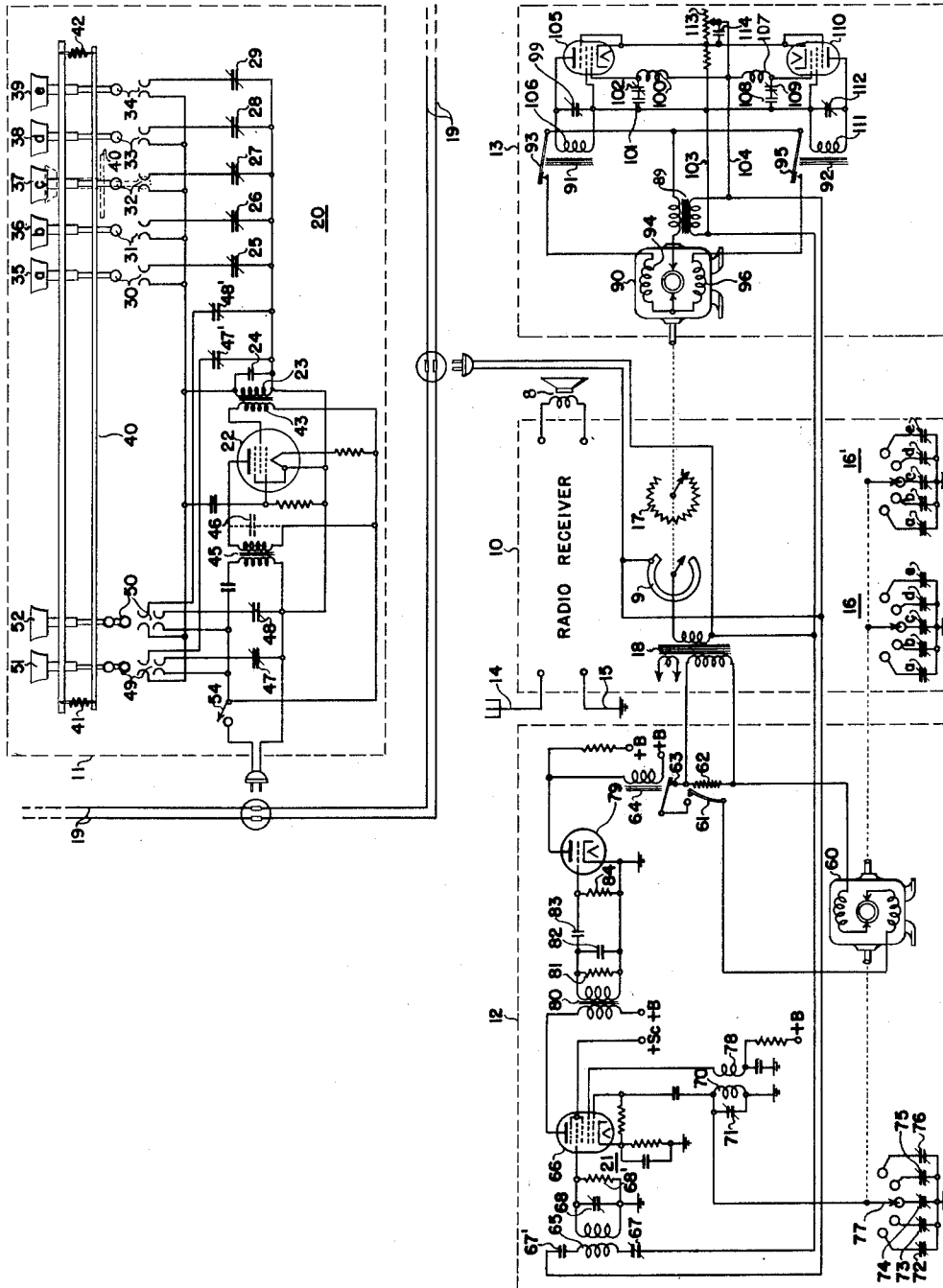


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REMOTE CONTROL WAVE SIGNAL
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This invention relates generally to remotely controlled wave-signal receivers and particularly to such receivers comprising a simplified remote-control arrangement.

5 It is frequently desirable to control a wave-signal receiver from a point remote from the receiver. For instance, it may be desirable to place the bulky parts of the receiver at some convenient part of the room, or at some position to secure the best acoustical effect, and to control the receiver by means of a control unit from a remote point conveniently located for manipulation. Furthermore, it may be desirable to move the control unit about from place to place.

15 Certain prior art systems for effecting a control of the type under discussion utilize a cable comprising a large number of conductors extending between the receiver proper and the remote-control station. It has also been proposed to effect a remote control by means of a high-frequency wave transmitted over the power lines of the source of power supplying the device to be controlled. However, systems of the last-mentioned type in general comprise complicated

25 apparatus if a relatively large number of control operations are to be effected. They generally comprise an oscillator for generating oscillations of adjustable frequency at the remote station and transmitting them to the controlled unit, and frequency sensitive circuits at the controlled unit to effect the various control operations. A simplification is generally procured in remote-control receiver systems by including a follower arrangement driven by the control

30 motor at the receiver, the tuning operation of the receiver being dependent upon the relation of the position of the manually-controlled element at the remote station and the position of the follower at the receiver.

40 Prior art remote-control systems comprising a follower arrangement have, however, the disadvantage of requiring additional conductors between the control station and the controlled unit, while it is desirable to control the receiver over the power-supply lines. Furthermore, in the prior art control arrangements in which a follower of some form is provided at the control station the follower is continuously adjusted by the tuning motor at the receiver, the energization of the tuning motor gradually decreasing as the follower approaches the point of balance so that the position at which the motor finally stops is not critically related to the setting of the control unit at the remote station.

55 It is an object of the invention, therefore, to

provide a wave-signal receiver which may be remotely controlled and which is not subject to the above-mentioned disadvantages of the arrangements of the prior art.

It is a further object of the invention to provide a wave-signal receiver which may be remotely controlled and in which the control arrangement may be connected to the receiver over the power-supply lines.

In accordance with one embodiment of the invention, in a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a tuning motor and tuning means for the receiver driven by the motor, there is provided a remote-control system comprising a control station remote from the motor and including a source of high-frequency oscillations of frequencies different from that of any of the signals to be received. There is also provided a manual control means for varying the frequency of the source, a frequency-adjustable frequency follower at the receiver external to the signal-translating channel thereof, and means differentially responsive to the high-frequency oscillations and to the output of the frequency follower for effecting operation of the motor only when the differential response is other than a predetermined value. Means comprising the motor are provided for adjusting the frequency of the frequency follower substantially to that effective to produce a differential response of said predetermined value and to tune the receiver in accordance with the setting of the manual control means.

In a preferred embodiment of the invention, there is also provided an oscillator at the receiver, the frequency of which is adjustable in discrete steps by the control motor, the operation of the motor being dependent upon a difference frequency characteristic of the two oscillations. The system is so proportioned that, when such frequency difference is equal to the value provided by a difference in the settings of the oscillators of at least one step, ample energy is provided to control the operation of the motor to adjust its associated oscillator to the step corresponding to the setting of the other oscillator while, when the oscillators are adjusted to corresponding steps, any residual inaccuracies in the circuit impedances result in insufficient energy to effect operation of the motor at all, thus rendering the system non-critical to such incidental inaccuracies.

Also, in a preferred embodiment of the in-

vention, the tuning motor drives a plurality of contact-making devices, one for each tunable circuit of the receiver, for inserting fixed-tuned elements in the receiver circuits to tune the receiver to a predetermined station at each position of the control unit and each having contact points corresponding to the adjustable steps of the oscillators. Preferably, there is included in the remote-control system of the invention means for remotely controlling the power supply to the receiver, means for remotely effecting a volume control of the receiver, and a calibrated station indicator dial or equivalent. In accordance with the preferred embodiment of the invention, a system which has these features requires only the usual power-supply lines between the receiver and the remote-control station.

For a better understanding of the invention, together with other and further objects thereof, reference is had to the following specification taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

The single figure of the drawing is a circuit diagram, partly schematic, of a wave-signal receiving system embodying the remote-control system of the invention. The complete system comprises a radio receiver 10, together with a remote-control arrangement which includes a remote-control unit 11 and an actuated control unit mounted adjacent or within the receiver and shown for convenience as two sections 12 and 13. The function of section 12 is to adjust the tunable circuits of the receiver and that of section 13 is to effect operation of the off-on switch and the volume-control element of receiver 10. The receiver 10 is indicated schematically and may be of a conventional type in which the tuning units thereof are uncontrolled for selecting signals intercepted by an antenna-ground circuit 14, 15 which signals are finally reproduced by loud-speaker 8. The receiver 10 includes sets of adjustably-fixed tuning condensers 16, 16', adapted for unicontrol, a separate set of condensers being provided for each tunable circuit of the receiver, and a predetermined condenser of each of the sets designated by letters *a*—*e* being switched into its respective tunable circuit of the receiver to tune the receiver to a particular station. The receiver 10 also comprises a volume-control potentiometer 17 and a transformer 18 adapted to supply power to the receiver from a source 19. A switch 9 is included in the primary circuit of transformer 18 and is adapted to be uncontrolled with volume-control potentiometer 17, the switch 9 being opened when the potentiometer is in such a position as to reduce the volume of the receiver to a minimum.

The remote-control system of the invention comprises an oscillator 20 located at the remote-control unit 11 and an oscillator-modulator 21 located in section 12, the frequency of each oscillator being adjustable in steps and the tuning of the receiver being dependent upon the difference frequency of the generated oscillations. Oscillator 20 comprises a tube 22, the control grid and the screen grid of which are used in the oscillator circuit. The oscillator frequency-determining circuit is connected to the control grid of tube 22 and comprises, insofar as receiver tuning is concerned, an inductance 23 tuned by condenser 24 and any one of condensers 25, 26, 27, 28, 29 adapted to be selectively connected in

parallel with condenser 24 by means of switches 30, 31, 32, 33, 34, operated by push buttons 35, 36, 37, 38, 39, respectively. The switches 30—34 are of the normally open type, push buttons 35—39 being adapted to be returned to their normally open position as soon as released by means of lever 40 and springs 41 and 42. Preferably, means are incorporated in the push-button unit whereby the last-operated button does not return fully to its former position in order to provide an indication of the station to which the receiver is tuned. The second grid of vacuum tube 22 is utilized as the oscillator anode and is connected to a feed-back circuit comprising inductance 43 inductively coupled to inductance 23 of the frequency-determining circuit. The output of the oscillator section of tube 22 is electronically coupled to the anode-cathode circuit of the tube which, in turn, is coupled to the line 19 through a suitable plug and a band-pass filter including transformer 45, the primary winding of which is turned by condenser 46, shown in dotted lines for the reason that it may be comprised in whole or in part of the inherent capacitance of the output circuit of tube 22.

In order to provide a remote volume control of receiver 10, the frequency-determining circuit of the oscillator is adapted to be tuned by condensers 47' and 48'. Condensers 47 and 48 are provided to tune the secondary winding of transformer 45 when condensers 47' and 48', respectively, are included in the circuit of the oscillator. Condensers 47, 47', 48 and 48' may be connected in their appropriate circuits by means of switches 49 and 50 operated by push buttons 51 and 52, constructed similarly to push buttons 35—39. The band-pass filter comprising tuned transformer 45 is adapted to be connected to the source of power supply 19 for receiver 10 through a switch 54, preferably uncontrolled with push buttons 35—39 and 51 and 52 so that switch 54 is closed only during the time a control operation is being effected. It will be understood that the same source is effective to supply power to the remote unit 11, to receiver 10, and the control sections 12 and 13. Anode and screen potentials for tube 22 are obtained directly from power-supply source 19, the oscillator 20 operating only during the positive half-cycles of the supply voltage.

Section 12 of the control arrangement, provided to effect tuning of receiver 10, comprises a tuning motor 60, the shaft of which is mechanically coupled to the shaft of the ganged switches of condenser sets 16, 16' by means of reduction gears which may be of any conventional type. Power is supplied to operate motor 60 through a thermostatic switch 61, having a heater 62, and normally closed contacts 63 of relay 64. The purpose of switch 61 is to open the circuit of motor 60 when the receiver 10 is not in operation so that motor 60 will not operate and disturb a previous tuning setting during the interval of heating of tubes 66 and 79 after power is supplied to the receiver.

The high-frequency tuning-control signals generated in remote unit 11 are transmitted over power line 19 to section 12 and are applied through transformer 65 to the signal input grid of a frequency changer comprising tube 66. The selector comprising transformer 65 is designed to pass a band of frequencies including those generated by oscillator 20 when any of push buttons 35—39 are operated and to reject the frequencies generated by oscillator 20 when push

buttons 51, 52 are operated for effecting volume control or on-off operation of the receiver. The primary winding of transformer 55 is series-tuned by means of condensers 67 and 67' and the secondary winding is tuned by condenser 68 and loaded by resistor 68'. The selector provides an impedance which approximately matches that of the power-supply line 19 over the range of the prescribed control frequencies. Frequency converter or oscillator-modulator 21 comprises an oscillator section for generating oscillations the frequency of which is variable in steps corresponding to those of oscillator 20 and comprising a frequency-determining circuit including an inductance 70 tuned by condenser 71 and any of condensers 72, 73, 74, 75, 76 adapted to be selectively connected in parallel with condenser 71 by a switch 77 driven by motor 60. The oscillator section of oscillator-modulator 21 also includes a feed-back circuit comprising an inductance 78 inductively coupled to inductance 70.

In order that motor 60 may be operated by the heterodyne or beat frequency comprising the difference of the frequencies of oscillator 20 and the oscillator section of oscillator-modulator 21, that is, in order that it may be differentially responsive to the outputs of these units, there is provided a triode rectifier tube 79 coupled to the output circuit of frequency changer 66 and adapted to energize relay 64. The coupling circuit between the tube 66 and the rectifier 79 comprises a transformer 80 across the secondary winding of which is connected a loading resistor 81 and condenser 82, the secondary winding of transformer 80 being coupled to the input circuit of tube 79 through a coupling condenser 83. A grid-leak resistor 84 is provided for rectifier 79.

Section 13 of the control system includes a motor 90 mechanically coupled to volume-control element 17 and the off-on switch 9 of receiver 10, preferably by means of reduction gears which may be of any conventional type. Motor 90 is a reversible motor having windings 94 and 96 the energization of which from supply transformer 89 is controlled by reversing relays 91 and 92 through contacts 93 and 95, respectively.

In order that relay 91 may be energized by high-frequency oscillations transmitted from the control station 11 over the power lines 19, there is provided a series-resonant circuit comprising inductance 100 and condensers 101 and 102 coupled across the power lines 19 through conductors 103 and 104. The input circuit of a pentode rectifier 105 is coupled across inductance 100, the output circuit of rectifier 105 comprising winding 106 of relay 91 and the by-pass condenser 99. Similarly, there is provided a second series-tuned circuit for relay 92 comprising an inductance 107 and condensers 108, 109 coupled across power lines 19 through conductors 103 and 104 and a pentode rectifier 110 having its input circuit coupled across inductance 107. Connected in the output circuit of rectifier 110 is winding 111 of relay 92, shunted by condenser 112. A common cathode-biasing resistor 113 is provided for rectifiers 105 and 110, resistor 113 being adjustable and being by-passed by condenser 114.

In considering the operation of the system described above, it will be understood that each of condensers 25—29, inclusive, when connected in the circuit of oscillator 20 is effective to tune the oscillator to generate oscillations of a different predetermined frequency utilized to tune the receiver, while each of condensers 47', 48' is

effective to tune oscillator 20 to generate a different frequency to effect volume control of the receiver and energization of the receiver and the control apparatus 12. The frequencies of the oscillations generated by oscillator 20 are sufficiently different that they may be separated by selective circuits, the frequencies preferably being separated by 10 kilocycles or more and falling within the range of 90–250 kilocycles. In any event the frequencies generated by oscillator 20 should fall outside the range of signals to be received by the receiver 10 in order to avoid interference from the control signals. It will be understood that the oscillations generated by oscillator 20 for effecting a volume control have a frequency outside of the pass-band selector comprising transformer 65 so that these oscillations have no effect on the tuning unit 12. Condensers 72—76, inclusive, are effective to tune the oscillator section of oscillator-modulator 21 to frequencies corresponding to those of oscillator 20 when oscillator 20 is tuned by condensers 25—29, respectively. The series-tuned circuits 100, 101, 102 and 107, 108 and 109 of unit 13 are tuned to the frequencies generated by oscillator 20 when tuned by condensers 47', 48', respectively.

It will be assumed that initially the parts of the system are in the positions illustrated and that the power switch 9 of the receiver 10 is open. When it is desired to place the receiver in operation, push-button 51 is operated simultaneously closing switch 54, causing oscillator 20 to deliver high-frequency oscillations of a predetermined frequency to the power lines 19. Series-tuned circuit 100, 101, 102, being resonant at this frequency, responds to such oscillations and energizes the coil 106 of relay 91 through rectifier 105, closing contacts 93 of relay 91 to operate motor 90 in such direction as to close switch 9 and to turn up the volume control 17 of receiver 10. After the proper setting of the volume-control potentiometer 17 has been made, push-button 51 is released opening switch 54 and relay 91 is deenergized thereby opening contacts 93 and stopping motor 90 at the proper position. When it is desired to reduce the volume of the receiver or to open switch 9, push-button 52 is operated, thereby causing oscillator 20 to deliver a different predetermined frequency to the power lines 19. Series-tuned circuit 107, 108, 109 is resonant at this frequency and effects operation of relay 92 through rectifier 110 to operate motor 90 in such direction as to reduce the volume of the receiver or to remove power from receiver 10 and unit 12 by opening switch 9. The motor is stopped at the desired point by releasing push-button 52 before switch 9 is opened.

Contacts 61 of thermostatic relay 62 are closed a predetermined time after energization of the primary winding of transformer 18 through switch 9. During this interval tubes 66 and 79 are heated and, provided no control signal is applied to tube 66, tube 79 draws sufficient anode current to open relay contact 63. As shown in the drawing, the receiver is tuned to the station indicated as c on the dial at the remote control station. With the elements in the positions indicated and switch 37 in the dotted position, the tuning control arrangement is in a condition of equilibrium. Under the conditions assumed, the oscillations of oscillator-modulator 21 are of the same frequency as those of oscillator 20 and the beat frequency generated by 75

oscillator-modulator 21 is zero. At zero beat frequency there is no input to grid-leak detector 79 because of the blocking action of condenser 83. Under this condition of equilibrium, the input circuit of rectifier 79 has a zero grid bias so that it has a high value of conductance and energizes the winding of relay 64, opening the circuit of motor 60 at contacts 63.

If now one of the other tuning-control push buttons is operated, the tuning arrangement is considerably unbalanced resulting in a difference in frequency of a value other than that corresponding to equality of the frequencies of the inputs to oscillator-modulator 21, the modulator having a beat-frequency output which results in a relatively large bias being developed in the grid circuit of rectifier 79 to reduce the conductance thereof to a minimum value and to deenergize the winding of relay 64 to close its contacts 63. Motor 60 is thus energized to adjust the frequency follower and the tuning of the receiver. The several contacts of switch 77 are closed consecutively as motor 60 operates to switch into the receiver circuit the sets of tuning condensers 16, 16' until the frequency of the oscillator section of oscillator-modulator 21 is equal to that generated by oscillator 20. At this time there is again substantially no output from oscillator-modulator 21 and the negative bias on rectifier 79 is reduced, energizing the winding of relay 64 to stop motor 60. Since motor 60 runs in only one direction, it may make almost a complete cycle of the steps to which oscillator 21 is tunable before the system is finally balanced.

It will be understood that the oscillator section of oscillator-modulator 21 locks exactly to zero beat frequency due to incidental couplings within tube 66 and from the circuit comprising transformer 65 to the frequency-determining circuit 70, 71, 78 when the frequency of the oscillations generated at the remote station is close to the resonant frequency of the frequency-determining circuit of oscillator-modulator 21. This simplifies the design of the filter comprising elements 80-84 and provides tolerance in the relative values of condensers 72-76 and 25-29, respectively.

In summary it is seen that, by means of a remote unit requiring no additional conductors, the receiver may be turned off and on, the volume may be adjusted, anyone of any desired number of stations may be selected, and indication may be produced at the remote-control unit showing the station to which the receiver is tuned.

In the particular application of the invention illustrated it will be understood that the location of remote unit 11 will never be outside the confines of the house or apartment where the receiver is installed so that the high-frequency oscillations utilized to effect control are not attenuated in passing through a watt-hour meter. The attenuation afforded by such meters prevents interference between similar neighboring remote-control installations.

It will also be understood, that while in the embodiment shown, the control oscillations generated in remote unit 11 are transmitted to the controlled units 12 and 13 of the receiver over the power lines 19, that a separate two-conductor cable may be utilized for transmission of the control oscillations or that they may be transmitted to the receiver by radiation in a known manner.

Furthermore, it will be understood that the frequency follower of the invention may take a

variety of forms. For example, instead of an active oscillation generator at the controlled unit, the frequency follower may comprise a passive electrical network and suitable frequency-responsive control apparatus.

While there has been described what is at present considered to be the preferred embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore, aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a tuning motor and tuning means for said receiver driven by said motor, a remote-control system comprising, a control station remote from said motor and including a source of high-frequency oscillations of frequencies different from that of any of said plurality of signals, manual control means for varying the frequency of said source, a frequency-adjustable frequency follower at said receiver and external to said channel, means differentially responsive to said high-frequency oscillations and to the output of said frequency follower for effecting operation of said motor only when said differential response is other than a predetermined value, and means comprising said motor for adjusting the frequency of said frequency follower substantially to that effective to produce a differential response of said predetermined value and to tune the receiver in accordance with the setting of said manual control means.

2. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a tuning motor and tuning means for said receiver driven by said motor, a remote-control system comprising, a control station remote from said motor and including a source of high-frequency oscillations of frequencies different from that of any of said plurality of signals, manual control means for varying the frequency of said source, a frequency-adjustable frequency follower at said receiver and external to said channel, means differentially responsive to said high-frequency oscillations and to the output of said frequency follower for effecting operation of said motor only when said differential response is above a predetermined value, the response of said differentially-responsive means being less than said predetermined value only when the frequency of said frequency follower bears a predetermined relation to that of said source, and means comprising said motor for adjusting the frequency of said frequency follower substantially to said predetermined relation and to tune the receiver in accordance with the setting of said manual control means.

3. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a tuning motor and tuning means for said receiver driven by said motor, a remote-control system comprising, a control station remote from said motor and including a source of high-frequency oscillations of frequencies different from that of any of said

plurality of signals, manual control means for varying the frequency of said source, a frequency-adjustable frequency follower at said receiver and external to said channel, means differentially responsive to said high-frequency oscillations and to the output of said frequency follower for effecting operation of said motor only when said differential response is above a predetermined value, the response of said differentially responsive means being less than said predetermined value only when the frequency of said frequency follower is substantially equal to that of said source, and means comprising said motor for adjusting the frequency of said frequency follower substantially to equality with that of said source of oscillations and to tune the receiver in accordance with the setting of said manual control means.

4. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a tuning motor and tuning means for said receiver driven by said motor, a remote-control system comprising, a control station remote from said motor and including a source of high-frequency oscillations of frequencies different from that of any of said plurality of signals, manual control means for varying the frequency of said source, a frequency follower at said receiver adjustable in discrete steps and external to said channel, means differentially responsive to said high-frequency oscillations and to the output of said frequency follower for effecting operation of said motor only when said differential response is above a predetermined value, the response of said differentially-responsive means being less than said predetermined value only when the frequency of said frequency follower bears a predetermined relation to that of said source, and means comprising said motor for adjusting the frequency of said frequency follower substantially to said predetermined relation and to tune the receiver in accordance with the setting of said manual control means.

5. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a tuning motor and tuning means for said receiver driven by said motor, a remote-control system comprising, a control station remote from said motor and including a first source of high-frequency oscillations of frequencies different from that of any of said plurality of signals, manual control means for varying the frequency of said source, a second source of high-frequency oscillations at the receiver and external to said channel, the frequency of said second source being adjustable, means responsive to the difference of two similar characteristics of said oscillations for effecting operation of said motor only when said difference is above a predetermined value, and means comprising said motor for adjusting the frequency of said second source substantially to that effective to produce a differential response of less than said predetermined value and to tune the receiver in accordance with the setting of said manual control means.

6. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a tuning motor and tuning means for said receiver driven by said motor, a remote-control system comprising, a control

station remote from said motor and including a first source of high-frequency oscillations of frequencies different from that of any of said plurality of signals, manual control means for varying the frequency of said source, a second source of high-frequency oscillations at the receiver and external to said channel, the frequency of said second source being adjustable in discrete steps, means responsive to the difference of two similar characteristics of said two oscillations for effecting operation of said motor only when said difference is above a predetermined value, and means comprising said motor for adjusting the frequency of said second source substantially to that effective to produce a differential response of less than said predetermined value and to tune the receiver in accordance with the setting of said manual control means.

7. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a tuning motor and tuning means for said receiver driven by said motor, a remote-control system comprising, a control station remote from said motor and including a first source of high-frequency oscillations of frequencies different from that of any of said plurality of signals, manual control means for varying the frequency of said source, a second source of high-frequency oscillations at the receiver and external to said channel, the frequency of said second source being adjustable in discrete steps, means responsive to the difference in frequency of said oscillations for effecting operation of said motor only when said difference is above a predetermined value, and means comprising said motor for adjusting the frequency of said second source substantially to that of said first source and to tune the receiver in accordance with the setting of said manual control means.

8. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a tuning motor and tuning means for said receiver driven by said motor, a remote-control system comprising, a control station remote from said motor and including a first source of high-frequency oscillations of frequencies different from that of any of said plurality of signals, manual control means for varying the frequency of said source, a second source of high-frequency oscillations at the receiver and external to said channel, the frequency of said second source being adjustable in discrete steps, means responsive to the difference in frequency of said oscillations and comprising a high-pass filter and rectifier for effecting operation of said motor only when said difference is above a predetermined value, and means comprising said motor for adjusting the frequency of said second source substantially to that of said first source and to tune the receiver in accordance with the setting of said manual control means.

9. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a tuning motor and tuning means for said receiver driven by said motor, a remote-control system comprising, a control station remote from said motor and including a source of high frequency oscillations of frequencies different from that of any of said

plurality of signals, manual control means for varying the frequency of said source, a second source of high-frequency oscillations at the receiver and external to said channel, the frequency of said second source being adjustable in discrete steps, means including a modulator for developing from said first and second sources a beat-frequency oscillation, means responsive to said beat-frequency oscillation for effecting operation of said motor only when said beat frequency is above a predetermined value, and means comprising said motor for adjusting the frequency of said second source substantially to that of said first source and to tune the receiver in accordance with the setting of said manual control means.

10. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a nonreversible tuning motor and tuning means for said receiver driven by said motor, a remote-control system comprising, a control station remote from said motor and including a first source of high-frequency oscillations of frequencies different from that of any of said plurality of signals, manual control means for varying the frequency of said source, a second source of high-frequency oscillations at the receiver and external to said channel, the frequency of said second source being adjustable in discrete steps, means including a modulator for developing from said first and second sources a beat-frequency oscillation, means responsive to said beat-frequency oscillation for effecting operation of said motor only when said beat frequency is above a predetermined value, and means operable in only one direction by said motor for adjusting the frequency of said second source substantially to that effective to produce a beat frequency of less than said predetermined value and to tune the receiver in accordance with the setting of said manual control means.

11. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a tuning motor and fixed-tuned tuning means for said receiver adapted to be switched into the circuit of said receiver by said motor, a remote-control system comprising, a control station remote from said motor and including a source of high-frequency oscillations the frequency of which is adjustable in discrete steps to frequencies different from that of any of said plurality of signals, a frequency-adjustable frequency follower at said receiver and external to said channel, means differentially responsive to said high-frequency oscillations and to the output of said frequency follower for effecting operation of said motor only when said differential response is above a predetermined value, the response of said differentially-responsive means being less than said predetermined value only when the frequency of said frequency follower bears a predetermined relation to that of said source, and means comprising said motor for adjusting the frequency of said frequency follower in discrete steps substantially to said predetermined relation and to tune the receiver in accordance with the setting of said manual control means.

12. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a tuning motor and tuning means for said receiver driven by said

motor, a remote-control system comprising, a control station remote from said motor and including an oscillator comprising a first source of high-frequency oscillations of frequencies different from that of any of said plurality of signals, manual control means comprising adjustably-fixed tuning elements for varying the frequency of said oscillator, a second source of high-frequency oscillations at the receiver and external to said channel, the frequency of said second source being adjustable in discrete steps, means responsive to the difference in frequency of said oscillations for effecting operation of said motor only when said difference is above a predetermined value, and means comprising said motor for adjusting the frequency of said second source substantially to that of said first source and to tune the receiver in accordance with the setting of said manual control means.

13. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, a tuning motor and tuning means for said receiver driven by said motor, a remote-control system comprising, a control station remote from said motor and including a first source of high-frequency oscillations of frequencies different from that of any of said plurality of signals, manual control means for varying the frequency of said source, a second source of high-frequency oscillations, the frequency of said second source being adjustable in discrete steps, means responsive to the difference frequency of said oscillations for effecting operation of said motor only when said difference is above a predetermined value, means comprising said motor for adjusting the frequency of said second source substantially to that of said first source and to tune the receiver in accordance with the setting of said manual control means, and means comprising said first source and said manual control means for effecting a volume control of said receiver.

14. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, an actuating motor and tuning means for said receiver driven by said motor, a remote-control system comprising, a control station remote from said motor and including a first source of high-frequency oscillations of frequencies different from that of any of said plurality of signals, manual control means for varying the frequency of said source, a second source of high-frequency oscillations external to said channel, the frequency of said second source being adjustable in discrete steps, a common power-supply line for said receiver and said control station, said oscillations generated at said remote-control station being transmitted over said line to said receiver, means responsive to the difference of said oscillations for effecting operation of said motor only when said difference is above a predetermined value, means comprising said motor for adjusting the frequency of said second source substantially to that of said first source and to tune the receiver in accordance with the setting of said manual control means, and means responsive to oscillations from said first source transmitted over said line for effecting a volume control of said receiver.

15. In a remote-control wave-signal receiver including a received-signal translating channel tunable to any of a plurality of signals of different carrier frequencies, an actuating motor and

tuning means for said receiver driven by said motor, a remote-control system comprising, a control station remote from said motor and including a first source of high-frequency oscillations of frequencies different from that of any of
5 said plurality of signals, manual control means for varying the frequency of said source, an oscillator for generating a second source of high-frequency oscillations at the receiver and external to said channel, a plurality of adjustably-
10 fixed tuning elements for adjusting the frequency of said second source in discrete steps, means responsive to the difference frequency of said sources for effecting operation of said motor only

when said difference is above a predetermined value, and means comprising said motor for adjusting the frequency of said second source substantially to that of said first source and to tune the receiver in accordance with the setting of
5 said manual control means, the incidental couplings of said first and second sources of oscillations being such that they lock at exactly zero beat frequency when the frequency setting of said first source corresponds closely with that of said
10 second source.

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