Oct. 29, 1946. R. B. ALBRIGHT 2,410,329

ELECTRICAL APPARATUS

Filed Sept. 8, 1944

Fig. 1.

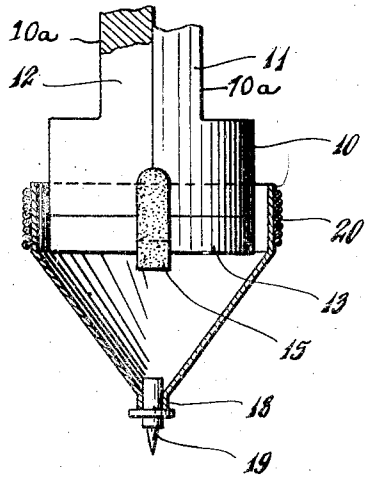


Fig. 2.

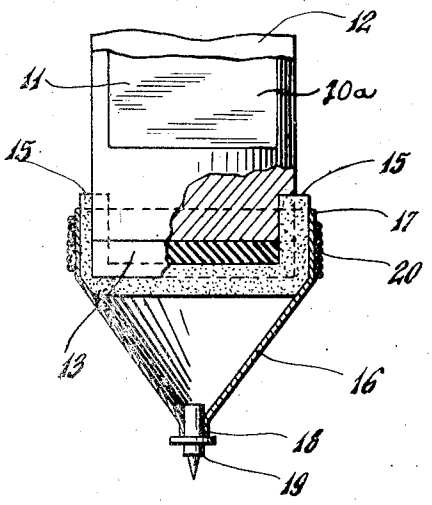


Fig. 3.

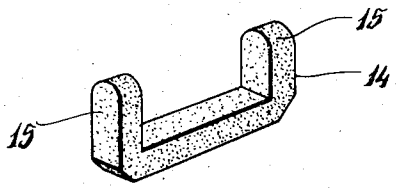
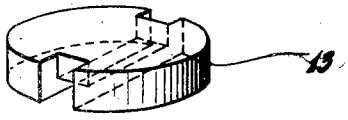


Fig. 4.



INVENTOR
Robert B. Albright
BY Darby & Darby
ATTORNEYS

Patented Oct. 29, 1946

2,410,329

UNITED STATES PATENT OFFICE

2,410,329

ELECTRICAL APPARATUS

Robert B. Albright, Philadelphia, Pa., assignor, by mesne assignments, to Philco Corporation, Philadelphia, Pa., a corporation of Pennsylvania

Application September 8, 1944, Serial No. 553,155

7 Claims. (Cl. 179—100.41)

1

The present invention relates to a phonograph pick-up device for use with a radio receiver and particularly to such a device designed to vary the inductance of an oscillator input circuit in accordance with the movements of the stylus as controlled by a phonograph record. This variation in inductance brings about the production of frequency modulated signals which are then amplified and reproduced in a frequency modulation receiver.

It is known that a powdered iron core inserted into a coil will increase the inductance of the coil and, conversely, a copper core will decrease the inductance. I have discovered that if then a core is used which is part copper and part iron, it is possible to insert the core into a coil without affecting the inductance thereof. Further, I have discovered, that if the coil then be tipped laterally with respect to the axes of the core in accordance with the grooving of a phonograph record, the coil will then enclose more or less flux and as a result its inductance will be affected and the frequency of a resonant circuit of which the coil is an element likewise affected.

It is an object of this invention to provide a phonograph pick-up for use with frequency modulation radio receivers so constructed that the movement of the coil under control of a phonograph record will vary the inductance of the coil and consequently the frequency of a resonant circuit of which the coil is a part.

It is another object of this invention to construct such a phonograph pick-up in which the frequency modulation induced by movement of the coil in accordance with the grooves of a phonograph record shall be a linear variation of frequency above and below that corresponding to the normal position of the coil.

It is a further object of this invention to construct such a phonograph pick-up which shall be of very small dimensions and readily and economically manufactured.

Other objects and features of my invention will be apparent when the following description is considered in connection with the annexed drawing of a preferred embodiment in which:

Figure 1 is an elevation of the pick-up of my invention showing the construction thereof. In this view the paper cone and the coil mounted thereon are in cross-section.

Figure 2 is an elevational view taken at right angles to the view of Figure 1. In this view likewise the paper cone and coil mounted thereon are shown in cross-section.

Figure 3 is a detailed view of a U-shaped piece

2

of rubber which is utilized for mounting the coil and the paper cone on the core member.

Figure 4 is a detailed view of a Bakelite washer which is utilized in cooperation with the U-shaped member of Figure 3 to properly locate the paper cone with respect to the core member.

It will be understood that the drawing is to a much enlarged scale.

Referring now to the drawing and particularly to Figures 1 and 2 thereof, there is shown at 10 a core which is generally circular in cross-section and which has flattened portions at 10a for mounting in the tone arm of a phonograph or record player. The core member 10 is composed of two portions 11 and 12 each of which may be semi-cylindrical. Portion 11 is powdered iron and portion 12 may be copper so that any coil which may be disposed about the core member may have its inductance substantially unaffected by the presence of the core member.

At the lower end of the core member 10 is a non-conducting washer 13, which is conveniently of Bakelite or other low loss material. A U-shaped resilient piece 14, which is conveniently of rubber, functions as a pivot and bearing member for the cone 16, as described in the copending application of L. I. Bobb, Serial No. 502,003, filed September 11, 1943.

The cone 16 terminates at its upper end in a cylindrical portion 17. This cone likewise terminates at its lower end in a smaller cylindrical portion 18 in which a stylus 19 is fixed. The portion 17 of cone 16 has a coil 20 wound thereon and of course the leads to the coil 20 extend to a desired portion of the radio receiver so that the variations in inductance brought about by movement of the stylus 19 will be effective to cause frequency modulated signals to be applied to the radio, as described for example, in United States Patent No. 2,330,697 issued September 28, 1943.

Due to the flexibility of the arms 15, U-shaped piece 14, the cone 16 and with it the coil 20 will be oscillated about their center line position under control of the grooves of a phonograph record, this oscillation being from left to right as seen in Figure 1, or back and forth perpendicular to the plane of the paper, as seen in Figure 2. Of course, the coil may be pivotally supported from the core member 10 in any other suitable fashion and the use of the member 14 is merely illustrative of one mode of providing such pivotal connection.

As illustrated in Figure 1 the lower end of the core member 10 may be approximately at the lon-

gitudinal center line of the coil 20. By virtue of this arrangement when the coil is tipped in one direction the portion of the core included within the coil contains less iron and more copper and when the coil is tipped in the reverse direction the portion of the core included in the coil will contain less copper and more iron. The position of the core in the coil is determined by the thickness of the washer 13. While, in the drawing, the core member 10 is illustrated as comprising two similarly shaped semi-cylindrical members 11 and 12, it should be understood that the linearity of operation may, in some instances, be enhanced by deforming one or both of the members 11 and 12.

The details of construction are of course relatively unimportant, the most important feature of the invention being that the core shall be made of portions of high permeability magnetic and high conductivity non-magnetic materials whereby the movement of the coil will be effective to linearly vary the coil inductance from a normal value in both directions.

While I have described a preferred embodiment of my invention it is obvious that other embodiments and constructions may be adopted without departing from the spirit thereof and, consequently, I desire to be limited not by the foregoing description but solely by the scope of the appended claims.

What is claimed is:

1. In a phonograph pickup for varying the tuning of a resonant circuit, in combination a coil, a stylus, means for transmitting movement of said stylus to said coil, and a core within said coil, said core being formed partly of a high permeability magnetic material and partly of a high conductivity non-magnetic material, whereby movement of said coil with respect to said core will vary the inductance of said coil linearly about a normal value and the resonant frequency of the tuned circuit which may embody said coil will be accordingly varied.

2. In a phonograph pickup device, in combination a core member comprising two substantially semi-cylindrical portions, one of powdered iron and one of copper, placed together to form a cylinder, a movement transmitting means pivotally mounted on said core, said movement transmitting means carrying a stylus at the end thereof opposite to said pivotal connection and a coil mounted on said movement transmitting means with its longitudinal center line approximately opposite the end of said core, said coil being concentric with said core member.

3. In a phonograph pickup device, in combination a core member comprising two substantially semi-cylindrical portions, one of powdered iron and one of copper, placed together to form a cylinder, a movement transmitting means, a washer of non-conducting material, a U-shaped member of flexible rubber passing around said washer and contacting the lower end of said core member, said movement transmitting means being mounted on the upstanding arms of said U-shaped member, a stylus carried by said movement transmitting member and a coil mounted on said movement transmitting member with its longitudinal center line substantially on the line of division between said core member and said washer, whereby movement of said movement transmitting member is effective to vary the inductance of said coil.

4. In a phonograph pickup device, in combination a core member comprising two substantially semi-cylindrical portions, one of powdered iron and one of copper, placed together to form a cylinder, a non-conducting washer of the same diameter as said core member having slots at the ends of a diameter thereof, and a channel connecting said slots, a U-shaped member of flexible material having a portion of the base of the U in said channel, the arms of the U-shaped member extending upwardly through the slots and clamping the washer against the face of said core member, a paper cone having terminating portions of cylindrical form, said cone being fastened to the upstanding arms of said U-shaped member on a diameter thereof and said cone bearing a stylus fixed to the opposite cylindrical termination, and a coil mounted on the first mentioned cylindrical portion of said cone, the longitudinal center line of said coil being substantially on the line of joinder between said washer and said core, whereby movement of said stylus causes movement of said coil from its normal position of parallelism with respect to said cylindrical core to positions at angles thereto to thereby vary the relative amounts of iron and copper included within the turns of said coil and thus increase and decrease the inductance of said coil from a normal value.

5. A phonograph pickup device of the variable inductance type, comprising an inductance coil, a ferromagnetic element adjacent said coil, the presence of said ferromagnetic element tending to increase the inductance of said coil, a non-magnetic electrically conducting element adjacent said coil, the presence of said non-magnetic element tending to decrease the inductance of said coil, said coil being mounted for movement with respect to both said elements simultaneously, a phonograph stylus coupled to said coil for effecting vibration of said coil relative to said elements in accordance with vibrations of said stylus, said elements being so related to said coil positionally that variations in coil inductance due to movement of said coil with respect to said ferromagnetic body are in the same sense as are the variations in coil inductance due to the movement of said coil with respect to said non-magnetic body.

6. A phonograph pickup device of the variable inductance type, comprising a coil, a ferromagnetic body adjacent said coil, the presence of said ferromagnetic body tending to increase the inductance of said coil, a non-magnetic electrically conducting body adjacent said coil, the presence of said non-magnetic body tending to decrease the inductance of said coil, said coil being supported for vibratile oscillation about an axis which is generally perpendicular to the axis of said coil, said oscillation being effective to move said coil with respect to both said bodies simultaneously, and a phonograph stylus coupled to said coil for effecting such oscillation of said coil in response to vibration of said stylus, said magnetic and non-magnetic bodies being so positioned with respect to said coil that variations in coil inductance due to movement of said coil with respect to said ferromagnetic body are in the same sense as are the variations in coil inductance due to the movement of said coil with respect to said non-magnetic body.

7. A phonograph pickup device as claimed in claim 6, characterized in that the inductance increasing effect of said ferromagnetic body is substantially equal to the inductance decreasing effect of said non-magnetic body.

ROBERT B. ALBRIGHT.