

PATENT SPECIFICATION (11)

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(54) APPARATUS FOR THE POSITIVE POSITIONING OF THE TRANSDUCING HEAD OR HEADS AND THE PRESSURE ROLLER OR ROLLERS IN MAGNETIC TAPE RECORDING AND PLAYBACK APPARATUS

(71) We, AUTOVOX S.P.A., an Italian Company, of 981 via Salaria—00199 Rome, Italy, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to magnetic tape recorders and players in which the tape in unwinding from one reel and winding onto another, passes in front of one or more playback and/or recording heads and passes between a tape drive capstan and a co-operating pinch roller.

It is known that both the heads and the pinch roller have to be advanced towards or retracted away from co-operating elements, i.e. stop members in the case of the heads and the capstan for the pinch roller so that they are in the correct position for normal advancement of the tape, for the insertion of the tape and/or for the fast forward wind or rewind of the tape.

According to the present day techniques, these problems are resolved by mounting the heads and the pressure roller on rotating arms or on slides which carry the heads against the stop members which are rigidly fixed to the chassis and the pinch roller against the capstan with a suitable elastic loading, the said arms and slides normally being elements with complicated linking means, operating means and means for taking up play.

It is an object of the present invention to provide a means by which the transducing head or heads and an associated pinch roller are advanced into or retracted from the operative position by the movement of a single support member.

Accordingly in magnetic tape recording and playback apparatus of the reel-to-reel type having at least one tape drive capstan the present invention provides the improve-

ment comprising apparatus for ensuring the positive operative positioning of a transducing head or heads and the operative engagement of at least one pinch roller and a said tape drive capstan, comprising the following features in combination:—

(1) a chassis having guide members,
(2) a single support member adapted to move relative to the chassis with lateral play in said guide members to and from said operative position,

(3) the transducing head or heads and the pinch roller being carried on said single support member,

(4) there being a pair of abutments provided on said support member adapted to move against respective ones of a pair of stop elements provided on said chassis when the support member is moved into its operative position,

(5) and wherein said support member is located in said operative position by the engagement of three regions of contact in a tripodal arrangement,

(6) said regions comprising, firstly that between the pinch roller and the said tape drive capstan and secondly and thirdly that between each abutment and the corresponding stop element,

(7) said tripodal arrangement of contact regions being disposed in a plane substantially orthogonal to the direction of movement of said support member to and from said operative position.

Preferably the apparatus according to the invention also provides means for automatically taking up play, for example, in the mounting of the pinch roller.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

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Figure 1 shows a schematic isometric view of an apparatus according to the invention;

Figure 2 shows a view in section of the apparatus of Figure 1; and

Figure 3 shows a plan view of a variation of the apparatus, which is of particular use in tape players which read in the two directions of travel of the tape having two pressure rollers one for each direction of travel of the tape.

With reference to the said drawings and in particular to Figures 1 and 2, the heads for reading 14 and recording 15 and also the pinch roller 13 for the tape are carried by a rigid support member 2 which is located positively in the operating position by the engagement of three regions of contact 6, 7 and 8 in a tripodal arrangement disposed substantially orthogonal to the direction in which the support member is moved to and from the operative position. The support member 2 with heads 14, 15 and roller 13 is moved by a pin 3 connected to the support member 2 by means of an articulated joint formed with a collar 9 provided on the support member 2.

Preferably the pin 3 is attached to a rocking arm 17 which is mounted on a pivot 4 of the chassis 1.

One of the elements of the tripodal arrangement is formed by the contact 6 between pinch roller 13 and capstan 11 under elastic load, and the other two vertices are aligned along a line 12 through a pair of abutments 12a, 12b, formed on the support member 2 which in the operative position are in contact respectively with a pair of stop elements 1a, 1b, mounted on the chassis 1, i.e. forming contact regions 7 and 8.

Preferably the line 12 is orthogonal to the central longitudinal axis 10 of the tape with the contact 8 above the said axis and the contact 7 below, so as to form in the operative position a pivot axis 12 about which the support member 2 with heads 14, 15 and roller 13 rotates until contact 6 is made with the roller 13 coming into engagement with the capstan 11, thus maintaining the elastic load.

As will be seen in the drawings and will become apparent from the description, the advancing or retracting movement of the support member 2 and the elements which are mounted on it is made by means of the pin 3 which operates freely inside the collar 9, the axis of the joint so formed being located in the plane of the tripodal arrangement defined by the contacts 6, 7 and 8 and preferably passing through the axis 10 of the tape so that the angle between the axial plane of the support member 2 and the axis of the joint may vary with a sufficient degree of freedom to enable the three regions

of contact to be made in the operative position.

As has been mentioned, the pin 3 can for example be a pin on a rocking lever 17 which is pivoted on the pivot 4 of the chassis. The rocking lever 17 also provides the elastic load by means of a suitable element, for example a spring, which for clarity is not shown in the drawing, which causes the pinch roller 13 to contact the capstan at 6 and corresponding abutment 12a, 12b on the support 2 to contact stop elements 1a, 1b at the points 7 and 8. The support member 2 moves between guides 5, 5', 5'' provided on the chassis 1, which guides help in the vertical positioning of the support member 2.

Thus the head 14 and consequently the head 15 are positioned in the path of travel of the tape in that the elastic load on the point 6 of the pinch roller 13, in accommodating a misalignment of the pivot 16 with respect to the axis 10 and the line of contact or axis of the capstan 11, produces a component of motion for the pivot 16 and hence for the support member 2, in the direction of travel of the tape, which results in the taking up of the play between the collar 9 and the pin 3 and between the rocking arm 17 and the pivot 4.

It is possible, without making any alterations in the substance of the tripodal contact arrangement and the control inherent in this to provide a supplementary joint between the pivot 16 of the pinch roller 13 and the support, and further to provide on the support 2 a means urging it towards the tape which is independent of the collar 9, a means which at the moment when the tripodal contact arrangement is made positions the long axis of the support 2 in the direction of travel of the tape.

It should be pointed out that in the retracting phase of the pinch roller-head unit, by using two rear abutment regions 18 and 19, the support 2 will position itself with its length parallel to the plane of the tape and at a predetermined distance from it.

As has been mentioned previously, the system described above lends itself very well to the case of tape recorders which read in the two directions of travel of the tape, and are hence provided with two pressure rollers. The variation which is necessary which is also suitable for operation of the embodiment of Figures 1 and 2 is shown in Figure 3.

In the embodiment of Figure 3, a transducing head 34 and pinch rollers 22, 23 having pivots 24, 25 respectively, are mounted on a support member 32. Each pinch roller 22, 23 cooperates respectively with a tape drive capstan 20, 21 to drive the tape in the required direction. A pin 26 having its axis passing through the centre line of

the head 34 forms a pair of abutments positioned above and below the head corresponding to the abutments 7 and 8 of the previous embodiment, with the axis of the pin 26 corresponding to the axis 12. As in the previous embodiment, the abutments formed by pin 26 cooperate with stop elements provided on the frame 28 to form two of the three regions of contact of the aforementioned tripodal arrangement of contact, these two regions of contact being common to the tripodal arrangement for each of the two directions of travel of the tape. The third of the three regions is provided as before by the contact between one pinch roller 22 or 23 and its respective tape drive capstan, i.e. between 22 and 20 or 23 and 24. The support 32 is rotated about pin 26 to achieve one of these contacts between pinch roller and capstan.

In the embodiment of Figure 3 the primary movement to bring the support member 32 into the operative position is made by means of a positioning member 31 which is bifurcated with arms 30 extending respectively above and below the head 34 with the arms 30 engaging the pin 26. To complete the movement into the operative position the support member 32 is rotated as mentioned above about the axis of pin 26. This final movement into operative position is effected by means of a spring 35 acting on a central extension of the support 32. The spring 35 is secured at one end to the extension of the support member by a pivot pin 27 and at the other end to the frame 28 by pivot pin 29 fixed to the frame.

In a fully operative position, e.g. when the tape is being driven in one of the desired directions by the capstan 21 in cooperation with pinch roller 23 the extension of support member 32 is in position 33¹¹ and the core of the spring 35 in the position 36¹¹ (shown in dotted lines). The alternative positions for 33¹¹ and 36¹¹ when the tape is driven by capstan 20 and roller 22 are omitted for the sake of clarity. The positions 33¹ and 36¹ show respectively the position of the support member extension and the core of the spring 35 when the support member is not completely in the operative position.

When the support member 32 is retracted from the operative position the positioning member 31 is withdrawn to the position indicated by the dotted line, with abutments 40, 41 provided on support member 32 in contact with corresponding stop members provided on frame 28.

From what has been said above, the advantages inherent in illustrated embodiments of the present invention are obvious. In particular, the number of parts required can be reduced considerably also assembly and dis-assembly may be simplified with a

reduction of the space required with easy access to all parts. Obviously, a similar system for movement of the pressure roller or rollers and the heads can be used in tape recorders of any type, but the system lends itself particularly well to cassette players of the type for cars or the portable type, where the reduction in dimensions is an extremely important element.

WHAT WE CLAIM IS:—

1. In magnetic tape recording and play back apparatus of the reel-to-reel type having at least one tape drive capstan, the improvement comprising apparatus for ensuring the positive operative positioning of a transducing head or heads and the operative engagement of at least one pinch roller and a said tape drive capstan, comprising the following features in combination:—

- (1) a chassis having guide members,
- (2) a single support member adapted to move relative to the chassis with lateral play in said guide members to and from said operative position,
- (3) the transducing head or heads and the pinch roller being carried on said single support member,
- (4) there being a pair of abutments provided on said support member adapted to move against respective ones of a pair of stop elements provided on said chassis when the support member is moved into its operative position,

(5) and wherein said support member is located in said operative position by the engagement of three regions of contact in a tripodal arrangement,

(6) said regions comprising, firstly that between the pinch roller and the said tape drive capstan and secondly and thirdly that between each abutment and the corresponding stop element,

(7) said tripodal arrangement of contact regions being disposed in a plane substantially orthogonal to the direction of movement of said support member to and from said operative position.

2. Apparatus according to claim 1, wherein the support member is displaceable with respect to the plane of travel of the tape along a path which is substantially orthogonal to said plane of travel, the displacement being effected by means of a pin forming an articulated joint with said support member, the axis of said joint lying in the plane of said tripodal arrangement of contacts in the operative position.

3. Apparatus according to claim 2, wherein said two stop elements are located on a line substantially orthogonal to the central longitudinal axis of the tape, one of the said elements being above said longitu-

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the head 34 forms a pair of abutments positioned above and below the head corresponding to the abutments 7 and 8 of the previous embodiment, with the axis of the pin 26 corresponding to the axis 12. As in the previous embodiment, the abutments formed by pin 26 cooperate with stop elements provided on the frame 28 to form two of the three regions of contact of the aforementioned tripodal arrangement of contact, these two regions of contact being common to the tripodal arrangement for each of the two directions of travel of the tape. The third of the three regions is provided as before by the contact between one pinch roller 22 or 23 and its respective tape drive capstan, i.e. between 22 and 20 or 23 and 24. The support 32 is rotated about pin 26 to achieve one of these contacts between pinch roller and capstan.

In the embodiment of Figure 3 the primary movement to bring the support member 32 into the operative position is made by means of a positioning member 31 which is bifurcated with arms 30 extending respectively above and below the head 34 with the arms 30 engaging the pin 26. To complete the movement into the operative position the support member 32 is rotated as mentioned above about the axis of pin 26. This final movement into operative position is effected by means of a spring 35 acting on a central extension of the support 32. The spring 35 is secured at one end to the extension of the support member by a pivot pin 27 and at the other end to the frame 28 by pivot pin 29 fixed to the frame.

In a fully operative position, e.g. when the tape is being driven in one of the desired directions by the capstan 21 in cooperation with pinch roller 23 the extension of support member 32 is in position 33¹¹ and the core of the spring 35 in the position 36¹¹ (shown in dotted lines). The alternative positions for 33¹¹ and 36¹¹ when the tape is driven by capstan 20 and roller 22 are omitted for the sake of clarity. The positions 33¹ and 36¹ show respectively the position of the support member extension and the core of the spring 35 when the support member is not completely in the operative position.

When the support member 32 is retracted from the operative position the positioning member 31 is withdrawn to the position indicated by the dotted line, with abutments 40, 41 provided on support member 32 in contact with corresponding stop members provided on frame 28.

From what has been said above, the advantages inherent in illustrated embodiments of the present invention are obvious. In particular, the number of parts required can be reduced considerably also assembly and dis-assembly may be simplified with a

reduction of the space required with easy access to all parts. Obviously, a similar system for movement of the pressure roller or rollers and the heads can be used in tape recorders of any type, but the system lends itself particularly well to cassette players of the type for cars or the portable type, where the reduction in dimensions is an extremely important element.

WHAT WE CLAIM IS:—

1. In magnetic tape recording and play back apparatus of the reel-to-reel type having at least one tape drive capstan, the improvement comprising apparatus for ensuring the positive operative positioning of a transducing head or heads and the operative engagement of at least one pinch roller and a said tape drive capstan, comprising the following features in combination:—

(1) a chassis having guide members,
(2) a single support member adapted to move relative to the chassis with lateral play in said guide members to and from said operative position,

(3) the transducing head or heads and the pinch roller being carried on said single support member,

(4) there being a pair of abutments provided on said support member adapted to move against respective ones of a pair of stop elements provided on said chassis when the support member is moved into its operative position,

(5) and wherein said support member is located in said operative position by the engagement of three regions of contact in a tripodal arrangement,

(6) said regions comprising, firstly that between the pinch roller and the said tape drive capstan and secondly and thirdly that between each abutment and the corresponding stop element,

(7) said tripodal arrangement of contact regions being disposed in a plane substantially orthogonal to the direction of movement of said support member to and from said operative position.

2. Apparatus according to claim 1, wherein the support member is displaceable with respect to the plane of travel of the tape along a path which is substantially orthogonal to said plane of travel, the displacement being effected by means of a pin forming an articulated joint with said support member, the axis of said joint lying in the plane of said tripodal arrangement of contacts in the operative position.

3. Apparatus according to claim 2, wherein said two stop elements are located on a line substantially orthogonal to the central longitudinal axis of the tape, one of the said elements being above said longitudi-



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dinal axis and the other below, whereby during the movement to the operative position there is provided a pivot axis about which the support member is turned by an elastic load transmitted through the axis of said articulated joint until the pinch roller contacts the respective tape drive capstan.

4. Apparatus according to claim 2 or 3, wherein the articulation of said joint is such as to permit variation of the angle between the axial plane of said support member and the axis of said joint.

5. Apparatus according to any one of the preceding claims, wherein rear abutments are provided on said support member which co-operate with additional stop elements on said chassis to limit the retracting movement of said support with respect to the chassis away from the operative position.

6. Apparatus according to any of the preceding claims, adapted for tape travel selectively in either one of two directions, wherein said support member has a single head and a respective pinch roller co-operating with a respective tape drive capstan for each direction of travel of the tape forming a first said region of contact of said tripodal arrangement and wherein said pair of abutments are formed on a pin having its

axis through the centre line of said head with one abutment above the head and the other below, whereby the pair of contacts between the said abutments and corresponding stop elements forming the second and third of said regions of contact of said tripodal arrangement are common to the tripodal arrangements of contacts for the positioning of the support member for operation in the two directions of travel of the tape.

7. Apparatus according to claim 6, wherein means are provided for the swivelling the said support member into the operative position for the one or the other of the directions of travel of the tape with the respective pinch roller in contact with the corresponding capstan.

8. Apparatus according to claim 1, for ensuring the positive operative positioning of the transducing head or heads and the operative engagement of a pinch roller with the tape drive capstan in tape recording and playback apparatus, substantially as hereinbefore described and illustrated in the accompanying drawings.

HYDE, HEIDE & O'DONNELL,
2 Serjeant's Inn,
EC4Y 1LL.
Agents for Applicant.

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