April 27, 1937. C. A. GUNTHER 2,078,909

TUNING APPARATUS

Filed Oct. 31, 1934 2 Sheets-Sheet 1

Fig. 1.

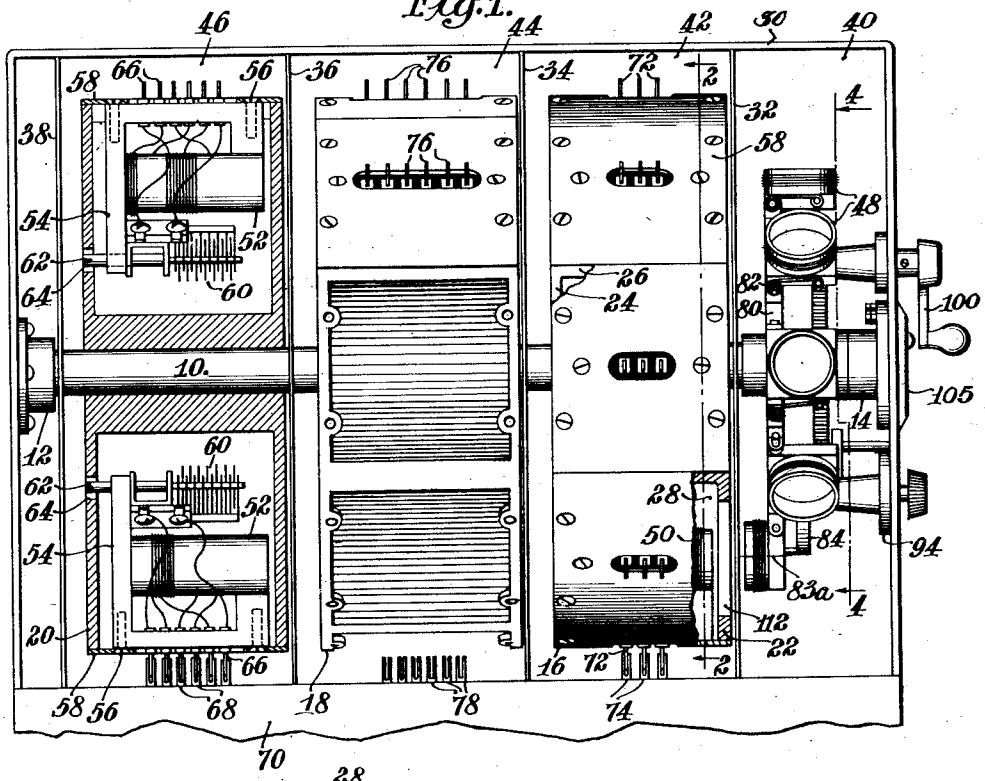


Fig. 2.

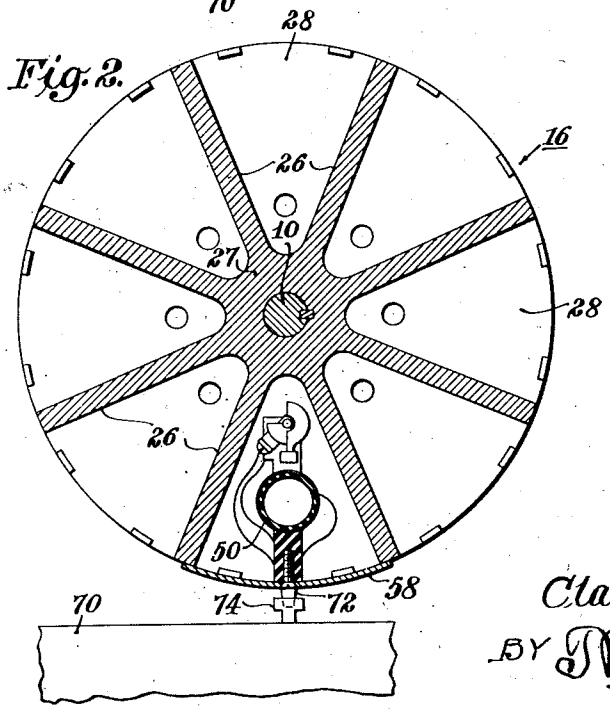
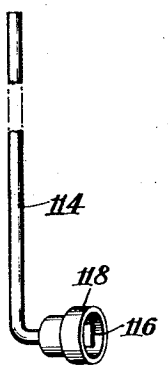


Fig. 3.



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Fig. 4.

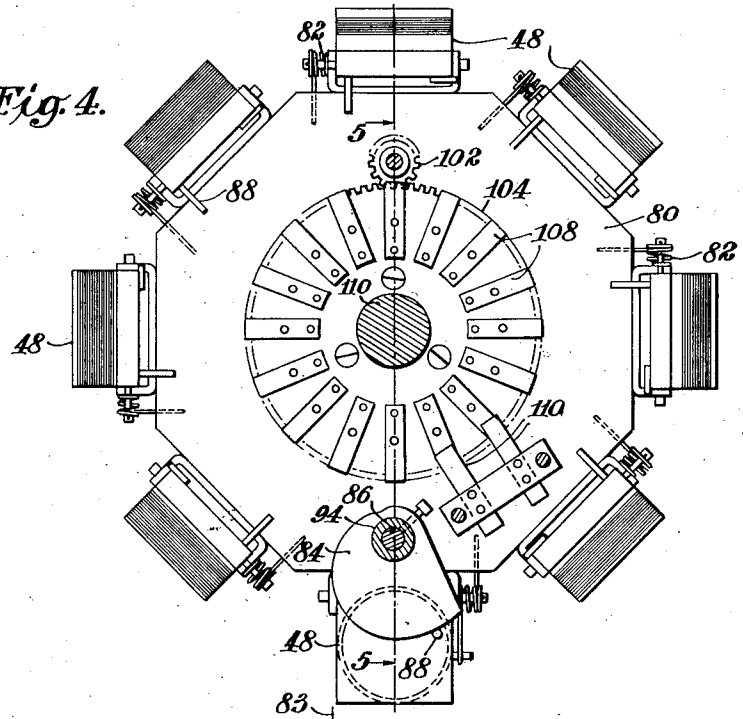


Fig. 5.

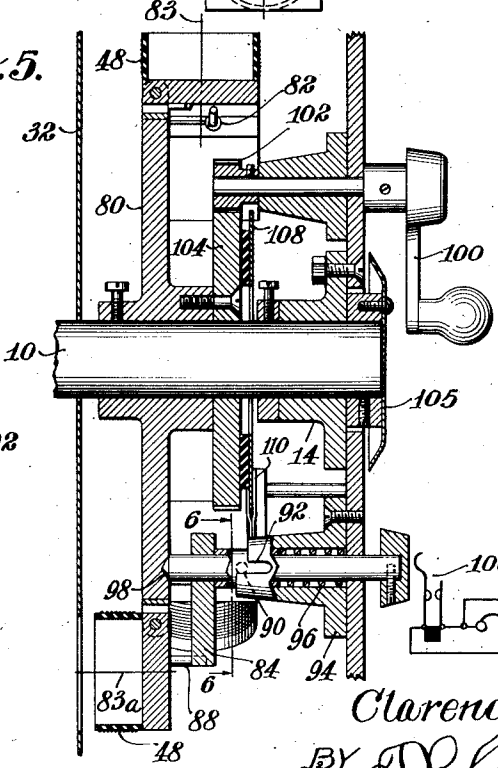
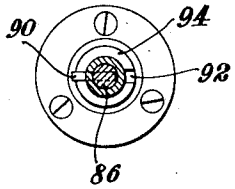


Fig. 6.



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UNITED STATES PATENT OFFICE

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TUNING APPARATUS

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Application October 31, 1934, Serial No. 750,811

10 Claims. (Cl. 250—40)

My invention relates to improvements in tuning apparatus for radio receivers and the like.

For the purpose of tuning over a wide frequency range in radio reception, sets of transformer coils and associated trimming condensers are usually provided for the tuned circuits, each set being designed to cover a given frequency band in the entire range. The different sets of tuning coils and trimming condensers are connected in circuit selectively by a wave-change switch.

One of the objects of my invention is to provide improved tuning apparatus for a radio receiver of the character referred to in which the tuning coils and condensers are so mounted and disposed with respect to each other that a change from one frequency band to another can be made easily and quickly, and in which provision is made for shielding the different groups of tuning elements from each other.

Another object of my invention is to provide improved tuning apparatus for a radio receiver of the character referred to which is relatively simple in construction and in its manner of operation, and in which adjustments can be made easily while the receiver is in operation.

Other objects and advantages will hereinafter appear.

In accordance with my invention, a group of antenna coils and a plurality of groups of coils for the radio frequency stages are disposed in separate compartments about a common axis, and are rotated together in changing from one band to another. A set of fixed contacts engages successively with complementary contacts connected to the tuning elements, whereby the proper element of each group is placed in circuit for reception over the selected band of the entire frequency range.

The antenna coils are normally out of inductive relation with respect to the tuning coils of the first radio frequency stage, the particular antenna coil needed for reception over a given band being swung into operating position after the required movement of all the parts has been made.

My invention resides in the improved construction of the character hereinafter described and claimed.

For the purpose of illustrating my invention, an embodiment thereof is shown in the drawings, wherein

Figure 1 is an elevational view, partly in section, of tuning apparatus constructed and operating in accordance with my invention, some of the parts being removed for the sake of clearness;

Fig. 2 is a sectional view, the section being taken on the line 2—2 in Fig. 1;

Fig. 3 is a perspective view of a wrench used in making adjustments in my improved apparatus;

Fig. 4 is a sectional view, the section being taken on the line 4—4 in Fig. 1;

Fig. 5 is a sectional view, the section being taken on the line 5—5 in Fig. 4; and

Fig. 6 is an enlarged sectional view, the section being taken on the line 6—6 in Fig. 5.

In the drawings, the reference numeral 10 designates a shaft journaled at its ends in bearings 12 and 14, and on which are fixed members 16, 18 and 20 for supporting the tuning coils and condensers.

The member 16 is comprised of circular end walls 22 and 24 and partitions 26 between the latter to form compartments 28. The partitions 26 extend radially outwardly from a central bearing portion 27 through which the shaft 10 extends. The members 18 and 20 are of the same construction.

The apparatus is enclosed in a casing 30 provided with shielding partitions 32, 34, 36 and 38 to form compartments 40, 42, 44 and 46.

The tuning apparatus disclosed by way of example is for use in a radio receiver in which eight frequency bands are used to cover a frequency range of 1,000 to 30,000 kilocycles. Any other range, naturally, could be covered by properly designing the inductors and trimmers. Eight antenna coils 48, one for each band, are disposed in the compartment 40. Eight transformer coils 50, for the first radio frequency stage, are carried by the rotary member or drum 16. Eight transformer coils, for the second radio frequency stage, are carried by the member 18, and eight transformer coils 52, for the third radio frequency stage, are carried by the member 20.

Each of the coils 52 is mounted on a bracket 54 which is fixed by screws 56 to a base plate 58. A trimmer or so-called lining-up condenser 60 is secured to the bracket 54 and is connected in circuit with the coil 52, as represented. This condenser is of the air type, adjustable and self-locking. The end of the shaft 62 to which the rotor plates are fixed is notched and extends through an opening 64 in the adjacent end wall of the member 20. The base plate 58 is screwed into place, as shown, for which purpose the edges of the end walls of the member 20 are tapped. The coil 52, the condenser 60, the base plate 58,

and the associated bracket 54 comprise a unit disposed within one of the chambers of the member 20. The unit is provided with contacts 66 which extend radially outwardly and engage with complementary fixed contacts 68 secured to a casing 70 containing other parts of the receiver, such as a gang condenser (not shown), with which the coil 52 and the condenser 60 are to be connected. Similar units are disposed in each of the other seven chambers of the member 20. The base plates 58 of these units close these chambers, and form with the member 20 a cylindrical drum.

The coils associated with the members 16 and 18 form part of units which are similar to those just described, and which are disposed, respectively, in the compartments of these members. The units associated with the member 16 are provided with contacts 72 which engage with fixed contacts 74, and the units associated with the member 18 are provided with contacts 76 which engage with fixed contacts 78.

The antenna coils 48 are pivotally mounted, as represented, to the edge of a plate 80 fixed to the shaft 10. By means of springs 82, the coils 48 are biased to the position in which their axes 83 are perpendicular to the shaft 10. In this position, there is no coupling between the antenna coils 48 and the tuning coils 50 in the adjacent compartment 42.

In operation, a tuning unit of each of the three groups of units is connected in circuit, and the antenna coil for the particular frequency band selected is in position with its axis 83*a* parallel to the shaft 10, as shown in Fig. 1, so that this coil is inductively coupled to the adjacent coil 50 whose axis is also parallel to the shaft 10. The antenna coil is held in operating position by a cam 84 fixed on a shaft 86 which engages a pin 88 extending outwardly from the antenna coil, as more clearly shown in Fig. 5. In tuning for reception over the next frequency band, the operator rotates the shaft 86 in a counter-clockwise direction, as viewed in Fig. 4, to permit the antenna coil to swing back, under the action of the spring 82, to the position in which its axis is perpendicular to the shaft 10. In doing this, the shaft 86 must be turned through 180° to the position in which a pin 90, fixed to this shaft, is adjacent a slot 92 in the bearing member 94. The shaft 86 can then be pulled outwardly to the right, as viewed in Fig. 5, to compress a spring 96 and withdraw the end of the shaft from an indexing hole 98 in the face of the plate 80. The shaft 10 can then be rotated by turning a crank 100 connected to the shaft through gears 102 and 104. When the next set of tuning elements is in position, the spring 96 causes the end of the shaft 86 to snap into the next indexing hole in the plate 80. The shaft 86 is then rotated in a clockwise direction through 180° to swing the antenna coil into the correct position, with its axis parallel to the shaft 10. When it is desired to tune through more than one frequency band, the shaft 86 is held out until the shaft 10 has been rotated to bring the required set of tuning units into operating position.

An index plate 105 fixed to the end of the shaft 10 provides an indication of the frequency band for which the apparatus is adjusted.

A switch 106 is arranged as shown diagrammatically in Fig. 5, to be closed and short-circuit the head-phones 107 when the shaft 86 is pulled out. In this way, excessive noise is prevented when shifting from one band to another.

The antenna coils are connected in circuit by contacts 108 carried by the gear 104 and which engage with fixed contacts 110.

The end wall 22 of the member 16 is provided with openings 112 adjacent the coils 50 so that this wall does not shield the latter from the antenna coils 48. The portion of the shield 32, adjacent the holes 112 may also be cut away or made of a reticulated screen material or the like which will not interfere with the inductive coupling.

When any given set of tuning units is in working position, the trimming condensers can be adjusted. For example, if it is desired to adjust the operating condenser 60, a wrench 114, shown in Fig. 3, is inserted between the partition 38 and the adjacent end wall of the member 20 to position a blade 116 with which it is provided in the notched end of the condenser shaft 62. The cup-like head 118 fits over the end of the shaft 62, and operates to hold the wrench in place, while the shaft is turned to make the desired adjustment of the condenser.

Since there are eight sets of tuning units to cover as many different frequency bands over the entire operating range, it is proposed that there be an eight to one reduction between the gears 102 and 104. In this way, it is provided that a change to the next frequency band is made by one complete turn of the crank 100.

From the foregoing it will be seen that I have provided improved tuning apparatus which comprises a plurality of tuning elements or units supported about a common axis and in individual groups disposed along this axis, the elements of each group being shielded from each other by the partitions 26. It will also be seen that on account of the interlocking action of the pin 90 and the slot 92, and the entry of the end of shaft 86 in the indexing holes 98, the shaft 10 cannot be rotated until the shaft 86 has been rotated to permit the antenna coil to swing back out of operating position under the action of the biasing spring 82.

While but one embodiment of my invention has been shown, it will be understood that various modifications, within the conception of those skilled in the art, are possible without departing from the spirit of my invention or the scope of the claims.

I claim as my invention:

1. Tuning apparatus comprising a plurality of tuning elements, means supporting said elements about a common axis and for movement to different angular positions with respect to said axis, contact means associated respectively with said elements, means common with respect to said elements and cooperable with said contact means for connecting said elements in circuit, means supporting said first and third named means for rotary movement relatively with respect to each other whereby said units can be connected in circuit selectively, and means for changing the angular position of the connected element with respect to said axis.

2. In a radio receiver, a first group of coils, a second group of coils, means supporting the coils of each group about a common axis with said groups disposed along said axis and with the coils of the first group normally disposed with their axes substantially perpendicular to the common axis and with the coils of the second group disposed with their axes substantially parallel to the common axis, contact means for connecting

simultaneously adjacent coils of said groups in circuit, and means for moving the connected coil of the first group into position with its axis substantially parallel to the common axis.

3. A coupling unit for a structure herein described, comprising a shielding casing, a plurality of separate circuit units mounted around the inner periphery of the casing, said circuit units including impedances, contacts carried by said units connected to said impedances and extending through the casing, fixed contacts connected to the circuit, exterior of the casing but adapted to be engaged by the contacts extending through said casing as the same is rotated, and means for rotating the casing.

4. A coupling unit for a structure herein described, comprising a shielding casing, a plurality of separate circuit units mounted around the inner periphery of the casing, said circuit units including impedances, each of said circuit units comprising an insulator having a base portion and a stem, said base portion fitting the inner part of the casing and having switch contacts extending through the casing, said stem carrying at least one impedance connected to said switch contacts for the purpose described.

5. A coupling unit for a structure herein described, comprising a shielding casing, a plurality of separate circuit units mounted around the inner periphery of the casing, said circuit units including impedances, each of said circuit units comprising an insulator having a base portion and a stem, said base portion fitting the inner part of the casing and having switch contacts extending through the casing, said stem carrying at least one impedance connected to said switch contacts for the purpose described, characterized in that the stems of said insulators are positioned and arranged so as to be on lines extending to the axis of the casing.

6. A combination structure for the purpose described, including a plurality of separable coupling units, each composed of a plurality of similarly constructed circuit units including impedances having suitable electrical values for responding to electrical impulses of different frequencies, said coupling units being shielded one from the other and arranged so the impedances for the same frequency band for all the circuits are in accurate alignment around the axis of the structure, switch contacts connected to said impedances, means for rotating all of said coupling units and switch contacts together, and stationary contacts connected to the various circuits adapted to be engaged by said rotatable contacts.

7. In a device of the class described, a plurality of individual metal containers fixed on a common shaft for simultaneous rotation, a plurality of shielded compartments in said containers, a plurality of sets of tuning units in said compartments, the units constituting each set being mounted in corresponding compartments in the several containers, terminals projecting from said compartments and individual to the tuning units therein, fixed contacts common to all of the terminals of a given container, and means for rotating said shaft to simultaneously connect all of the tuning units in a given set to said contacts.

8. In a device of the class described, a rotatable carrier, means dividing said carrier into shielding compartments, removable covers for said compartments, and tuning elements carried by said covers.

9. In a device of the class described, a rotatable metal drum, means dividing said drum into shielding compartments, tuning elements in said compartments and removable peripheral covers for said compartments.

10. The invention as set forth in claim 9 wherein said tuning elements are carried by said removable peripheral covers.

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