Jan. 14, 1947. T. L. GOTTIER 2,414,228

TELEVISION SYSTEM

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Fig. 1.

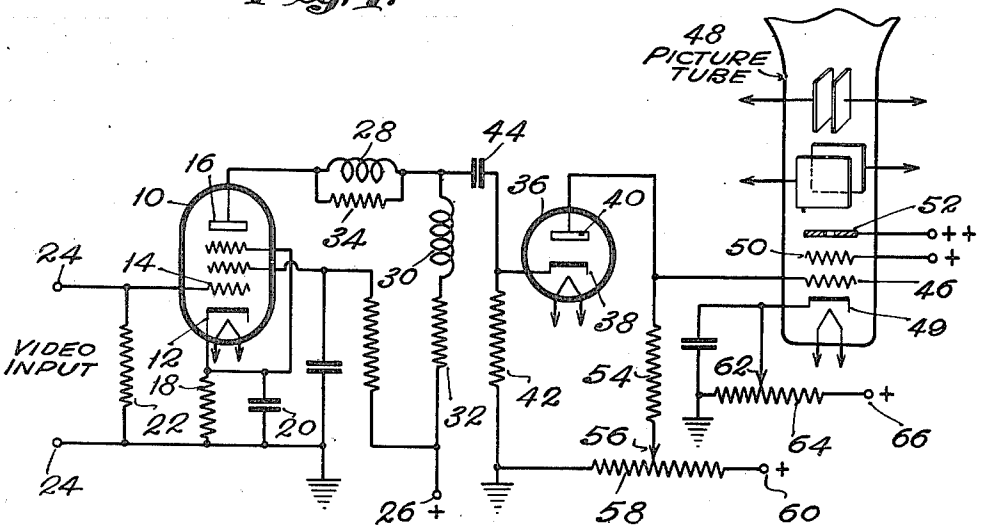
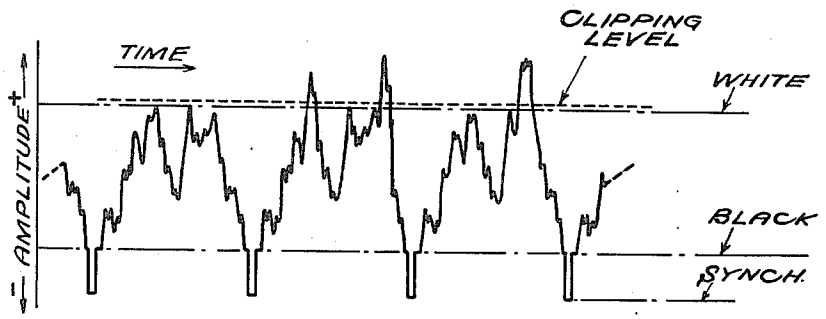


Fig. 2.



INVENTOR.
Thomas L. Gottier
BY
H. S. Grover.
ATTORNEY.

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TELEVISION SYSTEM

Thomas L. Gottier, Princeton, N. J., assignor to Radio Corporation of America, a corporation of Delaware

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2 Claims. (Cl. 178—7.5)

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This invention relates to an improvement in television receivers, and more particularly to a circuit arrangement to prevent "blooming" on the viewing screen of the television receiver picture tube.

In a conventional television receiving system a direct viewing cathode ray tube is normally employed which includes an electron gun structure for generating a beam of electrons. Additional apparatus is provided for deflecting the generated cathode ray beam in substantially mutually perpendicular directions across the screen of the tube in order that a predetermined pattern may be scanned. The screen or target of the tube is generally in the form of a fluorescent coating which will emit visible light when the coating is bombarded with a cathode ray beam. Since the intensity of the light emitted from the fluorescent coating is a function of the current intensity of the cathode ray beam, the cathode ray beam may be modulated in its current intensity in order to produce different effects on the fluorescent screen. When this is done during the scanning operation, a visual image may be produced upon the screen of the cathode ray tube. In order that a television image may be produced corresponding to the subject matter scanned at the transmitter, the cathode ray beam is deflected in synchronism with the scanning operation at the transmitter, and the current intensity of the cathode ray beam at the receiver is modulated by the received television video signals.

According to present television standards, a video signal series includes not only the picture or image signals but also blanking signals (which have an intensity corresponding to black in the picture) and synchronizing signals superimposed upon the blanking signals and extending in a blacker-than-black direction. In order that the proper effect may be produced upon the screen of the receiving tube, the series of signals (either with or without synchronizing signals) is impressed upon the control electrode of the electron gun structure in such a manner that image signals representing white in the picture decrease the bias of the cathode ray tube to increase the current intensity of the beam; whereas, picture or image signals representative of black increase the bias on the gun structure of the cathode ray tube thereby to decrease the current intensity of the generated cathode ray beam. The normal bias adjustment of the control electrode of the electron gun structure with respect to the cathode is such that the cathode ray beam is substantially suppressed during the application of

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signals representative of full black in the picture.

In the reception of television signals, as in the reception of other radio signals, noise disturbances may occur, and if these noise disturbances are in the form of signals accompanying or received simultaneously with video signals, they will then be applied with the video signals to the control electrode of the cathode ray beam with the result that undesired effects will often be produced. If the noise disturbances extend in the direction of black, the effect is not so noticeable since the result is merely a black spot on the screen; however, if the noise disturbances extend in the direction of white, their presence may be particularly annoying inasmuch as they produce readily visible white spots on the screen of the receiving tube. Furthermore, the signals representing the noise disturbances frequently have an intensity exceeding the normal intensity of the image signals, with the result that the disturbances exceed a value representative of full white in the picture. Under these conditions the current intensity of the cathode ray beam is materially increased during the presence of the noise disturbances, and when the current intensity of the cathode ray beam exceeds a predetermined value, "blooming" at the viewing screen results. By "blooming" it is meant that an exceedingly bright or undue amount of light is produced at the screen, and by reason of halation and some defocussing of the cathode ray beam, the size of the spot produced on the viewing screen of the cathode ray tube may be large as compared to the normal area effected by one traversal of the beam.

When noise signals extend in the direction of white and exceed the value representative of full white in the picture, particularly annoying disturbances on the screen of the cathode ray tube therefore result, and by means of the present invention these disturbances may be eliminated. The elimination of the noise disturbances that extend beyond a value representative of white in the video signal series is accomplished in the present invention by using a biased unilateral conducting device, the bias applied to the device being such that signals within the normal deviation range may be passed thereby, but if signals are impressed upon the device which exceed the normal deviation, they are blocked and their transmission is accordingly prevented.

It is, therefore, one purpose of the present invention to provide means in a television receiver to prevent "blooming" at the screen of a receiver

tube due to the reception of noise disturbances or undesired transient conditions.

Another purpose of the present invention resides in the provision of means in a television receiver whereby the current intensity of the cathode ray beam in the cathode ray receiver tube cannot exceed the predetermined value.

Still another purpose of the present invention resides in the provision of a circuit arrangement in a television receiver whereby blooming at the receiver screen is prevented when noise disturbances exceeding a value representative of full white in the picture are present in the video signal series.

A still further purpose of the present invention resides in the provision of a biased unilateral conducting device associated with a television cathode ray receiving tube whereby potential variations having a predetermined deviation may be passed by the conducting device, but deviations exceeding the predetermined amount are blocked by the unilateral conducting device.

Various other purposes and advantages of the present invention will become more apparent to those skilled in the art from the following detailed description, particularly when considered in connection with the drawing wherein:

Figure 1 shows a preferred form of the present invention, and

Figure 2 shows a curve representing a portion of a video signal including noise disturbances which are eliminated by the circuit arrangement shown in Figure 1.

Referring now to the drawing, and more particularly to Figure 1 thereof, there is shown a video signal amplifier tube 10 having at least a cathode 12, a control electrode 14, and an anode 16. The cathode is connected to ground by way of cathode resistor 18, and this resistor is bypassed by an appropriate condenser 20. The control electrode 14 is connected to ground by way of resistor 22, and input terminals 24 are provided for applying a series of video signals between the control electrode 14 and the cathode 12 of the tube 10. The video input as applied to the input terminals 24 may be derived from a preceding video signal amplifier or from a demodulator or other appropriate source of video signals.

The anode 16 is connected to a positive terminal 26 by way of series peaking coil 28, shunt peaking coil 30 and load impedance 32. The series peaking coil 28 preferably has a resistance 34 connected in parallel therewith in order to produce the desired results.

An electron discharge tube or diode 36 is also provided having a cathode 38 and an anode 40. The cathode 38 of the diode is connected to ground by way of resistance 42 and is also connected to the junction of the series and shunt peaking coils 28 and 30, respectively, by way of coupling condenser 44. Accordingly, amplified video signals present at the junction of the peaking coils are applied to the cathode 38 of the diode 36.

The anode 40 of the diode 36 is connected to the control electrode 46 of the electron gun structure of the television receiver or picture tube 48, a portion of which is shown in the figure. The electron gun structure includes, in addition to the control electrode 46, a cathode 49, a first accelerating electrode 50, and a second accelerating electrode 52. The potential of the second accelerating electrode 52 is normally maintained highly positive with respect to the cathode 49 in order to generate a cathode ray beam of substantially high velocity, and the first accelerating electrode 50 is maintained at a positive potential with respect to the cathode 49, this potential being less than the potential of the second accelerating electrode 52 and of a value sufficient to produce the desired focal condition of the generated cathode ray beam. The negative terminal of the source of potential applied to the cathode ray gun structure electrode may be connected to ground or to another appropriate fixed potential point.

The control electrode 46 of the cathode ray tube and the anode 40 of the diode 36 are connected by way of resistance 54 to the movable contact 56 of a potentiometer including resistance element 58. One end of the resistance element is connected to a positive terminal 60. By adjusting the position of the movable contact 56 along the resistance element 58, varying degrees of positive potential may be applied to the anode 40 of the diode 36. Since the control electrode 46 of the cathode ray tube operates at a slight positive average potential with respect to ground, the cathode 49 of the gun structure should have a potential slightly positive with respect to this average potential. For this purpose the cathode 49 of the electron gun structure is connected to movable contact 62 of a potentiometer including resistance element 64. One end of the resistance element 64 is connected to ground, whereas the opposite end is connected to a positive terminal 66. By adjusting the position of the movable contact 62 along the resistance element 64, the cathode may be made positive by a predetermined amount with respect to the average potential of the control electrode 46.

In the operation of the present invention, video signals are applied to the input terminal 24 in a polarity such that the synchronizing or blanking signals drive the control electrode in a positive direction, and signals representative of white drive the control electrode 14 in a negative direction. When video signals of such polarity are applied to the input terminals of amplifier tube 10, a corresponding series of amplifier video signals will be present at the coupling condenser 44 in reversed polarity.

In Figure 2 is shown a curve representing a series of video signals having a polarity such as is present at the output of amplifier tube 10, the polarity being such that the blanking signals, or signals representative of black, drive the cathode 38 in a negative direction, whereas image signals, representative of white, drive the cathode 38 in a positive direction with respect to the anode 40 associated therewith. It will be observed that in Figure 2 video signals include the blanking signals (at full black level), synchronizing signals having a value greater than black in the picture, and image signals having a deviation value extending from the two horizontal dash-dot lines representing black and white in the picture. It will also be observed that Figure 2 includes noise impulses which extend beyond full white in the picture. These noise impulses or disturbances are undesirable, and unless eliminated, result in disturbances and blooming at the viewing screen of the cathode ray tube.

If it is assumed that the contact 56 is positioned along the resistance 58 such that the potential of the anode 40 with respect to the cathode is positive by an amount at least equivalent to the extent to which the cathode 38 is driven in a positive direction by the video signals under full white conditions, then the entire video signal

may be passed by the tube 36 since the amount of the bias applied to the diode is not exceeded. If, however, the cathode 38 is driven in a positive direction such that it becomes positive with respect to the anode 40, then naturally the diode 36 is rendered non-conducting, with the result that such peak impulses are not passed thereby. A dotted line representing the clipping level is shown in Figure 2, and may represent an ideal potential setting for the anode of the diode 36. Under these conditions the diode 36 will pass all signals having a value less positive than the value represented by the dotted clipping level line. When noise signals are applied to the cathode 36 having a value more positive than the value represented by the dotted line in Figure 2, then the cathode 38 of the diode 36 becomes positive with respect to its anode 40, with the result that such signals are blocked or are "clipped" at a value representing full white in the picture.

Since video signals occurring within normal deviation limits are passed by the diode 36, these signals will be present at the anode or output circuit of the diode and will be impressed upon the control electrode 46 of the electron gun structure. Because the image signals representative of black extend in a negative direction, they will be effective to reduce the current intensity of the generated cathode ray beam with the result that the amount of light produced at the screen will be correspondingly reduced. Similarly, the potential of the control electrode 46 will be driven in a positive direction for signals representative of white, thereby to increase the current intensity of the generated cathode ray beam to effect an increase in the amount of light produced at that portion of the fluorescent screen traversed by the cathode ray beam at that particular instant. When noise signals are encountered in an intensity sufficient to block the conduction of tube 36, then the control electrode 46 of the electron gun structure will not be driven in an excessive positive direction, with the result that blooming at the viewing screen of the cathode ray tube is entirely prevented.

It will be seen, therefore, that through the use of the present invention a circuit arrangement is provided wherein blooming at the viewing screen of a television receiver tube is prevented by limiting the extent to which the control electrode of the electron gun structure may be driven in a positive direction relative to the cathode of the gun structure. Noise disturbances which would otherwise produce blooming are blocked in their transmission by the action of the biased diode 36.

Although the video signal represented in Figure 2 includes synchronized signals, their inclusion is not necessary, and they may in some instances be eliminated by clipping or by other appropriate effects since it is only necessary that the control electrode of the cathode ray tube gun structure be driven sufficiently negative to substantially preclude the formation of a beam during the blanking interval which coincides with the return deflection stroke of the cathode ray beam. As stated above, the position of the movable contact 62 is so adjusted that the current intensity of the cathode ray beam is reduced to substantially zero during the application of the blanking signals or picture signals representative of full black to the control electrode of the electron gun structure.

The present invention is described as being applicable to a direct viewing cathode ray tube, but the use of the invention need not be confined solely to such a tube since it is equally applicable to other forms of image reproducing tubes.

Various alterations and modifications may be made in the present invention without departing from the spirit and scope thereof, and it is desired that any and all such alterations and modifications be considered within the purview of the present invention except as limited by the hereinafter appended claims.

Having now described my invention, what I claim as new and desire to have protected by Letters Patent is:

1. A television receiving system for preventing "blooming" on the screen of a television image tube due to the presence of noise disturbances extending in the direction of white in the picture, including a source of image signals, a cathode ray image reproducing tube having a beam intensity control electrode, a diode including a cathode and an anode, means for connecting the anode of said diode to the control electrode of the image reproducing tube, means including a resistance for connecting the cathode of the diode to a point of fixed potential, means including a resistance for applying a predetermined average positive potential to the control electrode of the image reproducing tube and to the anode of the diode with respect to the point of fixed potential so that said diode is normally conducting, means including a condenser for applying the image signals to the cathode of said diode with signals representative of white extending in a positive direction, the bias potential of said diode being such that image signals having normal potential deviations are permitted to pass through said diode, while potential deviations in excess of full white in the picture cause the cathode of said diode to be driven positive with respect to its associated anode whereby such excessive potential deviations are not applied to the image reproducing tube.

2. A television receiving system for preventing "blooming" on the screen of a television image tube due to the presence of noise disturbances extending in the direction of white in the picture, including a source of image signals having a polarity such that signals representative of white in the image extend in a positive direction and signals representative of black in the image extend in a negative direction, a cathode ray image reproducing tube including an electron gun structure having a control electrode, a diode including a cathode and an anode, means for connecting the anode of said diode to the control electrode of said electron gun structure, means including a resistance for maintaining the cathode of said diode at a predetermined adjustable negative potential with respect to its associated anode so that said diode is normally conducting, means including a condenser for applying the image signals to the cathode of said diode, the bias potential of said diode being such that normal image signal potential deviations are permitted to pass through said diode, but potential deviations in excess of full white in the picture cause the cathode of said diode to be driven positive with respect to its associated anode whereby such excessive potential deviations are prevented from being applied to the control electrode of said electron gun structure.

THOMAS L. GOTTIER.