Description

The present invention relates to the display of alphanumeric or graphic information by an image reproducing device such as a kinescope and, in particular, to reducing current drawn by an image reproducing device during time periods when the alphanumerics or graphics are displayed in place of normal scenic images in order to reduce graphic image distortions.

Television (TV) receivers are increasingly being used not only as receivers for processing conventional video signals to reproduce moving images on the screen of a kinescope representative of a televised scene, but also as a monitor for processing auxiliary video signals to reproduce alphanumeric text and graphic displays on the screen of the kinescope. These auxiliary signals may be derived, for example, from a teletext decoder, video game or computer and applied to the TV receiver via the antenna input terminals.

The video processing stage of the TV receiver includes circuitry for controlling the amplitude characteristics of the processed video signal, such as its peak-to-peak level and D.C. level which affects the contrast and brightness, respectively, of the reproduced images. Since the luminance component of a conventional video signal typically has relatively few occasions where its signal level approaches peak white levels, contrast and brightness levels of the video processing stage are set relatively high for reproducing optimum images on the kinescope. However, the digital nature of alphanumeric and graphic video signals is such that the signal levels are either maximum or minimum and consequently there are many occasions where signal levels are at peak white levels.

It has been noted by the present inventor that when alphanumeric text and/or graphics are reproduced, the substantial number of peak white signal portions of these digital signals may tend to overdrive the kinescope causing defocusing or "blooming" of the alphanumerics or graphics.

In our EP-A-0004197, a system for displaying graphics information in a television receiver is described in which, with a view to limiting the intensity of displayed graphics information, the graphics signals, instead of being added to the video or image signals, are used to control the switching of a graphics intensity bias signal which determines the cathode ray tube beam intensity when graphics are being displayed, so that the intensity is determined solely by that bias signal and is not dependent on the amplitude of the graphics signals themselves.

Typically, TV receivers include protection circuitry, such as an ABL (automatic beam current limiter) circuit, which may be of the type described in U.S. Patent US-A-4,167,025 (Willis) entitled, "Automatic Peak Beam Current Limiter", for sensing excessive beam current (i.e., beam current which exceeds a preset threshold level) and deriving a control signal which is applied so as to reduce kinescope current conduction before the undesired blooming or other distortions of the displayed image occurs. ABL circuits of this type may include both an average current and peak current sensing circuit, for determining when kinescope beam current levels exceed a preset threshold level before reduction in kinescope conduction occurs.

EP-0136823/A2 describes a control circuit which automatically reduces the preset threshold level of the beam current limiter whenever graphics, such as a vertical tuning indication bar is displayed concurrently with a conventional television image on the screen of the kinescope. However, when only alphanumeric or graphic signals are to be reproduced by the kinescope, the relatively short duration of the peak white signal portions of the alphanumeric and graphic video signals and their relatively low average value are such that the average and peak beam current levels may never exceed the preset threshold levels which result in generation of the ABL control signal. Although the preset threshold level of the ABL circuit may be automatically reduced whenever graphics are to be displayed, due to the above-noted characteristics of alphanumeric signals, the threshold level would have to be substantially reduced in order to assure the threshold level can be exceeded. Unfortunately, at such a reduced threshold level, the ABL circuit could become very sensitive and may modulate the beam current based on the amount of graphics or density of the alphanumerics text displayed on the kinescope.

In accordance with the principles of the present invention, a video signal processing channel is provided which is adapted to be responsive to either a conventional video signal representative of a normal televised scene or an auxiliary video signal representative of alphanumeric text or graphic images. A control circuit is coupled to the video signal processing channel for altering its amplitude translation characteristics such as the contrast or brightness levels. The control circuit is responsive to a signal indicating that only the auxiliary video signal is being applied to the processing channel for reducing the amplitude translation characteristics of the channel.

In the drawings:

FIGURE 1 illustrates, partially in block diagram form and partially in schematic diagram form, a television receiver employing apparatus constructed in accordance with the present invention; and

FIGURE 2 illustrates in block diagram form circuitry useful in an alternative embodiment of the present invention.

The color television receiver shown in FIGURE 1 includes an antenna 2 for receiving VHF and UHF RF signals. A switch 4 applies, when set to do so as will be described below, the RF signals received from antenna 2 to a tuner 6 which converts the RF signal corresponding to the selected channel to a corresponding IF signal. The IF signal is filtered, amplified and demodulated to provide a composite video signal at the output of

an IF amplifier and detector stage 8. The composite video signal contains luminance, chrominance, sound and synchronizing components.

A sync processor and deflection stage 10 serves to separate the synchronizing (sync) component including horizontal and vertical synchronization pulses from the composite video signal and provide horizontal and vertical deflection signals, which are used in a known manner, for scanning a raster on a kinescope 12.

A video processor 14 processes the chrominance component of the composite video signal to supply R-Y, B-Y and G-Y color difference signals to respective inputs of a kinescope driver stage 16. Video processor 14 also processes the luminance component of the composite video signal to supply a luminance signal Y to a respective input of kinescope driver stage 16 where the luminance signal is combined with the color difference signals to form R, B, and G color signals. These signals are then coupled to signal inputs (e.g., cathode electrodes) of kinescope 12 for reproducing a color image of the received video signal. A contrast control stage 18 includes a viewer controllable potentiometer 20 for providing a variable DC voltage at it wiper which is applied to video processor 14 for changing the gain of an amplifier in the luminance section of video processor 14 to thereby change the peak-to-peak signal level (contrast) of the luminance signal.

Sound components of the IF signal are processed by a sound processor 22 to derive an audio signal which is reproduced by a loudspeaker 24.

High operating voltages for focus (not shown) and ultor electrodes of kinescope 12 are provided by a high voltage supply 26 in response to periodic horizontal flyback pulses occuring during horizontal retrace scanning intervals. A "resupply" current I, (i.e., a current coupled via the high voltage stage to recharge or resupply the ultor electrode voltage of the kinescope which is depleted as a result of beam current conduction) is representative of the beam current (i.e., ultor current) demand of the kinescope in response to the drive signals applied to it from driver stage 16.

An automatic beam current limiter (ABL) 28 senses when the resupply current I, exceeds a predetermined threshold level indicating the presence of excessive beam current demand. ABL stage 28 then develops an output control signal in accordance with the magnitude of the excessive beam current. This control signal is applied to video processor 14 in such a manner as to control the amplitude translation characteristics of processor 14 to reduce excessive beam currents. In the illustrated embodiment, this control signal is applied to the wiper of contrast control potentiometer 20 for reducing the AC peak-to-peak level (contrast) of the luminance signal in proportion to the amount the resupply current exceeds the predetermined threshold level. Potentiometer 20 is connected between a +11 volt supply and a reference potential such as ground. When the wiper of potentiometer 20 is at the top in Figure 1, maximum voltage is supplied providing maximum contrast. Lowering the wiper decreases the voltage and contrast.

An ABL stage and its coupling to the contrast control of the video processor in a manner for reducing excessive kinescope beam currents when alphanumerics or graphics are displayed in conjuntion with video signals representative of a scene, is described in greater detail in the previously mentioned European Application.

A character generator 30 which may be included, for example, in a teletext decoder, video game or computer, is the source of auxiliary video signals representative of alphanumeric text or graphic information which are generated in response to user activation by means of a control unit 32. A modulator 34 provides an RF carrier modulated by the auxiliary video signal to switch 4. Switch 4, in response to a signal I supplied by character generator 30 indicating the presence of the auxiliary video signal, decouples the RF signals received by antenna 2 from the input of tuner 6 and instead couples the RF signal from modulator 34 to the tuner input. The auxiliary video signal is processed in the same manner as described above for the conventional television signal for reproducing alphanumeric text or graphics on the screen of kinescope 12.

As previously noted, when alphanumeric text and/or graphics are reproduced, the substantial number of peak white signals portions of these digital signals may tend to overdrive the kinescope causing defocusing or "blooming" of the alphanumerics or graphics. Due to the relatively short duration of the peak white signal portions of these digital signals and their relatively low average value, the average and peak beam current levels may never exceed the preset threshold levels which result in generation of the ABL control signal for automatically reducing kinescope current conduction and undesired blooming or other distortions of the displayed image may occur.

In accordance with the principles of the present invention, this undesired blooming of the displayed image is eliminated by automatically changing an amplitude translation characteristic of the video signal processing channel whenever the auxiliary video signal representative of alphanumeric text or graphic information is displayed.

More specifically, the signal I supplied by character generator 30 whenever the auxiliary video signal is displayed, controls the operation of a stage 36 including a transistor 38, bias resistor 40 and a collector resistor 42 coupled to the wiper of contrast potentiometer 20 for reducing the level of the contrast control voltage (by voltage divider action). That is, the positive voltage provided by the signal I of the character generator 30 turns on the transistor 38, and the resistor 42 is placed in parallel with the effective portion of the potentiometer 20. This reduces the level of the contrast control voltage. This results

in a reduced peak-to-peak amplitude translation characteristic of video processor 14 which reduces kinescope current conduction so as to prevent image blooming whenever the alphanumeric text or graphic information is displayed.

While the invention has been described in terms of a preferred embodiment, it should be recognized that various modifications can be made by persons skilled in the art without departing from the scope of the invention. For example, the signal I may have a potential such that it can be directly applied to the wiper of potentiometer 20 via resistor 42, for effecting the desired reduction in video signal peak-to-peak amplitude. Also, the peak signal level of the chrominance alone or both of the luminance and chrominance components of the video signal can be reduced. Furthermore, the D.C. level (brightness) of the luminance component can also be reduced whenever the auxiliary signal is to be displayed. Additionally, the baseband composite video signal at the output of character generator 30 can be applied directly to an auxiliary signal input 44 of video processor 14 (as shown in dashed lines). Video processor 14 may include a circuit for sensing when an auxiliary baseband signal is applied at input 44 for providing the signal I indicating that alphanumeric text or graphics are displayed. This signal could also be used to deactivate the tuner 6 and IF stage 8 and also cause a portion of the auxiliary video signal to be coupled to sync processor and deflection stage 10 for developing the flyback and deflection signals therefrom. Finally, as shown in FIGURE 2, the signal I may be generated by a digital signal detector 210, which recognizes when alphanumeric text or graphic signals are being processed due to the digital nature of these signals.

Claims

1 In a system including a signal processing channel (14) selectively operable (4) for processing either a conventional television video signal (from (2)) representative of a televised scene or auxiliary video signals (from (34)) representative alphanumeric text or graphics, and an image reproducing device (12) for reproducing the televised scene in response to said processed conventional video signal and alphanumeric text or graphics in response to said processed auxiliary video signal, wherein current drawn by said image reproducing device is responsive to the amplitude characteristics of said processed conventional and auxiliary signals, apparatus for modifying said current drawn by said image reproducing device (12) comprising:

means (18, 28) coupled to said signal processing channel (14) for modifying the amplitude translation characteristics of said signal processing channel in a manner so as to reduce the level of said current drawn by said image reproducing device, and characterized by

means (30) for generating, whenever auxiliary video signals are to be processed by said signal processing channel for display of alphanumeric text or graphics, a control signal (I) effective for causing said amplitude translation characteristic modifying means to reduce the amplitude characteristics of said processed auxiliary signal.

2. Apparatus as claimed in claim 1 characterized by means (38) responsive to said control signal (I) and coupled to said modifying means (18, 28) for reducing said amplitude characteristics of said signal processing channel in the presence of said control signal.

3. Apparatus as claimed in claim 2 characterized in that said means (38) responsive to said control signal (I) is coupled to means (18) included in said modifying means for controlling the contrast of images reproduced by said image reproducing device.

4. Apparatus as claimed in claim 2 or 3 characterized in that said means responsive to said control signal (I) includes a controllable conduction device (38) the conduction of which is changed by said control signal.

Patentansprüche

1. Anordnung in einem System, das einen signalverarbeitenden Kanal (14) enthält, der wahlweise betreibbar (4) ist, um entweder ein herkömmliches Fernseh-Videosignal (von (2)), das eine durch Fernsehen übertragene Szene darstellt, oder zusätzliche Videosignale (von (34)) zu verarbeiten, die alphanumerischen Text oder Graphiken darstellen, und das eine Bildwiedergabeeinrichtung (12) enthält, um in Reaktion auf das verarbeitete herkömmliche Videosignal die durch Fernsehen übertragene Szene oder in Reaktion auf das verarbeitete zusätzliche Videosignal alphanumerischen Text oder Graphiken wiederzugeben, wobei der von der Bildwiedergabeeinrichtung gezogene Strom auf die Amplitudencharakteristiken der verarbeiteten herkömmlichen und zusätzlichen Signale reagiert,

zur Modifizierung des von der Bildwiedergabeeinrichtung (12) gezogenen Stroms,

mit einer Einrichtung (18, 28), die mit dem signalverarbeitenden Kanal (14) gekoppelt ist, um die Amplitudenübertragungscharakteristiken des signalverarbeitenden Kanals in einer solchen Weise zu modifizieren, daß der Pegel des von der Bildwiedergabeeinrichtung gezogenen Stroms vermindert wird, gekennzeichnet durch:

eine Einrichtung (30), um immer dann, wenn zusätzliche Videosignale vom signalverarbeitenden Kanal für die Wiedergabe von alphanumerischem Text oder Graphiken zu verarbeiten sind, ein Steuersignal (I) zu erzeugen, das die Einrichtung, welche die Amplitudenübertragungscharakteristik modifiziert, veranlaßt, die Amplitudencharakteristiken des verarbeiteten zusätzlichen Signals zu vermindern.

2. Anordnung nach Anspruch 1, gekennzeichnet durch eine Einrichtung (38), die auf das Steuersignal (I) anspricht und mit der modifizierenden

in a reduced peak-to-peak amplitude translation characteristic of video processor 14 which reduces kinescope current conduction so as to prevent image blooming whenever the alphanumeric text or graphic information is displayed.

While the invention has been described in terms of a preferred embodiment, it should be recognized that various modifications can be made by persons skilled in the art without departing from the scope of the invention. For example, the signal I may have a potential such that it can be directly applied to the wiper of potentiometer 20 via resistor 42, for effecting the desired reduction in video signal peak-to-peak amplitude. Also, the peak signal level of the chrominance alone or both of the luminance and chrominance components of the video signal can be reduced. Furthermore, the D.C. level (brightness) of the luminance component can also be reduced whenever the auxiliary signal is to be displayed. Additionally, the baseband composite video signal at the output of character generator 30 can be applied directly to an auxiliary signal input 44 of video processor 14 (as shown in dashed lines). Video processor 14 may include a circuit for sensing when an auxiliary baseband signal is applied at input 44 for providing the signal I indicating that alphanumeric text or graphics are displayed. This signal could also be used to deactivate the tuner 6 and IF stage 8 and also cause a portion of the auxiliary video signal to be coupled to sync processor and deflection stage 10 for developing the flyback and deflection signals therefrom. Finally, as shown in FIGURE 2, the signal I may be generated by a digital signal detector 210, which recognizes when alphanumeric text or graphic signals are being processed due to the digital nature of these signals.

Claims

1 In a system including a signal processing channel (14) selectively operable (4) for processing either a conventional television video signal (from (2)) representative of a televised scene or auxiliary video signals (from (34)) representative alphanumeric text or graphics, and an image reproducing device (12) for reproducing the televised scene in response to said processed conventional video signal and alphanumeric text or graphics in response to said processed auxiliary video signal, wherein current drawn by said image reproducing device is responsive to the amplitude characteristics of said processed conventional and auxiliary signals, apparatus for modifying said current drawn by said image reproducing device (12) comprising

means (18, 28) coupled to said signal processing channel (14) for modifying the amplitude translation characteristics of said signal processing channel in a manner so as to reduce the level of said current drawn by said image reproducing device, and characterized by

means (30) for generating, whenever auxiliary video signals are to be processed by said signal processing channel for display of alphanumeric text or graphics, a control signal (I) effective for causing said amplitude translation characteristic modifying means to reduce the amplitude characteristics of said processed auxiliary signal.

2. Apparatus as claimed in claim 1 characterized by means (38) responsive to said control signal (I) and coupled to said modifying means (18, 28) for reducing said amplitude characteristics of said signal processing channel in the presence of said control signal.

3. Apparatus as claimed in claim 2 characterized in that said means (38) responsive to said control signal (I) is coupled to means (18) included in said modifying means for controlling the contrast of images reproduced by said image reproducing device.

4. Apparatus as claimed in claim 2 or 3 characterized in that said means responsive to said control signal (I) includes a controllable conduction device (38) the conduction of which is changed by said control signal.

Patentansprüche

1. Anordnung in einem System, das einen signalverarbeitenden Kanal (14) enthält, der wahlweise betreibbar (4) ist, um entweder ein herkömmliches Fernseh-Videosignal (von (2)), das eine durch Fernsehen übertragene Szene darstellt, oder zusätzliche Videosignale (von (34)) zu verarbeiten, die alphanumerischen Text oder Graphiken darstellen, und das eine Bildwiedergabeeinrichtung (12) enthält, um in Reaktion auf das verarbeitete herkömmliche Videosignal die durch Fernsehen übertragene Szene oder in Reaktion auf das verarbeitete zusätzliche Videosignal alphanumerischen Text oder Graphiken wiederzugeben, wobei der von der Bildwiedergabeeinrichtung gezogene Strom auf die Amplitudencharakteristiken der verarbeiteten herkömmlichen und zusätzlichen Signale reagiert,

zur Modifizierung des von der Bildwiedergabeeinrichtung (12) gezogenen Stroms,

mit einer Einrichtung (18, 28), die mit dem signalverarbeitenden Kanal (14) gekoppelt ist, um die Amplitudenübertragungscharakteristiken des signalverarbeitenden Kanals in einer solchen Weise zu modifizieren, daß der Pegel des von der Bildwiedergabeeinrichtung gezogenen Stroms vermindert wird, gekennzeichnet durch:

eine Einrichtung (30), um immer dann, wenn zusätzliche Videosignale vom signalverarbeitenden Kanal für die Wiedergabe von alphanumerischem Text oder Graphiken zu verarbeiten sind, ein Steuersignal (I) zu erzeugen, das die Einrichtung, welche die Amplitudenübertragungscharakteristik modifiziert, veranlaßt, die Amplitudencharakteristiken des verarbeiteten zusätzlichen Signals zu vermindern.

2. Anordnung nach Anspruch 1, gekennzeichnet durch eine Einrichtung (38), die auf das Steuersignal (I) anspricht und mit der modifizierenden

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Einrichtung (18, 28) gekoppelt ist, um beim Vorhandensein des Steuersignals die Amplitudencharakteristiken des signalverarbeitenden Kanals zu vermindern.

3. Anordnung nach Anspruch 2, dadurch gekennzeichnet, daß die auf das Steuersignal (I) ansprechende Einrichtung (38) mit einer in der modifizierenden Einrichtung enthaltenden Einrichtung (18) zur Steuerung des Kontrastes von Bildern gekoppelt ist, die von der Bildwiedergabeeinrichtung wiedergegeben werden.

4. Anordnung nach Anspruch 2 oder 3, dadurch gekennzeichnet, daß die auf das Steuersignal (I) ansprechende Einrichtung ein Bauelement (18) steuerbarer Leitfähigkeit enthält, dessen Leitfähigkeit durch das Steuersignal verändert wird.

Revendications

1. Dans un système comprenant un canal de traitement de signaux (14) sélectivement actionnable (4) pour traiter soit un signal vidéo de télévision conventionnel (de (2)) représentatif d'une scène télévisée soit des signaux vidéo auxiliaires (de (34)) représentatifs d'un texte alphanumérique ou de graphiques, et un dispositif de reproduction d'images (12) pour reproduire la scène télévisée en réponse au signal vidéo conventionnel traité et le texte alphanumérique ou les graphiques en réponse au signal vidéo auxiliaire traité, où du courant soutiré par le dispositif de reproduction d'images est sensible aux caractéristiques d'amplitude des signaux auxiliaires et conventionnels traités, dispositif pour modifier le courant soutiré par le dispositif de reproduction d'images (12) comprenant:

un moyen (18, 28) couplé au canal de traitement de signaux (14) pour modifier les caractéristiques de translation d'amplitude du canal de traitement de signaux de manière à réduire le niveau du courant soutiré par le dispositif de reproduction d'images; et caractérisé par:

un moyen (30) pour produire, chaque fois que des signaux vidéo auxiliaires doivent être traités par le canal de traitement de signaux pour visualisation du texte alphanumérique ou des graphiques, un signal de commande (I) effectif pour amener le moyen de modification des caractéristiques de translation d'amplitude à réduire les caractéristiques d'amplitude du signal auxiliaire traité.

2. Dispositif selon la revendication 1, caractérisé par un moyen (38) répondant au signal de commande précité (I) et couplé au moyen de modification précité (18, 28) pour réduire les caractéristiques d'amplitude précitées du canal de traitement de signaux précités en présence du signal de commande.

3. Dispositif selon la revendication 2, caractérisé en ce que le moyen précité (38) répondant au signal de commande précité (I) est couplé au moyen (18) inclus dans le moyen de modification précité pour contrôler le contraste d'images reproduites par le dispositif de reproduction d'images précité.

4. Dispositif selon la revendication 2 ou 3, caractérisé en ce que le moyen précité répondant au signal de commande précité (I) comprend un dispositif de conduction contrôlable (38), dont la conduction est changée par le signal de commande.