

The invention relates to a magnetic tape apparatus according to the preamble of claim 1.

Magnetic tape apparatuses according to the preamble are known. Already in the case of the first practicable video recording and playback apparatuses for studio use the magnetic heads were mounted in a rotating head wheel and were run transversely across the magnetic tape apparatus, in order to achieve the required high relative speed between magnetic tape and magnetic head at a reasonable tape speed. With this known system of transversal recording, in which the head wheel comprising several magnetic heads rotates at right angles to the direction of tape run, the magnetic tape is in the head contact region run in a curved manner transversely to its longitudinal axis, in order to achieve optimum adaptation to the rotating magnetic heads.

Because of the width of commercial magnetic tapes it is impossible to record a full television image on a single track. The television image has to be spread over several tracks, and the transitions from one magnetic head to the next within a television image make complicated time error compensation necessary, so that phase breaks otherwise visible in the image can be minimized or eliminated.

An arrangement is known from the "Auslegeschrift" DE-B-119 185 in which the rotating head wheel of a video recorder is arranged displaceable in the direction of its axis of rotation. It is thus possible, e.g. when the magnetic tape is stationary, to scan several mutually adjacent magnetic tracks in order thereby to permit the reproduction of a frame. The longitudinal displacement is performed by a mechanical gear acting on the rotating head wheel and driven by the motor, which also causes the rotation of the head drum. This arrangement is very cumbersome mechanically and cannot be controlled electrically for track following purposes.

The transversal track recording system has been unable to date to penetrate the home video recorder market because of the expenditure involved. Helical scan recording (DE-PS-927 999) has penetrated it.

The object of the invention is to make transversal track recording usable also for home apparatuses.

This object is achieved by the invention described in claim 1. Advantageous developments of the invention are described in the sub-claims..

In principle an adjustment of the position of the magnetic heads relative to the recorded magnetic track is made possible in playback mode by the head wheel being displaceable in the direction of its axis of rotation. The displacement of the rotating head wheel thus makes possible the achievement of optimum track adjustment also for special functions in playback mode at reduced or increased tape speed or else with the magnetic tape stationary.

In the special case of a stationary magnetic tape, e.g. for stills reproduction, a control signal has to be added to the correction signals required in playback mode. The rotating head drum is thereby displaced in such a way that magnetic tracks in the number required for the representation of an image are scanned continuously. If more than two heads and a paired head arrangement ($2n$) are used, it is expedient to scan 300 lines per field instead of 312, i.e. 12 tracks per field, since a few lines are required for the change in image (rewind). In conjunction with a modern electronic system it is possible to keep the mechanical expenditure low and to reduce the frame size in respect of magnetic tape recording apparatuses comprising head drums wrapped round with magnetic tape.

The correction signals for playback mode for the mutual balancing out of the tracks with the aim of avoiding visible phase jumps can be determined at each head transition, e.g. by means of a sample-and-hold circuit through measurement of the line length (64 μ s). The values required for such a higher-frequency adjustment of the rotating head drum are approx. $\pm 5 \mu$ in the case of 12 μ track width with half the head change frequency of 312 Hz.

It is also possible, as is known from various publications, for additional signals for automatic track adjustment, so-called ATF signals (Automatic Track Following), also to be recorded during the recording. Processing of these signals can give rise to a comparatively lower-frequency correction of the drive system through adjustment of the capstan drive. A cassette with integral belt drive can be advantageous for such a correction.

According to a preferred form of the invention, tracks containing 25 television lines per track with a width of the magnetic tape of 8 mm are recorded. The scanning rate here is about 4 m/s. The number of magnetic heads is $2n = 6$ ($60^\circ - 80^\circ$) depending on the angle of wrap selected, or $2n = 8$ if an angle of wrap of $45^\circ - 60^\circ$ is produced by the curvature.

The invention will be explained in detail below by means of an exemplifying embodiment represented in the drawing.

The drawing shows in a partial transverse section the drive system for the head wheel 1 in working position together with an inserted magnetic tape cassette 8 in which a magnetic tape 2 is driven.

The magnetic 2 tape lies between the belt guide cylinder 7 and the felt pressure member 13. The belt guide cylinder 7 is firmly attached in this example, but does not rotate. The magnetic tape 2 within the sphere of influence of the magnetic heads K arranged on the head wheel 1 is curved so that its surface is adapted to the circle described by the magnetic heads K. The adaptation to the required curvature is provided by the felt pressure members 13, which are arranged on either side of the head wheel 1 in such a way that the tape 2 is adapted resiliently to the heads in the region of the tape-head contact. This precise adaptation makes good tape-head contact possible. The head wheel 1 is provided with $2n$ heads K, the

gaps between which exhibit in turn different azimuth angles.

The application or withdrawal of the signal voltages to or from the magnetic heads K is carried out by means of twofold rotary transformers 6. Furthermore, if there are four or more heads, the magnetic heads K with identical azimuth angle are each connected electrically to a rotary transformer 6. This can take place by series connection or else parallel connection of the magnetic head spools.

The head wheel 1 is driven by a drive motor 4 which is arranged, together with the head wheel 1 and an electro-mechanical converter 3 serving for the adjustment, on a common shaft 5. The electro-mechanical converter 3 consists of a spool 10 into which a soft iron core 11, and hence the shaft 5 bearing it, is on the application of a control voltage drawn against a spring 12.

The converter 3 is preferably part of the drive motor 4, so that on the application of the control voltage the rotor of the motor 4 is displaced in the axial direction.

It is also possible to use a piezo-electric system as a converter.

C l a i m s

1. Magnetic tape apparatus with magnetic heads for the recording and/or reading of magnetic tracks, said magnetic heads being disposed on a rotating head wheel (1) and moved transversely to the direction of tape run and the head wheel (1) being driven by a drive motor (4), characterised in that head wheel (1) and rotor of the drive motor (4) are disposed firmly on a common rotating shaft (5) and that the head wheel (1) together with the rotor are displaceable by the drive motor (4) in the direction of the common rotating shaft (5).
2. Magnetic tape apparatus according to claim 1, characterised in that the rotating part (1, 4) is displaced by means of an electromechanical converter (3).
3. Magnetic tape apparatus according to claim 1 and claim 2, characterised in that the moving part of the electro-magnetic converter (3) and the rotating parts (1, 4) are disposed on the common shaft.
4. Magnetic tape apparatus according to claim 2 and/or 3, characterised in that the rotor of the drive motor (4) is part of the electromagnetic converter (3).

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The head wheel 1 is driven by a drive motor 4 which is arranged, together with the head wheel 1 and an electro-mechanical converter 3 serving for the adjustment, on a common shaft 5. The electro-mechanical converter 3 consists of a spool 10 into which a soft iron core 11, and hence the shaft 5 bearing it, is on the application of a control voltage drawn against a spring 12.

The converter 3 is preferably part of the drive motor 4, so that on the application of the control voltage the rotor of the motor 4 is displaced in the axial direction.

It is also possible to use a piezo-electric system as a converter.

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2. Magnetic tape apparatus according to claim 1, characterised in that the rotating part (1, 4) is displaced by means of an electromechanical converter (3).
3. Magnetic tape apparatus according to claim 1 and claim 2, characterised in that the moving part of the electro-magnetic converter (3) and the rotating parts (1, 4) are disposed on the common shaft.
4. Magnetic tape apparatus according to claim 2 and/or 3, characterised in that the rotor of the drive motor (4) is part of the electromagnetic converter (3).



5. Magnetic tape apparatus according to claim 2 and/or 3, characterised in that the electromagnetic converter (3) consists of a solenoid system.
6. Magnetic tape apparatus according to claim 2 and/or 3, characterised in that the electromagnetic converter (3) consists of a piezoelectric system.
7. Magnetic tape apparatus according to any one of claims 1 - 3, characterised in that the head wheel (1) is provided with $2n$ heads (K) the gaps between which exhibit in turn two different azimuth angles.
8. Magnetic tape apparatus according to any one of claims 1 - 7, characterised in that the electromagnetic converter (3) is controlled during play-back as a function of correction signals obtained by processing of the phase breaks on the transition from one track to the next track.
9. Magnetic tape apparatus according to claim 8, characterised in that phase breaks on the transition from one track to the next track are minimized by control of the displacement of the rotating head wheel (1).
10. Magnetic tape apparatus according to any one of claims 1 - 9, characterised in that during play-back the magnetic tracks are scanned near their track centre and that a control signal for the displacement of the rotating head wheel (1) is derived from the deviation with respect to the track centre.
11. Magnetic tape apparatus according to any one of claims 1 - 10, characterised in that the rotating head wheel (1) is displaceable to such an extent that when the magnetic tape (2) is stationary, various magnetic tracks can be scanned in succession by the magnetic heads (K).
12. Magnetic tape apparatus according to claim 11, characterised in that when the magnetic tape (2) is stationary (2), a number of magnetic tracks are scanned such that during video recording a field or frame can be reproduced.
13. Magnetic tape apparatus according to claim 11, characterised in that when the magnetic tape (2) is stationary, the displacement speed of the rotating head wheel (1) is equal to the standard speed of the moved magnetic tape (2).



- 14.. Magnetic tape apparatus according to any one of claims 1 - 13, characterised in that the magnetic tape (2) has a width of 8 mm and with a scanning rate of approx. 4 m/sec each track is approx. 1 600 μ s long (25 television lines).
15. Magnetic tape apparatus according to any one of claims 1 - 14, characterised in that the number of magnetic heads (K) $2n = 6$, the diameter of the head wheel (1) is approx. 12 - 13 mm and the angle of wrap (curvature) of the magnetic tape (2) lies between 60 and 80°.
16. Magnetic tape apparatus according to any one of claims 1 - 15, characterised in that the number of magnetic heads (K) $2n = 8$, the diameter of the head wheel (1) is approx. 16 - 17 mm and the angle of wrap (curvature) of the magnetic tape (2) lies between 45 and 60°.

