

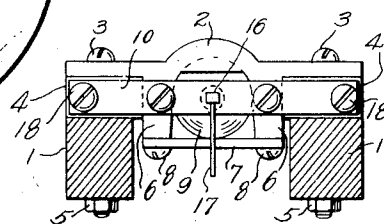
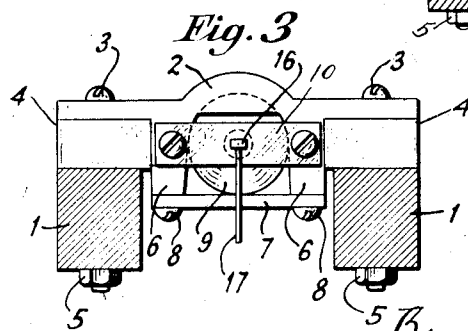
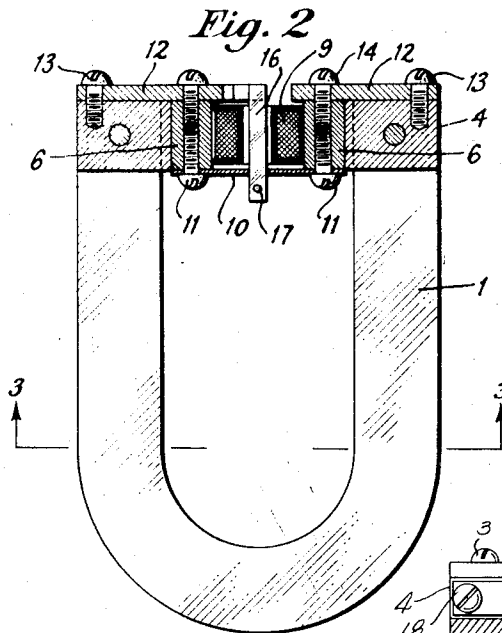
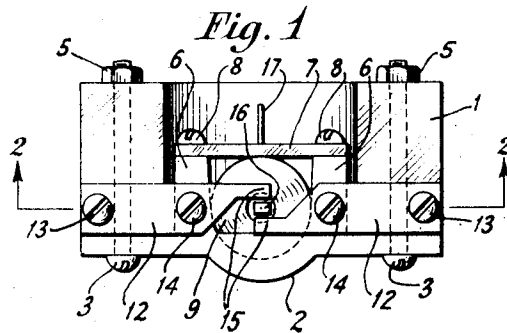
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ELECTROMAGNET FOR SOUND REPRODUCING INSTRUMENTS

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ELECTROMAGNET FOR SOUND-REPRODUCING INSTRUMENTS.

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This invention has reference to the art of electro-magnets and particularly relates to loud-speaker units which have usefulness in many branches of the art of sound reproduction and amplification

In electro-magnetic units of the balanced armature type, such as used to motivate radio loud-speakers and telephonic devices, it has been customary to employ four air-gaps in the permanent magnetic field in which the armature fluctuates, and also as part of the circuit for the electro-magnetic flux due to the telephonic currents. In practice, it has been found both difficult and expensive to secure a proper and equal adjustment of all four air-gaps. The effort has included pivoting the armature either in the middle between the two pairs of air-gaps or at a comparative remote point outside the magnetic circuit. The former method necessitates either two separate coils to provide room for the pivot between them, or a very delicate pivot around which the coil is wound, both of which methods are electrically inefficient and expensive. The other method, of pivoting the armature at a remote point, results in excessive inertia due to the long radius of the armature movement and this causes distortion in reproduction.

The purpose of the present invention is to avoid the difficulties and objections mentioned above, and also to attain further advantages, among which are ease of assembly of the parts, substantialness of construction, and a reduction of armature amplitude, without employing complicated lever and linkage mechanism. In carrying out the functional idea of means of my invention, one end of the armature is balanced between two air-gaps of the permanent magnetic field. Near the opposite end the armature is pivoted on, or so connected to, a flexible member or reed of magnetic material as to be able to freely respond to variant influences of the magnetic field. The stylus, which transmits the motion to the loud speaker diaphragm, is attached to the end of the armature at a suitable distance from the reed, or the point of connection of the armature with the reed, so as to provide the correct reduction of amplitude, or the correct ratio between the travel of the armature in the air-gaps and the desired movement of the diaphragm. One solid coil of wire sur-

rounds the armature between the air-gaps and the reed, providing an efficient disposition of wire with respect to armature iron. These are the fundamentals of my invention and are worked out, as to details, as shown in the accompanying drawings, wherein

Figure 1 is a view in top plan of an electro-unit, embodying my invention, adapted for use in connection with loud speakers of radio-receivers, phonographs, and talking moving picture apparatus;

Figure 2 is a view in sectional elevation of Figure 1, the section being on the line 2—2 of said figure;

Figure 3 is a horizontal sectional view taken on the line 3—3 of Figure 2, and

Figure 4 is a view similar to Figure 3 showing another form of my invention.

In the drawings I have shown a certain design of unit merely for the purpose of illustrating a practical method of embodying the principles of my invention. There are numerous other forms or designs of units in which my invention can be embodied and, therefore, I do not wish to be understood as restricting my invention to any particular form or structure.

Referring to the drawings, the numeral 1 indicates the U-shaped, or horse-shoe, magnet which acts as a supporting medium for the other elements of the unit. At the terminals of the magnet and on one side thereof, a yoke 2, of non-magnetic material is supported, being held in fixed position by screws 3, passing through the ends of the yoke, the arms of the magnet, and spacing blocks 4, nuts 5, on the ends of the screws, in cooperation with the heads of the latter, operating to tightly clamp the parts together and hold them rigidly in cooperative relation. The yoke has a curved center providing a circular receptacle, the walls of which are extended laterally to form lugs 6, on which is clamped a bar 7, of non-magnetic material, by means of screws 8, said bar bridging the space between the said lugs and closing the receptacle at that side. A single coil of wire 9, is retained in the receptacle by the bar 7, which prevents lateral displacement. Extending across the top of the yoke 2, are two pole-shoes 12, of similar shape and size so as to be interchangeable. The shoes are oblong bars secured to the blocks 4, by means of screws 13, passing

through the shoes at their outer ends, and screws 14, passing through the shoes near their inner ends, said screws being threaded into the lugs 6, of the yoke near their base and extending into abutment, or very nearly so, with the screws 11, which hold the reed 10, in position. The shoes at their inner ends are formed obtuse-angular on one face, said faces being opposed and spaced a predetermined distance to form a gap between the opposing, elongated ends 15. The screws 14, hold the adjustment, or set, of the shoes in cooperative relation. An armature 16, is mounted centrally of the reed 10, being passed therethrough and soldered thereto in proper relation, the arrangement being such as to give the armature a vibratory action as the reed flexes. The armature is the core of the coil and its outer end extends and terminates between the opposed ends 15, of the pole-shoes, a slight air-gap existing between the armature and pole-shoes on opposite sides of the former. Beyond the reed, near its inner end, the armature has a stylus 17, secured thereon and extending at a right-angle thereto into the space, between the arms of the magnet, where it can be secured to the tympanum of a loud-speaker of suitable form, preferably a membrane of the form shown in my co-pending application filed of even date, Serial No. 132,385 said stylus being secured to the apex, of large area, of said membrane either by washers and nuts screwed on the threaded end of the stylus, or by soldering to a sleeve or ferrule extending through the apex of said membrane.

I may use any form of permanent magnet; the yoke is of non-magnetic material; the reed is of thin magnetic material having the correct torsional resilience and ability to flex easily, and readily respond vibratorily to the influences of the armature. The screws 11 and 14, are of iron and preferably abut, though it would not be amiss to have a slight air-gap between their adjacent ends. The pole-shoes and blocks are of metal having high permeability. Since the reed is held by the two screws 11, which abut against, or are close to, the screws 14, which hold the shoes at the desired air-gap adjustment, there is a leakage of permanent magnetism from one pole-shoe to the other through said screws and the reed. But since the reed is easily saturated this slight leakage is not objectionable. However, these parts also form an efficient path for the electro-magnetic flux due to the telephonic currents, that is, the circuit is completed through the armature, reed, screws, pole-shoes and air-gaps. When the telephonic current produces magnetic flux in one direction, the armature moves to reduce one air-gap and at the same time picks up some of the permanent magnetism of the

correct polarity from the reed, thus amplifying the magnetic flux in the armature. In other words, some of the magnetism which was flowing straight across the reed is now deviated to a path through the armature and the reduced air-gap. Therefore, in addition to its numerous physical advantages, due to structure, arrangement, and mode of operation, this construction also results in increased efficiency due to a desirable disposition of coil winding with respect to armature iron, an efficient electro-magnetic circuit, and its faculty for magnetic amplification.

In Figures 2 and 3, I have shown the reed 10 of a length to bridge the space between the lugs 6 of the yoke at the base of the latter, and extend to the outer surface thereof so as to afford sufficient material for clamping the same to the lugs. In Figure 4, however, I have shown an alternative form of my invention, consisting in extending the reed 10, to the outer sides of the magnet 1, and clamping the extensions to the blocks 4, by screws 18, having the same relation to the screws 13, as described with reference to the screws 11 and 14. This structure may be preferable when the relative strength of the permanent magnet is ample to warrant additional flux of magnetism through the reed.

Having thus described my invention what I claim and desire to secure by Letters Patent is:

1. An electro-magnetic speaker unit comprising a permanent magnet and cooperating armature, and including a fixed means of leakage of magnetic flux across the poles of the permanent magnet, and means for diverting said leakage through the armature, air-gap and pole-shoes under the influence of the telephonic currents.

2. An electro-magnetic speaker unit comprising a permanent magnet and cooperating armature, and including a reed of magnetic material bridging the poles of the permanent magnet, shoes bridging the poles of said magnet having an air-gap at their cooperative ends, a single coil mounted between the shoes and the reed, and an armature mounted on the reed and extending through the coil and within the gap between the shoes.

3. An electro-magnetic speaker unit of the balanced armature type, including two pole-shoes arranged with an air-gap between them, an armature mounted to operate in said air-gap, and means for completing the electro-magnetic circuit through magnetic material leading to opposite sides of the air-gap.

4. An electro-magnetic speaker unit of the balanced armature type, including two pole-shoes with an air-gap between them, a reed of magnetic material bridging the poles of

the permanent magnet, and an armature mounted on the reed and extending into the gap between the shoes.

5. An electro-magnetic speaker unit of the balanced armature type including two pole-shoes arranged with an air-gap between them, a reed rigidly held at each end and magnetically bridging the pole-shoes, a coil mounted between the reed and the pole-shoes, and an armature mounted on the reed, extending through the coil and into the air-gap between the shoes.

6. An electro-magnetic speaker unit of the balanced armature type, including a permanent magnet, a yoke bridging the poles of the permanent magnet, pole-shoes mounted on the magnet and arranged to provide a gap between the pole-shoes, a reed mounted on the yoke in spaced relation to the shoes, a coil housed by the yoke between the shoes and the reed, and an armature mounted on the reed, extending through the coil and into the gap.

7. An electro-magnetic speaker unit, including means holding two pole-shoes so as to provide an air-gap between them, a reed mounted adjacent the pole-shoes, a coil between said reed and pole-shoes, and an armature secured to said reed in such position as to form a long arm and a short arm, the long arm of the armature extending through the coil and into the air-gap, and a stylus attached to the short arm.

8. An electro-magnetic speaker unit comprising a permanent magnet and cooperating armature, and having a member of non-magnetic material which holds the poles of the magnet at a definite distance apart to form an air-gap, means by which the armature is balanced in said air-gap, and means including magnetic material for completing the electromagnetic circuit.

9. An electro-magnetic speaker unit comprising an electromagnet and cooperating armature, two pole-shoes connecting the poles of the magnet but separated to leave an air-gap, means for supporting the armature balanced in said air-gap, and means including magnetic material for completing the electromagnetic circuit.

10. In a polarized electromagnet, the combination with a permanent magnet, of a pair of polar extensions separated by an air-gap, an armature mounted operatively within said air-gap, a coil surrounding said armature, and a flexible member of magnetic material supporting the armature and bridging the poles of the magnet so as to form part of the electromagnetic circuit.

11. An electromagnetic speaker unit comprising a permanent magnet the two poles of which are arranged to produce an air-gap; an armature cooperating with said magnet and a yoke bridging the poles of the permanent magnet, a reed of magnetic material carried by the yoke and also bridging said poles, pole-shoes held by the yoke, and a coil encompassed by said yoke between the shoes and the reed.

12. An electromagnetic speaker unit of the balanced armature type, including two polar extensions, a flexible member, an armature fixedly supported thereon, and a stylus fixed to one end of the armature at such a distance from its point of support as to obtain a predetermined reduction of motion between the stylus and the opposite end of the armature which is balanced between the polar extensions.

13. An electromagnetic speaker unit of the balanced armature type, including two polar extensions, a flexible reed, an armature fixedly attached to the reed between its ends, and a stylus fixed to the armature near one end thereof at such a distance from the reed as to obtain a predetermined reduction of motion between the stylus and the opposite end of the armature which is balanced between the polar extensions.

14. In telephonic apparatus, a magnet having polar extensions separated by an air-gap, an armature mounted in cooperative relation with said polar extensions, and additional means including magnetic material of comparatively low retentivity for conducting magnetic flux directly from the armature to the polar extensions.

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