April 18, 1939. G. H. COREY 2,155,304

RADIO TUNING APPARATUS

Filed Nov. 3, 1937 7 Sheets-Sheet 1

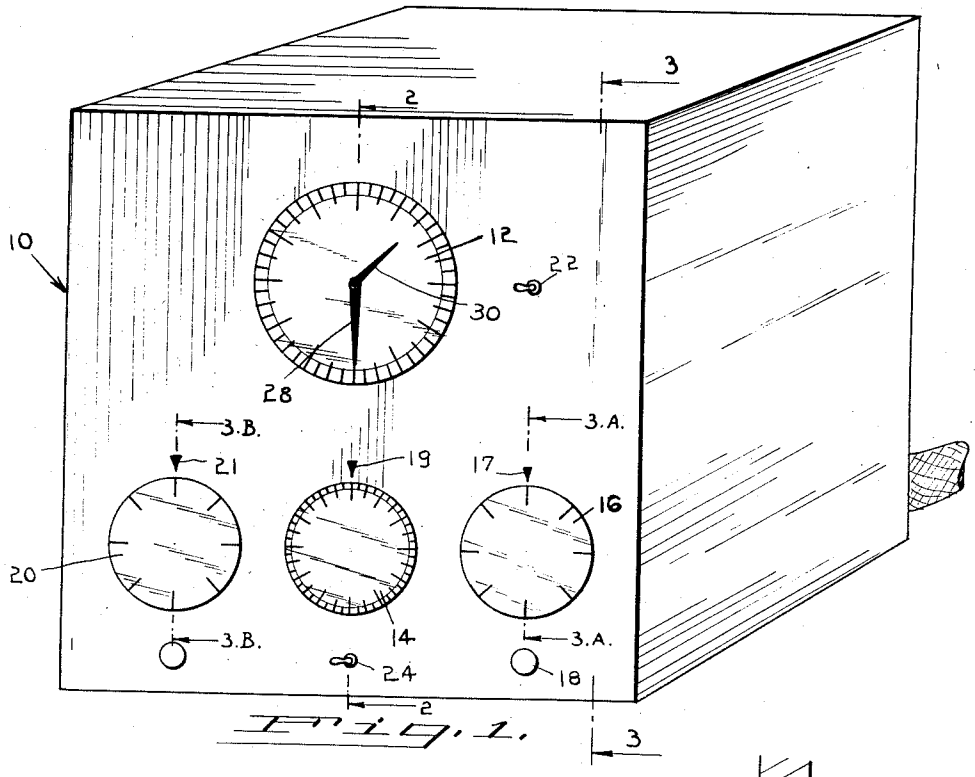

Fig. 1.

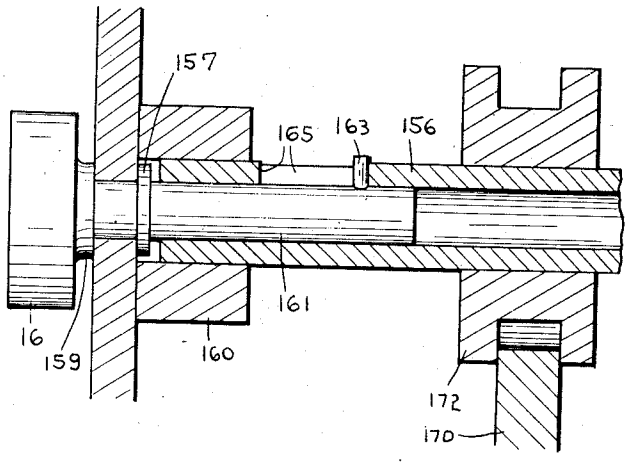

Fig. 3. A.

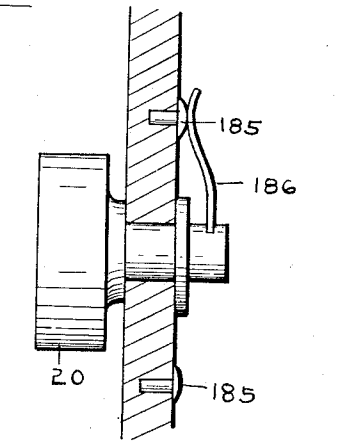

Fig. 3. A.

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RADIO TUNING APPARATUS

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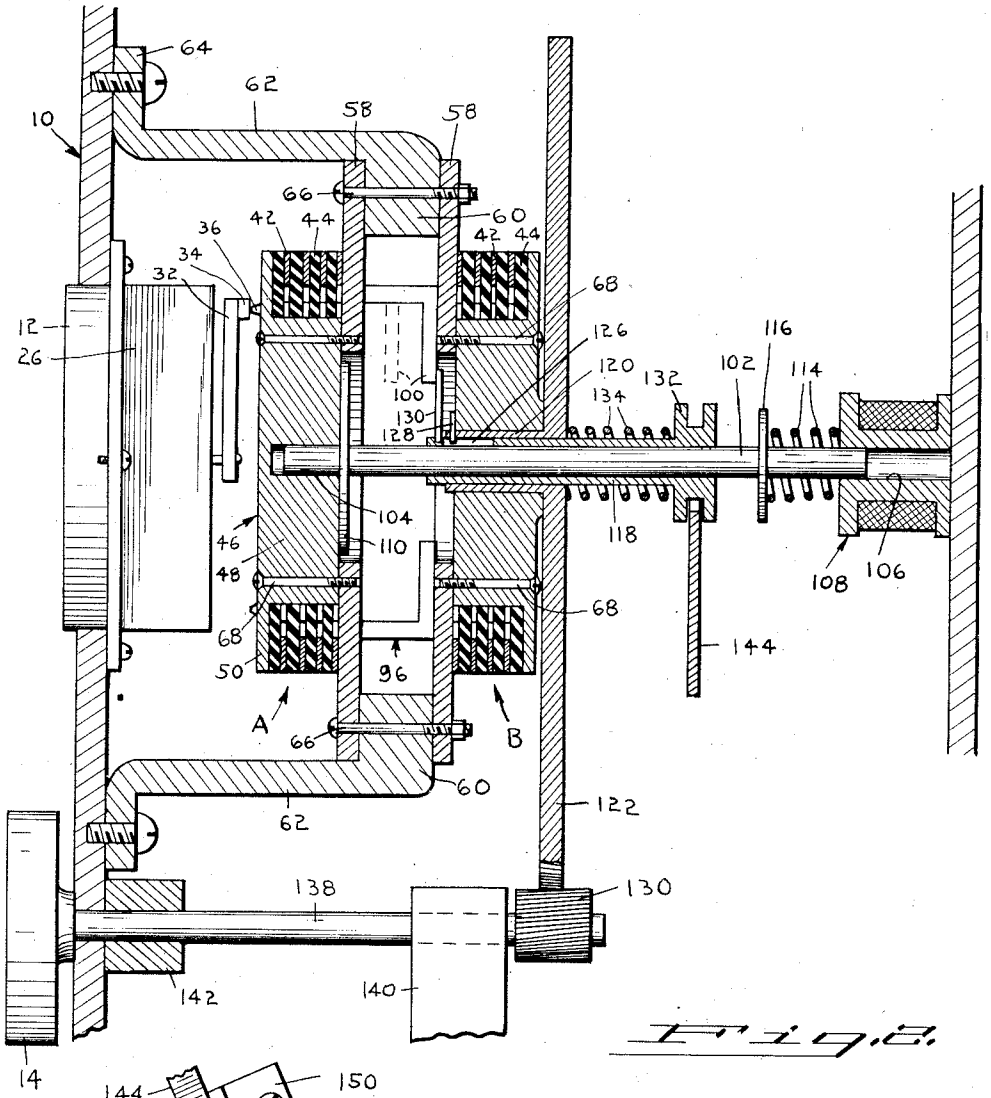

Fig. 6.

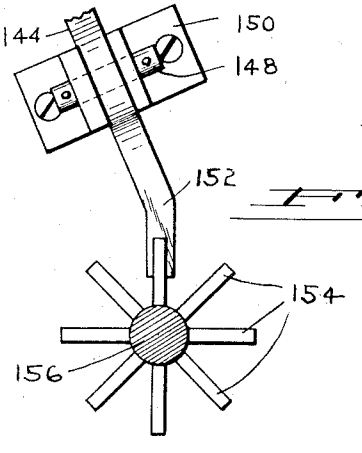

Fig. 7.

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RADIO TUNING APPARATUS

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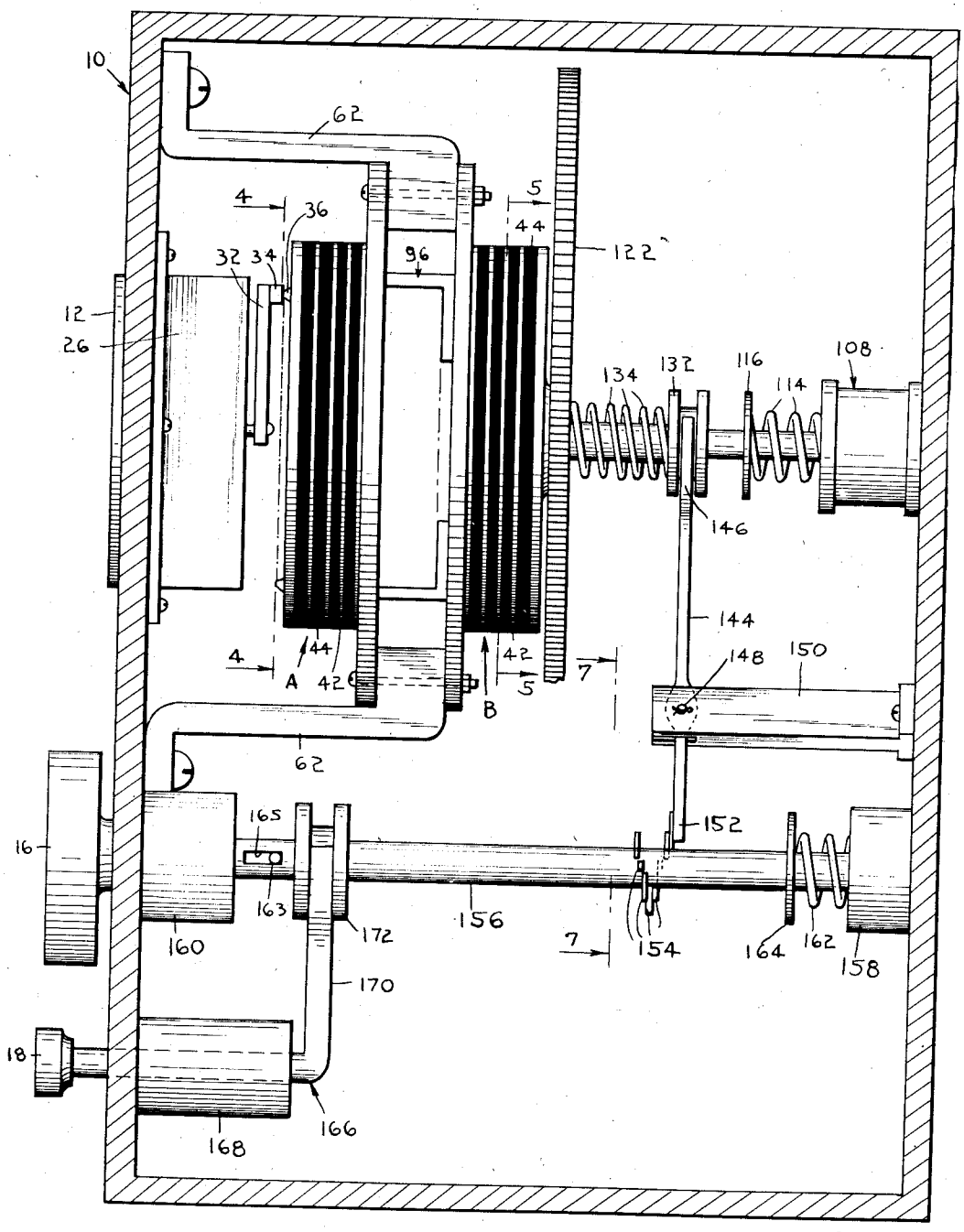

Fig. 3.

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RADIO TUNING APPARATUS

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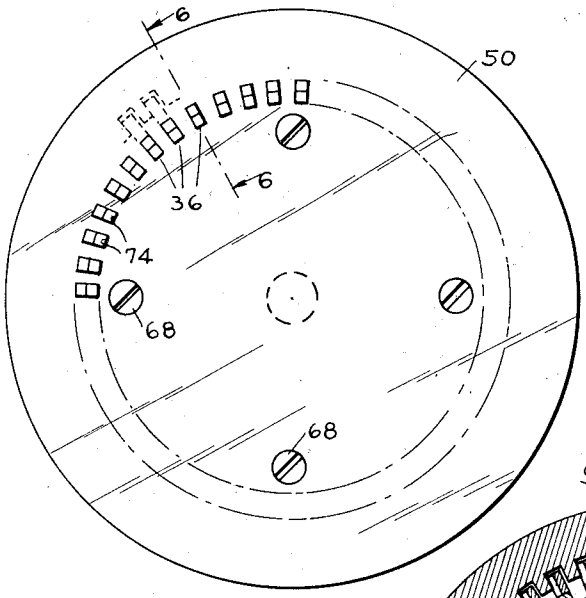


Fig. 4.

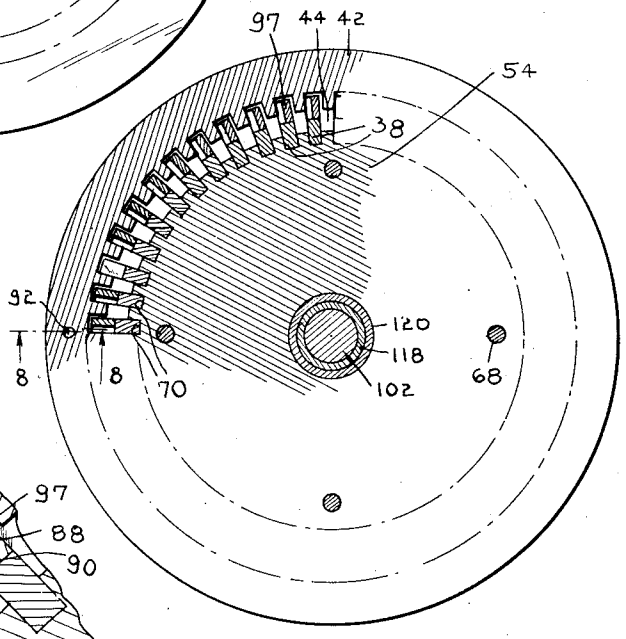


Fig. 5.

Fig. 5A.

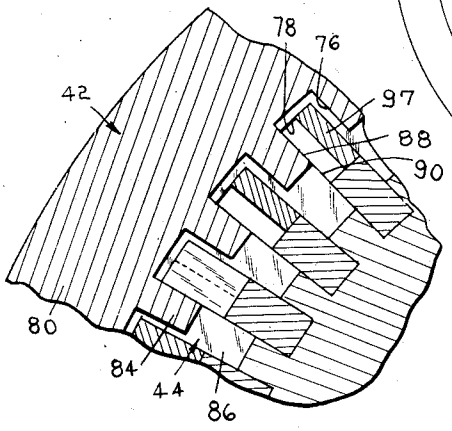
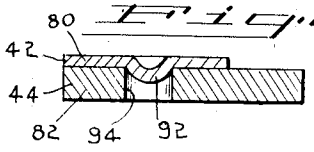


Fig. 6.



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RADIO TUNING APPARATUS

Filed Nov. 3, 1937 7 Sheets-Sheet 5

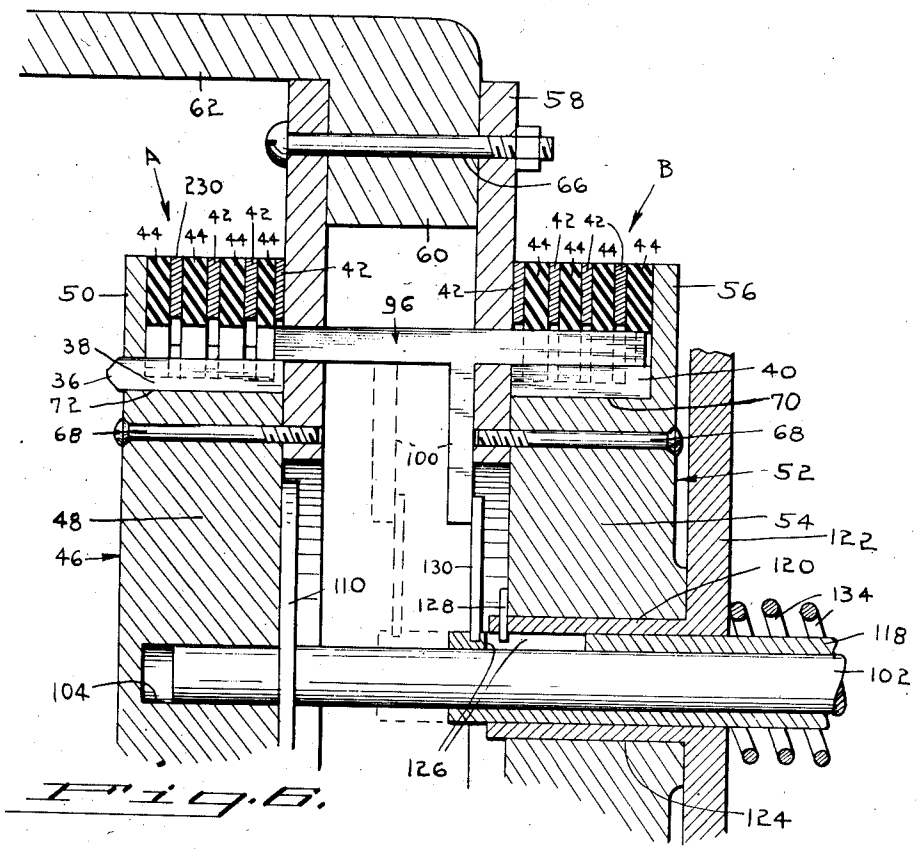

Fig. 6.

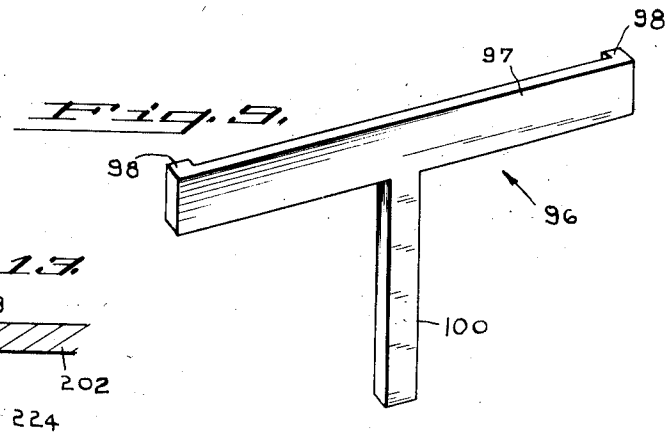

Fig. 9.

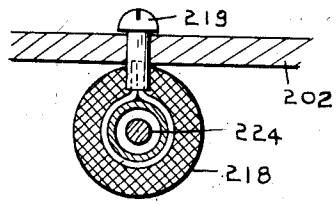

Fig. 12.

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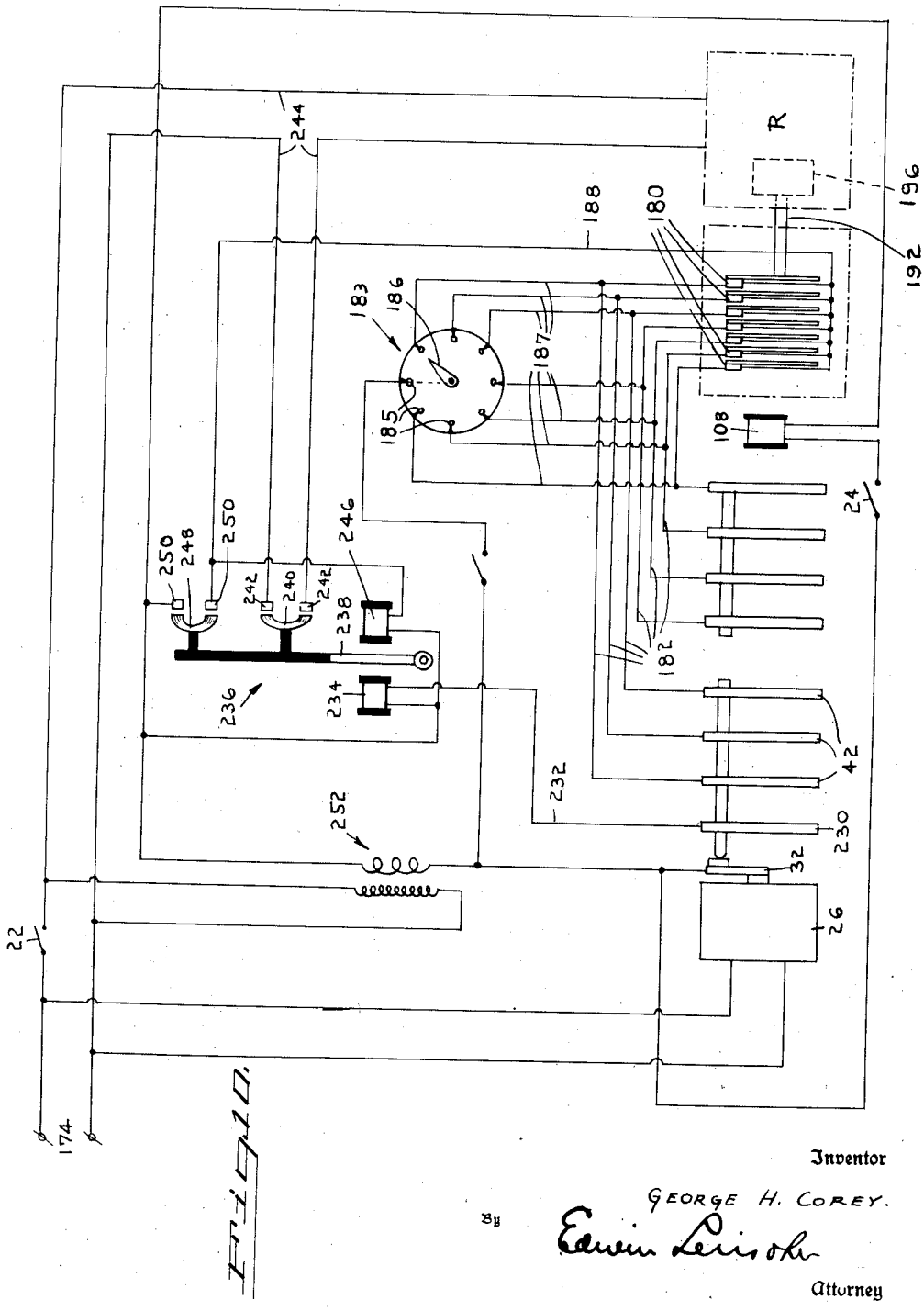

FIG. 10.

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RADIO TUNING APPARATUS

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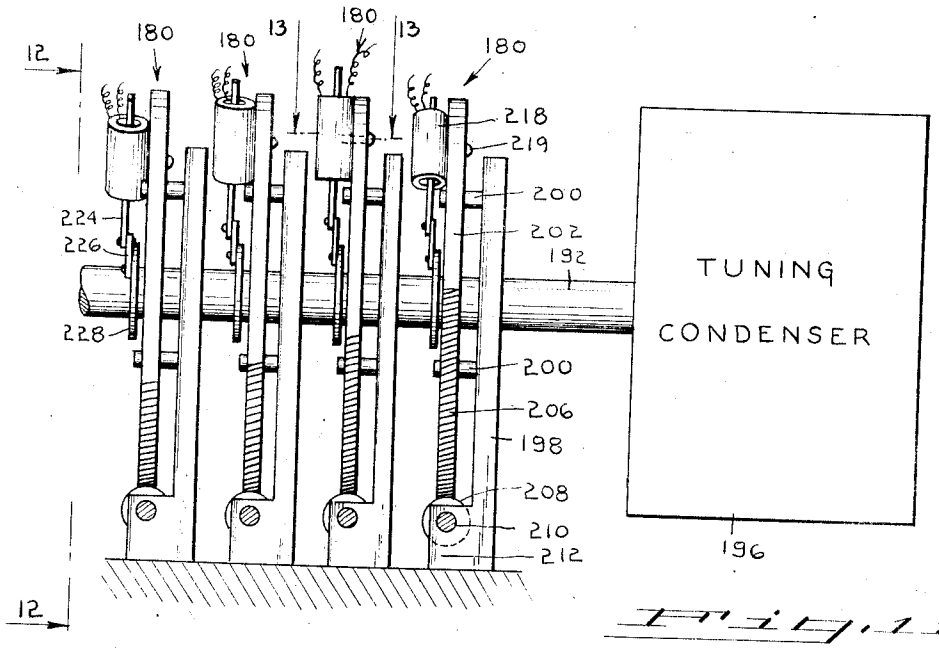

Fig. 11.

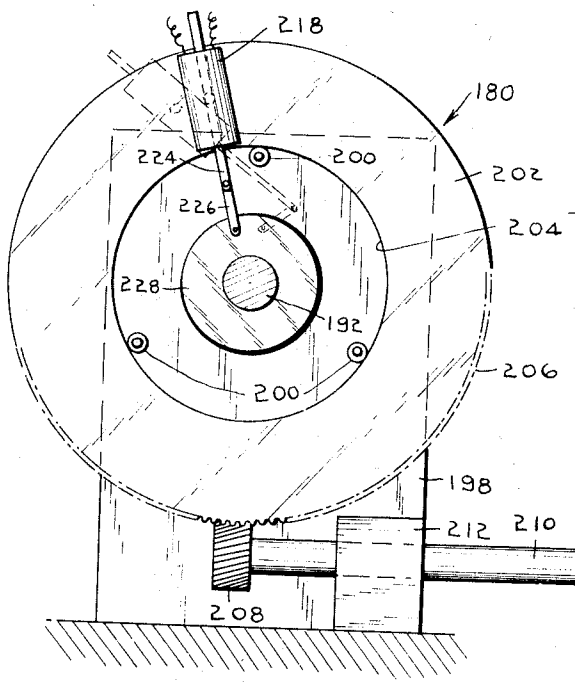

Fig. 11a.

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UNITED STATES PATENT OFFICE

2,155,304

RADIO TUNING APPARATUS

George H. Corey, New York, N. Y., assignor, by direct and mesne assignments, of forty-five per cent to Edmund Mantell, New York, N. Y., and ten per cent to Levisohn Niner & Levisohn, New York, N. Y., a firm composed of Samuel Levisohn, Isidor Niner, and Edwin Levisohn

Application November 3, 1937, Serial No. 172,530

11 Claims. (Cl. 200—37)

This invention relates to tuning apparatus for radio receivers.

One of the objects of the invention is to provide means associated with the tuning device of a radio and/or television receiver for automatically tuning the latter to one or more preselected broadcasting stations at predetermined intervals during a period of time so that programs previously selected will automatically be received during said intervals. For convenience in reference the term "radio" will be used to designate receivers for visual reproduction of images, as in television, as well as for sound reproduction.

Another object of the invention is to provide automatic means for instantaneously tuning a radio receiver to a particular broadcasting station.

Another object of the invention is to provide a radio receiver with time controlled means for automatically tuning the receiver to a plurality of pre-selected broadcasting stations at predetermined intervals of time and with automatic means for instantaneously tuning the receiver to a selected broadcasting station without disturbing the time controlled selections of other stations.

A yet further object of the invention is generally to provide automatic tuning devices of the character described which are simple in construction and reliable in operation.

The above objects of the invention and other objects ancillary thereto will be fully understood from the following description considered in connection with the accompanying drawings.

In the drawings:

Fig. 1 is a perspective view of the control apparatus embodying the present invention;

Fig. 2 is a sectional view, on a larger scale, on the line 2—2 of Fig. 1;

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

Fig. 3A is a detail sectional view on the line 3A—3A of Fig. 1;

Fig. 3B is a detail sectional view on the line 3B—3B of Fig. 1;

Fig. 4 is a view on the line 4—4 of Fig. 3;

Fig. 5 is a sectional view on the line 5—5 of Fig. 3;

Fig. 5A is a fragmentary enlarged face view of parts illustrated in Fig. 5;

Fig. 6 is a longitudinal sectional view of the apparatus taken on the line 6—6 of Fig. 4;

Fig. 7 is a detail sectional view on the line 7—7 of Fig. 3;

Fig. 8 is a detail sectional view on the line 8—8 of Fig. 5;

Fig. 9 is a perspective view of the movable selector switch member;

Fig. 10 is a more or less diagrammatic view of the apparatus showing the wiring diagram;

Fig. 11 is a view partly in elevation and partly in section of the tuning condenser and of the tuning controllers;

Fig. 12 is a view on the line 12—12 of Fig. 11;

Fig. 13 is a view on the line 13—13 of Fig. 11.

Referring now more particularly to the drawings, the control apparatus embodying the present invention is here shown housed within a cabinet 10 having an opening through which a clock dial 12 is visible. If desired, said cabinet may be part of the cabinet of the receiver or, alternatively and as here shown, may be a separate cabinet, especially when remote control of the radio receiver is desired. A time selector knob 14, station selector knob 16 and companion push button 18, and an instantaneous tuning knob 20, are disposed at the front wall of the cabinet, and in addition said front wall has disposed thereon the main circuit controlling switch 22 and a switch 24 actuated for returning the control members of the apparatus to initial position. As shown in Fig. 1, knob 14 has dial indications thereon arranged to cooperate with a stationary index pointer 19 for indicating time, and station selector knobs 16 and 20 have station indications thereon arranged to cooperate with stationary pointers 17 and 21, respectively, for obtaining station indications in the movement of said knobs.

By means of mechanisms and devices which will hereinafter be described and upon actuations of the time selector knob 14, the station selector knob 16, and push button 18, provision is made for automatically tuning the radio receiver to a number of selected broadcasting stations at predetermined intervals during a period of time, say twelve hours, so that programs previously selected will automatically be received during said intervals. Thus, for example, in utilizing the present apparatus the time selector knob 14 is rotated to a desired time indication corresponding to the time of a desired broadcast. The station selector knob 16 is rotated to indicate the station desired to be received at the time set by the operation of knob 14, after which push button 18 is actuated. This operation of knobs 14 and 16 and push button 18 as just described sets the control apparatus so that the radio receiver will be automatically

tuned to the selected station at the selected time. This operation may be repeated for additional stations so that for a certain period of time, normally twelve hours, the radio receiver will be automatically tuned to a number of broadcasting stations and will remain automatically tuned to any one station for a predetermined length of time. In the arrangement herein illustrated, the apparatus is designed to control for broadcasting intervals of at least fifteen minutes and the indicating dial for knob 14 is graduated accordingly. Thus, for a period of twelve hours, the radio receiver may be tuned automatically to forty-eight broadcasting intervals of fifteen minutes each and to one or more preselected broadcasting stations so that by properly setting the control apparatus in advance the radio receiver will be successively tuned automatically to different radio programs.

As clearly shown in Figs. 2 and 3 of the drawings, an electric clock 26 is mounted within cabinet 10 on the front wall of the latter and is provided with minute and hour hands 28 and 30 movable over dial 12. Said clock is also provided with an arm 32 which is actuated by the clock mechanism and rotates at the same speed as hour hand 30. Said arm carries a switch contact member 34 arranged to engage and make electrical contact with the ends 36 of a plurality of time contact members 38 consisting, as here shown, of iron bars. It will be understood that there are as many time contact members 38 as there are time intervals for which the apparatus may be set and that accordingly in the arrangement here shown where the apparatus is designed for tuning the receiver automatically to forty-eight intervals of fifteen minutes each there are forty-eight time controlled members. Each time contact member 38 has a companion time contact member 40 in longitudinal alignment therewith (Fig. 6).

As clearly shown in Figs. 4 and 5, time contact members 38 are disposed in equally spaced circumferential relation in conjunction with a plurality of station control members 42. Said station control members are composed of annular sheet metal disks of the same size and disposed in axially spaced relation. Annular disks 44 of insulation material are disposed between adjacent metal disks 42. Said metal and insulation disks are arranged in sets A and B with the disks of set A axially spaced from the disks of set B. The disks of set A are arranged in face to face relation and are carried by a supporting member 46 which is provided with a hub portion 48, about which said disks are disposed, and with a flange 50 in face to face engagement with the adjacent insulation disk 44. The disks of set B are similarly disposed and carried by a supporting member 52 provided with a hub portion 54, about which the disks of set B are disposed, and with a circular flange 56 in engagement with the endmost insulation disk 44 of said set. Supporting members 48 and 52 are in turn supported by annular disks 58 of insulation material secured to the opposite outer surface of the reflexed portions 60 of arms 62 which are secured at their opposite end portions 64 to the inner surface of the front wall of cabinet 10. Said disks 58 may be secured to said arms 62 in any suitable manner, as by bolts 66. It will be observed that the disks or sets A and B are clamped between circular flanges 50 and 56 and adjacent disks 58 respectively, and that supporting members 46 and 52 are secured to disks 58 by screws 68.

As shown in Fig. 5, hub portion 54 of supporting member 52 is provided with a plurality of circumferentially spaced longitudinally extending grooves 70 within which the stationary time contact members 38 are individually mounted, and as indicated in Figs. 4 and 6, hub portion 48 of supporting members 46 is provided with similar circumferentially spaced longitudinally extending grooves 72 within which the stationary time contact members 38 are individually mounted, grooves 70 and 72 being in longitudinal alignment. However, as shown in Figs. 4 and 6, circular flange 50 of supporting member 46 is provided with a plurality of circumferentially spaced openings 74 in alignment with grooves 72 for the extension of ends 36 of stationary contact members 38.

Disks 42 and 44 have circumferentially spaced grooves 76 and 78 respectively in radial alignment with the grooves 70 or 72 of the supporting members on which said disks are mounted and said grooves are defined by circumferential rim portions 80 and 82 of disks 42 and 44, respectively, and by the internal radial projecting toothed-like portions 84 and 86 of disks 42 and 44, respectively.

By reference more particularly to Figs. 5 and 5A, it will be observed that grooves 76 are somewhat wider than companion grooves 78 and that disks 42 and 44 are so disposed and the construction is such that one side edge 88 of each portion 84 of metal disk 42 is in alignment with the adjacent edge portion 90 of toothed portion 86 of insulation disk 44, the other groove defining edges of disk 42 being spaced outwardly of the corresponding groove defining edges of disk 44. Adjacent metal insulation disks are held in this relation by projections 92 formed on metal disks 42 and received in recess 94 formed in insulation disks 44 (Fig. 8).

Movable contact members 96, illustrated in Fig. 9, are disposed for longitudinal movement in engagement with stationary contact time members 38 and 40 in the passages formed by grooves 76 and 78 of disks 42 and 44. Said members 96 are permanently magnetized whereby they remain in adjusted position in engagement with iron contact members 38 and 40 until positively re-adjusted. Each movable contact member 96 comprises a bar 97 having end projections 98 which in the movement of said members through the slots in the disks make contact with said metal disks only at the edges 88 of disk portions 84 of the metal disks, the end portions of members 96 which include said projecting portions 98 having a thickness substantially equal to the width of a groove 78. The length of bar 97 is such in relation to the spaced positions of metal disks 42 and insulation disks 44 that in any position of member 96 one end portion 98 is in engagement with a metal disk 42 of one of the sets of said disks and the other end portion 98 is in alignment with an insulation disk 44 of the other set of said disks. Thus, as illustrated in Fig. 6, the left end portion 98 of member 96 is in engagement with the innermost metal disk 42 of set A while the opposite end portion 98 of set member 96 is in alignment with the outermost insulation disk 44 of set B. By reason of this construction and arrangement a member 96 can make contact with only one station disk 42 at a time. Each member 96 is provided with an arm 100 by which said member is moved lon-

gitudinally of stationary contact members 38 and 40 in engagement therewith and transversely of the metal and insulation disks of the channels provided by the grooves formed in said disks. Arm 100 may be formed integral with bar 97 or may be formed separately from any suitable material and need not be magnetized.

The movable contact members 96 are actuated selectively under the control of mechanism operated by time selector knob 14 and station selector knob and push button 16 and 18, respectively. Said mechanism comprises a longitudinally movable shaft 102 mounted at its ends in a bearing 104 formed in hub portion 48 of supporting member 46 and in a bearing 106 formed in a solenoid 108 fixed to the rear wall of cabinet 10. Said shaft has a circular disk 110 fixed at one end thereof and arranged to engage arms 100 of members 96 when the shaft is moved longitudinally to the right for returning all of said members to initial position when solenoid 108 is energized upon actuation of switch 24, as will hereinafter be described in greater detail. Shaft 102 is moved longitudinally in the opposite direction by a spring 114 which bears at one end on a solenoid 108 and at its other end on a disk 116 fixed to the shaft.

Said shaft also extends through a sleeve 118 and may have a bearing in said sleeve for further support thereof. Sleeve 118 is mounted for rotary and longitudinal movement within a sleeve 120 fixed to or integral with a gear 122 and forming a hub portion of said gear. Sleeve 120 is journalled for rotation in a bearing 124 formed in the hub portion 54 of supporting member 52. Sleeves 118 and 120 are connected to rotate together and to have relative longitudinal movement. For this purpose sleeve 118 is provided with a longitudinally extending slot 126 and sleeve 120 is provided with a pin 128 fixed thereto and projecting into said slot whereby rotation of sleeve 120 pursuant to rotation of gear 122 is effective to rotate sleeve 118 while said last mentioned sleeve can move longitudinally of and on shaft 102 and longitudinally of and in sleeve 120. An arm 130 is fixed at one end of sleeve 118 and is constructed and arranged to engage the arm 100 of a selected movable contact member 96. The other end of sleeve 118 is provided with a fixed grooved collar 132. A spring 134 bears at one end thereof against said collar and at its other end against gear 122 whereby to urge sleeve 118 to retracted position and to move said sleeve and arm 130 carried thereby to said position.

Gear 122 meshes with a gear 130 fixed to a rotary shaft 138 mounted in bearings 140 and 142. Knob 14 is fixed to the outer end of shaft 138 whereby rotation of said knob is effective to rotate gear 122, the sleeve or hub portion 120 thereof, and sleeve 118 and its arm 130 for positioning said arm selectively in alignment with an arm 100 of one of the time contact members 96. After arm 130 has been selectively positioned by rotation of knob 14, said arm is moved longitudinally into engagement with the arm of the selected contact member 96 for moving the latter longitudinally, to the left, viewing Fig. 2, for selecting the station to be received at the selected time.

The mechanism for moving the selected contact member 96 to make contact with a desired station disk 42 comprises in addition to sleeve 118 a pivoted lever 144 having a forked end 146 which engages within the groove of collar 132. Said lever is pivoted intermediate its ends on a pivot pin 148 mounted in a bracket 150 fixed to the wall of cabinet 10. The other end 152 of lever 144 is arranged for engagement by a selected one of a plurality of pins 154 fixed to and projecting radially of a rotary shaft 156. Pins 154 are arranged in longitudinal and circumferentially spaced relation on shaft 156 whereby a predetermined rotary movement of said shaft is effective to bring one of said pins into alignment with the end 152 of lever 144, as shown in Figs. 3 and 7 so that longitudinal movement of said shaft toward the right, viewing Fig. 3, is effective to move lever end 152 to the right and the opposite lever end 146 to the left for projecting sleeve 118 and arm 130 carried thereby and thereby to move the selected contact member 96 longitudinally for contact with the desired station disk. Shaft 156 is mounted for rotary and longitudinal movement in bearings 158 and 160 and is normally held in retracted position by the spring 162 which bears on one end against bearing 158 and at its other end against a disk 164 secured to said shaft.

Knob 16 is connected to one end of shaft 156 for rotating the latter. Said knob, however, is longitudinally fixed in relation to the front wall of cabinet 10 by inner and outer collars 157 and 159, as shown in Fig. 3A. Also as here shown the knob 16 has an integral or fixed stem 161 which is received within shaft 156 and is connected to the latter by a pin 163 movable longitudinally of a slot 165 in the shaft whereby said knob is effective to rotate said shaft while permitting longitudinal movement of the latter. Push button 18 is connected to shaft 156 for moving the latter longitudinally against the force of spring 162, and for this purpose said knob is connected to the outer end of an arm 166 which is mounted for longitudinal movement in a bearing 168. The inner end of said arm has a reflexed yoke portion 170 which engages a grooved collar 172 fixed to shaft 156.

Reverting to the station selector pins 154 and their engagement with lever 144 for actuating said lever to project sleeve 118 and arm 130 carried thereby for in turn moving the selected contact member 96 to the desired position for engagement with a predetermined station disk 42, it will be observed that while shaft 156 is moved the same longitudinal distance upon each actuation of push button 18, the distance of the longitudinal movement of sleeve 118 and its arm 130 is inversely proportional to the distance of the several station selector pins 154 from the end 152 of lever 144 in the retracted position of the associated parts of the mechanism.

As illustrated more or less diagrammatically in Fig. 10 the tuning devices 180, which will hereafter be described in more detail, are connected to the electric circuit for energization from source 174 under the control of the above described apparatus. From the above description it will be understood that when the movable contact member 32 of clock 26 makes contact with the end 36 of one of the stationary contact members 38 a station selector disk 42 is connected to the electric source 174 (Fig. 10), which is engaged by the contact member 96 which has been projected for this purpose as hereinbefore described. For time control, tuning devices 180 are connected to companion station disk 42 by wires 182. Said tuning devices are also arranged for direct control by a switch 183 operated by knob 20. Said switch 183 includes a plurality of stationary contact members 185, one for each broadcasting station to be received, and a movable contact member 186 rotated by knob 20 (Fig. 3B),

said tuning device being electrically connected to said switch by wires 187. The circuit through said tuning devices 180 has a common return wire 188.

Referring now more particularly to Figs. 11 and 12, the turning means including devices 180 will now be described. As here shown, said tuning devices 180 are associated with the rotary shaft 192 by which the movable condenser plates of the tuning condenser 196 are adjusted for tuning the receiver R to the frequency of a desired broadcasting station. Said shaft is rotated selectively by each of said tuning devices 180. Each tuning device comprises a stationary support 198 provided with three pin rollers 200 projecting therefrom and arranged in triangular relation. An annular plate 202 having a central opening 204 therein is mounted on said pin roller 200 for adjustment circumferentially in its own plane. Annular member 202 is provided with a peripheral gear portion 206. Said gear portion is of the worm wheel type and is in mesh with a worm gear 208 fixed to a rotary shaft 210. Said shaft is mounted for rotation in bearing 212 formed in support 198 and may be rotated by a knob 214 which, as here shown, is accessible externally of the wall 216 of the cabinet of the radio receiver.

A solenoid 218 is pivotally mounted on member 202 by means of a pin 219 fixed thereto and having a pivoted bearing in said member. Said solenoid is connected by wires 182 and 187 to the station disks 42 and to switch 183, respectively, whereby said solenoid may be energized either under the control of the time switch and the associated station switches and time switch contact members or independently of the latter directly under the control of switch 183. The solenoid armature 224 is pivotally connected to a link 226 which in turn is pivotally connected to a ring member 228 fixed to said shaft 192. The parts are designed so that when the solenoid and its armature and link 226 are in a straight line the radio is tuned to the selected broadcasting station. This alignment of the solenoid and its armature with link 226, effected when the solenoid is energized, results from the fact that the solenoid and the armature adjust themselves in relation to each other as the armature attempts to reach the magnetic center of the solenoid. It will be understood that member 202 is initially adjusted by means of knob 214 when the solenoid is energized, and its armature is in alignment with link 226 as shown in full lines in Fig. 12, and by said adjustment of knob 214 the radio receiver is manually tuned to a predetermined frequency and hence to a predetermined broadcasting station operated on such frequency. The relation of member 202 to the solenoid and its armature being thus adjusted for one broadcasting station, the subsequent energization of the solenoid will automatically tune the receiver to the same station. Similarly, the other tuning controllers are adjusted for operating shaft 192 to tune the radio receiver by means of condenser 196 to other frequencies and to the broadcasting stations corresponding thereto. Thus, when one of the tuning controllers is energized to adjust the condenser or other tuning means, the other tuning controllers and more particularly the solenoid and armature are displaced in relation to their companion links 226, but when any of such relatively displaced solenoids is energized under the control of the station selector disks and their associated mechanisms, said solenoid and its armature is caused to return to its aligned position with companion link 226 and thereby rotates condenser shaft 192 to tune the radio receiver to the respective broadcasting station.

It is seen from the above that the radio receiver R may be automatically tuned, by proper setting of the time and station selector mechanisms to receive a member of broadcasting stations in succession in predetermined order. Provision is also made for furnishing automatically a period of non-reception between two or more periods of reception. For this purpose there is provided a cut-off disk 230 of the same construction as station disks 42 and assembled with the latter in the disks of set A. Said cut-off disk 230 is made of metal and connected by a wire 232 to a solenoid 234, of circuit controller 236 (Fig. 10). Accordingly, when one or more contact members 96 are engaged with said cut-off disk 230 a circuit will be made at the selected times for energizing coil 234 to attract pivoted switch arm 238 which carries movable contact member 240 whereby to move said member away from its companion stationary contact members 242 to interrupt the circuit through the wires 244 which connect the receiver R to the power source 174. Subsequently when a predetermined station disk 42 is electrically connected to its companion tuning device 180 by means of movable switch contact member 32 and switch member 96, a circuit is completed through solenoid 246 which attracts circuit controller arm 238 and completes the circuit through switch contact members 240, 242, 248 and 250. When the circuit is made through contact members 248 and 250, solenoid 246 is shunted thereby permitting solenoid 234 to attract switch arm 238 when the cut-off disk 230 is again connected for the energization of coil 234. It will be noticed that clock 26 and the radio receiver R are connected directly to the power source 174 and that the rest of the control apparatus is connected to said source through a step-down transformer 252 as relatively low voltage is preferable.

When it is desired to return all of the projected contact members 96 to initial retracted position, the solenoid 108 is energized by actuation of push button switch 24 thereby moving shaft 102 longitudinally to the right, viewing Fig. 2, whereby to engage disk 110 with the arm 100 of said contact members 96 to move said contact members to the right adjacent disk 58.

Thus it is seen that the apparatus herein shown or described is well adapted to accomplish the several objects of the present invention. It will be understood, however, that the invention may be embodied otherwise than as here shown and that in the illustrated embodiment certain changes in the construction and arrangement of parts may be made. Therefore, I do not wish to be limited precisely to the present disclosure except as may be required by the scope of the appended claims.

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

1. In a control system of the class described, a plurality of station selector members each having a plurality of electrical contact portions arranged in relation to time, a plurality of stationary contact members common to all of said station selector members and arranged in the same time relation as said contact portions, a plurality of movable contact members each constructed and arranged to electrically connect one of the contact portions of one of said station selector members with the stationary contact members having the same time relation, and means

for selectively actuating said movable contact members.

2. In a control system of the class described, a plurality of station selector members each having a plurality of electrical contact portions arranged in relation to time, a plurality of stationary contact members common to all of said station selector members and arranged in the same time relation as said contact portions, a plurality of movable contact members each constructed and arranged to electrically connect one of the contact portions of one of said station selector members with the stationary contact member having the same time relation and rotary and longitudinally movable means for selectively actuating said movable contact members.

3. In a control system of the class described, a plurality of station selector members each having a plurality of electrical contact portions arranged in relation to time, a plurality of stationary contact members common to all of said station selector members and arranged in the same time relation as said contact portions, a plurality of movable contact members each constructed and arranged to electrically connect one of the contact portions of one of said station selector members with the stationary contact members having the same time relation, said movable contact members having magnetic engagement with said stationary contact members for releasably retaining said movable members in predetermined relation to said station selector members, and means for actuating said movable contact members.

4. In a control system of the class described, a plurality of station selector members each having a plurality of electrical contact portions arranged in relation to time, a plurality of stationary contact members common to all of said station selector members and arranged in the same time relation as said contact portions, a plurality of movable contact members each constructed and arranged to electrically connect one of the contact portions of one of said station selector members with the stationary contact members having the same time relation, said movable contact members having magnetic engagement with said stationary contact members for releasably retaining said movable members in predetermined relation to said station selector members, and rotary and longitudinally movable means for actuating said movable contact members.

5. In a control system of the class described, a support, a plurality of annular metal members arranged co-axially on said support in spaced relation and insulated from each other, said members having internal radial projections spaced from each other in relation to time, stationary contact members mounted on said support in spaced relation, each of said stationary contact members extending transversely of said annular members and spaced from said projections, and movable contact members for connecting said stationary contact members individually with a selected projection, and means for selectively actuating said movable contact members.

6. In a control system of the class described, a support, a plurality of annular metal members arranged co-axially on said support in spaced relation and insulated from each other, said members having internal radial projections spaced from each other in relation to time, stationary contact members mounted on said support in spaced relation as to time, each of said stationary contact members extending transversely of said annular members and spaced from said projections, and movable contact members for connecting said stationary contact members individually with a selected projection, said movable contact members having magnetic engagement with said stationary contact members for releasably retaining said movable members in predetermined relation to the projections of said annular members.

7. In a control system of the class described, a support, a plurality of annular metal members arranged co-axially on said support in spaced relation and insulated from each other, said members having internal radial projections spaced from each other in relation to time, stationary contact members mounted on said support in spaced relation as to time, each of said stationary contact members extending transversely of said annular members and spaced from said projections, and movable contact members for connecting said stationary contact members individually with a selected projection, said movable contact members having magnetic engagement with said stationary contact members for releasably retaining said movable members in predetermined relation to the projections of said annular members, and means for selectively actuating said movable contact members.

8. In a control system of the class described, a plurality of station selector members each having a plurality of electrical contact portions spaced in relation to time, a plurality of stationary contact members common to all of said station selector members and spaced in the same time relation as said contact portions, a plurality of movable contact members each constructed and arranged to electrically connect one of the contact portions of one of said station selector members with the stationary contact members having the same time relation, and means for selectively actuating said movable contact members in one direction comprising a rotary and longitudinally movable member for operatively connecting the same to any one of said movable contact members.

9. In a control system of the class described, a plurality of station selector members each having a plurality of electrical contact portions spaced in relation to time, a plurality of stationary contact members common to all of said station selector members and spaced in the same time relation as said contact portions, a plurality of movable contact members each constructed and arranged to electrically connect one of the contact portions of one of said station selector members with the stationary contact members having the same time relation, means for selectively actuating said movable contact members in one direction comprising a rotary and longitudinally movable member for operatively connecting the same to any one of said movable contact members, and means for simultaneously moving a plurality of said movable contact members in another direction.

10. In a control system of the class described, a support, a plurality of annular metal members arranged co-axially on said support in spaced relation and insulated from each other, said members having internal radial projections spaced from each other in relation to time, stationary contact members mounted on said support in spaced relation as to time, each of said stationary contact members extending transversely of said annular members and spaced from said projec-

tions, and movable contact members for connecting said stationary contact members individually with a selected projection, and time controlled rotary means for making an electrical connection with said stationary contact members.

11. In a control system of the class described, a support, a plurality of annular metal members arranged co-axially on said support in spaced relation and insulated from each other, said members having internal radial projections spaced from each other in relation to time, stationary contact members mounted on said support in spaced relation as to time, each of said stationary contact members extending transversely of said annular members and spaced from said projections, and movable contact members for connecting said stationary contact members individually with a selected projection, and means for selectively actuating said movable contact members.

GEORGE H. COREY.