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I. A. KRAUSE
VIDEO CLIPPING CIRCUIT

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Fig. 1 (PRIOR ART)

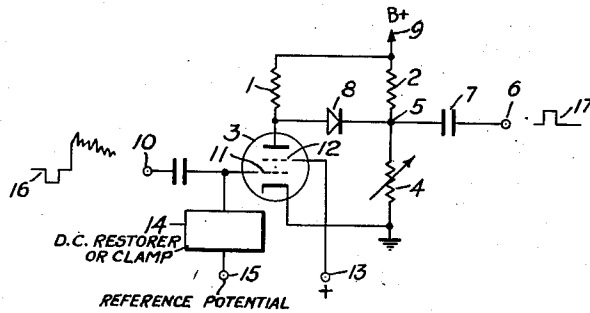
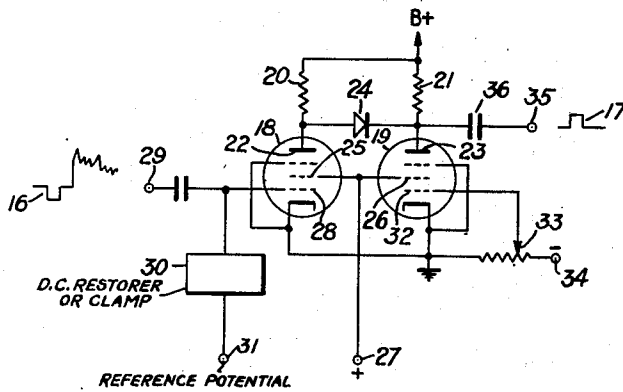


Fig. 2



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VIDEO CLIPPING CIRCUIT

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1 Claim. (Cl. 250—27)

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This invention relates to video clipping circuits and more particularly to a synchronizing pulse separator for television circuits.

One of the objects of this invention is to provide a stable clipping circuit for use in video circuitry.

Another object of the invention is to provide a clipping circuit which will maintain substantially a given clipping level regardless of variations in screen grid voltage, power supply voltage and/or plate current.

An important feature of the invention is the provision, in two opposing legs of a diode bridge clipping circuit, of two electron discharge devices or tubes having substantially equal operating characteristics. By balancing the bridge circuit so that the grid voltage of the input tube is balanced with the clipping level voltage bias of the second tube, the clipping level of the circuit is rendered independent of plate supply voltage changes. With matched tubes the circuit is also independent of the usual warm-up drift characteristics of the tubes. Once the tubes are adjusted for balance with a given grid voltage, clipping level of the circuit will remain constant or substantially so, even though the tubes warm up or age or the supply voltages vary.

The above-mentioned and other features and objects of this invention and the manner of attaining them will become more apparent by reference to the following description taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a schematic circuit diagram of a prior art diode clipping circuit; and

Fig. 2 is a schematic circuit diagram of a video clipping circuit according to the present invention.

Before describing the clipping circuit of the present invention, the prior art circuit of Fig. 1 will be described. The circuit of Fig. 1 comprises essentially a bridge network consisting of two like resistors 1 and 2 and an electron discharge tube 3, the resistance of which is equal to the resistance of a third resistor 4. The resistor 1 is connected to the anode circuit of the device 3, while resistors 2 and 4 are connected together at point 5 to which an output terminal 6 is coupled through a blocking condenser 7. The anode circuit is connected to point 5 through a diode rectifier or crystal 8. A voltage supply is connected as indicated at 9 to the legs of the bridge formed by resistors 1 and 2. The signal input terminal 10 is connected to the control grid 11 of the tube 3. As shown, the device includes a screen grid 12

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supplied with a bias voltage as indicated at 13. The grid 11 is provided with a D. C. restorer or clamp 14 adapted for connection to a given reference potential at 15. The resistor 4 is adjustable so that when the resistance thereof is made equal to the resistance of the vacuum tube 3, the bridge is balanced and there is no output at 6. When the resistance of the vacuum tube 3 is made less than resistor 4, there is no current flow through the diode 8 with its polarity as shown. When the resistance of the vacuum tube is greater than resistor 4, current flows through the diode and a voltage drop is obtained at the output 6.

The instantaneous resistance of the vacuum tube can be controlled by the bias on its grid, that is, the greater the negative bias, the higher the resistance. Depending upon the polarity of the diode 8 and on the value of the resistor 4, the circuit can be used to give an output whenever the grid voltage is greater than or less than a certain definite value. The D. C. restorer 14 in the grid circuit is used to insure that this value corresponds to a given porch voltage. With a combination video and synchronizing pulse signal, as indicated at 16, applied to the input 10, a selected bias will provide synchronizing pulses 17 only at the output 6.

In actual operation of the prior art circuit of Fig. 1, variations in the filament voltage, screen grid voltage, or plate voltage or the aging of the tube 3 will each have an effect on the resistance of the tube thus varying the clipping level of the circuit. While the tube is warming up, for example, which may take several minutes or even hours, a given voltage on the grid corresponding to a given porch voltage may leave the bridge unbalanced. After the tube has warmed up sufficiently, the resistance of the tube may change the bridge circuit toward or further away from balance. The net effect is that the clipping level of the input wave varies objectionably with the changes in the tube parameters.

In accordance with the present invention these variations which affect the operation of the prior art circuit of Fig. 1 do not alter the clipping level of the circuit of Fig. 2. The circuit of Fig. 2 is essentially a bridge circuit comprising two vacuum tubes 18 and 19 as two legs, the tubes selected having substantially identical operating characteristics, and while shown to be pentodes, need not be. The other two legs of the bridge comprise two resistors 20 and 21 of substantially equal value. The resistor 20 is connected to the anode 22 of the tube 18 and the resistor 21 is connected to the anode 23 of tube 19. A diode

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24 which may comprise a crystal or other rectifier is connected, on one side, to the inter-connection between the resistor 20 and anode 22 and, on the other side, to the inter-connection between the resistor 21 and anode 23. The screen grids 25 and 26 of the tubes 18 and 19 are supplied with the same bias voltage as indicated by terminal 27. The other electrodes are connected to ground except for the control grids. The control grid 28 of tube 18 is connected to the signal input terminal 29 and to a direct current restorer or clamp circuit 30 which may be connected to a reference potential at terminal 31. The control grid 32 of tube 19 is connected to a potentiometer 33, one terminal of which is connected to a source of negative voltage as indicated at 34. The output terminal 35 is connected through a blocking condenser 36 to the inter-connection between resistor 21 and anode 23.

In the operation of the circuit shown in Fig. 2, assuming that resistors 20 and 21 are equal and the tubes 18 and 19 are of the same types having substantially identical operating characteristics, the bridge circuit may be balanced at a given clipping level by adjusting the potentiometer 33. When a signal 16 is received, the portion of the signal exceeding the clipping level will be obtained at the output terminal 35 as indicated by the synchronizing pulse 17. By having the two tubes 18 and 19 of substantially identical operating characteristics, any changes in one will be offset by like changes in the other. Thus, the two legs of the bridge circuit will vary identically, thereby maintaining its stabilization. Once the circuit is adjusted for balance with a given grid voltage, the clipping level of the circuit will remain substantially constant, even though the tubes warm up or age or the supply voltages vary.

The circuit as shown in Fig. 2 will function as a television synchronizing separator. By reversing the polarity of the diode 24 or by invert-

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ing the input signal, the circuit will operate as a television synchronizing top clipper.

While I have described above the principles of my invention in connection with specific apparatus, it is to be clearly understood that this description is made by way of example only and not as a limitation to the scope of my invention, as set forth in the objects thereof and in the accompanying claim.

I claim:

A clipping circuit comprising a bridge network having two multi-electrode vacuum tubes of substantially identical operating characteristics connected in circuit as the first and second legs of the network, each tube having anode, cathode, control grid and screen grid electrodes, two resistors of substantially equal value connected to the anodes of said tubes to form the third and fourth legs of the network, a diode connected across the bridge circuit at said anode connections, a source of anode voltage connected to the legs containing said resistors, a first source of biasing voltage connected to the screen grids of both said tubes, a second source of biasing voltage, means connecting the control grid of the tube of said second leg to said second source of biasing voltage, a signal input and D. C. restorer circuit, and means connecting the control grid of the tube of said first leg to said input circuit.

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