April 10, 1928.

1,665,947

T. H. BRENNAN

INDUCTANCE COIL

Filed April 25, 1925

Fig. 1.

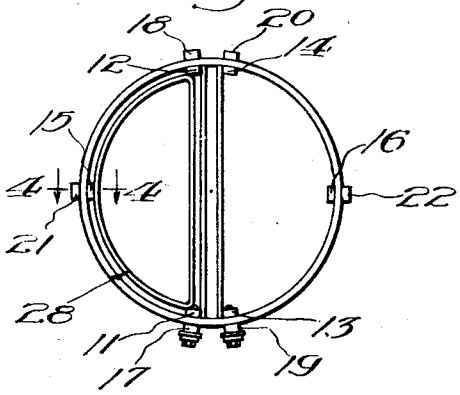


Fig. 3.

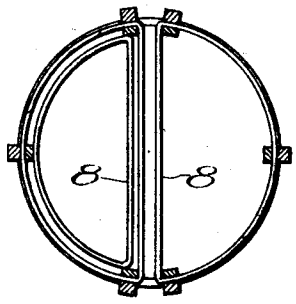


Fig. 2.

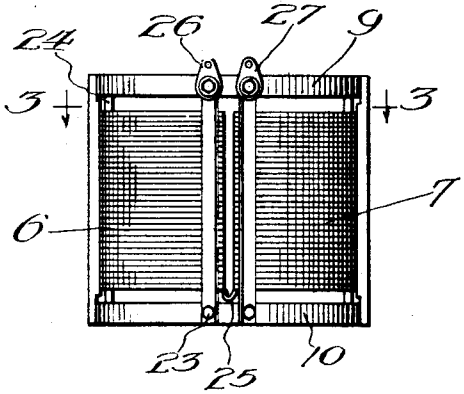


Fig. 4.

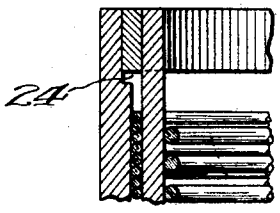
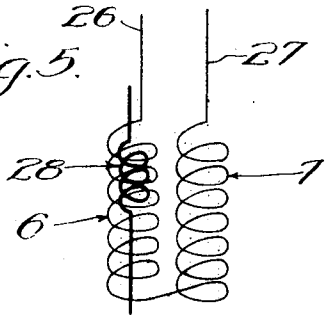


Fig. 5.



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UNITED STATES PATENT OFFICE.

THOMAS H. BRENNAN, OF CHICAGO, ILLINOIS.

INDUCTANCE COIL.

Application filed April 25, 1925. Serial No. 25,835.

This invention has to do with improvements in inductance coils and the like, particularly intended for use in connection with radio work. The coils herein disclosed are especially intended for use with radio reception, and especially in connection with the radio frequency portions of the circuit. Nevertheless, it will presently appear that the features of the invention are not limited to this or any other particular class of service, and I do not intend to limit myself thereto except as I may do so in the claims.

One of the objects of the invention is to provide a coil having an extremely low self capacity, but which coil nevertheless is self sustaining and sufficiently rigid to meet the service for which it is intended. In this connection, it is an object to provide a special form of frame for supporting the convolutions of the coil, while at the same time so arranging said frame that the coil to all intents and purposes will be purely an air dielectric coil. In this connection, it is an object to so arrange the frame that the same will have an extremely small amount of solid dielectric in contact with the wire so as to reduce the capacity interference and losses thereof as much as possible.

A further object of the invention is to provide a coil of peculiar shape and composed of two sections each of which is of D shape. These two D shaped sections are so related to each other that they provide a greatly improved inductance effect, while at the same time providing a structure which is of minimum self capacity and presents all of the advantages heretofore referred to.

A further object of the invention is to secure the foregoing construction of a "double D" coil, while at the same time using a cylindrical frame and also bringing the component parts of the structure substantially within a cylindrical space. This will be of great advantage from the standpoint of convenience of mounting and association with other parts of the circuit.

A further object of the invention is to provide, if desired, another coil circuit in conjunction with the double D coil arrangement, so that the features of the invention may also be used in radio frequency transformers. In other words, to also secure the benefits of the present invention in transformers as well as single circuit coils.

Another feature of the invention is to provide a coil of such construction that the magnetic flux is embraced within the body of the coil itself as fully as possible so as to substantially reduce the interference with outside circuits and other devices used in connection with the outfit. In other words, to provide a double D coil in which the magnetic lines of force are retained almost entirely within its own body with all of the attendant advantages.

In the drawing:

Fig. 1 shows a plan view of a coil embodying the features of the present invention, the same illustrating said features in conjunction with a radio frequency transformer;

Fig. 2 shows a side elevation corresponding to Fig. 1;

Fig. 3 shows a horizontal section on the line 3—3 of Fig. 2, looking in the direction of the arrows;

Fig. 4 shows a fragmentary section on the line 4—4 of Fig. 1, looking in the direction of the arrows, but on enlarged scale; and

Fig. 5 shows diagrammatically a hook up of the two coils of the combination illustrated in the figures.

Referring first to Figs. 1, 2, 3 and 4, I provide two semi-circular D shaped coils 6 and 7 together with a suitable frame work by which they are supported. Each of said coils, as shown in Fig. 3 in particular, has its convolutions helically arranged, but flattened on their inner sides 8 so that when the two coils are set with their flat sides in close proximity the coils together establish a practically perfect cylinder. Nevertheless, the convolutions of the two coils are separate and distinct so that the magnetic lines of force are compelled to travel within the bodies of the two coils independently considered. By proper connections between the upper and lower ends of the individual coils 6 and 7 their north and south poles may be brought into whatever relationship may be desired; but, ordinarily, they will be so connected and their turns will be spiralled in such directions with respect to each other that the north pole at the top of one coil will be brought into proximity with the south pole at the top of the other coil; and the south pole at the bottom of the first coil into proximity with the north pole at the bottom of the other coil.

With this arrangement the great bulk of the magnetic lines of force will travel through the cores of both coils and will be

always entirely embraced within the bodies of said coils, the amount of leakage of flux to points outside of the coils being reduced to a minimum. Consequently, this arrangement is admirably adapted for use in connection with radio frequency work, for example, in neutrodyne circuits wherein it is desired to keep down the cross interference with outside circuits as much as possible. In other words, this arrangement will reduce and control the "oscillation" as much as possible. This will also make it possible to secure what is known as zero coupling with great perfection.

The frame by which the coils are supported includes top and bottom rings 9 and 10 of proper size to set immediately above and below the convolutions of the associated coils 6 and 7, as will be evident from comparison of the different figures. I then provide inner posts 11 and 12 at the inner corners of the coil 6; inner posts 13 and 14 at the inner corners of the coil 7; and inner posts 15 and 16 against the central portions of the two coils; and I provide outside posts 17, 18, 19, 20, 21 and 22 corresponding to the inside posts, already referred to respectively.

The inner and outer posts are placed in pairs and reach vertically between the upper and lower rings to which they may be secured in any convenient manner as by means of through bolts 23. Furthermore, when the through bolts are tightened up not only are the posts drawn rigidly against the rings so as to establish a sufficiently rigid frame work, but also the inner faces of the pairs of posts are forced close enough together to grip the convolutions of the coils, or at least hold them with the desired firmness so as to retain them in proper shape. For this purpose, the ends of the posts are sometimes notched, as shown at 24 in Figs. 2 and 4.

As a matter of convenience the coils 6 and 7 are preferably wound in such directions that their lower terminals come to adjoining corners which may then be joined together by a loop 25, as shown in Fig. 2, their upper free ends coming adjacent to the upper ends of the posts 17 and 19, respectively. Such being the case said free ends may be connected to suitable binding posts or terminals 26 and 27 for connection to the other portions of the circuit.

When it is desired to use another coil, as, for example, in a transformer arrangement, said coil may be placed either wholly within one of the D shaped coils, or may be split, a portion being placed within each of the D shaped coils. In the particular arrangement illustrated in Fig. 1, I have shown only a single primary coil 28, the same being placed entirely within the upper portion of one of the D shaped coils, 6, but this is purely illustrative. Said primary coil, as illustrated, is also of D shape and is laid against the inside faces of the inner posts 11, 12 and 15 to which it is cemented in any desired manner. Instead of using a fixed primary, there may be used a movable or variable primary. In the former case, for example, the primary coil may be pivoted to any suitable portion of the frame, as, for example, to the upper ring. In such case, the frame will provide an admirable support upon which to mount said movable coil. This provides a variable primary arrangement in a coil which is to all intents and purposes an air dielectric coil. The terminals of the primary when used may be brought out in any convenient manner, as, for example, by bringing one of the terminals out at the top of the structure and the other at the bottom.

In Fig. 5 I have shown diagrammatically the connections of the coil arrangement illustrated in the previous figures, which arrangement it is believed will be readily understood by those skilled in the art.

It will be understood that both of the rings, together with the posts, are preferably of relatively small size, as indicated in the drawing, and preferably made of suitable dielectric material such as hard rubber, bakelite or the like.

While I have herein shown and described only certain embodiments of the features of my present invention, still I do not intend to limit myself to the same, except as I may do so in the claims.

I claim:

1. As a new article of manufacture, an inductance unit for the purpose specified comprising in combination a pair of D shaped helical coils, each comprising a single layer of turns progressing axially in a given direction, the two coils being placed with their flat sides in relatively close proximity to each other, the turns of each coil being completely self-contained within said coil and progressing from end to end thereof, the turns of the two coils progressing in opposite directions around the coils when measured from one end of the device to the other end thereof, a cross connection joining together the turns at one end of the device into a single continuous circuit, and means for supporting the two coils comprising a plurality of pairs of relatively thin and narrow bars extending axially through the coils and embracing the convolutions of the coils on which they are placed, end rings in alignment with the ends of the pairs of D coils and located between the end portions of the pairs of bars aforesaid, together with means for clamping the bars together in pairs and securing them to the end rings, substantially as described.

2. As a new article of manufacture, an inductance unit for the purpose specified

comprising in combination a pair of D shaped helical coils, each comprising a single layer of turns progressing axially in a given direction, the two coils being placed with their flat sides in relatively close proximity to each other, the turns of each coil being completely self-contained within said coil and progressing from end to end thereof, the turns of the two coils progressing in opposite directions around the coils when measured from one end of the device to the other end thereof, a cross connection joining together the turns at one end of the device into a single continuous circuit, and means for supporting the two coils, substantially as described.

3. As a new article of manufacture, an inductance unit for the purpose specified comprising in combination a pair of unitary D shaped helical coils, each comprising a single layer of turns progressing axially in a given direction, the two coils being placed with their flat sides in relatively close proximity to each other, the turns of each coil being completely self-contained within said coil and individual to said coil and progressing from end to end thereof, and a suitable cross connection between one end of one coil and an end of the other coil to place the coils in series with each other and cause current to flow in opposite directions through the two coils, substantially as described.

THOMAS H. BRENNAN.