

The invention relates to a method for controlling the phase of motors in video recorders when playing back video signals recorded on a magnetic tape, while using a phase comparison between the head switching pulses and the synchronous pulses recorded on a track of the magnetic tape and having a facility for displacing the desired phase position of the motor.

A method for controlling the phase of a head drum motor according to the preamble of the patent claim is known from Patent Specification US-A-36 51 276.

In video recorders the tracks are scanned by several rotating video heads. So that the heads scan the tracks associated with them optimally during playback, phase control of the tape transport motor is undertaken with the aid of synchronous pulses derived from the vertical synchronous signals and recorded too when recording the video signals, so that the video heads are each positioned over the tracks to be scanned. The synchronous pulses are tapped during playback by a control head. The said control head has to be precisely adjusted when manufacturing the video recorder, so that any desired videotape may be correctly scanned. The VHS standard for example prescribes that the control pulse should be recorded 6.5 lines after the vertical synchronous pulse. This requires high accuracy of the setting of the control head. If another person's tapes are played by means of a video recorder, it is often the case that the video tracks are no longer optimum in relation to the control pulses and that as a result the phase of the tape advance no longer coincides with an optimum track scan. Therefore, it is known to readjust the phase by consciously shifting the control pulse such that the video heads are correct with respect to the tracks to be scanned. A so-called tracking setter operable from outside serves this purpose, and makes it possible to displace the desired value of the control pulse from a mid-position, which corresponds to the standard position. This is possible within the limits ± 90 degrees in relation to the head switching pulse. This occurs by displacing a potentiometer, which changes the time constant of a multivibrator and thus shifts the flank of the control pulse. When shifting in one or other direction the catchment area of the phase control is decreased by the fact that the limits are fixed at $+90$ and -90 degrees. With a phase displacement of $+30$ degrees for example the catchment area is theoretically at $+60$ degrees to -120 degrees. Since the catchment area effectively relates however symmetrically to the set desired position, it decreases to ± 60 degrees.

The object underlying the invention is to achieve a phase control having a tracking setting of ± 180 degrees i.e. over the whole region of the angle and beyond. This object is achieved by the invention provided in the characterising part of the patent claim. It has the advantage that when setting to a certain phase value the catchment area remains over ± 180 degrees

symmetrically, since the control is not limited to positive nor to negative deviations whereas the known prior art is.

Below the invention is described with the aid of the drawings.

Figure 1 shows a diagram of operating sequences of the method applied for;

Figure 2 serves to elucidate the phase control.

Initially, a counter is reset by the head switching pulse. From this point in time onwards it counts clock pulses, in which the counter condition achieved is held in a store at the point in time of the synchronous pulse detected by means of the control head KK. The stored result is passed to a comparator stage in which the measured actual value is compared to a predeterminable desired value, while the desired value is subtracted from the actual value. This actual value is to be controlled on to the desired value. Thus it is established in an enquiry whether the actual value corresponds to a value which is below a deviation of ± 180 degrees. If this is the case the regulating magnitude R is formed from this deviation and acts on the servo circuit of the capstan motor after digital/analogue conversion, in order to reduce the deviation until it has become 0.

If the deviation is greater than ± 180 degrees, then a counting value is deduced from the ascertained deviation said value corresponding to one full rotation of the head drum. This value $R = I - S - N$ serves as a regulating magnitude for automatic timing control of the phase position. N is the number of counted pulses of a rotation at the desired speed. If the deviation at the beginning is smaller than 0, it is initially established whether this deviation is smaller than -180 degrees. If not, the ascertained value $R = I - S$ is used for regulating, otherwise the magnitude N is added to the ascertained value so that a regulating voltage is obtained corresponding to $R = I - S + N$. Through this additional correction N of the ascertained values for R the phase is stabilised respectively to the shortest angle region. The desired phase position may be applied to any desired point with the aid of the described method in relation to the zero phase position of the head switching signal between 0 degrees and 360 degrees. The desired predetermined amount may also be changed beyond 360 degrees which means that control is on to the closest following track of the video head associated therewith. By predetermining a digital value as the offset it is easy to set any desired angle. This allows single button operation of the tracking displacement, while the desired value is continuously incremented when actuating a key. When the angle region of 360 degrees is exceeded this 360 degree position is evaluated as a reference.

The method is to be clarified by a plan. The counting value for a rotation of the head drum may for example be $N = 40\ 000$. For 180 degrees this corresponds to a value of $N/2 = 20\ 000$. In Figure 2 for example two different tracking values S_1 and S_2 are recorded. The first tracking value S_1 is located at an angle value which corresponds to the counting value $n = 5\ 000$, the second tracking value S_2 is to correspond to a value of $n = 22\ 000$. The actual values I decide which is the direction of control and/or which regulating value R is formed.

The table below shows some examples for producing regulating voltage values, which are plotted in conjunction with Figure 2 in the form of a vector diagram.

S	I	I-S	I-S>0	I-S<+N/2	I-S<-N/2	R
5000	10000	+ 5000	yes	yes	-	+ 5000
5000	3000	- 2000	no	-	no	- 2000
5000	27000	+22000	yes	no	-	-18000
22000	1000	-21000	no	-	yes	+19000
22000	3000	-19000	no	-	no	-19000

Patent Claim

1. A method of phase control of a head drum motor in a video recorder when playing back video signals recorded on a magnetic tape while using a phase comparison between the head switching pulses and the synchronous pulses recorded on the magnetic tape, in which the desired phase position of the motor is settable, and having a device for measuring the instantaneous deviation from the desired phase position by counting off clock pulses which are passed between the head switching pulse and the synchronous pulse to a counter, characterised in that out of the difference in the number of actual pulses I coming into the counter and the number of the predetermined desired pulses S a regulating signal R is derived for the head drum motor in which

$R = (I - S)$, if a) $(I - S)$ is positive and smaller than $+N/2$ or
b) $(I - S)$ is negative and greater than $-N/2$
 $R = (I - S) + N$, if $(I - S)$ is negative and smaller than $-N/2$
 $R = (I - S) - N$, if $(I - S)$ is positive and greater than $+N/2$

in which N corresponds to the number of the clock pulses for a rotation of the head drum motor.

LEGEND
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Zaehler	counter
Speicher	store
Nein	no
Ja	yes