

D 91/091*WP 220791

- 1

☒	Description	: paged 01	to paged 06
☒	Claim(s)	: paged 07	to paged 08
☒	Drawing(s)	: paged 1/2	to paged 2/2
☒	Abstract	: paged -	to paged 09

460939
1102

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:

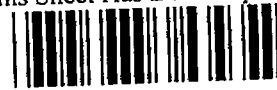
1. The comb filter used for the elimination of colour crosstalk has a finite filter depth and usually operates with a delay line for one line in the case of
15 NTSC or two lines in the case of PAL. A prerequisite for a good filter effect is that in playback the colour carrier is passed to the comb filter 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





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 developments 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 correction, 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-



D 91/091*WP 220791

- 3 -

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



D 91/091*WP 220791

- 4 -

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 T_2 . 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 C_1 , which otherwise has the same function as in Figs 3 and 4.

This Sheet Has Been Replaced



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).

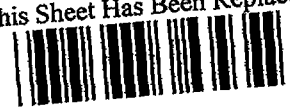
This Sheet Has Been Replaced



Abstract

1. Circuit for controlling the colour carrier amplitude in a video recorder.
- 5 2.1 In a video recorder there acts an ACC (automatic chroma [sic] control) circuit, which stabilizes the amplitude of the colour carrier by evaluation of the amplitude of the colour synchronizing signal. Owing to the head change, disturbances in the form of colour flicker may occur in each case at the beginning of the frame at the upper edge of the image. The object is to eliminate such disturbances in the form of colour flicker.
- 10 2.2 The time constant (T) of the ACC circuit is switched over to a smaller value (T2) at the beginning of the frame during the overscanning of the electron beam.
- 15 2.3 In particular for a VHS video recorder.
3. Fig. 1.

This Sheet Has Been Replaced



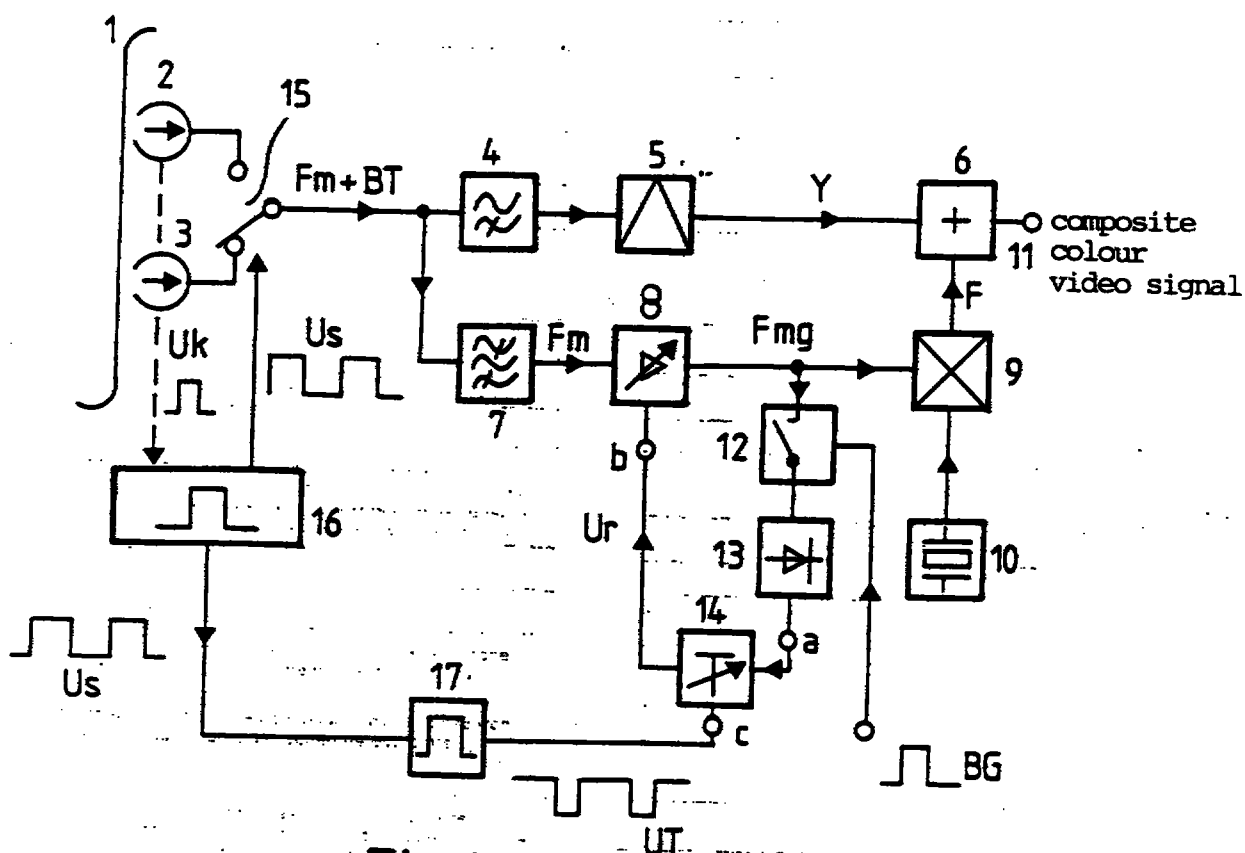


Fig.1

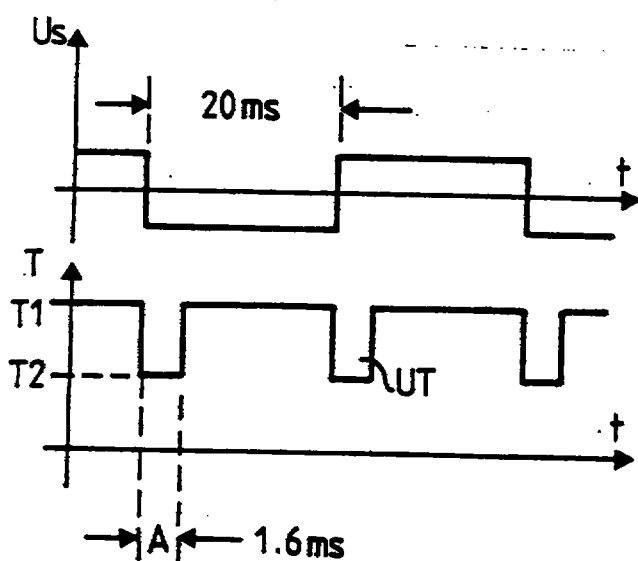


Fig.2

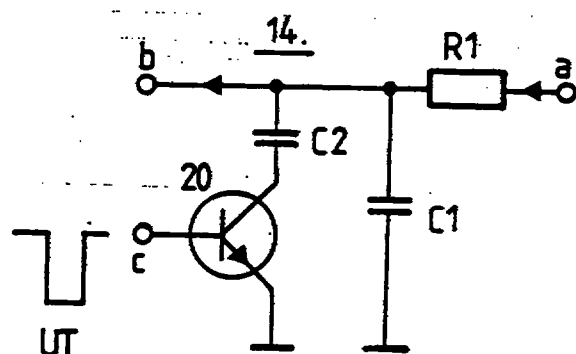


Fig.3

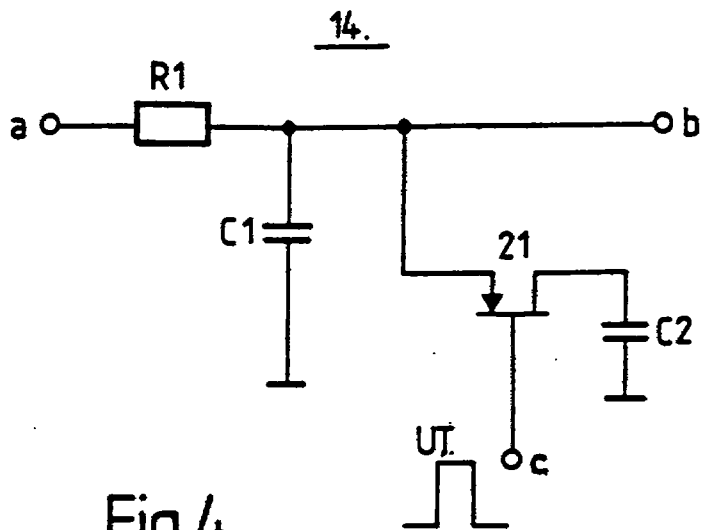


Fig.4

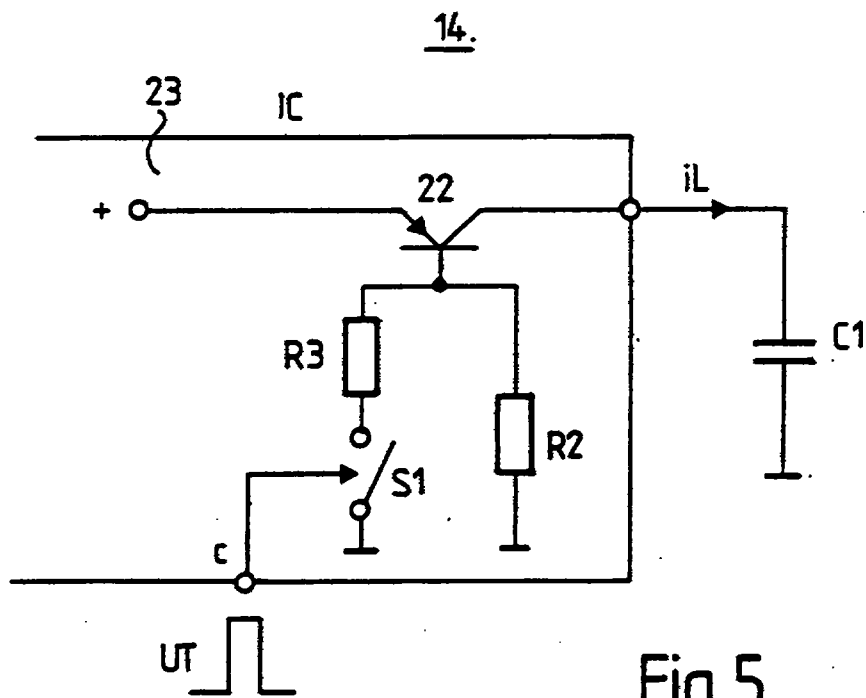


Fig.5



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.

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 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 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 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 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 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 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

REPLACEMENT SHEET

28 JAN 1997

REPLACEMENT SHEETS SG

- ☒ Description : paged 01 to paged 08
- ☒ Claim(s) : paged 07 to paged 08
- ☒ Drawing(s) : paged 12 to paged 21
- ☒ Abstract : paged 09 to paged 09

DATE OF RECEIPT 28/01/97

THIS SHEET HAS BEEN REPLACED

This Sheet Has Been Replaced





- 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.

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 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 developments of the invention are specified in the subclaims.

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 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 correction, i.e. a small time constant or a large charging 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 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 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-

REPLACEMENT SHEET

28 JAN 1997

THIS SHEET HAS BEEN
REPLACED

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

REPLACEMENT SHEET

28 JAN 1997

This Sheet Has Been Replaced



THIS SHEET HAS BEEN
REPLACED

28 JAN 1997

- 4 -

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

This Sheet Has Been Replaced



THIS SHEET HAS BEEN
REPLACED



28 JAN 1997

- 5 -

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 $R1$ and two capacitors $C1$ and $C2$. During the actual frame, the transistor 20 is turned on by the voltage U_T at the terminal c . $C1$ and $C2$ lie parallel and form the said large time constant $T1$. During the time period A , the transistor 20 is turned off by the switching voltage U_T . The capacitor $C2$ is consequently not active. $C1$ then forms together with $R1$ the smaller time constant $T2$. 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 $C2$, 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 $C2$ is connected in parallel to achieve the large time constant $C1$.

Fig. 5 shows an example of the switching over of the time constant, in which the charging current i_L for the capacitor $C1$ is switched over. Provided in an IC 23 is a constant-current source with the transistor 22 and the resistors $R2$ and $R3$, which supplies a charging current i_L for the capacitor $C1$ 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 $R3$ is connected in parallel with the resistor $R2$ via the switch $S1$. During the time period A , the switch $S1$ 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 $C1$ is thus reversed

THIS SHEET HAS BEEN
REPLACED

REPLACEMENT SHEET

28 JAN 1997

- 6 -

faster, which corresponds to the reduced time constant T_2 . 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 current i_L for the filter capacitor C_1 , which otherwise has the same function as in Figs 3 and 4.

This Sheet Has Been Replaced



THIS SHEET HAS BEEN
REPLACED



Patent Claims

REPLACEMENT SHEET

28 JAN 1997

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





REPLACEMENT SHEET

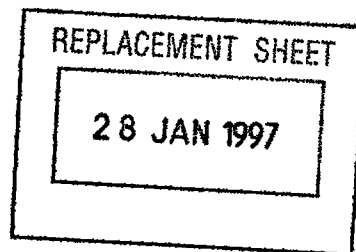
28 JAN 1997

- 8 -

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 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).

This Sheet Has Been Replaced

THIS SHEET HAS BEEN
REPLACED



CIRCUIT FOR CONTROLLING THE COLOUR CARRIER AMPLITUDE
IN A VIDEO RECORDER

Abstract

1. Circuit for controlling the colour carrier amplitude in a video recorder.
- 2.1 In a video recorder there acts an ACC (automatic chroma [sic] control) circuit, which stabilizes the amplitude of the colour carrier by evaluation of the amplitude of the colour synchronizing signal. Owing to the head change, disturbances in the form of colour flicker may occur in each case at the beginning of the frame at the upper edge of the image. The object is to eliminate such disturbances in the form of colour flicker.
- 2.2 The time constant (T) of the ACC circuit is switched over to a smaller value (T_2) at the beginning of the frame during the overscanning of the electron beam.
- 2.3 In particular for a VHS video recorder.
3. Fig. 1.

This Sheet Has Been Replaced



THIS SHEET HAS BEEN
REPLACED

28 JAN 1997

1

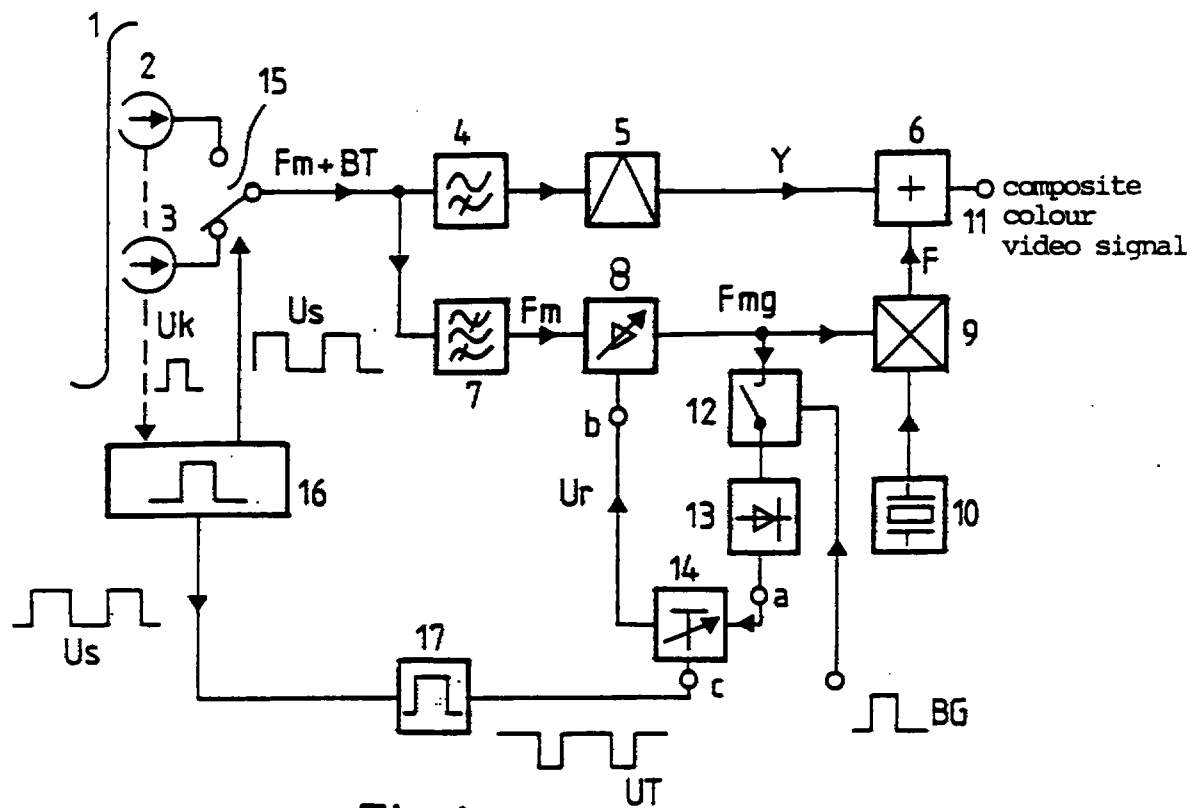


Fig.1

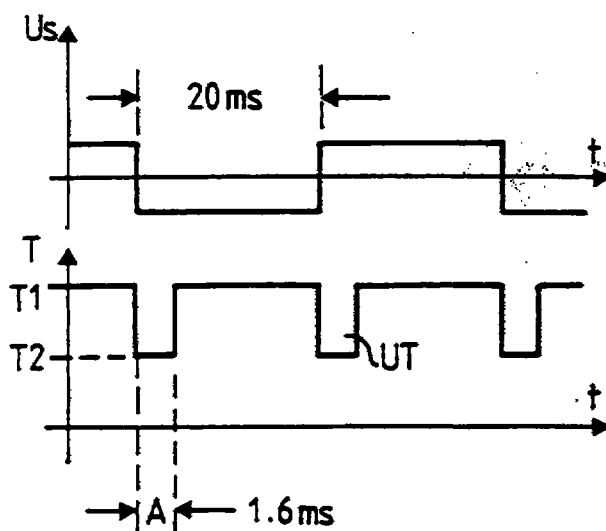


Fig.2

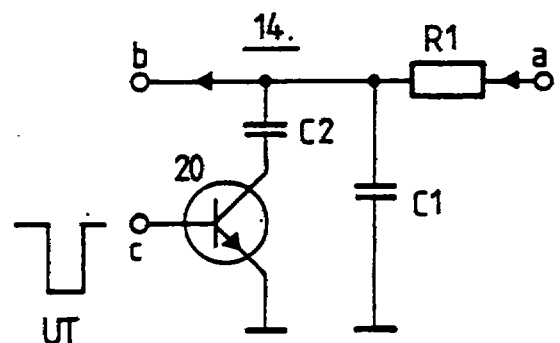


Fig.3

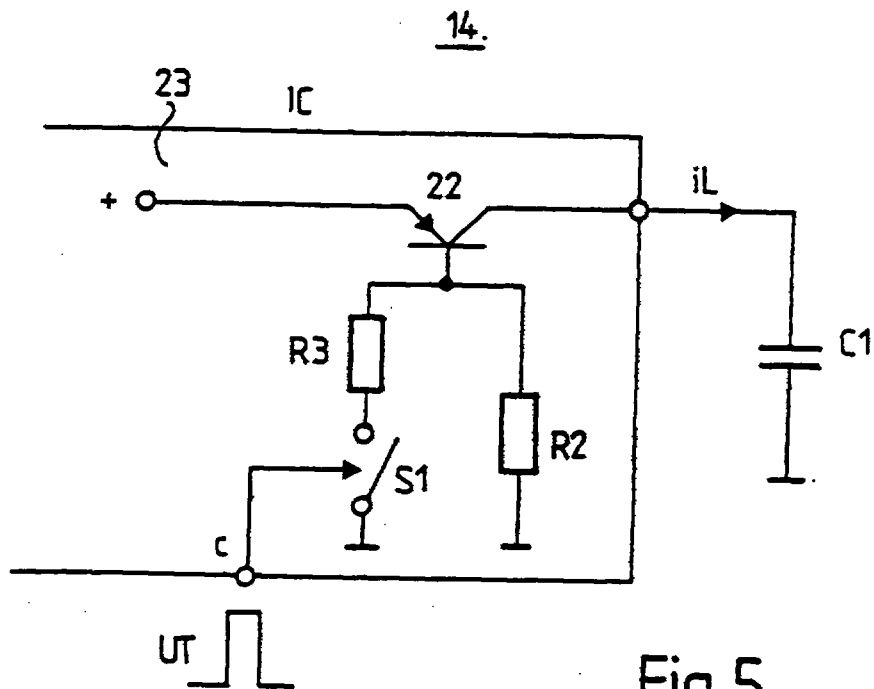
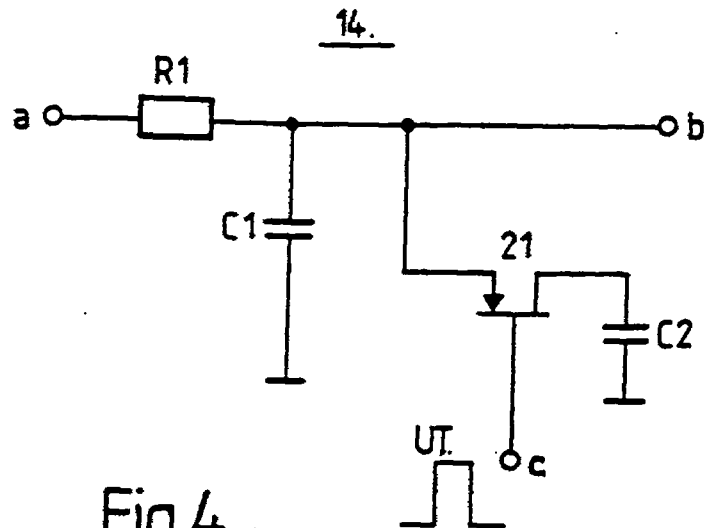
This Sheet Has Been Replaced



THIS SHEET HAS BEEN
REPLACED

28 JAN 1997

2



This Sheet Has Been Replaced

THIS SHEET HAS BEEN
REPLACED

30 SEP 1997

Circuit for controlling the amplitude of the chrominance carrier amplitude in a videorecorder

The invention is based on a circuit according to the first part of claim 1.

A video recorder, like a television receiver, is provided with a so-called ACC (automatic colour control) circuit in which the amplitude of the colour subcarrier scanned from the tape is regulated to its desired value by evaluation of the amplitude of the colour sync signal. On playback, two conflicting demands apply to the time constant of this control circuit.

1. The comb filter used for eliminating colour crosstalk has a finite filtering depth and operates usually with a delay line for one line with NTSC or two lines with PAL. A prerequisite for a good filtering effect is that the colour subcarrier on playback is fed to the comb filter unalienated, i.e. with the phase and amplitude errors caused by the crosstalk. The consequence of this is that the colour subcarrier may be stabilised during one or two lines, only to such a small extent that no material impairment of the crosstalk attenuation occurs. In case of a regulation which happens too fast a horizontally sorted noise appears in the colour.

2. On the other hand, the regulation must be so fast that level differences of the video heads which become relevant after the head change-over, as well as level break-downs, caused by the guiding of the tape, in the head cylinder run-in during the vertical blanking interval and the following picture overscanning are stabilised. If the regulation is too slow then colour flicker appears at the upper picture edge.

With the necessary compromise, more account is normally taken of point 1 than point 2 because

- additional noise would be severely disturbing in view of the colour quality

30 SEP 1997

being reduced through the principle of the colour recording,

- level differences can be kept relatively small by using paired video heads,
- level break-downs in the head cylinder run-in are small if the tape is carefully guided, and
- the ACC further reduces level differences which may not be stabilised in the connected television apparatus.

The copying from one video recorder to another is particularly critical as regards colour flicker.

From JP-A-55044233 there is known the switching over of the time constant, but in such a way that during the picture, a smaller time constant is employed.

The object of the invention is to avoid, using simple means, the above-mentioned disadvantages and to cause the colour subcarrier amplitude to be stabilised in an optimum way not only after head change-over but also during picture scanning. This object is achieved by means of the invention specified in claim 1. Advantageous further developments of the invention are specified in the dependent claims.

With the solution according to the invention, therefore, the slower stabilisation is chosen, which is more favourable for the actual picture i.e. a large time constant in the path of the regulating voltage or, in the case of an ACC with constant current, a small charging current. At the start of the picture or after the head change-over pulse, in any case during the period in which the electron beam is not visible on the picture screen owing to flyback or overscanning, a switch-

over occurs to a quicker stabilisation, i.e. a smaller time constant of high charging current.

Here, the fact that at the start of a picture during approximately 20 lines no visible picture is written and thus possible colour flicker and transient phenomena remain invisible anyway is exploited in an advantageous way. This solution achieves that after head change-over, when the scanned colour subcarrier has gone through the phase shift caused by the head change-over and the amplitude break-down, it is subjected to a stabilising adjustment to its desired amplitude which adjustment is as fast as possible and the amplitude of the colour subcarrier has already reached its desired value at the beginning of the visible picture, approximately at line No.20. Thus, the invention attains an optimum compromise between a large time constant which is, while advantageous and necessary for a picture reproduction without horizontal noise, of disadvantage for a quick regulation after head change-over and between a small time constant which is, while advantageous for a quick stabilisation after head change-over, however, of disadvantage in the picture in view of horizontal noise. When applying the invention, the large time constant during the picture can even be increased compared to prior values resulting in advantages with respect to horizontal noise without there being the danger of colour flicker appearing at the upper visible picture edge.

The invention is explained below with reference to the drawing. There is shown

Fig.1 a block circuit diagram of a playback circuit for a video recorder constructed in accordance with the invention.

Fig.2 curves for illustrating the operation of the circuit according to Fig. 1, and

Figs.3-5 circuit example for the switching-over of the time constant.

In Fig.1 the video carrier BT frequency modulated with the luminance signal and the colour subcarrier Fm recorded below the frequency spectrum of said video carrier and lowered in frequency, also referred to as colour under carrier, are scanned from the magnetic tape 1 by means of two rotating magnetic heads 2,3. The video carrier BT is fed via the high pass 4 with a limit frequency of 1.2 MHz to the FM demodulator 5 which supplies the luminance signal Y to the adding stage 6. The colour subcarrier Fm is fed via the band pass 7 with a pass range at 627 kHz to the adjustable amplifier 8 and then, from the output thereof, as a regulated colour subcarrier Fmg to the mixer stage 9 which is also fed with a mix carrier from the oscillator 10. The mixer stage 9 again supplies the colour subcarrier F with the original PAL colour subcarrier frequency of 4.43 MHz to the adding stage 6. Therefore, the colour composite signal FBAS is available at the output 11. The colour sync signal is evaluated from the colour subcarrier Fmg at the output of amplifier 8 using the gate 12. Gate 12 is controlled to be conductive by the pulse BG (burst gate) for the duration of the colour sync signal. The colour sync signal is rectified in the rectifier 13 and generates a regulating voltage Ur at the regulating input b of amplifier 8 which regulating voltage regulates the amplitude of the colour subcarrier Fmg to the desired value. A time constant element having a large time constant of 50 to 70 lines, corresponding to about 4 ms, is effective between the output a of rectifier 13 and the input b of amplifier 8.

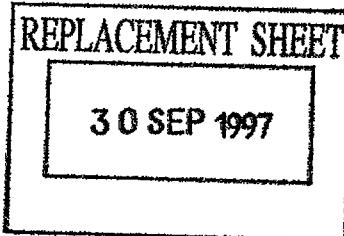
The signal is picked up using the change-over switch 15 alternating from field to field by the two video heads 2,3. The change-over switch 15 is actuated in each case by means of the switching voltage Us at the end of a field. Us is generated in the control circuit 16. This is controlled by a rotating head cylinder carrying the heads 2,3 by means of a head cylinder pulse Uk which indicates the

respective angular position of the head cylinder. The circuit described so far is known.

The switching voltage U_s from control circuit 16 is also fed to the pulse former 17. According to Fig.2, this generates, in each case at an edge of the switching voltage U_s , i.e. always at the start of a field, a pulse U_T with a duration A of about 25 lines corresponding to about 1.6 ms. This pulse is fed 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, which is effective during the picture, over to a smaller value T_2 of about 1 ms during the time period A . The period A approximately corresponds to the period during which the electron beam is not visible owing to overscanning on the picture screen. The reduced time constant T_2 serves to ensure that the amplitude of the regulated colour subcarrier F_{mg} , after the phase jump and amplitude break-down caused by the head change-over, again has its desired value at the start of the visible picture, i.e. at the end of the period A in Fig.2. Thus colour interference in the form of colour flicker at the upper visible picture edge is avoided.

The circuit can be constructed in such a way that the time constant during the time period A rises from the small value continually to large value.

Fig.3 shows a circuit for switching-over the time constant T . The time constant element 14 contains a resistor R_1 and two capacitors C_1 and C_2 . During the actual picture the transistor 20 is controlled to be conductive by the voltage U_T at the terminal c . C_1 and C_2 lie in parallel and form said large time constant T_1 . During the period A , transistor 20 is blocked by the switching voltage U_T . Therefore, the capacitor C_2 is not effective. C_1 then forms, together with R_1 , the smaller time constant T_2 . Preferably, the switching voltage U_T connects and disconnects a capacitor at a terminal of an integrated circuit representing the



remainder of the circuit.

Fig.4 shows a variation to the circuit according to Fig.3 in which the switching over of the time constant, i.e. the connecting and disconnecting of capacitor C2 is effected by means of a field effect transistor 21. The switching voltage U_T is applied to the control electrode c of said field effect transistor, as in Fig.3. During the time period A, the FET 21 is blocked by the switching voltage U_T , and it is conductive for the rest of the time, i.e. during the picture scanning, so that C2 is switched in parallel with C1 for achieving the large time constant.

Fig.5 shows an example for the switching-over of the time constant in which the charging current i_L for the capacitor C1 is switched over. In an IC 23 a constant current source with the transistor 22 and the resistors R2 and R3 is provided which supplies a charging current i_L for the capacitor C1 for reverse charging in accordance with the actual regulation. The value of the charging current i_L is switched over by the switching voltage U_T in that resistor R3 is switched, via switch S1, parallel to resistor R2. During the period A the switch S1 is closed by U_T so that the resistance in the base circuit is correspondingly reduced. Thus, the value of the charging current i_L is increased, i.e. C1 is reverse charged more quickly, corresponding to the reduced time constant T2. Here, the switching-over of the time constant happens, therefore, not by connecting or disconnecting a capacitor within a filter section but, rather, by means of switching over the charging current i_L for the filter capacitor C1 which otherwise has the same function as in Figs. 3 and 4.



30 SEP 1997

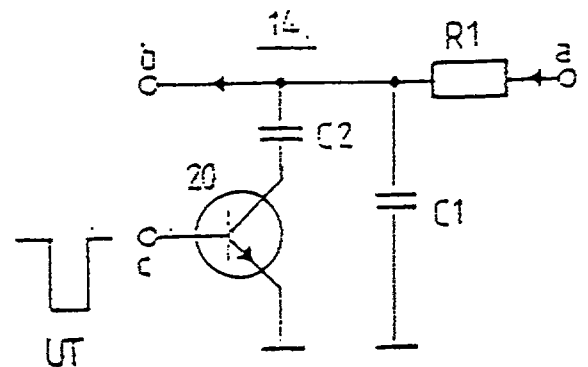
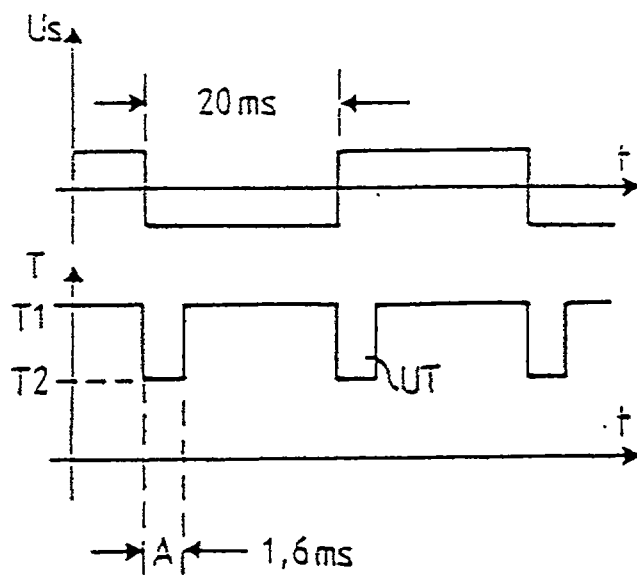
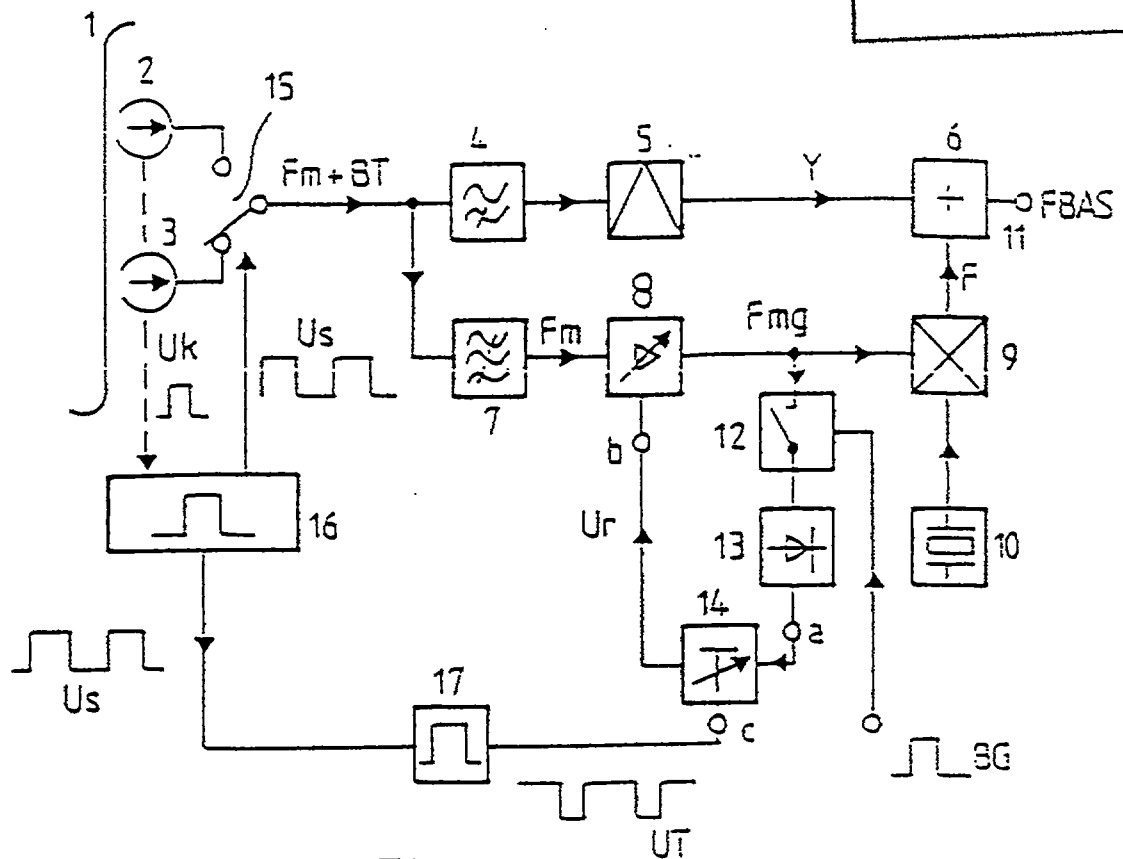
Claims

1. A circuit for regulating the colour subcarrier amplitude in a video recorder in which during reproduction a regulating voltage (U_r) derived from the amplitude of the colour sync signal regulates the amplification of a colour subcarrier amplifier (8) via a time constant element (14), characterised in that, during a time period (A) at the start of the picture in which the electron beam is not visible on the picture screen through overscanning, the time constant (T) is switched over from a large value (T_1) effective during the visible picture to a value (T_2) smaller than said large value.
2. A circuit according to claim 1, characterised in that the time period (A) with the smaller value (T_2) of the time constant (T) amounts to approximately 20 lines.
3. A circuit according to claim 1, characterised in that the small time constant (T_2) during said time period (A) is approximately 1 ms, and the large time constant (T_1) during the rest of the picture amounts to approximately 4 ms.
4. A circuit according to claim 1, characterised in that the time constant (T) is controlled by a control voltage (U_T) in such a way that it climbs, during said time period (A), continuously from the small value (T_2) to the large value (T_1).
5. A circuit according to claim 1, characterised in that a filter section with a resistor (R_1) and a capacitor (C_1) is arranged in the path of the regulating voltage U_r , and a further capacitor (C_2) can be switched in parallel to said capacitor (C_1) by means of a switch (20,21,S1).
6. A circuit according to claim 5, characterised in that the switch is formed by a transistor (20) or a field effect transistor (21).



7. A circuit according to claim 1, characterised in that the switching-over of the time constant is effected by the value of the charging current (i_L) for the capacitor (C_1) of the filter section (C_1, R_1) being switched over.

8. A circuit according to claim 7, characterised 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 capacitor (C_1) arranged externally of the integrated circuit can be switched over by means of a switching voltage (U_T) applied to a control terminal (c) of the integrated circuit (23).



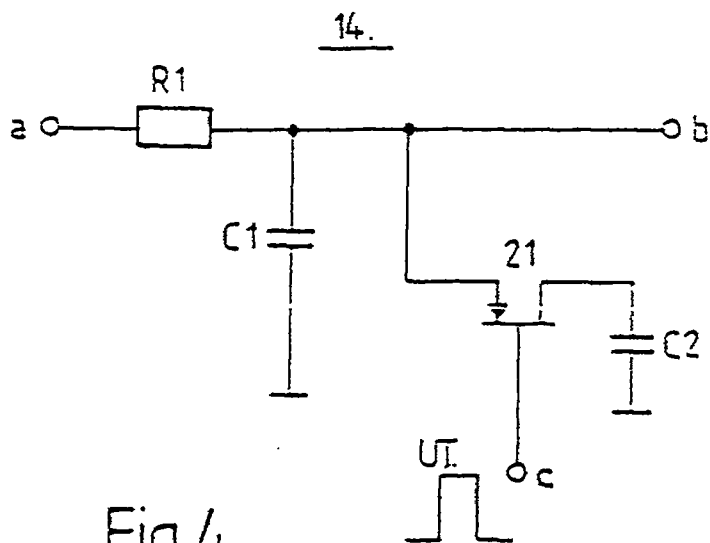


Fig.4

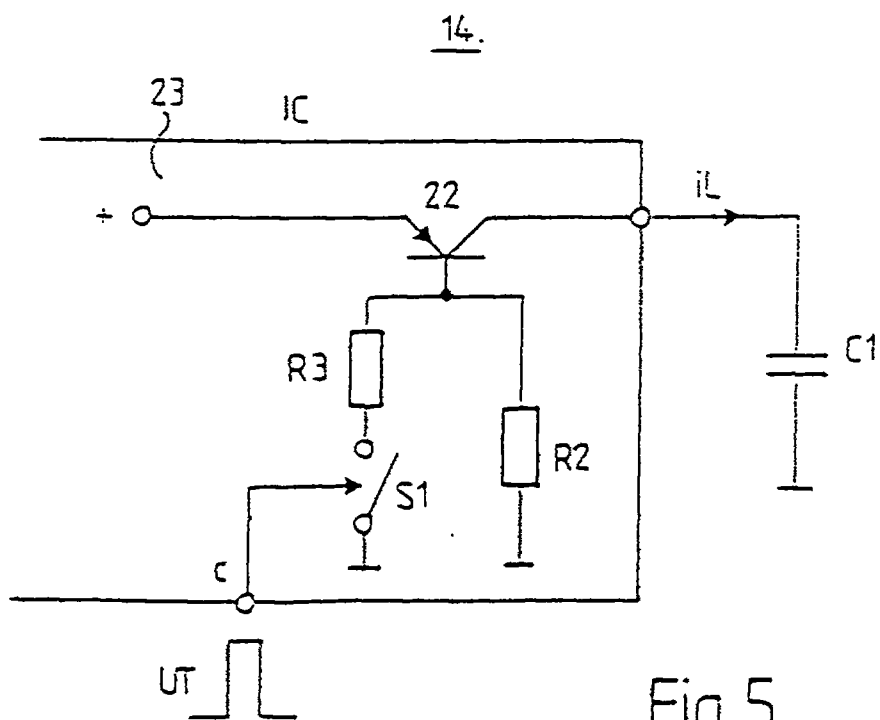


Fig.5