May 18, 1926. 1,585,389

F. L. JUDD ET AL

INDUCTANCE COIL

Filed Nov. 6, 1922

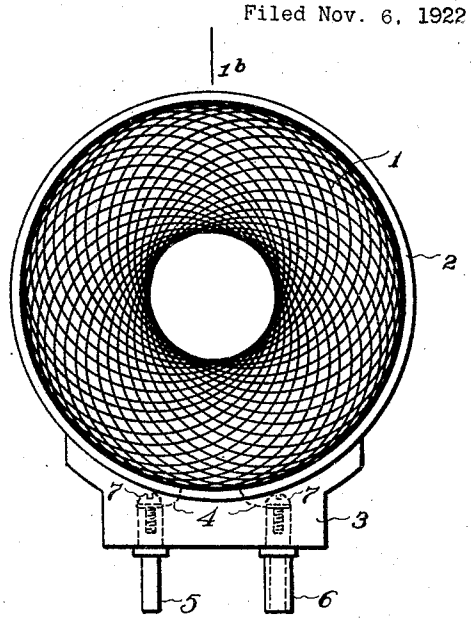



Fig. 1.

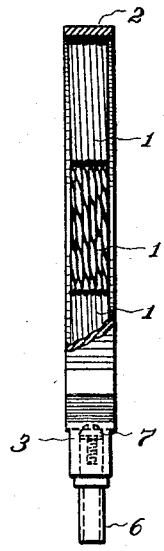



Fig. 2.

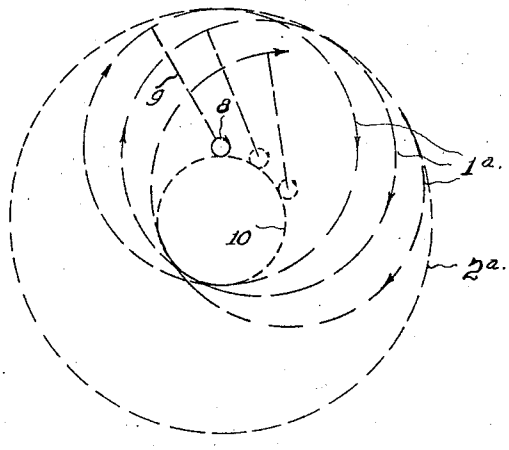



Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## INDUCTANCE COIL.

Application filed November 6, 1922. Serial No. 599,472.

This invention relates to an inductance coil, and has particular reference to one adapted for use with radio telephone and telegraph transmitting and receiving devices, and circuits for electric magnetic induction.

An object of the invention is to provide a method of winding inductance coils which will produce a better and more effective distribution of the magnetic field of the coil.

Another object is to improve generally the efficiency of inductance coils where high efficiencies are necessary; especially in regard to the windings and the disposition thereof so as to eliminate to as great an extent as possible, what is termed "end capacity"; and so as to increase to a maximum the volume of inductive capacity of the coil in relation to the size and length of wire used.

Another object is to provide a loose coupling with adjacent inductance coils, and thereby provide less distortion of the transmitted or received electrical current.

Another object is to reduce to a minimum the distributed capacity in the inductance coil.

Another object is to provide an inductance coil of compact form, with no "end capacity", with a comparatively great volume of inductive capacity in relation to the size and length of wire used, and with a better and more effective distribution of the magnetic field of the coil than has heretofore been possible.

These and other objects and advantages of our invention are set forth in the following description, taken in connection with the accompanying drawings. We disclose herein the best form of our inductance coil now known to us; but this form is to be taken as merely typical of numerous constructions in which the principle of our invention may be embodied and we reserve the right to make changes in the shape, size and arrangement of parts or the character of the materials used, to the full extent indicated by the general or broad meanings of the terms in which the claims are expressed.

In the drawings:

Figure 1 is a front view of our invention as mounted for connection with radio telephone and telegraph transmitting and receiving circuits.

Figure 2 is a partial section taken on the line $1^b$ of Figure 1.

Figure 3 shows the geometric development of the form of the coils.

As shown in Figures 1 and 2 the device comprises an eccentrically laid series of insulated copper magnet wire coils 1 held within a ring frame 2 of any suitable dielectric material. The terminals 4 are connected to the conductive terminal posts 5 and 6 set in the dielectric mounting 3 of the coil frame 2. The terminal post 5 is in the form of a plug, and the terminal post 6 is in the form of a socket so that the correct polarity of the coil may always be maintained in relation to the electric circuit of which it becomes a part.

The coil may be laid or wound with a single layer of loops or in a plurality of layers as shown, dependent on the radio wave length it is desired that the coil shall be capable of receiving.

The geometric form of the coil is that of a basis of curtate epitrochoids as shown in Figure 3 where the separate loops of the coil 1 are shown in development by $1^a$ within the circle $2^a$. The loops $1^a$ are generated by the rolling of circle 8 with its extended radius 9 on the exterior circumference of circle 10, this rolling being effected without slipping. The extension of the radius 9 of circle 8 is equal to the distance from the center of 8 to $2^a$. The direction of generation is indicated by arrow heads. While in the actual practical operation of winding the coil on a machine developed for that purpose it may not be possible to wind so accurately as to prevent some slippage, say of 8 in rolling on 10, yet it has been found that the individual loops of coil 1 are essentially of the exact form of a curtate epitrochoid or if a curtate hypotrochoid of circle 8 be rolled on the interior circumference of circle 10.

We have found by actual experiment that the method of winding shown enables a considerable broadening of the magnetic field of the coil in comparison with a more or less tightly wound coil such as the single layer solenoid bank wound, or even the well known honeycomb or duo-lateral types of inductance coil.

With the particular form of winding shown, the magnetic field is broadened and results in the reduction to the absolute minimum of the distributed capacity of the coil.

The method of winding shown makes clear the fact that the last layer wound will lie directly in the magnetic flux field of the first layer wound, or vice-versa, and that their inductive strength is thereby enhanced. This enhancement of inductive strength enables a "loose" type of coupling to be obtainable between the primary and the secondary coil and the "tickler" as used in the circuit of the usual regenerative receiving apparatus for radio use or between any two or more inductances.

We claim:

1. As an article of manufacture an inductance coil having a plurality of loop windings of a single continuous conductor arranged laterally eccentric one with the other.

2. The combination in a coil for magnetic induction, of a plurality of loop windings of a single continuous conductor or loops which are generated in the geometric form of a trochoid.

3. As an article of manufacture an inductance coil having a plurality of layers of loop windings of a single continuous conductor, each layer consisting of a plurality of windings arranged laterally eccentric one with the other.

4. As an article of manufacture an inductance coil comprised of a plurality of layers of loop windings of a single continuous conductor, the windings in each layer being eccentric one with the other and the layers being concentric with each other.

5. As an article of manufacture an inductance coil comprised of a plurality of layers of loop windings of a single continuous conductor, the windings in each layer being eccentric one with the other, but concentric with the corresponding windings of the adjacent layer.

6. As an article of manufacture an inductance coil comprised of a plurality of layers of loop windings of a single continuous conductor, the windings of each layer being eccentrically arranged so that the center of each winding shall lie on the circumference of a theoretical geometrically placed circle.

7. As an article of manufacture an inductance coil having a plurality of layers of loop windings of a single continuous conductor, each layer consisting of a plurality of windings progressively arranged in the geometric form of a series of trochoids.

Signed at New York in the county of New York and State of New York this 31st day of October A. D. 1922.

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