Feb. 18, 1930. H. C. HARRISON 1,747,829

ELECTRICAL REPRODUCER

Filed May 13, 1927

FIG. 1.

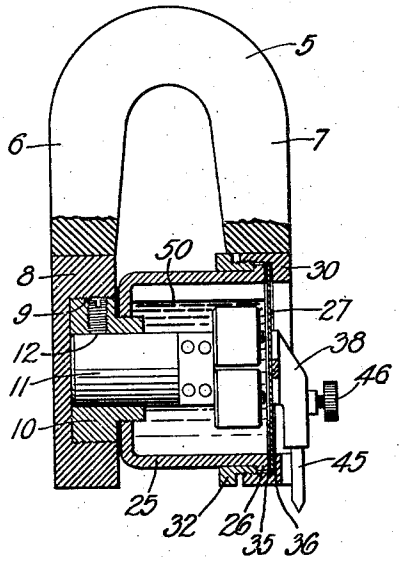


FIG. 2.

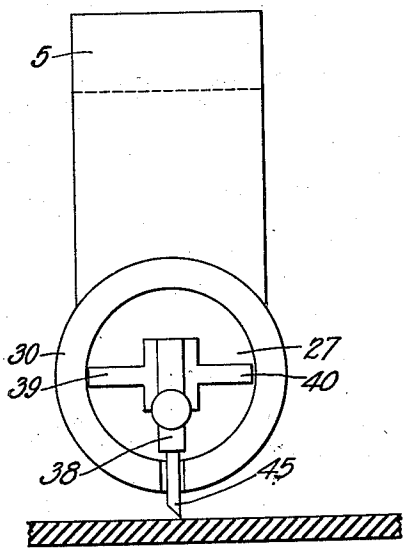


FIG. 3.

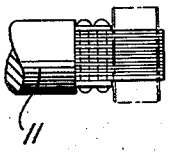


FIG. 4.

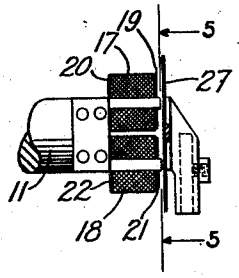
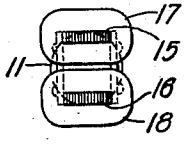


FIG. 5.



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UNITED STATES PATENT OFFICE

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ELECTRICAL REPRODUCER

Application filed May 13, 1927. Serial No. 191,012.

This invention relates to vibrating systems for acoustical apparatus and more particularly to electrical reproducers for phonographs.

The object of this invention is to provide a reproducer of the electromagnetic type that will have a substantially straight line response curve over a range of frequencies within the audible band and that will be sufficiently free from stiffness to enable the reproducer needle to follow faithfully the sound trace of the lowest frequencies recorded.

In accordance with the general features of this invention, there is provided a structure in which the vibrating system is sufficiently light and flexible to respond faithfully to all frequencies of the audible range and damping means is provided which will effectually limit the response over the frequency range to be reproduced to a substantially straight line characteristic.

In one practical application of the invention there is provided a bi-polar magnet system, the electromagnets of which are located within a chamber filled or substantially filled with viscous matter and closed by means of a very thin flexible diaphragm which is separated from the spool heads of the electromagnets by such a distance that the movement of the diaphragm in response to the movement of the stylus will cause a lateral movement or flow of the viscous matter between the diaphragm and spool heads that will effectually dampen the response of the diaphragm and maintain it constant over the desired range of frequencies.

The diaphragm may be of magnetic material or carry magnetic material or both, so that its movement will vary the flux through the magnet system.

In the drawings illustrating,

Fig. 1 is a view in side elevation with parts in section of a phonograph reproducer embodying this invention;

Fig. 2 is a plan view of the drive shown in Fig. 1;

Fig. 3 is a detail view of the pole piece and magnet construction of the electromagnet system;

Fig. 4 is a detail view of the electromagnet assembly showing also the diaphram and armature stylus mounting; and

Fig. 5 is an end view of the electromagnet assembly.

As shown in the drawings and particularly Fig. 1, 5 designates a U-shaped permanent magnet comprising legs 6 and 7. Abutting the leg 6 of the permanent magnet 5 is an annular member 8 of magnetic material provided with a threaded chamber 9 to receive a cylindrical block 10 of magnetic material. The block 10 is bored to receive a cylindrical part 11 of magnetic material which is adjustably supported in the bore of the block 10 by a set screw 12 and extends upwardly therefrom to provide a support for laminated pole pieces 15 and 16 carrying windings 17 and 18 supported between upper and lower spool heads 19 and 20, and 21 and 22 respectively.

The block 10 is provided with a reduced annular extension threaded to receive a cup shaped member or container 25 of brass or other non-magnetic material which surrounds the soft iron pole pieces 15 and 16 and the windings 17 and 18. The container 25 is provided at its open end with an annular extension 26 to seat a thin flexible diaphragm 27 preferably of magnetic material.

Abutting the end of the leg 7 of the U-shaped permanent magnet is an annular member 30 of magnetic material and having an L cross section which is adapted to fit over and be supported by the upper end of the container 25. The projecting portion of the annular member 30 which fits over the container 25 is provided with internal threads adapted to be engaged by an externally threaded ring 32 to draw the annular member 30 firmly against the upper end of the container 25.

Ring gaskets 35 and 36 are placed upon both sides of the diaphragm 26 at the portion of its periphery where it is clamped to provide a fluid tight joint.

Mounted upon the diaphragm 26 is an armature of magnetic material comprising a body portion 38 provided with arms 39 and 40 extending at right angles to the body portion 38 and substantially across the diameter of the free portion of the diaphragm 26.

The body portion 38 of the armature is drilled to receive a stylus 45 which is secured therein by means of a set screw 46.

The inner face of the body portion 38 and arms 39 and 40 of the armature lie flat against the adjacent face of the diaphragm 26 and are preferably, integrally secured thereto. The arms 39 and 40 extend along the axis of rotation of the armature and stylus 45 thereby stiffening the diaphragm against flexure in a direction at right angles to the axis of rotation of the armature but not materially stiffening it against flexure along that axis or parallel to that axis.

The container 25 is full or substantially full of a viscous fluid 50 which, in the flexing movement of the diaphragm 26 in response to the stylus armature movement, will be moved laterally between the inner face of the diaphragm and the adjacent end of the electromagnet or spool heads 19 and 21, and serve to dampen the vibrations of the system to insure an equal response to all vibrational frequencies within the audible range.

A viscous fluid which is quite insensitive to normal temperature changes is one composed of 75% polymerized castor oil and 25% nitro-benzol.

The device as illustrated and described is obviously adapted to be used as a recorder for cutting a sound groove upon a record or as a reproducer for generating electrical impulses in accordance with the movement of a stylus needle in a record groove.

The ends of legs 6 and 7 of the permanent magnet 5 are ground to fit the annular magnetic members 8 and 30 and the parts may be secured in position by sweating or by suitable clamping means not shown.

What is claimed is:

1. An electrical reproducer comprising a magnet system including an electromagnet, a chamber containing the electromagnet, a stylus operated flexible member closing the chamber adjacent one end of the electromagnet, and viscous means in said chamber cooperating with the diaphragm and the electromagnet to insure an equal response by the system to all vibrational frequencies within the audible range.

2. An electrical reproducer comprising a magnet system including an electromagnet, a chamber containing said electromagnet, a stylus operated diaphragm closing said chamber, and viscous matter in said chamber adapted for lateral movement between the diaphragm and the free end of the electromagnet to dampen the movement of said diaphragm.

3. In an electrical reproducer, in combination, a chamber, a bipolar electromagnet comprising cores and spooled windings thereon, located within the chamber, a flexible stylus operated diaphragm located at one end of said chamber in operative relation to the electromagnet, and viscous matter substantially filling the chamber and adapted for lateral movement between the diaphragm and adjacent ends of the electromagnet in response to the movement of the diaphragm to dampen the vibrational movement of the diaphragm.

4. In an electrical reproducer, in combination, a chamber, a bipolar electromagnet comprising cores and spooled windings located within the chamber, a stylus operated thin magnetic diaphragm closing said chamber and viscous matter within the chamber adapted for lateral movement between the diaphragm and the adjacent end of the electromagnet to dampen the vibrational movement of the diaphragm.

In witness whereof, I hereunto subscribe my name this 12th day of May, A. D. 1927.

HENRY C. HARRISON.