

Video recorder

The invention is based on a video recorder in accordance with the first part of claim 1.

A video recorder of this type contains a comb filter having a two line delay-line in the reproduction path of the colour carrier. This comb filter effects a compensation of the cross-talk from the adjacent tracks caused by a periodic phase switching of the colour carrier during every other field which is undertaken during the recording. The delay by two lines is necessary because, due to the line frequency PAL phase switching, only colour carriers from the line n and the line $n+2$ may be added on each occasion. Consequently, during the reproduction, the colour carrier is delayed by two lines due to the comb filter. This means that, during the reproduction, the colour signal and the luminance signal do not coincide in time on the screen. Thereby, colour distortions occur in the reproduced picture especially at transitions from black/white to colour or from colour to black/white in the vertical direction. In a test picture having a horizontal black bar and linked, vertical colour bars thereunder, the luminance signal is already present at the beginning of the colour bars for example, while the colour signal is missing due to the two line delay. This means that the beginning of the colour bars is not reproduced correctly as regards colour. Grey horizontal stripes appear over the width of approximately two lines at this point instead of the saturated colours.

The object of the invention is to eliminate such kinds of colour error during the reproduction at low cost. This object is achieved by the invention defined in claim 1. Advantageous developments of the invention are specified in the appendant claims.

Thus, in the invention, the line delay-line which serves for suppressing interference and drop-out compensation during the reproduction mode is switched into the path of the luminance signal during the recording mode.

The invention is based upon the following appreciations and considerations. The line delay-line in the reproduction path for suppressing interference and drop-out compensation is not a glass fibre operating at a particular frequency but rather a CCD line in which video signals having a frequency range of approximately 0 - 3 MHz can be delayed. This CCD line thus offers the opportunity of delaying the luminance signal by one line during the recording. The invention thereby consists in two advantageous steps. The first step consists in the following: in order to eliminate the said picture fault, the luminance signal

ought to be likewise delayed during the reproduction. This delay, which, for its part, is necessary during the reproduction, is now transferred to the recording side. This is possible because it is of no consequence for the reproduction as to the location at which the luminance signal has been delayed with respect to the colour signals. This first step now makes the second step possible. The second step consists in now using the delay-line, which is provided for the reproduction but is not required during the recording, in an advantageous manner during the recording. Thus the delay-line, which previously remained unused during the recording, is now allotted an additional function during the recording operation. The delay-line then fulfils altogether three functions, namely, the suppressing of interference and drop-out compensation during the reproduction and the delaying of the luminance signal during the recording. Thus, by the transfer of the delaying of the luminance signal from the reproduction to the recording and the utilisation of the delay-line not required for the recording for a new purpose, the posed object is achieved with practically no extra outlay. It is merely necessary to switch over the delay-line from the reproduction path into the recording path during the recording operation.

A further advantage consists in that tapes recorded with a recorder in accordance with the invention also effect the elimination of the picture fault in recorders not having the measures in accordance with the invention since the delaying of the luminance signal is contained within the tape. The correcting features in accordance with the invention are thus, as it were, frozen into the tape.

The invention will be explained hereinafter by means of the drawing.

The Figure shows in simplified form, the recording path Rec (Record) and the reproduction path PB (Playback) for a video recorder. During the reproduction, the head 2 scanning the magnetic tape 1 delivers the colour carrier B which is frequency modulated with the luminance signal and the colour carrier C which is lowered in frequency. The colour carrier B is analysed by the high pass filter 3 having a limit frequency of approximately 1 MHz and supplied to the FM demodulator 4. The latter delivers the luminance signal Y which then reaches the circuit 5. For its part, the circuit 5 effects an increase of the signal to noise ratio (noise canceller) by addition of the luminance signals from two lines which are successive in time. The circuit 5 also effects a drop-out compensation in which, for a drop-out in the luminance signal, the signal from the preceding line in time is inserted. A delay by the duration of one line is necessary for both tasks. To this end, the CCD

delay-line 6, which effects a delay by the duration of one line, is connected to the circuit 5. The delay-line 6 is constructed as a clocked memory (CCD) and is controlled by the clock oscillator 21 having a clock pulse rate of 13.3 MHz. The luminance signal Y' , processed in this manner as regards signal to noise ratio and drop-out, reaches the adding stage 7. The colour carrier C is analysed by the low pass filter 8 having a limiting frequency of approximately 1 MHz and arrives in the chroma stage 9. Amongst other things, the frequency of the colour carrier is shifted up again to the normal frequency in the stage 9. The colour carrier C' shifted up in frequency in this way is added to the luminance signal Y' in the adding stage 7. Consequently, the complete FBAS signal is available for the reproduction of the picture at the terminal 10.

During the recording Rec, the FBAS signal at the terminal 11 is split into the luminance signal Y and the colour signal C by the splitting stage 12 which operates in a frequency selective manner. The splitting stage 12 may consist of the usual LC filters or be constructed as a comb filter. The luminance signal Y reaches the magnetic head 19 and is recorded by the latter on the magnetic tape 1, via the amplifier 13, which also effects a fading regulation (AGC), over the dashed lead 14, the pre-emphasis stage 16, the FM demodulator 17 and the high pass filter 18 having a limiting frequency of 1 MHz. The low pass filter 15 having a blocking point for the clock frequency of 13.3 MHz serves for the suppression of the clock frequency in the signal at the output of the CCD delay-line 6. To simplify matters, the recording of the colour signal C in the form of a carrier on the same track or a separate track of the magnetic tape 1 is not explained in detail. The circuit described thusfar is known.

In the reproduction mode PB, the CCD delay-line 6 works in the manner described. Thereby, it is connected via the switches $S1$, $S2$ to the inputs of the circuit 5. In the recording mode Rec, the delay-line 6, which seems to have remained unused, is switched between the output of the amplifier 13 and the input of the pre-emphasis stage 16 by the switches $S1$, $S2$. The luminance signal Y is thereby delayed by the duration of one line during the recording.

It is equally possible to delay the luminance signal Y by two lines during the recording if the reproduction path has a delay for two lines.



Claims

1. Video recorder having a reproduction path (PB) for the luminance signal (Y) including a line delay-line (6) for suppressing interference and/or drop-out compensation and a reproduction path for the colour signal including a comb filter having a two line delay-line for the compensation of colour contamination, characterised in that, the line delay-line (6) is switched into the path of the luminance signal (Y) in the recording mode (Rec).
2. Recorder in accordance with Claim 1, characterised in that, the line delay-line (6) is a CCD line.
3. Recorder in accordance with Claim 1, characterised in that, the line delay-line (6) is located before the pre-emphasis circuit (16) in the recording mode (Rec).
4. Method in accordance with Claim 1, characterised in that, the line delay-line (6) has a delay time of several lines.