A strobo discharge device which generates audio signals when a main flash capacitor is charged in excess of a predetermined voltage capable of triggering a flash tube. When the voltage across the main flash capacitor rises above the predetermined level, a continuous wave voltage is intermittently interrupted and is converted by a speaker system into audio signals.

8 Claims, 6 Drawing Figures
STROBO DISCHARGE DEVICE WITH AUDIO SIGNAL GENERATOR

BACKGROUND OF THE INVENTION

The present invention relates to a strobo discharge device, and more particularly to a strobo discharge device which generates audio signals when a main flash capacitor is charged to a potential which is in excess of a predetermined level.

In the conventional strobo discharge device or flash unit, a neon bulb is generally used in order to indicate that the voltage across the main flash capacitor is above a predetermined level. In some cameras incorporating a flash unit, an operator may see the light from the neon bulb within or outside the viewfinder. In a camera of the type in which the light from the neon bulb is seen in the viewfinder, a rapid sequence of successive shots becomes difficult because the operator must, for each shot, determine framing and focusing and check whether the main flash capacitor is ready to trigger a flash bulb while simultaneously looking through the viewfinder. In the case of a camera of the type in which a neon bulb is disposed outside the viewfinder, the operator must remove his eye from the viewfinder in order to check the neon bulb every time he takes a shot.

SUMMARY OF THE INVENTION

One of the objects of the present invention is therefore to provide a strobo discharge device which generates audio signals when the main flash capacitor is charged to a potential in excess of a predetermined voltage.

Another object of the present invention is to provide a strobo discharge device of the type described above which is simple in construction.

Briefly stated, according to the present invention, when a voltage detecting means detects that the voltage across a main flash capacitor is in excess of a predetermined level, continuous wave output audio signals from a continuous voltage generating means such as blocking oscillator, are intermittently interrupted by switching means, such as an astable multivibrator, and are converted into audio signals by a speaker system, such as earphone.

According to the present invention, audio signals are generated when the voltage across the main flash capacitor exceeds a predetermined level so that an operator need not move his eye from the viewfinder in order to check the charging condition of the main flash capacitor. Furthermore the problem of framing, focusing and checking the charging condition of the main flash capacitor through the viewfinder is eliminated. Since the continuous wave voltage is intermittently interrupted and converted into audio signals, the audio signals may be readily discernible, and furthermore the frequency of the audio signals may be varied as desired in accordance with one of the embodiments of the present invention.

Moreover, according to the present invention the continuous wave voltage source also functions as a blocking oscillator for charging a main flash capacitor so that the construction may be simplified and the cost may be reduced.

The above and other objects, features and advantages of the present invention will become more apparent from the following description of some preferred embodiments thereof taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a block diagram of a strobo discharge device in accordance with the present invention;

FIG. 2 shows the waveforms derived from the component parts thereof and used for the explanation of the mode of operation thereof;

FIG. 3 is a circuit diagram of a first embodiment of the present invention;

FIG. 4 is a circuit diagram of a variation thereof; and

FIGS. 5 and 6 are circuit diagrams of second and third embodiments of the present invention, respectively.

DESCRIPTION OF THE PREFERRED EMBODIMENTS:

Principle, FIGS. 1 and 2

Referring to FIGS. 1 and 2, a voltage detector 1 detects whether the voltage across a main capacitor is sufficient to trigger a flash tube. A continuous wave voltage source 2 comprises for example a blocking oscillator; a switching means 3 comprises an astable multivibrator; and a speaker 4 may comprise an earphone.

When the voltage detector 1 detects that the voltage across the main capacitor exceeds a predetermined level, a continuous wave voltage (See FIG. 2(a)) from the continuous wave voltage source 2 is intermittently interrupted by the switching means 3 (See FIG. 2(b)) and is applied to the speaker 4 so as to generate sound signals (See FIG. 2(c)).

First Embodiment, FIGS. 3 and 4

Referring to FIG. 3, a blocking oscillator 6 is connected to a DC power source 5 and charges a main capacitor 7. Since the blocking oscillator 6 may be any conventional self-running blocking oscillator, a detailed description of its construction and mode of operation will not be given in this specification. The blocking oscillator 6 includes a transformer T1 so as to provide output voltage higher than the voltage supplied from the DC power source 5. When the voltage across the main capacitor 7 exceeds a predetermined level, a neon bulb 8 is turned on. Since a voltage divider consisting of resistors R1 and R2 is connected in parallel with the main capacitor 7, the voltage across the resistor R1 is applied across the neon bulb 8. That is, the voltage which triggers the neon bulb 8 is determined by the voltage across the main capacitor 7 and the values of the resistors R1 and R2. When the neon bulb 8 is turned on, the resistance of a photo cell, such as CdS cell 9, is reduced so that the base potential of a transistor T2 falls. Thus the transistor T2 is turned on so that the switching means comprising the astable multivibrator 10 starts oscillating. As a result a transistor T3 is intermittently turned on as shown at (b) in FIG. 2. Since the astable multivibrator 10 is of the conventional type, a detailed description of its construction and mode of operation will not be given in the specification.

To the collector of a transistor T3 in the blocking oscillator 6 are connected a capacitor 11 and the collector of the transistor T2 through a speaker or earphone 12 so that the continuous wave voltage of the blocking oscillator 6 is applied to the earphone 12 as shown at (a) in FIG. 2. Therefore when the transistor T3 is intermittently turned on as shown at (b) in FIG. 2, the sig-
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nals as shown at (c) in FIG. 2 are generated by the earphone 12.

When the main capacitor 7 is charged to a predetermined voltage, a capacitor 13 is charged through a resistor $R_4$ to a predetermined voltage for triggering a flash tube 14. In response to the actuation of a shutter mechanism of a camera, a contact (not shown) on the side of the camera connected to a plug 15 is closed, and the capacitor 13 is discharged through the primary of a transformer $T_2$, so that the flash tube 14 is triggered in response to the trigger signal generated by the transformer $T_2$. A contact 16 is used to check whether the flash tube 14 is ready to be triggered or not.

Instead of deriving the continuous wave voltage from the collector of the transistor $T_3$, it may be derived across an additional winding 17 of the transformer $T_1$ as shown in FIG. 4.

Second Embodiment, FIG. 5

In the second embodiment shown in FIG. 5, the parts similar to those shown in FIG. 3 are designated by same reference numerals. The neon bulb 8 is connected in series to a resistor $R_1$ and in parallel with the main capacitor 7 so that the voltage across the main capacitor 7 may be detected from a voltage at the junction S between the neon bulb 8 and the resistor $R_4$. When the voltage across the main capacitor 7 exceeds a predetermined value, the neon bulb 8 is turned on so that its resistance is reduced. As a result, the voltage at the junction $S$ rises so that the base potential of a transistor $T_4$ rises, whereby the latter is turned on. The astable multivibrator 10 is triggered so that the sound signals are generated through the earphone 12 as is the case of the first embodiment described in connection with FIG. 3. The second embodiment is more advantageous than the first embodiment in that the photo cell 9 may be eliminated.

Third Embodiment, FIG. 6

In FIG. 6 the parts similar to those shown in FIG. 3 are designated by same reference numerals. In the third embodiment, the circuit for detecting whether the voltage across the main capacitor exceeds a predetermined level or not also functions as a switching circuit 19 for temporarily interrupting the charging of the main capacitor 7 and intermittently interrupting the continuous wave voltage. That is, the collector-emitter circuit of a transistor $T_5$ is connected in parallel with the base-emitter circuit of the transistor $T_6$, and the base of the transistor $T_5$, the resistor $R_5$, and one electrode of the neon bulb 8 are connected in series. The other electrode of the neon bulb 8 is connected to the output of the blocking oscillator 6. When the main capacitor 7 is charged in excess of a predetermined level, the neon bulb 8 turns on and starts conducting so that the transistor $T_5$ is turned on. As a result the base potential of the transistor $T_6$ falls so that the transistor $T_6$ is cut off. Thus the blocking oscillator 6 is stopped. When the main capacitor 7 is naturally discharged or discharged through a variable resistor $VR_2$, connected in parallel with the main capacitor 7, the neon bulb 8 and the transistor $T_5$, the霓on bulb 8 turns on and starts conducting so that the blocking oscillator 6 is triggered again. As a result the earphone 12 generates the intermittent sound signals. By adjusting the variable resistor $VR_1$, the frequency of the intermittent sound signals may be varied.

In the third embodiment, the functions of the voltage detector and the switching circuit can be accomplished by a common circuit so that the astable multivibrator used in the first and second embodiments may be eliminated. A further advantage of the third embodiment is that the voltage across the main capacitor may be maintained within a predetermined range.

What is claimed is:

1. A stroboscopic discharge device comprising:
   a. a flash tube,
   b. a continuous wave voltage generator,
   c. a main capacitor for supplying energy to said flash tube,
   d. means for charging said main capacitor,
   e. means for detecting the voltage across said main capacitor,
   f. means for intermittently interrupting the continuous wave voltage from said continuous wave voltage generator in response to the signal from said detecting means generated when the voltage across said main capacitor is in excess of a predetermined level, and
   g. means for converting said intermittently interrupted continuous wave voltage into sound signals.

2. A stroboscopic discharge device as defined in claim 1 wherein:
   a. said means for charging said main capacitor and for generating said continuous wave voltage comprises a common blocking oscillator,
   b. said voltage detecting means comprises a neon bulb across which is applied a part of the voltage across said main capacitor and a photoelectric cell disposed to intercept the light emitted from said neon bulb,
   c. said means for intermittently interrupting the continuous wave voltage comprises an astable multivibrator, and
   d. said means for converting said intermittently interrupted continuous wave voltage into sound signals comprises a speaker system, whereby said continuous wave voltage is derived from said blocking oscillator and the signals for intermittently interrupting said continuous wave voltage are derived from said astable multivibrator.

3. A stroboscopic discharge device as defined in claim 2 wherein said voltage detecting means comprises a series circuit consisting of a resistor and said neon bulb and connected in parallel with said main capacitor.

4. A stroboscopic discharge device having a flash tube having two main terminals and a trigger terminal and firing when a firing signal exceeding a selected value is applied to its main terminal and a trigger signal is applied to its trigger terminal, means for storing a firing signal connected across the main terminals of the flash tube, means for gradually charging the storing means from a level below said selected value to a level exceeding said selected value, and first normally open switch means closeable to apply a trigger signal to the trigger terminal of the flash tube to fire it when a firing signal exceeding the selected value is applied to the main terminals of the tube, wherein the improvement comprises a device for audibly indicating when the storage means stores a firing signal exceeding said preselected value, comprising:
   a. means for generating a continuous wave form signal;
   b. means for converting said continuous wave form signal into an audible signal;
second normally open switch means interposed between the generating and the converting means and closeable to apply said continuous wave form signal to the converting means;
means for detecting the level of the signal in said storage means and for generating an enabling signal when the signal in the storage means exceeds said selected value; and
means responsive to said enabling signal for intermittently closing said second switch means, whereby the converting means provides an intermittent audible signal when the storage means stores a firing signal of a level sufficient for firing the flash tube, to indicate to an operator that closing of said first switch means would fire the flash tube.

5. A device as in claim 4 wherein the storing means is a capacitor and the charging means is the means for generating a continuous wave form signal.

6. A device as in claim 5 wherein the means for generating said continuous wave form signal is a blocking oscillator.

7. A device as in claim 6 wherein the detecting means comprise a neon bulb across which is applied a selected portion of the voltage across said capacitor and a photoelectric cell disposed to intercept the light from the neon bulb.

8. A device as in claim 7 wherein the means for intermittently closing the second switch means comprise an astable multivibrator.