

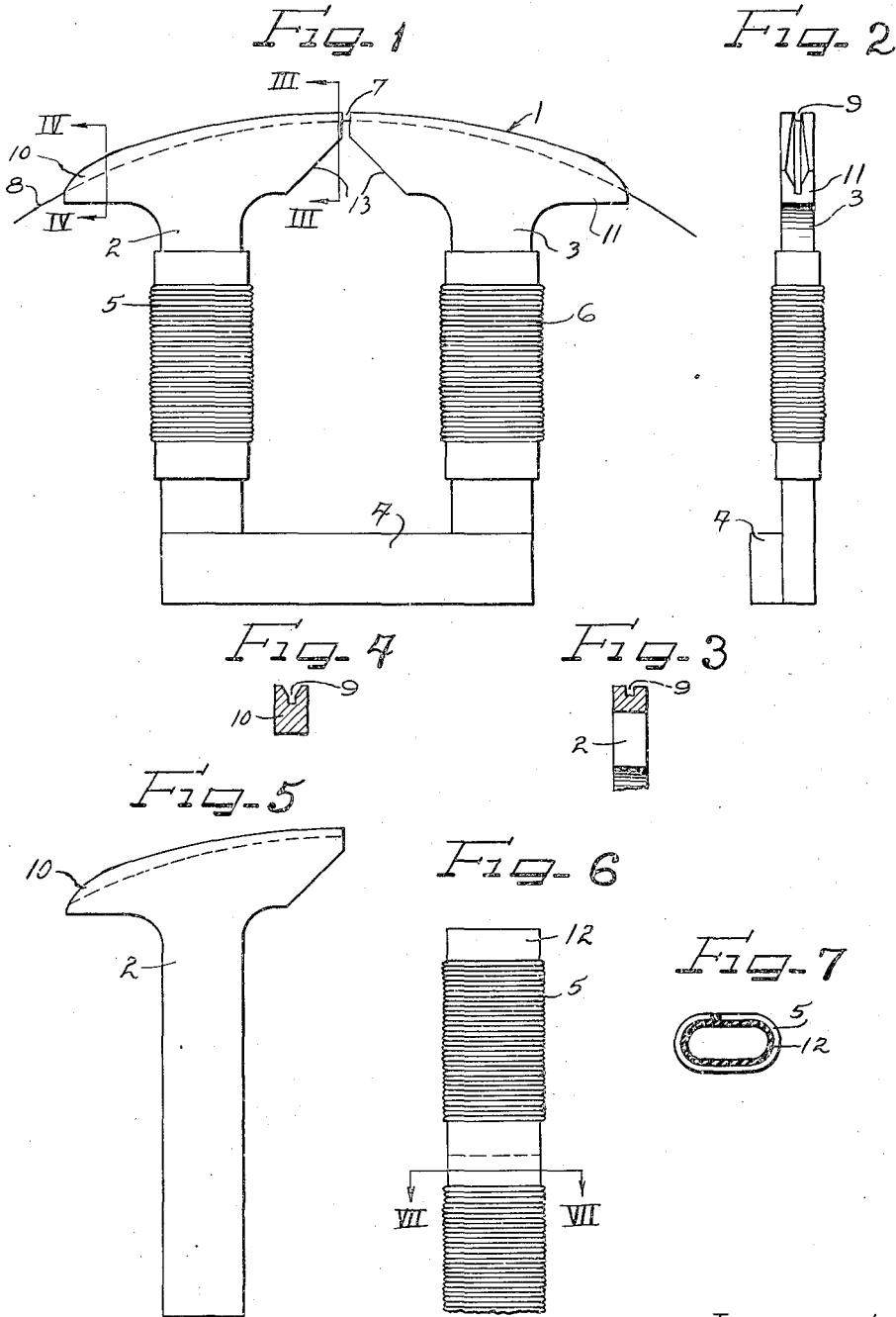
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MAGNETIC RECORDING HEAD

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# UNITED STATES PATENT OFFICE

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## MAGNETIC RECORDING HEAD

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2 Claims. (Cl. 179—100.2)

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The present invention relates generally to a magnetic recording and reproducing device, and more specifically relates to a novel magnetic recording head construction and to the method of assembly therefor.

The term recording head as used in the present specification and claims refers to an electromagnetic head for recording, reproducing or both recording and reproducing.

A magnetic recording head usually comprises an electromagnet having a core which is generally substantially U-shaped with confronting poles, and wherein a central groove is disposed along the central edge of the poles for guiding a longitudinally moving paramagnetic wire in a direction at right angles to the pole faces so that the wire may become incrementally magnetized in a longitudinal direction in accordance with current variations imposed on the electromagnet by an input circuit such as one controlled by a microphone receiving sound waves. Such recording head has generally been expensive to manufacture due primarily to its odd shape and to the fact that after the core is fabricated the wire has to be wound thereon through the only remaining narrow gap, thereby making the winding operation difficult and expensive. Another difficulty generally encountered with a magnetic recording head is that in order to insure suitable guiding means for the wire, the groove in the pole edges has to be made so deep as to unnecessarily increase the cross-sectional area of the air gap between the pole faces, thereby requiring considerably increased electric power for providing a predetermined magnetic field intensity at the gap.

An object of the present invention is to provide a novel magnetic recording head which requires relatively low power input for providing the necessary magnetic field intensity between the pole faces.

A more specific object of the present invention is to provide an electromagnetic recording head with a central groove of varying depth and shaped so as to suitably guide the wire, and at the same time, maintain a narrow cross-section of opposing pole faces so as to require minimum ampere turns for providing a predetermined magnetic field intensity between the pole faces.

Another object of the present invention is to provide a novel and simple method of assembly of the parts of a magnetic recording head so as to considerably decrease manufacturing costs particularly in the winding operation of the coils.

Other objects and advantages will become apparent from the following description of an em-

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bodiment of the present invention taken with the accompanying drawing wherein:

Figure 1 is a front view of a magnetic recording head embodying the principles of the present invention;

Figure 2 is a side view of the structure shown in Figure 1;

Figure 3 is a cross-sectional view taken along line III—III of Figure 1;

Figure 4 is a cross-sectional view taken along line IV—IV of Figure 1;

Figure 5 is a front view of a stamping forming a portion of the core in Figure 1 before assembly;

Figure 6 is a front view of a preformed coil ready for assembly in the structure shown in Figure 1; and

Figure 7 is a top view of the preformed coil shown in Figure 6.

Referring more particularly to the drawing, numeral 1 generally denotes a magnetic recording head made up of a core structure comprising substantially T-shaped core parts 2 and 3 whose straight ends are connected by a cross-piece 4. Coils 5 and 6 are disposed about T-shaped core parts 2 and 3. The lateral extending portions of parts 2 and 3 are disposed in close-spaced, confronting relationship so as to provide a narrow air gap 7 between the pole faces formed thereby which gap may be filled with solder if so desired. Portion 13 is cut away so as to provide narrowly tapered opposing poles for the purpose of increasing the field intensity between opposing pole faces so that a relatively low amount of power will be required for providing a predetermined magnetic field intensity such as required for magnetic recording and reproducing purposes.

While it is desirable to reduce the areas of the pole faces as much as possible so as to concentrate the magnetic lines of force onto the axially moving wire 8 of para-magnetic material which normally traverses a centrally disposed groove 9 extending along the edges of the poles, such decrease in areas of the poles would necessitate a relatively small depth of groove 9, therefore making the groove so shallow as to be ineffective for guiding the wire at all times.

In accordance with my invention, I provide a structure wherein the pole faces are of minimum cross-section without sacrificing the guiding qualities of the groove because of shallowness. This is accomplished by making groove 9 of progressively increasing depth in a direction away from the pole faces. This progressively increasing depth will be more apparent from an inspection of Figures 3 and 4 showing the cross-section

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of the groove adjacent the pole faces and away from the pole faces, respectively. As shown in Figure 3, the groove for accommodating the wire 8 is substantially U-shaped in cross-section at the pole faces and retains its U-shape throughout the length of the curved end faces of core parts 2 and 3. However, a larger, substantially V-shaped groove, such as shown in Figure 4, is provided which becomes progressively deeper in a direction away from the pole faces, being of zero depth at the pole faces. The U-shaped groove remains at the apex of the V-shaped groove throughout the entire length of the curved end faces thereof. Hence, while the wire may not remain at all times in the shallow groove, such as shown in Figure 3, particularly if it has splices therein, it will nevertheless at least be guided by the side surfaces of the U-shaped groove shown in Figure 4 so that it will always remain centrally guided with respect to the pole faces, and will always tend to slide back into the U-shaped groove after leaving it for any reason, such as considerably speeding of the movement of wire 8.

Another feature of the invention resides in the provision of long tails 10 and 11 on the T-shaped parts 2 and 3 so as to effectively guide the wire along an appreciably long groove portion as it is traversing the magnetic recorder head so as to decrease the danger of the wire jumping out of the groove. It should be noted, however, that for some applications such as for slow wire speeds, tails 10 and 11 may be eliminated, leaving substantially L-shaped core legs.

An outstanding feature of the present invention resides in the method of assembly of the various parts so as to simplify assembly and minimize manufacturing costs. The magnetic recorder head is constructed by first stamping the T-shaped parts 2 and 3 from suitable core material having high magnetic permeability and low retentivity. The coils 5 and 6 are preformed by winding on a suitable form 12, such as shown in Figure 6, made of cellulose acetate or other suitable material. Several adjoining coils may be wound on form 12, and afterwards the form may be suitably subdivided so as to provide a plurality of coils, such as 5 and 6, which are then slipped onto the straight ends of the T-shaped parts 2 and 3. After the coils are slid in place, a straight core piece 4 is spot-welded or otherwise suitably secured to the straight end portions of parts 2 and 3 while the lateral extensions of parts 2 and 3 are in close-spaced confronting relationship to form a narrow air gap. If desired, instead of providing only a single cross-piece 4, an additional cross-piece (not shown) may be welded or soldered or otherwise secured on the opposing surface of the straight end portions of parts 2 and 3. Any suitable number of turns, such as, for example, about 2000 turns of wire, may form each of high impedance coils 5 and 6. By so preform-

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ing the coils before they are slipped onto the electromagnet, the costly procedure of winding a coil on an already formed substantially U-shaped magnet is avoided particularly when it is realized that the gap 7 through which the coil would otherwise have to be wound is very narrow, perhaps in the neighborhood of 0.01 inch.

Thus, it will be seen that I have provided an efficient recorder head requiring a minimum amount of electrical power for providing the necessary magnetic field intensity without sacrificing the guiding qualities of the groove; furthermore, I have provided a simple method of assembly which greatly reduces manufacturing costs.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. A magnetic recording head comprising an electromagnet having substantially T-shaped portions whose legs are tapered and two of which are in confronting relationship to form the poles while two other of said legs form tail portions, the edges of said legs being arcuate and having a centrally disposed groove for accommodating a recording medium travelling at right angles to the pole faces.

2. A magnetic recording head comprising an electromagnet having substantially T-shaped core portions whose lateral legs are tapered and two of which are in confronting relationship to form the poles, two other of said lateral legs forming tail portions, the edges of said legs being arcuate and having a centrally disposed groove for accommodating a recording medium travelling at right angles to the pole faces, said grooves being of varying depth in the direction of travel of said recording medium and being shallowest adjacent the pole faces.

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