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ELECTRIC SOUND REPRODUCING APPARATUS

Filed July 10, 1931

Fig. 1.

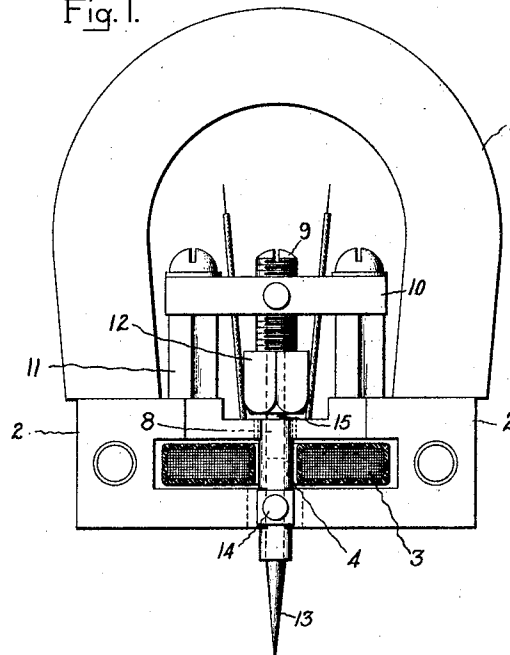
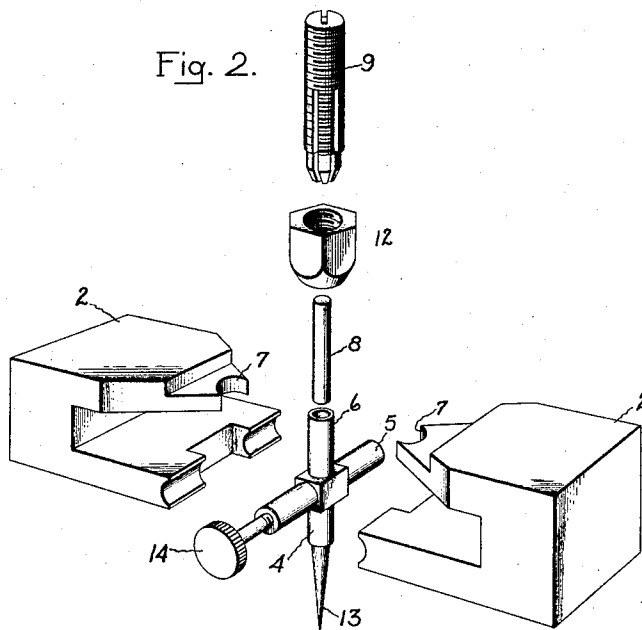


Fig. 2.



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UNITED STATES PATENT OFFICE

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TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK

ELECTRIC SOUND REPRODUCING APPARATUS

Application filed July 10, 1931, Serial No. 549,949, and in Great Britain February 17, 1931.

The present invention relates to electric sound reproducing apparatus and particularly to the kind of apparatus known as an electrical pick-up in which a stylus vibrated in accordance with the contour of a record of sound waves causes fluctuating electric currents to be produced which are adapted, after suitable amplification, to operate sound producing apparatus. In certain cases, such apparatus may be used for the recording of sound by energizing the apparatus with electric currents corresponding to sound waves and causing the corresponding movement of the stylus to form an impression on a record blank. The invention is an improvement in or modification of the apparatus disclosed in the application for U. S. Letters Patent, Serial No. 271,813, filed April 21, 1926, James W. Kendall.

In that application for patent there is disclosed an electric sound pick-up device having an armature pivotally mounted between the abutting ends of a pair of magnetic pole pieces and having a portion extending at right angles to the pivotal axis thereof, which portion is adapted to engage at its end a resilient member subjected to substantially no compressive or frictional force, the resilient member being also mounted upon the pole pieces. The purpose of the resilient member was to assist in centering the armature with respect to the pole pieces without providing any substantial additional damping other than that already applied in the pivotal mounting of the armature between the pole pieces.

The present invention is concerned with an improved construction of resilient member and mounting of the same whereby the resilient member is caused to engage the end of the armature.

In accordance with the present invention, the resilient member is in the form of a rod or tube of resilient material adapted to engage the end of the armature in such a manner that upon movement of the same a bending movement about its axis is produced in the resilient member as opposed to the compressional stress caused in the resilient member owing to the construction employ-

ed in the apparatus disclosed in the above-mentioned application, Serial No. 271,813. The tubular or rod-like resilient member may be arranged either to surround the extending portion of the armature or to engage a recess therein so as to project longitudinally of the axis of the extending portion, the resilient member being mounted so as to be fixed at its end remote from the armature. The distance of its support from the end of the armature is preferably made adjustable for the purpose of varying the stress produced in the resilient member by the movement of the armature, whereby the restoring force of the armature may be adjusted.

Our invention will be better understood from the following description when considered in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

Referring to the drawing, Fig. 1 is an elevation of the improved arrangement according to the invention and Fig. 2 is an exploded view to show more clearly the construction of the armature and of the resilient member.

In the drawing there is indicated at 1 a permanent magnet of horse-shoe shape provided with bipartite pole pieces 2 which are arranged to support and partly enclose a coil 3 interposed between the upper and lower extensions of the pole pieces 2, which extensions cooperate to provide upper and lower air gaps. Passing through the axis of the coil 3 and located in the air gaps is the armature 4 provided with a transverse shaft 5 which forms the pivotal axis of the armature, the shaft 5 being situated in the air gap formed between the recesses in the lower extensions of the pole pieces 2 where they abut against each other. Resilient material (not shown) is suitably interposed between the shaft and the abutting surfaces of the pole pieces to provide a restoring force to the armature and to center it into its normal position midway between the extensions of the pole pieces. The armature 4 terminates at its upper end in a tube-like or rod-like portion 6 which is located in

the air gap formed between the upper cooperating extensions of the pole pieces 2, which are rounded at 7 to receive the armature. The upper end 6 of the armature is thus free to move in the air gap formed between the upper extensions of the pole pieces and is largely centered by resilient material surrounding the shaft 5 being gripped between the lower cooperating extensions of the pole pieces.

To assist in centering the armature between the pole pieces, we provide in accordance with the invention a resilient member 8 subjected to substantially no initial compressive or frictional force other than that necessitated by its means of attachment and comprising a rod of resilient material such as rubber which engages the recessed end 6 of the armature, and is held by the screwed clamping member 9 supported by the bridging member 10 fixed to pillars 11 attached to the pole pieces 2. The member 9 has tongued ends which form, in cooperation with the nut 12, a chuck permitting the resilient member 8 to be gripped and held with its upper end stationary. By screwing the clamping member 9 towards or away from the pole pieces, the length of the resilient member 8 available between the end of the nut 12 and the armature can be adjusted and consequently the restoring force applied to the armature varied. Instead of using a chuck for securing the fixed end of the resilient rod, the end of the rod may be secured in a plane tubular clamping member by pressing the clamping member around the resilient rod after its insertion therein.

The mounting means above described for resilient rod 8 are so arranged that the unsupported portion 15 of this resilient rod extends freely and relatively loosely between the clamping member 9 and the end 6 of the armature and that movement of the armature 4 from its normal position causes a bending movement about its axis to be applied to the resilient member 8 as distinct from the compressive stress involved with the arrangement disclosed in the above-cited application, Serial No. 271,813. In the event of the chuck being adjusted extremely close to the end of the armature, the bending movement would disappear and shearing stress only would be involved. It is evident that the rod 8 may be replaced by a tube or tube-like member of resilient material adapted to fit over the end 6 of the armature with an equivalent result.

It will be observed that the arrangement herein disclosed of a resilient member engaging the armature and extending therefrom and having an unsupported portion the length of which may be varied provides an adjustable stiffening means for the vibrating armature, this stiffening means operating in connection with the upper end of

the armature and relatively distant from the pivotal axis thereof, at which point of attachment the stiffening means is most effective.

Provision is made in the usual way for securing a stylus needle 13 in the armature by means of the screw 14 which extends into the hollowed shaft 5 of the armature.

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

1. A sound producer including a pair of pole pieces, an armature mounted to vibrate between said pole pieces, a supporting member, a resilient member having an unsupported portion, the opposite ends of said resilient member being connected respectively rigidly to said supporting member and slidably to an end of said armature in such a manner that said unsupported portion of said resilient member extends between said supporting member and said end of said armature.

2. A sound producer including a pair of pole pieces, an armature mounted to vibrate between said pole pieces, a supporting member, a resilient member extending at right angles to the axis of vibration of said armature from an end of said armature and having an unsupported portion extending between said supporting member and said end of said armature, the opposite ends of said resilient member being connected respectively rigidly to said supporting member and relatively loosely to said end of said armature in such a manner that said unsupported portion of said resilient member is subjected to substantially no compressive or frictional force when said armature is in its mean position with respect to said pole pieces.

3. A sound producer including a pair of pole pieces, an armature mounted to vibrate between said pole pieces, a supporting member, a resilient member having an unsupported portion, the opposite ends of said resilient member being connected respectively rigidly to said supporting member and slidably to an end of said armature, and adjustable means to vary the length of said unsupported portion of said resilient member.

4. A sound reproducer including a pair of pole pieces, an armature pivotally mounted between said pole pieces and having a portion extending at right angles to the pivotal axis of said armature, a relatively long and narrow member of resilient material attached slidably at one end thereof to said extending portion of said armature, said member being so arranged that on movement of said armature about said pivotal axis said member is subjected to a bending stress.

5. A sound reproducer including a pair of pole pieces, an armature pivotally

mounted between said pole pieces and having a portion extending at right angles to the pivotal axis of said armature, a relatively long and narrow resilient member, means to connect slidably said extending portion of said armature to said resilient member at one extremity thereof, said resilient member extending in the direction of the axis of said extending portion of said armature, means to attach said resilient member at its other extremity rigidly to said pole pieces, whereby said resilient member is subjected to substantially no compressive or frictional force other than that required for its attachment to said armature and pole pieces when the armature is in the mean position with respect to said pole pieces.

6. A sound reproducer including a pair of pole pieces, an armature pivotally mounted between said pole pieces and having a portion extending at right angles to the pivotal axis of said armature, a member of resilient material, means to attach said extending portion of said armature to said resilient member at one extremity thereof, said resilient member extending substantially in the direction of the axis of said extending portion of said armature, means to attach said resilient member at its other extremity to said pole pieces, said last-named means being so arranged that the length of the free portion of said resilient member extending between said armature and said means for attaching said member to said pole pieces is adjustable.

7. A sound reproducer including a pair of pole pieces, an armature pivotally mounted between said pole pieces and having a portion extending at right angles to the pivotal axis of said armature, a member of resilient material, means to attach said resilient member at one end thereof to said extending portion of said armature at the other end thereof to said pole pieces, said member extending substantially in the direction of the axis of said extending portion of said armature, said attachment means for said resilient member being so arranged that the free portion of said member between said ends thereof is adjustable.

8. A sound producer including a pair of pole pieces, an armature mounted to vibrate between said pole pieces, stiffening means for said armature, a supporting member, said stiffening means including a relatively long and narrow member of resilient material connected slidably at one end thereof to said armature and at the other end rigidly to said supporting member, said resilient member being subjected only to bending stress on vibration of said armature.

9. A sound producer including a pair of pole pieces, an armature pivotally mounted between said pole pieces and adapted to vibrate therebetween, a supporting member,

stiffening means for said armature including a body of resilient material connected slidably at one end thereof to a portion of said armature relatively distant from the pivotal axis thereof, said body being connected rigidly at the other end thereof to said supporting member, said body being subjected only to bending stress on vibration of said armature, and adjustable means to vary the stiffening effect of said means.

10. A sound producer including a pair of pole pieces, an armature pivotally mounted between said pole pieces and adapted to vibrate therebetween, stiffening means for said armature including a body of resilient material connected to an end of said armature relatively distant from the pivotal axis thereof, said body of resilient material having an unsupported portion extending from said end of said armature, and adjustable means to vary the length of said unsupported portion.

11. A sound reproducer including a pair of pole pieces, an armature pivotally mounted between said pole pieces and having a portion extending at right angles to the pivotal axis of said armature, a member of resilient material, means to attach said extending portion of said armature to said resilient member at one extremity thereof, said resilient member extending substantially in the direction of the axis of said extending portion of said armature, means to attach rigidly said resilient member at its other extremity to said pole pieces, said last-named means being so arranged that the length of the free portion of said resilient member extending between said armature and said means for attaching said member to said pole pieces is adjustable.

12. A sound reproducer including a pair of pole pieces, an armature pivotally mounted between said pole pieces and having a portion extending at right angles to the pivotal axis of said armature, a member of resilient material, means to attach said resilient member at one end thereof to said extending portion of said armature and at the other end thereof rigidly to said pole pieces, said member extending substantially in the direction of the axis of said extending portion of said armature, said attachment means for said resilient member being so arranged that the free portion of said member between said ends thereof is adjustable.

13. A sound producer including a pair of pole pieces, an armature mounted to vibrate between said pole pieces, a supporting member, stiffening means for said armature including a body of resilient material extending in a direction substantially coaxial with said armature, said body being attached at one end thereof to said armature and at the other end rigidly to said supporting member, said body having an unsupported por-

tion adapted to be subjected only to a bending stress on movement of said armature, and adjustable means to vary the length of said unsupported portion.

5 14. A sound producer including a pair of pole pieces, an armature pivotally mounted between said pole pieces and adapted to vibrate therebetween, a supporting member, stiffening means for said armature including
10 a body of resilient material connected at one end thereof to an end of said armature relatively distant from the pivotal axis thereof, said body being connected rigidly at the other end thereof to said supporting
15 member, said body of resilient material having an unsupported portion extending in a direction substantially coaxial with said armature from said end of said armature and adapted to be subjected only to a bending
20 stress on movement of said armature, and adjustable means to vary the length of said unsupported portion.

In witness whereof, we have hereunto set our hands.

25 LEONARD B. AULT.
THOMAS F. ROBINSON.

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