

July 5, 1949.

M. CAMRAS
COMBINED ERASING AND RECORDING
MAGNETIC TRANSDUCER
Filed May 30, 1945

2,475,421

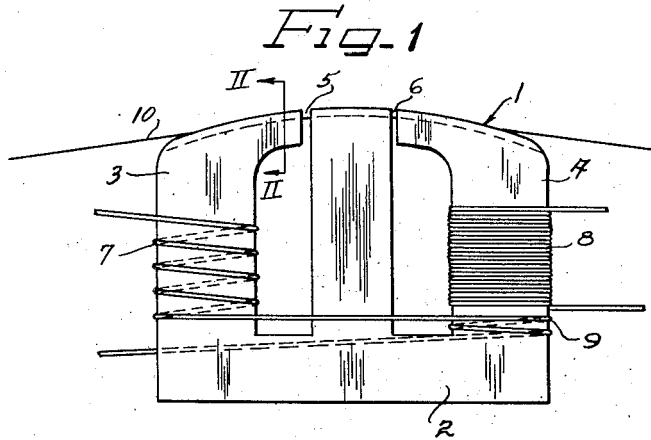
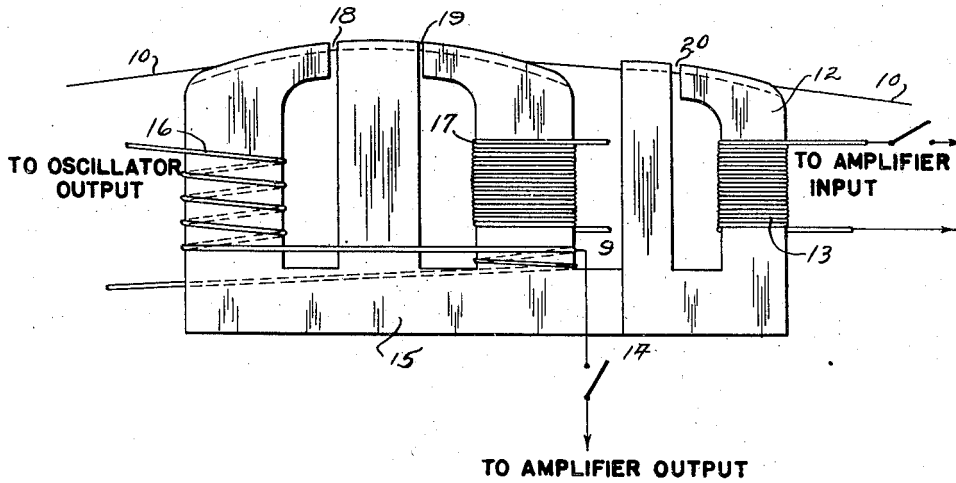


Fig-2



Fig-3



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UNITED STATES PATENT OFFICE

2,475,421

COMBINED ERASING AND RECORDING MAGNETIC TRANSDUCER

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Application May 30, 1945, Serial No. 596,779.

3 Claims. (Cl. 179—100.2)

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The present invention relates to a magnetic recording and reproducing device, and more particularly to a specific construction thereof for including a recording gap and an erase gap in the same recording head, and in some instances, the addition of a pick-up gap, also.

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.

Magnetic recording heads comprise generally an electromagnet with opposing poles, the edges of which are centrally grooved for accommodating an axially moving paramagnetic wire which is incrementally magnetized longitudinally in accordance with variations impressed on the electromagnet coil by sound waves falling on a microphone. A common method of operating a magnetic recording device is to first impress the record on the longitudinally travelling wire by the recording head, afterwards to reproduce the record on the same or a different head and then when desired, to erase or demagnetize the record by passing the wire through a separate erasing head, such as one energized by high frequency current. The provision of such separate erasing and recording heads makes the apparatus cumbersome and relatively expensive to manufacture.

An object of the present invention is to combine the erasing and recording gaps in a single magnetic recording head, that is, in a single electromagnet, thereby simplifying the apparatus and making it less expensive to manufacture.

A more specific object of the present invention is to provide an electromagnetic recording head embodying three separate gaps, namely, a recording gap, an erase gap, and a pick-up gap.

Other objects and advantages will become apparent from a study of the following specification taken with the drawings wherein:

Figure 1 is a front view of a magnetic recording head embodying erase and recording gaps in accordance with the principles of the present invention;

Figure 2 is a cross-sectional view taken along line II—II of Figure 1 showing the central groove for guiding a longitudinally moving paramagnetic wire; and

Figure 3 is a modified magnetic, recording head embodying, in addition to the erase and recording gaps, a pick-up gap as well.

Referring more particularly to the drawings, numeral 1 generally denotes a magnetic recording head comprising a substantially E-shaped magnetic core 2, preferably of material of high mag-

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netic permeability and low retentivity. The outer legs 3 and 4 of the E-shaped core have laterally inward extensions so as to present narrowly tapered poles which are in confronting relationship with the poles disposed on opposite surfaces of the end of the central leg of the E-shaped structure, thereby providing an erase gap 5 which may be of the order of 0.01 inch, and a recording gap 6 which may be of the order of 0.002 inch. A low impedance erase coil 7 is wound on leg 3 and has a few number of turns such as, for example, 20, whereas a somewhat higher impedance recording and pick-up coil 8 is wound on leg 4, such coil having a relatively large number of turns, such as, for example, about 2000. A few of the turns 9 of the low impedance coil 7 are wound about leg 4, thereby threading the recording side of the electromagnet to provide a high frequency component thereto.

Figure 3 shows a modified form of recording head similar to that shown in Figure 1 except that there is added an additional pick-up electromagnet having a substantially U-shaped core 12 on one of which legs is wound a high impedance pick-up coil 13. An advantage of making the pick-up coil of high impedance is that it eliminates the necessity for an input transformer which transformer not only adds to the expense and complication of the apparatus but introduces distortion. A pick-up gap 20 is provided between the ends of core 12. Core 12 may be either welded or merely placed in close abutting relationship with a projecting portion 14 of the substantially E-shaped core 15. On one leg of the E-shaped core 15 is wound a low impedance erase coil 16 and on the other leg, a low or medium impedance recording coil 17 so as to provide an erase gap 18 and recording gap 19, respectively. An advantage of making the erase or recording coil of low or at least medium impedance is that it will facilitate winding of the coils and coupling to associated circuits. While cores 12 and 15 may be made of the same material, it is preferable to make them of different materials because the desired characteristics of the pick-up head and recording head are somewhat different. More specifically, core 12 of the pick-up head should have high initial permeability because the flux threading the pick-up coil depends upon the permeability of the magnetic circuit, and should generate the least amount of noise when the wire 10 passes through the central groove 11 on playback.

While turns 9 are shown below coil 8 of Fig. 1 and coil 17 of Fig. 3, it should be noted that in

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some cases better operation is obtained if they are placed above these coils. On the other hand, core 15 of the recording head and erase head should be of material that does not saturate readily, because it is undesirable to have the core material saturate before the wire saturates. Wires have saturation values of the order of 8000 to 20,000 lines per square centimeter depending on the wire materials whereas the above mentioned alloys have higher saturation values although their initial permeability is lower than that of Mu-metal.

It should be noted that separate magnetic paths exist for each of the coils and their associated gaps. For example, the erase coil provides a flux which extends through the leg which it surrounds as well as a central part of core 15 whereas the recording coil 17 provides a flux going through its supporting leg and the central leg of core 15, and the pick-up coil 13 has induced a flux which extends through both legs of the U-shaped core 12 traversing pick-up gap 20.

If desired, the E-shaped structure shown in Figure 1 or 3 may be subdivided vertically in two halves as illustrated, that is, may be made up of two separate cores having adjoining surfaces such as the surfaces existing between the E-shaped and U-shaped cores of Figure 3.

The open design provided by the E-shaped structures permits insertion or removal of wire without threading. Thus, it will be seen that I have provided an efficient multipurpose electromagnet including not only a recording gap but an erase gap and in some instances a pick-up gap as well, thereby providing a relatively compact structure for accomplishing a number of purposes in a magnetic recording device.

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 a magnetic core having a plurality of legs, a relatively low impedance coil mounted on one leg and a relatively high impedance coil mounted on an-

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other leg, the ends of said legs being in closely spaced relationship to form two non-magnetic gaps energized by a different one of said coils, and means for guiding a magnetic record member along a path substantially parallel to the magnetic axes of said gaps and successively across said gap.

2. A magnetic recording head comprising a flat magnetic core including a plurality of legs forming a plurality of aligned gaps and having a relatively low impedance coil mounted on one leg and a relatively high impedance coil mounted on another leg, the ends of said legs having lateral extensions projecting in closely spaced relationship with opposed end portions of a centrally disposed leg to form an erase gap energized substantially only by said low impedance coil and a recording gap energized by said high impedance coil, said legs including means for guiding a magnetic record member along a path substantially parallel to the magnetic axes of said gaps and successively across said gaps.

3. A magnetic recording head comprising a substantially E-shaped magnetic core having a relatively low impedance coil mounted on one outer leg and a relatively high impedance coil mounted on the other outer leg, the ends of said outer legs being in closely spaced relationship with the end portion of the center leg to form two non-magnetic gaps, said low impedance coil having a pair of leads through which said coil is energized by a high frequency source, one of said leads making several turns around said other outer leg adjacent said high impedance coil to provide a high frequency component.

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