

Specification

In video recorders on the VHS, Betamax and V 2000 systems, the luminance signal Y is recorded by frequency modulation of a picture carrier from field to field on oblique tracks of a magnetic tape. In television broadcasting, it is known to transmit a videotext signal in digital form, in addition to the actual television picture, during two lines of the field blanking interval. In the television receiver, this signal is fed to a character generator which generates broad-band RGG signals from the videotext signal transmitted only briefly. These signals are supplied to the picture-tube electrodes in addition to the FBAS signal. In this manner, it is possible to represent characters on the viewing screen instead of the actual television picture or in addition to this. The videotext signal may also be related to the actual picture signal if, during a football game for example, the commentary for the hard of hearing is transmitted additionally as a videotext signal. During the recording of such a signal with a video recorder, it is therefore desired to record, apart from the actual television picture, also the videotext signal or even a videotext signal alone.

The recording of the videotext signal with ordinary commercial video recorders is not possible, however, without further ado. The digital videotext signal needs a bandwidth of about 3.5-4 MHz while the recording width of ordinary commercial video recorders is only about 3.0 MHz. If the videotext signal is recorded with a bandwidth of only 3.0 MHz, it can no longer be decoded satisfactorily in the videotext decoder for the production of the character signals during the reproduction.

It is the object of the invention to render possible an additional recording of the videotext signal with ordinary commercial video recorders without appreciable alterations being necessary in the video recorder.

The problem is solved by the invention described in Claim 1. Advantageous further developments of the invention are described in the sub-claims.

The construction and the processing of a videotext signal in a television receiver are described in the journal "Funkschau" 1977, pages 820-824 and 882-887. There stores are used for the conversion of the digital videotext signal received into an analogue video signal representing a character. The RAM stores used there serve to store the videotext signals which are only transmitted briefly each time, and an ROM store serves as a so-called character store which delivers the analogue video signals representing the characters, to control the picture tube. The problem of recording a digital videotext signal with a video recorder working in an analogue manner with a limited recording width is not dealt with there.

The invention is based on recognition of the following. A recording of the videotext signal by frequency modulation of the picture carrier, that is to say that of the luminance signal itself, is not possible because of the limited recording bandwidth. The picture carrier recorded on the video tape and frequency-modulated with the luminance signal Y nevertheless occupies a bandwidth of about 6 MHz on the video tape. This bandwidth is sufficient to record the digital videotext signal directly, that is to say without modulation on a carrier. This is possible, in particular, because the videotext signal, like the picture carrier frequency-modulated with the luminance signal, is an FM signal of constant amplitude and can therefore be recorded without difficulty like the modulated picture carrier itself.

The solution requires practically no additional expenditure in the video recorder. It is merely necessary, during the videotext lines, to supply not the modulated picture carrier but the digital videotext signal directly to the video heads and possibly to switch off the FM

modulator for the luminance signal in order to avoid disturbances. A corresponding procedure is followed during the reproduction. Then the signal scanned from the video tape is supplied, during the videotext lines, not to the FM demodulator but to the videotext decoder.

As a result of fluctuations in the relative speed between the video heads and the magnetic tape, video recorders generally cause timebase errors in the scanned signal. Such timebase errors in the digital videotext signal and the associated line synchronizing pulses may disturb the decoding of the videotext signal. Therefore, during the reproduction, a known circuit for the correction of timebase errors is preferably provided in the path of the videotext signal before the videotext decoder. Such circuits generally contain a delay line or an electronically timed store, the delay of which is controlled depending on the timebase errors and eliminates the timebase errors.

One example of embodiment of the invention is explained below with reference to the drawing. In this,

Figure 1 shows a block circuit diagram for the recording and

Figure 2 shows curves to explain the mode of operation of the circuit of Figure 1.

In Figure 1, a television broadcast signal, which also contains a videotext signal, is supplied from the aerial 1 to the tuner 2 which delivers the FBAS signal including the videotext signal at its output. The modulated chrominance carrier F is evaluated by the band-pass filter 3 with a pass frequency of $4.43 \text{ MHz} \pm 0.5 \text{ MHz}$ and converted into a frequency of about 0.63 MHz in the frequency converter 4 with a divisor factor n . The modified chrominance carrier F_m thus reduced in frequency reaches the adding stage 5. The luminance signal Y is supplied to the FM modulator 7 via the low-pass filter 6 with a critical frequency of 3 MHz . This modulator produces

the picture carrier B which is frequency-modulated with the luminance signal Y and is likewise supplied to the adding stage 5. The output signal of the adding stage 5, containing the modulated picture carrier B and the chrominance carrier Fm, reaches the video heads 9 via the switch 8 and is recorded on oblique tracks of the magnetic tape 10. With this circuit, the videotext signal received during the videotext lines would also be recorded. The recording bandwidth would be too small, however, so that the videotext signal would no longer render satisfactory decoding possible in the videotext decoder during the reproduction.

The recording of the videotext signal is explained with reference to Figure 2. The videotext signal VT is transmitted each time during the lines 17 and 18 in the field 1, that is to say in all odd-numbered fields, and during the lines 330 and 331 during the field 2, that is to say during all the even-numbered fields. A pulse 12 marking the beginning of each complete frame is obtained from the luminance signal Y by the synchronizing signal separator circuit 11 and is supplied to the counter 13. The counter 13 counts up to the lines 17, 18, 330, 331 each time and produces pulses 15 through the pulse shaper 14. During the odd-numbered fields, the pulses 15 last each time, during the lines 17, 18, from about the end of the back porch to the beginning of the front porch, in accordance with Figure 2b. They thus lie during the line trace interval and do not cover the line synchronizing pulses Z and the colour bursts 16 in time, so that the recording of these signals with the picture carrier B is not interrupted. During the even-numbered fields, the pulses 15 lie correspondingly during the lines 330 and 331 as shown in Figure 2d.

The pulses 15 actuate the switch 8 each time and switch the input of the video heads 9 over to the output of the

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videotext circuit 17. In this circuit, the videotext signals are prepared and, in particular, amplified to the amplitude necessary for the recording. Each time, for the duration of the pulses 15, that is to say during the trace interval of the lines 17, 18, 330, 331, therefore, not the modulated picture carrier B but the videotext signal VT is recorded directly by the video heads 9 on the magnetic tape 10. In addition, the pulses 15 switch off the FM modulator 7 via the line 18, for example by switching off the operating voltage, in order to avoid disturbances by its output signal. The pulses 15 may likewise switch off the adding stage 5 so that this does not deliver any output signal to the change-over switch 8.

During the reproduction, the circuit works correspondingly, in that the scanned signal is supplied, during the said lines, as a result of correspondingly produced pulses 15, not to an FM demodulator but to a videotext decoder. In this case, a circuit for the correction of timebase errors preferably also lies in the path of the videotext signal. Such circuits are described, for example, in DE-OS 21 22 592 and DE-OS 21 29 760.

Patent Claims

1. A video recorder with recording of a videotext signal (VT) wherein the luminance signal (Y) is recorded by frequency modulation of a picture carrier (B), characterised in that the received digital videotext signal (VT) which is processed in a path (17) separated from the path (6, 7, 5) of the luminance signal (Y), is recorded without modulation on a carrier, instead of the picture carrier (B).

2. A recorder according to Claim 1, characterised in that, during the videotext lines (Nos. 17, 18, 330, 331), the recording is effected each time only during the line trace interval.

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3. A recorder according to Claim 1, characterised in that, during the recording of the videotext signal (VT), the FM modulator (7) for the luminance signal (Y) is switched off.

4. A recorder according to Claim 1, characterised in that, during the reproduction, a circuit for the correction of timebase errors lies in the path of the videotext signal (VT).

Figure 1

Tuner

Synchronizing
signal
separator
circuit

Counter

Figure 2

Field 1

Field 2

