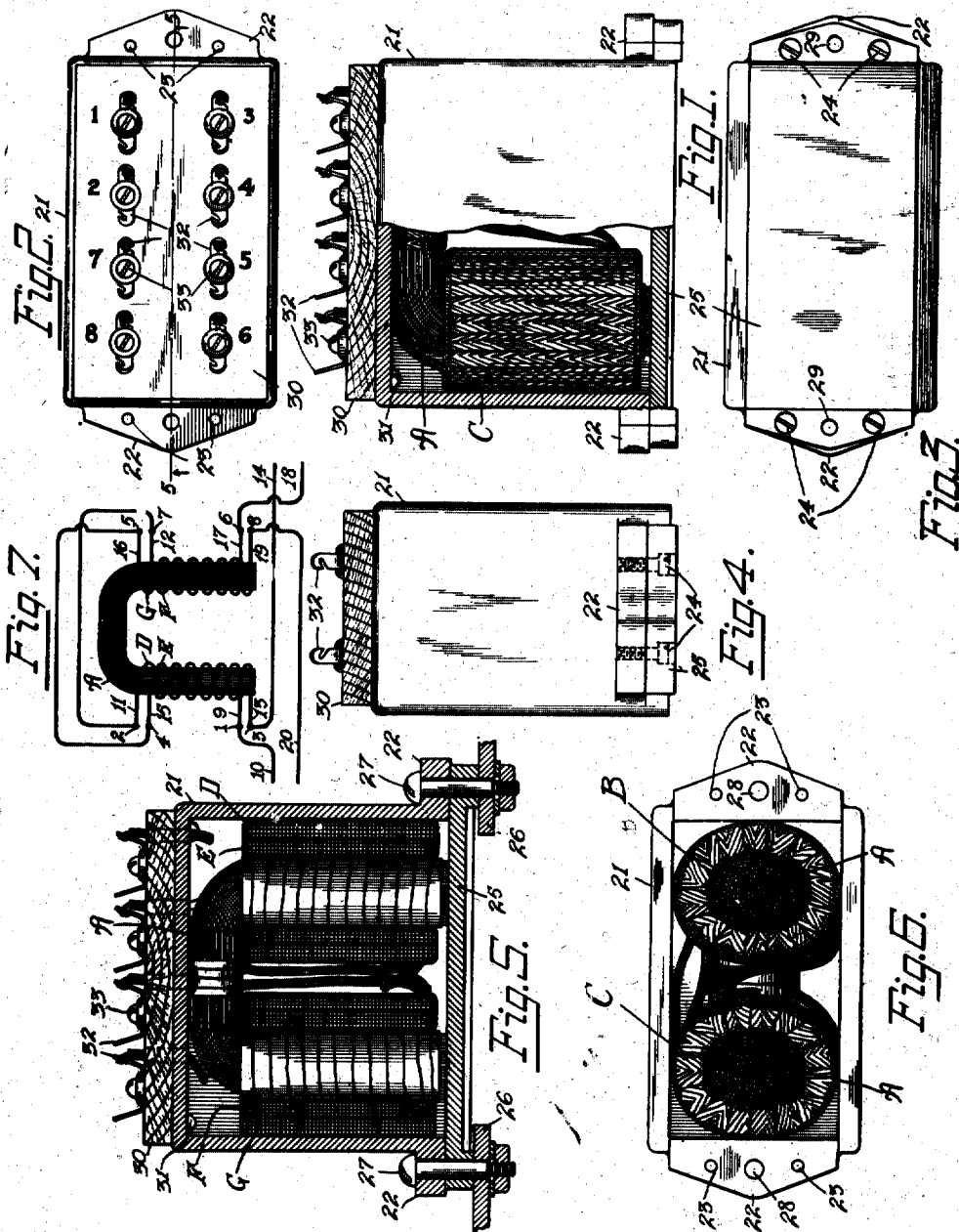


1,278,864.

Patented Sept. 17, 1918.



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UNITED STATES PATENT OFFICE.

HIRAM D. CURRIER, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

REPEATING COIL.

1,278,864.

Specification of Letters Patent.

Patented Sept. 17, 1918.

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To all whom it may concern:

Be it known that I, HIRAM D. CURRIER, a citizen of the United States of America, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Repeating Coils, of which the following is a specification.

My invention relates to repeating coils or telephone transformers for use in cord circuits of telephone switchboards. It is the object of my invention to produce an improved device of the class described, which will embody desirable features and advantages all in a simple, efficient and economical manner, and to this object and such other objects as may appear, my invention consists in the novel details of construction, parts and combinations of parts hereinafter described and as particularly pointed out in the appended claims. A feature of my invention is a U-shaped core permitting of easy mounting of the windings thereon in such relation to each other as to result in efficient disposition of the windings in relation to the core. Two spools each having an inside and outside winding concentrically related are placed over either arm of the U-shaped core. The inside winding of one spool is serially connected to the outside winding of the other spool and these two windings serve to form one half of the transformer circuit. The other windings of the spools are connected in like manner and form the other half of the transformer circuit.

The advantage in using a U-shaped core is in bringing the two poles of the core in such relation to each other that the lines of force set up in the core in passing from one pole to the other are deflected away from the windings and thus reduce the neutralizing effect resultant from such leakage when a straight core is used. The U-shaped core also adds to the compactness of the coil.

Referring to my invention as illustrated in the accompanying drawing, in which like characters denote like parts and in which—

Figure 1 is a front elevation of the repeating coil with the housing broken away to show one spool of the coil;

Fig. 2 is a top view of the repeating coil showing the terminals;

Fig. 3 is a bottom view of the repeating coil;

Fig. 4 is a left end view of Fig. 1;

Fig. 5 is a sectional view on the line 5, 5 of Fig. 2;

Fig. 6 is a view of the repeating coil with the bottom plate removed;

Fig. 7 is a diagrammatic view of the coil showing the windings upon the core and also showing connections of the four windings.

Referring now more in detail to my invention as illustrated, it comprises a U-shaped core A preferably made of small gage Norway iron which is wrapped with tape to help keep its cylindrical form. The core is made of small Norway iron to reduce the hysteresis loss to a minimum but this finely dividing of the core to reduce hysteresis loss is old in the art but the forming of the core into a U-shape I consider new as this brings the poles of the core in close proximity and thus tends to prevent the lines of force from separating from each other and consequently the lines of force are deflected to the opposite end of the core preventing the back leakage through the windings which would be the case if the core were straight. It is desirable to have an air gap in a telephone transformer and thus reduce the line constant of the coil providing this can be done without introducing leakage through the windings.

The coil is made up of two spools B and C each spool having two windings namely an outside winding D and an inside winding E on spool B and an inside winding F and an outside winding G on spool C, said windings being suitably insulated from each other by wrappings of oiled silk. As to the connection of the windings, by referring to Fig. 7, it may be seen that the outside winding D has its inside end 9 connected to the terminal 1 (Fig. 2), the said terminal 1 being connected to the tip conductor 10 of the transmitting side of the repeating coil when used on a metallic line. The outside end 11 of the winding D is connected to the outside end 12 of the inside winding F at terminal 7 (Fig. 2). The inside end 13 of the inside winding E is connected to the terminal 3 (Fig. 2), the said terminal 3 being connected to the tip conductor 14 of the receiving side of the repeating coil when used on a metallic line. The outside end 15 of the inside winding E is connected to the outside end 16 of the outside winding G at terminal 5 (Fig. 2). The inside end 17 of the outside winding G is connected to the terminal 6 (Fig. 2).

2), the said terminal 6 being connected to the sleeve conductor 18 of the receiving side of the repeating coil. The inside end 19 of the inside winding F is connected to the terminal 8 (Fig. 2), the said terminal 8 being connected to the sleeve conductor 20 of the transmitting side of the repeating coil. The outside end 12 of the inside winding F is connected to the outside end 11 of the outside winding D at terminal 2 (Fig. 2). The outside end 16 of the outside winding G is connected to the outside end 15 of the inside winding E at terminal 4, Fig. 2. This particular manner of connecting is necessary to the operation of the coil and is an important element of my invention.

The windings are connected so that the inside winding of one spool is connected to the outside winding of the opposite spool, and these two windings form one half of the transformer circuit. This arrangement permits each half of the transformer circuit being in the same dimensional relation to the core. With the arrangement as described above, which results in each half of the transformer circuit being in the same relation to the core, the current induced from one half of the transformer to the other reacts on the core to the same degree as the impressed current with the result that we obtain transformation with the minimum loss.

The repeating coil is placed in a rectangular shaped housing 21, the said housing being preferably made of cast iron and the reason for placing the said repeating coil in this housing is to eliminate cross talk. The housing also forms a dust proof containing member for the said repeating coil and is of a shape and size as to take only a small amount of space when being mounted. The flanges 22 extend downwardly from the lower extremities of the ends of the housing and are integral with the same. The said flanges 22 are drilled and tapped to receive the screws 24 which clamp the back plate or cover 25 to the housing 21. The cover 25 when clamped down tightly to the housing by means of the screws 24 bears against the ends of the U-shaped core A and forms a closed magnetic circuit for the core. The plate 25 in being clamped down to the housing 21 aids as a compression means against the ends of the U-shaped core to hold the said core and winding in the housing against said movement.

The terminal block 30 of any suitable insulation material is mounted on the opposite end of the housing 21 and is held in place on the housing by means of the screws 31 which pass through the housing and screw into the said terminal block 30. The terminal clips 32 are suitably fastened to the terminal block 30 by means of the screws 33, the said clips being terminals for the winding of the four coils which are mounted on the

U-shaped core. The terminal windings pass through openings in the housing and terminal block and are soldered to the said terminals. The terminals are numbered from 1 to 8 inclusive and aid in connecting the repeating coil when used in connection with the cord circuit of a telephone system.

I have shown the repeating coil in a mounted position in Fig. 5, the repeating coil being mounted on a rack 26 and held in place on the said rack by the bolts 27. The bolts 27 pass through openings 28 of the flanges 22 and openings 29 in the back plate 25.

Having described my invention, what I claim as new and desire to secure by United States Letters Patent is:

1. In a telephone repeating coil a U-shaped core having only four windings placed thereon two of said windings being inside windings and two outside windings with one inside winding connected to one outside winding forming one half of the transformer circuit and the other half of the transformer circuit formed with the other two windings connected in like manner and a member for completing the magnetic circuit of said core.

2. In a telephone repeating coil a U-shaped core having two spools, a primary and a secondary winding mounted on each of said spools, the inside winding of each spool being connected to the outside winding of the other spool, and a member for completing the magnetic circuit of said core.

3. In a telephone repeating coil a U-shaped core having four windings placed thereon, two of said windings being outside windings and two being inside windings, a rectangular shaped housing for containing said core and windings, a bottom plate secured to said housing, said plate contacting with ends of said U-shaped core to form a closed magnetic field for the said core, a terminal block mounted on the top of the housing, and clips to serve as terminal connecting means for the winding terminals.

4. In a telephone repeating coil, a U-shaped core having four windings placed thereon, a rectangular shaped housing, a bottom plate secured to said housing, said plate acting as a compression means for said core to securely hold the core in place when the plate is secured to the housing and for completing the magnetic path of said U-shaped core.

5. In a telephone repeating coil, a U-shaped core finely divided and having four windings placed thereon, a rectangular shaped housing, a bottom plate secured to said housing, said plate acting as a compression means for said core to securely hold the core and windings in place when the plate is secured to the housing, and the plate in contacting with the ends of the core forms a closed magnetic circuit for the said core.

6. A telephone repeating coil, a U-shaped core finely divided, two spools of two windings each, two of said windings being outside windings and two of them being inside windings, an inside winding and an outside winding concentrically related are mounted on each leg of the U-shaped core, a rectangular shaped housing for containing said core and windings, a bottom plate, and means adapted to clamp the said bottom plate to the housing to form compression means for said U-shaped core for holding the core in place in the housing and to provide when secured to said housing a closed magnetic path for said core.

7. In a transformer, a U-shaped core having four windings placed thereon, two of said windings being outside windings and two of said windings being inside windings, one outside winding being connected to one inside winding and the other outside winding being connected to the other inside winding, a rectangular shaped housing for holding said core and windings, a pair of ears formed integrally with said housing and extending out therefrom, a plate adapted to be secured to said housing for contacting with the ends of the core to form a closed magnetic circuit for said core, and fastening means for holding said plate in position, extending through said plate into said integrally formed ears.

8. In a transformer, a discontinuous core having windings thereon, said windings comprising two primary and two secondary windings, one primary and one secondary winding being mounted on one portion of the core, and the other primary and second-

ary windings being mounted upon the other portion of the core, an iron housing adapted to receive said core and windings, a cover plate for said housing adapted to be fastened thereto to render said core continuous, and a pair of flanges formed integrally with said housing, forming mounting means for said transformer.

9. In a transformer, a discontinuous core provided with a pair of primary and a pair of secondary windings, one of said primary and secondary windings being associated and mounted on one portion of the core, and the other primary and secondary winding being associated and mounted on another portion of the core, the secondary winding being nearest the core in one instance and the primary winding being nearest the core in the other instance, and means for rendering the discontinuous core continuous.

10. In a transformer, a core having two spools connected at one end thereof, a primary and a secondary winding forming a unit and adapted to be slid over one of the spools of said core, a similarly formed unit adapted to be placed on the other spool of said core, the inside winding of each spool being connected to the outside winding of the other spool, and a member adapted to connect the extended ends of said core to render the core magnetically continuous.

Signed by me at Chicago, in the county of Cook and State of Illinois, in the presence of two witnesses.

HIRAM D. CURRIER.

Witnesses:

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M. R. ROCHFORD.