

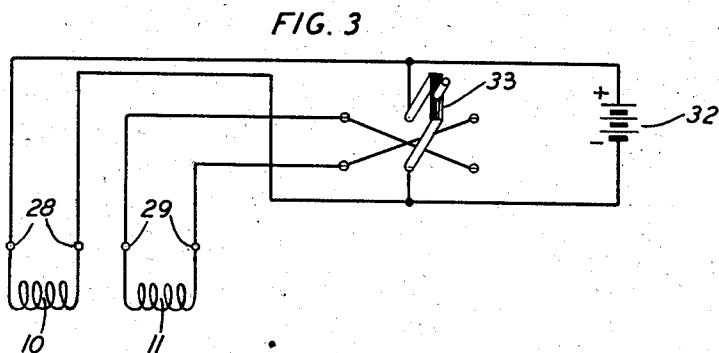
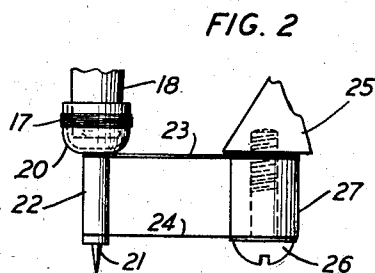
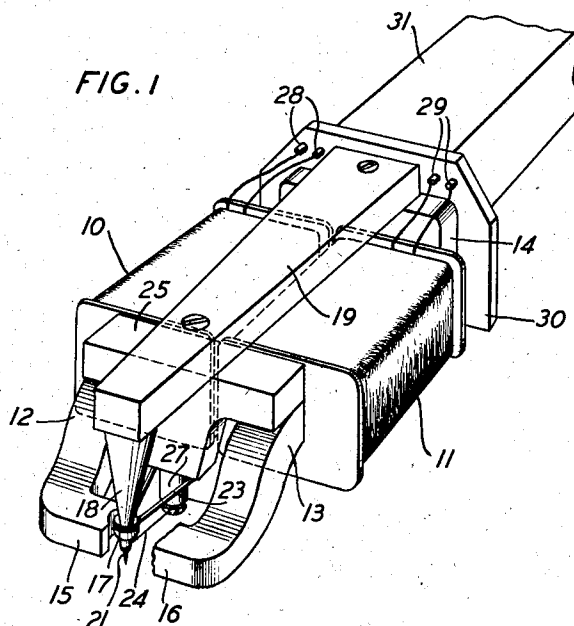
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VIBRATION TRANSLATING DEVICE

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VIBRATION TRANSLATING DEVICE

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7 Claims. (Cl. 179—100.41)

This invention relates to vibration translating devices such as recorders and reproducers which have moving systems adapted to vibrate in a plurality of modes.

The object of the invention is an efficient device of this type which may be readily used for reproducing (or recording) either hill and dale or lateral type records.

A recorder or reproducer according to the invention has a moving system including a stylus which may vibrate either vertically or laterally to record or reproduce either hill and dale or lateral cut records. The magnetic circuit for supplying the necessary steady flux is of the double electro-magnetic type and means are provided for reversing the relative direction of the flux at the sides of the vibratory element to make the device responsive for either mode of vibration.

In the preferred structure a coil disposed above the stylus is supported between main pole-pieces for both vertical and torsional vibrations and surrounds a central pole magnetically connected to a common portion of the main pole-pieces. For lateral operation the central pole is neutral, but for vertical operation, means is provided for reversing the current in one of the magnetizing windings to make the main pole-pieces of the same polarity in which case the return path for the combined flux from these pole-pieces is by way of the central pole.

The device is well adapted for use as a reproducer for either lateral or hill and dale records without change in the operating position. In changing from one type of reproduction to the other it is necessary merely to close the magnetizing switch in the proper position. If the operator neglects to do this the device will be inoperative, but no damage to either the reproducer or the record will occur.

The invention will be more clearly understood from the following detailed description and the accompanying drawing in which:

Fig. 1 is a perspective view of an assembled translating device according to the invention;

Fig. 2 is a detailed view of the vibratory system; and

Fig. 3 is a diagram showing the magnetizing circuit for the electromagnets.

Referring now to the drawing, the magnetizing windings 10 and 11 are disposed on magnetic cores 12 and 13 which have a common yoke portion 14 and terminate in opposed pole-pieces 15 and 16, the latter pole-piece being broken away to show more clearly the vibratory system. Disposed between the pole-pieces and extending into

the coil 17 is a central pole-piece 18 magnetically connected to the yoke 14 by the bar 19.

The vibratory system comprises the signal current coil 17 wound on a cup member 20 which is rigidly connected to a stylus 21 by a tubular piece 22. This system is supported with the coil in the air-gap defined by the pole-pieces 15, 16 and 18 by parallel cantilever springs 23 and 24 secured to a non-magnetic supporting piece 25 and held in proper relative position by a screw 26 and a spacer 27. The spring assembly is in general similar to that disclosed in my copending applications, Serial Nos. 742,761 and 746,073, filed September 5, 1934 and September 29, 1934, respectively. The upper spring 23 is preferably V-shaped and made from thin sheet material so that it is of low stiffness for vertical and torsional deflections but of relatively high stiffness for lateral deflections. The lower spring 24 should be free to deflect in all directions and is conveniently made from a single strand of fine wire.

The ends of the windings 10 and 11 are brought out to terminals 28—28 and 29—29 respectively on the mounting frame 30 of the reproducer and from these terminals conductors extend within the reproducer supporting arm 31 to a current source as shown in Fig. 3. The magnetizing current for the windings may be obtained from a battery 32 or some other source such as a rectifier in the associated amplifying system. One of the windings, 10 in this case, is directly connected to the current source but the other winding is connected through a reversing switch 33 which may be conveniently located on the frame of the phonograph in which the reproducer is used, or if preferred it may be placed on the reproducer or the reproducer supporting arm.

When the translating device described above is to be used as a reproducer on "hill and dale" or "vertical" cut records the switch 33 is closed to the right and the currents through the windings 10 and 11 are in opposite directions so that the flux due to both windings flows from one lateral pole-piece, 15 for instance, across the coil 17 and the central pole-piece 18 to the other lateral pole-piece 16. As the stylus 21 is vibrated vertically by the record grooves the springs 23 and 24 will both deflect vertically and the coil will be vibrated vertically in the magnetic field to generate currents corresponding to the sounds recorded on the record.

If a "lateral" cut record is to be reproduced the switch 33 is closed to the left and the flux in the cores 12 and 13 then flows in the same direction, that is, toward the pole-pieces 15 and 16

across the air-gaps and back to the yoke 14 through the pole-piece 18 and the bar 19. In this case the stylus 21 will be vibrated laterally and the lower spring 24 will deflect laterally but the upper spring 23 due to its high lateral and low torsional stiffness, will act as a fulcrum and the coil 17 will oscillate, both sides of the coil adjacent the pole-pieces 15 and 16 moving vertically but in opposite directions. But since the flux is now flowing toward the pole-piece 18 from both pole-pieces 15 and 16 the electromotive forces generated in the opposite sides of each turn of the coil 17 will again be additive and the currents in the coil will correspond to the sounds recorded on the lateral record.

While the invention has been described for purposes of illustration as a universal phonograph reproducer, it will be apparent that a device of the general type shown is equally capable of being used as a recorder for making either lateral or hill and dale records. Various modifications in the design will occur to those skilled in the art but the invention is intended to be limited only by the scope of the following claims.

What is claimed is:

1. In a vibration translating device, a generating element, a stylus connected thereto, means for supporting the element for vibration in different modes corresponding to different modes of vibration of the stylus, means for producing flux transversely of the element, and means for reversing the direction of the flux at one side of the element.

2. In a vibration translating device, the combination with a coil, a stylus attached thereto, and means for supporting the coil for vertical and lateral vibrations of the stylus, of means for producing a magnetic flux transversely of the coil, and means for reversing the direction of the flux at one side of the coil.

3. In a vibration translating device the combination with a coil, a stylus attached thereto, a magnetic core for the coil, and means for supporting the coil for vertical and lateral vibrations of the stylus, of a pair of lateral pole-pieces for

producing flux transversely of the coil, and means for reversing the polarity of one of the pole-pieces.

4. The combination with a pair of lateral pole-pieces defining an air-gap, a coil, a stylus attached thereto and means for supporting the coil for vibration in different modes within the gap, of a central pole-piece within the coil, means for producing flux in the air-gap, and means for reversing the polarity of one of the lateral pole-pieces.

5. The combination with a pair of magnetizing coils, magnetic cores for the coils having a common portion at one end and defining an air-gap at the other end, a signal coil, a stylus attached thereto, and means for supporting the coil for vertical and torsional vibrations in the gap, of a magnetic member within the coil connected to the common portion of the cores, means for connecting the magnetizing coils to a source of current, and means for reversing the polarity of one of said coils.

6. In a universal phonograph reproducer, the combination with a plurality of pole-pieces, a generating element in operative relation to the pole-pieces, a stylus secured thereto and means for mounting the element to respond to both vertical and lateral vibrations of the stylus, of means for producing flux in the pole-pieces and means for reversing the direction of the flux in one of the pole-pieces.

7. In a universal reproducer, the combination with a magnet system comprising a central pole-piece, a pair of lateral pole-pieces defining two air-gaps on opposite sides of the central pole-piece, a yoke portion common to all the pole-pieces and a plurality of windings for producing flux in the pole-pieces, and a moving system comprising a coil surrounding the central pole-piece, a stylus attached to the coil and a plurality of mounting springs for the coil differing in lateral stiffness, of a source of current for the windings and means for reversing the direction of current flow in one of the windings.

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