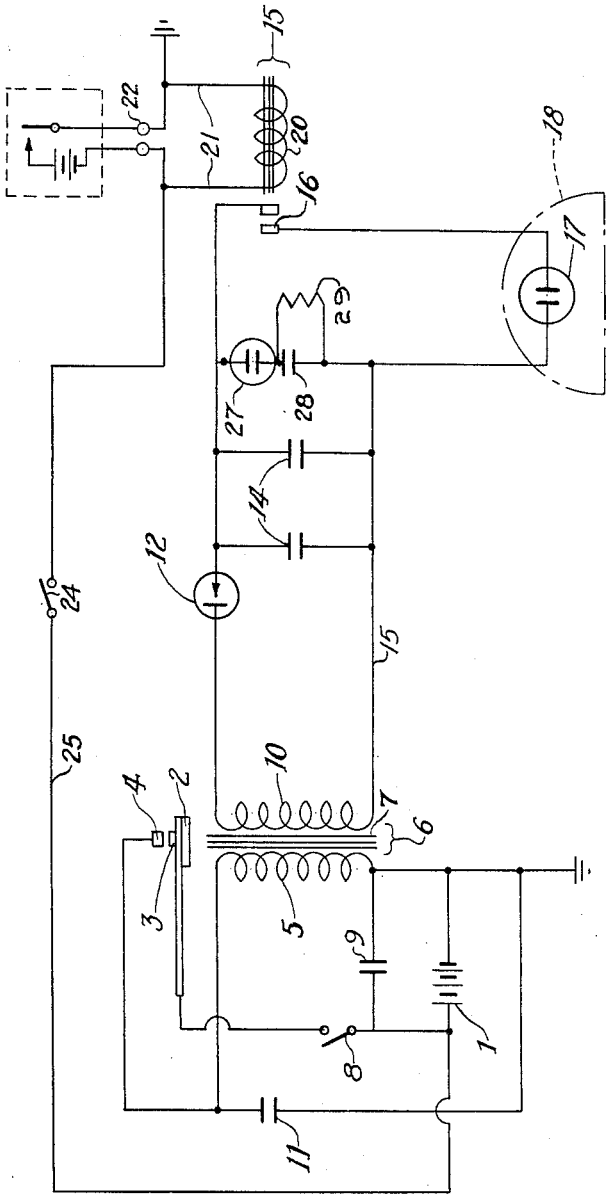

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ELECTRICAL FLASH LAMP SYSTEM

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My invention relates to an electrical flash lamp system for use in photography, and more particularly to a circuit arrangement that provides a visual indication showing whether or not the system is electrically conditioned for producing a luminous discharge in the flash lamp.

The flash lamp system with which my invention is used is normally of the portable, battery operated type. Low voltage D. C. power from the battery is applied to a vibrator device which supplies pulsating current to the primary of a step-up transformer. The high voltage output of the transformer secondary is rectified and applied to one or more storage condensers. The storage condensers, when fully charged, contain sufficient energy to produce a luminous discharge in the flash lamp, which discharge is synchronized with operation of the camera shutter.

One object of my invention is to provide a visual indication that shows the operator whether or not the storage condensers are sufficiently charged to produce the desired luminous discharge in the flash lamp. With such indication, the operator is enabled to avoid premature film exposure.

Another object is to provide a safety arrangement whereby the high voltage of the charged condensers may gradually leak away, thus avoiding some of the dangers inherent in using voltages of the order of 2,000 volts.

Others object and advantages of my invention will be apparent as the description proceeds, reference being had to the accompanying drawing which illustrates one form of the invention. It will be understood, of course, that in a practical, commercial application of the invention, the essential features are necessarily susceptible of changes in details and arrangements. The legal scope of the invention is to be measured by the claims hereinafter set forth.

As the flash lamp system to which my invention is applied utilizes the accumulation of energy over a relatively long period of time, with discharge of the accumulated energy in an extremely short space of time, I am able to utilize as an energy source, when portability is paramount, a single small storage cell 1 normally rated at 2.2 volts or two dry flashlight cells. One side of this battery is connected to an armature 2 carrying an armature contact 3, opposed by a stationary contact 4 which in turn is connected to the primary 5 of a step-up-transformer 6 having an iron core 7, one end of which is positioned to move armature 2. The other pole of battery 1 is connected to the other end of primary 5 to complete the primary circuit. A switch 8 is

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positioned in the primary circuit to control current flow therein, and a by-pass condenser 9 of .25 mf. is bridged across battery 1.

A secondary winding 10 is provided to complete the transformer structure and in the preferred circuit it normally is wound to provide a 1:70 voltage ratio. However, by placing a .5 mf. condenser 11 across the primary 5 of the transformer, thereby tuning the primary circuit, and by coordinating the vibratory frequency of the armature, I am able to obtain from the battery 1 a secondary voltage of about 2,000 volts.

This secondary voltage is passed through a rectifier tube 12 connected to one end of secondary 10 and the D. C. pulses are stored in two 8 mfd. condensers 14 in turn connected to the other end of secondary 10 by wire 15. Rectifier tube 12 may be, for example, an inert gas tube which has a high inverse voltage rating. A dry disc rectifier may also be used. The circuit is arranged so that condensers 14 charge up to full voltage in from 10–20 seconds, preferably in about 16 seconds.

The energy stored in condensers 14 is released through a relay 15 with contacts 16 connected to discharge the condensers 14 through a flash lamp 17 provided with a reflector 18. This lamp is preferably of the gaseous conduction type known as the "Amglo" lamp fully described and claimed in U. S. Patents 2,281,579, 2,217,315, 2,219,923 and 2,273,520, also preferably with xenon gas filling, preferably at about 25 m. m. Hg pressure, as I have found that the actinic value of the lamp filled with zenon is high, appears white, is effective over wide ranges of film response and is suitable for natural color photography, does not adversely affect the eyes of those exposed to the flash or cause the nervous reaction usually following metallic combustion flashes of similar duration and intensity. The flash, due to the condenser discharge, takes only a few milli-seconds for completion, and this is readily synchronized with camera shutters so that the flash takes place while the shutter is open.

In order that standard synchronizers may be used, such as might already be installed on cameras for use with metal combustion bulbs, relay winding 20 is provided with a cord 21 terminating in a bayonet plug 22 of a size to fit standard synchronizers. As such synchronizers contain a battery, no connection to battery 1 is needed. However, in order that the lamp 17 may be flashed at will, a flash switch 24 is provided connecting battery 1 with relay winding 20 through wire 25.

Because of the fact that I can obtain high

voltage from transformer 6, even from a single battery cell, and because I charge the condensers 14 over a substantial time period, I am able to deliver through the lamp a substantial amount of power in the short flash, and thus obtain satisfactory actinic power even though only a single dry cell is used as the power source. Tests have shown that the lamp flashes delivered by lamp 17 are in every way comparable for photographic purposes to the single exposure combustion lamp commonly used for flash exposures of camera films.

In such a circuit as has been described, it is highly desirable that the operator at all times be able to know the charge conditions of condensers 14, and to that end I have provided an indicator device preferably comprising a cold cathode glow lamp 27 of standard low current-low voltage type, connected across condensers 14 through a condenser 28 of about .01 mmf., capable of withstanding the series voltage. I may also prefer to by pass this condenser with a very high resistance leak 29, although I have found that some condensers have sufficient internal leakage to operate to give the desired indication without an external resistor.

The mode of operation desired and accomplished by the indicator device described, is that while condensers 14 are charging, the D. C. pulses imposed on glow lamp 27 cause this lamp to flash intermittently. However, as the voltage in condensers 14 approaches the supply voltage, flashing of the glow lamp ceases, and the light therein becomes continuous, due to leakage across condenser 282. Thus full charge on condensers 14 can be determined.

The small leak across condenser 28 also acts as a safety factor in case the circuit is left with a full charge on condensers 14, as the leak across condenser 28 will discharge condensers 14 in from ten to fifteen minutes.

From the above description it is thought that the construction and advantages of my invention will be readily apparent to those skilled in the art. Various changes and modifications may be made without departing from the spirit or losing the advantages of the invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an electrical flash lamp system having an electrical discharge lamp, a condenser providing energy for said lamp, an intermittent D. C. source for impressing a charge on said condenser, and means for discharging said condenser through said lamp, the combination therewith of a gaseous discharge glow tube connected across said condenser in series with a capacity bridged by a resistance leak whereby said tube flashes as said condenser is charging and glows steadily after said condenser has reached full charge.

2. In an electrical flash lamp system having an electrical discharge lamp, a condenser providing energy for said lamp, an intermittent D. C. source for impressing a charge on said condenser, and means for discharging said condenser through said lamp, the combination therewith of a gaseous discharge glow tube connected across said condenser in series with a capacity bridged by a resistance leak whereby said tube flashes as said condenser is charging and glows steadily after said condenser has reached full charge, the said resistance leak being proportioned to discharge said condenser in a time period in minutes when the condenser charging time is in seconds.

3. In an electrical system having a condenser for providing energy to a load and intermittent D. C. means for charging said condenser, the combination therewith of a gaseous discharge glow tube connected across said condenser, a capacitance in series with said glow tube, and a resistance leak in parallel with said capacitance whereby said tube flashes as said condenser is charging and glows steadily when said condenser has reached substantially full charge.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,849,376	Morse	Mar. 15, 1932
1,922,984	Soundy	Aug. 15, 1933
1,955,520	Vawter	Apr. 17, 1934
2,181,879	Edgerton	Dec. 5, 1939
2,196,046	Willis	Apr. 2, 1940
2,290,264	Wuerfel	July 21, 1942
2,341,541	Grier	Feb. 15, 1944
2,385,397	Blackburn	Sept. 25, 1945