Dec. 3, 1946. M. CAMRAS 2,411,849

MAGNETIC RECORDER HEAD

Filed May 30, 1945

Fig-1

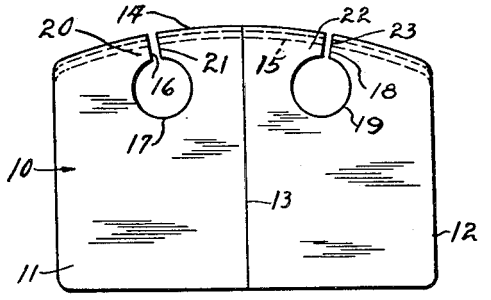


Fig-2

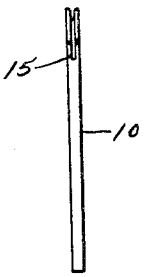


Fig-3

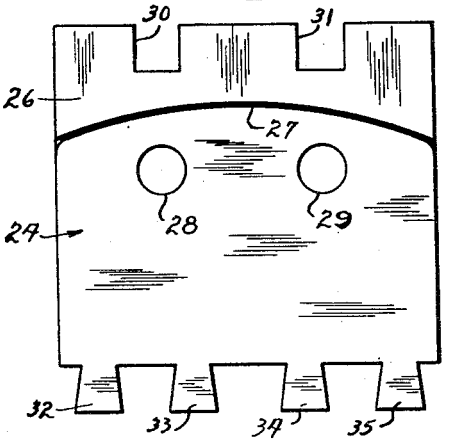


Fig-4

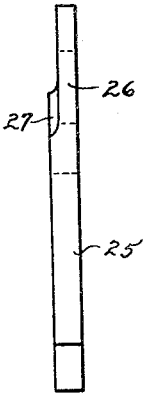
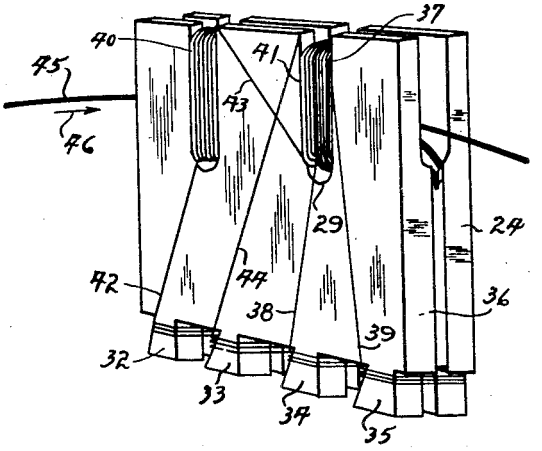


Fig-5



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MAGNETIC RECORDER HEAD

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10 Claims. (Cl. 179—100.2)

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This invention relates to a magnetic recorder head and more particularly to a recorder head which is especially designed to magnetically record audio frequency signals on a traveling record medium such as wire, or to reproduce signals previously recorded on the traveling record medium.

Magnetic recorder heads are preferably of a design which is of such character as to enable the recorder head to perform a triple function. More specifically, it is desirable that the recorder head shall include means for erasing any previous recordings on the wire when a new recording is to be made, and to this end means is provided for completely demagnetizing the wire or other traveling record medium passing across the recording head. After the wire has passed over a region of the recording head where it is completely demagnetized, it must then pass over a region where a fluctuating electric signal effects a correspondingly fluctuating magnetization of the traveling record medium. This same electric means, such, for example, as a coil, which effects magnetization of the traveling record medium when its electric circuit is suitably energized, must also be adapted to induce fluctuating electric signals therein when the head is to be used for reproducing purposes. Under this latter circumstance of course, the erasing means is deenergized so as not to interfere with the recording signal on the wire.

In order to have a satisfactory core material for an erasing head, it is important that the core material has a high saturation value for the erasing portion of the head must have a reversing field with maximum peak values greater than anything on the wire. For that reason it has been found that the material for the core of an erasing head should preferably have a saturation value higher than the saturation value of the record medium.

It has also been found that in order to have a good reproducing head the core material of the reproducer must have high initial permeability because the amount of flux threading the pick-up coil depends upon the permeability of the magnetic circuit. In referring to high initial permeability we refer to material which has relatively high permeability for very low values of the magnetizing field.

It has also been found that the most satisfactory core material for recording is one which saturates at substantially as high a point as that of the record medium on which the recording

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is to be made. If this is not done, the record medium is not used to its full capability.

It is an object of the present invention to provide a magnetic head arranged to perform the triple function of erasing, recording and reproducing, and in which a different core material is provided for the erasing portion of the head from that of the recording and reproducing portion of the head.

Another object of the present invention is to provide a unitary core member for a magnetic head made up in part of a material having a high saturation value, such, for example, as silicon steel or some of the cobalt iron alloys; and a second portion formed of a material having relatively high initial permeability, such, for example, as "Mu Metal" or "Permalloy."

A further object of the present invention is to provide a magnetic head for recording, reproducing and erasing having a core in the form of a single flat lamination, and which single flat lamination is made up of two different materials disposed in juxaposition along an edge thereof.

A still further object of the present invention is to provide a core plate for a magnetic head adapted to have a record medium pass over a predetermined path thereon, the core having a plurality of non-magnetic gaps adjacent said path, the material of the plate in the region of one of said gaps being characterized by having a high magnetic saturation value of material, and the region of another of the gaps being characterized by having high initial permeability.

It is a still further object of the present invention to provide a core plate for a magnetic head adapted to have a record medium pass over a predetermined path thereon, the core having a plurality of non-magnetic gaps adjacent said path, the material of the plate in the region of one of said gaps being characterized by having relatively low coercive force.

Another and further object of the present invention is to provide a novel recording and reproducing head which is economical to manufacture and which gives extremely high efficiency in use.

Another and still further object of the present invention is to provide a novel magnetic head in which the erasing means thereon is associated with the recording and reproducing means in a novel manner.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its manner of con-

struction and method of operation, together with further objects and advantages, may best be understood by reference to the following description, taken in connection with the accompanying drawing, in which:

Figure 1 is a front elevational view of a core member for a magnetic recorder head embodying the novel features of the present invention;

Figure 2 is an end view of the core member shown in Figure 1;

Figure 3 is a front elevational view of one of the insulating members which is arranged to overlie the core member shown in Figure 1, the view being taken of the inner surface thereof;

Figure 4 is an end view of the insulating member shown in Figure 3; and

Figure 5 is an isometric view of the magnetic recorder head which employs the core member shown in Figures 1 and 2.

The illustrated embodiment of the present invention includes a core member for a magnetic head such, for example, as the core member 10 shown in Figures 1 and 2 of the drawing. This core member 10 is made up of two parts 11 and 12 which are united together along the line 13. The material of the part 11 is a material having a high magnetic saturation value such, for example, as silicon steel or some cobalt iron alloy having a substantial percentage of cobalt therein. One commercial material which has been found to be extremely satisfactory for the desired purpose is an alloy known as "Permadur" which has a saturation value in the neighborhood of 23,000 to 24,000 gauss.

The material of part 12 is a ferrous metal alloy or other suitable material having relatively high initial permeability. As will presently be explained, the part 12 of the core member 10 will be associated with the recording and reproducing coil of the magnetic head, while the part 11 will be associated with the erasing coil. Since the part 12 is to be associated with a coil which must be used for both recording and reproducing, it is desirable that it have not only high initial permeability, but also a saturation level which is somewhat comparable to the record medium. One record medium which has been found to be particularly satisfactory in magnetic recorders is stainless steel wire properly processed to render the same capable of being magnetized. Such stainless steel wire usually saturates somewhere between 8000 and 12,000 gauss.

One form of material which has been found to be particularly suitable for part 12 of the core member 10 is a nickel-iron alloy containing approximately 47% nickel and 50% iron.

The core member 10 is provided with a crowned edge 14. This crowned edge 14 is grooved therealong as at 15 to provide means for receiving a wire which is drawn therethrough. A slot 16 terminating in a large opening 17 extends back from the crowned edge 14 of the part 11 of the core member 10. Similarly, a slot 18 terminating in a large opening 19 extending back from the crowned edge 14 is provided in the part 12. The slot 16 provides a pair of confronting polar portions 20 and 21 in the material of high saturation value, and the slot 18 provides a pair of confronting polar portions 22 and 23 in the material of high initial permeability.

A pair of plates of dielectric material are arranged to be mounted on either side of the core member 10. One of such plates is illustrated in Figures 3 and 4. More particularly, the dielectric plate 24 is provided with a relatively thick body portion 25 and a somewhat thinned out upper portion 26. The shoulder 27 formed at the point where the body portion 25 merges into the upper portion 26 is crown shaped as it passes across the plate 24 from one side to the other, and is arranged to conform to the crowned edge 14 of the core member 10. A pair of openings 28 and 29 are provided in the plate 24 and positioned to have the same axes as the openings 17 and 19 of the core member 10. The openings 28 and 29, however, are smaller in diameter than the openings 17 and 19 for a reason which will presently be explained. The upper portion 26 of the plate 24 is notched out at 30 and 31 substantially opposite the openings 28 and 29. The upper portion 26 of the plate 24 is notched out at 30 and 31 substantially opposite the openings 28 and 29. The lower edge of the plate member 24 is provided with four protruding tongues 32, 33, 34 and 35.

Referring now to Figure 5 of the drawing, the core member 10 is assembled with the plate 24 and a second complementary plate of dielectric material 36 as shown. These three members may be secured together in any suitable manner, such as by cementing, or the like.

A coil 37 is now formed by winding a wire through the holes 19 and 29 and through the notches 31. Since the lower end of the notches 31 are higher than the top edge of the core 10, it will be apparent that the coil is spaced from this upper edge 14 of the core member 10. Also, it will be observed that since the holes 29 in the insulating plates 24 and 26 are smaller in diameter than the hole 19 in the core member 10 the wire forming the coil 37 is spaced from the core 10 as it passes through the hole 19. One end of the wire forming the coil 37 is terminated as at 38 by wrapping it several times around the tongue 34. The other end of the wire forming the coil 37 is terminated by the end 39 by wrapping the same around the tongue 35.

The erase coil 40 is formed in a similar manner through the holes 28 of the insulating members 24 and 26 and the holes 17 of the core member 10. In this instance, however, the wire 40 is not only wrapped a number of turns through the holes 28 and 17, but is also given three or four turns through the holes 29 and 19, as at 41. One end of the wire forming the coil 40 extends down as at 42 and is wrapped around the tongue 32. The other end of the coil 40 extends as at 43 across to the recording and reproducing coil, is wrapped several turns through the holes 29 to form the auxiliary coil 41 and thus down as at 44 to be terminated around the tongue 33.

By wrapping several turns of the erase coil around the gap between the polar portions 22 and 23 of the recording and reproducing portion of the head, a high frequency flux is provided for the recording operation. Since the erase coil is only employed during the recording operation, it will be apparent that whenever the erase coil is on, a high frequency flux is provided for the recording coil.

The record medium, such, for example, as a steel wire 45, threads through the head and is seated in the groove 15. The direction of motion of the wire is indicated by the arrow 46 in Figure 5.

As used in the present case the term "recorder head" refers to a magnetic head which may be used either for recording or reproducing or both.

From the above description it will be seen that I have provided a novel recorder head which is

both extremely efficient as an erasing means and also extremely efficient for both recording and reproducing.

While I have shown a particular embodiment of my invention, it will, of course, be understood that I do not wish to be limited thereto, since many modifications may be made and I, therefore, contemplate by the appended claims to cover all such modifications as fall within the true spirit and scope of my invention.

I claim as my invention:

1. A magnetic recorder head comprising an integral core member having two pairs of confronting polar portions, an erase coil mounted on said core member to establish a field between the poles of one pair of polar portions and a signal impressing coil to establish a field between the poles of the other pair of polar portions, said core member being formed of one material in the region of said one pair of polar portions, and of a different material in the region of said other pair of polar portions.

2. A magnetic recorder head comprising an integral core member having two pairs of confronting polar portions, an erase coil mounted on said core member to establish a field between the poles of one pair of polar portions and a signal impressing coil to establish a field between the poles of the other pair of polar portions, said core member being formed of a material of relatively high saturation value in the region of said one pair of polar portions and a material of relatively high initial permeability in the region of said other pair of polar portions.

3. A magnetic recorder head comprising an integral core member having two pairs of confronting polar portions, an erase coil mounted on said core member to establish a field between the poles of one pair of polar portions and a signal impressing coil to establish a field between the poles of the other pair of polar portions, said core member being formed of silicon steel in the region of said one pair of polar portions and of a ferrous nickel alloy having a substantial percentage of nickel therein in the region of said other pair of polar portions.

4. A magnetic recorder head comprising an integral core member having two pairs of confronting polar portions, an erase coil mounted on said core member to establish a field between the poles of one pair of polar portions and a signal impressing coil to establish a field between the poles of the other pair of polar portions, said core member being formed of a ferrous cobalt alloy having a substantial percentage of cobalt therein in the region of said one pair of polar portions, and of a ferrous nickel alloy having a substantial percentage of nickel therein in the region of said other pair of polar portions.

5. A plate-like paramagnetic core for a magnetic recording head adapted to have a record medium pass over a predetermined path thereon, said core having a plurality of non-magnetic gaps adjacent said path, said core being formed of different materials in the region of at least two of said gaps.

6. A plate-like paramagnetic core for a magnetic recorder head of the type adapted to have a record medium pass over a predetermined path thereon, said core having a plurality of non-magnetic gaps adjacent said path, said core being formed of a material having a high magnetic saturation value in the region of one of said gaps and of a material having a relatively high initial permeability in the region of another of said gaps.

7. A plate-like core for a magnetic recorder head having a curved edge extending from one end of the core to the other, said curved edge being grooved for receiving and defining a path of travel for a traveling record medium, said core being formed of two parts secured together in end to end abutting arrangement along a line extending away from a medium point along said curved edge, and each of said parts having a non-magnetic gap in the path of travel of said record medium.

8. A plate-like core for a magnetic recorder head having a curved edge extending from one end of the core to the other, said curved edge being grooved for receiving and defining a path of travel for a traveling record medium, said core being formed of two parts secured together in end to end abutting arrangement along a line extending away from a medium point along said curved edge, and each of said parts having a non-magnetic gap in the path of travel of said record medium, one of said parts being formed of a material having a relatively high magnetic saturation characteristic, while the other of said parts being formed of a material having a relatively high initial permeability characteristic.

9. A plate-like core for a magnetic recorder head having a curved edge extending from one end of the core to the other, said curved edge being grooved for receiving and defining a path of travel for a traveling record medium, said core being formed of two parts secured together in end to end abutting arrangemet along a line extending away from a medium point along said curved edge, and each of said parts having a non-magnetic gap in the path of travel of said record medium, one of said parts being formed of a material having a relatively high magnetic saturation characteristic, while the other of said parts being formed of a material having a relatively high initial permeability characteristic, an erase coil disposed around the gap in the part formed of a material of high saturation value, and a signal coil around the gap in said part of relatively high initial permeability.

10. A magnetic recorder head comprising a core member having two pairs of confronting polar portions, an erase coil mounted on said core member to establish a field between the poles of one pair of polar portions, and a signal impressing coil to establish a field between the poles of the other pair of polar portions, said core member being formed of one material in the region of said one pair of polar portions and of a different material in the region of said other pair of polar portions, said two different materials being secured together to form a unitary member.

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