

[54] **EXPOSURE CONTROL CIRCUIT FOR AN ELECTRICALLY SHUTTERED IMAGE TUBE**

[72] Inventor: **Donald F. Dion**, Burlington, Mass.

[73] Assignee: **The United States of America**

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[58] Field of Search. **250/206, 213, 83.3 HP, 200; 313/108**

Primary Examiner—James W. Lawrence

Assistant Examiner—T. N. Grigsby

Attorney—Harry M. Saragovitz et al.

[57]

ABSTRACT

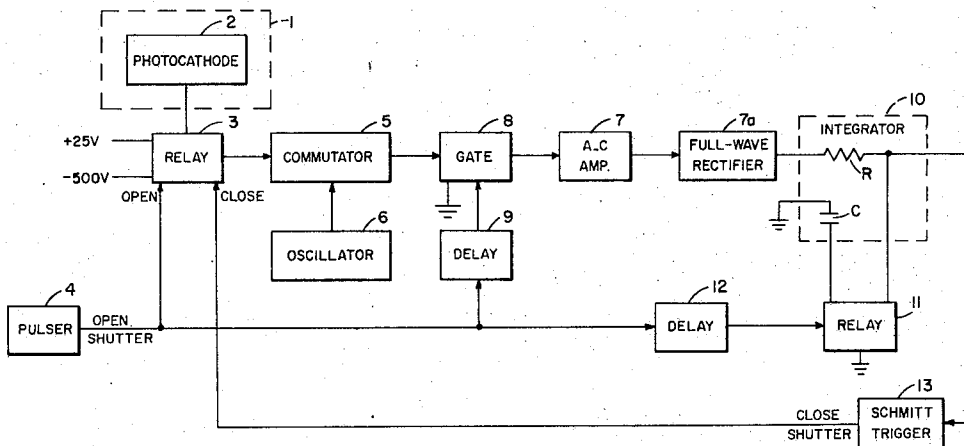
In order to maintain an optimum image under varying light conditions for an electrically shuttered image tube, it is necessary to control the time that the electronic shutter is open. This is done in the instant disclosure by detecting the amount of photocathode current that flows after the shutter is opened, and closing the shutter when a predetermined amount of current has flowed.

[56] **References Cited**

UNITED STATES PATENTS

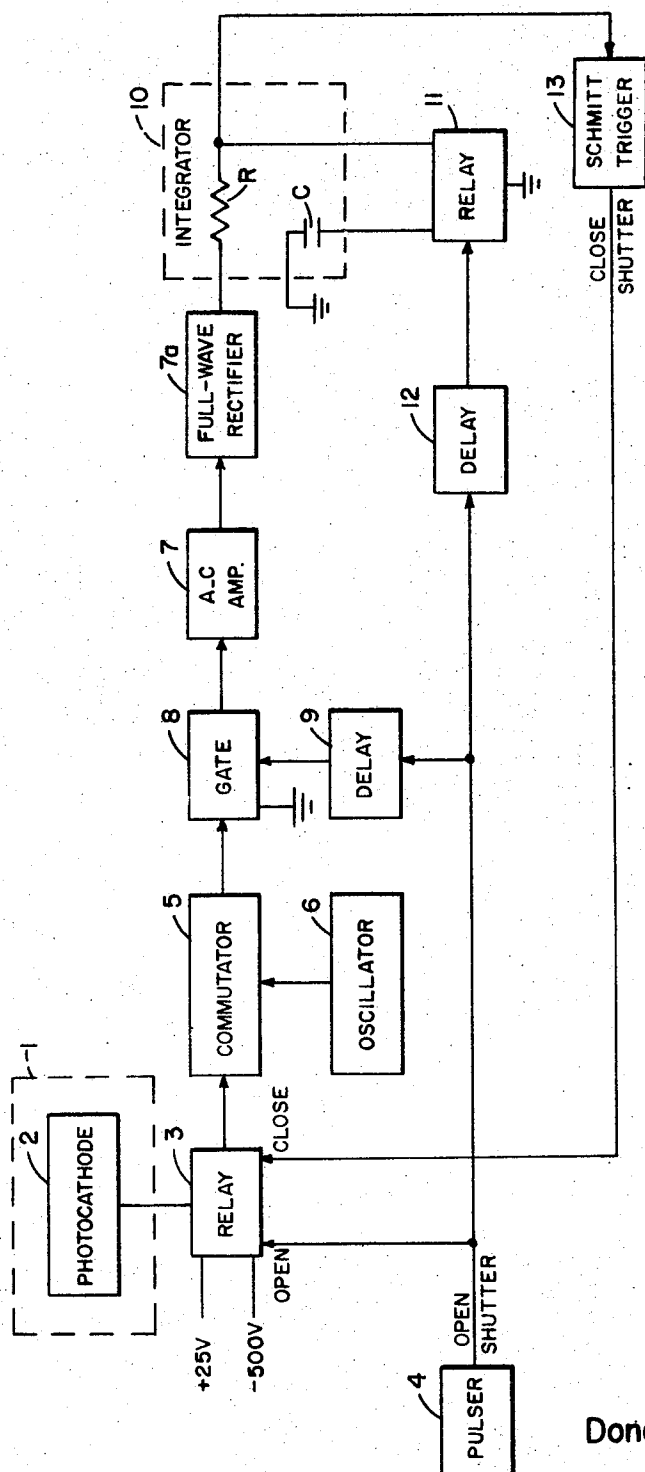
2,976,758 3/1961 Parker 250/200 X

2 Claims, 1 Drawing Figure



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Donald F. Dion,
INVENTOR.

BY *Harry M. Seregin*
Edward J. Kelly
Harold Bail
Aubrey J. Sauer

EXPOSURE CONTROL CIRCUIT FOR AN ELECTRICALLY SHUTTERED IMAGE TUBE

BACKGROUND OF THE INVENTION

This invention is in the field of automatic exposure controls for image tubes (such as image orthicons) using electronic shutters. Various ways: mechanical, optical, electrical, and combinations thereof are known for varying the exposure of image tubes. These ways include iris diaphragms movable variable-density filters, etc. The instant invention, because of its electronic nature, is rapid acting. It does not require changes in the image tube, per se.

SUMMARY OF THE INVENTION

The invention is an automatic control system for the shutter of an electronically shuttered image tube exposed to varying light conditions. The system includes a relay between the shutter and the power supply for the shutter. The relay contacts are closed by a pulsed signal and opened in response to photocathode current in the tube. When sufficient current has flowed in the photocathode to give an acceptable image, the relay is opened. The current is measured in a circuit including an a-c amplifier fed by the commutated output of the photocathode. The amplifier output is full-wave rectified and integrated. The integrated signal operates a Schmitt trigger, and the trigger turns-off the photocathode relay.

BRIEF DESCRIPTION OF THE DRAWING

The single drawing FIGURE shows a schematic diagram of the invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawing, reference numeral 1 designates an image tube, such as an image orthicon, having a photocathode 2. It should be understood that tube 1 includes the usual screen, electron gun, grids, and coils. For the invention, only the photocathode need be considered, since the remainder of the tube elements operate in their usual manner. The shutter of tube 1 (its photocathode 2) is opened by applying -500 volts to the photocathode. Normally, about +25 volts is applied at the photocathode. The -500 volts is supplied through relay 3. Relay 3 is operated by pulses from "open shutter" pulser 4. Relay 3 may be merely an impulse or stepping relay with fixed contacts respectively

connected to the +25 volts and -500 volts inputs and with a movable contact connected to the photocathode. The current generated in photocathode 2 flows from relay 3 (through its movable contact) to commutator 5 fed by oscillator 6. Commutator 5 (in combination with oscillator 6) acts as a chopper for the d-c current from photocathode 2. The commutator may take any one of several forms, such as a balanced modulator. The output of commutator 5 is fed into a-c amplifier 7 through gate 8. As can be seen, gate 8 is fed pulses from pulser 4, through delay 9. Gate 8 provides a low impedance to ground at the input to amplifier 7 for a short time after the shutter is opened, to permit the parasitic capacity from the photocathode to be completely discharged before the photocathode current is sensed. The output from amplifier 7 is fed through full-wave rectifier 7a to integrator 10 including resistor R and capacitor C. Relay 11 is so connected, through delay 12, to pulser 4 that integrating capacitor C is shunted (or shorted to ground) to avoid integrating any transients from gate 8. The output of integrator 10 is fed to Schmitt trigger 13. When the output of 10 rises to a sufficient value, trigger 13 will have an output, and this output will cause the shutter to close from operation of relay 3.

While the invention has been directed to relays having contacts, etc., it should be realized that the instant invention may be a circuit entirely solid-state in nature, but need not be limited thereto.

I claim:

1. A system for electronically shuttering an image tube, wherein said tube includes a photocathode for providing a current related to light level when said photocathode is energized including: voltage means; relay means for connecting said voltage means to said photocathode; current sensing means connected to said photocathode; a trigger having an input connected to said current sensing means and having an output connected to said relay means.

2. The system as defined in claim 1 wherein said current sensing means includes a commutator having an output, and having an input connected to said photocathode; an a-c amplifier having an output, and having an input connected to said output of said commutator; an integrator having an input and having an output connected to said input of said trigger; and a fullwave rectifier connected between said output of said a-c amplifier and aid input of said integrator.

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