

Description

The invention relates to an apparatus for recording and/or reproducing information on a record carrier in the form of a tape in tracks which are inclined relative to the longitudinal axis of the record carrier, which apparatus comprises

a first magnetic head (4),

a first electro-mechanical actuator (2) on which said magnetic head is arranged for controlling the position of said magnetic head in a direction transverse to the tracks, said actuator comprising two piezoelectric transducers (7, 8) which are arranged on opposite sides of a common electrode (6) and which are each provided with an electrode (9, 10) on the side which is remote from said common electrode,

a rotatable body (1), on which said actuator is mounted, for moving the magnetic head (4) in the track direction,

a tracking-signal generator (18) for supplying a signal to the actuator (2) for controlling the position of the magnetic head (4) relative to the tracks,

a drive-signal input (11) which is coupled to an electrode of the piezoelectric transducers in such a way that the transducer deflects as a function of the signal applied to said drive-signal input, and

a first rotary signal-coupling means (13) for coupling the tracking-signal generator to the drive-signal input of the actuator.

Such apparatus is used in commercially available video recorders of the well-known V2000 system. Such a video recorder is very suitable to be provided with a mode of operation in which the pictures can be reproduced at a substantially higher speed in order to locate a specific passage. The reproduction in this mode remains excellent because the electromechanical actuator ensures that the head follows the track correctly. The maximum reproduction speed is dictated by the maximum deflection of the actuator, which maximum deflection depends on the maximum driving voltage. The maximum driving voltage depends on the depolarization limit of the piezoelectric elements.

DE-A-2,711,691 and GB-A-2,006,541 disclose an apparatus of the type mentioned in the opening paragraph, further comprising a bias voltage input (21) for applying a bias voltage (E) so that both piezoelectric elements (7, 8) are biased in the direction of polarisation (P), at least during periods in which they are driven by the tracking-signal (18).

The application of a bias counteracts depolarization, so that the maximum deflection can be increased by applying a bias. This means that the maximum reproduction speed can be increased by applying a bias voltage. However, each actuator (the aforementioned video recorder comprises two such actuators) would require the use of an additional signal-coupling means, such as a slip ring.

The invention aims at providing an apparatus of the type known from either DE-A-2 711 691 or

GB-A-2 006 541 which allows a bias voltage to be applied without the use of additional signal-coupling means and to this end it is characterized by

a buffer element (25) for buffering said bias voltage (E) during said periods

a first voltage isolator (23) between the bias-voltage input (21) and the drive-voltage input (11), and

switching means (16) arranged between the tracking-signal generator (18) and the signal-coupling means (13), for alternately connecting the drive-signal input (11) to the tracking-signal generator (18) and a source (20) of bias voltage (E), via said signal-coupling means.

The invention is based on the recognition of the fact that it is possible to apply a voltage pulse, for examples at times when the head is not used (for example during the period in which the second head follows the track). This voltage pulse is applied to the buffer via the voltage isolator. If subsequently the drive signal, whose amplitude is lower, is applied the voltage isolator isolates the buffer from the drive signal input.

In an apparatus comprising a second electro-mechanical actuator (3) of the same type as the first actuator (2), which second actuator carries a second magnetic head (5), is also mounted on the rotatable body (1), and is connected to the tracking-signal generator (18) via a second rotary signal coupling means (14) and switching means (17), the invention is further characterized in that the bias-voltage input (22) of said second actuator (3) is connected to the bias-voltage input (21) of the first actuator (2), both bias-voltage inputs have a common connection to the buffer element (25), and a second voltage isolator (24) is arranged between the drive-voltage input (12) of the second actuator and the bias-voltage input (22) of said second actuator.

With respect to the buffer element the invention may further be characterized in that the buffer element (25) comprises a capacitor.

With respect to the voltage isolator the invention may further be characterized in that the first or the second voltage isolator (23, 24) comprises a diode the forward direction of which is from the drive-voltage input (11, 12) to the corresponding bias-voltage input (21, 22).

A preferred embodiment of the invention is further characterized in that the two piezoelectric elements (7, 8) arranged one on each side of the common electrode (6) are biased in opposite directions relative to said common electrode, the bias-voltage input (21, 22) is connected to the other electrode (9) of one piezoelectric element (7) whereas the other electrode (10) of the other piezoelectric element (8) is coupled to earth.

The invention will now be described in more detail, by way of example, with reference to the accompanying drawing, in which

Fig. 1 shows an embodiment of the invention,

Fig. 2 shows some signal waveforms to explain the operation of the apparatus in accordance with the invention, and

Fig. 3 shows an alternative to a part of the embodiment shown in Fig. 1.

Fig. 1 shows an embodiment of the invention. In a rotatable body 1, shown schematically, two electro-mechanical actuators 2 and 3 are arranged diametrically opposite each other, which actuators carry video heads 4 and 5, respectively. Via means, not shown, for example a rotary transformer, these video heads are connected to the non-rotating part of the apparatus. This assembly rotates within a drum around which a magnetic tape is wrapped along a helical path over 180° (in said V2000 system). The heads 4 and 5 then alternately follow an inclined track on the magnetic tape. The electro-mechanical actuators 2 and 3 control the heads 4 and 5 in directions indicated by arrows T, i.e. in directions transverse to the direction of the tracks followed by these heads owing to the rotation of the body 1.

The electro-mechanical actuators 2 and 3 each have a common electrode 6, two piezoelectric elements 7 and 8 arranged one on each side of the electrode 6, electrodes 9 and 10 being arranged on those sides of said elements which are remote from the electrode 6, so that the piezoelectric element 7 is arranged between the electrodes 6 and 9 and the piezoelectric element 8 between the electrodes 6 and 10. Both piezoelectric elements are polarized in the direction indicated by P.

In the present example the electrode 10 is connected to earth via the body 1. The common electrode 6 of the actuator 2 or 3 is connected to a respective drive-signal input 11 or 12, which via a respective slip ring 13 or 14, and switching means 15 is connected to a source 18 of tracking signals. The electrode 9 of each of the actuators 2 and 3, is connected to earth via a capacitor 25 and to a respective bias-voltage input 21 and 22. Via a voltage isolator, in the present example a diode 23 or 24, this bias voltage input 21 or 22, is connected to the corresponding drive-voltage input 11 or 12. The switching means 15, which may be electronic means, may be regarded as two change-over switches 16 and 17 which under the control of a device 19 alternately connect the tracking signal generator 18 to one of the slip rings 13 and 14 and a direct voltage source 20 to the other of the slip rings in phase opposition.

The operation of the apparatus shown in Fig. 1 will be explained with reference to Fig. 2 which shows the signals S_1 and S_2 on the slip rings 13 and 14, respectively, as a function of time.

Between the instants t_1 and t_2 a tracking signal is applied to the slip ring 13. If it is assumed that capacitor 25 carries a higher direct voltage (E), the diode 23 will be cut off. The common electrode 6 of the actuator 2 then receives a signal which appears in parallel across both piezoelements, as indicated by the dashed arrows S, because the electrode 10 is connected directly and the electrode 9 is connected indirectly, via capacitor 25 and via diode 24 and source 20, to earth. In one element the polarity of the signal then has the same direction as the polarization (P) and in the other element it is directed oppositely, so that the

transducer 2 deflects in conformity with the signal S_1 . The voltage E across capacitor 25 also appears on the electrode 9. Since the common electrode 6 is connected to the tracking signal source and the electrode 10 is connected to earth, this bias voltage is distributed uniformly as indicated by the arrows V between the two piezoelements in accordance with the polarization P. As a result of this, the neutral level of the actuator (no deflection) is obtained when the voltage on the common electrode 6 is $1/2E$ (electrode 9 is then at E and electrode 10 at 0 V). The steady-state d.c. level of the tracking signal should then also be $1/2E$.

At the same time the direct voltage E from source 20 will appear on slip rings 14 (signal S_2). If the charge on capacitor 25 is not sufficient, capacitor 25 will be charged substantially to the voltage E (but for one diode voltage) via the diode 24 which then conducts. The voltage on electrode 9 of element 3 and, via drive signal input 12, on the common electrode 6 is then E volts. This results in a substantial deflection of the actuator in conformity with the drive signal of E volts, but this is no problem because the head 5 is inoperative during this period. At the instant t_2 the signal S_2 on slip ring 14 changes over from the direct voltage E to the tracking signal. Diode 24 is then cut off. The tracking signal then appears on the common electrode 6 and capacitor 25 is charged.

The same happens between the instants t_2 and t_3 but now the actuators 2 and 3 are interchanged.

It is to be noted that a system is conceivable in which both heads are operative simultaneously, for example in the case of a tape-wrapping angle of 210°, the additional 30° wrap being used for audio recording. Switches 16 and 17 must then be operated so that the voltage E is transferred during a shorter period, for example after the instant t_4 as shown in Fig. 2. The switching means 15 must then be modified so that each of the drive inputs 11 and 12 can receive an independent drive signal, at least when both heads are driven simultaneously.

In principle it is also possible to re-charge the capacitor 25 with shorter voltage pulses. The invention may, in principle, also be employed in single-head video recorders.

Fig. 3 shows a possible variant to the device shown in Fig. 1, in which both piezoelectric elements 7 and 8 are polarized in the same direction viewed from the common electrode 6. The drive signal must then be applied to electrodes 9 and 10 in phase opposition in order to obtain a deflection and the bias-voltage input 21 must be connected to the mean voltage across the buffer capacitor 25. Instead of the diode 13 active voltage isolators may then be used. It will be clear that, in the embodiment of Fig. 3, the electrodes 10 have no galvanic connection to earth, such as is the case in the embodiment of Fig. 1.

Claims

1. An apparatus for recording and/or reproducing information on a record carrier in the form of a tape in tracks which are inclined relative to the longitudinal axis of the record carrier, which apparatus comprises

a first magnetic head,

a first electro-mechanical actuator on which said magnetic head is arranged for controlling the position of said magnetic head in a direction transverse to the tracks, said actuator comprising two piezoelectric transducers which are arranged on opposite sides of a common electrode and which are each provided with an electrode on the side which is remote from said common electrode,

a rotatable body, on which said actuator is mounted, for moving the magnetic head in the track direction,

a tracking-signal generator for supplying a signal to the actuator for controlling the position of the magnetic head relative to the tracks,

a drive-signal input which is coupled to an electrode of the piezoelectric transducers in such a way that the transducer deflects as a function of the signal applied to said drive-signal input,

a first rotary signal-coupling means for coupling the tracking-signal generator to the drive-signal input of the actuator, and

a bias voltage input for applying a bias voltage so that both piezoelectric elements are biased in the direction of polarization, at least during periods in which they are driven by the drive signal, characterized by

a buffer element for buffering said bias voltage during said periods,

a first voltage isolator between the bias voltage input and the drive voltage input, and

switching means arranged between the tracking signal generator and the signal coupling means, for alternately connecting the drive-signal input to the tracking-signal generator and a source of bias voltage via said signal coupling means.

2. An apparatus as claimed in Claim 1, comprising a second electro-mechanical actuator of the same type as the first actuator, which second actuator carries a second magnetic head, is also mounted on the rotatable body, and is connected to the tracking signal generator via a second rotary signal coupling means and switching means, characterized in that the bias-voltage input of said second actuator is connected to the bias-voltage input of the first actuator, both bias-voltage inputs have a common connection to the buffer element, and a second voltage isolator is arranged between the drive-voltage input of the second actuator and the bias-voltage input of said second actuator.

3. An apparatus as claimed in Claim 1 or 2, characterized in that the buffer element comprises a capacitor.

4. An apparatus as claimed in Claim 1, 2 or 3, characterized in that the first or the second volt-

age isolator comprises a diode the forward direction of which is from the drive-voltage input to the corresponding bias-voltage input.

5. An apparatus as claimed in Claim 1, 2, 3 or 4, characterized in that the two piezoelectric elements arranged one on each side of the common electrode are biased in opposite directions relative to said common electrode, the bias-voltage input is connected to the other electrode of one piezoelectric element whereas the other electrode of the other piezoelectric element is coupled to earth.

Patentansprüche

1. Gerät zum Aufzeichnen und/oder Wiedergeben von Information auf einem Aufzeichnungsträger in Form eines Bandes in Spuren, die in bezug auf die Längsachse des Aufzeichnungsträgers schräg verlaufen, wobei dieses Gerät enthält

einen ersten Magnetkopf,

ein erstes elektromechanisches Betätigungselement, auf dem der Magnetkopf zur Steuerung der Position dieses Magnetkopfes in einer Richtung quer zu den Spuren angeordnet ist, wobei das Betätigungselement zwei piezoelektrische Wandler enthält, die an gegenüberliegenden Seiten einer gemeinsamen Elektrode angeordnet und mit je einer Elektrode an der von der gemeinsamen Elektrode angewandten Seite versehen sind,

einen drehbaren Körper, auf dem das Betätigungselement montiert ist, zum Bewegen des Magnetkopfes in der Spurrichtung,

einen Nachführungssignalgenerator zum Erzeugen eines Signals zum Betätigungselement zur Steuerung der Position des Magnetkopfes in bezug auf die Spuren,

einen Steuersignaleingang, der auf derartige Weise mit einer Elektrode der piezoelektrischen Wandler verbunden ist, dass der Wandler abhängig vom Signal zum Steuersignaleingang ablenkt,

ein erste rotierendes Signalverknüpfungsmittel zum Verknüpfen des Nachführungssignalgenerators mit dem Steuersignaleingang des Betätigungselements, und

ein Vorspannungseingang zum Anlegen einer Vorspannung, so dass beide piezoelektrischen Elemente in der Polarisationsrichtung vormagnetisiert werden, wenigstens in den Zeiträumen, in denen sie vom Steuersignal gesteuert werden, dadurch gekennzeichnet, dass

ein Pufferelement zum Puffern der Vorspannung in diesen Zeiträumen,

ein erster Spannungsisolator zwischen dem Vorspannungseingang und dem Steuerspannungseingang, und

Schaltungsmittel zwischen dem Nachführungssignalgenerator und dem Signalverknüpfungsmittel zum abwechselnden Verbinden des Steuersignaleingangs mit dem Nachführungssignalgenerator und mit einer Vorspannungsquelle über das Signalverknüpfungsmittel vorgesehen sind.

2. Gerät nach Anspruch 1 mit einem zweiten elektro-mechanischen Betätigungselement vom gleichen Typ wie das erste Betätigungselement,



wobei das zweite Betätigungselement einen zweiten Magnetkopf trägt, ebenfalls auf dem drehbaren Körper montiert und über ein zweites drehbares Signalverknüpfungsmittel und Schaltungsmittel an den Nachführungssignalgenerator angeschlossen ist, dadurch gekennzeichnet, dass der Vorspannungseingang des zweiten Betätigungselements mit dem Vorspannungseingang des ersten Betätigungselements verbunden ist, beide Vorspannungseingänge eine gemeinsame Verbindung mit dem Pufferelement haben, und ein zweiter Spannungsisolator zwischen dem Steuerungseingang des zweiten Betätigungselements und dem Vorspannungseingang des zweiten Betätigungselements angeordnet ist.

3. Gerät nach Anspruch 1 oder 2, dadurch gekennzeichnet, dass das Pufferelement einen Kondensator enthält.

4. Gerät nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, dass der erste und der zweite Spannungsisolator eine Diode enthalten, deren Durchgangsrichtung vom Steuerungseingang zum entsprechenden Vorspannungseingang verläuft.

5. Gerät nach Anspruch 1, 2, 3 oder 4, dadurch gekennzeichnet, dass die zwei je an einer Seite der gemeinsamen Elektrode angeordneten piezoelektrischen Elemente in bezug auf die gemeinsame Elektrode in entgegengesetzten Richtungen vormagnetisiert sind, dass der Vorspannungseingang mit der anderen Elektrode eines piezoelektrischen Elements, jedoch die andere Elektrode des anderen piezoelektrischen Elements mit Erde verbunden ist.

Revendications

1. L'invention concerne un appareil d'enregistrement et/ou de lecture d'information sur un support d'enregistrement en forme de bande, dans des pistes inclinées par rapport à l'axe longitudinal du support d'enregistrement, appareil comportant

une première tête magnétique,

un premier actionneur électro-mécanique sur lequel est disposé ladite tête magnétique pour régler la position de ladite tête magnétique dans une direction transversale aux pistes, ledit actionneur comportant deux transducteurs piézo-électriques disposés sur des faces opposées d'une électrode commune et munis chacun d'une électrode sur la face située à l'opposé de ladite électrode commune,

un corps rotatif sur lequel est monté ledit actionneur pour déplacer la tête magnétique dans la direction des pistes,

un générateur de signaux de poursuite de piste pour fournir à l'actionneur un signal pour commander la position de la tête magnétique par rapport aux pistes,

une entrée de signal de commande couplée à une électrode des transducteurs piézo-électriques de telle manière que le transducteur fléchisse en

fonction du signal appliqué à ladite entrée de signal de commande,

de premiers moyens rotatifs de couplage de signaux pour coupler le générateur de signaux de poursuite de piste à l'entrée de signal de commande de l'actionneur et

une entrée de tension de polarisation pour appliquer une tension de polarisation de façon que les deux éléments piézo-électriques soient polarisés dans la direction de polarisation au moins au cours des périodes où ils sont commandés par le signal de commande, caractérisé par

un élément tampon pour emmagasiner ladite tension de polarisation au cours desdites périodes,

un premier isolateur de tension, intercalé entre l'entrée de tension de polarisation et l'entrée de tension de commande et

des moyens de commutation intercalés entre le générateur de signaux de poursuite de piste et les moyens de couplage de signaux pour raccorder l'entrée de signal de commande alternativement au générateur de signaux de poursuite de piste et à une source de tension de polarisation à travers ledits moyens de couplage de signaux.

2. Appareil selon la revendication 1, comportant un second actionneur électromécanique de même type que le premier actionneur, second actionneur qui porte une seconde tête magnétique, est également monté sur le corps rotatif et est relié au générateur de signaux de poursuite de piste à travers de seconds moyens rotatifs de couplage de signaux et des moyens de commutation, caractérisé en ce que l'entrée de tension de polarisation dudit second actionneur est reliée à l'entrée de tension de polarisation du premier actionneur, en ce que les deux entrées de tension de polarisation sont reliées en commun à l'élément tampon et en ce qu'un second isolateur de tension est disposé entre l'entrée de tension de commande du second actionneur et l'entrée de tension de polarisation dudit second actionneur.

3. Appareil selon la revendication 1 ou 2, caractérisé en ce que l'élément tampon est constitué par un condensateur.

4. Appareil selon la revendication 1, 2 ou 3, caractérisé en ce que le premier ou le second isolateur de tension est constitué par une diode dont le sens direct s'étend à partir de l'entrée de tension de commande vers l'entrée correspondante de tension de polarisation.

5. Appareil selon les revendications 1, 2, 3 ou 4, caractérisé en ce que les deux éléments piézo-électriques disposés chacun sur l'une des faces de l'électrode commune sont polarisés dans des directions opposées par rapport à ladite électrode commune et en ce que l'entrée de tension de polarisation est reliée à l'autre électrode de l'un des éléments piézo-électriques, tandis que l'autre électrode de l'autre élément piézoélectrique est reliée à la masse.

