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**Circuit for controlling the colour carrier amplitude in
a video recorder**

The invention is based on a circuit according to the precharacterizing clause of Claim 1.

5 Like a television receiver, a video recorder has a so-called ACC (automatic colour control) circuit, in which the amplitude of the colour carrier scanned from the tape is controlled to its set value by evaluation of the amplitude of the colour synchronizing signal. In
10 playback, two mutually contradicting requirements apply for the time constant of this control circuit:

1. The comb filter used for the elimination of colour crosstalk has a finite filter depth and usually operates with a delay line for one line in the case of
15 NTSC or two lines in the case of PAL. A prerequisite for a good filter effect is that in playback the colour carrier is passed to the comb filter in an unfalsified state, i.e. with the phase and amplitude errors caused by the crosstalk. It follows from this that the colour
20 carrier may be corrected during one or two lines only to such a small extent that no significant impairment of the crosstalk reduction occurs. If control is too fast, a horizontally sorted noise occurs in the colour.

2. On the other hand, the control must be fast
25 enough to correct the differences in the level of the video heads which have an effect after head switchover, and also tape-guidance-induced drops in level at the head-drum entry during the field blanking time and the following overscanning. If control is too slow, colour
30 flicker occurs at the upper margin of the image.

In the compromise which is needed, item 1 is usually taken more into account than item 2, because

- with the colour quality reduced due to the principle of colour recording, additional noise
35 would have a highly disturbing effect,
- by using paired video heads, the differences in level can be kept relatively small,
- drops in level at the entry to the head drum are





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small if the tape is carefully guided, and
- the ACC in the connected television set further
reduces any differences in level which have not
been corrected.

5 Recording from one video recorder over to the
other is particularly critical with respect to colour
flicker.

 The invention is based on the object of using
simple means to avoid the disadvantages listed and to
10 bring about the effect that the colour carrier amplitude
is optimally corrected both after the head switchover and
in the field trace period. This object is achieved by the
invention specified in Claim 1. Advantageous develop-
ments of the invention are specified in the subclaims.

15 In the solution according to the invention, the
slow correction, advantageous for the actual picture, is
thus chosen, i.e. a large time constant in the path of
the control voltage or, in the case of an ACC with
constant current, a small charging current. At the
20 beginning of the frame or even after the head switchover
pulse, in any event in the time period in which the
electron beam is not visible on the screen due to flyback
or overscanning, a switchover is made to fast correc-
tion, i.e. a small time constant or a large charging
25 current.

 This advantageously utilizes the fact that at the
beginning of a frame no visible image is recorded for
about 20 lines and consequently any colour flicker and
initial transients remain invisible in any case. This
30 solution achieves the effect that, after the head change,
when the scanned colour carrier has the phase shift and
drop in amplitude caused by the head change behind it,
[lacuna] undergoes as fast a correction as possible to
its set amplitude, and the amplitude of the colour
35 carrier already has its set value at the beginning of the
visible image, at about line No. 20. Thus, the invention
accomplishes an optimum compromise between a large time
constant, which although advantageous and necessary for
image reproduction without horizontal noise is disadvan-



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tageous for fast adjustment after the head change, and between [sic] a small time constant, which although advantageous for fast adjustment after the head change is disadvantageous with regard to horizontal noise in the picture. If the invention is used, the large time constant can be increased further during the frame in comparison with previous values, thereby achieving advantages with regard to horizontal noise without any risk of colour flicker at the upper visible margin of the image.

The invention is explained below with reference to the drawing, in which:

- Fig. 1 shows a block diagram of a playback circuit designed according to the invention for a video recorder,
- Fig. 2 shows curves for explaining the operating principle of the circuit according to Fig. 1 and
- Fig. 3-5 show an example of a circuit for the switchover of the time constant.

In Figure 1, the picture carrier BT, frequency-modulated with the luminance signal and the frequency-reduced colour carrier Fm, recorded below the frequency spectrum of the said picture carrier and also known as a colour under carrier, are scanned from the magnetic tape 1 by two rotating magnetic heads 2, 3. The picture carrier BT passes via the high-pass filter 4, having a cut-off frequency of 1.2 MHz, to the FM demodulator 5, which supplies the luminance signal Y to the adding stage 6. The colour carrier Fm passes via the band-pass filter 7, having a pass-band at 627 kHz, to the controllable amplifier 8 and from the output of the latter as a controlled colour carrier Fmg to the mixing stage 9, which is also fed a mixing carrier from the oscillator 10. The mixing stage 9 again supplies the colour carrier F with the original PAL colour carrier frequency of 4.43 MHz to the adding stage 6. Consequently, the composite colour video signal is available at the output 11. The colour carrier Fmg at the output of the amplifier 8 is



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used to evaluate the colour synchronizing signal by the gate 12. The gate 12 is opened during the duration of the colour synchronizing signal by the pulse BG (burst gate). The colour synchronizing signal is rectified in the rectifier 13 and generates at the control input b of the amplifier 8 a control voltage U_r , which controls the amplitude of the colour carrier F_{mg} to the set value. Between the output a of the rectifier 13 and the input b of the amplifier 8 there acts a time-constant element 14, which has a large time constant of 50 - 70 lines, corresponding to about 4 ms.

The signal is picked up alternately from field to field from the two video heads 2, 3 by the changeover switch 15. The changeover switch 15 is activated by the switching voltage U_s respectively at the end of a field. U_s is generated in the control circuit 16. The latter is controlled by a rotating head drum, bearing the heads 2, 3, with a head-drum pulse U_k which indicates the respective angular position of the head drum. The circuit described thus far is known.

The switching voltage U_s from the control circuit 16 also passes to the pulse shaper 17. According to Fig. 2, the latter generates respectively at an edge of the switching voltage U_s , that is to say respectively at the beginning of a field, a pulse U_T with a duration A of approximately 25 lines, corresponding to approximately 1.6 ms. This pulse passes to a control input c of the time-constant element 14 and switches the time-constant T from the high value T_1 , of about 4 ms, effective during the frame, to a lower value T_2 , of about 1 ms, during the time period A. The time period A corresponds approximately to the time period during which the electron beam is not visible on the screen due to overscanning. It is ensured by the reduced time constant T_2 that the amplitude of the controlled colour carrier F_{mg} already has its set value again after the phase shift and drop in amplitude, caused by the head change, at the beginning of the visible image, that is to say at the end of the time period A in Fig. 2. As a result, colour disturbances in



the form of colour flicker at the upper visible margin of the image are avoided.

Fig. 3 shows a circuit for switching over the time constant T . The time-constant element 14 includes a resistor R_1 and two capacitors C_1 and C_2 . During the actual frame, the transistor 20 is turned on by the voltage U_T at the terminal c . C_1 and C_2 lie parallel and form the said large time constant T_1 . During the time period A , the transistor 20 is turned off by the switching voltage U_T . The capacitor C_2 is consequently not active. C_1 then forms together with R_1 the smaller time constant T_2 . Preferably, the switching voltage U_T causes the switching on and off of a capacitor at a terminal of an integrated circuit representing the remaining circuit.

Fig. 4 shows a variant of the circuit according to Fig. 3, in which the switching over of the time constant, that is to say the switching on and off of the capacitor C_2 , takes place by a field-effect transistor 21. At the control electrode c of the latter, the switching voltage U_T is applied, as in Fig. 3. During the time period A , the FET 21 is turned off by the switching voltage U_T and, during the remaining time period, that is to say during the field trace period, it is turned on, so that C_2 is connected in parallel to achieve the large time constant C_1 .

Fig. 5 shows an example of the switching over of the time constant, in which the charging current i_L for the capacitor C_1 is switched over. Provided in an IC 23 is a constant-current source with the transistor 22 and the resistors R_2 and R_3 , which supplies a charging current i_L for the capacitor C_1 for charge reversal corresponding to the respective control. The value of the charging current i_L is switched over by the switching voltage U_T , in that the resistor R_3 is connected in parallel with the resistor R_2 via the switch S_1 . During the time period A , the switch S_1 is closed by U_T , so that the resistance in the base circuit is reduced correspondingly. As a result, the value of the charging current i_L is increased, the charge of C_1 is thus reversed

faster, which corresponds to the reduced time constant T2. The switching over of the time constant thus takes place here not by switching on and off a capacitor within a filter element, but by switching over the charging
5 current i_L for the filter capacitor C1, which otherwise has the same function as in Figs 3 and 4.

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Patent Claims

1. Circuit for controlling the colour carrier amplitude in a video recorder, in which during playback a control voltage (U_r) derived from the amplitude of the colour synchronizing signal controls the gain of a colour-carrier amplifier (8) via a time-constant element (14), characterized in that the time constant (T) is switched over during a time period (A) at the beginning of the frame, in which the electron beam is not visible on the screen due to overscanning, from a large value (T_1), effective during the visible picture, to a value (T_2) which is smaller by comparison.
2. Circuit according to Claim 1, characterized in that the time period (A) with the smaller value (T_2) of the time constant (T) is about 20 lines.
3. Circuit according to Claim 1, characterized in that the small time constant (T_2) during the said time period (A) is about 1 ms and the large time constant (T_1) during the remaining frame is about 5 ms.
4. Circuit according to Claim 1, characterized in that the time constant (T) is controlled by a control voltage (U_T) such that it rises continuously during the said time period (Z) from the small value (T_2) to the large value (T_1).
5. Circuit according to Claim 1, characterized in that a filter element with a resistor (R_1) and a capacitor (C_1) lies in the path of the control voltage U_r and a further capacitor (C_2) can be switched in parallel with the capacitor (C_1) by a switch (20, 21, S_1).
6. Circuit according to Claim 5, characterized in that the switch is formed by a transistor (20) or a field-effect transistor (21).
7. Circuit according to Claim 1, characterized in that the switching over of the time constant takes place by the value of the charging current (i_L) for the capacitor (C_1) of the filter element (C_1 , R_1) being switched over (Fig. 5).
8. Circuit according to Claim 7, characterized in





that the charging current (i_L) for the capacitor (C_1) is supplied by a constant-current source (22), contained in an integrated circuit, and the charging current (i_L) supplied by the constant-current source, for the
5 capacitor (C_1) arranged [lacuna] externally integrated circuit can be switched over by a switching voltage (U_T) applied to a control terminal (c) of the integrated circuit (23) (Fig. 5).

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