Feb. 11, 1947. H. T. FAUS 2,415,681

ELECTRIC PICKUP

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Fig.1.

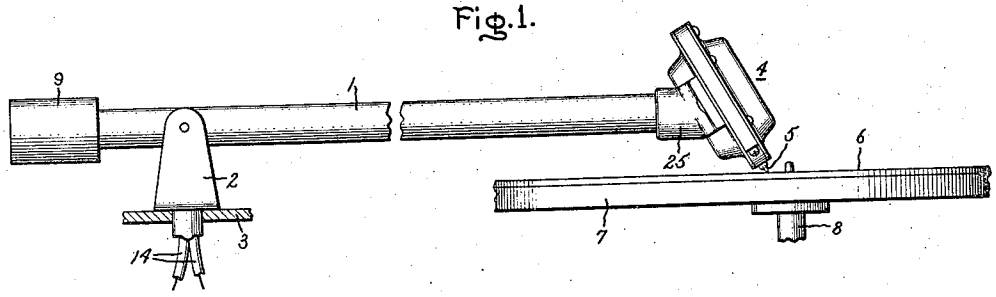


Fig.2.

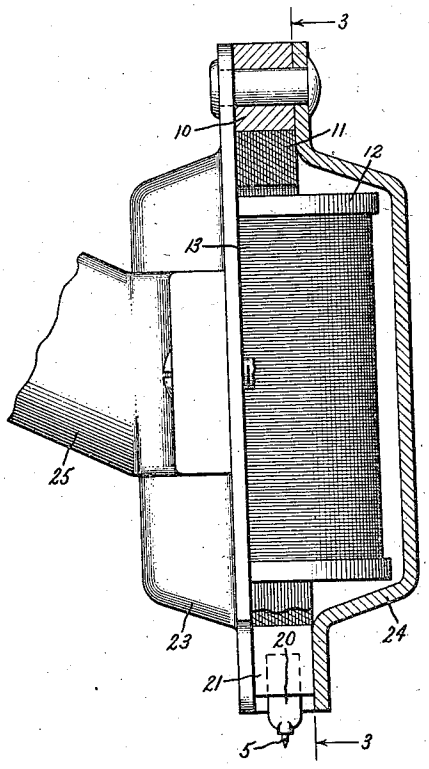
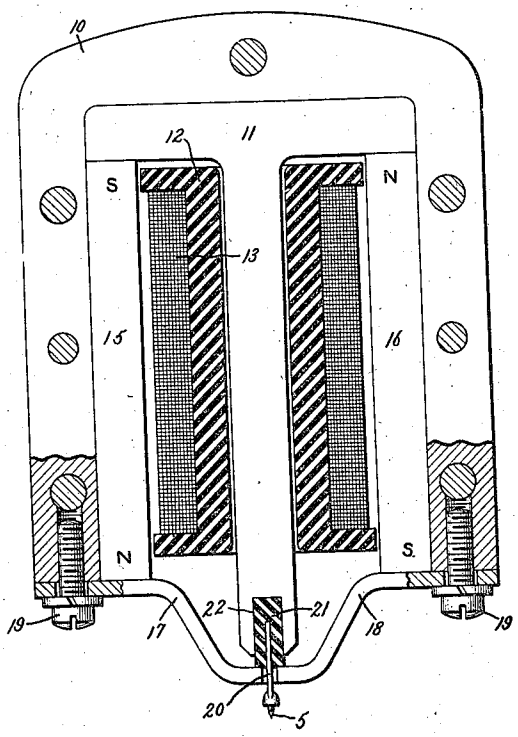


Fig.3.



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ELECTRIC PICKUP

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My invention relates to vibration translating devices such as phonograph pickups and particularly to such devices of the electromagnetic type.

It is an object of my invention to provide an electric pickup or vibration translating device of simple and improved construction and having a moving armature of very small mass.

The features of my invention which I believe to be novel are set forth with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawing in which Fig. 1 illustrates a phonograph tone arm and turntable provided with a pickup embodying my invention; Fig. 2 is an enlarged side elevation view, partly in section, of the pickup shown in Fig. 1; and Fig. 3 is a sectional view on the line 3—3 of Fig. 2.

Referring now to the drawing, a phonograph tone arm 1 is pivotally mounted on a bracket 2 secured to a supporting structure 3, and an electric pickup 4 is mounted at the end of the tone arm in a position such that a stylus 5 mounted on the pickup is held in position to engage a sound track on a disk record 6 supported on a turntable 7. The turntable is driven by a shaft 8 from a suitable mechanism mounted on the supporting structure 3 but not illustrated as it is not necessary to an understanding of the present invention. The weight of the pickup and tone arm on the pickup side of the bracket 2 is counterbalanced by weight 9 at the rear end of the tone arm so that a very small unbalanced weight is present to maintain the stylus 5 in engagement with the sound track of the record disk.

It is desirable that the moving mass vibrated by the sound track be as small as possible in order to facilitate the accurate following of the sound track by the stylus. It is particularly desirable to provide this small mass of the moving armature or stylus arm to provide accurate response at the higher frequencies in the range of frequencies of sound to be reproduced. The details of construction of the pickup 4 which make possible a very small movable mass attached for vibration with the stylus are clearly shown in Figs. 2 and 3. The pickup comprises an inverted U-shaped supporting head or frame 10 constructed of brass or other suitable non-magnetic material. Nested within the head 10 is a T-shaped core 11 constructed of laminated material of high magnetic permeability, the cross of the T fitting closely in the connecting portion of the U and the stem of the T extending downwardly longitudinally of the head beyond the lower ends of the legs of the U. The core 11 is of square cross section and has a spool 12 of insulating material fitted thereover, the spool 12 having a bore of square cross section and being secured in position in any suitable manner such as with a resilient insulating cement. On the core is wound a suitable electric pickup winding or coil 13 the ends of which are brought out through the tone arm 1 as indicated at 14 in Fig. 1. A pair of permanent bar magnets 15 and 16 of Alnico or other suitable material are mounted along the legs of the frame 10 with their upper ends in contact with the cross member of the yoke 11; these magnets are held in place by pole pieces 17 and 18, respectively, secured to the lower ends of the yoke 10 by machine screws 19. The magnets 15 and 16 are arranged with poles of opposite polarity in contact with the upper end or cross of the core 11 and the magnets therefore lie in a series magnetic path including the two pole pieces 17 and 18 and the cross member of the core. The magnets preferably are selected to have equal strength so that they tend to produce equal flux in opposite directions through the stem of the core 11, with the result that there is normally no resultant flux in the stem of the core. The stylus 5 is mounted in a stylus arm 20 constructed of suitable nickel alloy or other magnetic material. The stylus arm 20 is a thin flat vane and is mounted in a block 21 of rubber or other suitable resilient material such as that sold under the trade name of "Pyralin." The block 21, which constitutes the sole support for the stylus arm, is securely mounted in a recess 22 at the lower end of the stem of the core 11 and the block 21 extends from the recess into engagement with the ends of the pole pieces 17 and 18. The stylus arm 20 is mounted centrally of the block 21 and the stem 11 in a position such that there is no resultant flux in the stem 11. However, when the stylus arm 20 is displaced laterally, as by vibrations produced when the stylus 5 moves along the sound track of a record, the arm 20 moves nearer to one of the pole pieces 17 or 18 and more flux flows through that pole piece thereby unbalancing the flux flowing through the stem of the core 11 and producing a variation in flux which in turn produces a corresponding variation of voltage in the coil 13.

The arrangement of the core 11 and the pole

pieces 17 and 18 is such that a large coil 13 of many turns of wire may be employed although the moving armature 20 is a relatively small element. The spacing of the poles 17 and 18 and the arrangement of the lower end of the stem of the core 11 and the resilient supporting block 21 are such that the entire pickup may be enclosed and sealed by casing members 23 and 24 riveted or otherwise secured rigidly about the frame 10. The tone arm 1 may be secured to the frame 10 by a suitable yoke 25 arranged to straddle the casing 23 and engage the tone arm 1 in a position to hold the pickup at a desired angle with respect to the record disk.

During the operation of the pickup described above, the stylus 5 is placed on the groove of a rotating record disk 6 and as the turntable operates, the stylus 5 follows the sound track and is displaced laterally with vibrations corresponding to the recorded sounds. The resilient block 21 affords the necessary relative movement between the stylus arm 20 and the pole pieces 17 and 18 while maintaining the arm 20 normally in a position such that no flux or at least a minimum flux flows through the stem of the core T. The voltage variations produced in the coil 13 and which correspond to the vibrations of the stylus arm 20 are utilized by any suitable amplifying apparatus in accordance with good engineering practice, the wires 14 being provided for connection to such apparatus. The stylus 5 is preferably a sapphire or other jewel which is permanent and does not require replacement except in the event of damage due to accident.

From the foregoing it is readily apparent that I have provided an electric pickup of simple and rugged construction which requires a minimum moving mass and which may be completely sealed within an enclosing casing. Furthermore, although the arrangement requires only a very small moving armature, a relatively large and sensitive pickup winding having many turns of wire can be accommodated easily within the space provided on the central core of the magnetic structure. Furthermore, the arrangement is such that powerful permanent magnets of simple bar form may be employed.

While I have illustrated my invention in connection with a particular form of phonograph pickup, other applications will be apparent to those skilled in the art. I do not, therefore, desire my invention to be limited to the particular construction illustrated and described and I intend by the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An electric pickup or the like comprising a supporting head, a T-shaped core of magnetic material in said head, a pair of permanent bar magnets extending parallel to the stem of said core and having opposite poles arranged adjacent the ends of the cross thereof whereby said magnets tend to produce flux in opposite directions in the stem of said core, the stem of said T-shaped core extending beyond the ends of said magnets remote from said cross, a pair of pole pieces secured on said head adjacent the opposite ends of said magnets and extending beyond the end of said stem for defining two parallel magnetic paths including said core, and means including a vibratory arm of magnetic material resiliently mounted at the end of the stem of said core and extending between said pole pieces

for varying said magnetic paths to vary the flux through said core in accordance with vibrations of said arm, said arm normally lying in a position such that there is no resultant flux through the stem of said core.

2. An electric pickup or the like comprising a supporting head, a T-shaped core of magnetic material in said head, a pair of permanent bar magnets extending parallel to the stem of said core and having opposite poles arranged adjacent the ends of the cross thereof, and a pair of pole pieces secured on said head adjacent the opposite ends of said magnets for defining two parallel magnetic paths including said core, said core having a recess therein at the end of the stem of said core, a block of resilient material mounted in said recess and extending into engagement with said pole pieces, and a vibratory member of magnetic material embedded in said block between the sides of said recess and extending between said pole pieces into position for engagement with a record sound track or the like for varying said magnetic paths to vary the flux through the stem of said core in accordance with vibrations of said member.

3. An electric pickup or the like comprising a U-shaped frame of nonmagnetic material, a T-shaped core of magnetic material mounted in said frame with the cross of the T adjacent the connecting portion of the U, a pair of permanent bar magnets extending parallel to the stem of said core and lying along the sides of said frame, means including a pair of pole pieces of magnetic material secured to the ends of said frame and extending into positions adjacent the end of the stem of said core for holding said magnets in position and for defining two magnetic paths through said core, and a stylus arm of magnetic material resiliently mounted at the end of the stem of said core and extending between said pole pieces for varying said magnetic paths to vary the flux through said core in accordance with vibrations of said arm.

4. An electric pickup or the like comprising a U-shaped frame of nonmagnetic material, a T-shaped core of magnetic material nested within said frame with the cross of the T adjacent the bottom of the U, a pair of permanent bar magnets extending parallel to the stem of said core and lying along the sides of said frame, said magnets having opposite poles adjacent the cross of the T, a pair of pole pieces of magnetic material secured to the ends of said frame and extending into positions adjacent the end of the stem of said core for holding said magnets in position longitudinally of said frame, said pole pieces cooperating with said core and said magnets to provide two parallel magnetic paths through said core, a vibratory arm of magnetic material resiliently mounted at the end of the stem of said core and extending between said pole pieces for magnetically coupling said core and said pole pieces to vary the flux through said core in accordance with vibrations of said arm, and a coil mounted on said core for producing voltages in accordance with the variations of flux through said core.

5. An electric pickup or the like comprising a supporting head, a magnetic core structure including two pole pieces spaced apart adjacent one end of said pickup, a stylus arm of magnetic material for varying the flux of said core structure in accordance with vibrations of the arm, means providing a housing enclosing said structure ex-

clusive of the opening between said pole pieces, and a single block of resilient material constituting the sole means for mounting said stylus arm on said head between said pole pieces for vibration with respect to said pole pieces, said block closing the opening between said pole pieces and sealing said housing.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,817,021	Schimpf	Aug. 4, 1931
2,290,057	Lindenberg	July 14, 1942
1,944,583	Sollie	Jan. 23, 1934
1,834,359	Vansickle	Dec. 1, 1931

FOREIGN PATENTS

Number	Country	Date
324,943	British	Jan. 30, 1930
333,922	Italian	Jan. 16, 1936