Feb. 28, 1939. A. BARBIERI 2,148,796

PHONOGRAPH PICK-UP

Filed May 18, 1937

Fig. 1.

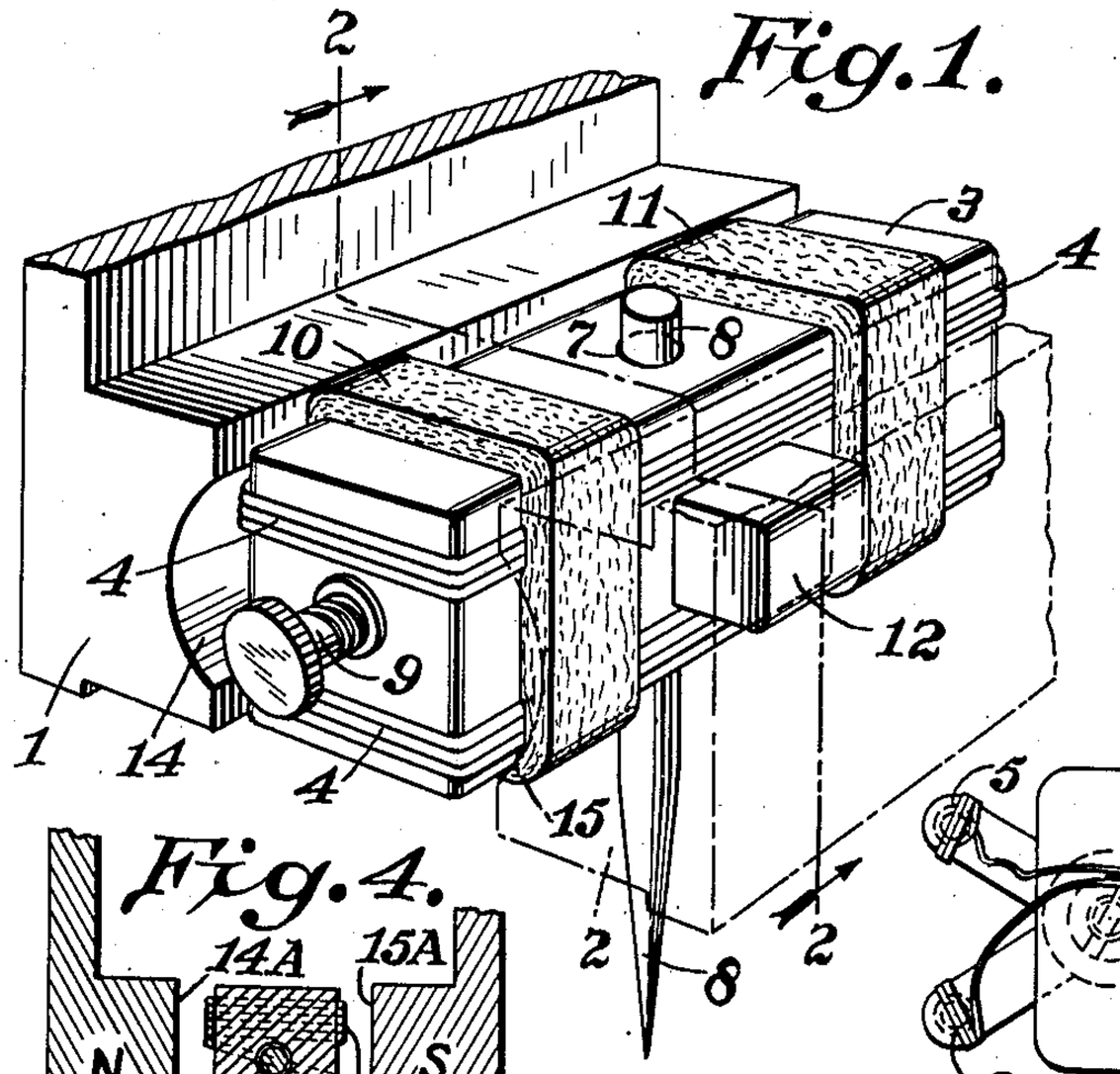


Fig. 2.

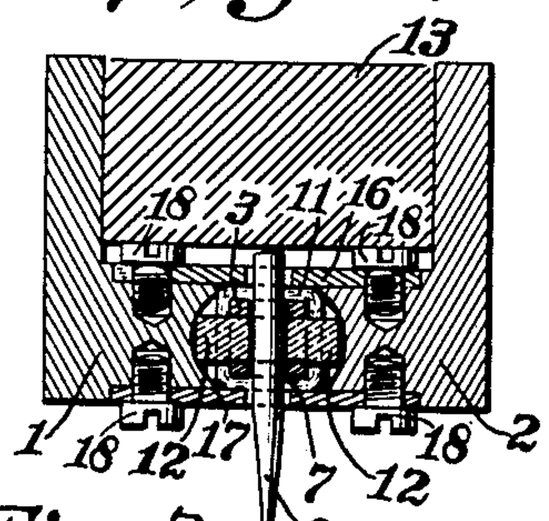


Fig. 3.

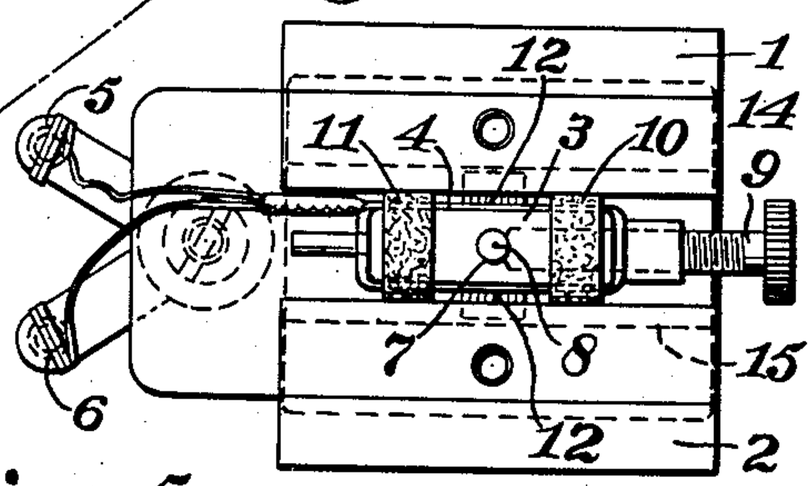


Fig. 4.

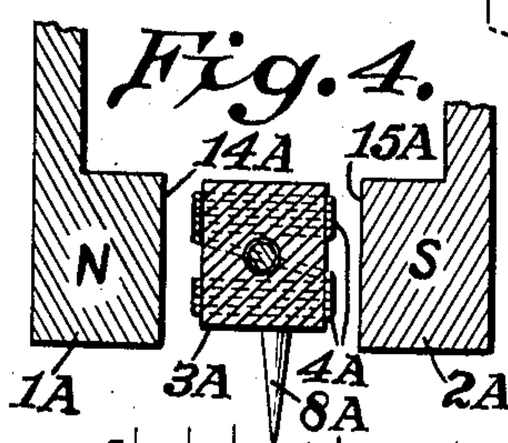


Fig. 5.

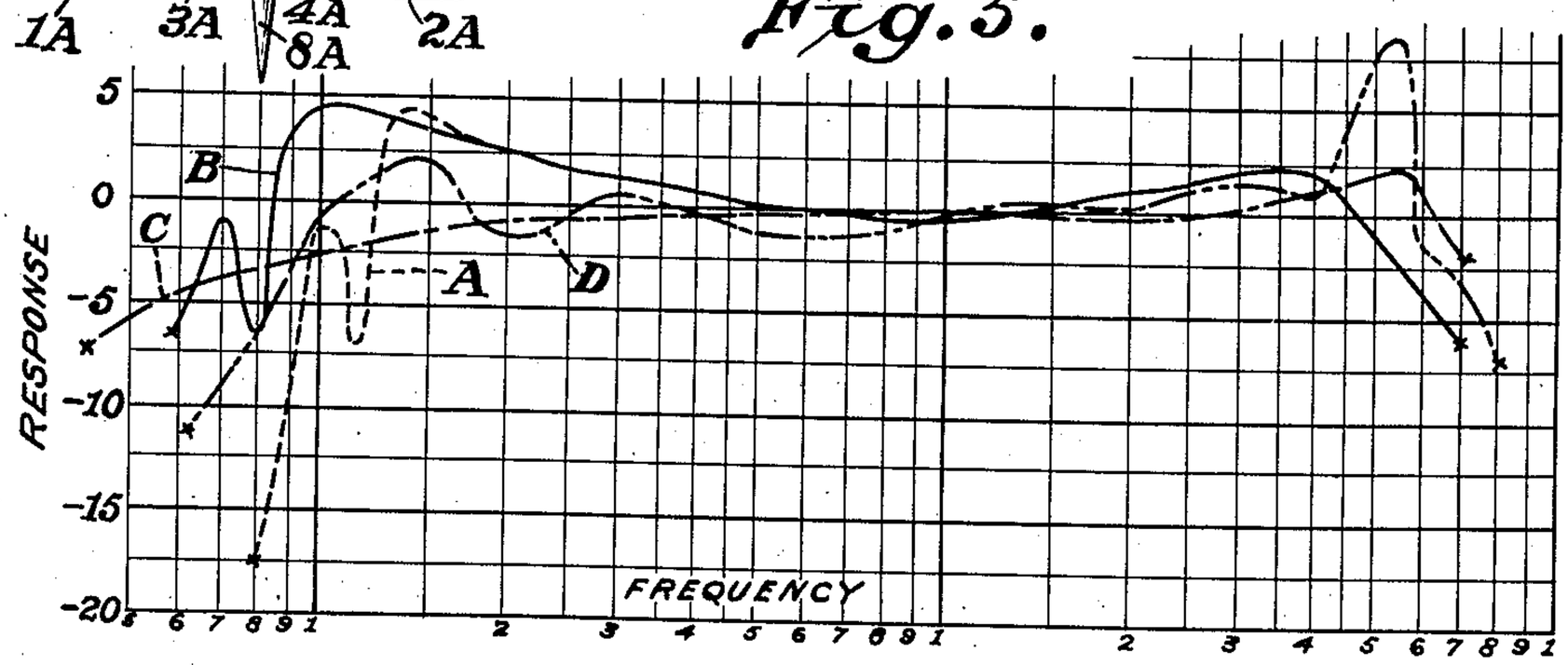


Fig. 6.

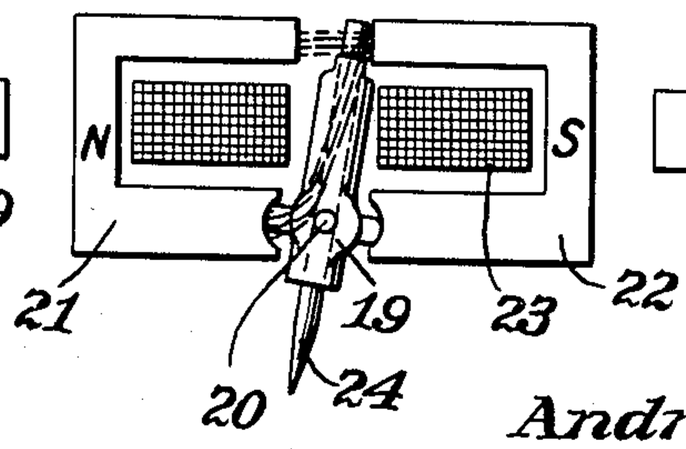


Fig. 7.

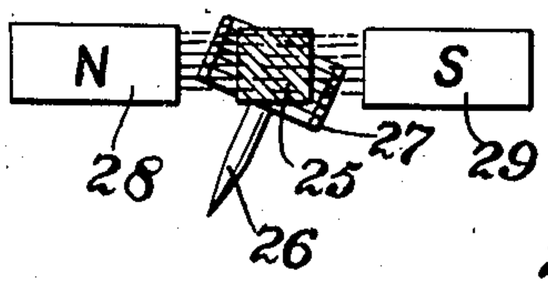
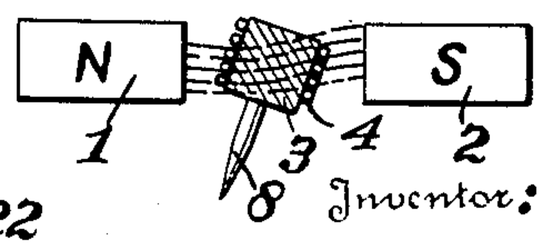


Fig. 8.



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UNITED STATES PATENT OFFICE

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PHONOGRAPH PICK-UP

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Application May 18, 1937, Serial No. 143,350

17 Claims. (Cl. 179—100.41)

This invention relates to a novel pickup for recorded sound.

Pickups for recorded sounds in general use at the present time are either of the magnetic or dynamic type. In both of these pickups current is induced in a coil which varies in accordance with the variations in the sound recordings. In the magnetic type of pickup, the current is induced in the coil by varying the strength of the magnetic field to which the coil is exposed. In the dynamic type of pickup the coil is moved through a magnetic field of uniform strength and the current induced in the coil is varied by the movement thereof. Both of these types of pickup, however, are insufficiently responsive to low frequencies. The pickup, according to this invention, combines, in general, the operating characteristics of both the magnetic and dynamic types in that the coil of the device is moved and at the same time the strength of the field through which it moves is varied. The performance of the pickup according to this invention, however, is characterized by a marked dissimilarity from the performance of the magnetic or dynamic type of pickup, having a greatly increased response at low frequencies.

It is one of the objects of this invention to provide a pickup which is especially responsive to recorded sounds of low frequency.

Another object of this invention is the provision of a pickup armature especially shaped for greatly increased response at low frequency.

A further object of this invention is the provision of a specially shaped pickup armature and poles for greatly increasing the uniformity of the response at low frequencies.

A fourth object of this invention consists in a novel mounting for the moving armature of a phonograph pickup.

A fifth object of this invention consists of a combined bearing and damping member for a pickup armature.

Many other objects and advantages of the construction herein shown and described will be obvious to those skilled in the art from the disclosure herein set forth.

To this end my invention consists in the novel construction, arrangement and combination of parts herein shown and described and more particularly pointed out in the claims.

In the drawing, wherein like reference numerals indicate like or corresponding parts:

Figure 1 is a perspective view, partially broken away, to show the position of armature in relation to the poles of the device.

Figure 2 is a secton taken on line 2—2 of Figure 1.

Figure 3 is a bottom plan view of the device with the cover plate removed.

Figure 4 is a diagrammatic sectional view of a modification.

Figure 5 is a diagram of a series of curves illustrating certain features of the invention.

Figure 6 is a diagrammatic showing of a magnetic type of pickup.

Figure 7 is a diagrammatic showing of a dynamic type of pickup.

Figure 8 is a diagrammatic showing of a pickup according to this invention.

Referring particularly to Figure 1 of the drawing, 1 and 2 are spaced magnetic poles. In the space between magnetic poles 1 and 2 is an armature 3 having a series of longitudinal windings 4 thereon. These windings 4 terminate at each end in a pair of contact members 5 and 6 which are connected in the usual manner to a conventional output. The armature 3 has a central opening 7 formed therein adapted to receive the usual phonograph needle 8. A set screw 9 suitably threaded into the end of the armature serves securely to retain the needle 8 in the opening 7.

The armature 3 is mounted for restricted rotation about its longitudinal axis by a pair of bearing and supporting members 10 and 11. These bearing members serve to support the armature for rotation in the space between the poles 1 and 2 and at the same time dampen its vibration. The bearing and damping members 10 and 11 are made of rubber or other suitable resilient material. An additional damping member 12 is mounted in a transverse central opening in the armature 3. The member 12 is made of a suitable non-magnetic and resilient material.

A permanent magnet 13 is positioned between poles 1 and 2. The poles 1 and 2 being made of steel or other suitable para-magnetic material therefore serve to concentrate the lines of force running from one pole to the other of the permanent magnet 13 and are thus in themselves north and south poles of the magnet 13. The pole pieces 1 and 2 are not permanently magnetized but are merely of para-magnetic material such as steel or iron. The armature 3 and coil 4 are protected by cover plates 16 and 17 held in place by suitable screws 18.

The adjacent faces of the pole pieces 1 and 2 are preferably, though not necessarily, arcuate in shape as indicated at 14 and 15, respectively.

In the modification as diagrammatically illustrated in Figure 4 the pole pieces 1*a* and 2*a* are

shown having flat faces 14*a* and 15*a*. In this modification the armature is indicated diagrammatically at 3*a*, the windings at 4*a* and the needle at 8*a*.

Essentially, the pickup according to this invention, combines some of the characteristics of the magnetic and dynamic types of pickup. The usual form of magnetic pickup is illustrated diagrammatically in Figure 6. It consists of a moving armature 19 of steel or other para-magnetic material pivoted at 20 and vibrating between a pair of poles 21 and 22, respectively. Surrounding the armature 19 is a stationary coil 23. The movement of the armature 19 changes the flux passing through the armature and hence through the stationary coil 23. As may be noted in Figure 6 some of the magnetic lines of force are shown passing through the armature 19 due to the position thereof. The movement of armature is, of course, caused by the corresponding movement of needle 24.

In the dynamic pickup diagrammatically shown in Figure 7 the armature 25 is stationary and the needle 26 and coil 27 move in unison in a constant magnetic field produced by the magnetic poles 28 and 29. The armature 25 is stationary and only serves to concentrate the strength of the magnetic field where it is cut by the moving coil 27.

Figure 8 is a diagrammatic representation of a pickup according to the present invention. Both the coil 4 and the armature 3 move in the magnetic field produced by poles 1 and 2 in accordance with the movement of needle 8. As shown in Figure 8 the lines of force between poles 1 and 2 are twisted by the position of armature 3. This change in the lines of force is somewhat analogous to the change produced by armature 19 as shown in Figure 6. At the same time current is also induced in coil 4 by the movement of the coil relative to the lines of force in a manner similar to the movemet of coil 27 in Figure 7. The total current induced in the coil 4, therefore, is influenced by the two changing factors and the pickup, therefore, partakes of the characteristics of both the dynamic and magnetic types of pickup.

The greatly increased response at low frequencies of the pickup according to the present invention is clearly illustrated in the curves designated A and B of Figure 5. These curves show the response of various types of pickups at various frequencies. The response in decibels is plotted along the vertical axis and the frequency along the horizontal. The curve denoted A is the response curve of the modification having flat poles as illustrated in Figure 4. The curve B is the response curve of the form of the invention illustrated in Figures 1, 2 and 3; the curve C, is a dynamic type of pickup as illustrated in Figure 7; and the curve D, that of a magnetic type of pickup as illustrated in Figure 6. In all of these tests a standard frequency record was used for the input, and the output was measured by means of a vacuum tube voltmeter.

It will be readily understood that the device as described in the drawing and specification may be varied without departing from the spirit of the invention. For example, the shape of the armature may be any rectangular form or may be oval in form instead of square as shown. The magnetic poles may be permanent magnets or any conventional form of electromagnet. The shape of the magnetic poles may also be varied. Various other modifications may also be made without departing from the spirit of the invention. I do not wish the scope of my patent to be limited except as defined by the claims annexed hereto.

What I claim as new and desire to secure by Letters Patent is:

1. In a pickup for recorded sounds, means movable in accordance with the recorded variations of the sounds, means for producing a magnetic field, an elongated core member movable with the first mentioned means and adapted to change the path of the magnetic flux of said magnetic field, a conductor positioned so that the longitudinal axis thereof is colateral with the longitudinal axis of said core member and arranged to move with said core member in a direction to induce a response therein influenced both by its own movement in said magnetic field and the change in the path of the flux of said magnetic field, and an output for said conductor.

2. In a pickup for recorded sounds, means movable in accordance with the recorded variations of the sounds, a magnet, a coil positioned in the field of said magnet so that the plane thereof is substantially parallel to the lines of force of said field, means for moving said coil in accordance with the movement of said first mentioned means in a direction to cut the magnetic lines of force in said field, means for simultaneously changing the path of the flux of said magnetic field, and an output for said coil.

3. In a pickup for recorded sounds, means for producing a magnetic field, means movable in accordance with the recorded variation of the sounds, an armature in said magnetic field movable with the last mentioned means and constructed and arranged to change the path of the flux in said field, a coil positioned on said armature so that the plane thereof is substantially parallel to the lines of force of said field and movable therewith in a direction to cut the magnetic lines of force in said field and an output for said coil.

4. In a pickup for recorded sounds, a magnet, a pair of spaced pole members arranged and constructed to concentrate the magnetic field of said magnet in the space between said pole members, an armature movably mounted in the space between said pole members constructed and arranged to change the path of the flux in said field, a coil carried by said armature and movable therewith in a direction to cut the magnetic lines of force in said field and an output for said coil.

5. In a pickup for recorded sounds, a pair of spaced pole members, a magnet positioned between said spaced pole members, an armature movably mounted between said poles, a coil carried by the armature, and a combined bearing and damping member for supporting said armature.

6. In a pickup for recorded sounds, a pair of spaced pole members, a magnet positioned between said pole members and an armature of square cross-section mounted for rotational movement so as to change the path of the magnetic field in the space between said poles.

7. In a pickup for recorded sounds, a pair of spaced pole members, a magnet positioned between said pole members, an armature of square cross section mounted in the space between said poles for rotational movement a coil wound about the armature parallel to the longitudinal axis thereof, means for moving said armature and coil and an output for said coil.

8. In a pickup for recorded sounds, a pair of spaced pole members, said pole members having adjacent faces of arcuate shape, a magnet positioned between said pole members, an armature movably mounted between said pole members, a coil wound about said armature parallel to the longitudinal axis thereof, means for moving said armature and coil and an output for said coil.

9. In a pickup for recorded sounds, a pair of spaced pole members, said pole members having adjacent faces of arcuate shape, a magnet positioned between said pole members, an armature of square cross-section mounted between said pole members for rotational movement, a combined bearing and damping member for supporting said armature, a coil wound about said armature parallel to the longitudinal axis thereof and an output for said coil.

10. In a pickup for recorded sounds, a pair of spaced pole members, said pole members having adjacent faces of arcuate shape, a magnet positioned between said pole members, an armature of square cross-section mounted between said pole members for rotational movement, a coil wound about said armature parallel to the longitudinal axis thereof and movable therewith and an output for said coil.

11. In a pickup for recorded sounds, a pair of spaced pole members, said pole members having adjacent faces of arcuate shape, a magnet positioned between said pole members, an armature movably mounted between said pole members, a combined bearing and damping member for supporting said armature, a coil wound about said armature parallel to the longitudinal axis thereof and movable therewith and on output for said coil.

12. In a pickup for recorded sounds a member movable in accordance with the recorded variations of the sounds, a pair of spaced pole members, a magnet positioned between said pole members, an armature movably mounted in the space between said pole members and constructed and arranged to vary the path of the flux in said field, a coil wound about said armature parallel to the longitudinal axis thereof movable therewith, means on said armature for supporting the first mentioned member so that the armature moves with said member, and an output for said coil.

13. In a pickup for recorded sounds, a pair of spaced pole members, an armature mounted in the space between said pole members, a coil carried by said armature and a combined bearing and damping member for supporting said armature comprising a sleeve of resilient material.

14. In a pickup for recorded sounds, a member movable in accordance with the recorded variations of the sounds, a pair of spaced pole members, an armature mounted in the space between said pole members, a coil carried by said armature, a combined bearing and damping member for supporting said armature comprising a sleeve of resilient material and means on said armature for supporting said first mentioned movable member.

15. In a pickup for recorded sounds, means for producing a magnetic field, means movable in accordance with the recorded variations of the sounds, an armature in said magnetic field movable with the last mentioned means and a coil positioned on said armature so that the plane thereof is substantially parallel to the lines of force of said field, said armature being constructed and arranged to vary the path of the lines of force of said magnetic field, and said coil being constructed and arranged to cut the varying lines of force when moved in the magnetic field, and an output for said coil.

16. In a pickup for recorded sounds, means movable in accordance with the recorded variations of the sounds, means for producing a magnetic field, spaced means to concentrate said field in the space therebetween, means positioned in said space movable with the first mentioned means and adapted to change the path of said flux in said space, and a conductor movable with said first mentioned means in said space in a direction to produce a response influenced both by its own movement in said magnetic field and the change in the path of the flux of said magnetic field, and an output for said conductor.

17. In a pickup for recorded sounds, means movable in accordance wih the recorded variations of the sounds, a magnet, a coil positioned in the field of said magnet, means for rotating said coil about an axis in said field in accordance with the movement of said first mentioned means in a direction to cut the magnetic lines of force in said field, an additional means having a high magnetic permeability for simultaneously changing the path of the flux of said magnetic field, and an output for said coil.

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