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A METHOD & APPARATUS FOR CORRECTING COLOUR DIFFERENCE SIGNALS

Field of the Invention

This invention relates to colour television video processors utilising a luminance stretch function. More particularly, the invention relates to the colour matching function used in connection with the luminance or white stretch function in a television video processor.

Background Art

With the use of a luminance or white stretch function in a television video processor as part of a picture enhancement feature, there arises a need to provide some automatic adjustment in the amplitude of the colour difference signals to compensate for the effect of the stretch of the luminance signal. If compensation is not provided then the dematrixed colour signals will be incorrect and the picture will appear de-saturated. The provision of this compensation is called colour matching. The general principle of colour matching is that any percentage change in the amplitude of the luminance signal due to the white stretch effect, must be balanced by the same percentage changes in the colour difference signal so that the ratio of the colour signals (R G B signals) can be maintained after matrixing. Existing circuits provide a compensation for the colour difference signals, however, the performance is only satisfactory for a luminance level below 50IRE and tends to over compensate above this level.

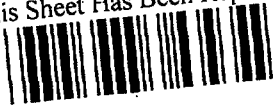
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Disclosure of the Invention

It is an object of this invention to provide an improved method and apparatus for correcting colour difference signals, which will overcome the limitations of the prior art.

Accordingly, in one aspect this invention provides a method of correcting colour difference signals in a colour television video processor utilising a luminance stretch function;



said method comprising the steps of detecting the level of the input luminance signal; applying a constant amount of compensation to the colour difference signals when the level of the input luminance signal is below a selected input luminance threshold and applying an amount of compensation to the colour difference signals that decreases with increasing input luminance signal level when the level of the input luminance signal is above said selected threshold.

In a second aspect, this invention also provides an apparatus for correcting colour difference signals in a colour television video processor utilising a luminance stretch function, said apparatus comprising means to detect the level of the input luminance signal; means to apply a substantially constant amount of compensation to the colour difference signals when the level of the input luminance signal is below a selected input luminance threshold and to apply an amount of compensation to the colour difference signals that decreases with increasing input luminance signal level when the level of the input luminance signal is above said selected threshold.

Preferably, the amount of compensation decreases linearly with increasing input luminance signal level. It is also preferred that the amount of compensation is reduced to zero at and above a selected maximum luminance signal level. The maximum luminance level is preferably about 100IRE.

In the preferred embodiment, the input luminance threshold corresponds to the maximum luminance stretch of said video processor. Typically, this corresponds to a threshold luminance signal level of about 50IRE.

In one form of the invention, the input luminance signal is compared to a reference signal corresponding to the input luminance threshold to determine whether the input luminance signal level exceeds the input luminance threshold.

The invention is preferably applied to an existing video processor providing a constant

compensation for the colour difference signals by applying a correction to adjust the amount of compensation.

Best Mode for Carrying Out the Invention

One embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

- Figure 1 is a plot of the DC characteristics of the white stretch function used in a television video processor;
- Figure 2 is a plot of the DC characteristics of the compensation applied to the colour difference signals according to this invention; and
- Figure 3 is a simplified schematic circuit diagram of the circuit used to implement the compensation of the colour difference signals according to this invention.

As shown in Figure 1, the white stretch function of a television video processor is characterised by a constant stretch of the input luminance below 50IRE, and a linear decrease of the stretch for input luminance above 50IRE.

Figure 2 shows the DC compensation characteristic according to the preferred embodiment of this invention. A constant correction level is applied to the colour difference signals where the input luminance is below 50IRE and the amount of compensation decreases linearly when the input luminance is above 50IRE until it reaches a zero correction at 100IRE.

Referring to Figure 3, the compensation of the colour difference signals is achieved by adjusting the gain of the saturation control of the television video processor. This in turn changes the colour difference signal levels (R-Y, and B-Y). In the preferred embodiment of this invention, a compensation current is generated and applied to the saturation control circuit.

As will be apparent from Figure 3, the luminance input signal level is detected and compared to a 50IRE reference voltage. The circuit operates such that the compensation is at a maximum for when the input luminance signal is less than 50IRE and linearly decreases to zero as the input luminance signal increases from 50IRE to 100IRE. The circuit utilises the variable DC control current (I_{ws}) depending on the amount of white stretch from an existing white stretch circuit (not shown) and provides this level of output compensation current to the saturation control circuit when the input luminance is below 50IRE and linearly decreases this control current to zero for luminance signals between 50IRE and 100IRE. The circuit utilises a voltage to current converter formed by transistor pair Q22, Q23 with an active PNP load Q20, Q21, a transistor pair Q10, Q11 and current mirrors. In operation:

$$I_c Q27 = I_{ws} - I_c Q24$$

$$I_c Q24 = 0 \text{ to } I_{ws}$$

therefore

$$I_c Q27 = I_{ws} \text{ to } 0 = I_{\text{compensation}}$$

thus

$$\text{when } Y_{in} \leq 50\text{IRE}, I_{\text{compensation}} = I_{ws}$$

$$\text{when } 50\text{IRE} < Y_{in} \leq 100\text{IRE}, I_{\text{compensation}} = I_{ws} \text{ to } 0 \text{ linearly}$$

$$\text{when } Y_{in} > 100\text{IRE } I_{\text{compensation}} = 0$$

The correction of colour difference signals according to this invention provides for improved colour matching over the whole of the input luminance range thus ensuring correct colour matching.

The foregoing describes only one embodiment of this invention and modifications can be made without departing from the scope of the invention.



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CLAIMS

1. A method of correcting colour difference signals in a colour television video processor utilising a luminance stretch function; said method comprising the steps of detecting the level of the input luminance signal; applying a constant amount of compensation to the colour difference signals when the level of the input luminance signal is below a selected input luminance threshold and applying an amount of compensation to the colour difference signals that decreases with increasing input luminance signal level when the level of the input luminance signal is above said selected threshold.
2. A method as claimed in claim 1, wherein said amount of compensation decreases linearly with increasing input luminance signal level.
3. A method as claimed in claim 1 or claim 2, wherein said amount of compensation is reduced to zero at and above a selected maximum luminance signal level.
4. A method as claimed in claim 3, wherein said maximum luminance level is about 100IRE.
5. A method as claimed in any one of claims 1 to 4, wherein said input luminance threshold corresponds to the maximum luminance stretch of said video processor.
6. A method as claimed in any one of claims 1 to 5, wherein said threshold luminance signal level is about 50IRE.
7. A method as claimed in any one of claims 1 to 6, wherein said input luminance signal is compared to a reference signal corresponding to said input luminance threshold to determine whether the input luminance signal level exceeds the input luminance threshold.

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8. A method as claimed in any one of claims 1 to 7, wherein said video processor provides a constant compensation for said colour difference signals and a correction is applied to adjust the amount of compensation.
9. An apparatus for correcting colour difference signals in a colour television video processor utilising a luminance stretch function, said apparatus comprising means to detect the level of the input luminance signal; and means to apply a substantially constant amount of compensation to the colour difference signals when the level of the input luminance signal is below a selected input luminance threshold and to apply an amount of compensation to the colour difference signals that decreases with increasing input luminance signal level when the level of the input luminance signal is above said selected threshold.
10. An apparatus as claimed in claim 9, wherein said amount of compensation decreases linearly with increasing input luminance signal level.
11. An apparatus as claimed in claim 9 or claim 10, wherein said amount of compensation is reduced to zero at and above a selected maximum luminance signal level.
12. An apparatus as claimed in claim 11, wherein said maximum luminance level is about 100IRE.
13. An apparatus as claimed in any one of claims 9 to 12, wherein said input luminance threshold corresponds to the maximum luminance stretch of said video processor.
14. An apparatus as claimed in any one of claims 9 to 13, wherein said threshold luminance signal level is about 50IRE.
15. An apparatus as claimed in any one of claims 9 to 14, where said input luminance signal is compared to a reference signal corresponding to said input luminance threshold to



determine whether the input luminance signal level exceeds the input luminance threshold.

16. An apparatus as claimed in any one of claims 9 to 15, wherein said video processor provides a constant compensation for said colour difference signals and a correction is applied to adjust the amount of compensation.

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ABSTRACT

A METHOD & APPARATUS FOR CORRECTING COLOUR DIFFERENCE SIGNALS

A method and apparatus for correcting colour difference signals in a colour television video processor utilising a luminance stretch function. The level of input luminance signal is detected and a constant amount of compensation to the colour difference signal is applied when the level of the input luminance signal is below a selected input luminance threshold. Above the input luminance signal threshold, an amount of compensation is applied to the difference signals that decreases within increasing input luminance signal level.

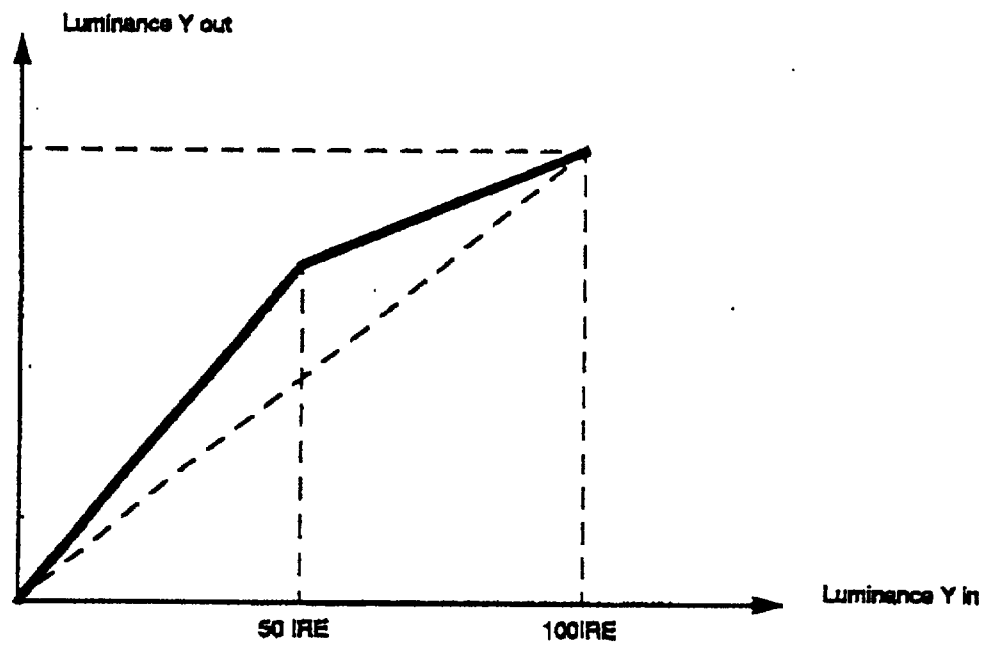


Fig 1

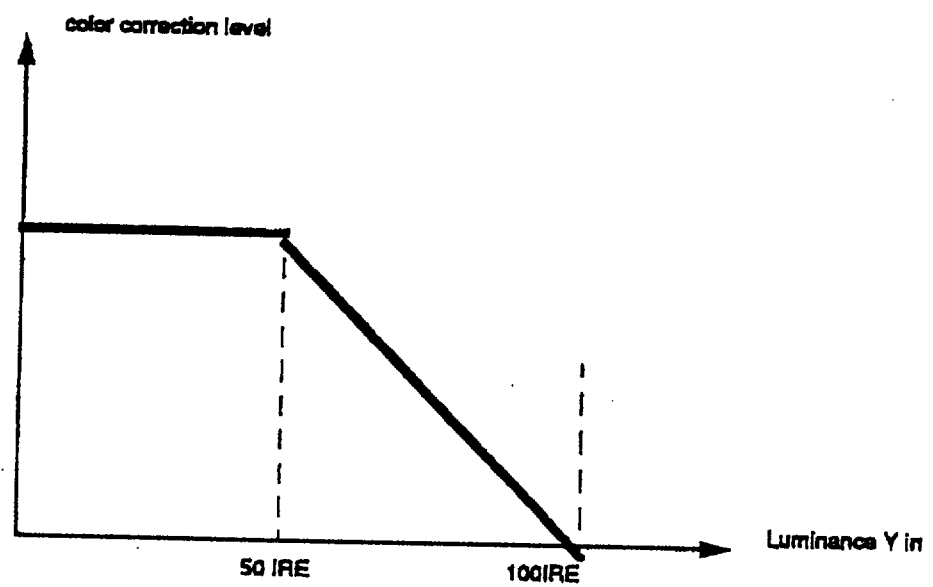
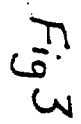
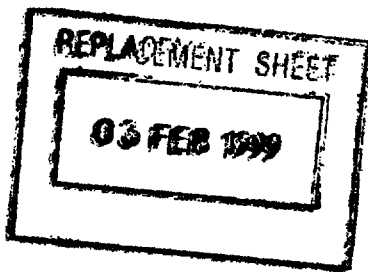


Fig 2





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A METHOD & APPARATUS FOR CORRECTING COLOUR DIFFERENCE SIGNALS

Field of the Invention

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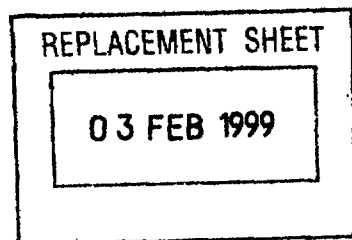
This invention relates to colour television video processors utilising a luminance stretch function. More particularly, the invention relates to the colour matching function used in connection with the luminance or white stretch function in a television video processor.

10 Background Art

With the use of a luminance or white stretch function in a television video processor as part of a picture enhancement feature, there arises a need to provide some automatic adjustment in the amplitude of the colour difference signals to compensate for the effect of
15 the stretch of the luminance signal. If compensation is not provided then the dematrixed colour signals will be incorrect and the picture will appear de-saturated. The provision of this compensation is called colour matching. The general principle of colour matching is that any percentage change in the amplitude of the luminance signal due to the white stretch effect, must be balanced by the same percentage changes in the colour difference signal so that the
20 ratio of the colour signals (R G B signals) can be maintained after matrixing. Existing circuits provide a constant compensation for the colour difference signals based on average picture level, however, the performance is only satisfactory for a luminance level below 50IRE and tends to overcompensate for parts of the picture above this level of 50IRE.

25 Disclosure of the Invention

It is an object of this invention to provide an improved method and apparatus for compensating colour difference signals, which will overcome the limitations of the prior art. Throughout the following description and claims use of the words "compensation" and
30 "compensating" in relation to a colour difference signal is to be taken as meaning application



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of an additional gain factor to the relevant signal.

Accordingly, in one aspect this invention provides a method of correcting colour difference signals in a colour television video processor utilising a luminance stretch function;
5 said method comprising the steps of detecting the level of the input luminance signal compensating the colour difference signals by a fixed amount when the level of the input luminance signal is below a selected input luminance threshold and compensating the colour difference signals by a varying amount that decreases with increasing input luminance signal level when the level of the input luminance signal is above said selected threshold.

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In a second aspect, this invention also provides an apparatus for correcting colour difference signals in a colour television video processor utilising a luminance stretch function, said apparatus comprising means to detect the level of the input luminance signal; and means to apply a substantially fixed compensation to the colour difference signals when the level of
15 the input luminance signal is below a selected input luminance threshold and to apply a varying compensation to the colour difference signals that decreases with increasing input luminance signal level when the level of the input luminance signal is above said selected threshold.

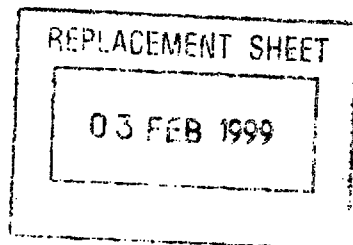
20 Preferably, the amount of compensation decreases linearly with increasing input luminance signal level. It is also preferred that the amount of compensation is reduced to zero at AND above a selected maximum luminance signal level. The maximum luminance level is preferably about 100IRE.

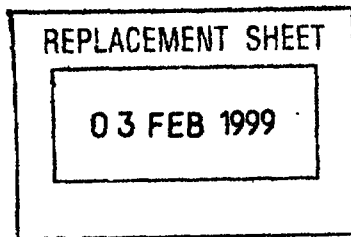
25 In the preferred embodiment, the input luminance threshold corresponds to the maximum luminance stretch of said video processor. Typically, this corresponds to a

threshold luminance signal level of about 50IRE.

In one form of the invention, the input luminance signal is compared to a reference signal corresponding to the input luminance threshold to determine whether the input
5 luminance signal level exceeds the input luminance threshold.

The invention is preferably applied to an existing video processor providing a constant





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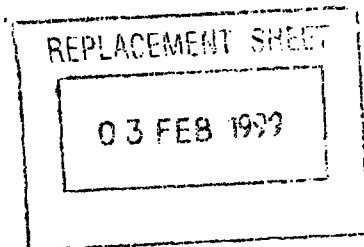
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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of correcting colour difference signals in a colour television video processor utilising a luminance stretch function; said method comprising the steps of detecting
5 the level of the input luminance signal, compensating the colour difference signals by a fixed amount when the level of the input luminance signal is below a selected input luminance threshold and compensating the colour difference signals by a varying amount that decreases with increasing input luminance signal level when the level of the input luminance signal is above said selected threshold.
- 10 2. A method as claimed in claim 1, wherein said amount of compensation decreases linearly with increasing input luminance signal level.
3. A method as claimed in claim 1 or claim 2, wherein said amount of compensation is
15 reduced to zero at and above a selected maximum luminance signal level.
4. A method as claimed in claim 3, wherein said maximum luminance level is about 100IRE.
- 20 5. A method as claimed in any one of claims 1 to 4, wherein said input luminance threshold corresponds to the maximum luminance stretch of said video processor.
6. A method as claimed in any one of claims 1 to 5, wherein said threshold luminance
25 signal level is about 50IRE.
7. A method as claimed in any one of claims 1 to 6, wherein said input luminance signal is compared to a reference signal corresponding to said input luminance threshold to determine whether the input luminance signal level exceeds the input luminance threshold.

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8. A method as claimed in any one of claims 1 to 7, wherein said video processor provides a constant compensation for said colour difference signals and a correction is applied to adjust the amount of compensation.
- 5 9. An apparatus for correcting colour difference signals in a colour television video processor utilising a luminance stretch function, said apparatus comprising means to detect the level of the input luminance signal; and means to apply a substantially fixed compensation to the colour difference signals when the level of the input luminance signal is below a selected input luminance threshold and to apply a varying
- 10 compensation to the colour difference signals that decreases with increasing input luminance signal level when the level of the input luminance signal is above said selected threshold.
10. An apparatus as claimed in claim 9, wherein said amount of compensation decreases
- 15 linearly with increasing input luminance signal level.
11. An apparatus as claimed in claim 9 or claim 10, wherein said amount of compensation is reduced to zero at and above a selected maximum luminance signal level.
- 20 12. An apparatus as claimed in claim 11, wherein said maximum luminance level is about 100IRE.
13. An apparatus as claimed in any one of claims 9 to 12, wherein said input luminance threshold corresponds to the maximum luminance stretch of said video processor.
- 25 14. An apparatus as claimed in any one of claims 9 to 13, wherein said threshold luminance signal level is about 50IRE.
15. An apparatus as claimed in any one of claims 9 to 14, where said input luminance
- 30 signal is compared to a reference signal corresponding to said input luminance



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threshold to determine whether the input luminance signal level exceeds the input luminance threshold.

16. An apparatus as claimed in any one of claims 9 to 15, wherein said video processor
5 provides a constant compensation for said colour difference signals and a correction is applied to adjust the amount of compensation.

