

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN OR RELATING TO VOLTAGE CONVERTERS

(71) We, FRANKE & HEIDECHE, GMBH, a German Body Corporate, trading as ROLLEI-WERKE FRANKE & HEIDECHE, of 196 Salzdahlumerstrasse, Braunschweig, Germany, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a voltage converter for the charging of the storage capacitor of electronic flash apparatus. The invention is particularly concerned with converters of the type in which the converter is turned off when a predetermined voltage across the storage capacitor is reached, and is turned on again when the voltage falls below this voltage.

In apparatus of this kind, in order to enable the apparatus to be set to different guide numbers, it is desirable for these latter to be reproducible with the maximum possible accuracy. This task is rendered more difficult by the fact that when the transistors are subjected to high temperatures it may be no longer certain that the converter will be turned off when the selected final voltage for the storage capacitor is reached.

The present invention seeks to eliminate this uncertainty and ensure that the final voltage of the storage capacitor will be accurately regulated.

According to the present invention, there is provided a voltage converter for supplying voltage to the storage capacitor of an electronic flash apparatus, said converter comprising a pair of transistors arranged to be connected to a voltage supply and connected to form a push-pull voltage converter circuit, a voltage indicator connected to monitor voltage across the storage capacitor and actuable upon a predetermined voltage being reached across the storage capacitor when charging and a

relay having switch contacts, the relay being connected with the voltage indicator and being responsive to the output voltage of the voltage indicators to operate the switch contacts to disconnect the bases of the transistors from the supply and to short the base and emitter connections of the respective transistors.

The principle of completely disconnecting the transistor bases from the supply and connecting them to the emitter electrodes, in contrast to the known process of reverse biasing has considerable advantages. The leakage current particularly in germanium transistors, increases very fast as the temperature rises. If the base is open circuit, high temperatures will lead to voltage build up at the base which may be sufficient to render the transistor conductive and result in eventual destruction of the transistor because of the low resistance of the voltage source and the uncertain switching state. Even if the base is short-circuited without disconnecting the base from the voltage supply the blockage of the transistor is no longer ensured at elevated temperatures with the possible dangers outlined above.

In order that the invention may be better understood, an embodiment thereof will now be described by way of example only and with reference to the accompanying drawing which shows an embodiment of a voltage converter according to the invention.

The voltage converter comprises a pair of transistors 1 and 2, which are connected in a push pull circuit with the windings 3 and 4 of a transformer 20 and are supplied from a low voltage D.C. source 5. The base connections of transistors 1 and 2 are connected to the winding 4 by means of a ganged double throw switches 6 and 7 of a relay 8 respectively. In the contact position shown in the drawing, the switches 6 and 7 connect the transistor bases to the transformer

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5 winding 4 so that the converter is switched on. In this position, the converter charges up the storage capacitor 10 of a flash apparatus 11 in the conventional manner, the converter output appearing across the output winding of the transformer 20 and being rectified by the bridge rectifier 9. Parallel with the capacitor 10 is a voltage divider comprising resistors 12 and 14, and a potentiometer 13. To the slider 15 of the potentiometer 13 is connected a glow tube 16, which ignites when a predetermined voltage across capacitor 10 is reached and which actuates the relay 8 via a transistor amplifier 17, 18.

15 The actuation of the relay 8 causes the relay switches 6 and 7 to switch to the contact position not shown in the drawing, thus shorting the base and emitter of each of the transistors 1 and 2, and disconnecting the respective bases from the supply. Thus the converter is switched off the voltage ceases to be generated thereby. If now the voltage across the capacitor 10 falls below a lower predetermined voltage as a result of leakage current or due to the consumption of the discharge in the flash apparatus 11, the glow tube 16 is extinguished; the relay 8 is released, and the switches 6 and 7 return to their positions shown in the drawing and thus set the converter in operation.

30 WHAT WE CLAIM IS:—

1. A voltage converter for supplying

voltage to the storage capacitor of an electronic flash apparatus, said converter comprising a pair of transistors arranged to be connected to a voltage supply and connected to form a push-pull voltage converter circuit, a voltage indicator connected to monitor voltage across the storage capacitor and actuable upon a predetermined voltage being reached across the storage capacitor when charging and a relay having switch contacts, the relay being connected with the voltage indicator and being responsive to the output voltage of the voltage indicator to operate the switch contacts to disconnect the bases of the transistors from the supply and to short the base and emitter connections of the respective transistors.

2. A converter in accordance with claim 1, wherein the voltage indicator comprises a glow tube which actuates the relay via a transistor amplifier upon said predetermined voltage being reached.

3. A voltage converter, substantially as described herein with reference to and as illustrated by the accompanying drawing.

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