

Specification

In video recorders, the composite video signal is recorded on oblique tracks of the magnetic tape by frequency modulation of a picture carrier. In the course of this, one field falls to an oblique track each time. The value of the synchronizing pulses corresponds to 3.6 MHz for example and the white level to 4.8 MHz of the frequency-modulated picture carrier. The recording is effected in such a manner that the line synchronizing pulses of adjacent oblique tracks lie side by side. If, therefore, during the scanning, the video head also scans the signal of the adjacent track as a result of crosstalk, this signal corresponds to the same picture element of the preceding field while the synchronizing pulses from the scanned track and those scanned from the neighbouring track as a result of crosstalk coincide in time. The crosstalk is reduced by this means.

The crosstalk between adjacent tracks is also reduced by the fact that the head gaps of the two video heads which record the video signal on the oblique tracks alternately from one field to the next, are offset by opposite angles of about $+7^\circ$ to the transverse direction of the tracks. As a result, an additional crosstalk attenuation is achieved by utilizing the so-called azimuth losses.

There are video recorders, however, which do not have the said correlation of the signals of adjacent oblique tracks. There, for example, the line synchronizing pulses of one track lie in the middle of the line of the signal of the adjacent track. This is the case, for example, in video recorders in long-play operation, so-called LP operation. Also in recorders on the so-called 8mm video system, the line synchronizing pulses of adjacent oblique tracks are offset in relation to one another by about $1/2$ the line duration. With such a recording, therefore, the said correlation of the signals between tracks situated

side by side is no longer there. As a result of crosstalk during the scanning, the synchronizing pulses of the adjacent track may then become visible for example in the form of a dark vertical bar. In a video recorder of the kind mentioned in the preamble to Patent Claim 1, known from US-PS 41 65 518, the carrier frequency is shifted by an odd multiple of half the line frequency, from track to track, in order to reduce such interference. It is the object of the invention to reduce interference in the picture by crosstalk in a recording in which the line synchronizing pulses of adjacent tracks do not lie side by side.

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

Thus with the solution according to the invention, the correlation between the individual amplitude values of the composite video signal and the frequency values of the picture carrier frequency-modulated thereby is deliberately reversed in polarity from track to track, that is to say from field to field, so that, for example, the synchronizing pulse in one track corresponds to the frequency value 3.6 MHz and in the next track to the frequency value 4.8 MHz of the modulated picture carrier. For this purpose, for example, the modulation characteristic of the FM modulator may be switched over from track to track. The composite video signal is preferably fed to the FM modulator through an inverter during every other track, which inverter reverses the polarity of the composite video signal. If a video head is scanning a track n for example, and the synchronizing pulses of the scanned composite video signal lie in the infrablack level, the synchronizing pulses of the signal scanned from the adjacent track by crosstalk extend as far as the white level. The vertical bar resulting from this consequently becomes considerably less disturbingly visible than the dark bar appearing without the invention. As

a result of the said attenuation due to the azimuth angle, which increases towards higher frequencies of the picture carrier, the synchronizing pulses extending as far as the white level, that is to say lying at high frequencies of the picture carrier, are scarcely visible any more. The interferences at vertical picture edges are likewise greatly reduced because the difference frequencies between adjacent picture sections are higher and also are no longer correlated.

The invention is explained in more detail with reference to the drawing. In this,

Figure 1 shows a block circuit diagram for the recording,

Figure 2 shows a diagram to explain the modulation according to the invention and

Figure 3 shows a block circuit diagram for the reproduction.

In Figure 1, the composite video signal is obtained from the composite colour signal applied to the terminal 1 by the low-pass filter 2 with a critical frequency of about 3.0 MHz. The composite video signal passes on the one hand via the clamping stage 3 and on the other hand via the inverter 4 and the clamping stage 5 to the two inputs of the change-over switch 6 which is actuated at the beginning of each field by the head-change pulses 7 derived from the head wheel with a frequency of 25 Hz. Thus the composite video signal arrives with a polarity switched over from field to field, via the non-linear preemphasis stage 8 and the amplifier 9, at the FM modulator 10 which produces the picture carrier frequency-modulated with the composite video signal. This picture carrier arrives, via the amplifier 11, at the two video heads 12a, b, which record the modulated picture carrier from field to field on oblique tracks of the magnetic tape 13.

Figure 2 shows the frequency modulation switched over from field to field. In the range from about 0 to 1.5 MHz, the modified chrominance carrier, reduced in frequency, is recorded frequency-modulated. The circuit means for this

are not illustrated in Figure 1. The modulated picture carrier is recorded above the chrominance carrier F_m . During the track 1, the modulation in the FM modulator 10 by composite video signal is effected in such a manner that the synchronizing pulse corresponds to the frequency value of 3.6 MHz and the white level to the frequency value 4.8 MHz of the modulated picture carrier. This is the modulation usual in itself and used constantly in each track.

During every other track, the composite video signal BAS is reversed in polarity by the switch 6 into the signal BAS' so that now the synchronizing pulses lie at the frequency 4.8 MHz of the picture carrier.

In Figure 3, the signal is again scanned from the magnetic tape 13 by the video heads 12a,b and fed to the FM demodulator 16 via the amplifier 14, the high-pass filter 23 with a critical frequency of 1.5 MHz and the limiter 15. This demodulator delivers the signals BAS and BAS' alternately from track to track and hence from field to field. This signal is fed to the change-over switch 19 on the one hand via the inverter 17 and on the other hand via the amplifier 18. The high-pass filter 23 serves to suppress the quadrature-modulated chrominance carrier F which is recorded below the frequency spectrum of the picture carrier at a frequency of about 630 kHz. The change-over switch 19 is changed over at the beginning of each field by the control voltage 7, as is the switch 6 in Figure 1. In the switch position illustrated, therefore, the signal BAS' is again converted into the signal BAS. As a result, the signal BAS continuously appears again with the same polarity, in the desired manner, at the output of the change-over switch 19. This signal passes via the non-linear de-emphasis stage 20 and the amplifier 21 to the output terminal 22 and is available there for the picture reproduction or for combination with the chrominance carrier F .

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The circuit with the components 4, 6 in Figure 1 and the circuit with the components 17, 18, 19 in Figure 3 can be realized by the same circuit which is then effective both during the recording and during the reproduction. This is possible because, in both cases, the circuit causes a reversal of the polarity of the composite video signal at the beginning of each field.

PATENT CLAIMS

1. A video recorder with reduction of the crossview between adjacent tracks, wherein the composite video signal of successive fields is recorded, by frequency modulation of an image carrier, on oblique tracks of the magnetic tape (13) and the correlation between the amplitude scale of the composite video signal and the frequency scale of the image carrier is altered from one track to the next, characterised in that the correlation between the amplitude scale of the composite video signal and the frequency scale of the image carrier is reversed in polarity from one track to the next.

2. A recorder according to Claim 1, characterised in that, during the recording, the composite video signal is fed to the frequency modulator (10) through an inverter (4) during every other track.

3. A recorder according to Claim 1, characterised in that, during the reproduction, the composite video signal produced by the frequency modulator (16) is conveyed through an inverter (17) during every other track.

4. A recorder according to Claim 3, characterised in that the switching on of the inverter (17) is effected by the head-change pulse (7) which at the beginning of each field, switches over the path of the composite video signal between two video heads (12a,b), scanning the magnetic tape (13) alternately.



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5. A recorder according to Claims 2 and 3, characterised in that the inverting during the recording and the opposite inverting during the reproduction are effected by the same circuit.

Figure 1

Composite colour signal

Figure 2

Track 1

Track 2

