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TUNING APPARATUS

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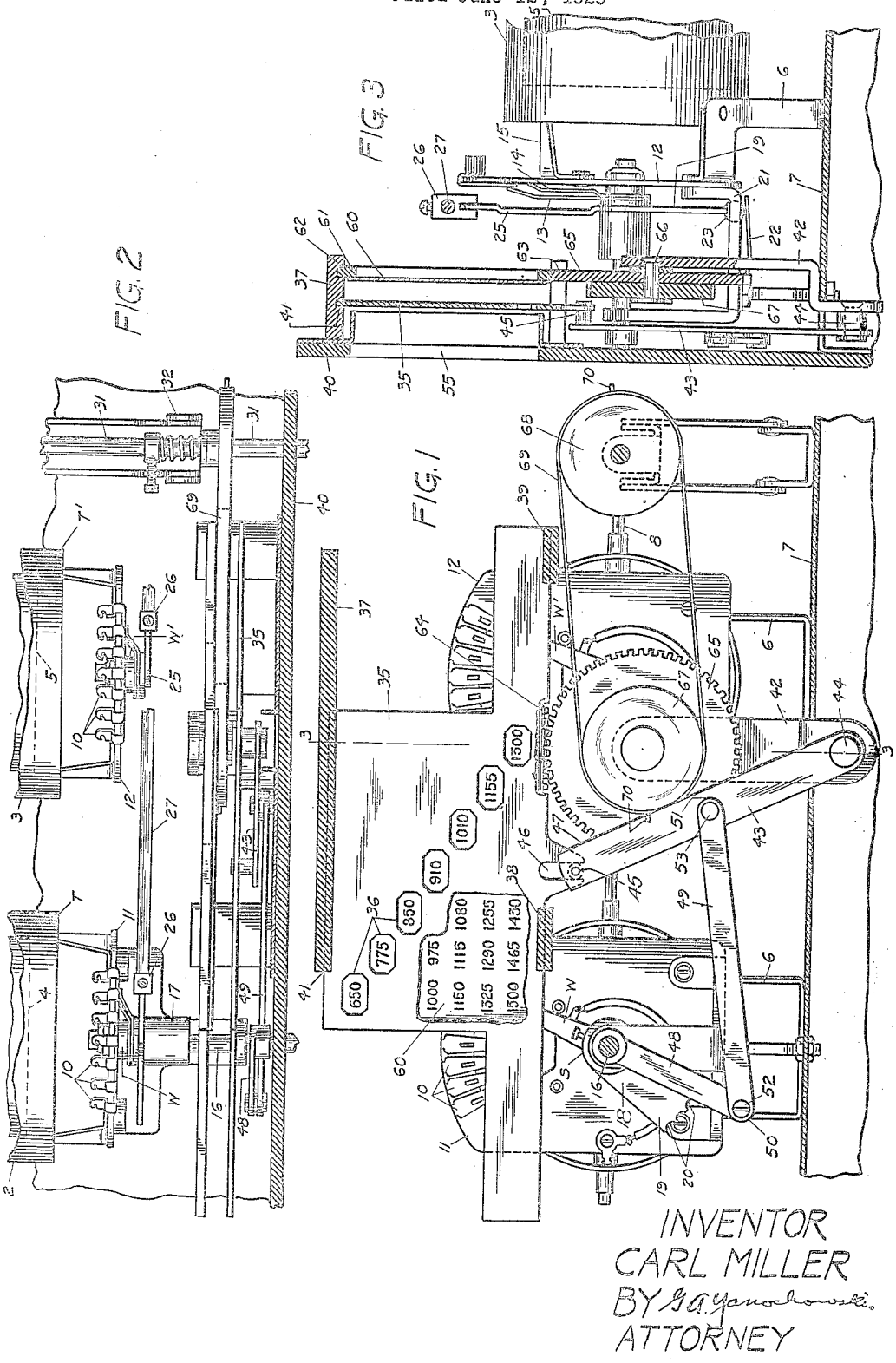

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TUNING APPARATUS

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My invention relates to the tuning of a multiple arrangement of couplers or transformers such as are used in an inductively tuned radio receiving circuit, and has to do more particularly with multiple couplers or transformers, the inductances of the secondaries of which are simultaneously varied in steps by means of a switch arrangement and in which the inductances of the transformers are simultaneously varied within the steps by a separate control arrangement.

An object of my invention resides in the provision of a novel indicator for an arrangement of the above type and the method of construction and arrangement of parts for operating the same.

A feature of my invention is the provision of a pair of indicator plates, having a reciprocating movement, which are associated, respectively, with the mechanism for varying the inductance of the secondaries of the couplers in steps and the mechanism for varying the inductance within the steps, to produce in effect a single indication.

Another feature of my invention is the provision of an arrangement associated with a switching device for varying the secondaries of the transformers by steps and which, when moved in successive steps, also actuates an arrangement to move an indicator chart associated therewith correspondingly to indicate the position or zone to which the switch has been moved.

Still another feature of my invention is the provision of a suitable rack and gearing arrangement, associated with a control device for varying the inductance within the various steps or zones of the secondaries, which, when actuated, moves an indicator plate associated therewith to indicate the calibration of the particular zone to which the switch associated with the secondaries of the couplers has been stepped.

The above features as well as others not particularly pointed out above will be more fully described in the ensuing specification and pointed out in the appended claims.

For a more complete understanding of my invention reference may be had to the accompanying drawing in which like reference characters in the several views denote like parts and in which

Fig. 1 is a front elevation of the indicator control of my invention operatively associated with a multiple control arrangement and in which the front panel has been removed to more clearly illustrate the mechanism associated therewith;

Fig. 2 is a top view of Fig. 1, and

Fig. 3 is a sectional view along the line 3—3 of Fig. 1.

Referring now more in detail to the accompanying drawing, the dial control apparatus of my invention, for the purpose of illustration and description, is shown associated with a multiple control arrangement for controlling an inductively tuned circuit. The transformers T and T′ comprise the stator elements 2 and 3, and the rotor elements 4 and 5, shown in dotted lines in Fig. 2, rotatably mounted within these stator elements. The stator elements 2 and 3 are secured to the brackets 6 which are in turn secured to a sub-panel 7 by suitable screws. The rotor elements 4 and 5 are supported on a suitable rod 8 and may be rotated 90 degrees or until their axes are at right angles to the axes of the stator tubes 2 and 3. The stators 2 and 3 support suitable windings (not shown in the drawing); taps from these windings are connected to contacts 10 mounted upon the panels 11 and 12. The contacts 10 of each panel are arranged in an arc of a circle and a double wiper arm W or W′, comprising wipers 13 and 14, is adapted to wipe over the contacting ends of its respective group of contacts 10.

The panel 11 associated with the transformer T is located forward of the stator element 2 and is secured to angular extensions of the bracket 6 and additional securing means for the panel 11, in the form of brackets 15 which are secured respectively to the panel 11 and stator elements 2 and 3, rigidly secure the upper portion of the panel 11 against movement. The wiper arms 13 and 14 of the wipers W and W′ are supported by a suitable member 17 rotatably mounted on the panel 11. A shaft 16 is secured to the supporting member 17. When this shaft is rotated by a suitable knob attached thereto, it

causes the wiper arms 13 and 14 to move step by step to engage successive contacts 10. An arm 18 secured to the member 17 is provided with a fan shaped extension 19 having in its arcuate shaped edge a plurality of notches 20 equal in number to the contacts 10 secured to the panel 11. A bracket 21, secured to the panel 11, supports a leaf spring 22, the free end of which presses a ball bearing 23, which rests in an orifice in the bracket 21, into engagement with the notches 20 in the arm 18. As the shaft 16 is rotated to move the wiper arms 13 and 14 from one contact 10 to another, the arm 18 also rotates and the successive notches 20 engage the spring pressed ball 23 to produce a snap action as the wiper arms 13 and 14 pass from one contact 10 to the next.

The wiper W′ associated with the transformer T′ is rotatably supported on the panel 12 in a manner similar to wiper W and has associated with it an arm 25. Links 26 are pivotally secured, respectively, to the free ends of the arms 18 and 25 and orifices extending through the links 26 receive a rod 27 which is held in the links 26 by means of suitable screws. As the rod 27 connects the arms 18 and 25, associated with the wipers W and W′, it is apparent that when the shaft 16 is operated the arm 18, moving with the wiper W, transmits movement to the arm 25, causing the arm 25 and its associated wiper W′ to move in unison with the arm 18 and wiper W′.

The rotor elements 4 and 5 of the transformers T and T′ are supported within the stator elements 2 and 3 on the rod 8 which is rotatably supported in suitable bushings secured to the stator elements 2 and 3, and are rotated by the rods 31 and 8 in a manner well understood in the art, and it is not deemed necessary to give a detailed explanation of this operation or to show it in Fig. 2 of the drawing. Cooperating bevel gears (not shown) are secured respectively to the rod 8 and a control shaft 31 rotatably supported in a bracket 32. Thus, movement of the shaft 31, by means of a suitable knob secured thereto, transmits rotary motion to the rod 8 and the rotor elements secured thereto. Only a brief description of the multiple control arrangement illustrated, with which the dial control of my invention is associated, is given above. For a more complete understanding of the same reference may be had to the Patent No. 1,740,977 granted to Fred E. Freers, December 24, 1929.

Having described in general the multiple control arrangement with which I associate the indicator control of my invention, I will now describe in detail the indicator control mechanism and the operation of the same in association with the multiple control arrangement illustrated. The windings supported on the stator elements 2 and 3 are tapped as before described and connected to the contacts 10 secured to the respective plates 11 and 12. There are as many contacts as there are taps from these windings, seven contacts 10 being shown in the drawing. The wipers W and W′ are moved from one contact on the respective plates 11 and 12 to the next through the medium of the shaft 16 as before described. The different positions to which the wipers W and W′ move in engaging successive contacts may be termed zones. The shaft 16 and its associated mechanism for controlling the movement of the wipers W and W′ from one zone position to the next may be called a zone switch indicated generally by the reference character S.

To indicate the position or zone to which the wipers W and W′ have been moved I provide a zone indicator plate 35 which is operatively associated with the zone switch S. The zone indicator plate 35 is provided with seven rectangular openings or windows 36, spaced relative to each other both horizontally and vertically. The number of windows 36 corresponds to the number of positions to which the zone switch S may be moved. An upper guide member 37 and lower guide members 38 and 39, suitably supported by the front panel 40, are provided with grooves 41 which receive the opposite edges of the zone dial plate 35 to guide said plate as it is moved horizontally from left to right and vice versa through the medium of suitable mechanism connecting the zone indicator plate 35 to the zone switch S. A bracket 42 is secured to the sub-panel 7 forward of the stator elements 2 and 3. An upwardly extending arm 43 is pivotally supported on bracket 42 by means of a pivot pin 44. At the free end of the arm 43 is a pin 45 which extends laterally into a slot 46 in a depending member 47 formed integrally with the zone indicator plate 35, for purposes which will presently be described. A depending arm 48, secured to the shaft 16 of the zone switch S, is linked to the arm 43 by means of a link member 49, the ends 50 and 51 of which are pivotally secured respectively to the free end of the arm 48 and the arm 43 by means of the pivot pins 52 and 53. The contacts of the zone switches associated with the transformers T and T′, are so spaced that the wipers W and W′ move through an arc of 48 degrees in their travel from the first to last contact or vice versa or through an arc of 8 degrees when moved from one zone contact to the next. The arm 48, secured to the shaft 16 thus moves through like arcs. The link 49 is joined to the arm 48 and to the arm 43 at equal distances from their fulcrums. Thus the arm 43 also will move through corresponding arcs. As the zone switch S is rotated

through the medium of the shaft 16, the arms 48 and 43, joined thereto, move in a like manner. The said levers and parts are so proportioned and interconnected that the movement of the zone switch S from one contact to the next causes the pin 45 on lever 43 to move the indicator plate 35 horizontally a distance equal to the horizontal distance between successive windows 36 in the indicator plate. The front panel 40 has a vertical opening 55 which is substantially the same width as one of the windows 36 and equal in height to the distance from the lower side of the lowest of the windows 36 to the upper side of the highest of the windows 36, and so positioned that as the indicator plate 35 is moved laterally one or another of the windows 36, corresponding to the zone position of switch S, will be brought into position behind the vertical opening 55 in the panel 40.

Positioned behind the indicator plate 35 is a selector chart 60 which comprises a rectangular frame 61 supporting a sheet of transparent material on which are seven horizontal rows of calibrations, corresponding to the seven zones, as illustrated in Fig. 1. The selector chart 60 is supported in slots 62 in the upper guide member 37 and lower guide members 38 and 39 and may be moved from left to right and vice-versa horizontally through the medium of suitable mechanism connecting the selector chart 60 and the selector shaft 31. The lower edge 63 of the frame 61 is in the form of a toothed rack 64 which meshes with a gear 65 rotatably supported on a stub shaft 66 secured to the bracket 42. A pulley 67, secured to the gear 65, and a pulley 68, secured to the selector shaft 31, are connected by a metal belt 69. Thus, rotation of the selector shaft 31 causes rotation of the pulleys 68 and 67. The gear 65, to which the pulley 67 is secured, is also rotated and, being in mesh with the toothed rack 64 of the selector chart 60, movement is transmitted to the selector chart 60. Pins 70 in the respective pulleys 67 and 68 extend through the metal belt 69 to prevent slippage of the same.

The horizontal rows of numbers on the chart 60 which indicate the calibrations within the respective zones correspond in vertical position to the zone windows 36 in indicator plate 35. Thus it will be seen that as the zone switch S is moved from zone to zone, the windows 36 will successively be brought in position to disclose the proper horizontal row of calibrations on chart 60.

As above described, the gear 65 will be rotated incident to the rotation of shaft 31. Thus as the rotor elements 4 and 5 are rotated to vary the inductance within a zone the chart 60 will be moved to display at one or another of windows 36 the calibration corresponding to the particular inductance selected. It will be obvious that the position of the zone switch S and therefore, of the indicator 35, will determine which of the horizontal rows of calibrations on chart 60 will be disclosed. The only calibrations on chart 60 which will be visible will be those of the horizontal row corresponding in vertical position to the window 36 positioned before slot 55 by the zone switch S.

Having described in detail the mechanism comprising the indicator control of my invention and its association with a multiple control arrangement, I will now describe the operation of the same. In an inductively tuned arrangement, such as illustrated, the zone switch shaft 16 will be rotated by means of a suitable knob to a position corresponding to a desired frequency band. Through the medium of the arms 43 and 48 and link 49, reciprocating movement is given to the zone indicator 35 as before described. The zone indicator 35 will be moved to the right or left as the case may be to position a predetermined zone window 36 before the opening 55 in the panel 40. The window 36 thus positioned will represent the particular frequency band or zone selected by switch S. The desired zone having been selected, the shaft 31 will be rotated by a suitable knob to cause the rotor elements 4 and 5 to select the desired inductance within the selected zone. During the selective operation of shaft 31, the chart 60 will be shifted laterally to at all times display the calibration corresponding to the selected inductance opposite the zone window 36 before slot 55. This operation will clearly appear from an inspection of Fig. 1 of the drawing. A light bulb (not shown) may be mounted behind the selector chart to illuminate the same so that the calibrations thereon may be made visible to the operator through one or another of the windows 36.

While I have illustrated and described the indicator control of my invention in connection with a particular multiple arrangement, it is to be understood that it is applicable to other forms of control mechanism. I also do not wish to be limited to the exact structure shown but aim to cover all such changes and modifications as come within the spirit and scope of the appended claims.

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

1. A device of the character described including a tuning element having a plurality of operative positions, a control member for moving said tuning element to any of its operative positions, an indicating plate for said tuning element having a plurality of orifices therethrough, a cover plate overlying said indicator plate and having an opening therein, and means controlled by said control member for moving said indicator

plate to position the orifice of said plurality of orifices associated with the then position of said tuning element in alignment with the opening in said cover plate.

2. A device of the character described including a tuning element having a plurality of operative positions, a control member for moving said tuning element to any of its operative positions, a zone indicating plate for said tuning element having a plurality of orifices therethrough, a cover plate overlying said indicator plate and having an opening therein, and means controlled by said control member for imparting a reciprocating movement to said indicator plate to position the orifice of said plurality of orifices associated with the then position of the tuning element in alignment with the opening in said cover plate.

3. A device of the character described including a tuning element having a plurality of operative positions, a control member for moving said tuning element to any of its operative positions, a zone indicating plate for said tuning element having a plurality of orifices therethrough, said orifices being offset laterally and also longitudinally of said plate, a cover plate overlying said indicator plate and having an opening therein, and means controlled by said control member for moving said indicator plate rectilinearly to position the orifice of said plurality of orifices associated with the then position of said tuning element in alignment with the opening in said cover plate.

4. A device of the character described including a tuning element having a plurality of operative positions, a control member for moving said tuning element to any of its operative positions, an indicating plate for said tuning element having a plurality of orifices therethrough, a cover plate overlying said indicator plate and having a slot therein, and means controlled by said control member for imparting a rectilinear reciprocating movement to said indicator plate to position the orifice of said plurality of orifices associated with the then position of the tuning element in alignment with the opening in said cover plate.

5. A device of the character described including a zone indicating plate having a plurality of orifices therethrough, a cover plate overlying said indicator plate and having an opening therein, means for moving said indicator plate to position a selected one of said plurality of orifices in alignment with the opening in said cover plate, a selector indicating chart positioned back of said zone indicating plate, said chart having a plurality of series of calibrations thereon, and a control member for moving said chart to cause a series of calibrations to pass in operative relation to the selected orifice in said zone indicating plate.

6. A device of the character described including a zone indicating plate having a plurality of orifices therethrough, a cover plate overlying said indicator plate and having an opening therein, means for imparting a reciprocating movement to said indicator plate to position a selected one of said plurality of orifices in alignment with the opening in said cover plate, a selector indicating chart positioned back of said zone indicating plate, said chart having a plurality of series of calibrations thereon, and a control member for moving said chart to cause a series of calibrations to pass in operative relation to the selected orifice in said zone indicating plate.

7. A device of the character described including a zone indicating plate having a plurality of orifices therethrough, a cover plate overlying said indicator plate and having an opening therein, means for moving said indicator plate to position a selected one of said plurality of orifices in alignment with the opening in said cover plate, a selector indicating chart positioned back of said zone indicating plate, said chart having a plurality of series of calibrations thereon, and a control member for imparting a rectilinear movement to said chart to cause a series of calibrations to pass in operative relation to the selected orifice in said zone indicating plate.

8. A device of the character described including a zone indicating plate having a plurality of orifices therethrough, a cover plate overlying said indicator plate and having an opening therein, said openings being offset laterally and longitudinally of said plate, means for imparting a rectilinear movement to said indicator plate to position a selected one of said plurality of orifices in alignment with the opening in said cover plate, a selector indicating chart positioned back of said zone indicating plate, said chart having a plurality of series of calibrations thereon, and a control member for imparting a similar rectilinear movement to said chart to cause a series of calibrations to pass in operative relation to the selected orifice in said zone indicating plate.

Signed by me at Chicago, in the county of Cook and State of Illinois, this 10th day of June, 1929.

CARL MILLER.