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RADIOFREQUENCY TRANSFORMER

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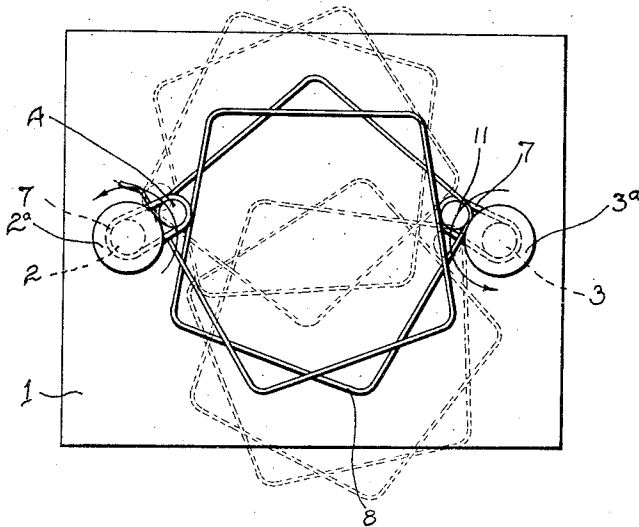


FIG 1

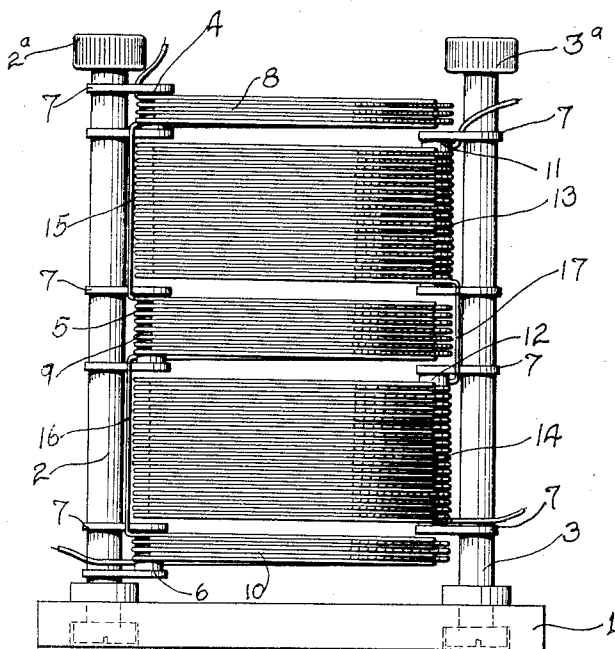


FIG 2

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RADIO FREQUENCY TRANSFORMER

Application filed December 7, 1925. Serial No. 73,678.

My invention relates to a radio frequency transformer, and the objects of my invention are: first, to provide a transformer of this class which is adapted to be connected in various relations with the several parts or elements of radio and wireless transmitting or receiving apparatus alike for synchronizing, tuning or harmonizing the antenna or aerial with the other part of the apparatus under various conditions and for different wave bands; second, to provide a radio frequency transformer consisting of a combination of wire wound coils, substantially cylindrically shaped and wound substantially helically in the open or low loss manner, using the necessary primary and secondary relations or combinations applicable to the different wave bands; third, to provide a radio frequency transformer consisting of sets of spaced apart, interpositioned and intershiftable primary and secondary coils adapted to be readily shifted relatively to each other; fourth, to provide a transformer of this class having intershiftable primary and secondary coils in which the primary and secondary coils are mounted on separate axes and separately shiftable relatively to each other, thus permitting the transformer to be adjusted to an accurate wave form, to the antenna capacity and to the tube capacity, and to correct losses due to incorrect polar attraction, resulting in the reduction of current consumption by the tubes to a minimum; fifth, to provide a transformer of this class in which the primary and secondary coils are constructed in substantially cylindrical form and in separated sections, the several sections of the primary and secondary coils being interpositioned and intershiftable so as to produce more complete induction to the secondary coils or equalization of the impedance of the primary in relation to the secondary coils; sixth, to provide a transformer of this class whereby neutralization of other interfering or undesirable waves is more readily and effectively obtained, and whereby the flow of current is harmonized; seventh, to provide a transformer of this class having intershiftable primary and secondary coils whereby the desired polar relations relatively

to each other and to the adjacent parts of the radio or wireless apparatus are easily obtained for readily controlling radio reception; eighth, to provide as a whole a novelly constructed transformer of this class, and ninth, to provide a transformer of this class which is simple and economical of construction, durable, efficient, practical, and which will not readily deteriorate or get out of order.

With these and other objects in view, as will appear hereinafter, my invention consists of certain novel features of construction, combination and arrangement of parts and portions, as will be hereinafter described in detail and particularly set forth in the appended claims, reference being had to the accompanying drawings and to the characters of reference thereon, which form a part of this application, in which:

Figure 1 is a plan view of my radio frequency transformer, showing by dotted lines the primary and secondary coils shifted in opposite directions, and Fig. 2 is a side elevational view thereof.

Like characters of reference refer to similar parts and portions throughout the views of the drawings.

In order to perform the functions intended by my radio frequency transformer, one of said transformers is positioned at the portion of the apparatus where it is most needed, which is in the antenna circuit. In certain radio hook-ups, one of said transformers is positioned in the circuit of and connected with the detector or rectifier tube; and in certain others, one each of said transformers is used in connection with the second and third stage frequency tubes.

In its preferred form of construction, as illustrated in the drawings, the framework of my radio frequency transformer consists essentially of the nonconducting base 1 on which are rotatably supported at their lower ends the primary coil support 2 and the secondary coil support 3, which are provided, respectively, at their upper ends with knobs 2^a and 3^a for rotating the same as desired. At one side of and intermediate the ends of the primary coil support 2 are positioned the in-

insulating coil supporting members or rods 4, 5 and 6, which are positioned in alinement with and their ends spaced from each other, and are supported at their opposite ends, by means of straps or brackets 7, in spaced relation from and on the rotatable support 2, as shown. The primary coils or coil sections 8, 9 and 10 (the first and last of which are shorter than the other) are wound in a substantially helical and in an open or low loss and cylindrical manner about a plurality of circularly arranged pegs, this particular type of coils being sometimes known as "spider-web coils". These coils 8, 9 and 10 are supported at their one sides between one of the looped and straight portions of the coil winding on the coil supporting rods 4, 5 and 6, respectively, as shown, and are non-rotatably supported relatively to the rotatable support 2. On the rotatable support 3, which is positioned outside of the circumscribing path of the primary coils, are secured other straps or brackets 7, between the ends of each pair of which are supported and secured the opposite ends of other coil supporting members or rods 11 and 12. Intermediate the ends of the supporting rods 11 and 12 are similarly supported secondary coils or coil sections 13 and 14, which are constructed similarly to the primary coils but of greater length and are adapted to be positioned and shifted, respectively, between the primary coils 8 and 9, and 9 and 10. When in their normally closed positions, as indicated by solid lines in Fig. 1, said coils are all in alinement with each other, and in this position provide the greatest induction from the primary coil as a whole to the secondary coil. The primary coils 8 and 9 are connected with each other by a conductor 15, and the primary coils 9 and 10 are connected with each other by a conductor 16, as shown in Fig. 2; the secondary coils 13 and 14 are also connected with each other by means of a conductor 17. The outer or free ends of the primary coil sections 8 and 10, when the transformer is positioned in the antenna circuit, are directly connected with the antenna and with the ground; and the free ends of the secondary coil sections 13 and 14 are both connected with the variable condenser.

When desiring to adjust the primary and secondary coils to synchronize the antenna to the tube characteristics, either one of the coils may be shifted or rotated about its axis, or both may be shifted in opposite directions, as indicated by arrows in Fig. 1, the directions in which either of the coils are shifted depending upon the polar relation of both the primary and secondary coils to the tube and condenser connections. The amount of shifting of either coil in one direction is limited only by the influence of either of the coils on the adjacent parts of the apparatus by reason

of the coils being adapted to induce currents into said adjacent parts.

The division of the primary coil into three sections and the division of the secondary coil into two sections, as shown, develops an equalization of inductance and strengthens the receptive wave, resulting in the reduction of voltage for the tube filament to a marked degree. The combining of coil constructions, as described, and their radial adjustment, in a circuit for broadcasting or receptive radio use, results in straightening out of the sine wave and a synchronization of one part of the apparatus with the other, eliminating, to a marked degree, the so-called static influences, which, in reality, are only lack of harmony or synchronization.

Though I have shown and described a particular construction, combination and arrangement of parts and portions, I do not wish to be limited to this particular construction, combination and arrangement, but desire to include in the scope of my invention, the construction, combination and arrangement substantially as set forth in the appended claims.

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

1. In a transformer of the class described, a pair of spaced apart, independently rotatable, parallel supports, and coils mounted at their one sides on each of said supports, spaced from each other and shiftable relatively to each other into and away from the space between said supports.

2. In a transformer of the class described, a pair of spaced apart, independently rotatable, parallel supports, a substantially helically wound primary coil supported at its one side on one of said supports, and a similarly wound secondary coil mounted at its one side on said other support, the one adjacent ends of said coils being spaced from each other, said coils being revoluble by their respective supports into and away from the space between said supports.

3. In a transformer of the class described, a pair of mutually rotatable, spaced apart, parallel supports, a sectional primary coil having substantially cylindrically shaped coil sections connected with each other but spaced with their adjacent ends from each other and supported at their one sides on one of said rotatable supports, and a similarly constructed sectional secondary coil supported at its one side on said other support with the separate coil sections thereof positioned between the adjacent ends of and spaced from the sections of said primary coil.

4. In a transformer of the class described, a pair of mutually rotatable, spaced apart, parallel supports, a sectional primary coil having substantially cylindrically shaped coil sections connected with each other but

spaced with their adjacent ends from each other and supported at their one sides on one of said rotatable supports, and a similarly constructed sectional secondary coil supported at its one side on said other support with the separate coil sections thereof positioned between the adjacent ends of and spaced from the sections of said primary coil, the axes of the sections of each coil being in alinement with each other, and the axes of each set of said sectional coils as units being at all times parallel with the other and rotatable with their respective supports.

5. In a transformer of the class described, a base, a pair of vertically extending spaced apart supports independently rotatable on said base, knobs on the upper ends of said supports for rotating same, coil supporting rods secured to said supports in spaced apart, parallel relation therewith, and helical coils rigidly secured at their one side to said supporting rods and positioned substantially parallel with said base.

6. In a transformer of the class described, a base, a pair of vertically disposed, spaced apart supports independently rotatable on said base, coil supporting rods secured to each of said supports in spaced apart, parallel relation therewith, a helical primary coil secured at its one side on one of said coil supporting rods, a helical secondary coil secured on its one side to the other coil supporting rod, said coils being rotatable into parallel, spaced apart, overlapping relation.

7. In a transformer of the class described, a base, a pair of vertically extending, spaced apart supports rotatably mounted on said base, a plurality of coil supporting rods secured to each of said supports at intervals, and in parallel relation therewith, sectional helically wound primary and secondary windings secured to said coil supports, said primary winding comprising coil sections secured on their one sides to the coil supporting rods of one of said supports, said secondary winding comprising coil sections secured on their one sides to the coil supporting rods of said second support, said primary and secondary coils being positioned in vertically offset relation and rotatable into parallel overlapping relation.

8. A radio frequency transformer for radio apparatus comprising a base portion adapted to remain in fixed relation with the stationary elements of said apparatus, a plurality of spaced apart primary coils having a substantially common longitudinal axis, means for simultaneously shifting said primary coils relative to said base in planes perpendicular to said longitudinal axis, secondary coils positioned in offset parallel relation with said primary coils and means for shifting said secondary coils into and out of the spaces between adjacent primary coils, whereby the mutual induction of primary and secondary

coils may be varied and reversed in sense and the space relation of said primary coils with fixed portions of the apparatus may be varied.

In testimony whereof, I have hereunto set my hand at San Diego, California, this 30th day of November, 1925.

FREDERICK E. KNAPP.

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