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(54) PICTURE SIGNAL STORE

(71) We, TED BILDPLATTEN AKTIENGESELLSCHAFT AEG-TELEFUNKEN-TELDEC, a Swiss Body Corporate, of Postfach 126, Hanibumh 8, Zug, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

It is known to record an electrical picture signal, e.g. a television signal, representing an optical picture, on a record carrier in such a way that different sections of a continuous track are side by side. This is the case, for example, with a disc record carrier in which the track has a spiral configuration. The recording is made by modulating a physical value of the carrier, e.g. magnetically, optically or mechanically in the form of raised and recessed portions. It is known to make the recording in such a way that track sections associated with spatially identical parts of a picture are side by side. For example, the track sections for lines with the same spatial ordinal number for successive pictures or frames are spatially in side by side arrangement. On a round disc-shaped carrier, for example, these lines are radially side by side and the line sync pulses are always on one radius of the disc. This recording has the advantage that no noticeable errors occur if the scanner covers two tracks or changes between two tracks, because the black-white information of a certain line does not usually change substantially from picture to picture, or from frame to frame.

If a coded colour picture signal is recorded by this method, it has become apparent that faults occur in the colour of the reproduced picture. These faults are independent of the construction of the colour picture

signal, and appear in an NTSC signal, in a Secam (Registered Trade Mark) signal, in a PAL signal, and also in a three-line sequential signal. The recording method described above appears, therefore, unsuitable for recording a colour picture signal.

The invention seeks to enable the development of the method described above in such a way that a colour picture signal may be recorded without these faults or with these faults reduced.

The invention is based on a picture signal record carrier or store with a picture signal recorded along a track in such a manner that track sections associated with spatially corresponding points of successive pictures are located side by side.

According to the invention, there is provided a video-disc on which colour picture signals recorded on radially displaced adjacent track sections of a spiral track have chrominance modulated signals such that if the picture content is the same the chrominance modulated signals in the adjacent track sections are identical.

The invention is based on the following fact. All known colour television signals have the peculiarity that they differ in some parameter from line to line. In the NTSC colour carrier, the phase of the colour carrier is switched relative to the line period through 180° from line to line (half line offset). With a Secam (Registered Trade Mark) colour carrier there occurs also a phase switching between lines according to a certain system. With the colour carrier of the PAL system, there is a phase change based on the quarter line offset and on the 25 Hz offset, and in addition from line to line there is a change of the PAL state, i.e. the phase of one of the modulation axes is changed. In a three line sequential signal, the colour signals

represent from line to line different primary colours. Since the number of lines of a picture is not divisible by two and with the three line sequential system by three, when corresponding parts of consecutive pictures are assigned to adjacent track sections different colour signals are recorded on adjacent track sections. If now the scanner scans two radially adjacent track sections or changes between two track sections, colour falsification will occur because different colour signals are added or alternately scanned. It has been discovered that this is the cause for the colour errors described above.

The invention eliminates this disadvantage by recording colour signals of the same kind on adjacent track sections, e.g. colour signals of the same phase relative to the line period or of the same primary colour, or of the same PAL state. If the scanner scans two track sections simultaneously, or changes between two track sections, equivalent colour picture signals are transmitted, and no noticeable faults occur in the reproduced picture.

In one arrangement in accordance with the invention where a recording is made in the form of a frequency modulated carrier, the carrier is adjusted during a periodically recurring interval, corresponding to a constant signal value, to a constant frequency, and to a definite phase relative to the line period. This FM carrier may be a colour carrier or a carrier modulated with the whole signal, e.g. the luminance signal Y and the colour carrier F, or only with F. This makes it possible to achieve between adjacent track sections with the same signal a perfect agreement in frequency and phase of the two recorded FM carriers. If the scanner jumps between these track sections, or scans simultaneously signal portions of both sections, or the signals of the track sections are slightly run together during the recording, or any other interaction occurs between these signals, the resulting fault remains small in view of the agreement between frequency and phase.

Preferably this control is effected during the line blanking period, e.g. the black shoulder or the sync pulse. Preferably, the constant signal value is the black value or an ultra-black value. The control voltage passes through a store which ensures that the control voltage effective at the input of the FM modulator becomes fully effective with a small time constant during this periodic interval, or quickly assumes a new value, and maintains the same thereafter during the forward scan. This may be achieved, e.g., with a clamping circuit which clamps the picture signal during the periodic interval at the value of the control voltage. The control may be achieved, e.g. by comparing the modulated FM carrier with a reference oscillation having a frequency corresponding to the constant signal value, and a phase constant relative to the line period,

wherein the adjusting value produced in this way during the periodic interval serves as the control voltage.

The invention will now be described in greater detail, by way of example with reference to the drawings, in which:—

Figs. 1 to 11 show the operation of various embodiments of the invention, viz:—

Figs. 1 and 2 for an NTSC signal;

Figs. 3, 4, 5 are circuit diagrams for the solution according to Fig. 2;

Figs. 6, 7 and 8 for a Secam (Registered Trade Mark) signal;

Figs. 9 and 10 for a PAL signal;

Fig. 11 for a three line sequential signal;

Figs. 12 and 13 show an embodiment of the invention.

In Fig. 1, a modulated NTSC colour carrier F is recorded on adjacent track sections 1, 2. The point 3 represents a definite point, e.g. the start of lines with the same line number of consecutive pictures. In view of the half line offset of the NTSC colour carrier and the odd number of lines per picture, the phase of the colour carrier associated with a certain colour differs at these points by 180° between picture and picture, i.e. between the track section. If the colour carrier is modulated at the point 3 on the sections 1, 2 with the same signal (identical information content of consecutive pictures), and the scanner scans due to misalignment both track sections 1, 2 a data transmission is made of the colour carriers F_1 and F_2 , directed in opposite directions. It can be seen that, for example, in the case where the same signal amount is taken from both tracks, the colour carriers cancel each other. In other faulty positions of the scanner 4, phase errors occur in the scan colour carrier which give rise to colour faults.

According to Fig. 2, the half line offset of the colour carrier is cancelled, so that the colour carriers F_1 and F_2 have the same phase, i.e. the signals on both sections 1, 2 are similar. It can be seen that if the scanner 4 scans both track sections 1, 2, colour carriers of the same phase are detected and the above described colour falsification does not occur.

According to Fig. 3, the transformation of the colour carrier F into the modified colour carrier F_m suitable for recording is effected by means of a phase switch 5 controlled by a switching voltage S5 with half line frequency and switching the phase of the colour carrier by 180° temporarily in each second line. This cancels the phase shift through 180° from line to line, caused by the half line offset; the colour carrier has the same phase for a certain colour at a certain point of all lines and, therefore, also for adjacent points of the track sections 1, 2, as in Fig. 2. During the reproduction a corresponding switching takes place during the demodulation

in order to produce the correct phase relationship between the modulated colour carrier and the reference carrier serving for the demodulation. For example, the offset is again introduced, or the reference carrier is switched in accordance with Fig. 3. Switch 5 is, therefore, therefore, effective during the recording and the reproduction.

According to Fig. 4, the transformation of F and F_m takes place in a mixing stage 6. The latter is controlled by an oscillator 7 whose frequency is dimensioned and coupled by line sync pulses 20 with the line frequency f_H in such a way that the frequency of the colour carrier F_m is an integral multiple of the line frequency. This meets the condition according to Fig. 2. For the reproduction, the demodulation is effected with a reference carrier with this new frequency.

In Fig. 5, the colour carrier F is demodulated by a synchronous demodulator 9 controlled by a reference carrier oscillator 8. The two produced video frequency colour signals U & V are modulated upon a new colour carrier produced in an oscillator 7 in a modulator 10. The oscillator 7 is again controlled by the line sync pulses 20 and produces a colour carrier with an integral multiple $n \cdot f_H$ of the line frequency.

In Fig. 6, relating to a Secam (Registered Trade Mark) signal, equivalent colour difference signals, e.g., $R-Y$ or $B-Y$, are recorded on adjacent track sections 1, 2 in video frequency, or as colour carrier modulation. Hence, the scanner 4 detects during the scanning of two track sections 1, 2 or during changing between the track sections, similar colour difference signals, so that no noticeable colour faults occur.

Fig. 7 shows another condition which must be fulfilled with a standardised Secam (Registered Trade Mark) colour television signal. According to Fig. 7, the phase of the Secam (Registered Trade Mark) colour carrier is switched between 0° and 180° in certain lines according to the law represented. Fig. 7 shows that for example the colour carriers in the lines with the spatial line number 1 have different phases between the frames 3 and 5 recorded on adjacent track sections. To effect the recording of this type of signal in accordance with the invention, means, for example as shown in Fig. 3, are provided which always transform the phase indicated at π in Fig. 7, into the phase 0° . The control of this switching may be effected by the unmodulated colour carrier oscillations transmitted at the start of each line, and switched in frequency from line to line, or by the Secam (Registered Trade Mark) identification signal transmitted during the vertical blanking interval.

Such a circuit is shown in Fig. 8. The Secam (Registered Trade Mark) colour carrier F is applied through a push-pull

transformer 12 to switch 13 consisting of four diodes, whereby a phase switching is possible by means of a switching voltage applied to a terminal 14. The modified colour carrier F_m is taken from a terminal 15 of a transformer. The switching voltage 17, shown in the drawing applies, for example, to the temporally consecutive lines 1, 3, 5, 7, 9, 11 of frame 1. Whenever the phase is π i.e. 180° , the switching voltage 17 is positive and switches the phase through 180° to 0° . The modified colour carrier F_m has then, for a certain colour in adjacent points of adjacent track sections, always the same phase. For the colour reproduction, reciprocal switching is necessary only if the reproduced signal is also to be compatible.

In the case of the colour carrier of the PAL colour television signal, as with the half line offset in the NTSC signal according to Figs. 1 to 5, the quarter line offset and the 25 Hz offset of the colour carrier are removed. This may again be achieved with one of the circuits according to Fig. 3, 4 and 5. In this case, the colour carrier for the modulation axis $B-Y$, i.e. the colour carrier modulated only with the colour different signal $B-Y$ has the same phase at the same points of all lines. According to the invention, in the PAL signal, the PAL Switching, i.e. the line frequency switching of the $R-Y$ axis is also taken in to consideration.

This will now be explained with reference to Figs. 9 and 10. In Fig. 9 it will be assumed that the quarter line offset and the 25 Hz offset have already been cancelled, e.g. with a circuit according to Fig. 4, as indicated by F_m . In the recording of the PAL signal, the colour carriers recorded on adjacent track sections 1, 2 have then the shape F_m and F_m^* , wherein these colour carriers relate always, for example, to the line start. Thus, adjacent track sections 1, 2 carry conjugate complex colour carriers. If now the scanner 4 scans track sections 1, 2, or changes between them, there occurs according to Fig. 9 an average between the colour carriers F_m and F_m^* , so that in fact the colour carrier F_U is produced. It may be seen that this is a colour carrier with the wrong phase.

According to Fig. 10 PAL colour carriers of the same PAL state, i.e. either only F_m or only F_m^* , are recorded on adjacent track sections 1, 2. If here the scanner 4 scans both track sections 1, 2 it scans with the same data content colour carriers with the same phase, so that the colour falsification according to Fig. 9 does not occur. Thus, in the PAL signal three factors must be taken into account or balance, namely the quarter line offset, the 25 Hz offset, and the phase switching according to Fig. 9. Here it is also important that the colour carrier for the same colour has the same phase at adjacent points of adjacent track sections.

In Fig. 11 the invention is shown with reference to a three line sequential signal and a disc record carrier (video disc). The colour signals R, G, B, are recorded sequentially in lines on a spiral track 18, wherein the track sections corresponding to same primary colour lines are side-by-side in the radial direction. The line sync pulses of the signal are always on radial lines 19. According to the invention colour signals of the same primary colour, i.e., e.g., R, G or B, are recorded on radially adjacent track sections. If the scanner has not the correct radial position shown at 4', but the position 4, scanning therefore two track sections 1, 2; no noticeable faults occur because these track sections contain colour signals representing the same primary colour. Even if the head 4 oscillates between two track sections 1, 2, no noticeable faults occur.

The association between the colour picture signals and the track sections may also be achieved in such a manner that the colour picture signal receives a certain displacement in time. For example, in Fig. 1 the modulated colour carrier could be delayed by the duration of one line during the duration of every second picture, thereby achieving the desired phase condition according to Fig. 2. In the same way, this delay may be introduced in the Secam (Registered Trade Mark) signal according to Fig. 6, and in the PAL signal according to Figs. 9 and 10. If, for example, in Fig. 9 the track sections 1, 2 are associated with consecutive pictures and the colour carrier sequence F during the picture associated with the track section 2 is delayed by one line, the desired arrangement according to Fig. 10 is obtained. By means of this time shift it is also possible to achieve the association according to the invention of the colour signals according to Fig. 11 representing the individual primary colours. This time shift between the colour picture signal sequence and the track sections may also be produced by a matched control of the movement of the record carrier.

The colour picture signal may also be recorded together with a luminance signal, more particularly in a different frequency position. For example, a colour carrier of 500 kHz, modulated with two colour difference signals, and a carrier, frequency modulated with a luminance signal within the range of 3 to 4 MHz are recorded on the same track. The invention is also suitable for other types of modulation e.g. line sequential methods in which luminance signal and coded colour signals are recorded alternately in lines.

Fig. 12 shows again two track sections 1, 2 located adjacent to each other in the radial direction on a spiral track of a video disc. At the point X of the track sections 1, 2, a line of a recorded picture starts. The track section 1 carries an FM carrier 23 and the

track section 2 an FM carrier 24. During the interval Δt , corresponding to the black shoulder, the signals have a constant value, i.e. the black value. According to further features of this embodiment of the invention, a control triggered by a scanning pulse 26 arranges that the carriers 23, 24 are adjusted during the period Δt to a constant frequency, corresponding to the signal value during the period Δt , and also to a constant phase relative to the line period. This is shown in Fig. 12 by the phase 0° at the point X. By means of this control, which is maintained by a store circuit described in Fig. 13 during the line scan, the carriers 23, 24, recorded side by side, have, during the line scan following the period Δt , for the same modulated signal the same frequency and same phase relative to the start of the line period. If now a scanner 4 scanning the track sections 1, 2 in the direction 25 scans signals from both track sections 1, 2 it detects carriers with the same frequency and the same phase. This largely eliminates interference faults. The carriers 23, 24 may be modulated with a colour signal R, G, B, or a colour carrier F.

Fig. 13 shows an embodiment for carrying out the control according to Fig. 12. A chrominance signal to be recorded is applied at a terminal 28 through an adder 29 to a modulating input 30 of a frequency modulator 31, whose output delivers through an amplitude chopper 32 a carrier frequency modulated with the chrominance signal, which is recorded as known in the art. The frequency of the carrier is, therefore, always equal to the instantaneous value of the chrominance signal. According to a further development of the invention, the modulated carrier is compared in a discriminator 33 with a comparison oscillator f_0 ; this reference oscillation is produced in an oscillator 34, which is controlled from a terminal 44 by line sync pulses 20 of the picture signal. The line sync pulses 20 are derived from the picture signal or from a clock generator. The pulses 20 produce in the oscillator 34 a reference oscillation f_0 with a frequency corresponding to that of the chrominance signal value during the period Δt , and a constant phase relative to the line period. The oscillator 34 can be a start-stop oscillator, or a locked oscillator which is always started with the same phase by the line sync pulse 20. The discriminator 33 supplies a control voltage U_R which passes through a filter 37, a gate 38 and a store 41 to one input of the adder 29. The gate 38 is opened by the scanning pulse 36 during the period Δt . The store 41 is so constructed that the control voltage forming at the output of the gate 38 is quickly stored with a time constant which is small compared with the line flyback, and is maintained during the line scan. The out-

put of the circuit 41 yields, therefore, a control voltage which controls during the period Δt the frequency modulator 31 to the correct frequency and phase. This control voltage is quickly corrected always during the flyback, and is maintained during the forward scan. In the adder-29, the chrominance signal causing the frequency modulation, is superimposed upon the control voltage. The circuit 41 may be a clamping circuit in which the control voltage present at the time is retained.

WHAT WE CLAIM IS:—

1. A video-disc on which colour picture signals recorded on radially displaced adjacent track sections of a spiral track have chrominance modulated signals such that if the picture content is the same the chrominance modulated signals in the adjacent track sections are identical.

2. A video-disc as claimed in claim 1 in which lines which have the same frame position are recorded radially side by side on the track.

3. A video-disc as claimed in Claim 1 or 2 wherein the chrominance modulated signals are recorded as frequency modulations of a carrier, which carrier has, during a periodically recurring time interval, a specific phase relative to the picture line period and a constant frequency corresponding to a constant signal value.

4. A video-disc as claimed in Claim 1 or 2, wherein the chrominance modulated signals are recorded as a modulated colour carrier and the phase or frequency associated with a certain colour is the same for adjacent points of radially disposed track sections.

5. A video-disc as claimed in Claim 1, 2 or 4, wherein the chrominance modulated signals are recorded as a colour carrier of the PAL type and the PAL states of the colour carrier recorded on radially adjacent track sections are the same.

6. A video-disc as claimed in Claim 1, 2 or 4, wherein the chrominance modulated signals are recorded as colour difference signals with alternate lines carrying different colour difference signals and radially adjacent track sections carrying colour difference signals associated with the same colour.

7. A video-disc as claimed in Claim 1, wherein the chrominance modulated signals are recorded as line sequential colour signals, representing in lines different primary colours sequentially, and radially adjacent track sections always carry colour signals representing the same primary colour.

8. A method of recording the video-disc as claimed in Claim 1 or 2, wherein the phase or frequency of the chrominance modulated signals for recording in radially displaced track section is altered in predetermined lines before the actual recording.

9. An apparatus for recording a video-disc in accordance with the method of Claim 8, comprising switching means which change the phase or frequency of chrominance modulated signals having a frequency having a phase relationship with the line frequency offset by half a line in such a way that the phase associated with a certain colour is the same for radially adjacent points of two track sections.

10. An apparatus as claimed in Claim 9, wherein the switching means comprises a phase shifter located in the path of the chrominance modulated signals and whose phase shift is switched from line to line.

11. A method as claimed in Claim 8, wherein the frequency of the chrominance modulated signals is transformed to be an integral multiple of the line frequency.

12. A method as claimed in Claim 11, wherein the frequency transformation is effected by mixing the chrominance modulated signals with a reference signal at a frequency having a fixed ratio to the line frequency.

13. A method as claimed in Claim 11, wherein the frequency transformation is effected by demodulating the chrominance modulated signals and modulating a new carrier at an integral multiple of the line frequency with the demodulated information.

14. A method as claimed in Claim 11, wherein using chrominance modulated signals of the PAL system, the frequency of the chrominance modulated signals is transformed to be an integral multiple of the line frequency with cancellation of the quarter line offset and of the 25 Hz offset.

15. An apparatus for recording a video disc in accordance with the method of Claim 8, comprising a phase shifter mounted in the path of chrominance modulated signals having colour difference signals and switched periodically in such a way that a 180° phase shift of the chrominance modulated signals between lines of the same spatial ordinal number in certain frames is cancelled.

16. A method of recording the video-disc as claimed in Claim 1 or 2, wherein chrominance modulated signals differing from line to line are shifted with respect to time relative to the transport of the video disc in such a way that said identical chrominance modulated signals are always recorded on radially adjacent track sections.

17. A method of playing back the video-disc as claimed in Claim 1 or 2 wherein a reference carrier is used for decoding the chrominance modulated signals and is matched in respect of each line to the modulation phase of the chrominance modulated signals.

18. An apparatus for playing back a video-disc in accordance with the method of Claim 17, comprising a periodically switched phase shifter mounted in the path of the chromin-



put of the circuit 41 yields, therefore, a control voltage which controls during the period at the frequency modulator 31 to the correct frequency and phase. This control voltage is quickly corrected always during the flyback, and is maintained during the forward scan. In the adder 29, the chrominance signal causing the frequency modulation, is superimposed upon the control voltage. The circuit 41 may be a clamping circuit in which the control voltage present at the time is retained.

WHAT WE CLAIM IS:—

1. A video-disc on which colour picture signals recorded on radially displaced adjacent track sections of a spiral track have chrominance modulated signals such that if the picture content is the same the chrominance modulated signals in the adjacent track sections are identical.

2. A video-disc as claimed in claim 1 in which lines which have the same frame position are recorded radially side by side on the track.

3. A video-disc as claimed in Claim 1 or 2 wherein the chrominance modulated signals are recorded as frequency modulations of a carrier, which carrier has, during a periodically recurring time interval, a specific phase relative to the picture line period and a constant frequency corresponding to a constant signal value.

4. A video-disc as claimed in Claim 1 or 2, wherein the chrominance modulated signals are recorded as a modulated colour carrier and the phase or frequency associated with a certain colour is the same for adjacent points of radially disposed track sections.

5. A video-disc as claimed in Claim 1, 2 or 4, wherein the chrominance modulated signals are recorded as a colour carrier of the PAL type and the PAL states of the colour carrier recorded on radially adjacent track sections are the same.

6. A video-disc as claimed in Claim 1, 2 or 4, wherein the chrominance modulated signals are recorded as colour difference signals with alternate lines carrying different colour difference signals and radially adjacent track sections carrying colour difference signals associated with the same colour.

7. A video-disc as claimed in Claim 1, wherein the chrominance modulated signals are recorded as line sequential colour signals, representing in lines different primary colours sequentially, and radially adjacent track sections always carry colour signals representing the same primary colour.

8. A method of recording the video-disc as claimed in Claim 1 or 2, wherein the phase or frequency of the chrominance modulated signals for recording in radially displaced track section is altered in predetermined lines before the actual recording.

9. An apparatus for recording a video-disc in accordance with the method of Claim 8, comprising switching means which change the phase or frequency of chrominance modulated signals having a frequency having a phase relationship with the line frequency offset by half a line in such a way that the phase associated with a certain colour is the same for radially adjacent points of two track sections.

10. An apparatus as claimed in Claim 9, wherein the switching means comprises a phase shifter located in the path of the chrominance modulated signals and whose phase shift is switched from line to line.

11. A method as claimed in Claim 8, wherein the frequency of the chrominance modulated signals is transformed to be an integral multiple of the line frequency.

12. A method as claimed in Claim 11, wherein the frequency transformation is effected by mixing the chrominance modulated signals with a reference signal at a frequency having a fixed ratio to the line frequency.

13. A method as claimed in Claim 11, wherein the frequency transformation is effected by demodulating the chrominance modulated signals and modulating a new carrier at an integral multiple of the line frequency with the demodulated information.

14. A method as claimed in Claim 11, wherein using chrominance modulated signals of the PAL system, the frequency of the chrominance modulated signals is transformed to be an integral multiple of the line frequency with cancellation of the quarter line offset and of the 25 Hz offset.

15. An apparatus for recording a video disc in accordance with the method of Claim 8, comprising a phase shifter mounted in the path of chrominance modulated signals having colour difference signals and switched periodically in such a way that a 180° phase shift of the chrominance modulated signals between lines of the same spatial ordinal number in certain frames is cancelled.

16. A method of recording the video-disc as claimed in Claim 1 or 2, wherein chrominance modulated signals differing from line to line are shifted with respect to time relative to the transport of the video disc in such a way that said identical chrominance modulated signals are always recorded on radially adjacent track sections.

17. A method of playing back the video-disc as claimed in Claim 1 or 2 wherein a reference carrier is used for decoding the chrominance modulated signals and is matched in respect of each line to the modulation phase of the chrominance modulated signals.

18. An apparatus for playing back a video-disc in accordance with the method of Claim 17, comprising a periodically switched phase shifter mounted in the path of the chromin-

ance modulated signals taken from the video-disc.

19. Apparatus for playing back a video-disc in accordance with the method of Claim 17, comprising a periodically operated phase shifter for switching the phase of the reference carrier in alternate lines.

20. A video-disc as claimed in Claim 2 or 3, wherein the chrominance modulated signals and a luminance signal are recorded sequentially along the track.

21. A method of recording the video-disc as claimed in Claim 3, wherein a control voltage is passed through a store enabling a quick change of the control voltage during each periodically recurring time interval and maintenance of the control voltage until the following periodically recurring time interval.

22. An apparatus for recording a video-disc in accordance with the method of Claim 21, comprising a store circuit in the form of a clamping circuit which retains the chrominance modulated signals at the value of the control voltage until the following periodically recurring time interval.

23. A method of recording the video-disc as claimed in Claim 3, wherein the chrominance modulated signals and a reference oscillation with constant phase with respect to the line period are compared in a phase com-

parator whose output voltage occurring during each periodically recurring time interval is supplied as a control voltage to a modulating input of a frequency modulator producing the chrominance modulated signals.

24. A video-disc substantially as described herein with reference to the drawings.

25. A method of recording the video-disc as claimed in Claim 1 or 2 and substantially as described herein with reference to the drawings.

26. An apparatus for recording a video-disc in accordance with the method of Claims 8, 16, 21 or 23 substantially as described herein with reference to the drawings.

27. A method of playing back the video-disc as claimed in any one of Claims 1 to 7 substantially as herein with reference to the drawings.

28. An apparatus for playing back a video-disc in accordance with the method of Claim 17, substantially as described herein with reference to the drawings.

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