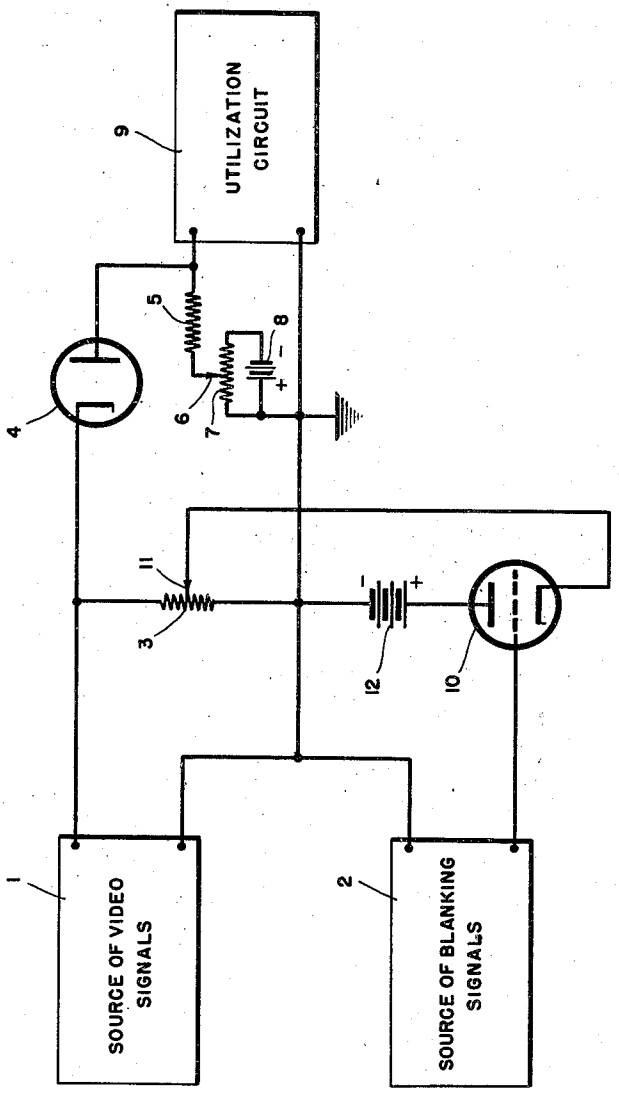
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COMPOSITE TELEVISION SIGNAL GENERATOR

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COMPOSITE TELEVISION SIGNAL GENERATOR

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This invention relates to television signal generating systems and more particularly to apparatus for producing a composite television signal, including video and system control information.

According to the television standards in effect at present in the United States, there is transmitted a composite signal comprising video, blanking and horizontal and vertical synchronizing information. The carrier wave which is utilized as the medium for transmitting such signals is negatively modulated; that is, minimum carrier amplitude corresponds to picture white and maximum carrier amplitude represents the synchronizing information, and this latter amplitude is excessive by a predetermined amount over that representative of picture black. This is the so-called "blacker-than-black" synchronizing system. Also, according to the U. S. standards the carrier amplitude representative of picture black is substantially 75% of the maximum carrier amplitude, the remaining 25% representing the synchronizing signal. The synchronizing signal is a substantially rectangular wave form superimposed upon a so-called pedestal at or slightly in excess of the carrier amplitude representative of picture black.

According to conventional practice, the video signal information is generated by means of a picture analyzing tube; the blanking and synchronizing signals are developed separately and combined with the video signals to form the composite television signal. In such systems the blanking signals are generated, having a uniform amplitude which bears the desired relationship to the average type of video signals so that, when combined therewith, the composite signal voltage is increased during the retrace periods of the scanning apparatus to a value which is substantially equal to that which represents picture black. In combining the video and blanking signals by prior art means, the blanking signal voltages of uniform amplitude have been superimposed effectively upon the average voltage value of the video signals. As long as the average value of the video signals remains substantially uniform the composite signal voltage during retrace intervals may be raised by such means to the desired black level.

However, the average value of the video signal voltage is dependent upon the average illumination of the television subject. For a normal subject illumination the average video signal voltage has a normal value which, for example, may be considered as the mean of the picture black representative voltage and the picture white representative voltage. If the blanking signal voltage has a value which is substantially equal to the difference between the average video signal voltage and the video voltage representative of picture black for a normal illumination, then during retrace intervals the composite signal voltage is raised substantially to the black level.

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However, if now the subject illumination becomes subnormal, the average video signal voltage will more closely approach the picture black representative voltage. When the blanking signal voltage is superimposed upon this new average video signal voltage it produces a composite signal voltage during retrace intervals, which is considerably in excess of the voltage representative of picture black. In other words, the pedestal upon which the synchronizing signals are to be placed extends into the blacker-than-black voltage region farther than in the case of a normal subject illumination. As a result, the percentage of the carrier amplitude which is utilized for blanking and synchronizing signal purposes is considerably in excess of the standard 25%. The consequence, therefore, is that there is less of the carrier amulitude available for the video signals. Hence, at the receiver the resolution of the reproduced image is reduced with a consequent degradation of the reconstituted picture.

It is an object of the present invention, therefore, to provide a means for producing a composite television signal in which the blanking voltage bears a fixed relationship to the voltage representative of picture black, irrespective of changes of the average value of the video signal voltage.

In accordance with this invention there is provided a unilaterally conducting device connected between a source of video signals and a utilization circuit. In addition, there is provided means coupled between a source of blanking signals and the unilaterally conducting device for rendering the device non-conducting in response to the blanking signals. By means of such an arrangement signal voltages are impressed upon the utilization circuit only while the unilaterally conducting device is in a conducting state. The values of the circuit components may be chosen so that the device is conditioned for threshold conductive operation in response to a video signal voltage corresponding to picture black and remains conducting for all other video signal voltages. Then, by means of the biasing facilities responsive to the blanking signals, the device is rendered nonconducting at a signal level which corresponds

substantially to that representative of picture black.

For a better understanding of the invention, together with other and further objects thereof, reference is had to the following description, taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

The single figure of the accompanying drawing illustrates diagrammatically the circuit arrangement of one embodiment of the invention.

Having reference now to the drawing, there is shown a source of video signals 1 and a source of blanking signals 2. The voltages representative of the respective signals are developed relative to ground in such manner that the video signals are of negative polarity and the blanking signals are of positive polarity. The video signals derived from the source 1 are developed across the resistive component 3 of a potentiometer having a value of the order of 3200 ohms.

The ungrounded terminal of the resistor 3 is connected through a unilaterally conducting device such as a diode 4 to one terminal of a load circuit. The unilaterally conducting device may be a diode, as illustrated, or may comprise one of the two space discharge paths of a tube of the SN7GT type or its equivalent, in which the control grid is directly connected to the anode. The diode 4 is connected in such polarity that, when it is in a conductive state, the negative video signals are impressed upon the load circuit.

The load circuit for the diode includes a resistor 5, one terminal of which is connected to the diode and the other terminal to the sliding contact 6 of a potentiometer which also comprises a resistor 7. The terminals of the resistor 7 are connected to the terminals of a source of direct current such as a battery 8, the positive terminal of which is grounded. Thus, the load circuit for the diode also includes an adjustable biasing facility for a purpose to be described. A utilization circuit 9 is connected to the terminals of the diode load circuit, as shown. In one form of the invention the value of the resistor 5 is of the order of 5,000 ohms and the value of the resistor 7 is of the order of 500 ohms in the case where the battery 8 is substantially 24 volts.

The blanking signals which are derived from the source 2 are impressed upon the control grid of a space discharge device such as a triode 10. This tube may be one in which a single space discharge path is included in an envelope, as illustrated, or if desired may be one of the space discharge paths of a tube of the SN7GT type or its equivalent. In the latter case the tubes 4 and 10 may be combined in a single envelope or the elements of tube 10 may be included in the same envelope as the space discharge tube electrodes forming a part of the utilization circuit 9, if desired. The cathode of the tube 10 is connected to the sliding contact 11 which together with the resistor 3 forms a potentiometer. In general, the slider 11 is so positioned on the resistor 3 that the resistance included in the cathode circuit of the tube 10 to ground is of the order of 500 ohms. The anode of the tube 10 is connected to the positive terminal of a source of direct current such as a battery 12. The negative terminal of the battery is connected to ground. The tube 10 then is provided with an output circuit of a character wherein the load impedance is concentrated substantially entirely in the cathode circuit. Such a tube is known as a cathode follower since the voltage changes of the cathode occur in the same polarity as the voltage variations of the control grid.

Referring now to the operation of the described apparatus, it is to be understood that during trace periods when the video signals are being developed by the source 1 in response to the scanning of a television subject, the voltage derived from the blanking signal source 2 is of such polarity and magnitude that the tube 10 is substantially non-conducting. In such a case, therefore, the current flow through the resistor 3 is representative only of the video signals so that the voltage developed across this resistor is the video signal voltage. It also will be understood that the maximum negative video signal voltage impressed upon the resistor 3 represents picture white and similarly the minimum negative video signal voltage represents picture black.

Consider the case where the black area of the television subject is under scansion to develop a negative voltage in the resistor 3 of minimum amplitude. The circuit components should be so chosen that such a voltage corresponds substantially to the conducting threshold of the diode 4. This adjustment may be made by suitably positioning the slider 6 upon the resistor 7. Where the circuit constants are as described and the video signals are derived from a conventional image dissector tube provided with an eleven-stage electron multiplier in which the multiplier electrode accelerating potentials are of the order of 200 volts, it has been found that a suitable adjustment of the slider 6 is at a point where the voltage is approximately two volts negative with respect to ground. In such a case a voltage developed across the resistor 3, which is only slightly less negative than that representative of picture black, will render the diode 4 non-conducting. With the diode non-conducting there is no voltage developed across the load circuit associated therewith and, consequently, there is no signal voltage impressed upon the utilization circuit 9. It is apparent that for negative voltages of greater magnitudes developed across the resistor 3 in response to the scansion of lighter portions of the television subject, correspondingly greater voltages will be developed in the diode load circuit for impression upon the utilization circuit. In this manner then the video signal voltages may be impressed upon the utilization circuit during trace periods.

During retrace periods there are developed blanking signals of such positive magnitudes that when impressed upon the triode 10 this tube is rendered conducting. Space current which is conducted in this tube also flows through the cathode connected portion of the resistor 3 which results in the development in this resistor of a voltage which is positive with respect to ground. This positive voltage is impressed upon the cathode of the diode 4 as a bias and is of sufficient magnitude to render the diode non-conducting. This diode state is registered upon the utilization circuit in which substantially the same response is obtained as in the case of a video signal representative of picture black. It has been found that optimum operating results are obtained when the response by the utilization circuit to a blanking signal is slightly different from the response to a black representative video signal. For example, if the video signal representative of picture black decreases the response to a predetermined level by reason of the fact that the diode 4 in these circumstances is just over the threshold region in a conducting state, then the response by this

circuit to a blanking signal effects a slightly greater decrease.

By making the diode conductive only for video signals substantially at and above the level of picture black areas the effect produced by the blanking signals always bears a substantially fixed relation to the video signals representative of picture black. Regardless of the average illumination of the television subject, a black area is always represented by the same viedo signal voltage which, as described, the diode **4** is just capable of impressing upon the utilization circuit. Thus, when the diode is conditioned for nonconduction in response to a blanking signal, the response by the utilization circuit is always the same and always bears the same relation to the response by this circuit to a black representative video signal.

While there has been described what, at present, is considered the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and therefore, it is aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In a television system, a source of video signals, a source of blanking signals, a utilization circuit, a diode connected directly between said video signal source and said utilization circuit, said diode being poled to be conductive only for video signals above the level of black picture areas, an impedance device connected to said video signal source, and a triode having an input circuit electrode coupled to said blanking signal source and an output circuit electrode connected to said impedance device for biasing said diode to a non-conductive state in response to blanking signals.

2. In a television system, a source of video signals, a source of blanking signals, a utilization circuit, a diode having a cathode connected directly to said video signal source and an anode connected to said utilization circuit, said diode being biased to be conductive only for video signals above the level of black picture areas, an impedance device connected in parallel with said video signal source, and a vacuum tube having a control grid coupled to said blanking signal source and an output circuit including an anode, a cathode and a portion of said impedance device coupled to said diode for rendering said diode cathode of positive polarity relative to said diode anode in response to blanking signals.

3. In a television system, a source of video signals, a source of blanking signals, a utilization circuit, a diode having a cathode and an anode connected directly between said video signal source and said utilization circuit, said diode being poled to be conductive only for video signals above the level of black picture areas, a source of negative biasing voltage connected to said diode anode, an impedance device connected to said diode cathode, and a vacuum tube having a control grid coupled to said blanking signal source and an output circuit including a cathode connected to a point on said impedance device, whereby to impress a positive biasing voltage upon said diode cathode in response to blanking signals.

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