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ELECTRON-OPTICAL IMAGE-REPRODUCING SYSTEM WITH POWER SUPPLY VOLTAGE REGULATED ACCORDING TO AMBIENT LIGHT
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Fig. 1

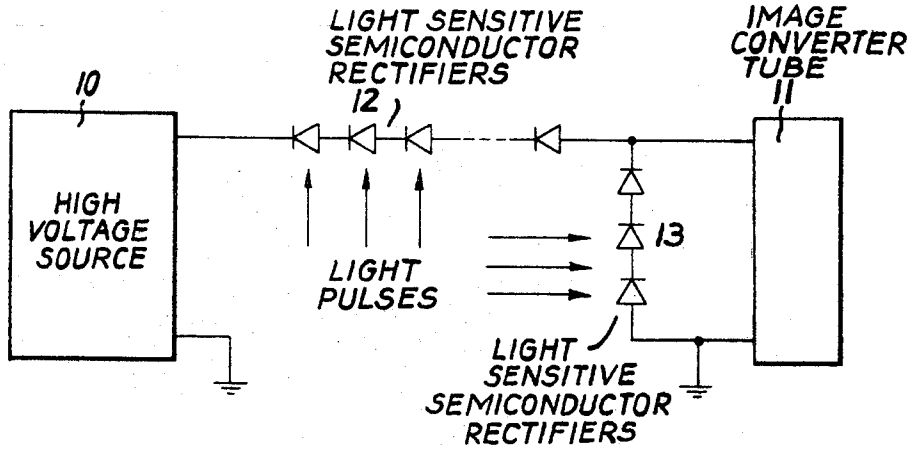
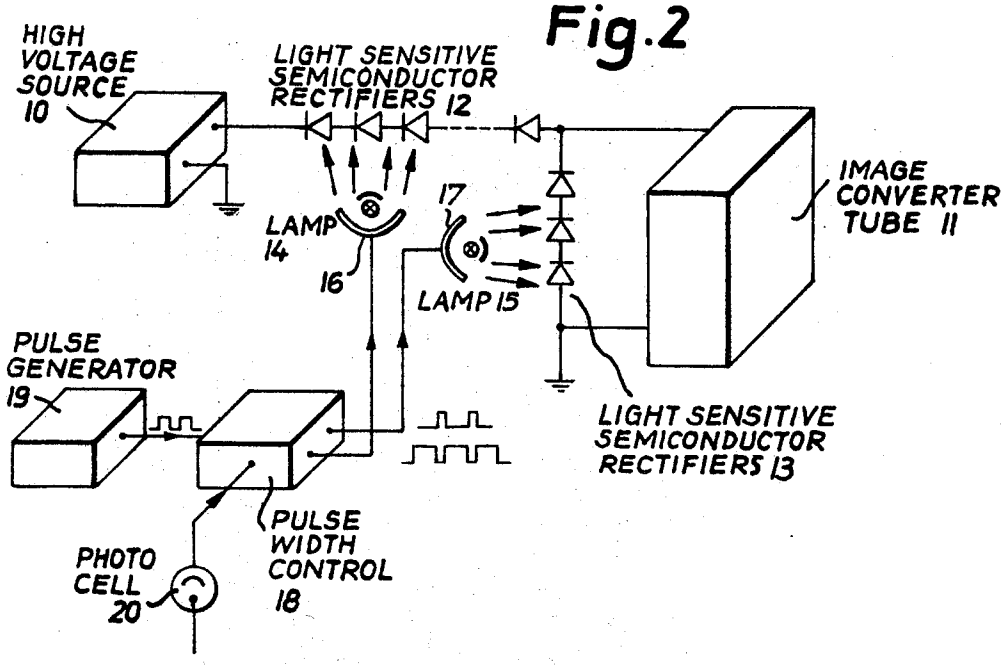


Fig. 2



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ELECTRON-OPTICAL IMAGE-REPRODUCING SYSTEM WITH POWER SUPPLY VOLTAGE REGULATED ACCORDING TO AMBIENT LIGHT

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3 Claims. (Cl. 315—10)

ABSTRACT OF THE DISCLOSURE

The power supply voltage applied to an electron-optical image-reproducing system is varied in accordance with ambient light intensity by means of a first group of light-sensitive rectifiers which are connected in series with each other and in series between the electron-optical image-reproducing system and the source of high voltage therefor, and a second group of light-sensitive rectifiers which are connected in series with each other, and the series circuit being connected in parallel with the electron-optical image-reproducing system and the source of high voltage therefor, with both groups of light-sensitive rectifiers being alternately illuminated by light pulses to vary the power supply voltage applied to the electron-optical image-reproducing system in accordance with the ambient light intensity.

Background of the invention

The invention relates to a high voltage power supply circuit for an electron-optical image-reproducing system. Such image-reproducing systems, as for example multistage image-converter tubes and brightness amplifier tubes, or television camera tubes with electrostatic and magnetic focussing, are easily damaged by an increase in ambient brightness and a subsequent overloading of the cathode and screen thereof. In most cases, the voltage supply for such electron-optical image-reproducing systems is generated by means of a voltage multiplier circuit. Because of the inertia of the voltage multiplier circuit, which is caused by the discharge time periods of the capacitors therein, it is often impossible to regulate the voltage of the power supply as is necessary for protection against overloads.

Summary of the invention

The present invention provides a power supply circuit for electron-optical image-reproducing systems in which the occurrence of damages resulting from large increases in brightness is avoided. The invention provides that one or a plurality of light-sensitive semiconductors are series-connected between the high voltage source and the electron-optical image-reproducing system, and furthermore that one or a plurality of light-sensitive semiconductors are connected in parallel with the electron-optical image-reproducing system, and that the series-connected semiconductors as well as the parallel-connected semiconductors are alternately illuminated by light pulses. A variation in the pulse frequency as well as in the pulse width of the light pulses results in a variation of the chronological mean value of the supply voltage for the electron-optical image-reproducing system. In this way, the level of the supply voltage can be adapted to the ambient light intensity in that the frequency and the pulse width of the light pulses is regulated directly by the ambient light intensity.

It would be conceivable to achieve pulsed operation in some other way. However, conventional switches are not

suitable for the pulsed operation of electron-optical image-reproducing systems. Mechanical switches are too slow and bistable multi-vibrators can not be used because no transistors or relays are available for high voltages, i.e., voltages in the order of 20 kv.

Brief description of the drawings

FIGURE 1 is a block diagram of one illustrative embodiment of the invention.

FIGURE 2 is a perspective view of the embodiment shown in FIGURE 1, and of one pulsating light source that can be used in connection with this invention.

Description of the preferred embodiments

Before discussing the illustrated embodiment in detail, the general aspects of the invention will first be discussed. The generation of a pulsating voltage supply for electron-optical image-reproducing systems according to this invention operates as follows: When the series-connected light-sensitive semiconductors and the parallel-connected light-sensitive semiconductors are exposed to light, their inverse current increases by several powers of ten. Upon exposure of the semiconductors disposed in series with the electron-optical image-reproducing system, the system is connected to the high voltage source so that a current can flow thereinbetween. This current is interrupted as soon as the light pulse is terminated. If the semiconductors disposed in parallel with the electron-optical image-reproducing system are illuminated at this time, they short-circuit the capacitive load of the electron-optical image-reproducing system. The high voltage source, for example a voltage multiplier circuit, is isolated from this short circuit by the semiconductors in series with the electron-optical image-reproducing system, so that immediately after renewed illumination of the semiconductors in series with the electron-optical image-reproducing system, a current can flow again. The time constant of the increase and decrease of the power supply current is dependent on the capacitance of the light-sensitive semiconductors and of the electron-optical image-reproducing system as well as its resistors.

FIGURE 1 shows an illustrative embodiment of the invention in which a high voltage source **10** feeds an image-converter tube **11**. A first plurality of light-sensitive semiconductor rectifiers **12** are connected in series with each other between high voltage source **10** and image converter **11**. A second plurality of light-sensitive semiconductor rectifiers **13** are connected in series with each other and the series circuit is connected in parallel with image converter tube **11** and high voltage source **10**. Both the semiconductor rectifiers **12** and the semiconductor rectifiers **13** are connected in the inverse polarity with respect to the output current of voltage source **10**, and the two groups of semiconductor rectifiers are alternately illuminated by light pulses to vary the power supply voltage applied to the image converter tube in accordance with the ambient light intensity.

FIGURE 2 shows a perspective view of the embodiment shown in FIGURE 1, and of a suitable lighting source for irradiating the light-sensitive semiconductor rectifiers **12, 13**. Light sensitive semiconductor rectifiers **12, 13** are exposed to lamps **14, 15** respectively, the light beams of which are directed by means of reflectors **16, 17**. Lamps **14, 15** are fed by antivalent outputs of pulse width control **18**, which in turn is fed by pulse generator **19**, and controlled by photo cell **20**.

The pulses delivered by the outputs of pulse width control **18** are of equal frequency, which is determined by pulse generator **19**, but are antivalent, i.e. the one output is "on" while the other is "off" and vice versa. Photo cell **20** controls the pulse width of both outputs as a function of ambient light intensity. If, for instance, the

ambient light intensity rises the pulse width of lamp **14** is diminished while that of lamp **15** is increased by the same amount.

It would be conceivable to achieve pulsed irradiation of light sensitive semiconductor rectifiers **12, 13** using a single lamp mounted in a housing with two openings directed at the light sensitive semiconductor rectifiers, and with independent shutters fitted to both openings. Then, the openings could be opened and shut alternatively according to the output commands of pulse width control **18**, while the lamp could be kept lighted continuously.

It will be understood that the above description of the present invention is susceptible to various modifications, changes and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

I claim:

1. A power supply circuit for an electron-optical image-reproducing system, comprising, in combination:

(a) a source of high voltage;

(b) a first light-sensitive semiconductor element coupled in series between said high voltage source and said image-reproducing system;

(c) a second light-sensitive semiconductor element coupled in parallel with said high voltage source and said image-reproducing system; and

(d) means for alternately illuminating said first and second light-sensitive semiconductor elements with light pulses.

2. A power supply circuit as defined in claim **1**, further comprising a first plurality of light-sensitive semiconductor elements coupled in series with each other between said high voltage source and said image-reproducing system; a second plurality of light-sensitive semiconductor elements coupled in series with each other and the series circuit being coupled in parallel with said high voltage source and said image-reproducing system; and means for alternately illuminating said first and second plurality of light-sensitive semiconductor elements with light pulses.

3. A power supply circuit as defined in claim **2** wherein said light-sensitive semiconductor elements comprise light-sensitive semiconductor rectifiers, and wherein said light-sensitive semiconductor rectifiers are connected in inverse polarity to the output of said high voltage source.

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