

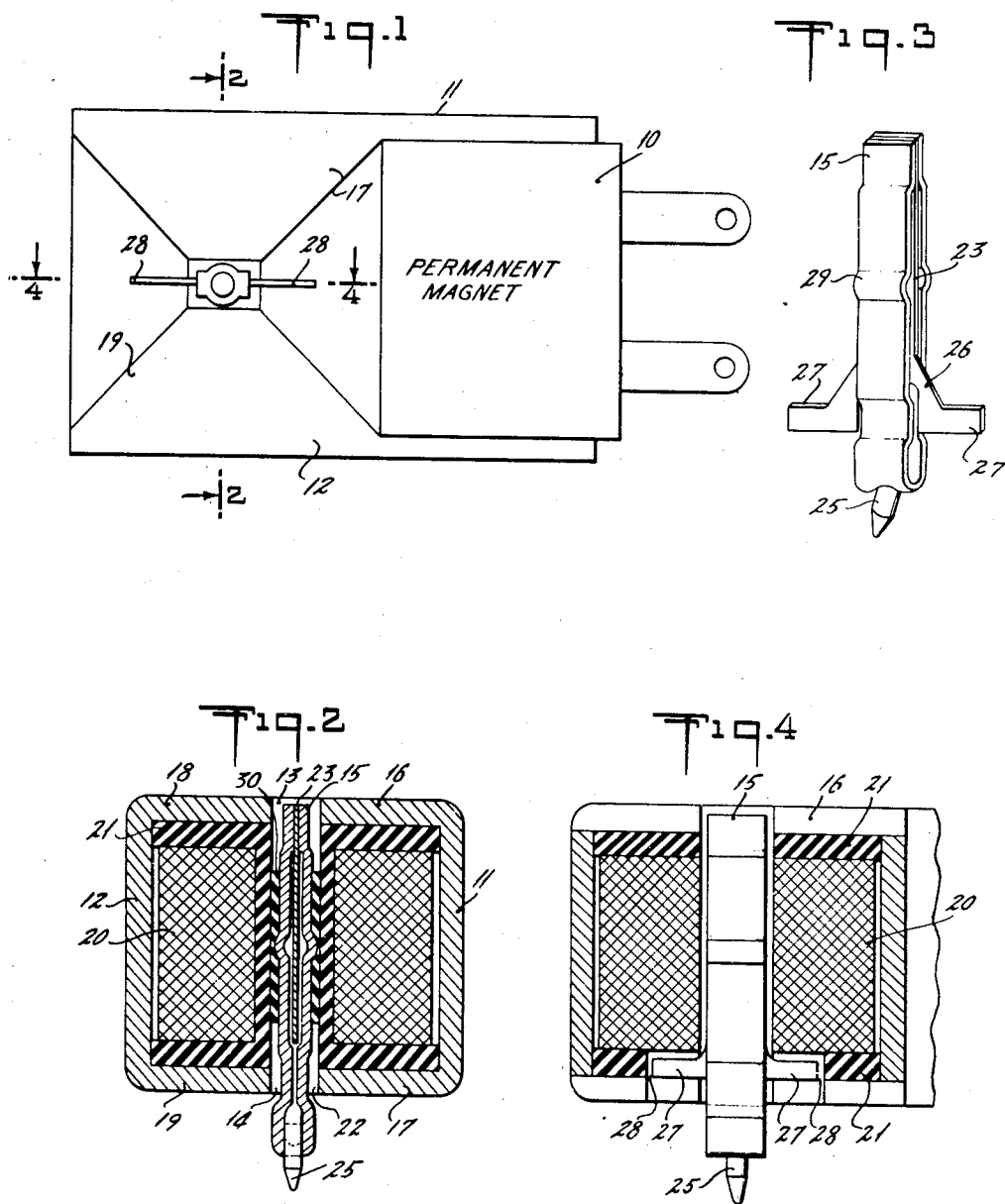
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ARMATURE STRUCTURE FOR ELECTROMAGNETIC APPARATUS

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ARMATURE STRUCTURE FOR ELECTRO-MAGNETIC APPARATUS

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My invention relates to an armature structure for an electro-magnetic, especially an electro-acoustic apparatus, for instance for recording or reproducing sound tracks.

The present invention relates to an improved armature structure in an electro-magnetic apparatus of the kind in which the armature is disposed in the central opening of the winding of the apparatus and under the influence of a force applied electrically or mechanically from outside moves in the air-gaps of two parallel, magnetic circuits, situated on either side of the ends of the winding. Apparatuses according to these principles have among other things been extensively used in electro-acoustics, as for microphones, loud-speakers and especially for recording and reproducing sound tracks on gramophone records or the like. However, in designing armatures for such apparatuses it is difficult to obtain a fixed centre of oscillation in the middle of the armature and at the same time the necessary directional force. It is important that the oscillations of the armature take place about an axis through its centre, since then the ends of the armature for a given deviation of the needle move equal distances in their respective air-gaps and thus cause a greater variation in the reluctance of the magnetic circuits and higher efficiency of the electric pick-up, than would be the case under otherwise unchanged conditions if the centre of oscillation were situated elsewhere.

These difficulties are overcome by means of an armature structure according to the present invention in which the armature is suspended by means of a plate spring, one end of which is secured to one end of the armature and the other end of which is clamped in a stationary part of the apparatus substantially level with the other end of the armature. By this suspension the armature will oscillate substantially as if it were mounted on a shaft through its centre. In a preferred embodiment the armature has the shape of a frame the interior of which is divided in two equal parts in the longitudinal direction by the plate spring and the longer sides of which are each at its middle provided with a transverse pad or swell engaging the inner sides of the winding. In order to obtain appropriate damping this engagement is arranged through insertions of elastic material.

The invention is illustrated in the shape of a pick-up in the accompanying drawing, in which Fig. 1 shows an assembly view of such an apparatus seen from below with its housing re-

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moved and provided with an armature structure according to the invention; Fig. 2 is a section through the winding and the armature structure taken on line 2—2 of Fig. 1; Fig. 3 is a perspective view of the same armature structure; and Fig. 4 is a cross-sectional view taken on the line 4—4 of Fig. 1.

In Fig. 1, reference character 10 designates a permanent magnet which may be made of the material known as Alnico. Against the poles of the magnet rests a pair of pole shoes 11 and 12 of soft iron. As best seen from Fig. 2, the magnetic circuit forms two air-gaps 13 and 14, in which an armature 15 is arranged to move. Said air-gaps are formed between the opposing tips of the truncated triangular ears 16, 17 and 18, 19 of the respective pole-shoes 11 and 12, bent at right angles. Between the ears of the pole-shoes lies the winding 20, wound on spool 21 which, by way of example, may be made of moulded plastic such as Bakelite or Trolitul. The armature 15 extends through the whole of the central opening 22 of the spool 21 its ends extending outwardly between the pole-shoes.

In the embodiment of the armature structure shown in Figs. 2 and 3, the armature 15 is made from a strip of transformer sheet-iron or Permalloy bent double upon itself. A plate spring 23 is disposed between the two legs of the armature. The ends of the strip are welded to one end of the spring and the remaining portions of the legs are offset outwardly so as to provide clearance between them and the spring. At the place where the armature extends through the air gap 14, the legs are offset inwardly sufficiently so that the armature at this point has substantially the same thickness as it has within the air gap 13. To the bent end of the armature there is fastened a reproducing stylus 25, for example, a sapphire stylus, or a holder for a stylus of such kind.

The plate spring 23, which serves as a suspension for the armature and to give it a certain directional force, extends through the greater part of the armature frame and divides it into two equal portions in its longitudinal direction. At the end 26 which is not fastened to the armature the spring is bifurcated and each of its branches is provided with sidewise protruding lugs 27 for securing the spring in a stationary part of the pick-up. The fastening may simply be effected by inserting the lugs 27 in frictional engagement with the walls of corresponding notches 28 made in the lower end flange of the spool 21 on either side of the central opening 22. The spring lugs 27 are retained in the

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notches 28 without special fastening means so that the armature will be particularly easy to remove and reinsert in case of repair or replacement.

In the middle of each leg of the armature frame there preferably is formed a transverse projection 29 of such extent that the armature engages the inner sides of the winding and its centre of oscillation is more effectively fixed. The engagement is preferably with insertions 30 of elastic material in order to obtain appropriate damping. The insertion may have the form of a tube 30 of synthetic rubber or Neoprene, passed over the armature frame. Adjustment of the damping to the desired magnitude may then be achieved by the choice of length and wall thickness of the tube. If the rubber tube has an appreciable length, as shown in the drawing, it also contributes to the directional force.

From the preceding description it is clear that an armature structure according to the invention is relatively simple to manufacture and particularly easy to mount and that, due to the manner in which the directional spring is secured to the armature and to the spool of the winding, the axis of oscillation of the armature will lie approximately in the centre of the winding and its deviations in the two air-gaps be substantially equal in magnitude. For the same reason the pressure of the stylus will also be taken up in a natural manner by the armature.

Instead of making the armature 15 in the form of a frame as has hitherto been described one may use a small solid rod of soft iron as an armature. It is then necessary also to make that change of the directional spring that it is branched or U-shaped in its full length with one shank on either side of the armature rod. The frame-shaped embodiment, however, is preferred with respect to its lower weight.

Although a couple of embodiments of the invention only has been described it will be evident that modifications thereof will fall within the scope of the invention.

What is claimed:

1. In an electro-magnetic device, a fixed structure including permanent magnet means provided with two spaced air gaps, an armature extending between both of said air gaps, and a plate spring for movably supporting said armature, said spring being secured to said armature in the vicinity of one of said air gaps and to said fixed structure in the vicinity of the other air gap.

2. In an electro-magnetic device, a fixed structure including permanent magnet means provided with two spaced air gaps, an armature extending between both of said air gaps, said armature including two spaced parallel legs, and a plate spring for movably supporting said armature, said plate spring being secured to said armature between the legs thereof in the vicinity of one of said air gaps and to said fixed structure in the vicinity of the other air gap.

3. In an electro-magnetic device, a fixed structure including permanent magnet means provided with two spaced air gaps, an armature extending between both of said air gaps, said armature comprising a strip of metal bent double upon itself to form two parallel legs, a plate spring

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extending between said legs for movably supporting said armature, said spring being secured to said armature between the ends of said strip in the vicinity of one of said air gaps, said legs being off-set outwardly throughout the central portion of the armature to provide clearance between them and said spring, and means for securing said spring to said fixed structure in the vicinity of the other air gap.

4. A device as defined in claim 3 in which said legs are off-set inwardly where they extend through said other air gap a sufficient extent so that the thickness of said armature is substantially the same in both air gaps.

5. In an electro-magnetic device, a fixed structure including permanent magnet means provided with two spaced air gaps, an armature extending between both of said air gaps, said armature including two spaced parallel legs, a plate spring for movably supporting said armature, one end of said spring being secured to said armature between the legs thereof in the vicinity of one of said air gaps, arms extending laterally from the other end of said spring, and means for securing said arms to said fixed structure in the vicinity of the other air gap.

6. In an electro-magnetic device, a fixed structure including permanent magnet means provided with two spaced air gaps, an armature extending between both of said air gaps, said armature including two spaced parallel legs, said fixed structure being formed with slots, a plate spring for movably supporting said armature, one end of said spring being secured to said armature between the legs thereof in the vicinity of one of said air gaps, and arms extending laterally from the other end of said spring and received in the slots in said fixed structure in the vicinity of the other air gap.

7. In an electro-magnetic device, magnet means provided with two spaced air gaps, an armature extending into both of said air gaps, said fixed structure extending on either side of said armature, a plate spring for movably supporting said armature, said spring being secured to said armature in the vicinity of one of said air gaps and to said fixed structure in the vicinity of the other air gap, and a projection extending laterally from either side of the center of said armature and engaging said fixed structure.

8. A device as defined in claim 7 in which resilient material is disposed between said projection and said fixed structure.

9. A device as defined in claim 7 in which a tube of resilient material surrounds the central portion of said armature and the projections thereon.

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