

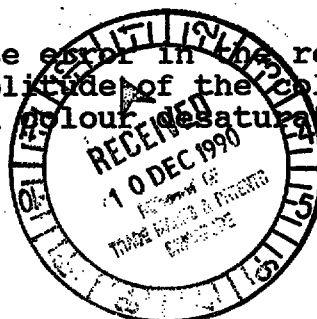
In a PAL television receiver the colour carriers of two chronologically successive lines are, as is known, added in an adding stage and subtracted in a subtracting stage in the PAL delay decoder. Thus, the quadrature modulated colour carrier is split up into two colour carrier frequency signals corresponding to the two modulation axes U and V which are released by the intrinsic phase modulation of the colour carrier and are each amplitude modulated by one of the two colour difference signals (B-Y) and (R-Y) with suppressed carriers.

The two colour carrier frequency signals are supplied to two synchronous demodulators which deliver the video frequency colour signals (B-Y) and (R-Y) at their output. Also a reference carrier with the colour carrier frequency and constant phase is required for the synchronous demodulators. This reference carrier is produced, as is known, in a PLL phase regulating circuit, which is synchronised by the colour synchronous signal. The colour synchronous signal is only transmitted during the back porch, so that for the majority of the line time there is no synchronising data available and therefore a relatively high time constant is required in the path of the regulating voltage of the PLL circuit.

The time constant has to be as small as possible for a short oscillator capture time. However, if there is background noise the time constant has to be as large as possible for a small phase deviation, known as phase jitter.

It is also known DE-C 11 89 124, to use the said two colour carrier frequency signals additionally for synchronising the reference carrier oscillator during the forward line sweep time. This is possible, because these signals are released by the phase modulation. Owing to the type of modulation with a suppressed carrier the phase may however vary between 0° and 180° . This is why it is necessary in such a circumstance to release the signals from the 180° shifts. It is also known (DE-C 11 97 500), to bring the two colour carrier frequency signals to the same phase and to use their sum total for synchronising the reference carrier oscillator. In this known solution synchronising data is available almost continuously, i.e. the colour synchronous signal during the back porch and the said colour carrier frequency signals during the forward line sweep time.

During demodulation the said phase error in the reference carrier results in a reduction in the amplitude of the colour signals obtained and therefore results in colour desaturation. This is



tolerable when signal saturation is low, but leads to errors in the displayed image especially when saturation is high.

The object of the invention is to provide an innovative circuit of the type just described, in which phase errors in the reference carrier produced are reduced, and in fact are reduced independently of the time constant of the filter in the PLL phase regulating circuit.

This object is achieved by the invention described in Claim 1. Advantageous further refinements of the invention are described in the dependent claims.

A circuit is also known (DE A 18 12 760), in which the colour carrier frequency output signals are added to the adding stage and subtracting stage of a PAL decoder and supplied to an additional phase comparison stage which is independent of the PLL circuit of the reference carrier oscillator and which on the other hand is fed with the reference carrier. The output voltage of this additional phase comparison stage acts additionally as a regulating voltage on the reference carrier oscillator. Also the amplitude and the polarity of the colour signal obtained from the colour carrier frequency signal are not evaluated, so as to through-connect a colour carrier frequency signal or through-connect the inverted colour carrier frequency signal to the input of the phase comparison stage depending on the amplitude and the polarity of said signal.

In the solution in accordance with the invention, it is not necessary to eliminate the 180° phase shifts in the colour carrier frequency signals. Rather the polarity of the demodulated colour signal (B-Y) or (R-Y) is used as a criterion for whether the colour carrier frequency signal has the phase position 0° or 180° . Depending on this the colour carrier frequency signal or the inverted colour carrier frequency signal is supplied to the phase comparison stage of the PLL circuit. This is because the phase change in the colour carrier frequency signal occurs when the polarity of the modulated colour difference signal is reversed.

Basically, both colour carrier frequency signals may be used for synchronisation. When changing the signal which corresponds to the switched over modulation axis, the line frequency PAL switch over has to be cancelled with a line frequency switch and the signal has to be brought into phase with that corresponding to the modulation axis which has not been switched over. In particular, when using two colour carrier frequency signals it is possible to achieve synchronisation of the oscillator, which is as continuous as possible chronologically.



The above considerations are based on the assumption that the colour signals in two successive lines are identical. With vertical colour shifts this no longer applies. The said colour carrier frequency signals no longer have exactly the phase of the two modulation axes. The reference carrier oscillator may then be synchronised by these signals to an incorrect phase. Therefore in accordance with one embodiment of the invention evaluation of the colour carrier frequency signal for synchronisation is deliberately prevented when there is a phase deviation. The phase deviation can be determined by demodulating a colour carrier frequency signal, e.g. FU, at the modulation axis which is perpendicular thereto, e.g. V. The product of demodulation is zero with the correct phase. When there is a phase deviation it rises and may serve to prevent input.

The invention is explained by means of the drawings with an embodiment.

In the figure the two colour carrier frequency signals FU and FV are supplied from the outputs of the matrix of a PAL delay decoder to two synchronous demodulators 1,2, which deliver the video frequency colour difference signals (B-Y) and (R-Y) at their outputs. The synchronous demodulators 1,2 are fed by the reference carrier oscillator 3 with reference carriers having the phase positions 0° , 90° and -90° , and the line frequency PAL switch 4 lies in front of the synchronous demodulator 2. This is actuated from the terminal 5 by means of the half line frequency switching voltage 6. The reference carrier oscillator 3 forms a PLL phase regulating circuit together with the phase comparison stage 7 and the filter 8. The circuit described so far is known. In the following the synchronisation of the oscillator 3 is described in greater detail.

Synchronisation through the colour synchronous signal

The colour synchronous signal component which corresponds to the modulation axis which has not been switched over is contained in the colour carrier frequency signal FU and has the constant phase of the axis U. The gating pulse BG which appears during the duration of the colour synchronous signal passes from the terminal 9 via the adding stage 10 to gate 11 and makes said gate conduct so that the colour synchronous signal component reaches the phase comparison stage 7. The pulse BG also passes from the terminal 12 via the adding stage 13 and the gate 14 which is assumed to be conductive to the gate 15 and makes this conduct. The result is that the regulating voltage which appears during the duration of the colour synchronous signal component and the pulse BG passes from the output of the phase comparison stage 7 to the filter component 8 and becomes effective in regulating the oscillator 3.

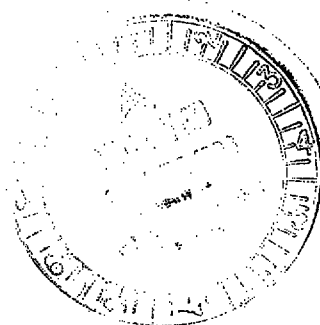
The colour difference signal (B-Y) is supplied additionally to a threshold value circuit having the two differential amplifiers 16, 17, to which two reference voltages $Ur1+$ and $Ur1-$ are applied. If the signal (B-Y) exceeds in a positive direction a certain voltage value specified by $Ur1+$, then a pulse 18, arises at the output of the differential amplifier 16, said pulse 18 extending in accordance with the amplitude of (B-Y) over the whole of the forward line sweep time or a part thereof. The pulse 18 reaches the gate 11 via the adding stage 10 in addition to the pulse BG and makes said gate 11 conductive. As a result the signal FU is through connected by the gate 11 also during the forward line sweep time for synchronising the oscillator 3 to the phase comparison stage 7. This signal then has, for example in accordance with the positive polarity of (B-Y), the phase 0° of the modulation axis U which has not been switched over, i.e. the same phase as the colour synchronous signal component.

If the polarity of the signal (B-Y) is negative, the phase of the signal FU is 180° and must not be used any longer for synchronisation. With a negative signal (B-Y) above a certain amplitude the differential amplifier 17 delivers the pulse 19, which switches the inverted colour carrier frequency signal FU with the gate 20 to an input of the phase comparison stage 7. Since the signal FU now has a phase position of 180° , the axis -U, but the inverted signal FU is through connected, the phase comparison stage 7 in turn receives a signal with the phase 0° of the modulation axis U which has not been switched over. The inputs of the phase comparison stage 7 which are fed from the gates 11, 20 are equivalent and may be joined together into one input. The polarity of (B-Y) determines therefore whether the signal FU or the signal FU is through connected for synchronisation.

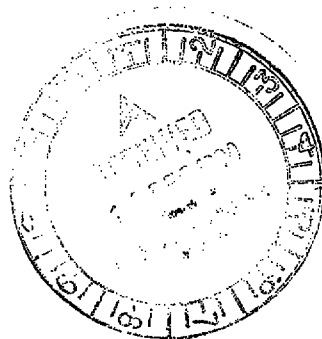
Signals FV and FV may also be treated in a similar way, if the said signal has previously been released from the PAL switchover and from the 90° offset as compared to the signal FU. The oscillator 3 would then be synchronised alternately by the colour synchronous signal component of signal FU and by the signals FU, FU, FV and FV, depending on which amplitude these signals have. When the last mentioned four signals are zero, synchronisation may not take place during the forward sweep time. However, this state does mean an image devoid of colour, for which the correct phase of the reference carrier is effectively meaningless.

The signal FU is supplied to a further synchronous demodulator 21, which on the other hand receives the reference carrier with the phase 90° . Since the signal FU has the phase of the axis U, the synchronous demodulator 21 does not deliver any signal when the phase is correct. When there is a phase deviation in the signal FU from the phase of the modulation axis U, i.e. for example with colour shifts from line to line, then a voltage appears at the output of the synchronous demodulator 21. This voltage is supplied to the threshold value circuit having the two

differential amplifiers 22,23, the threshold values of which are fixed by applied reference voltages U_{r2+} and U_{r2-} . As soon as the voltage at the output of the synchronous demodulator 21 overshoots the voltage values fixed by U_{r2+} and U_{r2-} either in a positive or a negative direction, the pulse 24 appears at the output of the differential amplifiers 22,23. The pulse 24 makes the gate 14, which was assumed to be conducting in the observations so far, non-conducting. As a result, the regulating voltage arising through the signals FU or FU is prevented from reaching the output of the phase comparison stage 7 and the filter component 8 and the regulating voltage for the oscillator 3 is prevented from having an effect in the sense of an incorrect phase of the reference carrier. The effect of the signals FU and FU on synchronisation of the oscillator 2 is therefore



deliberately blocked in this case. The pulse BG from the terminal 12 nevertheless reaches gate 15 via gate 14, because the signal FU is not present during the line fly back time and thus the pulse 24 cannot appear during the duration of the pulse BG or the colour synchronous signal and thus the gate 14 in any case remains conducting during the line fly back time. The gate 14 prevents a phase error in the reference carrier from the oscillator 3, when there are vertical colour shifts in which the signal FU has an incorrect phase during the forward line sweep time and is no longer suitable for additional synchronisation.



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