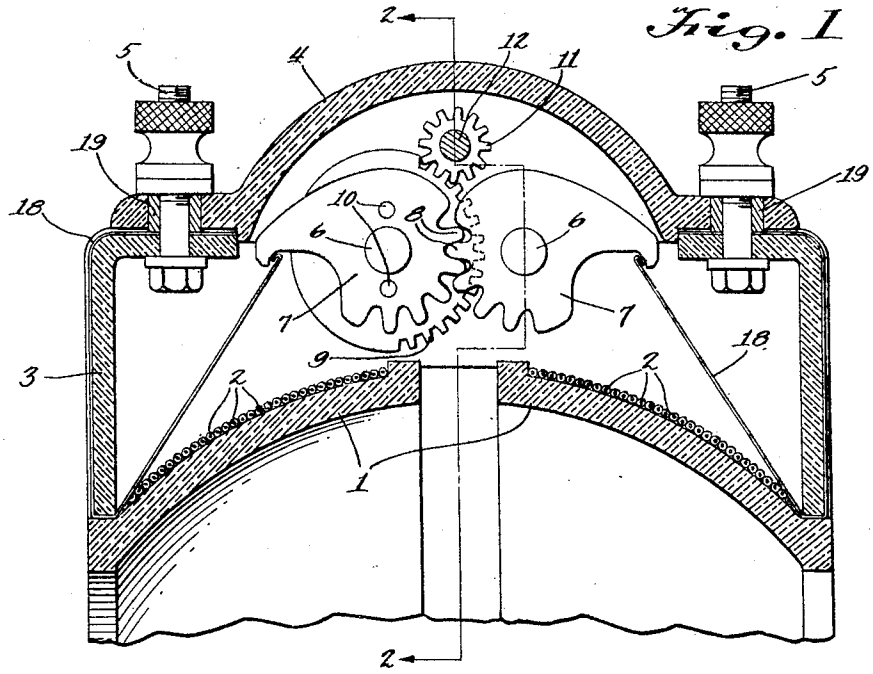
Feb 24, 1925. 1,527,484

R. E. MacDOWELL

VARIABLE INDUCTANCE COIL

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Fig. 1



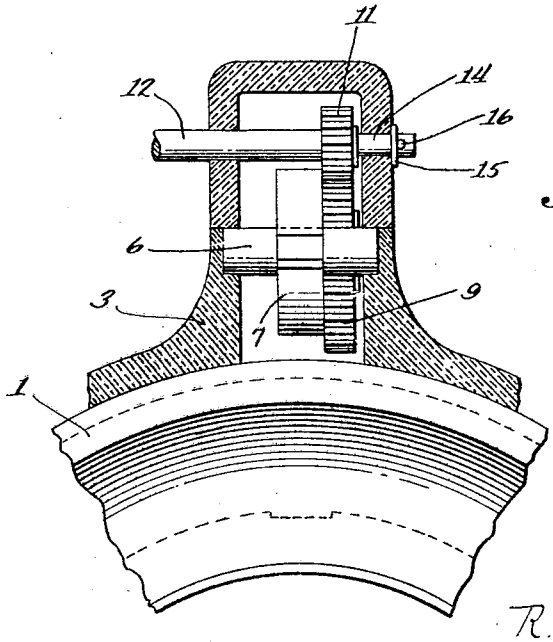


Fig. 2

Inventor
R. E. MacDowell
By John A. Bommhardt
Atty

Feb. 24, 1925. 1,527,484

R. E. MacDOWELL

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Fig. 3

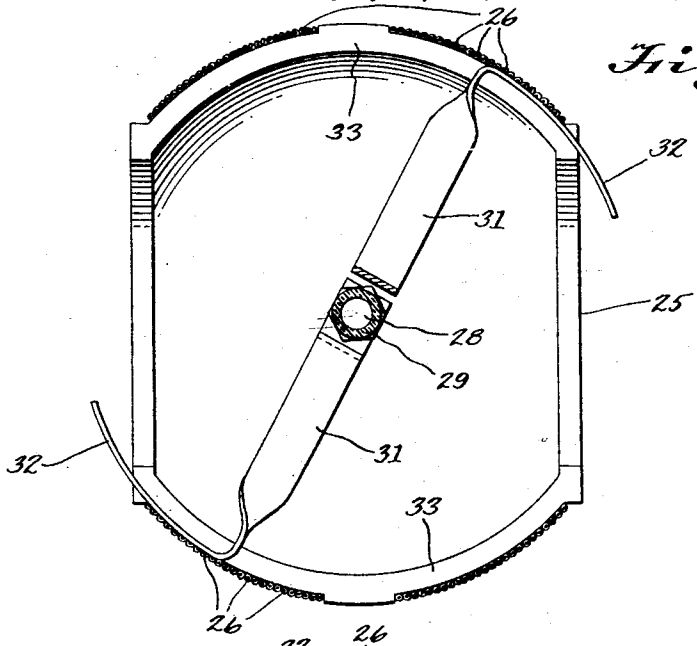
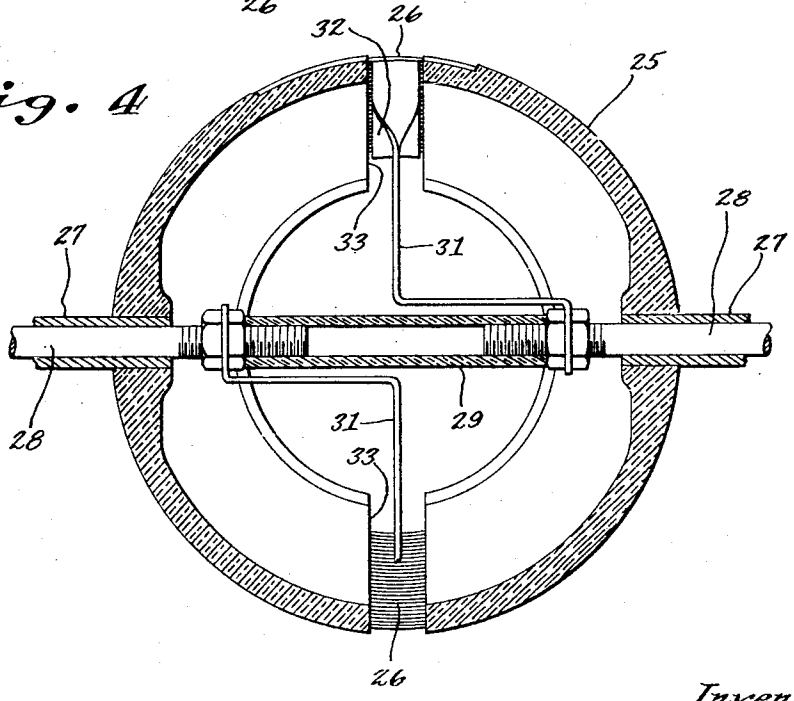


Fig. 4



Inventor
R. E. MacDowell
By John A. Bommhardt
Atty

Patented Feb. 24, 1925. 1,527,484

UNITED STATES PATENT OFFICE.

ROBERT E. MacDOWELL, OF CLEVELAND, OHIO, ASSIGNOR TO THE WORKRITE MANUFACTURING COMPANY, OF CLEVELAND, OHIO, A CORPORATION.

VARIABLE INDUCTANCE COIL.

Application filed May 18, 1923. Serial No. 639,862.

To all whom it may concern:

Be it known that I, ROBERT E. MacDOWELL, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Variable Inductance Coils, of which the following is a specification.

This invention relates to inductance coils and has particular reference to an improved form of variable inductance coil for use in radio circuits.

Heretofore it has been customary to vary the number of turns of wire of an inductance coil either by providing a movable contact finger or slider which is movable along the coil to engage separate turns of the wire, or by tapping the coil at certain definite intervals and connecting each tap with one of a series of contact points over which a switch arm is movable to vary the number of turns in the circuit. These arrangements are each open to many objections, the most important of which is that the unused portion of the coil is always connected with the circuit and hence absorbs energy. This loss of energy is usually referred to as dead end loss and becomes an important factor in radio circuits wherein the currents handled are of a very small value and each instrument must be designed and constructed for maximum efficiency.

It is the general object of the present invention to provide an improved manner of varying the number of turns of an inductance coil wherein the unused portion of the coil shall be eliminated from the circuit and hence the aforesaid dead end losses shall be avoided and the efficiency of the inductance unit as a whole, greatly increased.

Another object is to provide an improved manner of varying the number of turns of an inductance coil which shall be applicable with equal success to stationary or stator windings, and to movable or rotor windings.

Another object is to provide an inductance coil of the aforesaid character wherein the inductance may be varied progressively by small values.

A further object of the invention is to permit 100% inductive relationship by bringing portion of coil in use in a direct inductive couple.

A still further object is to provide an improved inductance unit which shall be simple in construction, easy to operate, and which shall be inexpensive to manufacture.

With these and other objects in view, the invention consists in the various novel features of construction and arrangement or combination, all of which will be fully described hereinafter and pointed out in the appended claims.

In the accompanying drawings wherein I have shown certain illustrative embodiments of my invention but without intent to limit myself thereto, Fig. 1 is a vertical sectional view through a portion of a variocoupler employing my invention; Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1; Fig. 3 is a vertical sectional view through the rotor of the inductance unit; and Fig. 4 is a similar view taken at right angles to Fig 3.

Describing by reference characters the various parts illustrated 1 denotes a suitable insulated form over which the stator winding 2 of the inductance unit is wound. This form is preferably spherical in shape so that the rotor winding, to be referred to more fully hereinafter, may be varied with respect to the stator winding by means of a rotary motion and thus occupy a minimum space. Rising from the form 1 is a substantially rectangular housing 3 also formed from insulating material and the upper end of this housing is normally closed by means of a cap 4 which is conveniently secured thereto at each side by a binding post 5.

Journalled within the housing are a pair of shafts 6 which are arranged in spaced parallel relation and each shaft has mounted thereon a pawl 7. These pawls are each provided with suitable gear teeth 8 which are intermeshed so that movement of one pawl will cause a corresponding movement of the other in a reverse direction. One of the shafts 6 also has mounted thereon a segmental gear 9 which is pinned to the pawl as indicated at 10. This gear is meshed with a pinion 11 which is mounted on a shaft 12 that is journalled in the cap 4. As shown in Fig. 2, shaft 12 projects through each side of the cap and is adapted to receive an operating lever such as a dial (not shown), while the opposite end is reduced

in diameter as indicated at 14 and is provided with a washer 15 and a locking pin 16 to retain said shaft in position.

Interposed between each side of the cap and housing is a flat or leaf spring 18 which extends downwardly along each side of the housing and inwardly between said housing and the stator form 1, and then upwardly into engagement with its respective pawl 7. These metallic springs serve as conductors, as will be more fully explained hereinafter, and in order to insure good electrical contact with their respective binding posts 5, I preferably surround the stem of each post with a metallic bushing 19 which offers an increased area of contact between said spring and post.

In operation, the binding posts are connected in the circuit in any desired manner, as for example, one to the aerial and the other to the ground. Shaft 12 is then rotated which rotates pinion 11 and segmental gear 9 and this in turn rotates the pawls 7 in opposite directions which serves to urge the flat springs 18 progressively into contact with the previously bared turns of the stator winding. It will be obvious that the springs contacting with the stator winding will short circuit the turns thereof with which they are in contact and hence these unused turns will in effect be eliminated from the cicuit as a direct electrical path will be provided, through the medium of the springs, direct to the binding posts. It will be noted that the springs are preferably arranged so that they will normally be in contact with the outer or first and last turns of the stator winding and in this position maximum inductance will be obtained. The inductance is gradually reduced as the springs progressively short circuit the turns of the winding and minimum inductance is obtained when the springs are in contact along their entire length with the previously bared paths on the stator winding.

In Figs. 3 and 4 I have shown my invention applied to a movable or rotary winding. In these views, 25 denotes the rotor form which is made of a suitable insulating material and is provided with a winding 26. A hollow shaft or sleeve 27 is secured to and projects from diametrically opposite points of the rotor form, and these sleeves serve as axes about which the rotor revolves with respect to the stator winding to vary the coupling between these windings. One of these sleeves is preferably projected beyond the stator form so that an operating handle such as a dial (not shown) may be conveniently applied thereto. Journalled within each sleeve 27 is a shaft 28, and the inner opposing ends of these shafts are connected by means of an insulating tube 29 so that rotation of one of said shafts will cause a corresponding movement of the other. Each shaft is fitted with a spring contact finger 31 which extends inwardly along the axes of tube 29 to substantially the midpoint thereof, then outwardly at right angles thereto so that said fingers lie in the same plane of rotation. The outer end of each finger is bent to define a contact shoe 32 which is in the shape of a segment of a circle and these shoes extend in opposite directions as clearly shown in Fig. 3. The shoes are adapted to move through diametrically opposite slots 33 formed in the rotor and thus contact progressively with the inner surface of the previously bared turns of wire forming the rotor winding. In this manner the turns of the rotor winding are progressively short circuited from the outer edges toward the center and hence a direct electrical circuit is obtained through the contact fingers and respective shafts and the short circuited turns or unused portion of the winding is eliminated from the circuit.

In some instances it might be desirable to have both the primary or stator winding and the secondary or rotor winding variable, while in other instances it might be desirable to have only the stator or only the rotor winding variable and such modifications are deemed within the scope of the present invention.

While I have shown and described my invention as applied to what is commonly known as a variocoupler, it will be understood that it may be applied with equal success to variometers or other form of inductance units employing a single coil or multiple coils.

I claim:

1. The combination with an inductance coil wound to form two opposite segmental sections, of a pair of flexible strip contacts cooperating with said sections respectively and operable across the same from the opposite ends thereof toward the middle, to short circuit successive turns in said sections, and means for operating said contacts simultaneously and uniformly.

2. The combination with an inductance coil, of a pair of conductors arranged one adjacent each end of the coil, and means for placing said conductors into contact with the coil to short circuit succeeding turns from opposite ends thereof, to vary the inductance of the coil.

3. The combination with an inductance coil, of a pair of conductors arranged one adjacent each end of the coil, and means for simultaneously placing said conductors into contact with the coil to short circuit succeeding turns from opposite ends thereof, to vary the inductance of the coil.

4. The combination with an inductance coil, of a pair of conductors arranged one adjacent each end of the coil, a shaft, and means connecting said shaft with each of

said conductors whereby rotation of the former will urge the latter simultaneously into contact with succeeding turns of the coil from opposite ends thereof, to vary the inductance thereof.

5. The combination with an inductance coil, of a pair of conductors arranged adjacent each end of the coil, a shaft and a pawl connected to each of said conductors and to said shaft whereby rotation of said shaft will urge said conductors simultaneously into contact with said coil from opposite ends thereof to vary the inductance of the latter.

6. The combination with an inductance unit having a spherical insulating surface, of a coil wrapped around said surface and defining a segment of a sphere, flexible strip conductors adapted to engage successive turns of the coil from opposite ends thereof, said strip conductors being adapted to uniformly short circuit successive turns of the coil from the ends toward the middle of the winding, and means for operating said strip conductors simultaneously and uniformly.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT E. MacDOWELL.

Witnesses:
R. B. WHITLEY,
H. RODINE.