The invention is based on a circuit according to the preamble of claim 1. This circuit known from US A 4 015 076 serves to eliminate pulse peaks in the video signal, known as spikes, which can disrupt the line synchronisation on playback, at the beginning of the line blanking time in a video recorder.

In video recorders according to the systems VHS, Betamax or Video 2000 the luminance signal is recorded as is known by frequency modulation of a picture carrier, while the colour carrier is recorded at a lowered frequency of approx. 600 kHz to 1.2 MHz below the frequency spectrum of the modulated picture carrier. In these devices the band width of the recorded luminance signal which is available for reproducing the picture is only approximately 2.5 - 3.5 MHz, i.e. considerably less than the video band width of 5 MHz of a standard TV signal. This reduction of the band width automatically causes a reduction in the definition on playback, since the high frequency components of the luminance signal in the 2 - 5 MHz range are not present.

It is known in these cases to increase the definition with so-called crispening circuits. In these circuits in general, a correction signal obtained by double differentiation and in some cases limited in amplitude, is added to the luminance signal. These circuits produce a steepening of the video signal at signal edges, but do not cause any true increase in the video frequency range beyond about 2.5 - 3 MHz. The pictures reproduced with these circuits can therefore be three dimensional like and unnatural.

The object underlying the invention is to so refine the known circuit described at the outset that an increase in definition is achieved with it on playback of the video signal derived from the tape.

This object is achieved by the invention described in claim 1. Advantageous refinements of the invention are described in the dependent claims.

In the circuit in accordance with the invention the time curve of the video signal is not affected as with the conventional derivative equalisers in the sense of an increase in steepness of edges. Rather the amplitude of signal components, in the part of the video band width in which the amplitude of the signal components falls effectively to zero, is directly increased. A clearly better picture reproduction can be achieved by the invention using simple means, without the actual band width of the luminance signal which is scanned by the tape being increased.

The invention is described in the following by way of the drawing. In which:

Fig. 1 shows a block circuit diagram of the circuit in accordance with the invention and

Fig. 2 shows diagrams of the signals arising in Fig. 1

In the drawings:

$Y^o$ = demodulated luminance signal after the low pass filter of the demodulator for the frequency modulated picture carrier after the so-called de-emphasis

Y = former, uncorrected narrow band luminance signal

Y′ = the luminance signal of the part of the video (band) width, i.e. approximately 2 - 3.5 MHz

Y′′ = correction signal after noise removal and amplitude limitation

Y′′′= corrected, broad band luminance signal.

In Fig. 1 the luminance signal $Y^o$ is at the terminal 1, and is shown in Fig. 2a for one line duration. The luminance signal between two line synchronous pulses Z consists of a so-called multi-burst signal, i.e. a sine-wave oscillation, the frequency of which rises during the outward line sweep time from approximately 100 kHz to 5 MHz. When recording such a signal with a video recorder according to Fig. 2a a sharp fall in amplitude arises approximately in the region of 2 - 3.5 MHz, at which the signal between 3.5 MHz and 5 MHz effectively has zero amplitude. The signal $Y^o$ is supplied to the band pass filter 3 via the amplifier 2, said filter having a pass band of about 2 - 3.5 MHz. As a result, the luminance signal Y′ is obtained which therefore only represents the frequency component of the luminance signal $Y^o$ between 2 and 3.5 MHz. The amplifiers 2,4 cause an amplification of about 10-30 dB. The noise component is amplified too by this amplification. Therefore the signal Y′ reaches via a coupling capacitor the amplitude threshold value circuit 5 having the two antiparallel connected diodes D1 and D2, said circuit 5 only allowing through the signal above a certain positive and negative level. As a result, noise components are cut out. The amplification is so adjusted that the amplified noise does not exceed the threshold of the diodes D1 and D2, i.e. about +0.7 V and -0.7 V, and is therefore suppressed. Since the high frequency components of the luminance signal have strong amplitude fluctuations, the amplitude limiter 6 is provided with the diodes D3 and D4, which limits the amplitude of the obtained correction signal Y′′. The amplitude limiter 6 therefore limits

the correction signal Y'' according to Fig. 2b in the range of 2 - 3.5 MHz. This correction signal reaches the adding stage 9 via the stage 7, which serves to balance the propagation time, and the amplifier 8. The original corrected luminance signal Y (therefore not = $Y^O$), which is not frequency corrected, but is possibly treated in a noise cancelling circuit, is supplied from the terminal 10 via the amplifier 11 also to the adding stage 9. In the adding stage 9 the luminance signal Y according to Fig. 2c, the amplitude of which at 3 MHz has already fallen to zero, is added to the correction signal Y'' by the amplifier 8. As a result, the corrected luminance signal Y''' according to Fig. 2d appears at the terminal 12. It is clear that this signal has as far as possible a constant amplitude in the range of 2 - 3.5 MHz, compared with the amplitude in the range of 0 - 2 MHz. The marked fall in amplitude of the signal $Y^O$ or Y of 2 - 3.5 MHz, which restricts the definition during playback, is thus eliminated. The corrected signal Y''' according to Fig. 2d is therefore a full value luminance signal having a band width of about 2.5 MHz without a significant fall in amplitude towards high video frequencies.

The circuit according to Fig. 1 therefore is located in a video recorder in the playback path of the luminance signal Y. The corrected luminance signal Y''' is added later to the colour carrier which is scanned from tape and is raised in frequency again to the original frequency position of 4.43 MHz.

The two signals designated $Y^O$ and Y in Fig. 1 are essentially equal. Y is the luminance signal directly after the demodulator low pass filter. In general a de-emphasis element and a noise cancelling circuit follow this, the latter reducing the interference in the luminance signal. The luminance signal obtained therefrom is designated $Y^O$ in Fig. 1.

The capacitor in Fig. 1 between the stages 4,5 serves as a coupling capacitor and prevents the diodes D1,D2 from obtaining any bias. The steep rise in the signal Y'' according to Fig. 2b is determined by the transition region of the band pass filter 3.

* C L M S *

## Patent Claims

1. A circuit for producing a corrected luminance signal ($Y'''$) in a video recorder, in which the original luminance signal ($Y^O$), corrected in a de-emphasis means is applied via a frequency filter (3), an amplifier (4) and an amplitude limiter (6) to an adding stage (9), characterised in that the frequency filter is formed as a band pass filter (3) having a pass band of 2 - 3.5 MHz, which corresponds to the part of the frequency range in which the amplitude of the luminance signal ($Y^O$) falls to zero and that the uncorrected luminance signal (Y) is supplied moreover to the adding stage (9).

2. A circuit according to claim 1, characterised in that an amplitude threshold value circuit (5) is located in front of the amplitude limiter (6), said circuit (5) only allowing through the signal above a certain positive and negative voltage level.

3. A circuit according to claim 2, characterised in that the threshold value circuit (5) includes two diodes (D1,D2), or transistors connected as diodes, which lie in the signal path and are connected in antiparallel.

4. A circuit according to claim 1, characterised in that the amplification of the amplifier (4) is 10 - 30 dB.