

SPECIFICATION

Apparatus for recording and/or playing back signals on a magnetic tape

5 The invention relates to an apparatus for recording and/or playing back signals on a magnetic tape, comprising a head plate on which a magnetic head support carrying a magnetic head is supported by a

10 first supporting member which is rigidly attached to the head plate and on which the magnetic head support is pivotable and a second supporting member which is adjustably attached to the head plate for adjusting the azimuth angle of the magnetic head by

15 pivoting the magnetic head support on the first supporting member, the magnetic head being attached to a flat plate member which comprises projecting limbs which constitute a tape guide for guiding the edges of the magnetic tape.

20 An apparatus of this type is known from United States Patent Specification 3,649,773. In this known apparatus the flat plate member comprising the tape guide is spaced from the head plate via the magnetic-head support by means of a fixed supporting

25 member which takes the form of a cylindrical sleeve. In order to minimize the influence of the adjustable supporting member, constituted by a set screw, on this spacing, the flat plate member is disposed near the fixed supporting member.

30 The flat plate member, which constitutes an integrated unit with the magnetic head support, it bent at right angles to the fixed supporting member. The distance from the tape guide to a reference plane formed by the head plate surface which faces

35 the magnetic head is subject to certain tolerances as a result of this bending operation. These tolerances, which further increase owing to the tolerances in respect of the axial dimension of the cylindrical sleeve, generally result in the tape guide being

40 positioned at a deviating distance from the reference plate in comparison with other tape guides. As the tape guide of another magnetic head (such as the erase head) is also subject to such a tolerance, the difference in distance as a result of these tolerances

45 may be doubled. However, as in an apparatus of the above type it is essential for a correct tape motion that in particular the tape guides of the magnetic head are positioned equidistantly from the reference plane with the greatest accuracy, the desired accuracy is attainable only by eliminating the obtaining

50 tolerances with the aid of expensive, difficult-to-operate and time-consuming adjusting means.

According to the invention there is provided an apparatus for recording and/or playing back signals

55 on a magnetic tape, comprising a head plate on which a magnetic head support carrying a magnetic head is supported by a first supporting member which is rigidly attached to the head plate and on which the magnetic head support is pivotable and a

60 second supporting member which is adjustably attached to the head plate for adjusting the azimuth-angle of the magnetic head by pivoting the magnetic head support on the first supporting member, the magnetic head being attached to a flat plate member

65 which comprises projecting limbs which constitute a

tape guide for guiding the edges of the magnetic tape, wherein the flat plate member comprises a tongue which extends towards the head plate and engages in an elongate recess of substantially

70 V-shaped cross-section in the first supporting member to form a knife-edge bearing for pivotally supporting the magnetic head support.

By thus defining the distance from the tape guide to the reference plane by means of two parts which can be manufactured very accurately, namely, the

75 fixed first supporting member and the flat plate member, the tape guide need not be adjusted relative to the head plate, and it is ensured that any deviations in the distance of the various tape guides of the magnetic heads from the reference plane are

80 minimal. The dimensions of the flat plate member which are critical for this distance, namely, the distances from the respective tape-guiding edges of the tape guide limbs to the distal end of the tongue

85 measured perpendicularly to the reference plane can be defined very accurately in a blanking die, whilst as the fixed first supporting member can be moulded on the head plate simultaneously with

90 fixed supporting members for other magnetic heads by means of precision techniques, for example, injection moulding, the distances of the supporting surfaces of the fixed supporting members from the reference plane can also be adapted to each other very accurately.

95 The elimination of an adjustment of the tape guide by the use of parts which can be manufactured simply and the simple assembly, requiring merely the fixation of the adjustable supporting member, simplifies not only the manufacture of the apparatus

100 in accordance with the invention but also the servicing.

Preferably, the recess in the first supporting member extends with its longitudinal axis at right angles to a plane which is tangential to the curved

105 contact face of the magnetic head at the air gap in this face, and for holding the tongue in the longitudinal direction of the recess the latter is closed at at least one end. The contact face of the magnetic head is the face with which the magnetic tape cooperates

110 in the operation of the apparatus.

As a result of this the tongue, and thus the tape guide and the magnetic head, can be positioned accurately not only in respect of their distances from said reference plane but also in respect of their

115 distances from a second reference plane which is defined by a tangent plane to adjacent tape guides.

According to one embodiment of the invention the flat plate member is provided with two of said tongues and for each tongue there is provided an

120 associated first supporting member which is rigidly attached to the head plate and which is formed with an elongate recess of substantially V-shaped cross-section in which the respective tongue engages to form a knife-edge bearing for pivotally supporting

125 the magnetic head support, the recesses in the two first supporting members being disposed longitudinally in line with each other and each being closed at the end remote from the other recess. This provides a stable arrangement which, in view of the forces exerted on the magnetic head by the tape,

130

may be desirable in order to keep the magnetic head and tape guide in the correct position.

The flat plate member may constitute an integrated unit with the magnetic head support, and this unit may be urged in at least one direction about the knife-edge bearing or bearings by a spring which between the supporting members is attached to the unit. As a result of this the unit is urged against the various supporting members with sufficient force to keep the magnetic head and the tape guide in the correct position in spite of said forces exerted by the tape.

In one embodiment of the invention the spring consists of a leaf spring which at one end is attached to said unit and at the other end bears on an element which is fixed to the head plate. This not only further simplifies the mounting of the unit but also produces an accurately defined spring tension, which ensures that the unit retains the correct position.

Embodiments of the invention will now be described in more detail with reference to the accompanying drawings, in which

Figure 1 is a plan view of an apparatus constructed in accordance with the invention,

Figure 2 is an elevation, looking in the direction of the arrow II in *Figure 1*, of a magnetic head of the apparatus of *Figure 1* and its mounting on the head plate,

Figure 3 shows a part of *Figure 2* on an enlarged scale,

Figure 4 is an exploded perspective view of the parts shown in *Figure 2*,

Figure 5 is a view similar to *Figure 2* of a magnetic head and its mounting on the head plate in a second embodiment of the invention,

Figure 6 is a view similar to *Figure 2* of a magnetic head and its mounting on the head plate in a third embodiment of the invention, and

Figure 7 is an exploded perspective view of the parts shown in *Figure 6*.

The apparatus 1 shown in *Figure 1* is for recording and/or playing back signals on a magnetic tape 2 which is wound around two winding hubs in a generally rectangular cassette 3 and which between the winding hubs is guided along one of the longer sides of the cassette which side is referred to herein as the "front" of the cassette.

The apparatus comprises a chassis having a deck plate 4, whose upper surface constitutes a supporting surface for the cassette 3. When the cassette is placed on the supporting surface the winding hubs engage with winding mandrels 5 and 6 of the apparatus, which can be coupled to a drive system situated underneath the deck plate 4.

The apparatus further comprises movable head plate 7 near the front of the cassette, which plate carries the magnetic heads of the apparatus, comprising an erase head 8 and a combined recording/playback head 9. At the front the cassette comprises a wall in which is formed a number of openings which, by shifting the head plate 7 in the direction of the cassette, enable the magnetic heads 8 and 9 to be brought into operative contact with the magnetic tape and the magnetic tape to be pressed against a capstan 11 by a pressure roller 10, which capstan can

be coupled to the drive system and extends perpendicularly to the head plate 7.

As is shown in *Figures 2* to *4*, a number of supporting members is provided on the head plate 7 for positioning the two magnetic heads relative to the head plate 7. These include fixed supporting members 12, 13, 19 and 20 which are rigidly attached to the head plate 7. If the supporting member and the head plate are both made of a plastics material the supporting members can be moulded integrally with the plate. In the case of a metal head plate the fixed supporting members are formed on the plate preferably by the process known as "outsert moulding". This involves first forming holes in the plate at the places where the supporting members are to be located and then forming these members *in situ* on the plate from a plastics material by injection moulding. The supporting members are thus rigidly secured in the holes in the plate. Owing to this precision manufacturing technique each of the various fixed supporting members is formed very accurately in respect of the distance (distance *a* for the supporting member 20, for example) of its supporting surface from a reference plane 7A which is constituted by the surface of the head plate 7 facing the magnetic heads (*Figure 3*), and the mutual differences in the distances of the supporting surfaces of the supporting members from the reference plane 7A are minimal. The erase head 8, on which in the present embodiment a tape guide 8A is mounted in an accurate manner during manufacture of the head, is directly mounted on two fixed supporting members 12 and 13, whilst the recording/playback head 9 is supported by a magnetic-head support 14, which on the side nearer the erase head 8 bears against an adjustable supporting member constituted by a set screw 15, and on the side nearer the pressure roller 10 is supported by two fixed supporting members 19 and 20 via a flat plate member 16 which forms an integrated unit with the head support and which comprises two tongues 17 and 18 which extend towards the head plate 7. For receiving the tongues 17 and 18 the supporting members 19 and 20 are formed with slot-like recesses 21 and 22 respectively of substantially V-shaped cross-section. These recesses extend with their longitudinal axes perpendicular to a plane which is tangential to the curved contact face 9a of the magnetic head 9 at the air gap (not shown) in this face. The recesses 21 and 22 are disposed longitudinally in line with each other, and at their outer ends, i.e., the ends which are remote from each other, they are closed for holding the tongues 17 and 18 in the longitudinal direction of the recesses. The distal ends of the tongues 17 and 18 cooperate with the recesses 21 and 22 respectively to form knife-edge bearings, about which the magnetic head support 14 is pivotable by turning the set screw 15, so as to adjust the azimuth angle of the magnetic head 9.

The unit comprising the magnetic head support 14 and the plate member 16 is preferably manufactured from a thin sheet material. The plate member 16 and the support 14 comprise upstanding wall portions 23 and 24, respectively, between which the magnetic

head 9 has an interference fit. The head is secured to the wall portions 23 and 24 by bolts 25. Instead of bolts it is equally possible to secure the magnetic head 9 to the wall portions by means of spot-welding 5 or adhesive.

The wall portions 23 and 24 extend at right angles to a base portion 26 of the magnetic head support. The flat plate member 16, in addition to the wall portion 23 and the tongues 17 and 18, comprises a 10 tape guide 27 in the form of two projecting limbs 28 and 29 which extend in the direction of the cassette 3 for respectively guiding the upper and the lower edges of the magnetic tape. Thus, viewed in the elevation of Figure 2, the limbs 28 and 29 are 15 situated straight above the tongues 17 and 18. By blanking the plate member 16 with the tongues 17 and 18 and the limbs 28 and 29 out of one piece of flat sheet material, the distances b and c of the tape-guiding edges of the limbs 29 and 28 respec- 20 tively from a plane containing the distal ends of the tongues 17 and 18 and extending perpendicularly to the plate member 16, may be defined very accurately in a blanking die; a tolerance of ± 0.015 mm is found to be feasible.

25 The base portion 26 extends from the plate member 16 beyond the wall portion 24 and in the part which lies beyond this wall portion is formed with a bore through which the set screw 15 extends to screw into a screw-threaded hole 43 in the plate 7. 30 The base portion 26 is urged against a head 30 of the screw 15 by a leaf spring which is integral with the support 14 and which within a triangle formed by lines connecting the supporting members 15, 19 and 20, adjoins the base portion 26.

35 The spring 31 extends from the base portion 26 through the space between the supporting members 19 and 20 towards the head plate 7, and its end portion which is remote from the base portion 26 engages beneath the head of a stud 32 fixed on the 40 head plate 7, so that the spring tends to pivot the unit about the knife-edge bearings in the direction of the arrow A in Figure 2. With this arrangement of the spring the unit comprising the support 14 and the plate member 16 is urged against the various 45 supports with an accurately defined spring force.

For controlling the coupling between the drive system and the winding mandrels 5 and 6 respectively and the capstan 11 and for moving the plate 7 there is provided a number of press-buttons 33.

50 The apparatus parts supported by the head plate 7 and described in the foregoing can be mounted in a simple yet accurate manner. After the magnetic head 9 has been secured to the wall portions 23 and 24, the unit comprising the head support 14 and the 55 plate member 16 is fitted with the tongues 17 and 18 engaging in the recesses 21 and 22 and the spring 31 engaging beneath the head of the stud 32. The screw 15 is inserted in the hole 43 in the plate 7 and is then tightened, so that the base portion 26 is pressed 60 against the head 30 of the screw 15 under the influence of the spring 31, and finally the azimuth angle of the magnetic head is adjusted with the screw 15. When the magnetic heads 8 and 9 have been mounted the arrangement of the tape guides 65 and of the magnetic heads ensures that any devia-

tions in the distances of the tape guides 8A and 27 from the reference plane 7A are minimal and that the respective tape-guiding edges of the tape guides 8A and 27 will so guide the tape past the magnetic 70 heads that in this region the longitudinal axis of the tape extends perpendicularly to the capstan 11. As the recesses 21 and 22 are closed at their outer ends, the tongues 17 and 18 and the magnetic head 9 are not only positioned accurately in respect of their 75 distances from the reference plane 7A but also in respect of their distances from the front wall of the cassette 3 in which the openings are formed and from the magnetic tape contained in the cassette, without the risk of this alignment being disturbed by 80 forces exerted by the tape. Moreover, by thus minimizing the tolerances obtaining, the penetration depth of the magnetic head into the cassette 3 when the head plate 7 is moved is accurately defined. By means of the set screw 15 the azimuth angle of the 85 magnetic head can be adjusted very precisely, the magnetic head support 14 pivoting very accurately about the distal ends of the tongues 17 and 18, considering the normally very small angular movements involved in azimuth adjustments, without 90 thereby affecting the position of the tape guide 27 relative to the reference plane 7A. Thus, by the use of fixed supporting members and a flat plate member, which are easy to manufacture, adjustment of the tape guides of the magnetic heads 8 and 9 is 95 superfluous, so that an accurate guidance of the magnetic tape is obtained in an economically very attractive manner.

In the second embodiment, shown in Figure 5, a separate leaf spring 34 is used instead of the integral 100 spring 32. This spring 34 is clamped underneath a screw 35 at the end which is remote from the base portion 26 of the magnetic head support 14. As the spring 34 tends to pivot the magnetic head in the direction indicated by arrow B, the adjustable sup- 105 porting member is constituted by a nut 36 on the screw 15. The same positioning accuracy can be obtained with this construction as with the first embodiment, the spring 34 being adaptable as required.

110 In the third embodiment, shown in Figures 6 and 7, the flat plate member 16 is a separate part from the magnetic head support 14 and comprises a single broad tongue 37 which engages in one long slot-like recess 38 of substantially V-shaped cross-section in 115 a single fixed supporting member 39. The magnetic head support 14 comprises a base portion 40, which is disposed adjacent the magnetic head, and a wall portion 41, to which the magnetic head 9 is attached by a bolt 25. Furthermore, a tension spring 42 is used 120 which, as in the first embodiment, tends to pivot the magnetic head support in the direction indicated by the arrow A. The use of a separate plate member 16 provides a high degree of flexibility, for example, in respect of mounting the tape guide on various types 125 of magnetic heads. The one long recess 38 in a single supporting member can provide the desired stability for the positioning of the plate member 16. However, it is alternatively possible to use a separate plate member having two tongues engaging in 130 recesses in two supporting members, as in the

previous embodiments. It is to be noted that in the previous embodiments it is also possible to have a single supporting member (such as the supporting member 39) and only one tongue.

- 5 The constructions of the embodiments described in the foregoing may be used to advantage for accurately positioning a plurality of magnetic heads relative to each other, for example, in equipment with separately arranged recording and playback
10 heads. Moreover, their use is not restricted to apparatus operating with a magnetic tape accommodated in a cassette; the construction described may also be used with great advantage in equipment operating with magnetic tape carried on
15 reels, which equipment will generally be provided with a plurality of magnetic heads.

- Although the constructions described relate to recording and/or playback heads, the constructions of the flat plate member and the magnetic heads
20 relative to each other may also be used advantageously in conjunction with erase heads (such as the erase head 8), in which case mounting of the head on fixed supporting members will suffice, because erase heads generally require no
25 adjustment of the azimuth angle.

- Reference is invited to the specification of the Applicants' copending patent application no. 8200552, which was divided out of the present application. In the specification of this copending
30 application there is claimed a magnetic-head assembly for an apparatus of a kind to which the present invention belongs for recording and/or playing back signals on a magnetic tape, the assembly comprising a magnetic head attached to a
35 magnetic-head support and to a flat plate member which comprises projecting limbs constituting a tape guide for guiding the edges of the magnetic tape, wherein the flat plate member further comprises a
40 part having an edge which extends in a plane containing the projecting limbs and which, when the magnetic-head assembly is mounted on the head plate of the apparatus, pivotally engages a surface of the first supporting member on the head plate to define a pivotal axis for the azimuth-angle
45 adjustment of the magnetic-head assembly, the magnetic-head support having a part which is constructed for cooperation with the second supporting member on the head plate.

50 CLAIMS

1. An apparatus for recording and/or playing back signals on a magnetic tape, comprising a head plate on which a magnetic head support carrying a
55 magnetic head is supported by a first supporting member which is rigidly attached to the head plate and on which the magnetic head support is pivotable and a second supporting member which is adjustably attached to the head plate for adjusting the
60 azimuth angle of the magnetic head by pivoting the magnetic head support on the first supporting member, the magnetic head being attached to a flat plate member which comprises projecting limbs which constitute a tape guide for guiding the edges
65 of the magnetic tape, wherein the flat plate member

comprises a tongue which extends towards the head plate and engages in an elongate recess of substantially V-shaped cross-section in the first supporting member to form a knife-edge bearing for pivotally
70 supporting the magnetic head support.

2. An apparatus as claimed in Claim 1, wherein the recess in the first supporting member extends with its longitudinal axis at right angles to a plane which is tangential to the curved contact face of the
75 magnetic head at the air gap in this face, and wherein for holding the tongue in the longitudinal direction of the recess the latter is closed at at least one end.

3. An apparatus as claimed in Claim 2, wherein the flat plate member is provided with two of said
80 tongues and for each tongue there is provided an associated first supporting member which is rigidly attached to the head plate and which is formed with an elongate recess of substantially V-shaped cross-section in which the respective tongue engages to form a knife-edge bearing for pivotally supporting
85 the magnetic head support, the recess in the two first supporting members being disposed longitudinally in line with each other and each being closed at the
90 end remote from the other recess.

4. An apparatus as claimed in any preceding Claims, wherein the flat plate member constitutes an integrated unit with the magnetic head support, and wherein this unit is urged in at least one direction
95 about the knife-edge bearing or bearings by a spring which between the supporting members is attached to the unit.

5. An apparatus as claimed in Claim 4, wherein the spring consists of a leaf spring which at one end
100 is attached to said unit and at the other end bears on an element which is fixed to the head plate.

6. An apparatus for recording and/or playing back signals on a magnetic tape, substantially as herein described with reference to Figure 1 and
105 Figures 2, 3 and 4 or Figure 5 or Figures 6 and 7 of the accompanying drawings.



previous embodiments. It is to be noted that in the previous embodiments it is also possible to have a single supporting member (such as the supporting member 39) and only one tongue.

- 5 The constructions of the embodiments described in the foregoing may be used to advantage for accurately positioning a plurality of magnetic heads relative to each other, for example, in equipment with separately arranged recording and playback
10 heads. Moreover, their use is not restricted to apparatus operating with a magnetic tape accommodated in a cassette; the construction described may also be used with great advantage in equipment operating with magnetic tape carried on
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Although the constructions described relate to recording and/or playback heads, the constructions of the flat plate member and the magnetic heads
20 relative to each other may also be used advantageously in conjunction with erase heads (such as the erase head 8), in which case mounting of the head on fixed supporting members will suffice, because erase heads generally require no
25 adjustment of the azimuth angle.

Reference is invited to the specification of the Applicants' copending patent application no. 8200552, which was divided out of the present application. In the specification of this copending
30 application there is claimed a magnetic-head assembly for an apparatus of a kind to which the present invention belongs for recording and/or playing back signals on a magnetic tape, the assembly comprising a magnetic head attached to a
35 magnetic-head support and to a flat plate member which comprises projecting limbs constituting a tape guide for guiding the edges of the magnetic tape, wherein the flat plate member further comprises a part having an edge which extends in a plane
40 containing the projecting limbs and which, when the magnetic-head assembly is mounted on the head plate of the apparatus, pivotally engages a surface of the first supporting member on the head plate to define a pivotal axis for the azimuth-angle
45 adjustment of the magnetic-head assembly, the magnetic-head support having a part which is constructed for cooperation with the second supporting member on the head plate.

50 CLAIMS

1. An apparatus for recording and/or playing back signals on a magnetic tape, comprising a head plate on which a magnetic head support carrying a
55 magnetic head is supported by a first supporting member which is rigidly attached to the head plate and on which the magnetic head support is pivotable and a second supporting member which is adjustably attached to the head plate for adjusting the
60 azimuth angle of the magnetic head by pivoting the magnetic head support on the first supporting member, the magnetic head being attached to a flat plate member which comprises projecting limbs which constitute a tape guide for guiding the edges
65 of the magnetic tape, wherein the flat plate member

comprises a tongue which extends towards the head plate and engages in an elongate recess of substantially V-shaped cross-section in the first supporting member to form a knife-edge bearing for pivotally
70 supporting the magnetic head support.

2. An apparatus as claimed in Claim 1, wherein the recess in the first supporting member extends with its longitudinal axis at right angles to a plane which is tangential to the curved contact face of the
75 magnetic head at the air gap in this face, and wherein for holding the tongue in the longitudinal direction of the recess the latter is closed at at least one end.

3. An apparatus as claimed in Claim 2, wherein the flat plate member is provided with two of said
80 tongues and for each tongue there is provided an associated first supporting member which is rigidly attached to the head plate and which is formed with an elongate recess of substantially V-shaped cross-section in which the respective tongue engages to
85 form a knife-edge bearing for pivotally supporting the magnetic head support, the recess in the two first supporting members being disposed longitudinally in line with each other and each being closed at the
90 end remote from the other recess.

4. An apparatus as claimed in any preceding Claims, wherein the flat plate member constitutes an integrated unit with the magnetic head support, and wherein this unit is urged in at least one direction
95 about the knife-edge bearing or bearings by a spring which between the supporting members is attached to the unit.

5. An apparatus as claimed in Claim 4, wherein the spring consists of a leaf spring which at one end
100 is attached to said unit and at the other end bears on an element which is fixed to the head plate.

6. An apparatus for recording and/or playing back signals on a magnetic tape, substantially as herein described with reference to Figure 1 and
105 Figures 2, 3 and 4 or Figure 5 or Figures 6 and 7 of the accompanying drawings.