March 5, 1929. O. C. ROOS 1,704,215

APPARATUS FOR VARYING THE ELECTROMAGNETIC CONSTANTS OF SLOW SPEED COILS

Original Filed Dec. 28, 1925 2 Sheets-Sheet 1

Fig. 1.

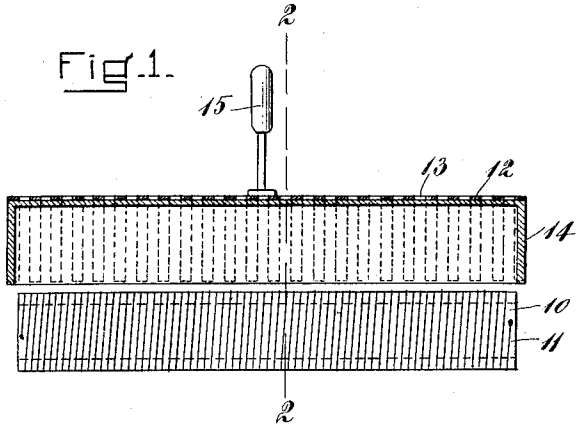
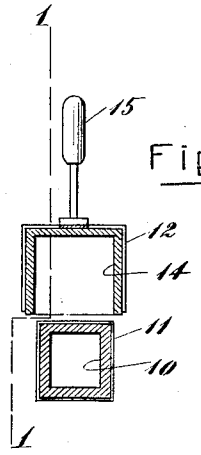


Fig. 2.



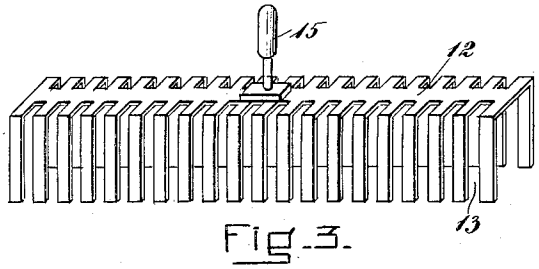
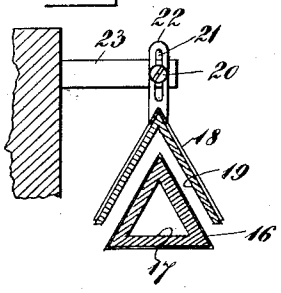


Fig. 3.

Fig. 4.



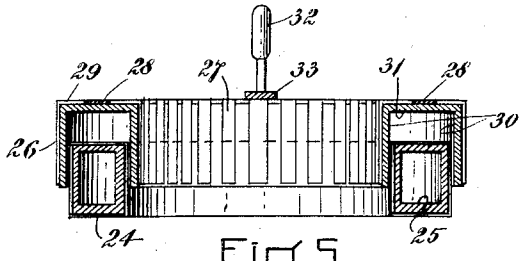
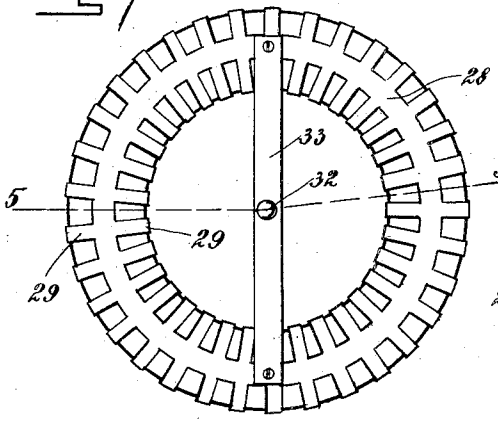


Fig. 5.

Fig. 7.



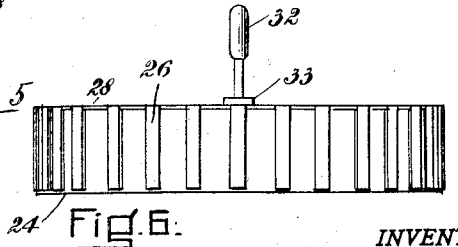


Fig. 6.

INVENTOR
Oscar C. Roos
BY Geo. N. Woodworth
ATTORNEY

March 5, 1929. O. C. ROOS 1,704,215

APPARATUS FOR VARYING THE ELECTROMAGNETIC CONSTANTS OF SLOW SPEED COILS

Original Filed Dec. 28, 1925 2 Sheets-Sheet 2

Fig. 8.

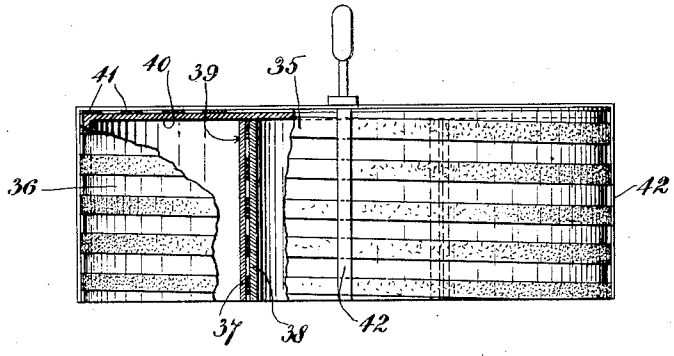
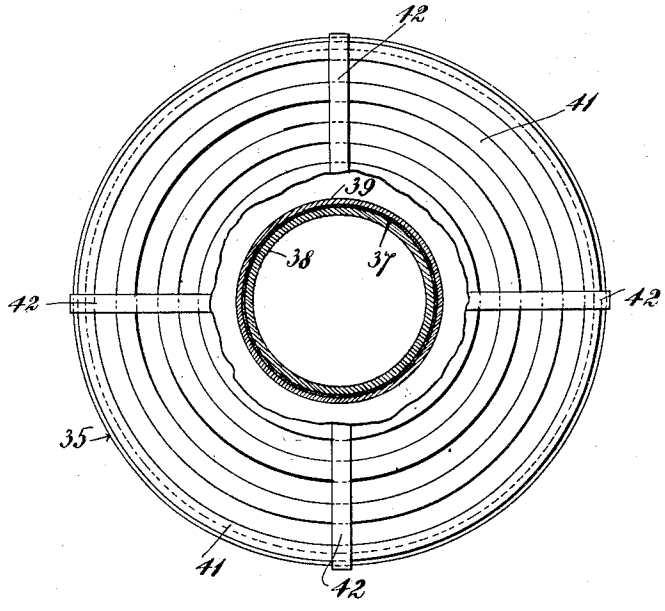


Fig. 9.



INVENTOR:
Oscar C. Roos
By Geo. K. Woodworth
ATTORNEY:

Patented Mar. 5, 1929. 1,704,215

UNITED STATES PATENT OFFICE.

OSCAR C. ROOS, OF NEW YORK, N. Y.

APPARATUS FOR VARYING THE ELECTROMAGNETIC CONSTANTS OF SLOW-SPEED COILS.

Application filed December 28, 1925, Serial No. 77,980. Renewed April 28, 1928.

In my application Serial No. 505,785 filed October 6, 1921, I have disclosed an electromagnetic-wave receiving-system wherein slow-speed circuits or coils such as solenoids designed to permit the development therein of at least a quarter wave length of an electric wave are employed as reverberators and spatializers for converting abrupt or impulsive electrical forces into periodic vibrations and spatializing such periodic vibrations, if the device performs the functions both of reverberator and spatializer, and for spatializing the electrical vibrations created in the receiving system by such electrical forces and by electromagnetic waves the energy of which is to be received.

The present invention relates to a convenient means for continuously and simultaneously varying the electromagnetic constants of every element of a solenoid or slow-speed coil separately and equally, and is adapted especially for use in the systems described in said application, although capable of more general application and not limited to such use.

The slow-speed circuit or coil to which my present invention is applied preferably has its electromagnetic constants uniformly distributed continuously as in the case of an open or closed solenoid. The properties of such slow-speed circuits or coils are well understood by those skilled in the art and need not be set forth at length herein, except to point out that such a circuit or coil in order to perform the function of a spatializer, must be so designed as to permit the development therein of at least a quarter wave length of an electric wave.

In carrying out my invention I employ preferably a casing of conductive material snugly fitting the solenoid and arranged to be placed in adjusted position around the same in co-operation with every element thereof so that the electromagnetic constants of every element of said solenoid may separately and equally be varied simultaneously and continuously by changing the position of said casing with respect to the solenoid. The said casing is so constructed and arranged that for every adjusted position thereof with respect to the solenoid, it is in co-operation with every element thereof. Preferably the conductive casing is slotted to prevent the development of eddy currents and is lined with suitable insulating material to prevent injury to the insulation of the solenoid winding.

My invention contemplates also the use of a cylindrical casing of insulating material provided with a helically arranged conducting member disposed transversely to the elements of the slow-speed circuit, said member having substantially the effect of a slotted metal casing and its transverse disposition resulting in a more efficient variation of the electromagnetic constants of the slow-speed circuit.

The drawings which accompany and form a part of this specification illustrate several embodiments of my invention, but said drawings are to be considered as illustrative merely and not as restrictive, because it will be obvious to those skilled in the art that the particular apparatus therein shown and hereinafter described may be modified without departing from my invention as defined by the appended claims.

In the drawings—

Figure 1 is a longitudinal transverse section taken on the line 1—1 of Fig. 2 of an apparatus for varying the electromagnetic constants of a slow-speed circuit of the open solenoid type, the slow-speed circuit being shown in elevation;

Figure 2 is a transverse section taken on the line 2—2 of Fig. 1 of the apparatus shown in Fig. 1;

Figure 3 is a perspective view of said apparatus with the insulating lining removed;

Figure 4 is an end view of a modification;

Figure 5 is a central vertical section taken on the line 5—5 of Fig. 7 of a slow-speed circuit of the toroidal solenoid type and an apparatus for varying the electromagnetic constants thereof which embodies the present invention;

Figure 6 is an elevation of the apparatus shown in Figure 5;

Figure 7 is a plan view of the last mentioned apparatus;

Figure 8 is an elevation, partly in section, of a modification;

Figure 9 is a plan view, partly in section, of the modification shown in Figure 8.

In the particular drawings selected for disclosing the principle of my invention, 10 represents a frame of any suitable type upon which is wound a slow-speed circuit 11 of the open solenoid type such as described in my application above referred to. For varying the electromagnetic constants of every element of said slow-speed circuit simultaneously and continuously, I provide a conductive casing 12 preferably slotted as indicated at 13 and provided with a lining 14 of insulating material, said casing being constructed and arranged to closely fit said solenoid so that it will be frictionally held thereon in whatever position it may be placed.

In Figure 1 the said casing 12 is shown as raised clear of the solenoid, and for maximum effect it will of course be pushed downwardly over said solenoid until the plane of its lower edges is coincident with the base of the solenoid. A handle 15 may conveniently be attached to the upper surface of the casing for manipulating the same.

In Figure 4 the solenoid 16 is wound on a triangular base 17 and an open-ended conductive casing 18 lined with insulating material 19 is arranged to be raised and lowered with respect to the solenoid to simultaneously and continuously vary the electromagnetic constants of every element thereof.

Any suitable means such as the screw 20 passing through the slot 21 in the arm 22 attached to said casing and co-operating with the fixed support 23 may be employed for holding the casing 18 in adjusted position.

In the modification shown in Figs. 5, 6 and 7 the slow-speed circuit 24 is of the closed solenoid type and is represented as wound on the toroidal support 25. The conductive casing in this instance consists of two concentric slotted cylinders 26, 27 connected at their upper ends by the circumferential conductive strip 28 and the radial conductive strips 29, the several elements preferably forming one integral structure, substantially the same as if the oblong casing of Figure 3 were bent into circular form. The inner surfaces of said cylinders are lined with suitable insulating material 30 and the upper edges of the latter are connected by a flat ring 31 also of insulating material, the elements 30, 31, preferably forming an integral structure. A handle 32 may be attached to a cross bar 33 secured to the upper base of the ring 31.

As illustrated in Fig. 5 the conductive casing is placed in the position of medium effect with the plane of its lower edges coincident with the mid-plane of the solenoid. Here again, as in the case of the arrangement shown in Figs. 1, 2 and 3, the insulating lining 28 may preferably closely fit over the solenoid so that the casing will be frictionally held in adjusted position.

In the embodiment of my invention shown in Figs. 8 and 9, a flat spiral conductor 35, such as wire, metal braid or foil, is wound around the outside of the insulating cylinder 36 and a similar spiral 37 is wound around the interior insulating cylinder 38, concentric with said cylinder 36, the said spiral 37 being protected by a thin insulating cylinder 39 which performs in this modification the same function as the element 30 shown in Fig. 5, and in addition protects the insulation on the slow-speed circuit from abrasion when the device is moved with respect to said circuit. It will be noted that in the devices shown in Figs. 1 to 7, inclusive, certain elements of the slow-speed circuit lie opposite the slots of the slotted metallic casings, so that while the relative movement between the casing and circuit will simultaneously and continuously vary the electromagnetic constants of every element of said slow-speed circuit, those elements thereof which are not in juxtaposition with the metal portions of the casings are less affected than the others. In the apparatus shown in Figs. 8 and 9, however, the transverse disposition of the helical conducting member will result in a uniform variation of the electromagnetic constants of every element of the slow-speed circuit simultaneously and continuously when the casing is raised or lowered with respect to the slow-speed circuit.

Preferably the insulating disc 40 which is united to and is preferably integral with the upper ends of the cylinders 36, 38, is provided with a series of flat concentric rings 41 of conducting material spaced to prevent eddy currents and interconnected by the radial strips 42 which make electrical contact with the helix 35 to maintain all the metallic members at the same potential.

Having thus described illustrative embodiments of my invention without however limiting the same thereto, what I claim and desire to secure by Letters Patent is:—

1. The combination with a slow-speed coil of means for simultaneously and continuously varying the electromagnetic constants of every element of said coil separately and equally.

2. The combination with a slow-speed coil of a conductive casing adjustable with respect to said coil and disposed around the same, said casing being so constructed and arranged that for every position thereof, it is in co-operation with every element of said coil.

3. The combination with a slow-speed coil of a conductive casing adjustable with respect to said coil and disposed around the same, said casing being so constructed and arranged that for every position thereof, it is in co-operation with every element of said coil, and a lining of insulating material for said

casing, said lining closely fitting said coil and holding said casing in frictional engagement therewith.

4. The combination with a slow-speed coil of a conductive casing adjustable with respect to said coil and disposed around the same, said casing being so constructed and arranged that for every position thereof, it is in co-operation with every element of said coil, said casing comprising a helically-arranged conducting member disposed transversely to the elements of said coil.

In testimony whereof, I have hereunto subscribed my name this 24 day of December, 1925.

OSCAR C. ROOS.