

April 7, 1931.

W. C. JONES

1,799,799

SOUND REPRODUCER

Filed Oct. 4, 1928

FIG. 2.

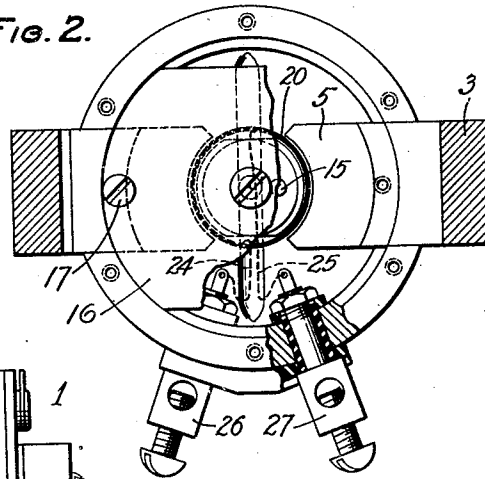


FIG. 1.

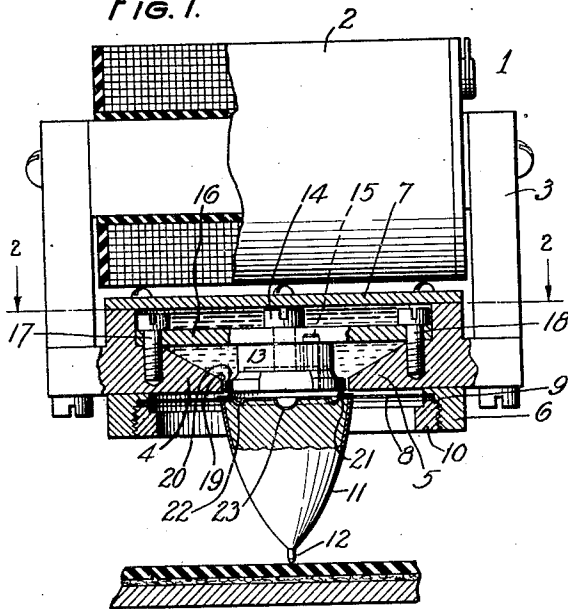
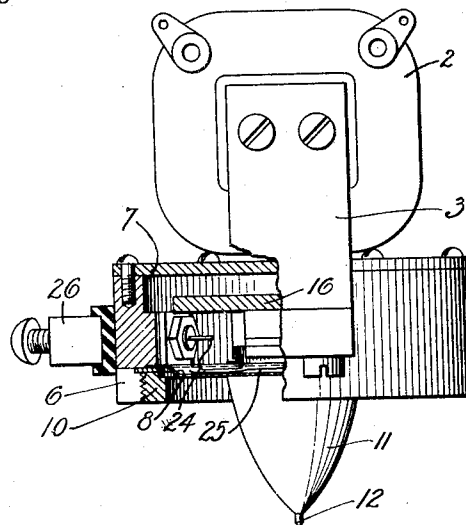


FIG. 3.



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SOUND REPRODUCER

Application filed October 4, 1928. Serial No. 310,245.

This invention relates to sound reproducers and has for its object the provision of a high quality device of this sort which may be used both for playing commercial pressing and for playing back directly from an original wax record.

It is essential that a reproducer for this purpose shall have a moving system of very low mass and stiffness, (so that the stylus will track in the record grooves without damaging them) and a magnetic system capable of substantially uniform frequency response over the range of interest. It is desirable also of course, that the efficiency of the reproducer be comparable to that of other types of reproducers.

These advantages have been combined successfully in a reproducer of the oil damped type by attaching a long light stylus needle and a light weight coil to opposite sides of a diaphragm which serves as a pivot for this moving system as well as a closure for the oil filled chamber. Currents representing the recorded sounds are generated by the coil vibrating about a diameter of the diaphragm and cutting the flux in the gap between the pole pieces and the magnetic material surrounded by the coil. The flux is transverse with respect to the diaphragm thereby eliminating magnetic pull on the diaphragm and making possible very low balance stiffness.

In the drawing Fig. 1 is a cross-section of an electro-dynamic reproducer embodying the present invention; Fig. 2 is a plan view showing the arrangement of the terminal posts and the magnetic circuit; and Fig. 3 is an elevation broken away to show how the coil leads may be brought out to the terminals.

Referring to Fig. 1, 1 is an electromagnet having a coil 2 and a core 3 terminating in pole-pieces 4 and 5 which project into an oil-tight non-magnetic casing 6. The casing is closed at the top by cover 7, which is readily accessible when the coil 2 is removed, and at the bottom by the diaphragm 8 which is secured in place by a washer 9 and a threaded annular member 10. A stylus 11 fitted with a suitable point 12 is cemented directly to the diaphragm 8. This stylus is

preferably of the general type disclosed in a copending application of L. A. Morrison, Serial No. 310,259, filed Oct. 4, 1928, and consists of a central conical portion of light wood such as balsa wood fitted with a sapphire or other permanent point and covered with duralumin paint to give it the necessary stiffness. Between the pole-pieces 4 and 5 a cylindrical piece of magnetic iron 13 is supported by machine screws 14 and 15 from the brass member 16 which is in turn secured to the pole-pieces by screws 17 and 18. The member 13 provides a low reluctance return circuit for the magnetic flux by occupying the entire space between the pole-pieces except for an annular gap 19 of just sufficient width to give operating clearance for the coil 20. This coil consists preferably of a number of turns of aluminum ribbon conductor; it is made up as described in Patent 1,707,544 to A. L. Thuras, April 2, 1929, and is secured in position by strips 21 which may be of stiffened fabric or light weight metal.

The diaphragm has a small circular corrugation 22 concentric with its center and a larger linear groove 23 extending across the free portion of one of its diameters. When assembling the unit, this linear groove is placed at right angles to the direction of magnetic flux so that the moving system comprising the stylus, the diaphragm and the coil pivots freely about this diameter but is highly resistant to movement about the diameter parallel to the flux. The circular corrugation 22 aids in keeping the stylus in its proper position on the diaphragm and also adds stiffness to the central section of the diaphragm, thereby insuring that the coil will move bodily in accordance with the movements of the stylus.

The pole-pieces 4 and 5 and the member 13 are shaped to concentrate the flux along the more active portions of the coil in the well known manner. Since this flux flows from pole-piece to pole-piece it is in the same direction in both gaps so that when the diaphragm is flexed in the manner already described, the sides of the coil move in opposite directions to give additive induced voltages. The currents in the coil are led out

through the lead wires 24, 25 secured to the bottom of groove 23 and brought out to a point near the periphery of the diaphragm for connection to binding posts 26 and 27 from which they may be conducted to the amplifier or other parts of the reproducing system. Since groove 23 is along the pivot axis of the moving system there is practically no movement at the point where the leads leave the diaphragm and hence no tendency for the lead wires to become broken in service.

The casing is completely filled with oil 28 and when the device is in operation the necessary damping action is provided by the lateral displacement of the oil between the diaphragm and the magnetic structure. As already pointed out, a reproducer of the kind described may have a moving system of very low stiffness and is therefore capable of responding faithfully to such small forces that an original wax record may be played back without injury to it. It has been found also that the efficiency of these reproducers compares favorably with other high quality reproducers and that their response to the frequencies within the speech and music range is more nearly uniform.

What is claimed is:

1. In an electro-dynamic pick-up device, a diaphragm, a stylus for flexing the diaphragm about a diameter and means including a coil disposed in a magnetic field and attached to the diaphragm for generating electric currents in accordance with the movements of the stylus.

2. A moving system for vibratory translating devices comprising a diaphragm, a coil and a light stiff stylus, the coil and the stylus being attached to the diaphragm and the diaphragm being adapted to be flexed about a diameter.

3. In a sound reproducer, a casing, a diaphragm, a magnetic circuit carrying flux, a coil disposed in the flux and attached to the diaphragm and a stylus for flexing the diaphragm about a diameter.

4. In a sound reproducer a casing containing viscous matter, a magnetic circuit carrying flux, a diaphragm forming a closure for the casing, a coil attached to the diaphragm and disposed in the flux and a stylus adapted to flex the diaphragm about a diameter.

In witness whereof, I hereunto subscribe my name this 29th day of September, 1928.

WARREN C. JONES.