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1,575,552

W. J. DOW
COUPLING TRANSFORMER
Filed April 3, 1924

Fig. 1

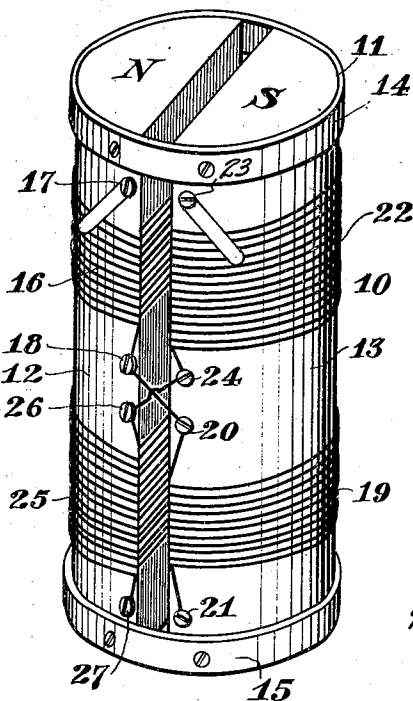


Fig. 2

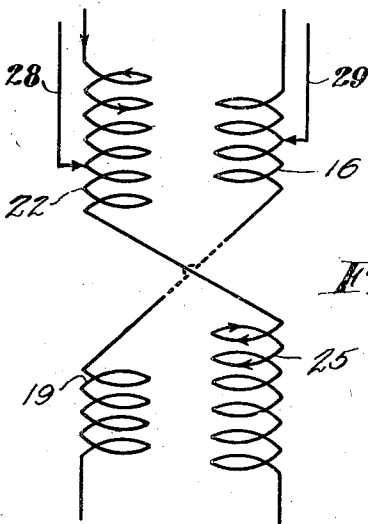
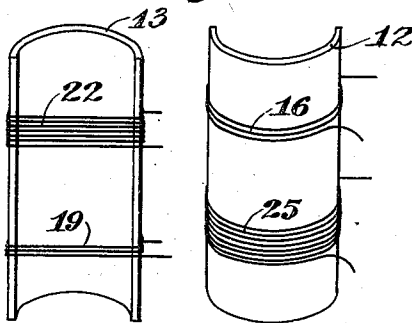


Fig. 3

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UNITED STATES PATENT OFFICE.

WILLIAM J. DOW, OF WASHINGTON, DISTRICT OF COLUMBIA.

COUPLING TRANSFORMER.

Application filed April 3, 1924. Serial No. 704,071.

To all whom it may concern:

Be it known that I, WILLIAM J. DOW, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Coupling Transformers, of which the following is a specification.

This invention relates to coupling transformers and more particularly to a coupling device for use between two electric circuits of a radio receiving apparatus where small amounts of energy are utilized to transmit signals.

In the operation of radio receiving apparatus usually employed in various circuits used with crystal or tube detectors and including both regenerative and non-regenerative types and audio or radio frequency amplification where energy transference from one circuit to another is effected through electro-magnetic coupling, much difficulty has been experienced in obtaining a suitable degree of selectivity of the apparatus throughout a wide range of wave lengths of the signals. This difficulty has been largely due to the fact that the external magnetic field produced about the coupling coils has caused magnetic disturbances which affects the neighboring apparatus and prevents the coupler or transformer from functioning with the proper and desired selectivity.

An object of this invention contemplates a novel winding which confines the magnetic field in such a manner that magnetic leakage in the neighborhood of the coil will be practically zero.

Another object of this invention consists in the provision of a novel type of coupling transformer for use in radio circuits in which the coupling may be as tight or loose as desired and yet in which there is substantially no external magnetic field.

These and other features and advantages of the invention appear more fully from the detailed description when read in connection with the accompanying drawings and pointed out in the appended claims.

In the drawing:

Figure 1 is a perspective view of a coupling transformer constructed in accordance with this invention;

Fig. 2 is a perspective view showing modified core sections separated and the coils mounted thereon; and

Fig. 3 is a diagrammatic representation of the windings embodying an adjustable inductance feature.

Referring to Fig. 1, 10 indicates a coupling transformer embodying this invention. The coils of the transformer are mounted upon a tubular core or support 11 which may be composed of bakelite or other suitable insulating material. While the core 11 may be of any convenient shape, I preferably employ two sections 12 and 13 which give the transformer a cylindrical configuration. These sections are secured in spaced relation by suitable bands 14 and 15 placed at the upper and lower portions of the core sections.

Upon the core sections 12 and 13 are mounted the windings of the primary and secondary circuits which are wound so that substantially no external magnetic fields of force will be set up in the vicinity of the coil. As shown, a coil comprising the primary circuit consists of a suitable number of turns of wire 16 coiled around the top portion of section 12, and connections to this coil are afforded by binding posts 17 and 18, respectively. In a like manner, an equal number of turns 19 are coiled around the bottom portion of the adjacent D-shaped section 13, and connections to this coil section are afforded by binding posts 20 and 21. These two coils may be connected in series as shown and the arrangement is such that the coil sections 16 and 19 which form the primary circuit are wound in opposite directions so that at any one instant the direction of the magnetic lines of force in the two parts of the coil are opposite as indicated by the letters N and S. The coils comprising the secondary circuit are mounted upon these same supports, the arrangement being similar to that of the primary and shown more clearly in Fig. 2. As shown, a coil 22 forming a portion of the secondary circuit is wound on the top portion of section 13 opposite the primary section 16 and provided with binding posts 23 and 24 and another portion 25 of the secondary coil, oppositely wound, and preferably connected in series therewith, consists of an equal number of turns coiled around the bottom portion of section 12 opposite the primary section 19. This portion of the coil is also provided with binding posts 26 and 27. Any number of primary and secondary sec-

tions may be used, the arrangement being such that the coils of the secondary circuit may be said to interleave with corresponding coils of the primary circuit.

5 The diagrammatic representation of the coil illustrated in Fig. 3 shows the coils in their relative positions and in order that the ratio of the turns may be variable, adjustable contact riders 28 and 29 are provided on a portion of the primary and secondary coils.

In effect the coils of the transformer are in stagger-relation so that the coil portions on each core support are alternately primary and secondary windings. It will be noted that from this interrelation of the coils with respect to each other a substantial magnetic field will traverse the coil sections when an electric current traverses one of the coils of the coupling transformer, the magnetic lines of force following a substantially elliptical closed circuit, the external circuit of the field of force being thus materially reduced. This result is particularly necessary and advantageous in the operation of radio apparatus where great care must be exercised to prevent adjacent apparatus from being affected by electrical disturbances which are inherent in the usual apparatus.

This is particularly true in the operation of fixed couplings in a radio receiving apparatus where it is desirable to obtain a great degree of selectivity of the incoming or transferred signal and the success of the reception of the signal depends to a large extent upon the proper ratio of the windings of the primary and secondary circuits as well as the ability of the instrument to be free from the electric disturbances set up in adjacent apparatus.

While but one modification has been disclosed, it is to be understood that the invention may take various forms and it is desired that it shall only be limited by the scope of the appended claims.

What I claim is:

1. A coupling transformer having primary and secondary windings comprising a pair of insulation cores having their axes parallel, a section of one of said windings on each core at axially displaced positions, said sections being wound in opposite directions, and a portion of said other winding on one of said cores.

2. A coupling transformer having primary and secondary windings comprising a pair of insulation cores having their axes parallel, a section of one of said windings on each core at axially displaced positions, said sections being wound in opposite directions, and a portion of said other winding

on one of said cores adjacent one of said first mentioned sections.

3. A coupling transformer having primary and secondary windings comprising a pair of insulation cores having their axes parallel, a section of one of said windings on each core at axially displaced positions, said sections being wound in opposite directions, and a portion of said other winding on each of said cores.

4. A coupling transformer having primary and secondary windings comprising a pair of insulation cores having their axes parallel, a section of one of said windings on each core at axially displaced positions, said sections being wound in opposite directions, and a portion of said other winding on each of said cores adjacent one of said first mentioned sections.

5. A coupling transformer having primary and secondary windings comprising a pair of parallel adjacent insulation cores, one of said windings being divided between said cores in staggered oppositely wound sections, said other winding being interposed beside said sections and inductively coupled to said first mentioned winding.

6. A coupling transformer for radio systems comprising a primary and a secondary winding, the turns of each winding being divided into groups and staggered to bring alternate groups of one winding into alignment with alternate groups of the other winding, the adjacent groups of each winding being oppositely wound.

7. In a transformer, a primary and a secondary winding, each winding comprising two sections, a section of one winding in axial alignment with a section of the other winding and constituting a pair and arranged parallel to the other pair of sections, the sections of one winding arranged in offset relation to the sections of the other pair and connections between the sections of each winding.

8. In a transformer, a primary and a secondary winding, each winding comprising two sections said sections arranged in axially aligned pairs, one pair parallel with the other, each pair comprising a section of each winding arranged in offset relation, and connections between the two sections of each winding.

9. A coupling transformer comprising a primary and a secondary winding, the turns of each winding being divided into groups, the adjacent ones of which are wound in opposite directions and the alternate groups of each winding being offset laterally to align with the offset groups of the other winding.

In testimony whereof I affix my signature.

WILLIAM J. DOW.