

Synchronising signal separating circuit for a television receiver

The invention is based on a synchronising signal separating circuit for a television receiver in accordance with the first part of claim 1.

In a television receiver, the line deflection circuit is provided with a high time constant in order to compensate for disturbances in the form of missing or temporarily wrongly phased line synchronising pulses. A high time constant of this type is possible because the line synchronising pulses coming from the transmitter are practically constant, with a high degree of accuracy in phase and frequency, and phase displacements in the line raster practically never occur.

In practice however, video signals having appreciable variations in frequency and in the phasing of the line raster are also proffered to the television receiver. This is particularly the case when the video signal is delivered by a video recorder because the line frequency and the phasing of the line raster are then no longer constant, due to fluctuations in speed, stretching of the tape and other such effects. In particular, sudden alterations in the phasing of the line raster occur when the scanning video head runs at an angle across a plurality of adjacent tracks during a search process in a video recorder. If the time constant of the line deflection means in the television receiver then has the said high value, the line deflection means cannot follow the new phase quickly enough and there will be geometrical distortions in the reproduced image. It is then necessary, and known, to switch the time constant in the line synchronising means to a lower value for such a signal.

The sought after high degree of immunity to disturbance thus leads to a high time constant, while a signal having line pulses fluctuating in frequency or phase requires a smaller time constant. Consequently, a compromise is required as regards the dimensioning of the line deflection circuit in order to satisfactorily meet the two demands.

The object of the invention is to construct a synchronising signal separating circuit such that no unsatisfactory compromise is needed, but rather, that the requirements in respect of a high time constant for immunity to disturbance and a low time constant for adapting to signals having frequency and phase errors are fulfilled to the same extent. This object is achieved by the invention defined in claim 1. Advantageous developments of the invention are specified in the appendant claims.

Thus, with the solution in accordance with the invention, the structure of the proffered video signal is initially investigated in the control circuit. Thereby, there are three particular states. The line synchronising pulses may exhibit absolutely constant frequency and phase as for a transmitted signal, i.e. there are no disturbances in the time raster. In a second case, just one line synchronising pulse for example is displaced in phase within the line raster, or, is completely missing, while the line raster is not disturbed. In a third case, the whole line raster is displaced in phase by one time unit with respect to the previous line raster as from the beginning of the disturbance whereby the frequency may continue to be the same. In the first case and the second case, the control circuit does not have any affect on the synchronising signal separating circuit which is provided with a flywheel stage. In these two cases, there is only a temporary disturbance which is compensated for by the flywheel stage which continues to run unchanged. In the third case however, it is desired, and necessary, that the separating circuit is set as quickly as possible to the new phasing of the raster. Initially however, this is not possible for the effective flywheel stage which exhibits the high time constant. Consequently, in the third case, the flywheel stage is deliberately temporarily switched off, a time constant being substantially reduced for example. The separating circuit can then be set, in the desired manner, to the new phasing of the line raster with practically no response time. As soon as this has occurred, the flywheel stage is re-activated after a few lines or within one line i.e. the effective time constant is increased again so that the wanted

immunity to disturbance is once more provided in the desired manner.

The said measure, namely the rendering inoperative of the flywheel stage, should, in so far as possible, occur immediately at the beginning of the disturbance, with the jump in the phase angle of the line synchronising pulses for example. On the other hand however, the control circuit needs a plurality of lines in order to investigate the structure of the line synchronising pulses. Thus, in a manner of speaking, the circuit has "to be able to see into the future" in order to carry out, without any delay, an action whose necessity is not actually perceived until some time later. In order to make this possible, the delivered video signal is supplied to the separating stage via a delay stage of several lines. It is thereby possible to institute the action, which is only perceived to be necessary several lines after the beginning of the disturbance, right at the beginning of the disturbance.

Thus, with the solution in accordance with the invention, the advantage of the flywheel stage having the large time constant for suppressing disturbances is combined with the advantages of the small time constant for adapting to a fluctuating signal in that the circuit automatically adapts itself to the current structure of the signal. For a transmitter signal which is not interfered with in any way, or a signal subject to only a short-term disturbance during just one line, the flywheel stage and the high time constant remain effective. For a signal including a disturbance in the form of a sudden displacement in the phasing of the line raster however, the flywheel stage is automatically de-activated and thus the wanted small time constant becomes temporarily effective.

The invention will be explained hereinafter with the aid of the drawing. Therein

Fig. 1 shows a simplified block circuit diagram of the solution in accordance with the invention,

Fig. 2 curves for explaining the manner of operation of the circuit in accordance with Fig. 1,

Fig. 3 a block circuit diagram for one embodiment of the control circuit and

Fig. 4 diagrams for explaining the effects of disturbances to the line deflection means.

In Fig. 1, the proffered video signal V including the line synchronising pulses Z, which may be coming from a television transmitter, a video recorder or some other signal source, is supplied from the terminal 1 via the delay stage 2 having a delay time in the order of magnitude of three lines to the synchronising signal separating stage 3 which delivers the separated line synchronising pulses Z at its output 4. The flywheel stage 5, which is illustrated symbolically by means of an oscillatory circuit, is associated with the separating stage 3. The flywheel stage 5 produces a high time constant in the separating stage 3 which, for example, is such that the failure or a temporarily altered phase angle of just one line synchronising pulse is suppressed. Moreover, the video signal V reaches the control circuit 6 which investigates the time sequence of the phasing of the line synchronising pulses.

The manner of operation of the circuit in accordance with Fig. 1 will be explained for two extreme cases with the aid of Fig. 2. Fig. 2a depicts a video signal V that is not subject to disturbance and which has a constant separation in time between the line synchronising pulses Z without any frequency and phase errors. With a signal of this type, the control circuit 6 does not have any affect on the separating stage 3, 5 i.e. the flywheel stage 5 remains connected via the closed switch S. In accordance with Fig. 2b, only the line synchronising pulse Z1 has an incorrect phase angle during the line between the time points t_2 and t_3 , while the line synchronising pulses at t_4 , t_5 , t_6 etc in the succeeding lines again have a phase angle which is not subject to disturbance. Likewise in this case, the control circuit 6 does not have any affect on the separating circuit 3,

5. Thus, the incorrect phase angle of Z1 is suppressed by the effect of the flywheel stage 5 in the stage 3 and does not appear at the output 4. In accordance with Fig. 2c, there is a phase jump at the position of the line synchronising pulse Z between t_2 and t_4 caused for example, by the scanned video head in a video recorder running from one helical track onto an adjacent helical track. Beginning with the line synchronising pulse Z2, the phasing of the line raster is thus suddenly altered with respect to the phasing of the line raster in accordance with Fig. 2a but remains unchanged thereafter. For this case in accordance with Fig. 2c, the control circuit 6 generates a control signal U_s . U_s opens the symbolic switch S and thereby separates the flywheel stage 5 from the separating stage 3. The otherwise effective large time constant of the separating stage 3 is preferably switched to a substantially smaller value. Due to the separation or decoupling of the flywheel stage 5, the separating stage 3 can now be very quickly set, approximately in the region of the time point t_4 , to the newly altered phase angle of the line synchronising pulses in accordance with Fig. 2c as from t_4 . Shortly thereafter, e.g. two to three lines after the beginning of the disturbance, the switch S is re-closed by the control signal U_s and consequently the flywheel stage 5 is coupled-in again and the time constant raised once more.

Fig. 3 shows a block circuit diagram for the implementation of the control circuit 6. The video signal V arrives from the terminal 1 at the synchronising signal separating stage 7 which operates without a flywheel stage, i.e. with practically no time constant, and only separates the line synchronising pulses Z from the video signal amplitude selectively. The separated line synchronising pulses Z, which thus exactly correspond in time with the line synchronising pulses Z of the video signal at the terminal 1, then reach the phase comparison stage 8. Moreover, the video signal V is fed to the second synchronising signal separating stage 9. This, however, always operates with the flywheel stage indicated by the oscillatory circuit i.e. with a high time constant. The line synchronising pulses Z' at the output of the stage 9 thus do not follow sudden alterations in

the time position of the proffered line synchronising pulses. The time position between the line synchronising pulses Z and Z' is now compared in the phase comparison stage 8. Each deviation in phase between Z and Z' i.e. between the line synchronising pulse Z2 of the delivered video signal V and the corresponding line synchronising pulse coming from the separating stage 9 at t_3 in accordance with Fig. 2 for example, is detected in the phase comparison stage 8 and supplied to the connected store 10. The store 10 now stores the results of the phase deviation according to magnitude, direction and number. As soon as a phase deviation has been detected in a plurality of successive lines, i.e. the state in accordance with Fig. 2c is detected, the control signal U_s , which induces the decoupling of the flywheel stage 5 in accordance with Figs. 1, 2 in the manner described, is generated via the pulse stage 11. U_s is generated for example, when a phase deviation of the line synchronising pulses with respect to the preceding raster is detected over three successive lines.

Fig. 4 shows different shapes of vertical lines illustrated on the picture screen for a signal from a video recorder.

Fig. 4a shows the normal reproduction process without any errors worth mentioning in the signal. The vertical lines in the picture are then free from distortion.

Fig. 4b shows the state for a search process. Due to the scanning heads successively running over adjacent tracks and also reaching tracks which do not have a matching azimuthal angle, there is a disturbed zone 12 in the form of a noise bar in the middle of the image.

Fig. 4c shows the same thing for a recorder in which it is ensured that a scanning always occurs with the correct azimuthal angle by switching over a plurality of heads. A loss of signal then no longer occurs and the disturbance bar 12 in accordance with Fig. 4b is avoided. However, due to the heads successively running over different tracks and the occurrence of a switching between different heads, there is a phase jump of the line

synchronising pulses 2. If the line deflection circuit cannot follow this jump in phase quickly enough, then there are distortions in accordance with Fig. 4c in the form of a chipping of the vertical lines.

Fig. 4d depicts the case including the described decoupling of the flywheel stage. Since the cause for the distortion in accordance with Fig. 4c is appreciated and the effect is counteracted in good time by decoupling the flywheel stage, there is only a short disturbance in the course of one or a plurality of lines as is indicated by lines 13, 14. The distortion in accordance with Fig. 4c, which results from too high a time constant, is avoided.

Claims

1. Synchronising signal separating circuit for a television receiver including an amplitude selective stage and a flywheel stage which introduces a response time into the separation that serves for suppressing disturbances, characterised by the following features:

a) a delay circuit (2) is located in the path of the video signal (V) to the separating stage (3),

b) prior to the delay stage (2), the video signal (V) is applied to a control circuit (6) which generates a control signal (Us) for the following two cases of disturbance by evaluating the time positions of line synchronising pulses (Z) of a plurality of successive lines

just one line synchronising pulse (Z1) is missing within the line raster, or, it has an incorrect time position, and the following line synchronising pulses are then correct once more with respect to the line raster, the whole line raster following a disturbance is displaced by one time unit (ΔT) from the beginning of the disturbance.

c) in the second case of disturbance, the control signal (Us) temporarily makes the flywheel stage (5) inoperative.

2. Circuit in accordance with Claim 1, characterised in that, the delay time of the delay stage (2) amounts to a plurality of lines.

3. Circuit in accordance with Claim 1, characterised in that, the delay stage (2) is constructed as a digital store.

4. Circuit in accordance with Claim 1, characterised in that, the rendering inoperative of the flywheel stage (5) is effected by reducing a time constant which is effective in the separating stage (3).



5. Circuit in accordance with Claim 1, characterised in that, the control circuit (6) contains a second separating stage (9), which incorporates a flywheel stage and is controlled by the signal, and a phase comparison stage (8) which evaluates the time position between the supplied line synchronising pulses and the line synchronising pulses generated therefrom in the second separating stage (9) and generates the control signal (Us) therefrom.

6. Circuit in accordance with Claim 1, characterised in that, a store (10) for the phase deviations that have been determined in terms of number, magnitude and direction is connected to the phase comparison stage (8).

7. Circuit in accordance with Claim 5, characterised in that, a counter, which counts the phase deviations between the line synchronising pulses (Z) the successive lines that have been determined in the phase comparison stage (8) and generates the control signal (Us) upon reaching a predetermined counter state (3), is connected to the output of the phase comparison stage (8).

