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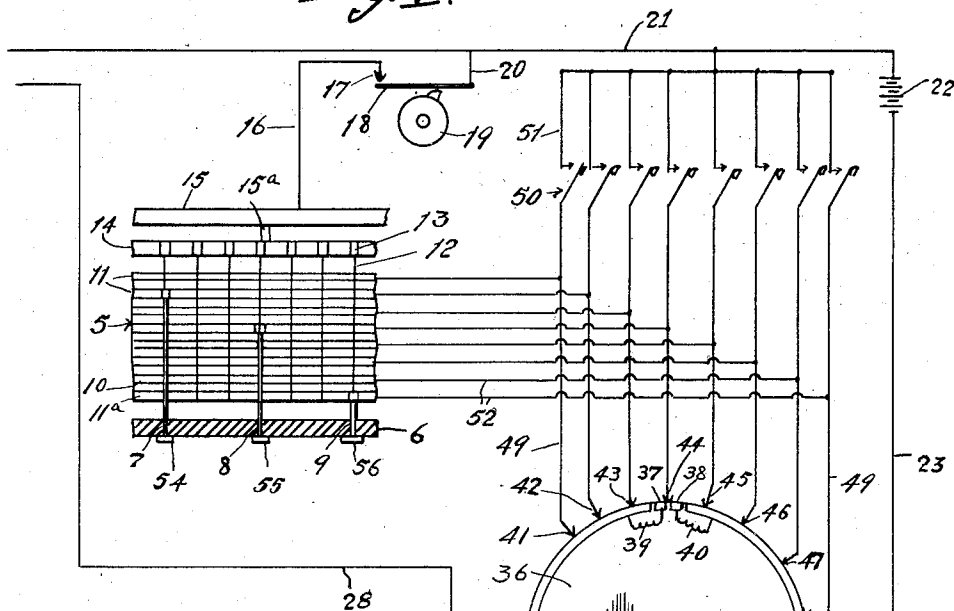
N. NELSON

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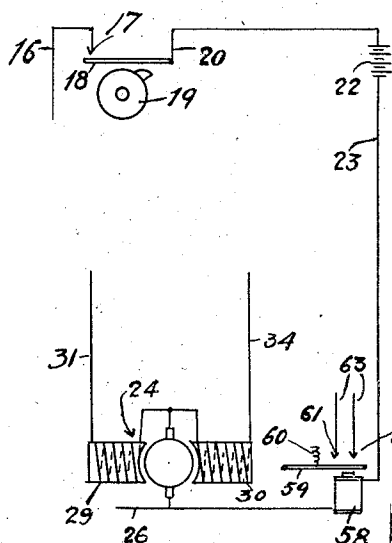
RADIO TUNING DEVICE

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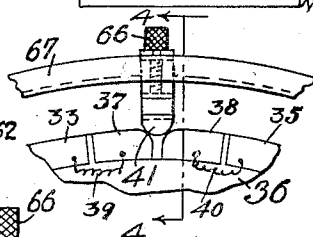
*Fig. 1.*



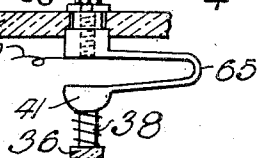
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



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## UNITED STATES PATENT OFFICE

2,108,607

## RADIO TUNING DEVICE

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Application February 27, 1931, Serial No. 518,643

16 Claims. (Cl. 250—20)

My invention relates to new and useful improvements in a radio tuning device and more particularly to improvements on my co-pending application bearing Serial No. 430,926, dated February 24, 1930 which has issued as Patent No. 2,042,956, June 2, 1936.

One of the objects of my invention is to simplify the construction of the means which actually controls the rotation of the tuning elements, such as condensers.

Another object of the invention is to provide a universal series type motor having two fields, said fields being wound in opposite directions to each other, whereby the energization of one field to a greater extent than the other field will cause the motor to revolve in one direction which is reverse to the direction it will revolve when said other field is energized to the greater extent and to provide a controller for said motor, which controller includes a segmental ring, the several segments being insulated from each other so that when a certain contact, a number of which are disposed around the controller, is energized, that field of the motor which is in direct circuit with the energized contact will be also energized to a greater extent than the opposite field and caused to run in a direction which will rotate the controller in the proper direction to move a predetermined or selected point on the controller toward and to the energized contact.

A further object of my invention is to so construct the controller that when a predetermined or selected point on said controller reaches the energized contact the electrical circuit will be "split" and the current caused to flow equally through both motor fields thus bucking each other and stopping the motor.

It is to be understood that, preferably, the tuning device is to be used with a time controlled mechanism so that a radio set may be automatically tuned to different pre-selected broadcasting wave lengths of broadcasting stations at predetermined or pre-selected times although the motor circuits can and may be closed or opened by manually actuating suitable hand operated switches connected in parallel with the motor circuit closers of the time mechanism. The motor circuits are closed and opened by the manually operated switches or the time controlled circuit closers for supplying electrical energy to or cutting off said energy from the motor and never by the contacts which engage or co-act with the controller.

A still further object of the invention is to provide means in combination with the above

mentioned structures, features, circuits and mechanism, for regulating the radio set during the tuning of the operations whereby noises incident to said tuning operations will be dampened or entirely eliminated from the device which translates the electrical impulses into sound waves.

With these and other objects in view, it will become apparent from the complete description of the tuner this invention consists in the details of construction and combination of elements hereinafter set forth and then specifically designated by the claims.

In order that those skilled in the art to which this invention appertains may understand how to make and use the same, I will describe its construction in detail, referring by numerals to the accompanying drawing forming a part of this application, in which:—

Fig. 1 is a diagrammatic view of a radio tuning device embodying my invention.

Fig. 2 is also a diagrammatic view illustrating a modified means for regulating the radio set during the tuning operations, parts of the time controlled mechanism and the controller being left out.

Fig. 3 is an enlarged fragmentary face view of the controller and one of the contacts to illustrate a preferred construction; and

Fig. 4 is a section on the line 4—4 of Fig. 3.

In carrying out my invention as herein embodied, 5 represents a time controlled mechanism preferably embodying the features of a clock, as shown and described in my co-pending application above referred to and said time controlled mechanism includes a face panel 6 preferably of insulated material and while the same could be separate and distinct from any part of the radio set, it might be the panel thereof, or any wall of the cabinet.

While it is impossible to illustrate diagrammatically the principal arrangement of holes in the face panel, it is preferred that such holes, three of which are designated by the numerals 7, 8, and 9, be arranged in a circle and spaced to represent certain divisions of time.

It is advisable that the time controlled mechanism be provided with a minute and an hour hand and that certain major divisions of time, such as hours, be indicated on the face panel so that the holes 7, 8, and 9 will represent minor divisions of time, such as quarter-hours.

As the majority of all radio programs are changed on the quarter-hour periods, it is unnecessary to provide means for changing the programs at other periods, although it will be

obvious that any number of holes can be used representing 5, 10 and other minute periods of divisions of time.

The timed controlled mechanism also includes a drum or other suitable supporting means 10 carrying station selector rings 11 of electrically conductive material, but suitably spaced apart in sidewise relation. The support 10 also carries one other ring 11a similar to all the others, but is used as a selector for stopping the operation of the radio set and will, therefore, be called a stop selector ring.

Co-operating with said selector rings and disposed in juxtaposition thereto and running crosswise thereof in suitably spaced relation thereto and spaced from each other distances corresponding to the spacing of the holes in the face panel, are crossbars 12, also of electrically conductive material, each provided at this inner end with contact portions or lugs 13, and by embedding all of said contact portions or lugs 13 in a support 14 of insulating material and leaving only a small part of each portion or lug 13 exposed, I will have, in effect, a commutator.

In proximity to the contact portions or lugs 13 and running in circular parallelism therewith, is a collector ring 15 insulated from the other parts and from which electric current is supplied to the cross bars 12 through a sliding contact or brush 15a, connected by a conductor 16 with a fixed contact member 17, of an electric switch; the balance of said switch includes a companion movable contact member 18 which may be a spring arm, or the same may be spring operated to normally maintain the switch open so that the electric circuit in which said switch is included is a normally opened one, but is periodically closed as will be presently described. It might be well to state at this time that the switch just referred to is a part of the time controlled mechanism and is closed upon the movement of the cam wheel 19. Where the time controlled mechanism is constructed or arranged to place the radio set in condition for program changes from fifteen minutes, then said cam wheel makes a complete revolution in fifteen minutes.

The movable contact member 18 is connected by conductors 20, and 21, with one pole of a source of electrical energy 22, while the other pole of said source of electrical energy is connected by a conductor 23 with the motor 24, and for a purpose to be later described; and suitable resistance 25 is inserted between the source of electrical energy 22, and said motor 24.

From the conductor 23, may lead a conductor 26, to one side of a spring switch 27, which is normally closed, and from the other side of said spring switch may lead a conductor 28, to the radio set, for supplying the necessary electrical current, it being understood that the conductor 21 also runs to the radio set as the other side of the circuit.

The motor 24 is of the universal series type and includes two fields 29 and 30, one of which is wound in a direction opposite to the other so that said motor will run in either direction depending upon which field is energized or depending upon which field is energized to a greater extent than the other. One field, as 29, is connected by a conductor 31, with one side of the motor controller 32, and more particularly with the ring segment 33 of suitable electrical conductivity while the other field 30 is connected by a conductor 34, with the other side of the controller or more particularly the ring segment 35.

The motor controller 32 includes a web 36 of insulating material and on this is mounted the controller ring which is divided into a number of segments insulated from each other at their ends by air gaps or non-conducting material. The controller ring, preferably, is divided into two major segments 33 and 35 and two minor segments 37 and 38, the latter being insulated from each other and from the major segments. Between the segment 37 and the major segment 33, is inserted a small resistor 39 and between the minor segment 38 and the major segment 35, is inserted another small resistor 40.

The contiguous ends of the minor segments 37 and 38 are preferably beveled to provide a recess for the reception of each station selector contact, 41, 42, 43, 44, 45, 46, and 47, any number of which may be used, and a stopping selector contact 48. Each selector contact, preferably, has a round, beveled or tapered nose and is arranged or mounted for a to-and-fro movement relative to the controller or longitudinal movement but not sidewise, and the same should be provided with means to normally hold it in contact with the controller. For purposes of illustration I have shown means for urging the several selector contacts towards the controller conductors wherein each contact, as 41, is fixed to one end of a U-shaped spring 65, the latter having its other end anchored by a screw 66 or equivalent means to a support 67. The several selector contacts 41 to 47 inclusive, are disposed about the controller in proper relation for tuning in the radio set to radio broadcasting waves corresponding to the broadcasting stations which the several selector contacts represent, while the selector contact 48 is positioned to cause a certain movement which will operate the spring switch 27 to shut off the radio set.

Each selector contact 41 to 48 inclusive, is connected by a conductor 49 with one part of a manually operated switch, while the other part of each switch is connected by a conductor 51, with the conductor 21, which in turn is connected with one pole of the source of electrical energy 22, and the conductors 49 in turn are connected by conductors 52 with the selector rings 11 and 11a of the time controller mechanism. In other words, all of the selector rings 11, and 11a, and all of the manually operated switches 50 are connected in parallel with the selector contacts 41 to 48 inclusive.

A finger 53 is provided on the motor control for controlling the spring switch 27, more particularly for opening said switch when the controller is moved to one extreme position and permitting said switch to close when withdrawn therefrom, and said finger 53 is preferably diametrically opposite the recess formed between the contiguous ends of the minor controller ring segments 37 and 38.

In order to partially complete any predetermined or pre-selected circuit, a number of tuning plugs or keys of various lengths are provided and three of these are shown and represented by the numerals 54, 55 and 56. The number of tuning plugs or keys of any one length will be determined by the number of times it may be desired to retune in particular stations after another or other stations have been tuned in and the number of hours that the set is to be pre-regulated.

The motor controller is mounted upon the tuning shaft 57 of the radio set, as for instance, the shaft on which the tuning condensers are mounted.

ed and the motor 24 is connected with said tuning shaft 57 in any suitable manner but preferably through a train of gears to provide an efficient, effective or desirable movement of the tuning shaft relative to the motor and also a friction clutch is, preferably, provided between the tuning shaft and motor, in order that the radio set may be tuned by hand without turning the motor.

10 Assuming that the radio set was first tuned to a broadcasting wave length represented by the selector contact 42, due to the positioning of the selector plug or key 54, and a person desired to have the radio set automatically tuned to the station represented by the selector contact 44, it will be noted that the plug or key 55 is inserted to make contact between one of the cross bars 12 and the station selector ring 11, which is connected by one of the conductors 52, with one of the conductors 49, leading to the selector contact 44 and said selector contact 44 being in a position relative to the contact 42, the same as one of the contacts at the right hand side of the contact 44, said contact 44 will be energized when the brush 15a is in contact with the lug of the cross bars 12, which is engaged by the key 55 and when the switch including the contacts 17 and 18, is closed by the cam wheel 19, a circuit will then be completed between the major segment 35, conductor 34, motor field 30, resistor 25, and conductor 23, so that said motor will revolve in the proper direction to move the tuning shaft 57 and with it the controller 32, until the gap or recess between the minor segments 37 and 38 reaches the contact 44, at which time the circuit will be "split" and will include both major segments of the controller and both motor fields and said fields will buck each other and cause the motor and associate parts to stop. Shortly thereafter, the switch which includes the elements 17 and 18, will be opened to shut off the electrical energy.

As the switch 50 is in parallel with the selector rings the same result can be accomplished by closing that switch 50, which is connected with the selector contact 44.

As soon as the electric current is shunted or directed through the motor and its controller, the resistor 25, will cut down the current flowing to the radio set thereby dampening the sound output so that any noises incident to the operation of the motor and other movable parts, will be reduced to such an extent as not to be annoying to listeners.

55 As no plugs or keys are inserted in the time controller mechanism for engagement with the next two cross bars 12, the station which is tuned in, due to insertion of the key 55, the same broadcasting station will be heard for three periods of fifteen minutes, at which time the brush 15a will have moved to the lug 13 of the cross member 12, with which key 56 is in engagement and as said key 56 is also in engagement with the selector ring 11a, when the switch including the parts 17 and 18 is closed, then a circuit will be completed from the source of electrical energy 22, through conductor 21, conductor 20, contact points 18 and 17, conductor 16, collector 15, brush 15a, one of the lugs 13, one of the cross bars 12, key 56, ring 11a, one of the conductors 52, one of the conductors 49 to selector contact 48 and thence through the major segment 35, conductor 34, motor field 30, resistor 25, conductor 23 and back to the source of electrical energy 22. The motor field 30 being energized to a greater

extent than the motor field 29 because of the resistors 39 and 40, the motor will operate in that direction which will move the controller to carry the gap or recess between the minor segment 37 and 38 toward and to the selector contact 48, at which time the electrical energy will evenly pass through both motor fields and stop the controller. This movement of the controller will carry the finger 53 into contact with the movable member of the spring switch 27 and open the latter so as to shut off the radio set. Shortly thereafter the cam 19 will permit the switch including parts 17 and 18, to open the circuit through the motor.

Whenever another circuit is completed by the insertion of a selector key or plug at a proper place and the brush 15a reaches a proper location and the switch operated by the cam 19 is closed, the controller will be moved by the motor to withdraw the finger 53 from the switch 27, so that the latter will be closed and the set will be turned on and ready for operation as soon as the predetermined or preselected station has been tuned in and the circuit through the motor opened.

It should now be noted that the switch which is operated by the cam 19 must be so timed as to remain closed during the time necessary to move the controller approximately 180°.

In Fig. 2, I have illustrated an arrangement for regulating the radio set as a substitute for the resistor 25, in which case an electromagnet 58 is inserted at some suitable point in the motor circuit to attract an armature 59, which acts as the bridging element of a switch and is operated in one direction by a spring 60 or its equivalent, to move the armature into contact with contact points 61 and 62, on which conductors 63 lead to a suitable part of the radio set. These conductors may lead to the device which translates the electrical energy into sound waves, or they may lead to the current supply, to the antenna, or some other part of the radio set, which will temporarily shut off the broadcasting during the tuning operations, in order that all sounds incident to the tuning operations will be eliminated. Of course I do not wish to be limited to the exact details of construction herein shown, as these may be varied within the limits of the appended claims without departing from the spirit of my invention.

Having thus fully described my invention, what I claim as new and useful is:—

1. The combination with a tuning shaft of a radio receiving set; of a controller fixed on said tuning shaft and having opposed segmental conductors insulated from one another with the ends in close proximity to each other to provide a recess; a plurality of selector contacts capable of bridging the contiguous ends of said segmental conductors and disposed in predetermined spaced relation about said conductors to control the positions of the tuning shaft; resistors inserted between certain of the segmental conductors at each side of the recess; a motor having oppositely wound fields, with each field electrically joined with a separate one of the segmental conductors and at opposite sides of the resistors; said motor being connected with the tuning shaft to rotate the latter in either direction depending upon the greater energization of one field over the other; two sets of normally open circuits in parallel with each other and connected to the selector contacts; time controlled means whereby said circuits may be closed at predetermined settings of the time controlled mechanism and manually operated

means whereby said circuits may be closed independently of the time controlled mechanism.

2. In the structure set forth in claim 1, in combination with means to reduce the sound output from the receiving set, a normally closed spring actuated switch in the electrical supply circuit of the radio set and means carried by the controller to open said switch when the tuning shaft is turned to one extreme position.

3. A radio tuning device consisting of the tuning shaft of a radio receiving set, a motor having oppositely wound fields and connected to said tuning shaft to rotate the latter, a controller fixed on the tuning shaft and including a pair of segmental conductors insulated from each other and each electrically joined to a separate motor field so that both are in a normally open motor circuit and continuous ends of said conductors forming a recess, and a plurality of beveled nose movable selector contacts to close the motor circuit at any one of a number of points about the tuning shaft to energize one motor field to cause said motor to revolve in a direction to move the recess in the controller to the beveled nose selector contact in the closed circuit, and means to project said selector contact into the recess to make contact with both of the segmental conductors thereby balancing the current through both motor fields to stop the motor.

4. The structure set forth in claim 3 in combination with means to reduce the sound output of the radio set during tuning operations and means on the controller to open a normally closed spring switch within the supply circuit of the radio set.

5. In a device of the kind described, a radio receiving set including a tuning shaft, a double field motor, a controller therefor driven by said motor and including a rotary member mounted upon the tuning shaft of the radio receiving set, spaced conductors on said rotary member and each of said segments connected with a separate field of the motor, a plurality of electrical contacts located in fixed positions about the rotary member and each contact adapted to bridge the space between the conductors to simultaneously complete the two field circuits through the motor, a secondary electrical circuit providing the power for the radio set, said circuit including a normally closed spring actuated switch, and means on the rotary member of the controller to open said switch when a certain one of said plurality of electrical circuits is completed and said switch being permitted to close at the time of the first tuning operation after the switch has been opened.

6. In a device of the kind described, a controller for mounting upon and rotation with a tuning shaft of a radio receiving set and including segmental conductors, the contiguous ends of which are insulated from each other, said contiguous ends constructed to provide a recess, a double field motor, contact members to be selectively electrically activated and each having a beveled nose, and means to urge said contacts towards the peripheries of the conductors so as to successively enter the recess to centralize the controller relative to the activated contact member and simultaneously engage the contiguous ends of said conductors for completing the two field circuits through said motor at the same time.

7. The combination with a radio receiving set including a tuning shaft, of a double field motor, a controller therefor driven by said motor and including a rotary member mounted upon the

shaft of the radio receiving set, segmental conductors on said rotary member with a recess between them and each of said segments connected with a separate field of the motor, a plurality of electrical contacts located in fixed positions about the rotary member, and means to urge the contacts into engagement with the segmental conductors for projection into the recess as the latter aligns with each of said contacts for simultaneously completing the two field circuits through the motor.

8. The combination with a radio receiving set including a tuning shaft, of a double field motor, a controller therefor driven by said motor and including a rotary member mounted upon the shaft of the radio receiving set, segmental conductors on said rotary member with a recess between them and the contiguous ends being beveled, and each of said segments connected with a separate field of the motor, a plurality of beveled nose contacts of a sufficient thickness to bridge the recess and located in fixed positions about the rotary member and in engagement with the segmental conductors and means to project each contact into the recess as the latter aligns with the said contacts for simultaneously energizing both fields of the motor substantially equally when the energized contact enters the recess, thereby stopping the motor and centralizing the controller relative to the said energized contact.

9. In a tuning device, a controller connected to the movable tuning shaft of a radio receiving set and including spaced conductors, their contiguous ends forming a recess, electric circuits connected to the conductors, a plurality of contact members in fixed locations relative to the conductors, and means to urge said contact members inwardly whereby each in turn will be projected into the recess to simultaneously complete the electric circuits.

10. In a tuning device, a controller connected to the movable tuning shaft of a radio receiving set and including spaced conductors, their contiguous ends forming a recess, electric circuits connected to the conductors, a plurality of contact members in fixed locations relative to the conductors, and resilient means to urge said contact members inwardly whereby each in turn will be projected into the recess to simultaneously complete the electric circuits and centralize the controller relative to the contact which completes the energized circuits.

11. In a tuning device for a radio receiving set, a controller connected to a tuning shaft and including spaced conductors movable therewith and a plurality of contact members in fixed locations relative to the conductors, means to urge said contact members towards the conductors, electric circuits connected to the conductors, contiguous ends of conductors forming a recess and means to move said conductors in opposite directions whereby said contact members will be projected into and forced out of said recess in consecutive order.

12. In a tuning device for a radio receiving set, a controller connected to a tuning shaft and including spaced conductors movable therewith and a plurality of contact members in fixed locations relative to the conductors, means to urge said contact members into constant engagement with the conductors, electric circuits connected to the conductors, contiguous ends of the conductors being beveled and forming a recess, and means to move said conductors in opposite directions whereby said contact members will be consecu-

tively projected into said recess to simultaneously complete and balance the electric circuits and forced from said recess due to the movements of the conductors.

5 13. In a tuning device for a radio receiving set, a controller connected to a tuning shaft and including spaced conductors movable therewith and a plurality of contact member in fixed locations relative to the conductors, means to urge said  
10 contact members towards the conductors, electric circuits connected to the conductors, contiguous ends of conductors forming a recess whereby all of said contact members may be projected one at a time in consecutive order into said recess to  
15 complete the electric circuits and forced from said recess due solely to the movements of said conductors.

14. The structure in claim 13 wherein the ends of the contact members that engage the conductors are beveled.  
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15. The structure in claim 13 wherein the contiguous ends of the conductors are beveled and diverge towards the outer circumferences of said conductors and wherein the inner ends of the contact members are similarly beveled. 5

16. In a tuning device for a radio receiving set, a controller connected to a tuning shaft and including spaced conductors movable therewith and a plurality of contact members in fixed locations  
10 relative to the conductors, means to urge said contact members towards the conductors, electric circuits connected to the conductors, contiguous ends of conductors forming a single recess where-  
15 by any one of said contact members may be projected into said recess to simultaneously complete the electric circuits and forced therefrom solely by the movements of the conductors.

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