Jan. 6, 1931. W. H. HUTTER 1,787,579

TRANSLATING DEVICE

Filed Nov. 19, 1928 2 Sheets-Sheet 1

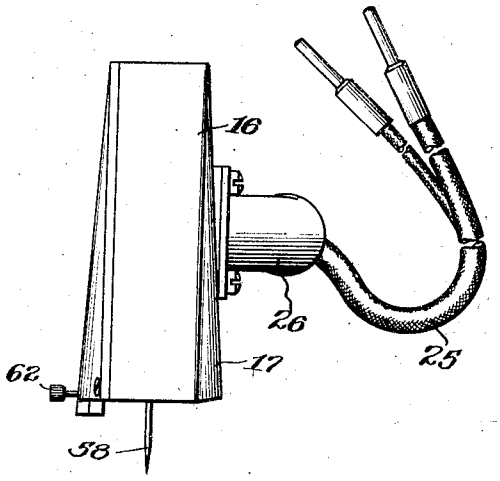


Fig. 1.

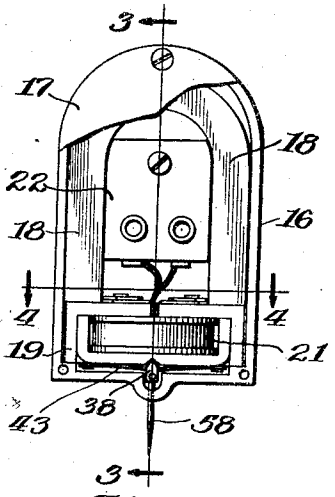


Fig. 2.

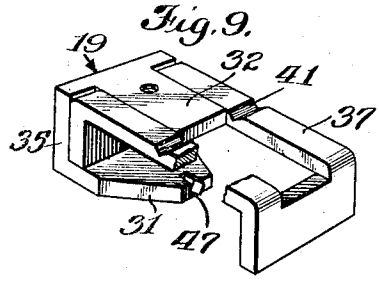


Fig. 9.

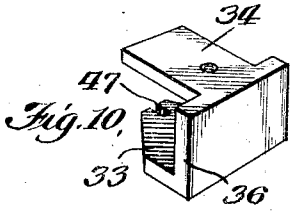


Fig. 10.

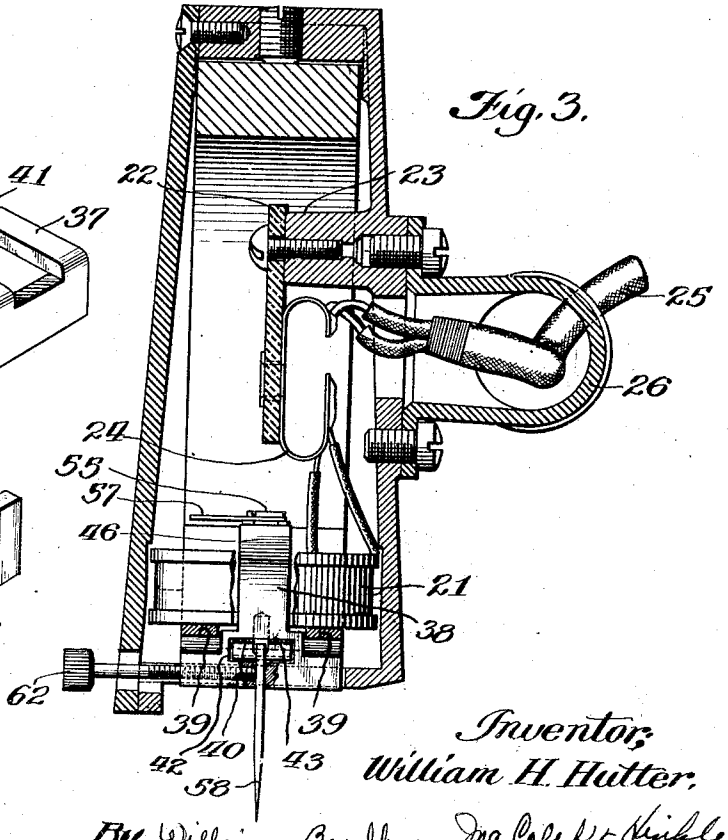


Fig. 3.

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TRANSLATING DEVICE

Filed Nov. 19, 1928 2 Sheets-Sheet 2

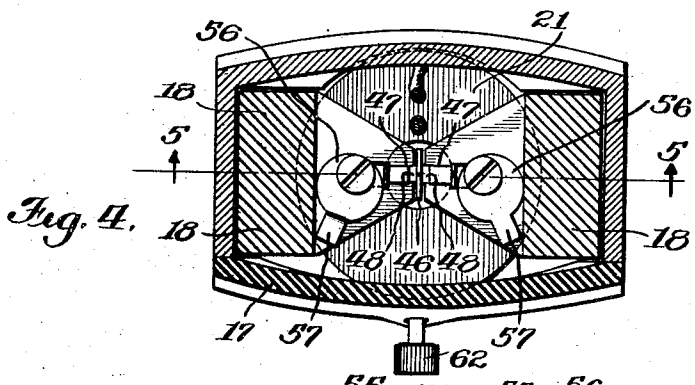


Fig. 4.

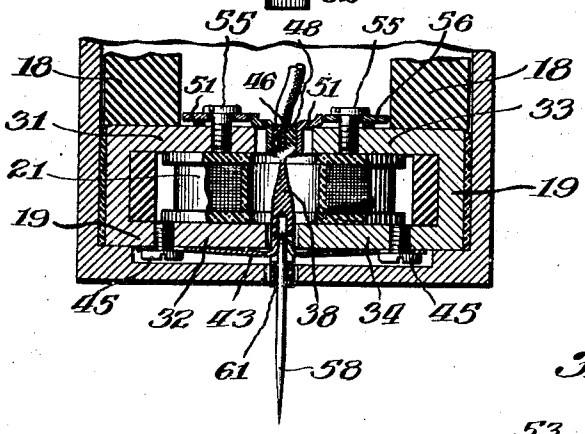


Fig. 5.

Fig. 6.

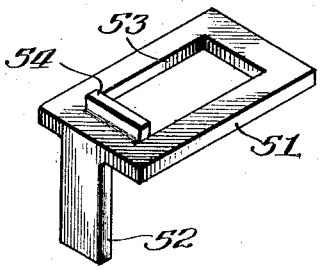


Fig. 7.

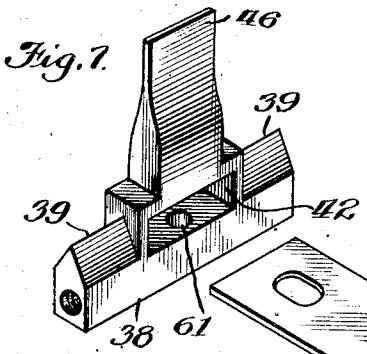
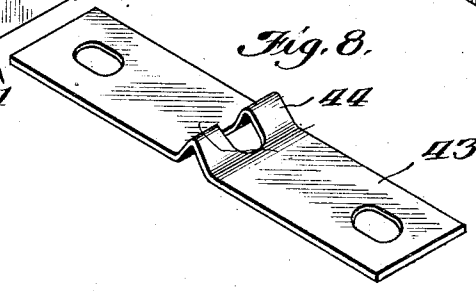


Fig. 8.



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Patented Jan. 6, 1931 1,787,579

UNITED STATES PATENT OFFICE

WILLIAM H. HUTTER, OF RACINE, WISCONSIN, ASSIGNOR TO WEBSTER ELECTRIC COMPANY, OF RACINE, WISCONSIN, A CORPORATION OF WISCONSIN

TRANSLATING DEVICE

Application filed November 19, 1928. Serial No. 320,259.

My invention relates to a translating device, and more particularly to a device for translating mechanical movements into electrical impulses such as used in electrical phonographs.

An object of the invention is to provide an improved translating device for reproducing sounds.

A further object is to provide a translating device in which the movement of a vibratory member is accurately and efficiently converted into correlated electrical impulses, which may be amplified and converted into sound waves.

A further object is to provide a translating device in which the vibratory member moving between the pole pieces of a magnet is resiliently restrained to counterbalance the effect of the magnet upon the movement of the vibratory member so that its entire movement will be due to mechanical causes.

A further object is to provide an improved mounting for the vibratory member of a translating device.

Other features and advantages of the apparatus will appear as the description proceeds.

In the drawings,

Fig. 1 is a side elevation of a translating device embodying the features of the invention;

Fig. 2 is a front elevation of the device shown in Fig. 1, with parts broken away to show the interior of the casing;

Fig. 3 is an enlarged longitudinal section taken on line 3—3 of Fig. 2;

Fig. 4 is an enlarged cross section of the device taken on lines 4—4 of Fig. 2;

Fig. 5 is a longitudinal section taken on lines 5—5 of Fig. 4;

Fig. 6 is an enlarged perspective of a part of the device;

Fig. 7 is a perspective of the vibratory member;

Fig. 8 is a perspective of a spring for mounting the vibratory member;

Fig. 9 is a perspective of the magnetic yoke; and

Fig. 10 is a perspective of the double pole piece shown removed from the yoke.

Referring to the drawings, in which the same reference characters refer to similar parts in the several views, a casing 16 is shown for enclosing the translating device. The casing may be made of any suitable non-magnetic material such as aluminum and is provided with a cover 17 of similar material. Within the casing is a U-shaped magnet 18, preferably of the permanent magnet type, across the poles of which is a magnetic yoke 19 which surrounds a generating coil 21. A terminal block 22 is mounted upon a stud 23 integral with the casing and carries a plurality of terminal members 24, to which the ends of coil 21 are connected.

A cord 25 passes through a tubular arm 26 supporting the casing 16 and makes electrical contact with the terminal members 24. The currents generated in coil 21 may thus be led through cord 25 to a suitable amplifying device and converted into sound waves.

The magnetic yoke comprises pole pieces 31 and 32, and pole pieces 33 and 34, which are made of magnetic material and are magnetically interconnected in pairs, that is, pole pieces 31 and 32 are interconnected by an integral connector 35 of magnetic material, and pole pieces 33 and 34 are interconnected by an integral connector 36 of magnetic material. The pole pieces are held in fixed spaced relation by a non-magnetic support 37, which may be spot welded to the connectors 35 and 36. The non-magnetic support holds the pole pieces in such a position as to provide a small air gap between pole pieces 31 and 33, and a larger air gap between pole pieces 32 and 34.

Mounted upon the support 37 is a vibratory member or armature 38 having a plurality of knife edges 39, which engage grooves 41 of the support. The knife edges are held in the grooves by a spring 43 having a knife edge 44 which engages a surface 40 in an aperture 42 in the armature, the surface 40 and knife edge 44 being in alignment with the knife edges 39 so that the armature may pivot about the knife edges with a minimum of friction. Spring 43 is attached to the non-magnetic yoke 19 by screws 45 thus forming an efficient pivotal mounting for the armature upon the yoke, supporting the pivoted

portion of the armature in the gap between pole pieces 32 and 34. The free end 46 of the armature is reduced in thickness and slightly widened and is adapted to reciprocate between poles 31 and 33 as the armature moves about its pivot.

The grooves 41 in the non-magnetic support are accurately located midway between the faces of pole pieces 32 and 34 and are cut to such a depth that the axis of the pivot of the armature lies at the center of the faces of pole pieces 32 and 34. This construction maintains a uniform reluctance in the gaps between the armature and pole pieces 32 and 34 as the armature is vibrated, since the average length of the air gaps will be constant. The reluctance of the air gaps between the free end of the armature and pole pieces 31 and 33, however, will vary as the armature vibrates, since the distance of the free end of the armature from either of the pole pieces varies as the armature vibrates, varying the length of the air gap. When end 46 of the armature approaches nearer pole piece 31 than pole piece 33 the reluctance through pole piece 31, armature 38 and pole piece 34 will be less than the reluctance through pole piece 32, armature 38 and pole piece 33, causing a magnetic flux to pass through the armature in an upward direction as viewed in Fig. 5. The movement of the armature in the other direction increases the reluctance between pole piece 31 and the armature and when the end 46 of the armature is nearer pole piece 33 than pole piece 31, the reluctance of the path from pole piece 32, through armature 38 to pole piece 33 will be less than the reluctance through pole piece 31, armature 38 and pole piece 34 and the direction of the magnetic flux will be in the opposite direction from that in which it was when the armature was nearer pole piece 31. The vibration of the armature will therefore produce a corresponding variation in the lines of magnetic flux in the armature, inducing a current in coil 21 whose wave form will bear a definite relation to the vibrations of the armature.

Pole pieces 31 and 33 have slots 47 at their ends which are formed from the end by a round tool to give them a circular cross-section thereby adapting them to prevent material therein from working out sidewise. The slots are provided with a piece of resilient material 48 engaging the free end 46 of the armature to normally maintain the armature in the center of the gap between the pole pieces. Mounted upon each of the pole pieces 31 and 33 is a plate 51 having a tongue 52 extending into slot 47 and engaging the resilient material 48 in the slot.

Plate 51 is provided with a longitudinal slot 53, at one end whereof is a projection 54 extending upwardly from the plate. The plate is mounted upon a pole piece by means of a screw 55 which passes through slot 53 and at the same time supports an eccentric cam 56, which engages the projection 54 and serves to force the tongue 52 against the resilient material and vary the pressure of the resilient material in slot 47 against the free end of the armature. The cams 56 are provided with offset levers 57 which are accessible and may be adjusted when the cover 17 of the casing is removed. The pole pieces 31 and 33 attract the armature in accordance with the proximity of the armature to a pole piece, but on account of the resilient material a force will be applied to the armature tending to return it to its central position which also increases with the proximity of the armature to a pole piece so that the magnetic attraction of the armature is counterbalanced by the resilient material and therefore will not affect the movement of the armature.

A stylus 58, which is adapted to make contact with a record, is adapted to be inserted into an opening 61 in the armature, where it may be firmly held in place by turning a thumb screw 62 to grip the stylus.

The operation of the device is as follows: When the stylus passes over a record of the usual type, the undulations in the record will cause the stylus to vibrate, which movement is communicated to the armature 38, causing the reduced end 46 to reciprocate between the ends of poles 31 and 33. The magnet 18 sets up a magnetic potential difference between poles 31 and 33 and poles 32 and 34. On account of the fact that armature 38 is pivoted on a central line of the faces of pole pieces 32 and 34, the magnetic potential difference of pole pieces 32 and 34 will not affect the armature during the vibration of the armature. The end 46 of the armature will, however, approach and recede from the pole pieces 31 and 33 which have different magnetic potentials, thereby varying the magnetic flux through the armature and inducing a current in coil 21.

It will be seen, therefore, that the magnetic flux will vary through the armature as the armature is reciprocated and whenever the central position of the armature is passed, the flux through the armature will be reversed. The variation of the magnetic flux through the armature generates a current which is correlated to the movement of the armature and is adapted to be amplified and converted into sound by any suitable amplifying and reproducing apparatus.

One of the features of the device is that only the movement of end 46 of the armature produces a variation of the flux through the armature. The pivotal mounting of the armature between the pole pieces 32 and 34 at a point half-way between the upper and lower pole pieces maintains the average air gap between the armature and poles 32 and

34 constant during the movement of the armature, which results in greatly improved tone qualities when the electrical impulses generated are converted into sound.

Having described the nature of my invention and the embodiments thereof, what I desire to secure by United States Letters Patent is as follows:

1. A reproducing device comprising a permanent magnet, a coil, a magnetic bridge between the poles of the magnet and having a gap adjacent one side of the coil, a second magnetic bridge between the poles of the magnet and having a gap adjacent the other side of the coil, a movable armature passing through the coil and the gaps in the magnetic bridges, a nonmagnetic mounting for said armature having a groove therein in which a portion of said armature has pivotal engagement and means for maintaining the magnetic reluctance between the armature and one of the bridges constant and varying the magnetic reluctance between the armature and the other bridge thereby inducing a current in the coil.

2. In a reproducing device, a magnet, a coil, a yoke bridging the ends of the magnet and surrounding the coil comprising a pair of magnetic U-shaped members having their arms in alignment and a non-magnetic member supporting the U-shaped members and holding their ends in spaced relation, a vibratory armature pivotally mounted on the non-magnetic member in the plane of the arms of the U-shaped members on one side of the coil and extending into the gap between the arms on the other side of the coil whereby the vibrations of the armature induce a current in the coil.

3. In a reproducing device, a coil, a yoke for the coil comprising a non-magnetic member having a groove, a pair of magnetic members attached to the non-magnetic member and held in spaced relation thereby, said magnetic members extending from the center of the coil over the lateral side of the coil to the center on the other side forming gaps between the ends of the magnetic members, an armature having a knife edge support mounted in the groove of the non-magnetic member in one of the gaps between the magnetic material, said armature extending through the coil and having a free end reciprocable in the other gap.

4. In a reproducing device, a coil, a pair of pole pieces at each end of the coil having a gap therebetween, a magnet associated with the pole pieces, a non-magnetic mounting for an armature having a groove therein, an armature having a knife edge extending through the gaps in the pole pieces and pivally mounted in the gap at one end of the coil by engagement in said groove, the pivot point of said armature being in the center of the faces of the pole pieces forming the gap and means for moving the armature about its pivot to generate a current in the coil.

5. In a reproducing device, a coil, a yoke having a groove surrounding the coil, an armature having a knife edge mounted in said groove, said armature having an opening therethrough, one side of which is in alignment with the knife edge of the armature, and a resilient member having a knife edge engaging said side in the opening through the armature forming a mounting for the armature.

6. In a reproducing device, a yoke having a groove therein, an armature having a knife edge pivotally mounted in the groove, said armature having an opening therethrough, one side of which is in alignment with the knife edge, and a resilient blade attached to the yoke and passing through the opening in the armature, said blade having a knife edge in alignment with the knife edge of the armature engaging the opening in the armature.

7. In a reproducing device, a mounting for an armature having a groove therein, an armature having a pair of aligned knife edges resting in said groove, a surface on said armature between said knife edges and in alignment therewith and a member having a knife edge engaging said surface to retain the knife edges of the armature in the grooves forming a pivotal mounting for the armature.

8. In a reproducing device, a mounting for an armature having a groove therein, an armature having a knife edge pivotally engaging said groove, a surface on said armature in alignment with the knife edge, and a member having a knife edge engaging said surface to retain the knife edge of the armature in the groove.

In witness whereof, I hereunto subscribe my name this 16th day of November, 1928.

WILLIAM H. HUTTER.