

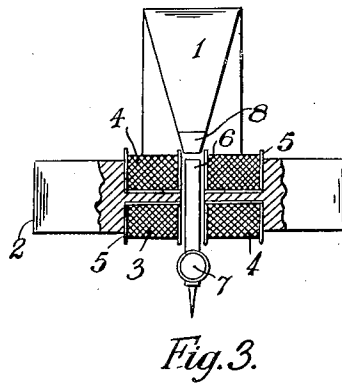
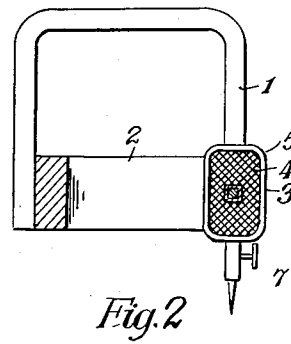
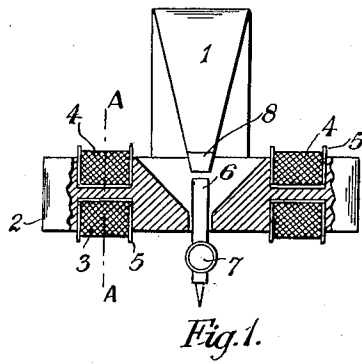
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J. WHITE ET AL

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ELECTROMAGNETIC ACOUSTIC DEVICE

Filed July 9, 1930



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UNITED STATES PATENT OFFICE

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ELECTROMAGNETIC ACOUSTIC DEVICE

Application filed July 9, 1930, Serial No. 466,670, and in Great Britain August 20, 1929.

The present invention relates to electro-magnetic acoustic devices such as are used for recording sound, for reproducing from sound records or for inter-converting sound and electrical oscillations.

It is an object of the present invention to increase the efficiency with which such devices convert electrical oscillatory energy into mechanical energy or the reverse and to make such devices more compact and of lighter weight.

According to the present invention an electro-magnetic acoustic device is provided with one or more coils in which the electrical conductor is of magnetic material.

The invention is illustrated by way of example in the accompanying drawing which shows diagrammatic views of two forms of the invention as applied to stylus operated devices for reproducing recorded sound, commonly known as pick-up devices.

Figs. 1 and 2 are views in part sectional front elevation and sectional side elevation respectively of one form of the invention, the section of Fig. 2 being taken along the line A—A of Fig. 1, and Fig. 3 is a view in part sectional front elevation of a modification of the arrangement in Figs. 1 and 2.

Referring to Figs. 1 and 2, a U-shaped permanent magnet 1 has attached to one of its poles a pole piece 2 (which is preferably laminated) of U-shape, the tips of the pole piece being turned inwards leaving a small air gap between them. The pole piece limbs are provided above and beneath at a short distance from their tips with slots so that the tips of the pole piece are connected to the remainder by a narrow strip 3 only. Coils 4 of insulated iron wire (or of any other wire having good magnetic properties) are wound in these slots so as to fill them. If desired the windings may project slightly beyond the upper and lower faces of the pole piece, in which case bobbins 5 are preferably provided as shown to retain the windings. The upper surfaces of the pole tips are tapered from the windings to the tips so that the area of the tips is only about one quarter of the cross-sectional area of the main portion of the pole piece.

An armature 6 is mounted for vibration between the two pole tips about an axis 7, the axis being disposed beneath but parallel to the plane of the pole piece and lying in the plane of the permanent magnet. The bearings for the armature are not illustrated. The pole 8 of the permanent magnet is tapered and its tip is disposed close to the tip of the armature 6. Means for clamping a reproducing stylus 9 are provided upon the armature beneath the axis. The magnetic force between the armature tip and the adjacent magnet pole tip 8 provides some or all of the necessary restoring force to the armature. If desired, however, additional damping and centering means may be provided in known manner.

In the modification of the arrangement described shown in Fig. 3, the tapered tips upon the pole piece are omitted and the armature 6 co-operates with the inner faces of the coils 4 themselves. The windings in this case may be held in position by shellac or the like or bobbins 5 may be used in which case the inner cheeks of the bobbins lie between the winding (constituting the greater part of the pole piece tip) and the armature. These inner cheeks, and, if desired, the whole bobbins may be made of magnetic material.

In the devices described the winding of magnetic material is used to form part of the alternating flux magnetic circuit but it is not intended to limit the scope of the invention to this arrangement. If desired, the coils may be used instead of existing coils without removing any of the normal core. The windings may also be used to carry direct current for magnetizing purposes in acoustic devices.

We claim:

1. In an electro-magnetic device having a vibratory armature, the combination of means providing a magnetic circuit having poles associated with said armature, said means including a core of magnetic material having slots adjacent to said poles whereby the cross-sectional area of the magnetic circuit is reduced through said slots, and a coil of insulated wire of magnetic material in each of said slots whereby said coils are

included in and form a part of the magnetic circuit and serve to restore said magnetic circuit to normal cross section.

2. In an electro-magnetic device of the character described, the combination of means providing a magnetic circuit within said device, said magnetic circuit having a normal cross-sectional area and a region along its length wherein said cross-sectional area is reduced, and a coil of insulated wire of magnetic material located in said region of reduced cross-sectional area, said coil being thereby included in and forming part of the magnetic circuit and serving to restore to substantially normal cross sectional area the magnetic circuit within said region.

3. In an electro-magnetic device of the character described, the combination of means providing a magnetic circuit having substantially a uniform cross sectional area

for a portion of its length, said cross sectional area of said portion of the magnetic circuit being wholly constituted by a core of reduced cross section and a winding, both of magnetic material, the one complementary to the other in providing said uniform cross sectional area through said portion of the magnetic circuit, and an adjacent portion of the circuit of substantially the same cross sectional area contiguous thereto being wholly constituted by the core whereby the winding serves to replace a portion of the magnetic core necessary to provide the cross sectional area of the magnetic circuit, with corresponding reduction in weight of said device.

In testimony whereof we have signed our names to this specification.

JACK WHITE.
EDWIN MALCOLM PAYNE.

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