June 10, 1924. 1,497,411

J. C. SNELL

TRANSFORMER

Filed June 2, 1922 2 Sheets-Sheet 1

Fig. 1.

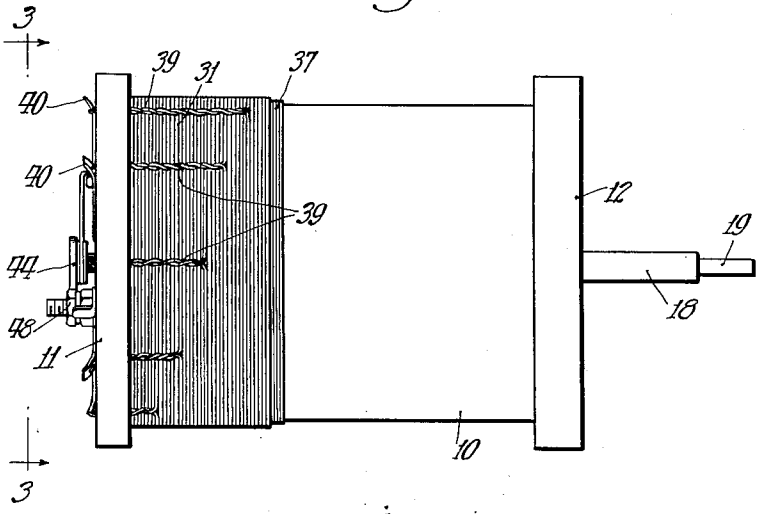


Fig. 2.

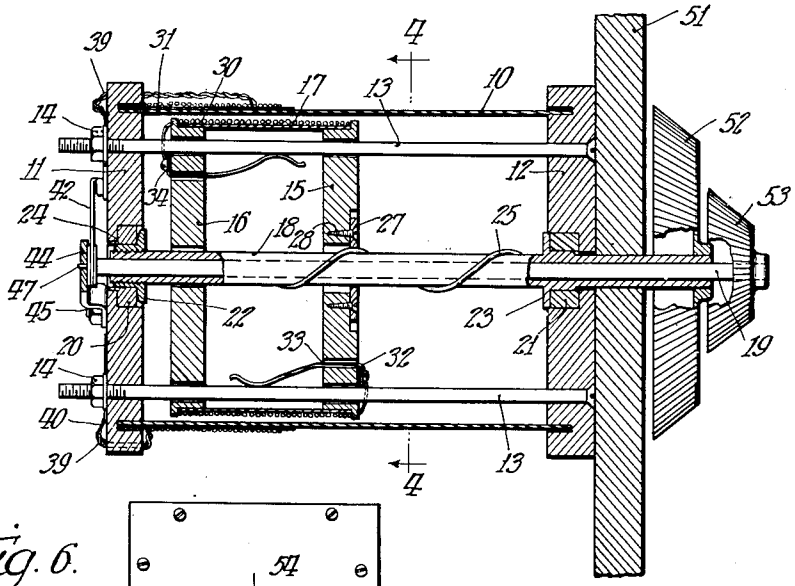
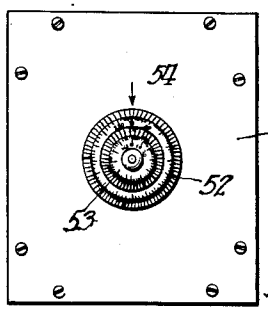


Fig. 6.



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Fig. 3.

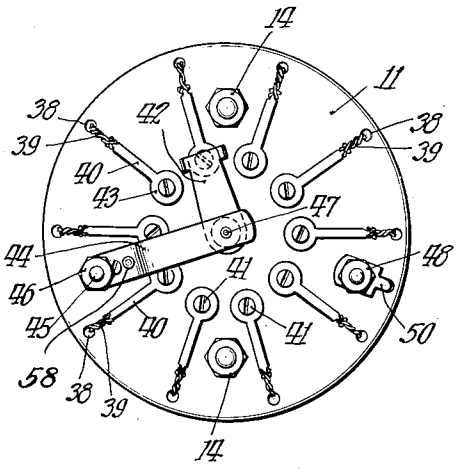


Fig. 4.

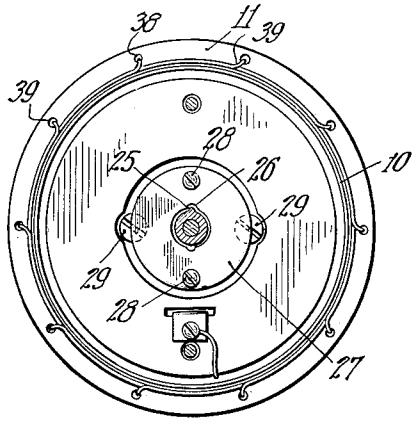
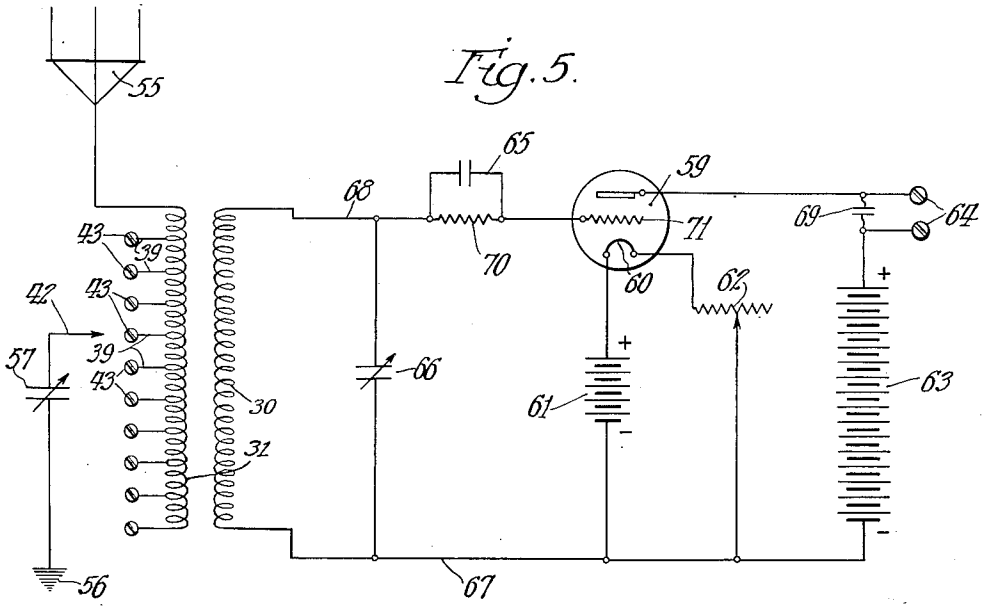


Fig. 5.



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Patented June 10, 1924. 1,497,411

UNITED STATES PATENT OFFICE.

JAMES C. SNELL, OF OAK PARK, ILLINOIS, ASSIGNOR TO PREMIER ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TRANSFORMER.

Application filed June 2, 1922. Serial No. 565,424.

To all whom it may concern:

Be it known that I, JAMES C. SNELL, a citizen of the United States, residing at Oak Park, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Transformers, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to transformers, and more particularly to a transformer used as a coupler in radio apparatus.

It is a purpose of the invention to provide means for varying the ratio between the primary and secondary of a transformer so that a very large amount of different ratios can be obtained and so that very slight changes in the number of effective turns in the two coils can be made for the purpose of tuning a receiving apparatus to various wave-lengths.

It is a further purpose of the invention to provide a radio receiving set with a coupler which comprises a primary coil which is so made that various portions thereof can be connected in the primary circuit and a secondary coil which can be moved so that a varying number of turns thereof will be in the field of the primary coil.

In the particular embodiment shown the primary coil is provided with taps which are connected with contact members which are adapted to be engaged by a movable contact finger for throwing various lengths of the primary winding into the circuit, said primary coil being wound preferably on a cylindrical member and having arranged in coaxial relation thereto the secondary coil which is mounted for axial movement relative to said primary winding so that various portions of the secondary coil will lie in the field of the primary coil in accordance with the desires of the operator. Preferably the movable winding is so mounted that the same is moved axially upon the turning of a suitable knurled head on the forward end of the device, and said head is provided with indicating means to indicate the position of the winding. The movable contact finger is preferably mounted on a shaft which extends through said coupler and out of the forward end thereof, said shaft being also preferably provided with a knurled head having suitable indicating means thereon to indicate the position of the contact finger.

Other objects and advantages of the invention will appear as the description of the accompanying drawings proceeds. However, I desire to have it distinctly understood that I do not intend to limit myself to the exact details shown or described, but that I intend to include as part of my invention all such obvious changes and modifications of parts as would occur to a person skilled in this art, and as would fall within the scope of the claims.

In the drawings:

Fig. 1 is a side elevation of my improved coupler, certain parts thereof being omitted;

Fig. 2 is a longitudinal section thereof;

Fig. 3 is an end view of the coupler looking at the same from the left of Fig. 1;

Fig. 4 is a section taken on the line 4—4 of Fig. 2;

Fig. 5 is a diagram of a receiving circuit showing the coupler in position therein; and

Fig. 6 is a face view looking at the coupler from the forward end thereof.

Referring in detail to the drawings, in Figs. 1 to 4 inclusive is shown a tubular shell 10 of insulating material which is provided with the end blocks or end members 11 and 12, the members 12 having a plurality of rods 13 seated therein which extend through the member 11, and which are screw threaded at the ends thereof to receive the nuts 14. The rods 13 with the nuts 14 thus serve to hold the members 10, 11 and 12 in assembled relation. Mounted on the rods 13 are the blocks 15 and 16 which are disk-like in contour and between which is mounted the tubular member 14 of insulating material. Extending through the members 11 and 12 and through the members 15 and 16 is a hollow shaft 18 within which is rotatably mounted the shaft 19. The shaft 18 is mounted in bearings 20 and 21 respectively in said members 11 and 12, so as to rotate therein, and is provided with flanges 22 and 23 engaging with the inner faces of the members 11 and 12. The flange 22 is provided on a member 24 having screw threaded engagement with one end of the hollow shaft 18. The shaft 18 is provided with a helical rib 25 thereon which acts as a thread of long pitch, and which is adapted

to engage with a slot 26 in the plate 27 secured to the member 15 by any suitable fastening means 28.

It will be seen that as the members 15 and 16 are secured together by means of the screw 29 so as to clamp the member 17 between the same, and as the rods 13 pass through openings in the members 15 and 16 when the shaft 18 is rotated, the thread 25 thereon will cause a movement of the members 15, 16 and 17 axially of the shaft 18 either toward the member 11 or toward the member 12, thus moving the coil 30 provided on the member 17 either into or out of position within the coil 31 provided on the member 10.

It will be seen that the members 13 act as conductors leading to the coil 30, one end of the coil 30 being secured to the outer end portion 32 of a spring contact finger 33 engaging with the lower member 13, and the other end of said coil 30 being connected with the outer end 34 of the contact member 35. The members 13 are provided with conductors positioned beneath the nuts 14, thus the coil 30 will be electrically connected with the conductors through the rods 13 in any position thereof. The coil 31 extends only part of the distance over the cylindrical member 10 and a wrapping 37 of thread is provided for holding the coil 31 in position near the one-end flange 11 of said outer coil carrying member. The member 11 is provided with a plurality of openings 38 through which the leads 39 extend, which are connected with the contact fingers 40, which are secured in position on the member 11 by means of the screws 41. The end of the shaft 19 is provided with a contact finger 42 which is adapted to engage with the contacts 40 at the enlarged ends 43 thereof, and said shaft 19 is held from movement in the direction toward the left in Fig. 1 by means of the spring finger 44 which is secured in position by means of the screw or bolt 45 provided with the nut 46 and held from turning by the pin 58 entering a suitable opening in the member 11. The shaft 19 is provided with a reduced portion 47 which is adapted to engage with an opening in the member 44, whereby the member 44 acts as a bearing for one end of the shaft 19. A conductor may be connected between the nut 46 and the member 44 so as to be electrically connected with the contact finger 42 through the member 47. Said conductor forms one terminal of a circuit, the other terminal of which is connected to the binding screw 48 from which the lead 49 soldered to the finger 50 leads to one end of the coil 31.

It will be noted upon reference to Fig. 1, that the taps 39 are taken from the coil 31 at spaced intervals so as to make it possible to throw varying numbers of turns of the coil 31 into the circuit, depending upon the position of the finger 42 relative to the contacts 43, to each of which one of the taps 39 is connected. The coupler comprising the coils 30 and 31 is preferably mounted in a panel 51, and a knurled head 52 is preferably provided on the hollow shaft 18. A similar head 53 is provided on the shaft 19. The heads 52 and 53 are provided with any suitable graduations thereon, the same being shown as being graduated in degrees so that the total distance which the inner coil may travel relative to the outer coil is designated by 360 degrees on the head 52. Any suitable marking, such as the arrow at 54, may be used to indicate the position of the coil relative to the panel 51. The head 52 is provided with similar markings to indicate the position of the contact finger 42.

Referring now to Fig. 5, it will be seen that the coil 31 is positioned between the antenna 55 and the ground at 56, a variable condenser 57 being provided between the contact finger 42 and the ground 56. It will be seen that various lengths of the coil 31 can be thrown into the primary circuit by moving the contact finger 42 into co-operative relation with the different contact members 43. The coil 30 is in the secondary circuit, and it will be seen that the influence of the coil 31 thereon will depend upon the distance that the coil 30 projects into the coil 31. The coil 30 is positioned in a standard receiving circuit comprising the audion or amplifier 59 having the filament 60 which is supplied with current from the battery 61, a variable resistance 62 being provided in the filament circuit. The receiving circuit also comprises the battery 63 and the receivers 64. A variable condenser 66 is bridged across the lines 67 and 68 and a condenser is provided at 69 bridging the lines leading to the receivers. A condenser 65 and a high resistance 70, acting as a grid leak, are also provided in the lead 68 to the grid 71.

It will be evident that due to the fact that various portions of the coil 31 can be put into use as desired and that various portions of the secondary winding 30 can be projected within the portions of the coil 31 in use, the apparatus can be tuned to a wide variety of wave lengths, and it will be seen that very fine adjustments are possible by the arrangement set forth.

Having thus described my invention, what I desire to claim and secure by U. S. Letters Patent is:

1. In a device of the character described, a pair of coaxially arranged windings, the outer of said windings being fixed and the inner of said windings being movable and means for moving said inner winding axially relative to said outer winding, com-

prising a rotatable member, a driving connection between said member and said winding comprising a helical thread and means for holding said winding against rotation, whereby said winding moves in an axial direction upon rotation of said rotatable member, said last mentioned means serving to connect said inner winding with a pair of fixed contacts for any position thereof.

2. In a device of the character described, a pair of coaxially arranged windings, the outer of said windings being fixed and the inner of said windings being movable and means for moving said inner winding axially relative to said outer winding, comprising a rotatable member, a driving connection between said member and said winding, comprising a helical thread and a pair of guide rods for holding said winding against rotation, whereby said winding moves in an axial direction upon rotation of said rotatable member, said inner winding having means engaging said rods to connect the opposite ends of said winding therewith.

3. In a device of the character described, a pair of co-axially arranged windings, one of said windings having rotatable means for throwing various lengths thereof in circuit, and the other of said windings having rotatable means for moving the same axially of said first winding, co-axially arranged means for turning each of said rotatable means, and means for indicating the position of each of said turning means.

In witness whereof, I hereunto subscribe my name this 23rd day of May, A. D., 1922.

JAMES C. SNELL.