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MAGNETIC HEAD

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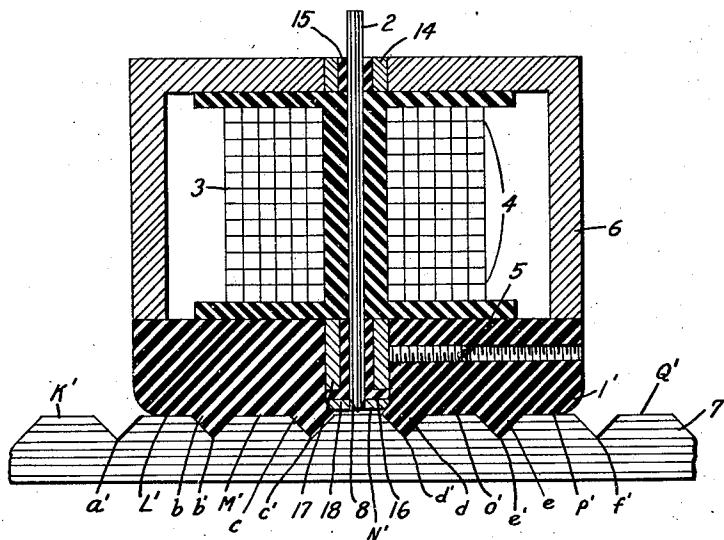


Fig. 1.

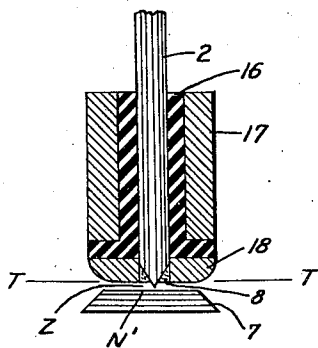


Fig. 2.

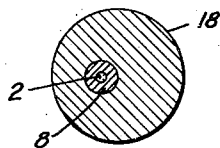


Fig. 3.

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MAGNETIC HEAD

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5 Claims. (Cl. 179—100.2)

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This invention relates to improvements in magnetic recording, reproduction or obliteration and particularly to magnetic head design for recording, reproduction or obliteration with a magnetizable sound carrier in the form of a circular drum, analogous in shape to the cylindrical record ordinarily used on well known dictating machines. The magnetic sound carrier is of magnetizable material, such as steel, most of the ferric alloys and certain nickel aluminum combinations.

This invention more specifically relates to improvements in methods disclosed by my United States patents entitled "Magnetic pole piece," numbered 2,361,753, and "Magnetic recording and reproducing system," numbered 2,361,752, and also my co-pending patent application entitled "Magnetic recording and reproducing head," filed February 2, 1945, Serial Number 575,832. The above cited United States patents and my co-pending application disclose methods and means of confining the stray magnetic fields normally associated with magnetic pole piece tips and reducing wear on such pole piece tips. The present invention discloses improved methods of design utilizing a non-metallic shoe incorporating improved shielding of the pole piece tip, and this improved design accomplishes considerable noise reduction. For a better understanding of the present invention, reference should be made to the United States patents and co-pending patent application above cited.

Experience has shown that where a metallic shoe is operated in contact with a metallic record a certain continuous noise level results upon reproduction. This noise level arises from various sources. In part, it may be due to electro-static charges represented in the two metals, it may further arise from the so-called contact potentials of a thermo-electric nature, and a further possible source of such noises a pinching action on the sound track itself which, in a magnetic system, could cause noise to be introduced in the reproducing coil.

The magnetic recording and reproducing system disclosed by my patents and patent application heretofore cited makes use of a non-magnetic metal shoe, which serves two primary purposes. First, it affords complete shielding of the pole piece tip. Second, it affords an ample bearing surface for the magnetic head, thus eliminating wear on the pole piece, per se.

If a non-metallic shoe is substituted for the metal shoe formerly used, then all shielding effect is lost and new shielding means must be intro-

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duced, if the advantages obtained by the system as previously described are to be retained. Experience has shown that a non-metallic shoe eliminates the reproduction noise developed from the sources set out above, and this invention discloses a means of introducing shielding within the non-metallic shoe, so that all of the advantages obtained by the magnetic recording and reproducing system disclosed by my United States patents and copending patent application heretofore cited are retained and, in addition, the signal to noise ratio is improved, this being accomplished primarily by lowering the reproduction noise level.

Among the numerous objects of this invention are:

First, to provide an improved magnetic head assembly for use in magnetic recording, reproduction, or obliteration, which shall provide a better signal to noise ratio than heretofore obtained.

Second, to accomplish the improvement set out in (1) above without sacrificing the ability of the magnetic head to (a) confine all stray magnetic fields, (b) reduce wear on the pole piece tips, and (c) guide itself laterally over the record when the record is moved tangentially to the head.

This invention will be best understood from a consideration of the following detailed description, in view of the accompanying drawings forming a part of the specification; nevertheless, it is understood that the invention is not confined to the disclosure, being susceptible to such changes and modifications as define no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Figure 1 shows a cross section view of a complete magnetic head assembly resting on a cross section of a magnetizable record carrier made in accordance with this invention.

Figure 2 is a grossly exaggerated view showing one method of pole piece assembly.

Figure 3 is a vertical cross section view through line TT.

All reference numerals used in Figures 1, 2 and 3 are identical with the reference numerals used in my co-pending patent application set out above.

Referring now particularly to Figure 1, which represents a cross section view of the magnetic head assembly and a partial longitudinal cross section view of the magnetizable record instantaneously in magnetic relation with the magnetic

head, where 1¹ represents the non-metallic shoe, which may be made from various grades of Bakelite, hard rubber, vulcanized fiber, hard wood or other non-metallic material. In actual practice, certain grades of paper base Bakelite and vulcanized fiber have been found fully satisfactory for this purpose. The pole piece is represented by 2, said pole piece being firmly anchored in its associated coil 3 having connecting leads 4 and said pole piece being further forced through sections 15 and 16, which may be of rubber or other insulating material designed to provide a shock absorbing mounting for pole piece 2, where said shock absorbing sections 15 and 16 are in themselves forced inside metallic sleeves 14 and 17. Additional metallic section 18 is soldered to the pole piece tip, the soldered area represented by 8. In practice, the entire assembly composed of pole piece 2, coil 3, shock absorbing sections 15 and 16 and mounting sleeves 14 and 17, together with shielding slug 12 are made up as an integral unit, this being further illustrated in detail by Figure 2.

A further feature of this assembly is that the center hole through mounting sleeves 14 and 17 is drilled sufficiently off center to provide eccentric action, which provides a means of adjusting pole piece 2 for exact alignment over its associated sound track. This complete assembly is then inserted in non-metallic shoe 1¹, so that mounting sleeve 17 is freely rotatable in non-metallic shoe 1¹ with means for locking in position by set screw 5. Shield can 6 provides further rigidity, where mounting sleeve 14 is freely rotatable at the point it passes through shield can 6, and mounting sleeve 14 is drilled eccentric in a manner identical to the eccentric drilling of mounting sleeve 17. This eccentricity is shown in further detail by Figure 3.

Non-metallic shoe 1¹ is machined with guiding ridges b, c, d and e, which are designed to instantaneously engage guiding grooves b¹, c¹, d¹ and e¹, while the area between guiding grooves, designated L¹, M¹, N¹, O¹ and P¹, represents the sound track areas, where the pole piece is shown in instantaneous magnetic relation with sound track N¹.

Referring now to Figure 2, a cross section detailed view of pole piece mounting is shown, all reference numerals being the same as used in Figure 1. In practice, pole piece 2 is adjusted to maintain a small air gap Z between the pole piece tip and the sound track in instantaneous magnetic relation with said pole piece tip. This is easily accomplished by slightly withdrawing pole piece 2 before locking set screw 5, and this air gap, while necessary for efficient noise reduction, is non-critical and may be on the order of .001" to .003" or .004".

Figure 3 represents a vertical cross section through the line TT of Figure 2 and is self-explanatory.

Summarizing, the invention as disclosed herein offers certain definite improvements over the methods previously disclosed by my United States patents and co-pending patent application heretofore cited and, in particular, the advantages resulting from this improved design may be stated:

First, improved methods of mounting the pole piece are shown, eliminating the need for difficult machine work, without sacrificing the complete shielding necessary for good recording at useable speeds.

Second, the pole piece mounting disclosed of-

fers all of the advantages offered by the complete system previously disclosed by my aforesaid United States patents and my aforesaid co-pending patent application, without sacrificing anything, while providing a considerable reduction in noise level. This is accomplished by providing a pole piece mounting which is shock absorbing, fully adjustable and completely shielded, while at the same time there is no metallic contact between the magnetic head and the magnetizable record. This lack of metallic contact removes all sources of noise previously encountered in operating magnetic systems, except such noise as may be inherent within the magnetic sound track, it being recognized that such noise does exist in most magnetic materials, such inherent noise being ascribed to random movement of the electrons or random movement of the spinning axes of the electrons, while magnetism has likewise been described as orderly arrangement of the spinning axes of the electrons.

The above examples are for the purpose of illustrating some of the methods and means by which the broad purposes of this invention may be carried out and are not to be deemed as restrictive in any manner. Other modifications and alternatives will occur to those skilled in the art without departing from the scope of this invention as defined by the following claims.

I claim:

1. In a magnetic recording or reproducing system including a magnetizable record having a plurality of sound tracks associated with guiding grooves and means for moving said magnetizable record tangentially to a polar extremity of a recording or reproducing magnetic head, a recording or reproducing magnetic head assembly including a bi-polar electromagnet having polar extensions where one of said polar extensions is instantaneously disposed in magnetic relation to part of one of said sound tracks, the other polar extension being located approximately 180° from the first polar extension so that at least part of the magnetic field existing between said polar extensions must pass through and act on said sound track, a shielding means associated with the first-named polar extension, a non-metallic shoe partly inclosing the first-named polar extension and the shielding means, said shoe having a face mating with a plurality of sound tracks and engaging at least one of the grooves associated with said sound tracks, a shock-absorbing means associated with the first polar extension and inclosed by the shoe and a second shock-absorbing means associated with the other polar extension.

2. In a magnetic recording or reproducing system including a magnetizable record having a plurality of sound tracks associated with guiding grooves and means for moving said magnetizable record tangentially to a polar extremity of a recording or reproducing magnetic head, a recording or reproducing magnetic head assembly including a bi-polar electromagnet having polar extensions where one of said polar extensions is instantaneously disposed in magnetic relation to part of one of said sound tracks, the other polar extension being located approximately 180° from the first polar extension so that at least part of the magnetic field existing between said polar extensions must pass through and act on said sound track, a shielding means associated with the first-named polar extension, a non-metallic shoe partly inclosing the first-named polar extension and the shielding means, said

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shoe having a face mating with a plurality of sound tracks and engaging at least one of the grooves associated with said sound tracks, and eccentric means for adjustably positioning the first polar extension to obtain optimum magnetic relationship with the sound track instantaneously associated with said polar extension.

3. In a magnetic recording or reproducing apparatus including a magnetic head, a magnetic pole piece and a non-metallic guide shoe for supporting the head in operative magnetic relation to a carrier having a plurality of magnetizable sound tracks thereon, a pole piece assembly including said pole piece, a mounting sleeve therefor, a non-magnetic metal shielding slug secured to and surrounding the polar extremity of the pole piece which is disposed in magnetic relation to the sound track, and shock-absorbing material interposed between the pole piece and mounting sleeve and between the end of the mounting sleeve and one face of said shielding slug, said pole piece, mounting sleeve, shielding slug, and shock-absorbing material, being assembled as a unit for ready mounting within said head.

4. The apparatus described in claim 3 wherein said pole piece is eccentrically disposed within said mounting sleeve and shielding slug, and wherein means are provided for adjusting said

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pole piece assembly within said head and about the axis of said mounting sleeve to align an extremity of the pole piece with a sound track on said carrier.

5. The apparatus described in claim 3 wherein said pole piece is provided with a pointed polar extremity, and wherein said shielding slug is provided with an aperture extending therethrough in which the pointed polar extremity of the pole piece is disposed, and a fusible non-magnetic metal alloy completely surrounding said pointed extremity of the pole piece and completely filling the space between said extremity and the walls of the aperture in said slug.

STANLEY D. EILENBERGER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,361,752	Eilenberger	Oct. 31, 1944

FOREIGN PATENTS

Number	Country	Date
322,033	Great Britain	Nov. 28, 1929