Dec. 14, 1937. F. M. HARRIS 2,102,070

REMOTE CONTROL SYSTEM

Filed July 15, 1933 2 Sheets-Sheet 1

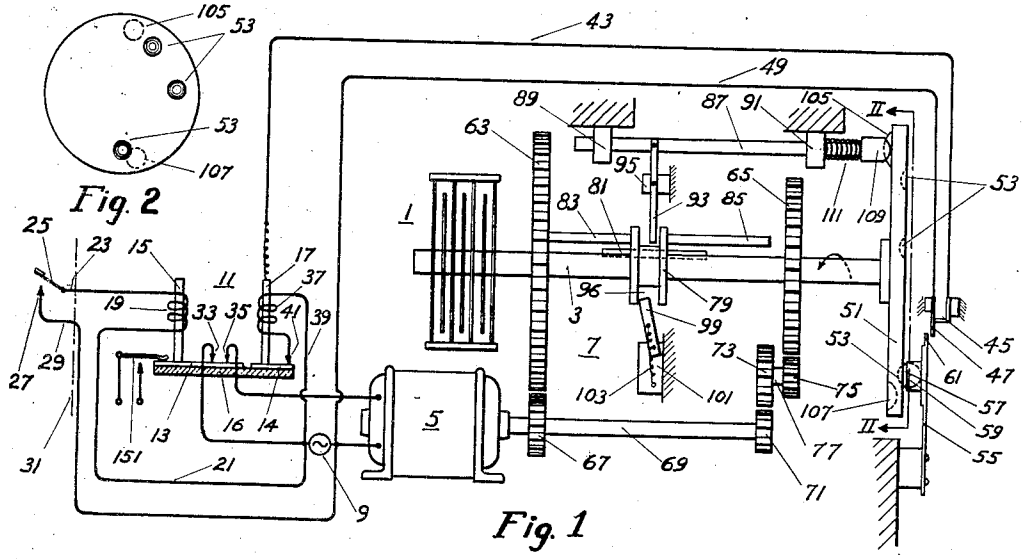


Fig. 2

Fig. 1

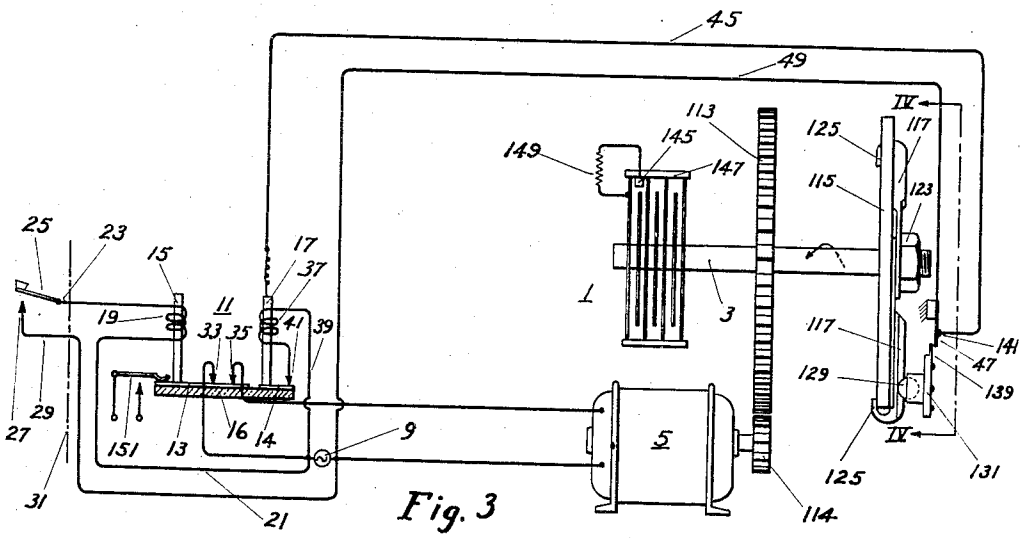


Fig. 3

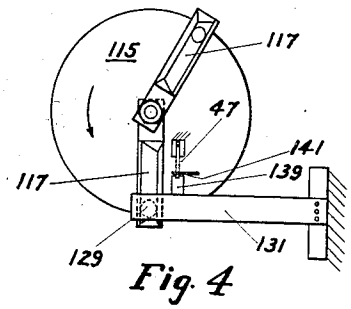


Fig. 4

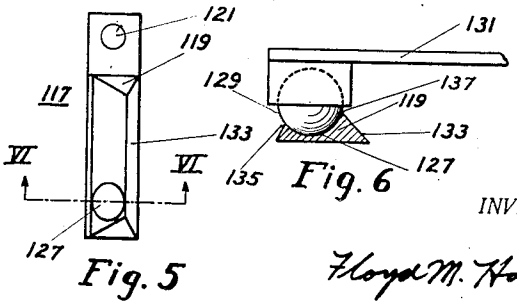


Fig. 5

Fig. 6

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REMOTE CONTROL SYSTEM

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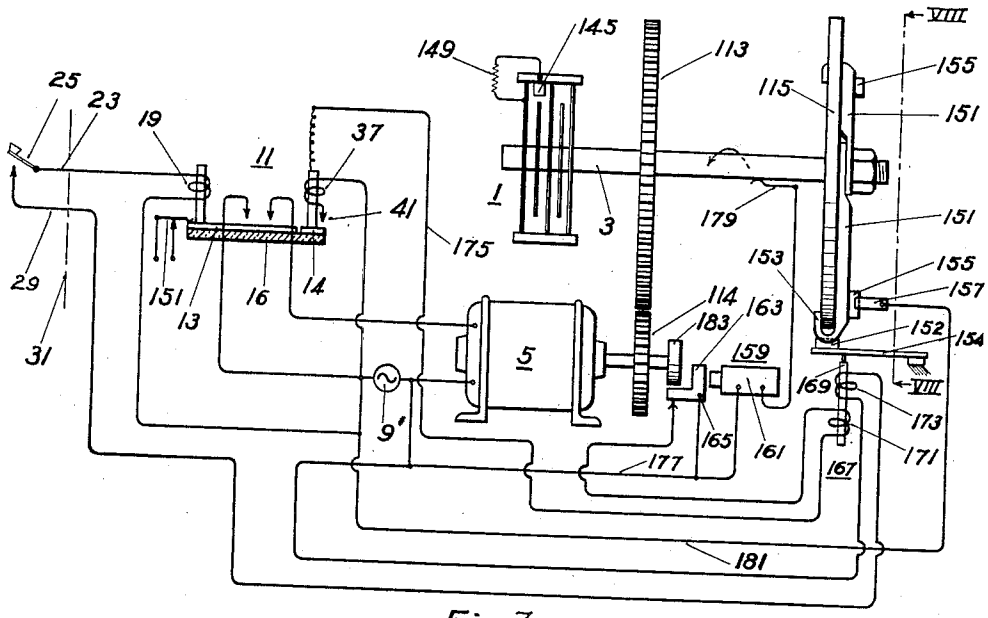


Fig. 7

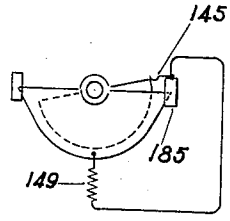


Fig. 9

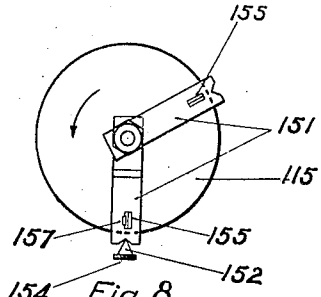


Fig. 8

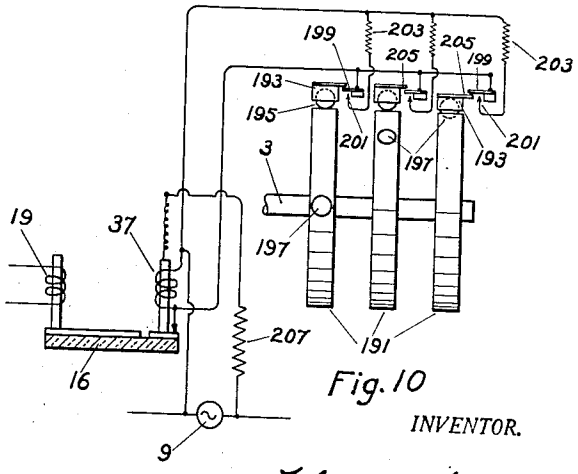


Fig. 10

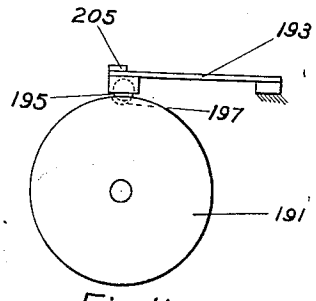


Fig. 11

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UNITED STATES PATENT OFFICE

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REMOTE CONTROL SYSTEM

Floyd M. Harris, Merchantville, N. J.

Application July 15, 1933, Serial No. 680,527

17 Claims. (Cl. 250—40)

My invention relates to remote control systems and particularly to a system for the remote control of a radio receiver by means of which a desired preselected radio station may be tuned in from a remote point.

One of the objects of my invention is to provide a remote control system of the above-mentioned type which is low in cost and satisfactory in operation.

A further object of my invention is to provide a remote control tuning system which is operated merely by the closing of a relay through a single remote control circuit whereby the system is simple and positive in operation.

A still further object of my invention is to provide a remote control system of the above-mentioned type in which the stations to be tuned in by remote control may easily be preselected by the owner of the radio receiver.

In practicing my invention I provide a relay at the radio receiver which, in response to the closing of a remote control circuit, connects a motor to a source of power for rotating the tuning condensers. A holding circuit is provided for the relay so that, once the relay is closed, it remains closed until the holding circuit is broken. Means is provided for breaking the holding circuit when the tuning condenser has been rotated to the desired point and for returning the holding circuit to its closed condition whereby the next station may be tuned in by again closing the remote control circuit.

Other features and advantages of my invention will appear from the following description taken in connection with the accompanying drawings, in which

Figure 1 is a schematic and circuit diagram showing an embodiment of my invention;

Fig. 2 is a view taken on the line II—II of Fig. 1;

Fig. 3 is a schematic and circuit diagram of another embodiment of my invention;

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

Fig. 5 is a detail view of one of the cam arms shown in Figs. 3 and 4;

Fig. 6 is a cross-sectional view taken on the line VI—VI of Fig. 5;

Fig. 7 is a schematic diagram of another embodiment of my invention;

Fig. 8 is a view taken on the line VIII—VIII of Fig. 7, and

Fig. 9 is an end view of the variable condenser and short-circuiting switch shown in Fig. 7.

Fig. 10 is a side view and a circuit diagram of another embodiment of my invention, and

Fig. 11 is an end view of a portion of the structure shown in Fig. 10.

Referring to Fig. 1, the tuning condenser, which is of conventional construction, is indicated at 1. The rotor shaft 3 of the condenser 1 is connected to an alternating current motor 5 through a reversing mechanism 7.

The motor 5 is connected to a power source 9 by means of a relay 11 when the relay is closed.

The relay 11 comprises an armature 13 of conducting material to which are fastened two magnetic cores 15 and 17. A relay winding 19 surrounds the core 15, the lower end of this winding being connected to one terminal of the power source 9 through a conductor 21. The upper end of the winding 19 is connected through a cable conductor 23 to one terminal of a switch 25. The other switch terminal 27 is connected through a second cable conductor 29 to the other terminal of the power source 9.

All of the apparatus at the right of the broken line 31 is located at the radio receiver while the switch 25 at the left of the line 31 is located at the remote control point, the switch being connected to the radio receiver by a cable having only the two conductors 23 and 29.

It will be seen that when the switch 25 is closed, a circuit is completed through the relay winding 19 and the armature 13 is pulled up into contact with contact points 33 and 35. This connects the motor 5 across the power source 9 and the motor begins to turn the rotor of the tuning condenser 1.

When the armature 13 is pulled up it also closes a holding circuit through a relay winding 37 which surrounds the core 17. The holding circuit may be traced from the left-hand terminal of the power source 9, through a conductor 39, the relay winding 37, a relay contact point 41, the armature 14 and core 17 through a conductor 43 to a switch contact point 45, and through a spring switch arm 47 and a conductor 49 to the right-hand terminal of the power source 9.

The motor 5 having been started by closing the switch 25 momentarily, it continues to run and rotate the tuning condenser 1 until the holding circuit is broken at the contact point 45.

The mechanism for breaking the holding circuit and for setting the tuning condenser 1 exactly at the proper position for receiving a desired station includes a disc 51 fastened to the shaft 3 to rotate with the rotor of the condenser 1. As indicated in Figs. 1 and 2, circular de-

pressions 53 are drilled or otherwise formed in the face of the disc 51, each depression being located in the proper position to stop the condenser rotor at the desired station setting.

A spring arm 55 which carries a ball bearing 57 held in a retainer 59 is mounted near the edge of the disc 51 with the ball 57 so placed that, as the disc 51 is rotated, the ball 57 seats itself successively in the depressions 53.

The end of the spring arm 55 has a projection 61 thereon so placed with respect to the switch arm 47 that, when the ball 57 is seated in a depression 53, the projection 61 is underneath the switch arm 47 as illustrated. When the disc 51 is rotated so that the ball 57 rides up out of the depression, the projection 61 is moved to the right against the switch arm 47 and past it, the switch arm 47 being short enough to permit the projection to slide past. The projection is now on the right-hand side of the spring arm 47, and, when the disc 51 rotates to a point where the ball 57 seats itself in the next depression 53, the projection 61 will move to the left and break the holding circuit as it again slides past the switch arm 47. The projection 61 is now in its original position on the left-hand side of the switch arm 47 as shown in Fig. 1.

Since the conventional type of tuning condenser is varied from its minimum to its maximum capacity when rotated through 180 degrees, it may be desirable to employ a mechanism for automatically reversing the direction of rotation of the condenser when it reaches the positions of maximum and minimum capacity.

The reversing mechanism illustrated in Fig. 1 comprises gear wheels 63 and 65 rotatably mounted upon the shaft 3. The gear wheel 63 is continually in mesh with a gear wheel 67 keyed to the motor shaft 69 while the gear wheel 65 is always connected to the other gear wheel 71 keyed to the shaft 69 through the gear wheels 73 and 75 on the counter shaft 77.

The gear wheels are caused to rotate the shaft 3 by means of a circular member 79 slidably mounted upon the shaft 3 and secured in non-rotatable relation therewith by means of a spline 81. A dog 83 projects from the left side of the member 79 for engagement with a depression in the side of the gear wheel 63 when the member 79 is moved to the left to the position illustrated. In this position the gear wheel 63 drives the shaft 3 through the member 79.

Another dog 85 projects from the right side of the member 79 for engagement with a depression in the side of the gear wheel 65 when the member 79 is moved to the right. When in this position, the shaft 3 is driven by the gear wheel 65.

The member 79 is moved to the right or left by means of a horizontal rod 87 slidably supported in supporting members 89 and 91. A vertical arm 93 is pivotably fastened to a supporting member 95 and pivotably secured to the horizontal rod 87. The lower end of the arm 93 extends into a circular groove 96 in the member 79 whereby the dogs 83 and 85 are moved to the right when the rod 87 is moved to the left, and to the left when the rod 87 is moved to the right.

A spring biasing device is provided for holding the member 79 in either its right-hand or left-hand position, depending upon the direction in which the member 79 is "kicked" by the arm 93. The biasing device comprises an arm 99 extending into the groove 96 and pivotally mounted at its lower end upon a suitable support 101. A biasing spring 103 is fastened at its upper end to the arm 99 and at its lower end to the support 101 at a point underneath the arm pivot point whereby the arm 99 will be pulled to either the right or the left of the vertical position depending upon the direction of the "kick" given the member 79.

The automatic operation of the reversing mechanism is accomplished by means of a semi-spherical projection 105 on the back of the plate 51 and a depression 107 in the back of the plate almost diametrically opposite projection 105.

The right end of the rod 87 carries a contact member 109 which is held against the plate 51 at all times by means of a spring 111.

It will be understood from the foregoing description that when the projection 105 rotates past the contact member 109, the member 79 is "kicked" over to the right and held there by the biasing arm 99 so that the condenser 1 is rotated in the opposite direction by the gear wheel 65. The direction of rotation of the plate 51 is also reversed and, while this reversal causes the rod 87 to be moved to the left again by the projection 105 as it begins its rotation in the reverse direction, there is no effect produced since the member 79 is being held over to the right by the spring biasing device. The member 79 is held over to the right far enough so that when the arm 93 is given the second "kick" it does not come in contact with the member 79.

When the depression 107 rotates past the contact member 109, the spring 111 forces the rod 87 to the right whereby the member 79 is "kicked" over to the left, the biasing arm 99 being "kicked" over to its left-hand position at the same time, and the direction of rotation of the condenser 1 is again reversed. As before, the second "kick" given to the arm 93 will have no effect as the arm 93 will not come into contact with the member 79.

By means of my improved apparatus any difficulty due to "over-running" of the motor 5 and the consequent mistuning may be avoided. With this in mind, the preferred adjustment of the projection 61 with respect to the spring switch arm 47 is such that the holding circuit is broken as the ball 57 is seating itself in a depression 53. If the inertia of the rotating parts (the motor armature, in particular) is great enough, the action of the ball 57 will, in part be that of a brake after it has become seated.

Under the conditions assumed, however, there is more than a braking action because the spring 55 is made stiff enough so that it and the ball bearing 57 can actually rotate the plate 51 a slight amount. That is, if the "over-run" of the motor 5 is too great, the ball 57 will seat itself in a depression 53 and then, acting as a brake, ride part way out of the depression. Here rotation of the plate 51 is stopped for an instant and then the force of the spring 55 again seats the ball, the rotation of the plate 51 being reversed to accomplish this. Thus, in the example assumed, the spring 55 reverses the direction of rotation of the condenser rotor to set the condenser at the exact position required to receive a desired station.

If the inertia of the rotating parts is small, the motor 50 will stop driving the plate 51 before the ball 57 has became seated, this being the preferred adjustment. In this case, the force of the spring 55 seats the ball in a depression 53, the spring 55 driving the plate 51, after the holding circuit is broken, in the same direction in which the motor was driving it.

When employing the last-mentioned adjustment, it may be desirable to connect the gear wheels 67 and 71 to the motor shaft 69 through one-way clutch mechanisms, of any suitable construction, in order that, when the spring 55 drives the plate 51, it will not have to rotate the motor armature.

In the embodiment of my invention illustrated in Fig. 3, provision is made for more easily presetting the radio receiver for any desired group of stations than is permitted by the design shown in Fig. 1.

Referring to Fig. 3, where like parts are indicated by the same reference numerals as in Fig. 1, the rotor of the tuning condenser 1 is always driven in the same direction through a gear wheel 113 which is keyed to the shaft 3 and which engages a pinion 114 on the motor shaft. The means for breaking the holding circuit at the desired instant includes a plate 115 keyed to the shaft 3 so that it rotates with the rotor of the condenser 1.

In place of depressions 53 drilled in the face of the plate, as in Fig. 1, station selecting or cam arms 117 are provided, there being one selecting arm for each station to be selected.

The structure of the selecting arms 117 will be better understood by referring to Figs. 5 and 6. Each arm 117 comprises a metal bar 119 which is trapezoidal in cross-section for a portion of its length. One end of the arm is flat and has a hole 121 therein whereby the arm may be fastened in fixed relation to the plate 115 by means of a nut 123 as indicated in Fig. 3. A hooked portion 125, preferably of springy material, may be provided at the other end of the arm for frictional engagement with the edge of the plate 115 to hold the arm in place when the nut 123 is loosened for adjusting another arm.

A circular depression 127 is drilled in the arm 117, as indicated in the drawings, for receiving a ball bearing 129 which is mounted on a spring arm 131. It will be clear from an inspection of Fig. 6 that as the ball 129 rides up the front face 133 of the arm 117, it is moved its maximum distance away from the plate 115, and moves towards the plate 115 again as the ball seats itself in the depression 127. When the ball 129 rides out of the depression 127, the arm 131 is not lifted as far away from the plate 115 as before since the back edge 135 of the depression is lower than its front edge 137.

The spring arm 131 carries a projection 139 on one end thereof for breaking the holding circuit at the desired instant. A spring switch arm 47 and a fixed contact point 141 (which may be identical with contact point 45, if preferred) are provided in the holding circuit as in Fig. 1, the switch arm 47 being so set with respect to the projection 139 that when the projection is moved away from the plate 115 the maximum amount, the projection slides past the end of the switch arm 47.

In operating the circuit shown in Fig. 3, the switch or key 25 at the remote point is closed for an instant and released, the switch being of the type which is normally open such as a telegraph key. This connects the motor 5 to the power supply 9 and closes the holding circuit for keeping the motor connected to the power supply until the spring switch arm 47 is moved away from the fixed contact point 141. It will be assumed, for the purpose of explanation, that when the remote switch 25 was closed, the ball 129 was resting on the plate 115 at a point between two of the selector arms 117.

The motor rotates the plate 115 in the direction indicated by the arrow so that when the next selector arm 117 reaches the ball 129, the ball rides up the face 133 of the selector arm, forcing the projection 139 past the spring arm 47.

The motor continues to drive the plate 115 as the ball 129 starts to seat itself in the depression 127, but, before the ball is seated, the projection 139 breaks the holding circuit as it moves towards the plate 115 and moves the spring arm 47 away from the fixed contact point 141. If the rotation of the parts due to inertia stops quickly enough, the spring arm 131 itself rotates the plate 115 a small distance further until the ball 129 is seated. Otherwise the spring arm 131 and ball 129 will act as a brake and rotate the plate 115 back to the proper position as explained in connection with Fig. 1.

Just as in the circuit of Fig. 1, as the ball 129 seats itself in the depression 127, the projection 139 slides past the spring arm to the position illustrated. The desired station has now been selected and the circuit has been returned to its original condition.

Assume that it is desired to select the next station. The remote switch or key 25 is again closed momentarily. Again the motor turns the tuning condenser 1 and plate 115. The ball 129 rides up out of the depression 127, passing over the back edge 135. The back edge 135 is so low, however, that the projection 139 does not slide past the spring arm 47 and, therefore the holding circuit remains closed.

As the plate 115 rotates, the ball 129 leaves the selector arm 117 and rides on the plate 115 until the next selector arm 117 is reached. Then the above-described operation is repeated to stop the rotor of the condenser 1 at the exact point required for receiving the next station.

It will be apparent that with the arrangement of Fig. 3, any desired station may be preset by tuning in the station manually, loosening a selector arm, moving it to the point where the ball seats in the selector arm depression and then tightening the selector arm. While only two selector arms have been illustrated, it will be understood that several more would be provided in practice.

As indicated in Fig. 6, the ball 129 and the depression 127 preferably have the same radius of curvature. Likewise, in Fig. 1, the ball 57 and the depressions 53 preferably have the same radius of curvature. This relation between dimensions of the balls and the depressions is not essential, however, and in some cases it may be desirable to make the radius of curvature of a depression 127 or 53 greater than that of the cooperating ball bearing.

It should be understood that a projection of any suitable shape, such as one having a conical point, may be substituted for a ball bearing and that either the semispherical depression or any other suitable shape utilized in cooperation therewith.

In the apparatus shown in Fig. 3, the tuning condenser 1 will tune over the entire frequency range twice in making one rotation unless precautions are taken to avoid such operation. As shown in Fig. 3, a short-circuiting switch 145, such as a piece of spring metal, may be mounted upon one of the insulating supporting members 147 of the stator frame, and so positioned that during a half rotation of the condenser it is in

electrical contact with the edge of a rotor plate. The switch 145 may be connected either directly to a stator plate or connected to it through a resistor 149, whereby the tuning circuit is made inoperative for a half rotation of the condenser.

It is desirable to have a receiver so designed that it is silent while tuning from one station to another. I accomplish this by means of a switch 151, shown in Figs. 1 and 3, which, when closed, completes the loud speaker circuit. When the relay 11 is open, the armature 13 is dropped down so that the switch 151 is closed and the loud speaker can be heard.

When key 25 is closed to tune in a different station, the armature 13 opens the switch 151 and thereby breaks the loud speaker circuit so that no sound issues from the loud speaker until the next station is tuned in. If preferred, a switch may be arranged to short-circuit the loud speaker in response to the closing of relay 11.

Another embodiment of my invention is illustrated in Fig. 7 where parts similar to those in Fig. 3 are indicated by like reference numerals. In the apparatus shown in Fig. 7 the plate 115 is provided with selecting arms 151 each of which comprises a metal strip having a hole in one end for fastening the arm at the center of the plate 115. The outer end of the arm 151 is in the form of a hook 153 for frictionally engaging the edge of the plate 115.

As indicated in Fig. 8, the end of each selector arm 151 is notched for cooperation with a wedge-shaped member 152 mounted on the end of a spring arm 154.

Also each selector arm 151 has a wedge-shaped contact point 155 mounted thereon for engagement with a spring switch arm 157.

The function of the contact point 155 and switch arm 157 is to break the holding circuit of the relay 11. This is accomplished by means of a relay 159 which consists of a solenoid winding 161 and an armature 163 pivoted at the point 165. So long as the armature 163 is in the position illustrated, the holding circuit is closed and the motor 5 is connected to the power source 9. As soon as the solenoid winding 161 is energized, the armature 163 is moved and the holding circuit is broken, thereby disconnecting the motor from the power supply.

The wedge-shaped member 152 is pulled out of a selector arm notch when key 25 is closed, and held out between selector arms when the plate 115 is rotated, by means of a solenoid 167 comprising a magnetic core 169 which is, mechanically connected to the spring arm 154, and two solenoid windings 171 and 173. The lower winding 171 is connected in the holding circuit while the upper winding 173 is connected in series with the key 25 and relay winding 19.

The system will be better understood by considering the way in which it operates. Assume the system is in the condition illustrated, that is, set to receive one of the preselected stations. It will be noted that in this condition the holding circuit is open so that the wedge-shaped member 152 is seated in the end of a selector arm to hold the condenser 1 at exact setting desired.

If a different station is desired, the key 25 is closed for an instant. This completes a circuit through relay windings 19 and 173 to close relay 11 and pull the wedge member 152 clear of the selector arm. At the same time the motor 5 is started and the holding circuit is closed.

In the particular embodiment illustrated, the holding circuit was closed the instant the relay 11 closed because, in the condition initially assumed, the contact member 155 and switch arm 157 were out of contact as shown in Fig. 8 and, consequently, the armature 163 of relay 159 was in the closed position illustrated.

The closing of the holding circuit completed a circuit through relay windings 37 and 171 whereby the motor is connected to the power source 9 and the wedge-shaped member 152 is held away from the selector arms until the holding circuit is broken.

The holding circuit may be traced from the left-hand terminal of source 9, through the winding 37, the conductor 175, the relay coil 171, the armature 163, and the conductor 177 to the right-hand terminal of source 9.

The motor will continue to run and rotate condenser 1 and plate 115 until the contact member 155 on the next selecting arm comes into contact with the switch arm 157 which, it will be understood, is mounted in a fixed position. The instant this contact is made, a circuit is completed which pulls the armature 163 over to its open position whereby the holding circuit is broken.

The last-mentioned circuit may be traced from the right-hand terminal of source 9, through the conductor 177, the relay winding 161, the brush 179, the shaft 3, a selector arm 151, a contact point 155 and switch arm 157, and through a conductor 181 to the left-hand terminal of source 9.

The instant the holding circuit is broken, the relay 11 drops open to disconnect the motor from the power source and break the holding circuit at the contact point 41. Also, the spring arm 154 is released to seat the wedge-shaped member 152 in the notch in the selector arm and thereby position the rotor of condenser 1 in the exact position required to receive the desired station.

As the member 152 seats itself, it will rotate the plate 115 forward (assuming the motor stopped instantly) a slight amount and the switch arm 157 will slide past the top of the contact member 155 and out of contact therewith to the position shown in Fig. 8. If the overrun of the motor is too great, the spring will rotate the plate 115 in the reverse direction a slight amount in the manner described in connection with Figs. 1 and 3.

As soon as switch arm 157 slides past contact point 155 and out of contact therewith, the armature 163 drops to its closed position. The holding circuit, however, is still open since relay 11 is open. The circuit is now in the condition originally assumed so that if the key 25 is again closed, the operation will be repeated to select the next station.

If desired, the armature 163 may be caused to function as a motor brake by mounting a brake drum 183 on the motor shaft in a position such that, when the armature 163 is pulled over to its open position, it makes contact with the brake drum 183. If the motor armature has a small amount of inertia, it may be preferable to omit the brake drum 183. Again, it may be preferable to omit the spring 154 and relay 167, relying upon the brake to prevent the motor from over running.

As in the circuit of Fig. 3, it is desirable to make the condenser ineffective for a rotation of 180 degrees where the condenser is rotated continuously in one direction. For this purpose the

short-circuiting switch 145 and resistor 149 may be employed. As shown more clearly in Fig. 9, the switch 145 is preferably mounted upon an insulating member 185 and so positioned that it makes contact with a rotor plate during a half rotation thereof.

Instead of designing the apparatus so that the rotor of condenser 1 rotates in one direction only, it may be preferred to add a reversing mechanism to the system shown in Fig. 7. The reversing mechanism shown in Fig. 1, or one of any other suitable design may be used.

If a reversing mechanism is included in the circuit of Fig. 7, it is preferable that the adjustment of switch arm 157 be changed so that it makes contact with switch point 155 just an instant before the condenser rotor is in the desired position regardless of the direction of rotation of the selector arms. This action will take place if the switch arm 157 is set on a line drawn from the center of the plate 115 to the top or middle of the wedge-shaped member 152.

With the last-mentioned adjustment, the brake drum 183 may be utilized to prevent the motor from overrunning, or it may be omitted and the spring 154 relied upon to seat the member 152 and thereby bring the condenser rotor to the exact position desired. Also, with this adjustment the switch arm 157 remains in contact with the contact point 155 after the station has been selected.

It follows that when the key 25 is again closed to select the next station, it must be held closed long enough to permit the contact point 155 to rotate away from switch arm 157. Otherwise the motor would not continue to run as the holding circuit would not be closed at the armature 163.

Obviously, the key 25 need not be held closed long, and, in fact, it must not be or the next station will be skipped instead of being tuned in. If the key 25 is closed for a fraction of a second, that, in general, will be long enough.

The key 25 may be replaced by a special contact making device, such as a telephone dial of the type used with automatic telephone systems, for holding the circuit closed just long enough to permit contact 155 to rotate clear of arm 157, yet not long enough to allow a station to be skipped. It will be understood that only one electric impulse from the telephone dial would be utilized.

Figs. 10 and 11 illustrate a modified form of my invention in which the holding circuit is made ineffective by short-circuiting the winding of the holding relay. In Fig. 10, only a portion of the remote control system is shown, the rest of the system being the same as that of Fig. 1 or Fig. 3.

Referring to Figs. 10 and 11, it will be seen that in place of a single selector plate (as 51 in Fig. 1), a selector disc 191 is provided for each of the preselected stations. These selector discs are mounted on the shaft 3 to rotate with the tuning condenser. In order to simplify the drawings, only three selector discs have been shown.

A spring arm 193 and ball bearing 195 are provided for each selector disc 191 and so positioned that the ball 195 will seat in a depression 197 in the edge of a disc 191 when the condenser rotor reaches a preselected position.

A plurality of spring switch arms 199 and contact points 201 are connected in parallel across the winding 37 of the holding relay, the switch arms 199 normally being out of contact with the contact points 201. Preferably, resistors 203 are connected in series with the contact points 201 to limit the flow of current when the coil 37 is short-circuited, the resistors having a lower impedance than that of the coil 37.

Each spring arm 193 is provided with a projection 205 which is adjusted to slide past the end of the switch arm 199 as the ball 195 seats itself in a depression, thus making contact between arm 199 and contact point 201 momentarily. This short-circuits the coil 37 and causes the relay 11 to open and disconnect the motor from the power supply.

In order to make the short-circuiting of coil 37 more effective, a resistor 207 may be connected in series with coil 37. This will cause a substantial drop in voltage across coil 37 when a shunting circuit is closed.

It will be apparent that when key 25 is again closed, there will be no short across coil 37 and the motor will remain connected to the power source until the depression 197 of another selector disc comes into position to actuate another switch arm 199.

Various modifications may be made in my invention without departing from the spirit and scope thereof, and I desire, therefore, that only such limitations shall be placed thereon as are necessitated by the prior art and set forth in the appended claims.

I claim as my invention:

1. In a remote control system for a radio receiver which includes a tuning element, a relay located at said receiver, means including a control device located at a point remote from said receiver for actuating said relay, means for changing the tuning position of said tuning element in response to the actuation of said relay, a holding circuit for said relay, means for closing said holding circuit in response to the actuation of said relay whereby the tuning position of said tuning element is continuously changed until said holding circuit is rendered ineffective, and means for making said holding circuit ineffective and for returning said control system to its original condition with respect to said control device in response to said tuning element reaching a predetermined tuning position whereby said tuning element is moved to a different position in response to a second actuation of said control device, said last means also including means for setting the tuning element at the exact predetermined position after the holding circuit is made ineffective.

2. In a remote control system for a radio receiver which includes a tuning element, a relay located at said receiver, means including a control device located at a point remote from said receiver for actuating said relay, means for changing the tuning position of said tuning element in response to the actuation of said relay, a holding circuit for said relay, means for closing said holding circuit in response to the actuation of said relay whereby the tuning position of said tuning element is continuously changed until said holding circuit is rendered ineffective, means for making said holding circuit ineffective and for returning said control system to its original condition with respect to said control device in response to said tuning element reaching a predetermined tuning position whereby said tuning element is moved to a different position in response to a second actuation of said

control device, and additional means for setting the tuning element at the exact predetermined position after the holding circuit is made ineffective.

3. A remote control system for setting an element of a radio receiver at a preselected position, said system comprising a motor mechanically connected to said element, a control circuit, means including a relay for connecting said motor to a source of power in response to the closing of said control circuit, means including a holding circuit for keeping said motor connected to said source after said circuit has been opened, and means responsive to the position of said element for making said holding circuit ineffective and for moving the said element to the exact preselected position after the holding circuit has been broken.

4. In a control system for setting a radio tuning element at any one of a plurality of preselected positions, an electric motor mechanically connected to said element, a control circuit, means including a relay for connecting said motor to a source of power in response to the closing of said control circuit, means including a holding circuit for keeping said motor connected to said source after said control circuit has been opened, and means responsive to the position of said tuning element for making said holding circuit ineffective and for returning the connections of the control system to their original condition, said last means including spring means for determining the position of said tuning element after said holding circuit has been made ineffective..

5. In a remote control system for setting a radio tuning element at any one of a plurality of preselected stations, a source of power, an electric motor mechanically coupled to said tuning element, a station selector plate mechanically coupled to said tuning element, a control device located at a point remote from said receiver, means including a relay located at said receiver for connecting said motor to said source of power in response to the actuation of said control device, means for closing a holding circuit for said relay in response to the actuation of said relay, and means for breaking said holding circuit in response to said tuning element reaching a preselected position, said last means including contact points connected in series relation with said holding circuit, a spring arm carrying a member which rides on said plate between preselected stations, said selector plate having an element at each preselected position which has a depression therein, said spring arm being so positioned with respect to said selector plate that the said spring arm member seats in one of said depressions when one of said preselected positions is reached, and means carried by said spring arm and cooperating with one of said contact points to open said contact points momentarily as said member seats itself in said depression.

6. A remote control system according to claim 5 characterized in that said selector plate element comprises an arm supported by said selector plate and adjustable with respect thereto.

7. A remote control system according to claim 5 characterized in that said selector plate element comprises an adjustable arm supported by said selector plate, the depression in said arm having a front edge which is higher than its back edge.

8. In a tuning control system for a receiver having a tuning element therein, a primary driving means coupled to said tuning element for moving it forward to a tuning position, a control device, means for energizing said driving means in response to the actuation of said control device whereby said element is moved forward toward a predetermined tuning position, an auxiliary driving means operating substantially independently of the inertia of the moving parts of said primary driving means for moving said tuning element forward exactly to said predetermined position after said primary driving means has moved said tuning element to the region of said predetermined position, and means for rendering said primary driving means ineffective and for rendering said auxiliary driving means effective to move said tuning element forward in response to said tuning element being moved to the region of said predetermined position.

9. In a tuning control system for a receiver having a rotatable tuning condenser therein, an electric motor mechanically coupled to said condenser for rotating it toward a tuning position, a control device, means for supplying current to said motor in response to the actuation of said control device whereby said condenser is rotated toward a predetermined tuning position, means for maintaining a flow of current to said motor until said condenser is rotated to the region of said predetermined position, and means for interrupting said flow of current and for rotating said condenser to said exact predetermined position in response to said condenser reaching said region, said last means comprising a first cam member coupled to said condenser and a second cam member for engaging said first cam member, and also comprising a spring for driving said cam members into engagement with sufficient force to rotate said condenser.

10. The invention according to claim 9 characterized in that said first member is a rotatable element having a depression therein and further characterized in that said second cam member is shaped to seat in said depression, said second cam member being so supported that it is forced against said first cam member by said spring.

11. In a tuning control system for a receiver having a tuning element therein, a primary driving means, means for coupling said driving means to said tuning element for moving it to a tuning position, a control device, means for causing said driving means to move said tuning element in response to the actuation of said control device whereby said element is moved toward a predetermined tuning position, an auxiliary driving means operating substantially independently of the inertia of moving parts in said system for moving said tuning element exactly to said predetermined position after said primary driving means has moved said element to the region of said predetermined position, and means for rendering said primary driving means ineffective and for rendering said auxiliary driving means effective to move said tuning element in response to said tuning element being moved to the region of said predetermined position and before it reaches said position.

12. In a receiver having a tuning element, a tuning control system for tuning said receiver to a preselected station, said system comprising a motor mechanically connected to said element, means including a switch for closing a power circuit and thereby connecting said motor to a source of power in response to the closing of said switch, means for holding said switch closed

in response to the closing thereof, means for opening said power circuit in response to the tuning element reaching a predetermined position where the receiver is tuned only approximately to said station and thereby disconnecting said motor from said source of power and means operating substantially independently of the inertia of the moving parts of said system for next automatically tuning the receiver exactly to the predetermined station in response to said tuning element reaching said position.

13. In a remote control system for tuning a receiver to a preselected station, said receiver having a tuning element, a remote control switch which is normally open and which is located at a point remote from said receiver, a motor mechanically connected to said tuning element, means for connecting said motor to a source of power in response to a momentary closing of said remote control switch, means for keeping said motor connected to said source of power after said remote control switch is opened, means for disconnecting said motor from said source of power in response to said tuning element being moved to a position where the receiver is tuned only approximately to said preselected station, and means operating substantially independently of the inertia of the moving parts of said system for tuning said receiver exactly to said station in response to said tuning element reaching said position.

14. In a control system for tuning a receiver to a preselected station, said receiver having a tuning element, a motor, means for coupling said motor to said tuning element, a control device, means for causing said motor to move said tuning element in response to the actuation of said control device, means for causing said motor to continue to move said tuning element until said tuning element is moved to a position where the receiver is tuned only approximately to said preselected station, and means operating substantially independently of the inertia of the moving parts of said system for causing said motor to cease moving said tuning element and for tuning said receiver exactly to said station in response to said tuning element reaching said position.

15. In a tuning control system for a receiver having a tuning element therein, a primary tuning means comprising a motor, means for coupling said motor to said tuning element for moving it to a tuning position, a control device, means for causing said motor to move said tuning element in response to the actuation of said control device whereby said element is moved towards a predetermined tuning position at which said receiver is tuned exactly to a preselected station, an auxiliary tuning means operating substantially independently of the inertia of moving parts in said system for tuning said receiver exactly to said preselected station after said primary tuning means has moved said element to the region of said predetermined tuning position, and means for rendering said primary tuning means ineffective to move said element and for rendering said auxiliary tuning means effective automatically to tune said receiver exactly to said preselected stations in response to said tuning element being moved to the region of said predetermined position and regardless of whether said primary tuning means stops moving said element before or after said element has reached said predetermined position.

16. In a receiver having a tuning element, a tuning control system for tuning said receiver to a preselected station, said system comprising a primary tuning means including a motor, means for coupling said motor to said tuning element for moving it to said preselected station, a preselecting element which is set to a position corresponding to said preselected station, a cooperating element, means for producing relative movement between said preselecting element and said cooperating element in response to movement of said tuning element, a control device, means for causing said motor to move said tuning element in response to the actuation of said control device whereby said tuning element is moved towards a position where said receiver is tuned exactly to said preselected station and whereby relative movement is produced between said preselecting element and said cooperating element, an auxiliary tuning means operating substantially independently of the inertia of moving parts in said system for tuning said receiver exactly to said preselected station after said primary tuning means has moved said element to the region of said position, and means for rendering said primary tuning means ineffective to move said element and for rendering said auxiliary tuning means effective to tune said receiver exactly to said preselected station in response to said preselecting element and said cooperating element moving into cooperating relation and regardless of whether said primary tuning means stops moving said element before or after said element has reached said predetermined position.

17. In a receiver having a tuning element, a tuning control system for tuning said receiver to any one of a plurality of preselected stations, said system comprising a motor, means for connecting said motor to said element, a plurality of preselecting elements which may be set to positions corresponding to said preselected stations, at least one cooperating element, means for producing relative movement between said preselecting elements and said cooperating element in response to movement of said tuning element, a control device, means for causing said motor to move said tuning element in response to the actuation of said control device whereby said tuning element is moved towards a position where said receiver is tuned exactly to one of said preselected stations and whereby relative movement is produced between said preselecting elements and said cooperating element, means for causing said motor to continue to move said tuning element until said tuning element is moved to the region of said position and until said cooperating element and one of said preselecting elements move into cooperating relationship with each other, means for causing said motor to cease moving said tuning element in response to said cooperating element and said one preselecting element moving into cooperating relation, and means operating independently of the inertia of the moving parts of said system for next automatically tuning said receiver exactly to said one preselected station in response to said cooperating element and said one preselecting element reaching said cooperating position.

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