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REMOTE CONTROL APPARATUS FOR RADIORECEIVERS

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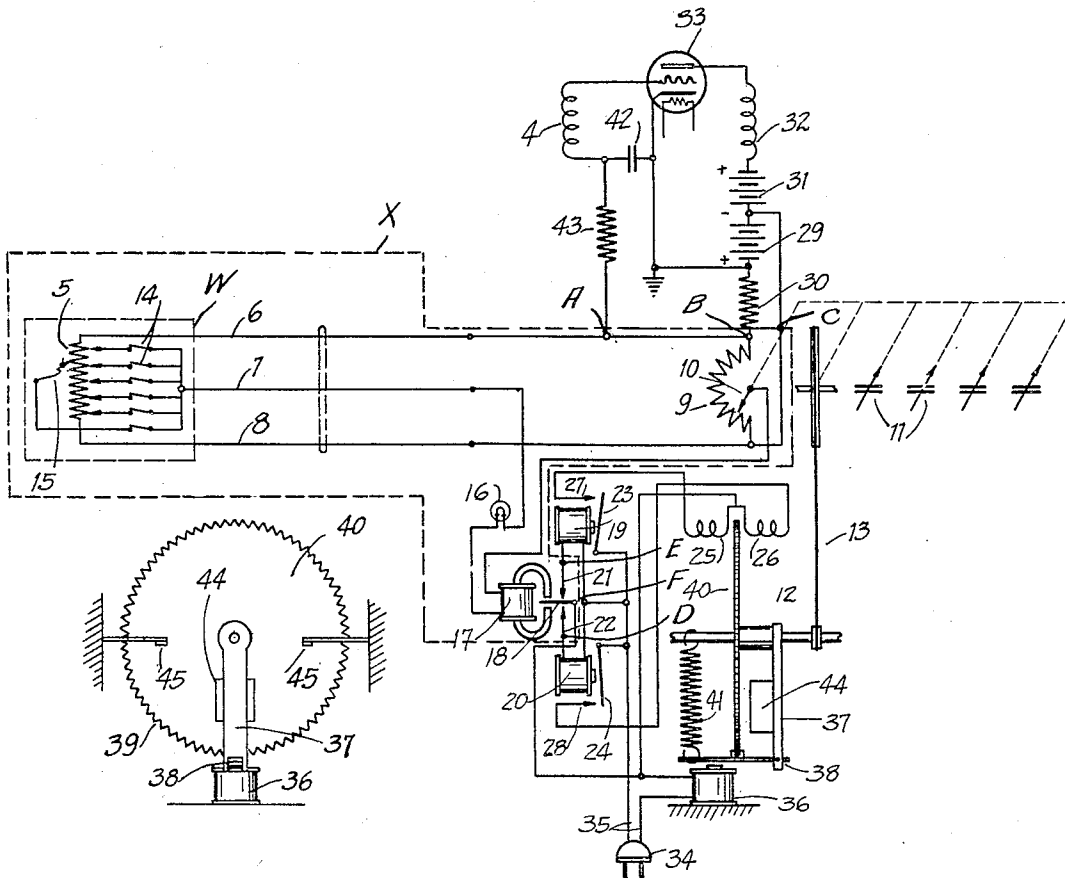


Fig. 1.

Fig. 2.

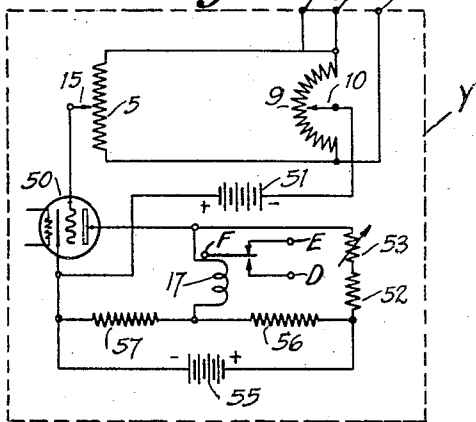


Fig. 3.

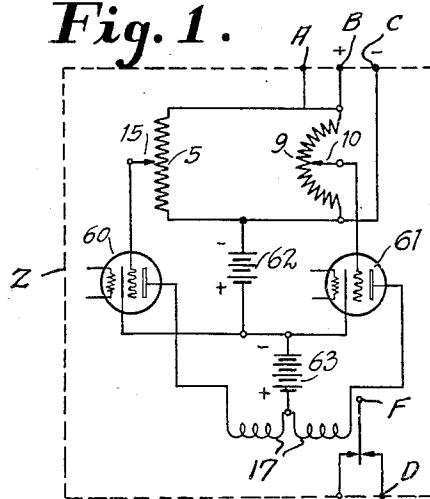


Fig. 4.

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REMOTE CONTROL APPARATUS FOR
RADIORECEIVERS

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Application September 26, 1929, Serial No. 395,352

14 Claims. (Cl. 250—20)

This invention relates to carrier wave broad-
cast receivers and particularly to systems for con-
trolling such receivers from a point or points
remote from the receivers.

5 An object of the invention is to control and tune
a radio receiver from a remote point.

Another object of the invention is to control
a radio receiver from a remote point, the control
being effected by the use of exceptionally small
10 currents.

A still further object of the invention is to con-
trol a radio receiver from a remote point by the
use of a polarized relay.

A feature of the invention is that vacuum tubes
15 are employed in a bridge circuit to control a
polarized relay, which in turn controls the actu-
ating motive means which may be of any suitable
type such as shown in Kolster co-pending appli-
cation 310,006 filed October 3, 1928.

20 The present invention consists substantially
in the construction, combination, location and
relative arrangement of parts which provide an
improved remote control system for radio re-
ceivers and apparatus of a like nature. In the
25 system disclosed in the application above referred
to, energy sufficient to operate the motive means
was transmitted through the remote control unit
and over the conductors leading thereto. In the
present system a comparatively small amount of
30 energy is required at the remote point to control
the operation of the tuning apparatus thereby
providing an extremely safe system as well as a
dependable one. This system further provides an
electrical blocking circuit effective during tuning
35 to prevent intermediate stations being received
in conjunction with a slow acting braking sys-
tem.

The invention will be more fully understood
by reference to the accompanying drawing in
40 which:

Fig. 1 is a diagrammatic schematic drawing of
a system embodying the principles of the inven-
tion;

45 Fig. 2 is a view of the motor-braking system,
showing a pendulum brake;

Fig. 3 is a schematic circuit drawing showing
the use of a single vacuum tube amplifier to
control a polarized relay; and,

50 Fig. 4 is a schematic circuit drawing showing
the use of a push-pull vacuum tube amplifier to
control a polarized relay.

Similar numerals refer to similar parts
throughout the several views.

55 In the apparatus and circuit shown in Fig. 1,
a high resistance potentiometer 5 is attached to

a 3-wire cable comprising conductors 6, 7, and
8, which terminates in a high resistance poten-
tiometer 9. A variable contact 10 located on
potentiometer 9 is mounted to rotate with a gang
condenser unit 11 of any well known type. The
condenser unit may be driven by an eddy current
motor 12 through any type of drive such as a
pulley and cord system 13.

Potentiometer 5 is provided with a plurality of
contacts 14, and a movable arm 15 in series with 10
a lamp 16 and a polarized relay 17. The relay
17 is provided with an armature 18 which closes
the energizing circuits of alternating current
relays 19 or 20 by contacts 21 and 22, re-
spectively, according to the direction of cur- 15
rent flow through relay 17. The relays 19 and
20 are provided with armatures 23 and 24, re-
spectively, which close circuits through contacts
27 and 28, energizing motor coils 25 and 26,
respectively, from a source of current received 20
over conductor 35 and plug 34. The plug may be
attached to the 110 V. house supply of alternat-
ing circuit.

The motor 12 is provided with a pendulum
arm 37 and a contact arm 38 adapted to fit 25
into a series of notches 39 in a driving disk 40
when drawn therein by a spring 41 and released
by the energization of a coil 36. Coil 36 is en-
ergized over conductor 35 when either relay 19 or
20 is energized, releasing the arm 38. To make 30
the braking action of the pendulum more effec-
tive, a weight 44 may be mounted on the arm 37.
Stops 45 limit the rotation of the arm 37.

Returning to the circuit, a definite voltage is
placed across the potentiometers 5 and 9 by a 35
battery 29 in series with a resistance 30. Bat-
tery 31, which is in series with battery 29, pro-
vides plate potential for a vacuum tube 33 which
may be any tube of a radio receiver although
preferably a radio frequency amplifier. A wind- 40
ing 32 is a primary of a coupling transformer and
winding 4 is a secondary of another coupling
transformer. The direct current grid circuit of
the tube 33 includes a resistance 43 and resistance
30. The latter resistance unit supplies the nor- 45
mal grid biasing potential by the drop across it
which is caused by the current flow from battery
29 through potentiometers 5 and 9. The alternat-
ing current circuit for the tube 33 is through a
condenser 42.

A description of the operation of the circuit is
as follows:

When it is desired to tune the receiver, adjust-
able arm 15 with its associated contact 14 or one
of the other contacts 14 is closed. If the motor 55

driven potentiometer arm 10 is not at a position corresponding to the contact which has been closed, current will flow from the battery 29 through the resistance 30 and through the coil of the relay 17. The direction of the current flow through the coil will depend upon the position of the arm 10 with respect to the contact which has been closed. For instance, if the arm 10 is at a lower position and one of the upper contacts 14 has been closed, current will flow in a definite direction through the relay 17 while if the arm 10 is in an upper position and one of the lower contacts 14 is closed, current will flow in the opposite direction through the relay 17. According to the direction of current flow, one of the contacts 21 and 22 will be closed, energizing the corresponding relay 19 or 20 and the corresponding coil 25 or 26. The motor 12 is thereby caused to rotate in one direction or the other depending upon the current flow through the relay 17. As long as the relay 17 remains energized, lamp 16, which may be placed either at the remote point or at the receiver, will be lighted showing that the receiver is in the process of being tuned.

When either of relays 19 or 20 is energized the energizing circuit includes the coil 36. The coil 36 by attracting the armature 38 releases the disk 40 from the pendulum and allows the motor to rotate the gang condenser unit 11 until the arm 10 reaches a position on resistance 9 corresponding to the position of the closed contact 14, balancing the bridge. When this condition is brought about relay 17 is deenergized, closed contact 21 or 22 is opened, relay 19 or 20 is de-energized, coil 36 is de-energized which allows spring 41 to connect the armature 38 to the disk 40 stopping the motor by the inertia of the pendulum arm 37 and weight 44. This type of braking action prevents an instantaneous stop of the disk 40 reducing shocks and jars and at the same time stopping the rotating mechanism within tuning limits even though the action is slightly oscillatory, since the receiving circuit is inoperative as will be explained hereinafter.

The apparatus 5, 14, and 15 shown within the dotted outline W may be located at any convenient distance from the receiver. Each of the contacts 14 may be preset to a particular broadcast wave length or station and thereafter a pressure on any contact will bring in that station. If, however, other stations are desired they may be tuned in under the control of contact 15 which may be in the form of the well known radio dial.

In the circuit just described, the resistance 30 performs two functions. It allows for the use of a high voltage across the potentiometers 5 and 9 which would ordinarily burn out the sensitive relay 17. The voltage drop across this resistance protects the relay. Furthermore when the current flow is increased through it by the energization of the relay 17, an increased grid bias is placed on the tube 33 blocking the signals therethrough and preventing any reception in the loud speaker while the rotating mechanism is moving and the set is being tuned. By this arrangement the receiver is made inoperative while the tuning operation is being accomplished. This blocking effect prevents relay clicks and noise produced by the motor from reaching the loud speaker. This blocking effect may be timed by the constants of condenser 42 and resistance 43 to be effective long enough to permit the rotating condenser mechanism to become stationary in spite of its oscillation due to the pendulum brake.

Fig. 3 shows a single tube amplifier in the

bridge circuit in which the plate impedance of the tube is in one arm of the bridge. The apparatus and circuit arrangement shown within the dotted enclosure Y may be substituted for that within the dotted enclosure X of Fig. 1, the points designated A, B, C, D, E and F representing where connections are to be made with the other parts of Fig. 1. Variable contact 15 is connected to the grid of the tube 50 while the variable arm 10 of potentiometer 9 is connected through grid biasing battery 51 to filament of the tube 50. A fixed resistance 52 and variable resistance 53 are shown in the plate circuit in shunt to the coil of relay 17. A high plate potential supply for the tube 50 is shown as a battery 55 shunted by a potentiometer composed of resistances 56 and 57.

The relay 17 operates as before on oppositely flowing currents due to the unbalancing of the bridge composed of potentiometers 5 and 9. When current is caused to flow in one direction, the grid has an increased, negative bias while current flow in the opposite direction reduces the normal bias placed on the tube by battery 51. This change in the plate impedance of the tube 50 changes the direction of flow of current through the polarized relay 17. For instance, with a high negative bias, the tube acts as an open circuit and raises the potential of the plate terminal to which the upper end of the coil 17 is connected. Current will then flow downward through the coil of relay 17 due to the fact that resistances 52 and 53 in series with coil 17 are in shunt with resistance 56 all of which have a common return to battery through resistance 57. With a high positive grid bias the tube acts as a short circuit and current will flow in upward direction through the coil of relay 17 due to the fact that the resistance ratio between the resistance 57 and the tube 50 will then be greater than the ratio of resistance 56 to the sum of the resistances 52 and 53. The variable resistance 53 is required to adjust the relay when using different tubes which may have different characteristics. With this type of circuit only comparatively small voltages are required at the remote point of control and across the contacts. This permits the controlled receiver to be located a long distance from the controlling unit.

Fig. 4 shows a circuit similar to Fig. 3 except that it is adapted to a push pull arrangement of vacuum tubes which further increases the sensitiveness of control with small currents. The apparatus and circuit arrangement shown within the dotted enclosure Z may be substituted for that within the dotted enclosure X of Fig. 1, the points designated A, B, C, D, E and F representing where connections are to be made with the other parts of Fig. 1. The grids of tubes 60 and 61 are connected to the arms 15 and 10, respectively, of the bridge formed by potentiometers 5 and 9 and receive a bias from a battery 62. Plate potential is obtained from a battery 63. With this type of circuit a double winding is required on the relay to produce the opposite polarization necessary with alternate biasing on the push pull tubes.

Although the invention as described above has been shown embodied in one particular system it is to be understood that equivalent systems are contemplated and the invention is to be limited only by the scope of the appended claims.

What is claimed is:

1. In a radio receiver having a plurality of electron tubes, means for tuning said receiver, means for actuating said tuning means, means

located at a point remote from said receiver for controlling said actuating means, and means operating responsive to actuation of said controlling means continuously to change a circuit of one of said electron tubes to render the receiver inoperative during all movements of said actuating means whereby no clicks are produced in the receiver when said last mentioned means is operated to change a circuit of said one of said electron tubes.

2. Remote control apparatus for tuning a receiver comprising a potentiometer having pre-arranged taps, a plurality of corresponding manual switches in parallel connection therewith, motor-mechanism for tunably adjusting said radio receiver, an electrically balanced network including at least one electron tube of those which are comprised in the receiving circuit of said radio receiver, said balanced network comprising conductors to the terminals of said potentiometer, a conductor common to said manual switches, a three-position relay responsive to an unbalancing of said balanced network, a second potentiometer in said balanced network and mechanically associated with motor-mechanism, and means having the dual function of selectively actuating said motor mechanism through said three-position relay and also of silencing said receiver while it is being tuned.

3. Apparatus for tuning a radio receiver comprising a set of manually operable switch keys remotely located from said receiver, each key being selectable to render said receiver responsive to a desired frequency, a reversibly operable motor-driven tuning device in said receiver, a balanced three-wire circuit connecting said switch keys with said tuning device, a variably tapped impedance associated with said switch keys at one end of said three-wire circuit, a potentiometer at the other end of said three-wire circuit and mechanically adjusted by the operation of said tuning device, a motor control relay included in said three-wire circuit, an electron tube and a portion of the radio receiving circuit in shunt with said three-wire circuit, means whereby an unbalancing of said three-wire circuit by manipulation of a switch key is caused to alter the grid bias of said electron tube so as to silence said radio receiver and another electron tube to impress an amplified current upon said relay thereby to control said tuning device, until the adjustment thereof with its associated potentiometer restores the balance in said three-wire circuit.

4. Apparatus for tuning a radio receiver having a plurality of electron tubes and comprising a tuning device, means for operating the tuning device, means located at a point remote from said receiver for controlling the operating means, and means operating responsive to actuation of said controlling means to effect such a continuous change in grid bias in one of the electron tubes that said one tube is rendered inoperative whereby the said radio receiver is silenced during all setting movements of said tuning device and no clicks are produced in said radio receiver.

5. Apparatus for tuning a vacuum tube radio receiver comprising a reversibly operable motor-driven tuning device, a balanced circuit arrangement for remotely controlling said tuning device to effect a desired setting thereof, electron-tube and potentiometer-balancing means in said circuit arrangement and means operable in response to the artificial unbalancing of the circuit

arrangement to control the direction and extent of movement of said tuning device and to effect a change of grid bias in the vacuum tube circuit of said receiver such as to silence the same.

6. In a radio receiver having a plurality of electron tubes, each having an input and an output circuit, means for tuning said receiver, means for actuating said tuning means, means located at a point remote from said receiver for controlling said actuating means, and means responsive to operation of said controlling means for continuously altering an electrical characteristic of one of said circuits of one of said tubes thereby to make the receiver inoperative during all movements of said actuating means whilst maintaining the heating circuit of said one electron tube, whereby no clicks will be produced in said receiver when the electrical characteristic of said one of said circuits is altered.

7. An actuator for the tuning mechanism of a radio receiver comprising a motor having an eddy-current disk provided with peripheral notches, and remotely controlled field circuits, means including a latch engageable with one of said peripheral notches for yieldingly arresting said eddy-current disk, said motor having a pendulum arm to which said latch is pivotally connected, a spring normally holding said latch in engagement with a notch of said disk, and means in circuit with said field circuits to release said latch from engagement with said disk, thereby permitting unimpeded operation of the motor.

8. An actuator for the tuning mechanism of a radio receiver comprising a motor having an eddy-current disk and having a remotely controlled field circuit, a pivotally mounted pendulum like weight member, means normally clutching said disk to said member, remotely controlled means to render said clutching means ineffective whilst said field circuit is energized, and means operating upon de-energization of said field circuit for causing said clutching means to clutch said disk to said member whereby the inertia of said member stops the rotation of said disk.

9. An actuator according to claim 8, in which said disk has notches of wedge-shaped cross-section around its periphery and said clutching means includes a lever pivotally connected to said weight member and having a portion shaped to enter one of said notches.

10. In a radio receiver having a plurality of electron tubes, means for tuning said receiver, means for actuating said tuning means, means located at a point remote from said receiver for controlling said actuating means, and means rendered effective in response to actuation of said controlling means continuously to change a characteristic of one of said electron tubes thereby to render the receiver inoperative during all movements of said actuating means whereby no clicks are produced during the operation of said last mentioned means.

11. In a radio receiver having a plurality of electron tubes, means for tuning said receiver, means for actuating said tuning means, means located at a point remote from said receiver for controlling said actuating means, and means rendered effective in response to actuation of said controlling means continuously to increase the input impedance of one of said electron tubes to a finite value as to render the receiver inoperative during movement of said actuating means

whereby no clicks are produced during the operation of said last mentioned means.

12. An actuator for the tuning mechanism of a radio receiver comprising a motor having an eddy-current disk fixed to a rotatable shaft and having remotely controlled field circuits, a pendulum arm pivotally mounted at one end on said shaft, means normally clutching said disk to said pendulum arm, remotely controlled means to render said clutching means ineffective whilst said field circuit is energized, and means operating upon de-energization of said field circuit to cause said clutching means to clutch the disk to said pendulum arm whereby rotation of said disk is stopped by the inertia of said pendulum arm.

13. In a radio receiver having a plurality of electron tubes, one of said tubes having a plurality of electrodes including a cathode, an anode and a grid, means normally maintaining said grid at a predetermined potential with respect to said cathode, means for tuning said receiver, means for actuating said tuning means, means located at a point remote from said receiver for controlling said actuating means, and means operating responsive to actuation of said controlling means continuously to alter said potential of said grid to a value so negative as to render one tube in-

operative as a translating device thereby to silence said radio receiver during a selected setting movement of said tuning device whereby no clicks are produced in said receiver when said last mentioned means is operated to alter the potential of the grid.

14. In a radio receiver having a plurality of electron tubes, one of said tubes having a plurality of electrodes including a cathode, an anode and a grid, a source of direct current, a resistance element, connections between said source, said resistance element and said grid for normally maintaining said grid at a predetermined biasing potential, means for tuning said receiver, means for actuating said tuning means, means located at a point remote from said receiver for controlling said actuating means, and means operating responsive to actuation of said controlling means to increase the flow of current from said source through said resistance element whereby the biasing potential of said grid is increased negatively to such a value as to render said one electron tube inoperative as a translating device and thereby silence said radio receiver during a selected setting movement of said tuning device.

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