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SOUND HEAD FOR MAGNETIC RECORDING MACHINE

Original Filed Oct. 25, 1937

2 Sheets-Sheet 1

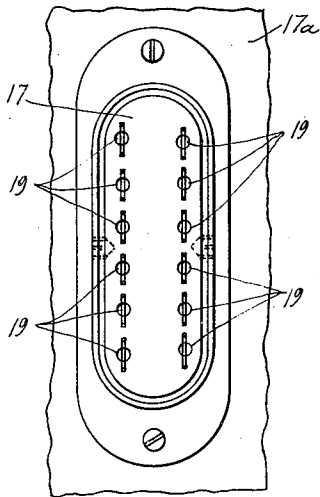


Fig. 7.

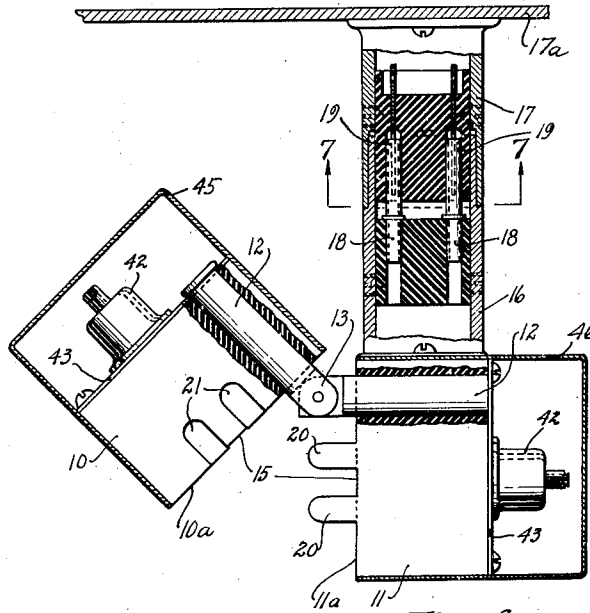


Fig. 6.

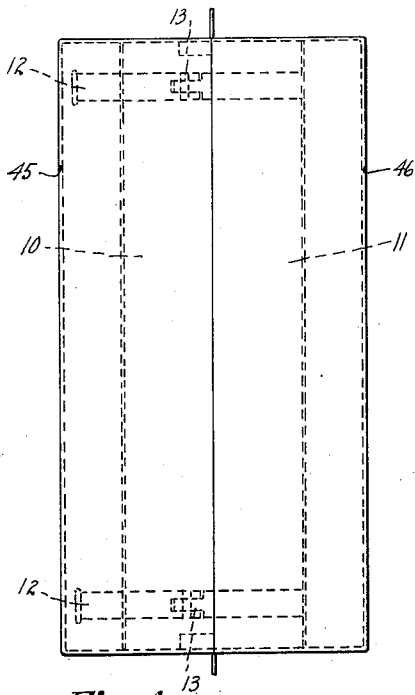


Fig. 1.

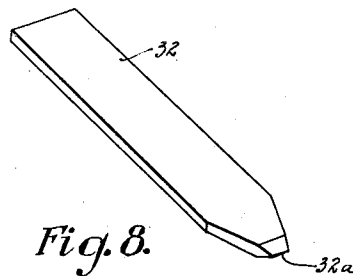


Fig. 8.

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2 Sheets-Sheet 2

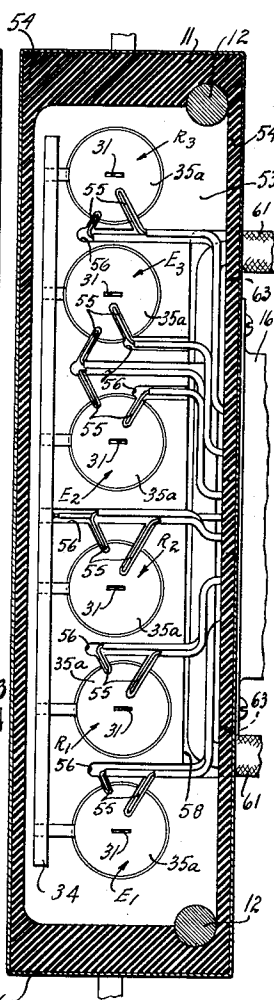


Fig. 5.

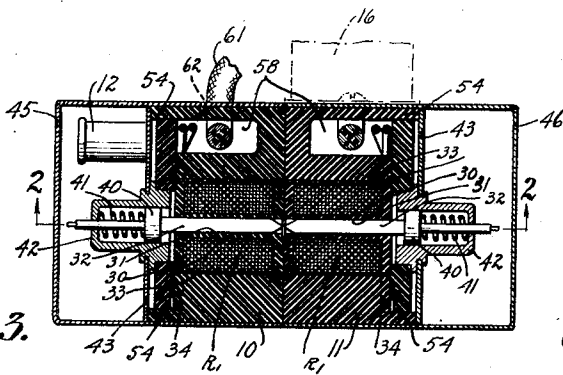


fig. 3.

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UNITED STATES PATENT OFFICE

2,229,326

SOUND HEAD FOR MAGNETIC RECORDING MACHINE

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Application October 25, 1937, Serial No. 170,985
Renewed July 10, 1940

6 Claims. (Cl. 179-100.2)

This invention relates generally to tone heads for magnetic sound recording machines.

In magnetic sound recording machines, a magnetic element, either a wire or a flat tape, is driven at constant speed through a tone head between erasing and recording pole pieces surrounded and magnetized by coils mounted in the tone head, these coils carrying the erasing or recording currents. In certain forms of such machines, the pole pieces bear lightly on opposite sides of the recording element, and since the tips of the pole pieces which ride in engagement with the travelling recording elements are frequently of thickness dimensions as small as a few thousandths of an inch, it becomes desirable to inspect or replace the pole pieces from time to time. It also frequently becomes necessary to remove the magnetic tape from the machine and replace it by another, which necessitates either pulling the end of the used tape through the tone head, and inserting the end of a new tape therethrough, or else opening the tone head in such a manner that the tape can be moved transversely into and out of operative position between the coils.

It is accordingly one object of the present invention to provide a tone head adapted to be opened up in an improved and highly convenient manner in order to expose the pole tips for inspection or for pole piece replacement, or for convenient removal and replacement of the tape.

In accordance with the present invention, the coils and pole pieces on each side of the recording elements are mounted in an insulation block, and the two insulation blocks, on opposite sides of the recording element, are connected by pins tightly engaging one block and slidable in the other, these pins being provided with hinge joints. When it is desired to open the tone head, either for the purpose of replacement of the recording element, or for the purpose of inspecting or replacing the pole pieces, the two insulation blocks are first pulled apart on these pins, and then swung apart in a jack-knife manner, thus opening up the tone head in such a manner that the pole pieces may be very conveniently observed or removed. If the purpose is simply to thread a different tape through the tone head, the two blocks may of course simply be pulled apart sufficiently for the purpose, without bending one of the blocks back on the hinge joints. In reclosing the tone head, the two coil-carrying blocks are first swung into alignment, so that the pole tips are directly opposite one another, and then moved together on the mounting pins, this assuring that the pole tips move properly into engagement with the recording element, without binding or strain.

Various additional objects and corresponding features of the invention will appear and be

more fully described in the course of the following detailed description of a present preferred embodiment thereof, reference for this purpose being had to the accompanying drawings, in which:

Fig. 1 is a front elevation of the tone head; Fig. 2 is a longitudinal medial vertical section of the tone head, being taken as indicated by line 2-2 of Fig. 3;

Fig. 3 is a transverse section taken on line 3-3 of Fig. 2;

Fig. 4 is a view taken as indicated by line 4-4 of Fig. 2;

Fig. 5 is a section taken as indicated by line 5-5 of Fig. 2;

Fig. 6 is a plan view of the tone head, with parts broken away, and showing the tone head in open position;

Fig. 7 is a section taken on line 7-7 of Fig. 6; and

Fig. 8 is a perspective view of a typical pole piece.

The tone head here shown for illustrative purposes has a multiplicity of erasing and recording coils, applicable for instance to a multiple lane recording system such as disclosed and claimed in a copending application filed jointly by myself and Leo G. Butler, entitled Apparatus for magnetic recordation and reproduction of sound, Serial No. 170,988, filed Oct. 25, 1937. In such a system, the recording element is in the form of a flat tape, and a plurality of recordings are made on adjacent lanes of the tape, using for this purpose a plurality of sets of erasing and recording coils, the central axes of which are latterly spaced from one another with reference to the magnetic tape, so as to act on adjacent recording lanes of the tape. While a tone head of the multiple lane recording type is here shown for illustrative purposes, it will of course be evident that the provisions of the present invention are applicable as well to conventional magnetic recording systems in which a single line of recording is made on the recording element, which may be either a flat tape or a wire.

The invention embodies two rectangular insulation blocks 10 and 11. A pair of headed pins 12, disposed at right angles to the meeting faces of blocks 10 and 11, pass with sliding fit through block 10 and are tightly embedded in block 11. Block 10 is thus movable toward and from block 11 on pins 12, the opposing faces of the two blocks being in engagement with one another when the device is in operating position. Pins 12 have hinge joints 13, permitting block 10 to be swung away from block 11 after being outwardly on pins 12, in the manner illustrated in Fig. 6.

Block 11 is mounted on the outer end of an electric plug member 16, which is adapted to be removably inserted in a socket member 17

mounted on a suitable support, as for instance a panel indicated in part at 17a. Leads from the erasing and recording coils are connected to pins 18 of plug members 16, which engage connector members 19 of socket member 17 when member 16 is inserted in 17. A suitable number of such pins and connectors are provided to take care of the leads from the erasing and recording coils, and also to take care of the ground lead coming from certain magnetic sheathing members, later to be mentioned. The opposed faces 10a and 11a of blocks 10 and 11 are formed with a longitudinally extending groove or way 15 adapted to receive and pass the recording element. For example, assuming use of a recording element in the form of a tape .002" in thickness and .125" in width, this way may be .003" in depth and .126" in width. The way should be only sufficiently larger than the cross-sectional side of the tape to permit the tape to be drawn freely therethrough. The two blocks may be grooved in such a manner that the depth of this way 15 lies half within each block when the two blocks are in face to face engagement. Each end of block 11 is formed, at opposite edges of way 15, with a pair of projections 20, and the projections 20 thus formed at each end of block 11 are received, when block 10 is moved into engagement with block 11, by a pair of complementary grooves or recesses 21. These projections 20 and grooves 21, which slide together by a straight line movement, necessitate that block 10 be moved on its hinge joints 13 into alignment with block 11 before being moved against block 11. Block 10 thus comes into engagement with block 11 by movement straight toward said block 11, this being desirable for reasons which will appear hereinafter. Projections 20 are provided with a somewhat snug sliding fit within grooves 21, and therefore serve to restrain the two blocks against becoming slightly separated during operation.

Assuming that there are to be three recording lanes on the magnetic tape, three sets of recording and erasing coils are mounted in laterally offset positions in blocks 10 and 11. The recording tape may be considered as divided laterally into two edge lanes and a middle lane, each of a width of one third the full width of the tape. Thus, a pair of erasing coils E₁ and a pair of recording coils R₁ are mounted in blocks 10 and 11, with their axes in line with the center of one edge lane of the tape (see Figs. 3 and 4). A second pair of erasing coils E₂ and a second pair of recording coils R₂ are mounted in blocks 10 and 11, with their axes in line with the center of the middle lane of the tape, and a third pair of erasing coils E₃ and a third pair of recording coils R₃ are mounted in blocks 10 and 11, with their axes in line with the center of the other edge lane of the tape. Assuming, as typical, though not as essential, that the tape runs in an upward direction through the recording unit while a record is being made on the first edge lane of the tape, travels downwardly through the recording unit while a record is being made on the second or middle lane, and again travels upwardly while a record is being made on the third edge lane, the relative disposition of the several coils is typically as follows: Erasing coils E₁ are located below recording coils R₁, erasing coils E₂ are located above recording coils R₂, and erasing coils E₃ are located below recording coils R₃. Thus, when the tape travels upwardly for the purpose of re-

cording on the first edge lane, it first passes erasing coils E₁ and then recording coils R₁; when the tape subsequently passes downwardly, for the purpose of recording on the middle lane, it first encounters erasing coils E₂ and then recording coils R₂; and when the tape next travels upwardly for the purpose of recording on the opposite edge lane, it first encounters erasing coils E₃ and then recording coils R₃.

Each of the recording and erasing coils comprises a wound magnetic bobbin 30 provided with a central aperture 31 of rectangular cross-section for the magnetic pole piece 32. Each bobbin 30 is received within a cylindrical magnetic sheath 33 mounted in insulation blocks 10 or 11, as the case may be. Sheaths 33 are interconnected by a grounded conductor 34. Preferably, the inside flange 35 of each bobbin is provided with a pair of lips 36 adapted to be received within notches 37 formed in the insulation blocks 10 and 11 in which the coils are mounted. These lips and notches are so related to the pole piece aperture 31 that when the bobbins are mounted in blocks 10 and 11, apertures 31 are disposed exactly at right angles to the way 15 for the magnetic tape.

Pole pieces 32, of rectangular cross-section, are slidably mounted in apertures 31, and their inner ends, which are preferably beveled and tapered to an edge preferably not over an approximate thickness of .003" and of a dimension at right angles to the tape approximately, or slightly less than, one-third of the width of the tape (assuming three-lane recording). The pole pieces may be formed initially with a comparatively sharp, chisel-like edge 32a, but by reason of wear on the tape are soon blunted somewhat and operate satisfactorily, with comparatively slow speed of tape, at a thickness dimension of approximately .003" as stated above.

The outer ends of pole pieces 32 are engaged by plunger members 40 pressed lightly against the pole pieces by means of compression springs 41 mounted in housing 42 carried by plates 43 which are mounted on the insulation blocks, as in the manner clearly illustrated in Fig. 2.

The tips of each pair of pole pieces are thus lightly pressed into contact with opposite sides of the recording tape, but are of such dimensions as to contact the tape only within the lane area within which said pole pieces are to act.

In the embodiment of the invention here shown, the pole pieces of each pair of erasing coils are somewhat offset from one another in a direction longitudinally of the tape, while each pair of recording coil pole pieces are directly opposite one another, as clearly indicated in Figs. 2 and 3.

Preferably, rectangular, electrically grounded magnetic sheaths 45 and 46 are placed over blocks 10 and 11, respectively, entirely enclosing said blocks except for their meeting faces. These sheaths serve to screen out extraneous magnetic fields which might otherwise cut the recording coils and produce noise.

Electrical connections are made to each coil through suitable apertures in the outside flanges 35a of the coil bobbin, as indicated in Fig. 5. The outer face of each of blocks 10 and 11 is recessed, as indicated, to provide a surface 53 in the plane of outer bobbin flanges 35a, leaving a marginal portion 54 for support of plate 43. Leads 55 connected to the coils through suitable apertures in bobbin flanges 35a are received in grooves 56 formed in surfaces 53, said grooves

leading to a longitudinally extending hollow 58 of sufficient cross-sectional area to carry the leads from all of the coils. The leads 55 running through hollow 58 in block 10 are gathered into a cable 61 extending through an aperture 62 in the rearward side of block 10 and entering a similar aperture 63 in the rearward side of block 11. The entire set of leads 55 finally extend through the rearward side of block 11 to connect to the various connector pins 18 of connector plug 16.

A feature of especial advantage in the tone head as now described is the novel means for moving the two members of the tone head apart when the magnetic tape is to be removed or replaced, or for the purpose of inspecting or replacing the pole pieces. If the tape is simply to be removed or replaced, block 10 may simply be pulled rearwardly on pins 12 until the tape clears projections 20. If the pole pieces are to be inspected or removed, block 20 is pulled outwardly until it engages pin heads 12, and is then swung rearwardly on hinges 13, thus exposing the pole piece tips so that they may be readily inspected or removed. It is a feature of the invention that block 10 must first be swung into alignment with block 11 before it can be moved inwardly on pins 12 to its closed or operative position. This insures that the pole piece tips will always move straight toward the magnetic tape as the device is closed, thus avoiding binding or scraping of the pole piece tips on the tape as block 10 comes against block 11.

It will be understood that various changes in design, structure and arrangement may be made in the device without departing from the spirit and scope of the invention or of the appended claims, the device as here shown being simply illustrative and typical of the invention rather than restrictive thereon.

I claim:

1. A sound head comprising a pair of insulation blocks normally occupying a position with opposing faces adjacent one another and adapted to have a recording element moved therebetween along a predetermined path, coils mounted in said blocks on opposite sides of said predetermined path, pole pieces in said coils adapted to contact opposite sides of the recording element, and means mounting one of said blocks on the other for movement first straight away from said other block and then on an axis between said blocks.

2. A sound head comprising a pair of insulation blocks normally occupying a position with opposing faces adjacent one another and adapted to have a recording element moved therebetween along a predetermined path, coils mounted in said blocks on opposite sides of said predetermined path, pole pieces in said coils adapted to contact opposite sides of the recording element, and means mounting one of said blocks on the other for movement toward and from said other block, said means comprising a plurality of pins rigidly mounted in one of the blocks and extending substantially at right angles to the meeting faces of said blocks, with sliding fit in the other block.

3. A sound head comprising a pair of insulation blocks normally occupying a position with opposing faces adjacent one another and adapted

to have a recording element moved therebetween along a predetermined path, coils mounted in said blocks on opposite sides of said predetermined path, pole pieces in said coils adapted to contact opposite sides of the recording element, and means mounting one of said blocks on the other for movement toward and from said other block, said means comprising a plurality of pins rigidly mounted in one of the blocks and extending substantially at right angles to the meeting faces of said blocks, with sliding fit in the other block, and hinge joints in said pins permitting said blocks to be swung apart.

4. A sound head comprising a pair of insulation blocks normally occupying a position with opposing faces adjacent one another and adapted to have a recording element moved therebetween along a predetermined path, coils mounted in said blocks on opposite sides of said predetermined path, pole pieces in said coils adapted to contact opposite sides of the recording element, and means mounting one of said blocks on the other for movement toward and from said other block, said means comprising a plurality of pins rigidly mounted in one of the blocks and extending substantially at right angles to the meeting faces of said blocks, with sliding fit in the other block, and hinge joints in said pins at points normally located within said last mentioned block but cleared by said block after a predetermined separation of the blocks to permit said last mentioned block to be swung away from said other block.

5. A sound head comprising a pair of insulation blocks adapted to be positioned with their opposing faces adjacent one another, there being a way between said opposing faces for a traveling recording tape, coils mounted in said blocks on opposite sides of said way, said coils comprising magnetic bobbins having flanges fitted in said blocks, and windings surrounding said bobbins, a formation on at least one flange of each bobbin and a complementary formation on the corresponding block, whereby said bobbins fit in predetermined positions in said blocks, a pole piece aperture extending axially through each of said bobbins, said apertures being substantially rectangular in cross-section, and being so placed in the bobbins that their direction of elongation is disposed substantially at right angles to said way when the bobbins are mounted in the blocks, and pole pieces substantially rectangular in cross-section slidably mounted in said apertures and adapted to bear on opposite sides of a tape travelling through said way.

6. A sound head comprising a pair of mountings, coils supported on said mountings in end to end opposition, pole pieces coaxially arranged in said coils adapted to contact opposite sides of a magnetic record element running therebetween, said mountings being adapted to occupy a normal operating position with the ends of said coils closely spaced from one another and with said pole pieces in engagement with opposite sides of said record element, and means mounting one of said mountings for opening movement first straight away from said other mounting on a direction line parallel to the axes of said coils and then on a pivot axis normal to said direction line.

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