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Bowen

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[54] **ELECTRONIC FLASH LIGHTING EQUIPMENT**

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[58] **Field of Search** ..... 315/240, 241 R, 241 P, 315/200 A, DIG. 4, DIG. 5; 95/82

[56] **References Cited**

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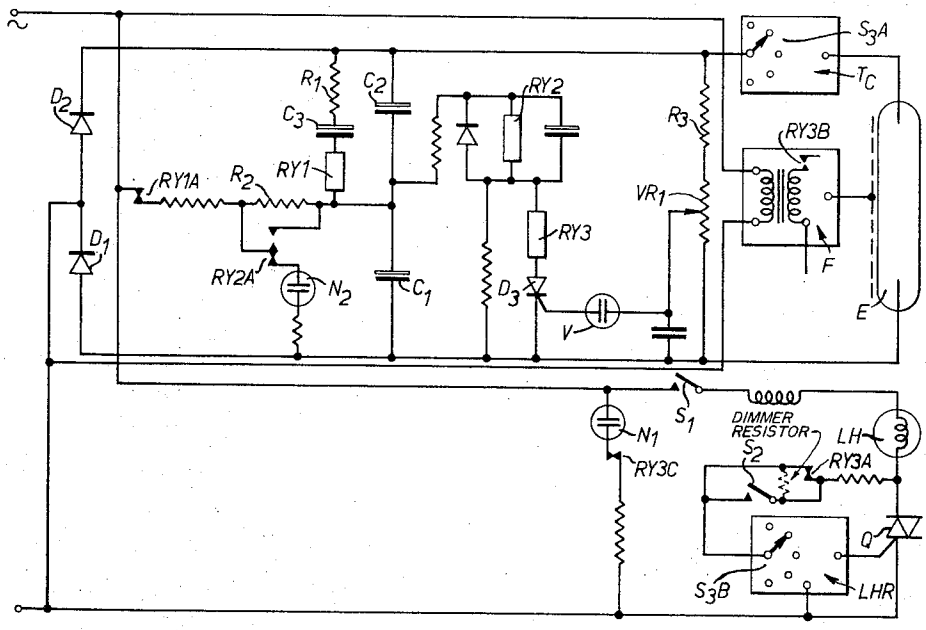
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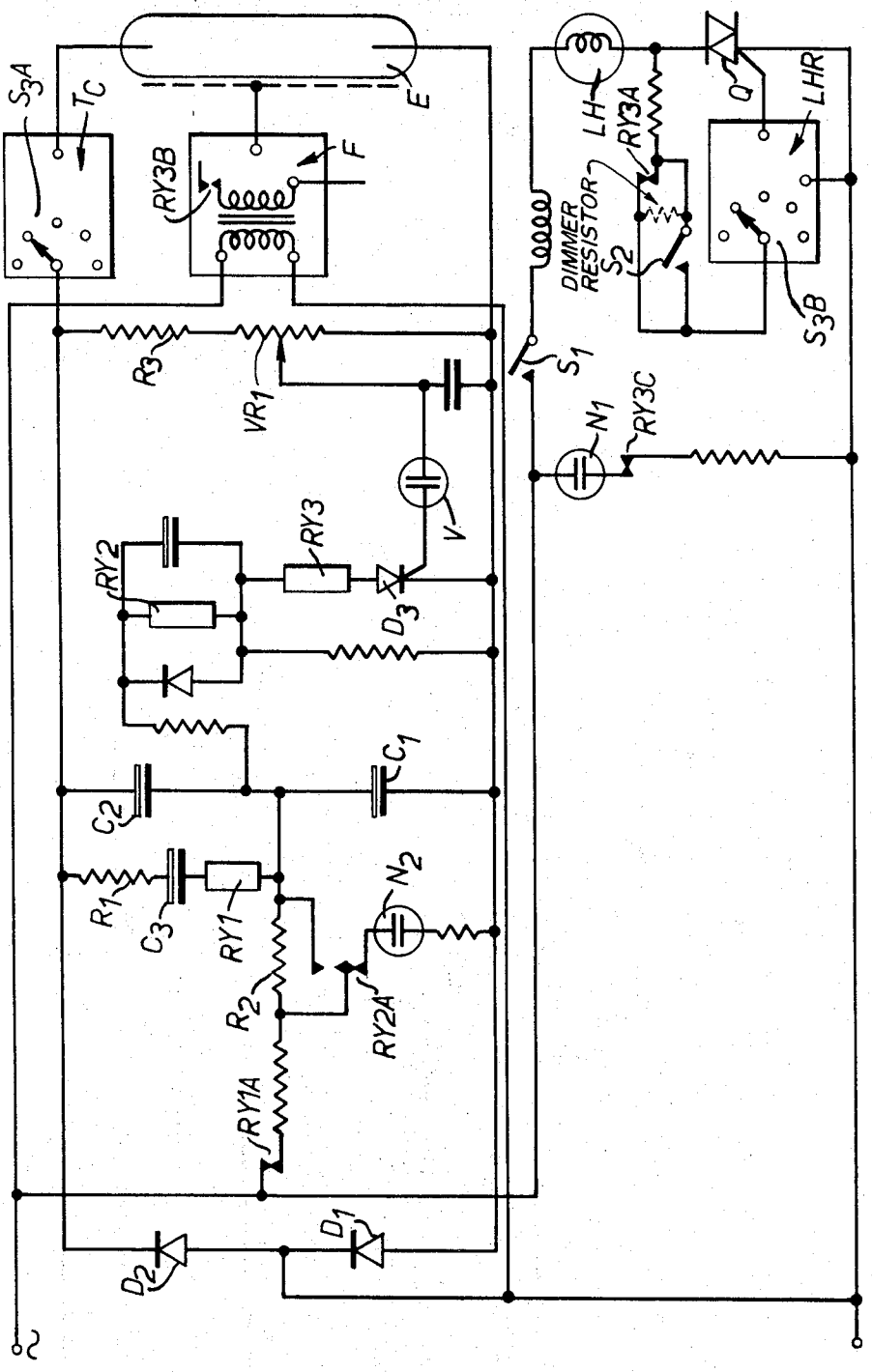
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[57] **ABSTRACT**

An electronic flash unit comprising an electronic flash tube, a modelling light, and a power supply and triggering arrangement for the flash tube, in which the said arrangement is coupled to the circuit supplying the modelling light in such a way that triggering of the electronic tube will, at least for a space of time thereafter, modify the light output of the modelling light.

5 Claims, 1 Drawing Figure




S3A
TC
E
RY3B
F
R3
VR1
V
RY2
RY3
D3
C2
C1
R1
C3
RY1
N2
R2
RY2A
RY1A
D1
D2
~
LH
RY3A
DIMMER RESISTOR
S2
Q
LHR
S3B
S1
N1
RY3C

ELECTRONIC FLASH LIGHTING EQUIPMENT

The invention relates to electronic flash lighting equipment, and in particular to equipment designed for studio photography.

In the past the several units of a studio lighting system have generally been controlled from a central power supply and control unit; more recently there has been introduced a system in which individual units are self-contained, each having its individual power supply arrangement.

In the older system synchronous firing of the several units was effected from the central control unit, being triggered by the synchronising contacts of the camera, the camera being connected by cable to the control unit with cable connections for both power supply and synchronisation from the control unit to each of the several lighting units.

In the new system all the cable connections may be eliminated and firing of the several units triggered by light-sensitive switches which operate in response to the firing of a small flash unit on or near the camera.

In both systems the lighting units will normally comprise, in addition to the electronic flash tube or tubes used for the actual exposure, a tungsten filament bulb lamp, a so-called "modelling" light, located within the unit to give a similar distribution of light, although at a much lower intensity, to that of the main flash tube or tubes.

If the output of the flash tube can be varied it is preferable that the brightness of the modelling light should be regulated in direct proportion to the selected tube output.

Although the newer system has the great advantage from the point of view of the photographer, of eliminating the complicated cable connections of the older system, the absence of the conventional control unit carries with it the disadvantage of leaving the photographer with no means of ascertaining after an exposure that every one of the flash units has indeed been triggered, and there may well be four or more units required for some of the more sophisticated lighting arrangements employed in modern photographic studios. The invention is concerned to remedy this defect.

In an electronic flash unit in accordance with the invention, comprising an electronic flash tube, a modelling light, and a power supply and triggering arrangement for the flash tube, the said arrangement is coupled to the circuit supplying the modelling light in such a way that triggering of the electronic tube will, at least for a space of time thereafter, modify the light output of the modelling light.

In the simplest embodiment of the invention the discharge of the storage capacitor of a conventional electronic flash tube power supply arrangement will be caused to switch off the modelling light for the duration of the recharging cycle. To mitigate the inconvenience of possible total darkness within the studio using such a unit as may be preferable to arrange that the modelling light should only be dimmed or that it should be caused to flash intermittently during the recharging period.

It will thus be possible for the photographer in a studio equipped with a number of such units to scan the respective modelling lights immediately after exposure and thereby ascertain whether each has been triggered.

In order that the invention may be more thoroughly understood an electronic flash unit in accordance with it will be described in some detail, by way of example, with reference to the accompanying drawing which is a diagram of the relevant parts of the circuit of the unit.

The unit comprises an electronic flash tube E and a tungsten filament modelling light LH. The power supply arrangement for the tube E includes a pair of diode rectifiers D_1 and D_2 arranged in a voltage doubling circuit to charge two storage capacitors C_1 and C_2. Firing of the tube E is effected in the usual way through a triggering (firing) circuit indicated generally at F, connected to the trigger electrode of the tube.

The output of the tube E can be regulated in discrete steps by means of a switch S_3A included in a control network TC and the brightness of the modelling lamp LH is maintained in direct proportion to the flash output setting by a switch S_3B, coupled to the switch S_3A, included in a regulator network LHR for the lamp LH which controls the lamp current through a solid state A.C. control device Q.

The flash tube power supply arrangement includes three relays **RY1, RY2** and **RY3.** The first relay **RY1** is connected across the storage capacitor C_2, in series with an electrolytic capacitor C_3 and a resistor R_1 and its contacts **RY1A**, in series with the A.C. mains supply to the storage capacitors C_1 and C_2, are normally closed. When the storage capacitors C_1 and C_2 are discharged upon firing of the tube E the relay **RY1** is energised for a space of time determined by the value of the capacitor C_3 and resistor R thereby opening the contacts **RY1A** and preventing the supply of charging current during that time.

The second relay **RY2** is arranged to be energised after the capacitors C_1 and C_2 have been pre-charged but before they are fully charged. The changeover contacts **RY2A** of this second relay are arranged to short circuit a current limiting resistor R_2 and to extinguish a precharge indicator neon lamp N_2 upon operation of the relay.

The third relay **RY3** is connected in series with a thyristor D_3 which is controlled through a discharge device V and a potential divider netowrk R_3 , VR_1 across the storage capacitors C_1, C_2. The thyristor D_3 will be switched on and relay **RY3** energised, only when a predetermined voltage level is reached in the storage capacitors.

The relay **RY3** has three sets of contacts: a normally open pair **RY3A** in series with the supply to the modelling lamp LH, a changeover set **RY3B** in the firing circuit for the tube E, and a normally open pair **RY3C** in series with a "ready" indicator neon lamp N_2. Upon operation of the relay therefore, the modelling lamp is switched on, the firing circuit becomes operative and the neon lamp N_2 is lit.

Upon firing the tube E, the device V ceases to conduct as the voltage across the capacitors C_1, C_2 collapses, the thyristor D_3 switches off and the relay **RY3** being no longer energised, the contacts **RY3A** open, to switch off the modelling lamp LH for the duration of the charging cycle. At the same time the firing circuit F is rendered inoperative by the opening of the contacts **RY3B** and the contacts **RY3C** open to switch off the "ready" indicator N_1.

A switch S_1 provides for extinction of the modelling lamp even when the relay **RY3** is energised and a second switch S_2 allows it to be switched on even when the

storage capacitors C_1 and C_2 are discharged and the relay RY3 is not energised.

Instead of the modelling light being completely extinguished during the recharging period it could be dimmed. This can be achieved either by the connection of a dimmer resistor across the relay contacts RY3A or by including those contacts in the regulating network LHR.

Alternatively by connecting a flasher network across the relay contact RY3A the modelling lamp may be caused to flash intermittently during the recharging period.

Instead of inter-connecting the supply arrangement of the modelling light and the main flash tubes it would be possible to employ a photocell to respond directly to the light output of the flash tube, and through appropriate circuitry, effect the required modification of the modelling light output for a prescribed interval. The photocell and/or its associated circuitry would have to be so arranged as to respond only to light above a threshold value to avoid false operation in response to the discharge of other units within the studio, or be arranged to receive light only from the tube within the unit.

The triggering circuit F of the unit described will normally include contacts enabling it to be operated to trigger the tube by means of a light-sensitive switch in response to the firing of a master flash unit, typically a small unit on or near the camera.

With the circuit arrangement shown in the drawing, extinction, diming or flashing of the modelling light is a positive indication that the flash tube of the unit has been discharged, i.e. it has not only been triggered but has actually fired. Modern flash tubes and the associated power and triggering arrangements are very reliable and in the type of lighting set-up with which units in accordance with the invention are mainly designed to be used by far the most likely cause of failure will be the result of inadequate illumination of the light-sensitive switch element. If one is satisfied with confirmation that the flash tube has been triggered it is possible to arrange for the power supply and triggering arrangement for the flash tube and the circuit supplying the modelling light to be coupled at a point in the triggering circuit (F in the drawing) instead of in the charging circuit for the main power capacitor.

I claim:

1. An electronic flash unit comprising an electronic flash tube, a modeling light, a power supply and triggering arrangement for the flash tube, said triggering arrangement including means coupled to a circuit supplying the modeling light and being operative in response to the triggering of said electronic flash tube to modify the light output of the modeling light, at least for a predetermined length of time after the triggering of said electronic flash tube.

2. An electronic flash unit in accordance with claim 1 in which said triggering arrangement is coupled to a circuit supplying the modeling light by means of a relay energized by said triggering circuit arrangement and being provided with contacts in circuit relationship in the circuit supplying the modeling light.

3. An electronic flash unit in accordance with claim 2 wherein said relay is connected in series with a controlled rectifier device, said controlled rectifier device being adapted to be switched on energizing the relay to close the contacts of said relay only when a predetermined voltage is reached in a storage capacitor in said power supply arrangement.

4. An electronic flash unit in accordance with claim 1 including means for switching off the modeling light in response to triggering of the electronic flash tube.

5. An electronic flash unit in accordance with claim 1 including means for dimming the modeling light in response to triggering of the electronic flash tube.

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