



Method of determining a position in a cassette recorder

The invention is based on a method in accordance with the first part of claim 1. The method is applicable in particular, for magnetic tape equipment for analogue and/or digital recording of video and/or audio data as well as for data recorders which have position switches available. This is the case for example when identifying cassettes or when getting feedback as to the position of the loading mechanism.

In the case of a tape loading mechanism in a magnetic tape recorder having a rotating head drum, the tape is pulled out of the cassette by means of the mechanism and wrapped around the head drum over an angle of approximately 180°. The tape is guided back towards the cassette during the unloading process. Various systems are known for the mechanism, such as the M-loading process in the case of VHS and the C-loading process in the case of Video 2000 for example. Differing positions are needed in both systems for the various operational states such as reproduction, pause, rewind, cassette ejection etc. Each single position represents a switching state that serves as feedback for the controlling electronics. Switch indexing plates are used predominantly thereby, as also are code switches or individual switches. The number of feedback lines amounts to approximately 3 to 4 in conventional equipment in dependence on the complexity of the mechanism.

It has been shown in practice that the differences between the voltage values associated with the individual positions are very small so that uncertainty arises during the evaluation process. A greater degree of certainty can be achieved using close tolerance resistors and by having a stabilised voltage on the resistance network and the reference input of the A/D convertor that serves for the purposes of evaluation. However, the costs of the circuit are thereby considerably increased. The object of the invention is to ensure a reliable evaluation despite the tiny differences between the individually determined voltage values without needing to use close tolerance resistors and a stabilised voltage for the resistance network and the A/D



convertor. This object is achieved by the invention defined in claim 1. Advantageous developments of the invention are specified in the appendant claims.

In the method in accordance with the invention, close tolerance resistors or stabilised voltages are thus replaced by an intentionally introduced calibration process. Due to this calibration process, practically all of the deviations in the resistor values or the operating voltage are taken into account and neutralised, in that the voltage values measured for the respective positions during the calibration operation are stored and used as reference values during normal operation. Thus, for the comparison in the evaluating electronic circuitry, it is not the theoretically correct reference values that are used, but rather, it is the values which were actually occurring in practice at the individual positions and which were determined and stored during a calibration process that are used. The resistance network can then be implemented using conventional cheap resistors of higher tolerance while a highly stable voltage is not required for the operating voltage for the network and the A/D convertor.

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

Fig. 1 shows a simplified basic circuit diagram for the determination of a position,

Fig. 2 a resistance network together with the evaluating electronic circuitry and

Fig. 3 a numerical example for the voltage values determined at the individual positions.

In Fig. 1, the wiper A is driven over the position indicator B, which comprises three contact tracks 1, 2, 3 as well as an earthed contact track 4, by the motor M via the active coupling WV. Due to the wiper A, the contact tracks 1, 2, 4 are connected to the contact track 4 in dependence on its location. Due to the

wiring of the contact tracks 1, 2, 3 through a respective resistor to the supply voltage, switching signals can be tapped off the leads a, b, c when there is a connection to the earthed contact track 4, the signals then being supplied to the evaluating electronic circuitry AE. The resistance network is formed from the equally large resistors R1, R2, R3 each of 22 kohm and it is connected to an operating voltage of +5 volts. One advantageous simplification is the reduction of the leads to just one whereby differing dc voltages are formed via one resistance network for the different switching states. The evaluating electronic circuitry AE includes an A/D convertor which converts the analogue voltages delivered over the leads a, b, c into digitally distinguishable values.

A resistance network of this type having resistors R1, R2, R3, R4 and R5 is illustrated in Fig. 2 wherein the resistors have the following values:

R1 = 27 kohm
R2 = 47 kohm
R3 = 100 kohm
R4 = 220 kohm
R5 = 39 kohm.

The common output e of the resistor matrix R1 to R6 is connected to the input of the A/D convertor W within the evaluating electronic circuitry AE.

Fig. 3 shows the respective resulting dc voltage for the individually possible switching states in numerical and graphical form. Once it is known to the evaluating electronic circuitry AE which voltage values are actually occurring, then the limiting values for the identification of each individual voltage value can be exactly defined. During a test phase, e.g. when setting up the equipment or in the event of it being serviced, a calibration run of the A/D convertor W is carried out using the connected network. The values measured thereby are stored and used as reference values during each loading/unloading process.



The calibration operation is started at a predetermined starting point. This "zero" position is gone to initially when the calibration function is called for, it is referred to hereinafter as phase A. There are various ways to this end. In the present case, the zero position is the unloading end position:

1. The unloading sequence is to be continued until the zero position is reached in all circumstances. A time criterion is efficacious in the case of this sequence.
2. The sequence is to be executed until there is a significant increase in the loading motor current. Here, one is concerned with interrogating the current.
3. The sequence is to be continued until a higher placed switching position is reached e.g. the position "cassette ejected". Here, one is concerned with interrogating the switches.

The step then ensuing, namely the phase B, is the actual calibration operation in which the loading mechanism is driven towards the tape loading end position at low speed in clocked manner i.e. two pulses "off" and one pulse "on". Any change of voltage on the test lead above a threshold value leads to the loading mechanism being stopped; the count of the position counter being increased and to a multiple interrogation of the dc voltage value concerned. The calculation of an average value occurs thereafter and this value is assigned a loading position number. One continues with these steps until all of the positions envisaged in the construction have been measured.

An ensuing step is executed in a further phase C although this is not absolutely necessary. Hereby, the loading mechanism is driven at low speed towards the tape unloading end position and one proceeds, in principle, as for the preceding case. Merely the count of the position counter is decreased for each change.



Upon reaching the condition 1. (time) or 2. (current) or 3. (switch), the position counter has again reached the starting value. Any difference points to a flawed measurement and the process (phase (A, B, C)) is executed once more. The insertion mechanism is now in the starting position so that a cassette can be immediately inserted for executing further tests. The measured and assigned values are placed in a non-volatile store e.g. an EEPROM and are read out therefrom following each activation process. Since the calibration operation is preferably executed without a tape in order to avoid for example superfluous things such as e.g. tape tensioning or the activation of the head drum, warning signals such as "no cassette, end of tape, start of tape, torn tape" for example, have to be consciously ignored.

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Claims

1. Method of determining a position in a cassette recorder including a mechanism for threading a tape in and for threading a tape out together with position switches, wherein the output signals of the switches are coupled via a resistance network whose output is connected to the input of an A/D convertor (W), characterised in that, during a calibration operation, the voltage value at the output of the network associated with a respective individual position is measured, entered into a store and used as a reference value during normal operation.
2. Method in accordance with Claim 1, characterised in that, the calibration operation ends automatically when a certain number of changes in position have been run through.
3. Method in accordance with Claim 1, characterised in that, the calibration operation is subdivided into two phases which differ from one another by virtue of the direction of movement of the mechanism and the counting direction of a position counter.
4. Method in accordance with Claim 1, characterised in that, the instantaneous voltage value is compared on each occasion with the preceding voltage value in a comparator.
5. Method in accordance with Claim 4, characterised in that, the movement of the mechanism is stopped on each occasion that a deviation of the instantaneous voltage value from the preceding voltage value is registered, a predetermined number of voltage measurements is effected and the counting state of a position counter is changed.
6. Method in accordance with Claim 4, characterised in that, the average value is formed from the predetermined number of measurements.
7. Method in accordance with Claim 2 and 6, characterised in that, a new overall average is calculated from the average values measured during the different phases.





8. Method in accordance with Claim 1, characterised in that, the calibration operation is effected at a speed of the mechanism which is lower than the speed of the mechanism during normal operation.

9. Method in accordance with Claim 8, characterised in that, the reduction of the speed of the mechanism is effected by altering the period for which the motor driving the mechanism is switched on.

10. Method in accordance with Claim 1, characterised in that, the starting point for the calibration operation is determined by interrogating the switches.

11. Method in accordance with Claim 1, characterised in that, the starting point for the calibration operation is effected by measuring the current delivered by the resistance network.

12. Method in accordance with Claim 1, characterised in that, the starting point for the calibration operation is determined in time controlled manner.

13. Method in accordance with Claim 1, characterised in that, the initiation of the calibration operation is effected during a test mode.

14. Method in accordance with Claim 3, 4, 6, 8 and 9, characterised in that, the interrogation of the resistance network lead, the position counting, the comparison, the forming of the average value, the controlling of the motor driving the mechanism and the storing of the determined voltage values are effected by a microprocessor.



Abstract

Method of determining a position in a cassette recorder

2.1. The determination of the position of the mechanism for threading a tape in and for threading a tape out is effected by means of position switches whose output signals are coupled via a resistance network. The differences between the voltage values for various positions are thereby very small so that uncertainty arises during the evaluation process. The object is to ensure an increased degree of certainty without needing to use close tolerance resistors or a highly stable voltage for the network.

2.2. During a calibration operation, the voltage value at the output of the network associated with a respective individual position is measured, entered into a store and used as a reference value during normal operation.

2.3. In particular for cassette recorders for analogue or digital video or audio recording

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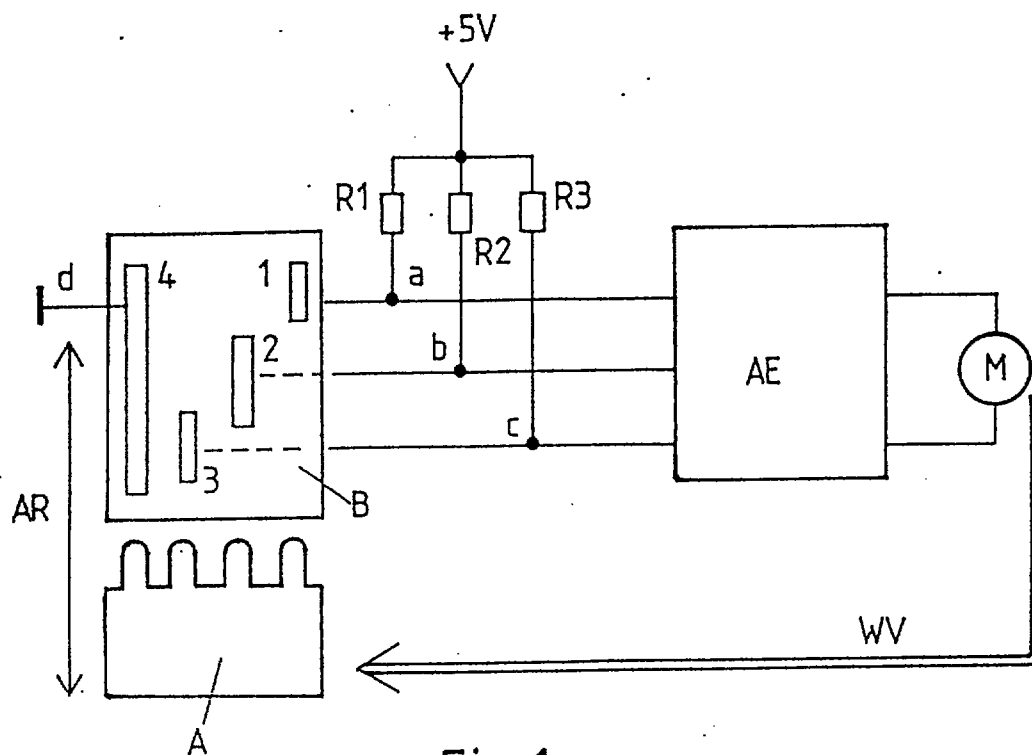


Fig.1

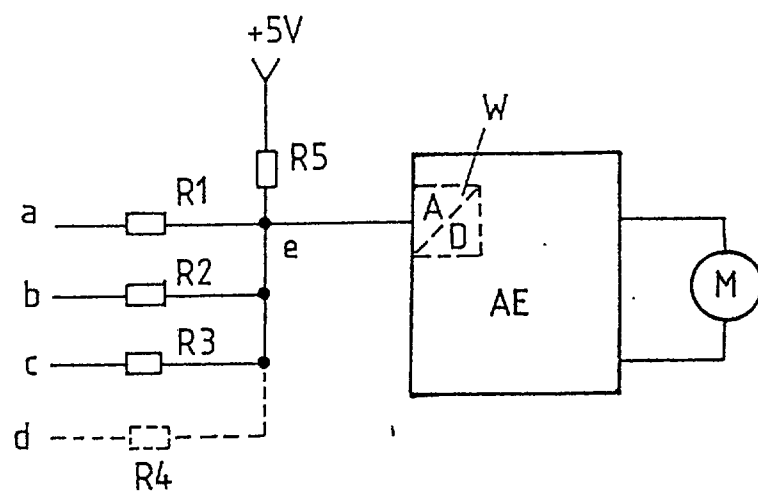


Fig.2

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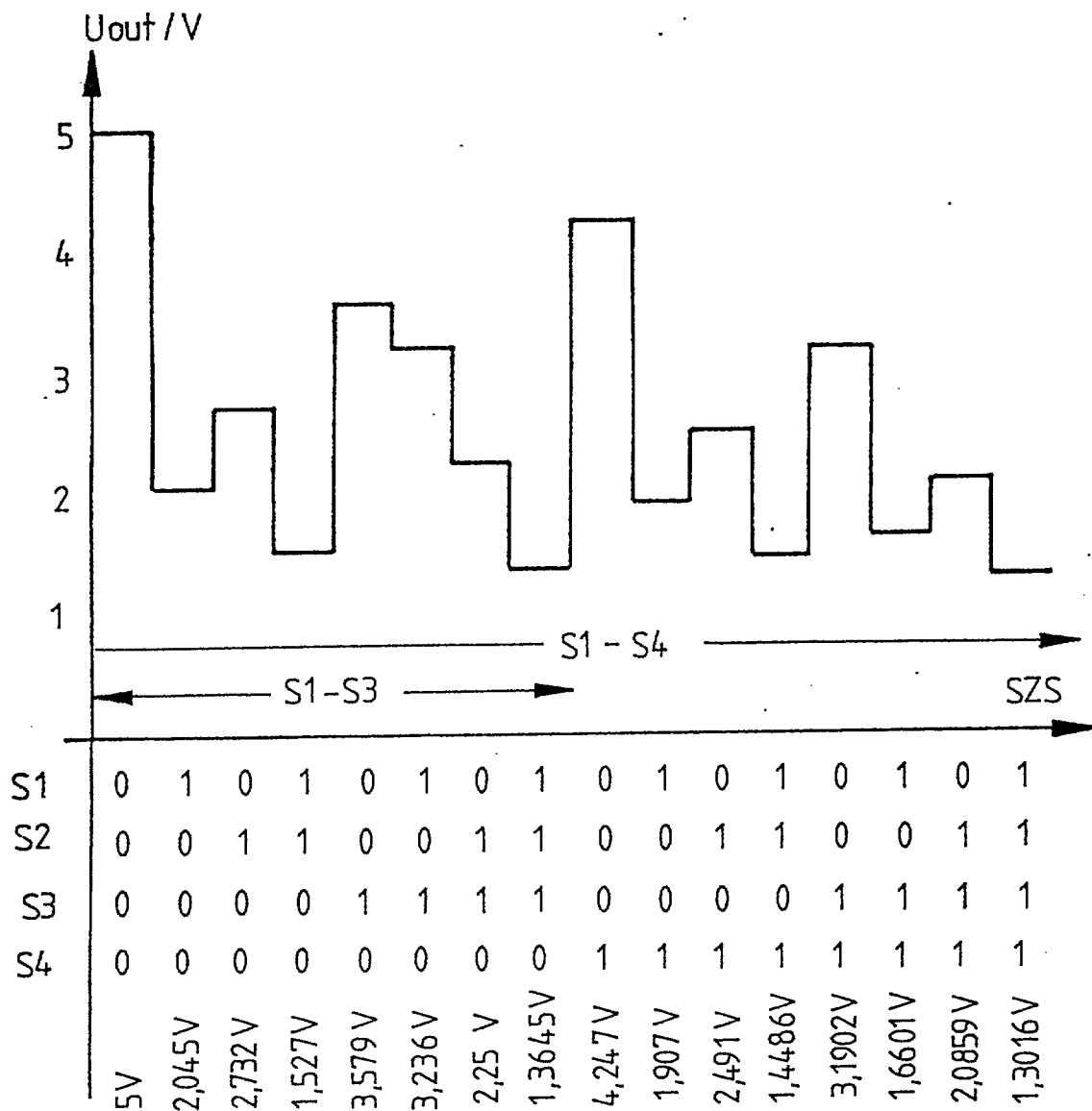


Fig.3

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Method of position determination in a
cassette recorder

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The invention is based on a method according to the precharacterizing clause of Claim 1. The method can be used in particular for magnetic tape equipment for analog and/or digital recording of video and/or audio data and also data recorders which have position switches. This is the case, for example, with cassette identification or loading mechanism position feedback.

In the case of a tape-loading mechanism in a magnetic tape recorder with a rotating head drum, the tape is pulled out of the cassette by the mechanism and wrapped around the head drum over an angle of about 180°. During the unloading operation, the tape is allowed to extend again in the direction of the cassette. Various systems are known for the mechanism, for example M-loading in the case of VHS and C-loading in the case of Video 2000. In both systems, different positions are required for the various operating states such as playback, pause, rewind, cassette ejection, etc. Each individual position represents a switching state, which serves as feedback for the controlling electronics. Switching sliders or else coding switches or individual switches are predominantly used for this. The number of feedback lines in the case of commercially available equipment is about 3 or 4, depending on the complexity of the mechanism.

It has been found that in practice the differences between the voltage values assigned to the individual positions is very small, making the evaluation unreliable. Greater reliability can be achieved with closely toleranced resistors and a stabilized voltage at the resistor network and the reference input of the A/D converter serving for the evaluation. However, this considerably increases the cost of the circuit. The invention is based on the object of ensuring a reliable evaluation in spite of the small differences between the individual determined voltage values, without requiring

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closely toleranced resistors and a stabilized voltage at the resistor network and the A/D converter. This object is achieved by the invention specified in Claim 1. Advantageous developments of the invention are specified in the subclaims.

Consequently, in the case of the method according to the invention, closely toleranced resistors or stabilized voltages are replaced by a deliberately introduced calibrating operation. By this calibrating operation, virtually all deviations in the resistance values or in the operating voltage are detected and neutralized in that the voltage values measured in calibration operation respectively for the positions are stored and used in normal operation as setpoint values. Thus, not the theoretically correct setpoint values but the values actually occurring in practice for the individual positions, determined and stored in a calibrating operation are used as setpoint values for the comparison in the evaluation electronics. The resistor network can then be realized with customary, inexpensive resistors of high tolerance, while a highly stable voltage is not required for the operating voltage for the network and for the A/D converter.

The invention is explained below with reference to the drawing, in which:

- Fig. 1 shows a simplified basic diagram for the position determination,
- Fig. 2 shows a resistor network with the evaluation electronics and
- Fig. 3 shows a numerical example of the voltage values determined for the individual positions.

In Fig. 1, the slider A is passed over the position sensor B, which has three contact decks 1, 2, 3 and also an earthed contact deck 4, by means of the motor M through the effective connection WV. By means of the slider A, depending on its position, the contact decks 1, 2, 4 [sic] are connected to the contact deck 4. With the contact deck 1, 2, 3 wired by one resistor in each case to the supply voltage, when the contact deck 4 is

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connected to earth switching signals can be picked off at the lines a, b, c and then sent to the evaluation electronics AE. The resistor network is formed by the equally rated resistors R1, R2, R3, each with 22 kohms, and is connected to an operating voltage of +5 volts. An advantageous simplification is to reduce the lines to a single line, different DC voltages being formed by means of a resistor network in the case of different switching states. The evaluation electronics AE includes an A/D converter, which converts the analog voltages supplied by the lines a, b, c into digitally distinguishable values.

Such a resistor network with resistors R1, R2, R3, R4 and R5 is represented in Fig. 2, the resistors having the following values:

R1 = 27 kohms
R2 = 47 kohms
R3 = 100 kohms
R4 = 220 kohms
R5 = 39 kohms.

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The common output e of the resistor array R1 to R5 is connected to the input of the A/D converter W within the evaluation electronics AE.

Fig. 3 shows the respectively resulting DC voltage in the case of the individual possible switching states in numerical and graphical form. If the evaluation electronics AE knows which voltage values are actually occurring, the limit values for the detection of each individual voltage value can be exactly fixed. During a test phase, for example equipment assembly or in the case of servicing, a calibrating run of the A/D converter W is carried out with the connected network. The values measured during this are stored and are used in every loading/unloading operation as setpoint values.

The calibration operation is started at a pre-determined starting position. This "zero position" is initially adopted after calling up the calibration function, referred to in the following as phase A. There are various possibilities for this. In the present case, the zero position is the unloading end position:

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1. Continue the unloading sequence until the zero position is reached under any circumstances. In this sequence, a time criterion is effective.
2. Execute the sequence until there is a clear increase in the loading motor current. This comprises a current interrogation,
3. Continue the sequence until a higher-level switch position is reached, for example "cassette ejected" position. This consequently comprises a switch interrogation.

The step which now follows, namely phase B, is the actual calibration operation, in which the loading mechanism is driven at low speed in clocked operation, i.e. two clocks "off" and one clock "on", in the direction of the tape-loading end position. Any change in voltage on the measuring line beyond a threshold value causes the loading mechanism to be stopped, the position counter reading to be incremented and the existing DC voltage value to be repeatedly interrogated. This is followed by the calculation of an average value and the assignment of this value to a loading position number. These steps are continued until measurements have been taken for all the positions provided in the structural design.

A subsequent step in a further phase C is executed, but is not absolutely necessary. In this step, the loading mechanism is operated at low speed in the direction of the tape-unloading end position and the same basic procedure is followed as in operation prior to this. The only difference is that the position counter reading is decremented with each change.

On reaching condition 1.(time) or 2.(current) or 3.(switch), the position counter has now again reached the starting value. A difference indicates a measuring error, and the operation (phase (A, B, C)) is executed once again. The drawing-in mechanism is then in the starting position, so that now a cassette can be inserted immediately for executing further tests. The measured and assigned values are stored in a non-volatile memory, for

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example EEPROM, and are read out from the latter after each switching-on operation. Since calibration operation is preferably executed without tape, in order for example to avoid superfluous things such as for example tape tensioning or the switching on of the head drum, the warning signals such as for example "no cassette, end of tape, start of tape, tape tear" must be deliberately ignored.

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Patent Claims

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1. Method of position determination in a cassette recorder having a tape threading-in and threading-out mechanism with position switches, the output signals of the switches being coupled via a resistor network, the output of which is connected to the input of an A/D converter (W), characterized in that, in a calibration operation, the voltage value respectively assigned to an individual position is measured at the output of the network, is entered in a memory and is used during normal operation as a setpoint value.
2. Method according to Claim 1, characterized in that the calibration operation is automatically ended when a predetermined number of position changes has been run through.
3. Method according to Claim 1, characterized in that the calibration operation is divided into two phases, which differ in the direction of movement of the mechanism and the counting direction of a position counter.
4. Method according to Claim 1, characterized in that the instantaneous voltage value in each case is compared in a comparator with the preceding voltage value.
5. Method according to Claim 4, characterized in that each time a deviation of the instantaneous voltage value from the preceding voltage value is registered, the movement of the mechanism is stopped, a predetermined number of voltage measurements are performed and the reading of a position counter is changed.
6. Method according to Claim 4, characterized in that the mean value is formed from the predetermined number of measurements.
7. Method according to Claims 2 and 6, characterized in that a new overall mean value is calculated from the mean values measured in the various phases.
8. Method according to Claim 1, characterized in that the calibration operation is performed at a speed of



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the mechanism which is lower than the speed of the mechanism during normal operation.

9. Method according to Claim 8, characterized in that the reduction in the speed of the mechanism is performed by a change in the operating time of the motor driving the mechanism.

10. Method according to Claim 1, characterized in that the starting position for calibration operation is determined by a switch interrogation.

11. Method according to Claim 1, characterized in that the starting position for calibration operation is performed [sic] by a measurement of the current supplied by the resistor network.

12. Method according to Claim 1, characterized in that the starting position for calibration operation is determined under time control.

13. Method according to Claim 1, characterized in that the initiation of calibration operation takes place within test operation.

14. Method according to Claims 3, 4, 6, 8 and 9, characterized in that the interrogation of the resistor network line, the position counting, the comparison, the formation of the mean value, the activation of the motor driving the mechanism and the storing of the voltage values determined are performed by a microprocessor.

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METHOD OF POSITION DETERMINATION IN A
CASSETTE RECORDER

Abstract

1. Method of position determination in a cassette recorder

2.1. The position determination of the tape threading-in and threading-out mechanism is performed with position switches whose output signals are coupled via a resistor network. In this case, the differences between the voltage values for different positions are small, making the evaluation unreliable. The object is to ensure increased reliability without requiring closely tolerated resistors or a highly stable voltage at the network.

2.2. In a calibration operation, the voltage value respectively assigned to an individual position is measured at the output of the network, entered in a memory and used during normal operation as a setpoint value.

2.3. In particular cassette recorders for analog or digital video or audio recording

3. Fig. 1

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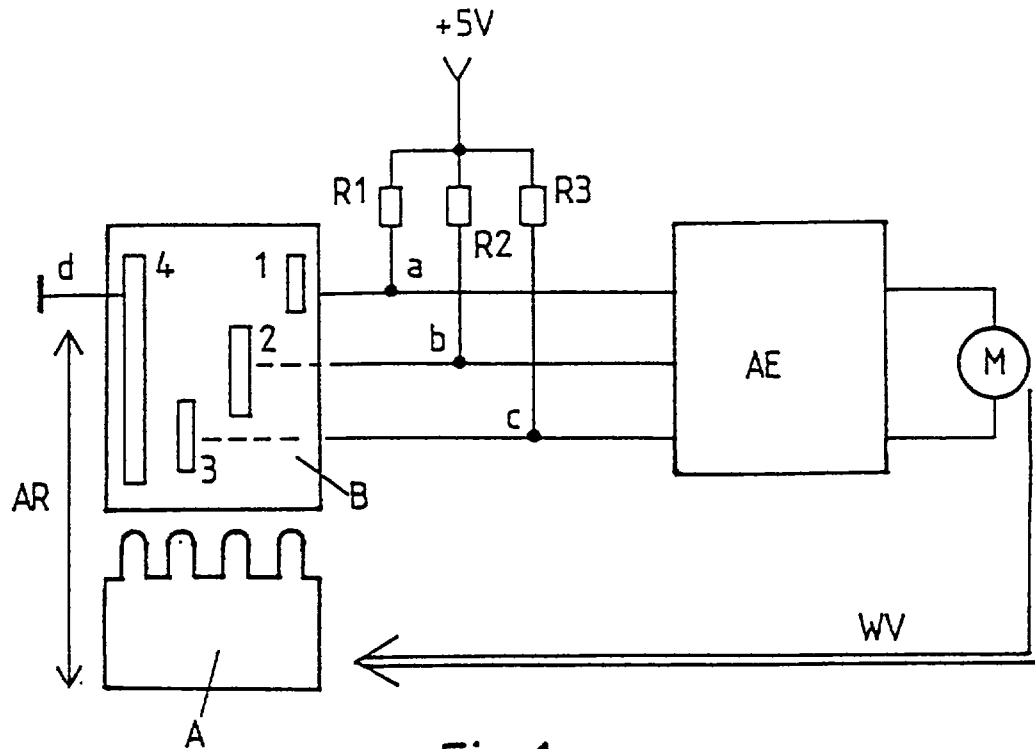


Fig.1

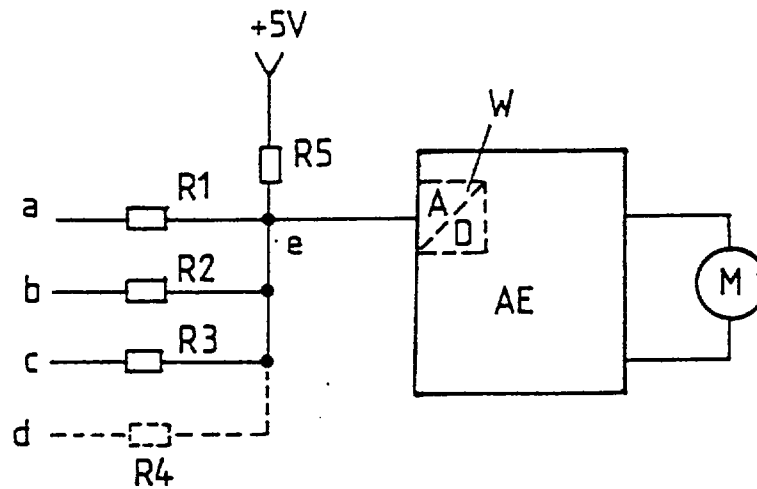


Fig.2

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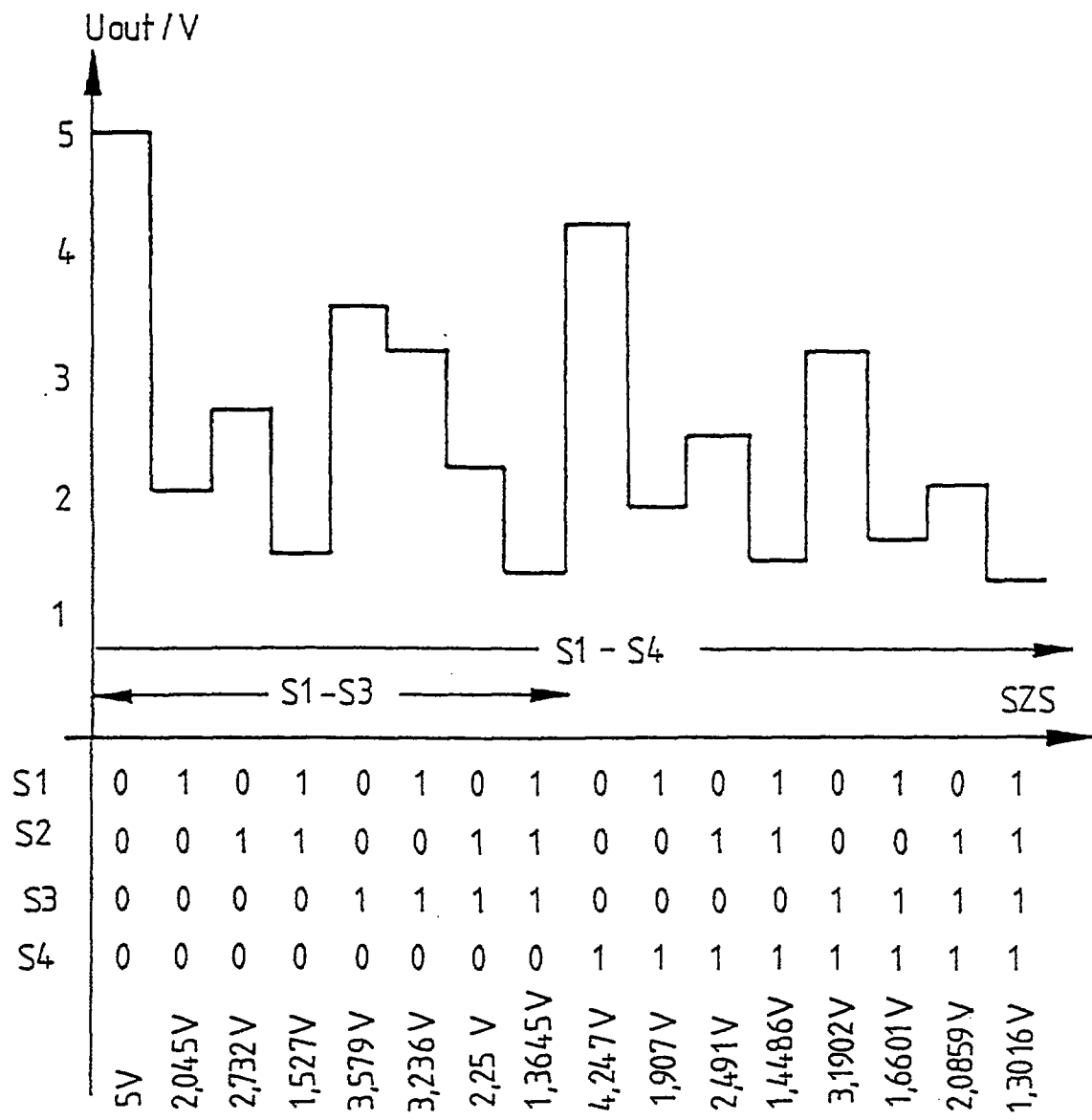


Fig. 3

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METHOD FOR DETERMINING THE POSITION IN A CASSETTE RECORDER

The invention relates to a method for sensing a position of a mechanism that controls a storage medium such as, for example, magnetic tape recorder preamble of claim 1. The method is especially applicable to magnetic tape devices for analog and/or digital recording of video and/or audio data as well as data recorders which comprise position switches. This is the case, for example, with cassette identification or loading mechanism position acknowledgement (feedback).

With a tape loading mechanism in a magnetic tape recorder having a rotating head drum (cylinder), the tape is drawn out from the cassette by means of the mechanism and wound around the head drum over an angle of approximately 180 degrees. During the eject (unloading) procedure the tape is guided back into the direction of the cassette. Various systems are known for the mechanism such as, for example, the M-loading in the case of VHS and the C-loading for Video 2000. Differing positions are required by both systems for the various operating states such as playback, pause, winding, cassette eject, etc. Each individual position represents a switching status which serves as a feedback for the controlling electronics. Here, indexing (shift) switches are mainly used, or coding switches or separate switches too. The number of feedback lines in conventional devices is about three or four, depending on the complexity of the mechanism.

In practice it has become apparent that the differences between the voltage values assigned to the individual positions are very small, whereby the evaluation becomes unreliable. Greater reliability can be achieved with very accurate resistors and a stabilized voltage at the resistor network and the reference input of the analog-to-digital converter serving for the evaluation. However, the cost of the circuit is, thereby, increased considerably. It is the object of the invention to guarantee a reliable evaluation despite the small differences between the individual determined voltage values and without needing highly accurate resistors and a stabilized voltage at the resistor network and the analog-to-digital converter. Developments of the invention are given in the subclaims.

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Therefore, with the method according to the invention, highly accurate resistors or stabilized voltages are replaced by an intentionally introduced calibration procedure. Practically all deviations among the resistor values or the operating voltage are detected and neutralized through this calibration procedure in that the voltage values measured at the respective positions in the calibrating operation are stored and used as desired (target) values during normal operation. Therefore, it is not the theoretically correct desired values which are used for the comparison in the evaluation electronics but, on the contrary, those values are used as desired values which actually occur at the individual positions in practice and which are determined and stored in a calibration procedure. The resistor network can then be realized with conventional, cost-effective resistors having a greater tolerance, while no highly stable voltage is necessary as the operating voltage for the network and the analog-to-digital converter.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a simplified circuit diagram for determining the position of a mechanism of a tape recorder;

FIG. 2 is a second embodiment of a circuit for determining the position of a mechanism, used for carrying out an aspect of the invention, that utilizes position switches of a resistor network such as shown in FIG. 1; and

FIG. 3 shows a numerical example for voltage values produced at different positions of the mechanism by the arrangement of FIG. 2.

In FIG. 1 the slider (wiper) contact 'A' is guided by motor M through the linkage line WV over the position transmitter (indicator) B which has three contact paths 1, 2, 3 as well as a contact path 4 clamped to ground. According to the respective position of the sliding contact 'A', the contact paths 1, 2, 4 are connected to the contact path 4. By wiring each of the contact paths 1, 2, 3 always with a resistor to the supply voltage, switching signals can be picked up at lines a, b, c upon connecting contact path 4 to ground, whereby said signals are then fed to the evaluation electronics AE.

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Each contact path such as contact path 1, 2 or 3, together with wiper contact A forms a corresponding position switch. The resistor network is formed by the resistors R1, R2, R3, each of equal size—22 kOhm, and is connected to an operating voltage of +5 V. An advantageous simplification is the reduction of the lines to one single line, whereby differing direct voltages are created for various switching states via a resistor network. The evaluation electronics AE contain an analog-to-digital converter which converts the analog voltages supplied by the lines 'a', b, c into digital values which can be differentiated.

Such a resistor network with resistors R1, R2, R3, R4 and R5 is illustrated in FIG. 2, whereby the resistors have the following values:

R1=27 kOhm

R2=47 kOhm

R3=100 kOhm

R4=220 kOhm

R5=39 kOhm.

The common output e of the resistor matrix (array) R1 through R5 is connected to the input of the analog-to-digital converter W within the evaluation electronics AE.

FIG. 3 shows the respective ensuing direct voltages for the individual possible switching states in numerical and graphical form. If the voltage values which actually occur are known to the evaluation electronics AE, then the limiting values for the recognition of each individual voltage value can be accurately defined. During a test phase, for example, assembly of the device or servicing, a calibration run (operation) is carried out for the analog-to-digital converter W with the connected network. The values measured thereby are stored and used during each insert/eject (loading/unloading) procedure as desired values.

The calibrating operation begins at a prescribed starting position. This "zero position" is triggered first upon calling up the calibration function, hereinafter designated phase 'A'. There are various possibilities for this. For the case presented here, the zero position is the eject position:

1. The eject operation is to be continued until the zero position is reached at all costs. A time criterion is effective in this operation.

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2. Carry out the operation until there is a clear increase in the loading motor current. Here, we are dealing with a current inquiry.
3. Continue the operation until a higher order switching position is reached, for example, "cassette ejected" position. Here, we are dealing with a switch inquiry.

The next and subsequent step, namely phase B, is the actual calibrating operation in which the loading mechanism is driven at low speed in cyclic operation, i.e. two cycles "off" and one cycle "on", in the direction of the tape load end position. Any changes in voltage in the measurement line above a threshold value leads to the loading mechanism being stopped, the position counter state being incremented and multiple inquiry of the applied direct voltage value. Following this, an average value is calculated and this value is assigned to a loading position number. These steps are continued until all positions designed for have been measured.

A following step in a further phase C is carried out, but this is not absolutely necessary, however. For this, the loading mechanism is operated at a low speed in the direction of the tape unload end position and, in principle, continued as in the preceeding operation. Merely the position counter state is decremented for each change.

Upon attaining condition 1 (time) or 2 (current) or 3 (switch), the position counter has now reached the starting position again. A difference implies an incorrect measurement and the procedure (phases A, B, C) is carried out once again. The insertion mechanism is now in the starting position again so that a cassette can be inserted immediately in order that further tests can be performed. The values which have been measured and assigned are deposited in a non-volatile memory, for example, an EEPROM, and read out from this after every switch-on procedure. As the calibrating operation is preferably carried out without a tape in order to avoid, for example, superfluous things such as tensioning the tape or switching on the head drum, the warning signals such as "no cassette", "tape end", "tape start", "broken tape" must be deliberately ignored.



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We claim:

1. Method for determining the position of a tape thread-in and thread-out mechanism of a cassette recorder having position switches, comprising the steps of:

in a calibration operation,

stepping said mechanism through a plurality of positions for producing signals in said position switches that vary in accordance with said plurality of positions;

applying said position switches signals to a resistor network;

applying an output signal of said resistor network to an analog-to-digital converter for producing an output signal of said converter at a plurality of values that are indicative of said plurality of positions, respectively;

storing said plurality of values in a memory; and,

in normal operation,

retrieving said stored plurality of values for determining the position of said mechanism.

2. Method according to claim 1 wherein the calibrating operation ends automatically when a prescribed number of position changes have occurred.

3. Method according to claim 1, wherein the calibrating operation is divided into two phases which are distinguished from each other through the direction of movement of the mechanism and a counting direction of a position counter.

4. Method according to claim 1, wherein an instantaneous value of said network output signal is compared with a preceeding value.

5. Method according to claim 4, wherein upon registering a deviation of the instantaneous value from the preceeding value, the movement of the mechanism is stopped, a predetermined number of measurements is carried out and the count of a position counter is altered.

6. Method according to claim 4, wherein an average value is formed from a predetermined number of measurements.

7. Method according to claim 1, wherein the calibrating operation is performed at a mechanism speed which is lower than the speed of the mechanism during normal operation.



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8. Method according to claim 7, wherein the reduction in mechanism speed is carried out through an alteration to a switch-on time of a motor driving the mechanism.

9. Method according to claim 1, wherein a starting position for the calibrating operation is determined by a switch inquiry.

10. Method according to claim 1, wherein a starting position for the calibrating operation is carried out by measuring a current supplied by the resistor network.

11. Method according to claim 1, wherein a starting position for the calibration operation is determined in a time-controlled manner.

12. Method according to claim 1, wherein the calibration operation is carried out within a test operation.

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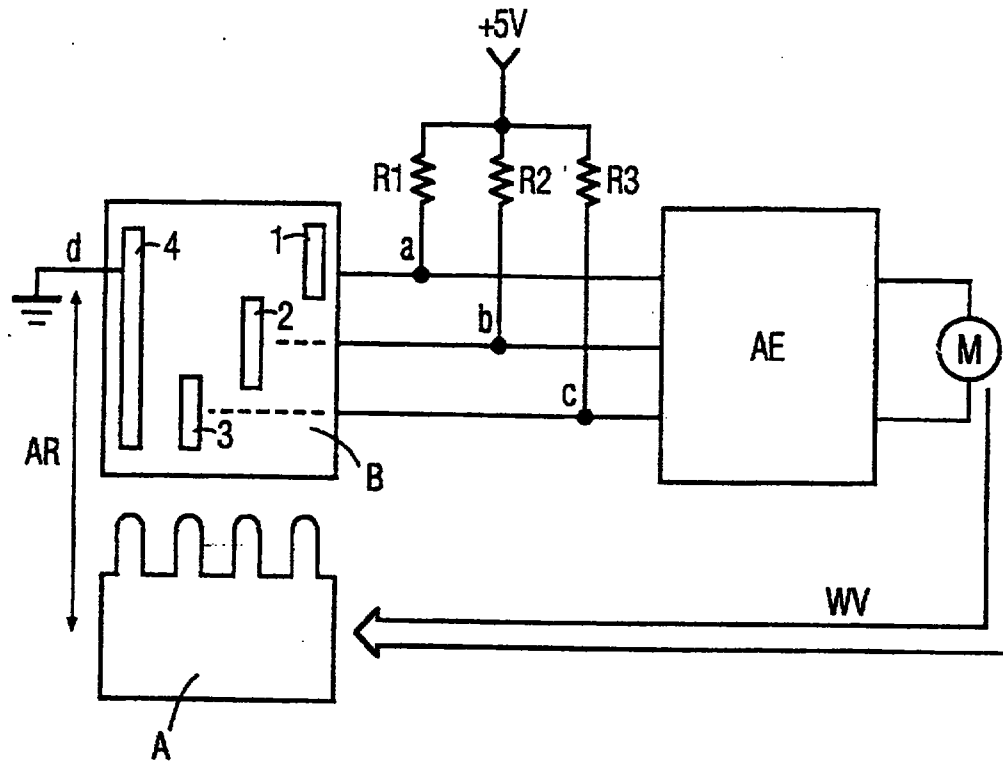


FIG. 1

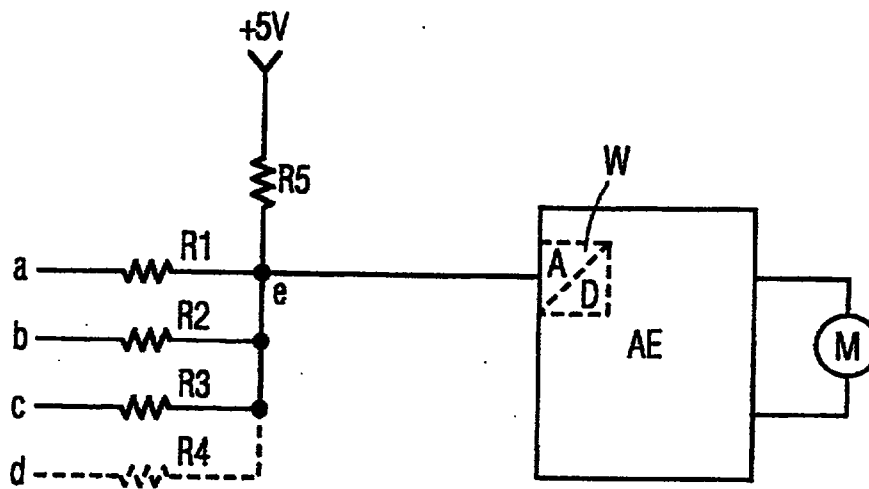


FIG. 2

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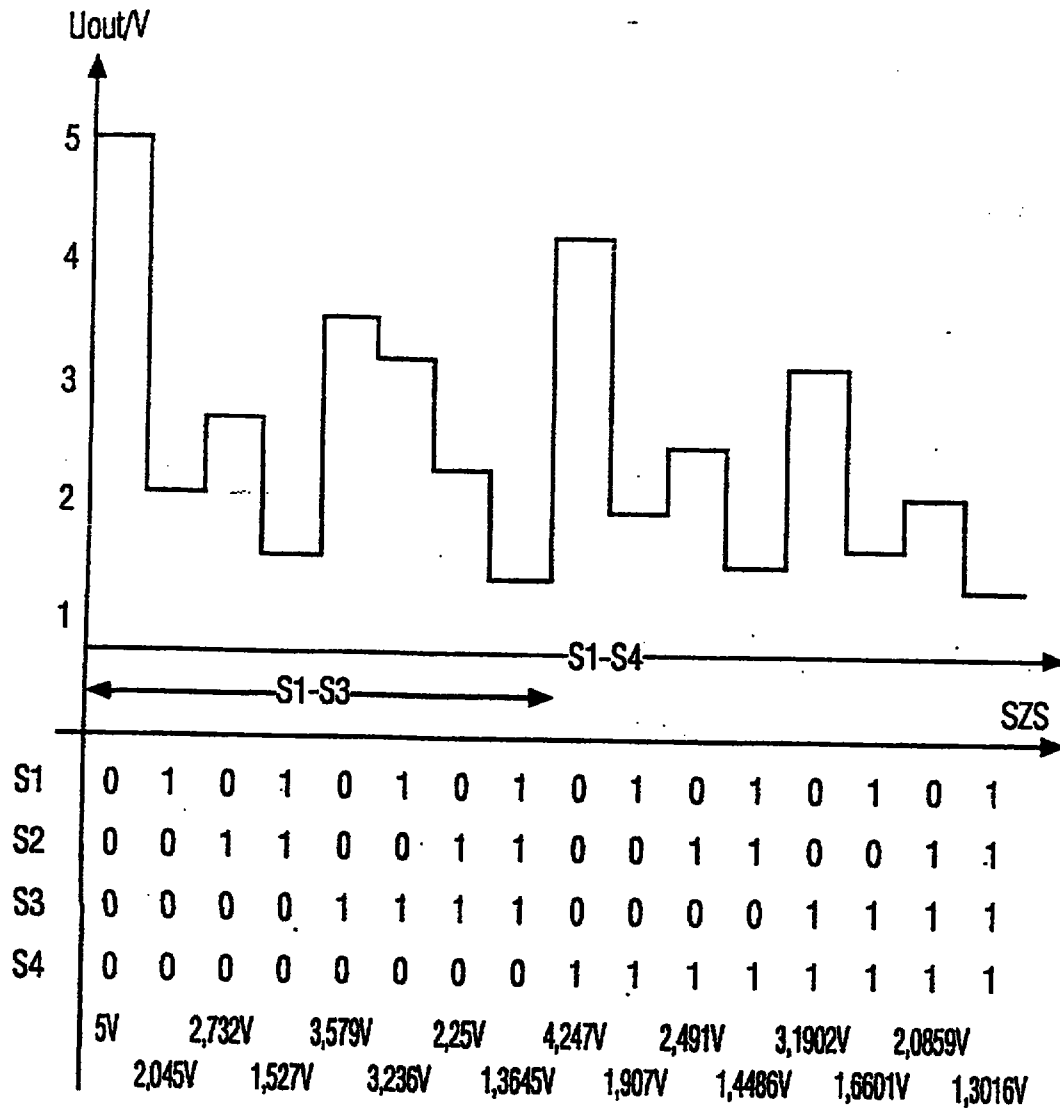
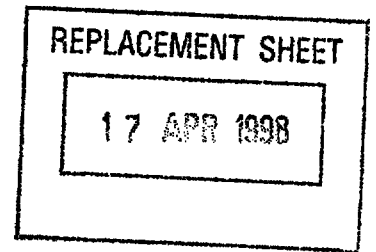


FIG. 3

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METHOD FOR DETERMINING THE POSITION IN A CASSETTE RECORDER

ABSTRACT

The determination of the position of a tape thread-in and thread-out mechanism in a cassette recorder is carried out using contact paths together with a slider contact that form position switches. Output signals of the position switches are coupled via a resistor network that combines the output signals and produces an output signal on a signal conductor. The resistor network output signal is coupled to an input of an analog-to-digital converter. To improve the reliability of determining the position of the mechanism without requiring the use of high accurate resistors in the resistor network, the voltage value assigned to each individual position is measured at the output of the network during a calibration operation. The voltage values are stored in a memory and used as the desired values during normal operation.

Figure 1