Oct. 10, 1933. M. ALDEN 1,930,029

REMOTE CONTROLLED RADIO RECEPTION

Original Filed Feb. 4, 1927 3 Sheets-Sheet 1

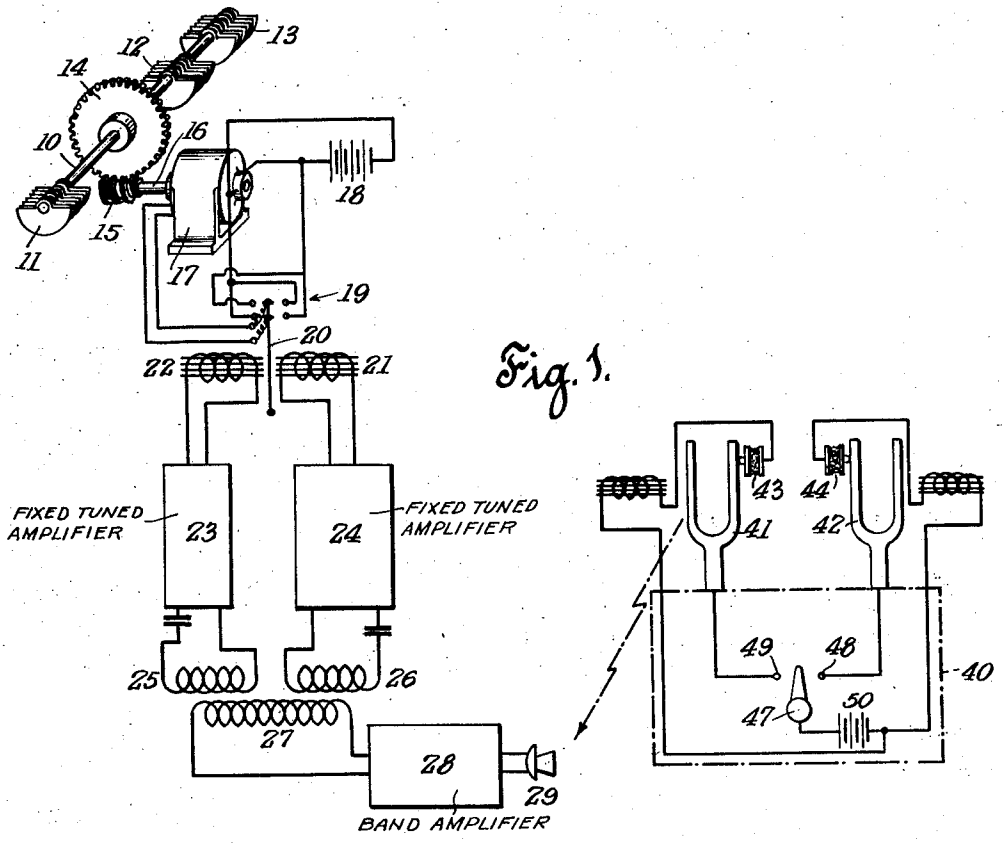


Fig. 1.

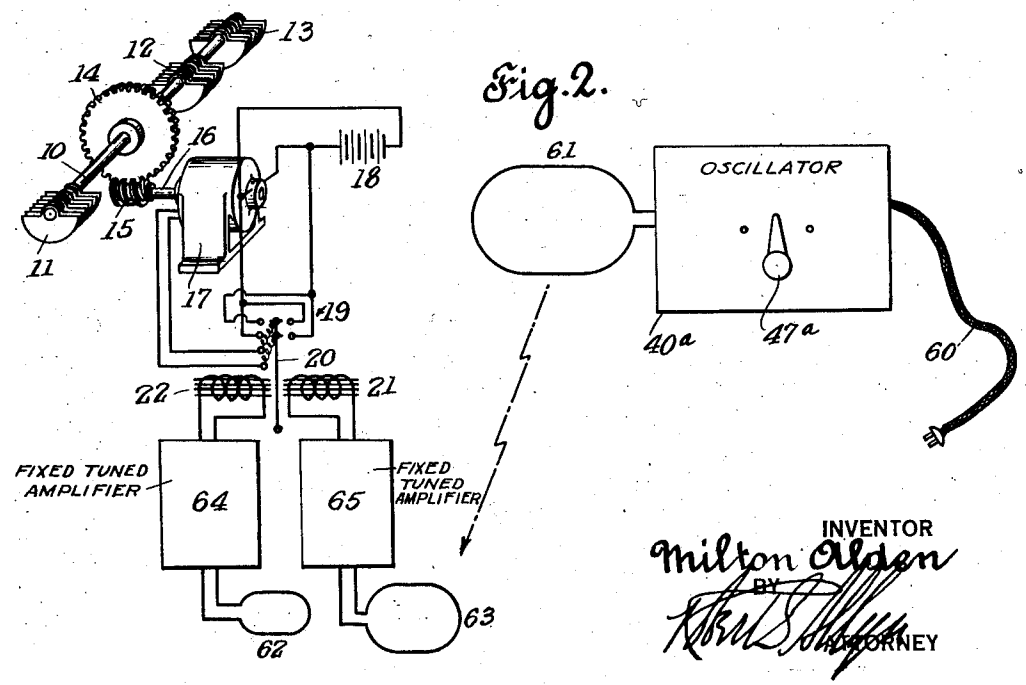


Fig. 2.

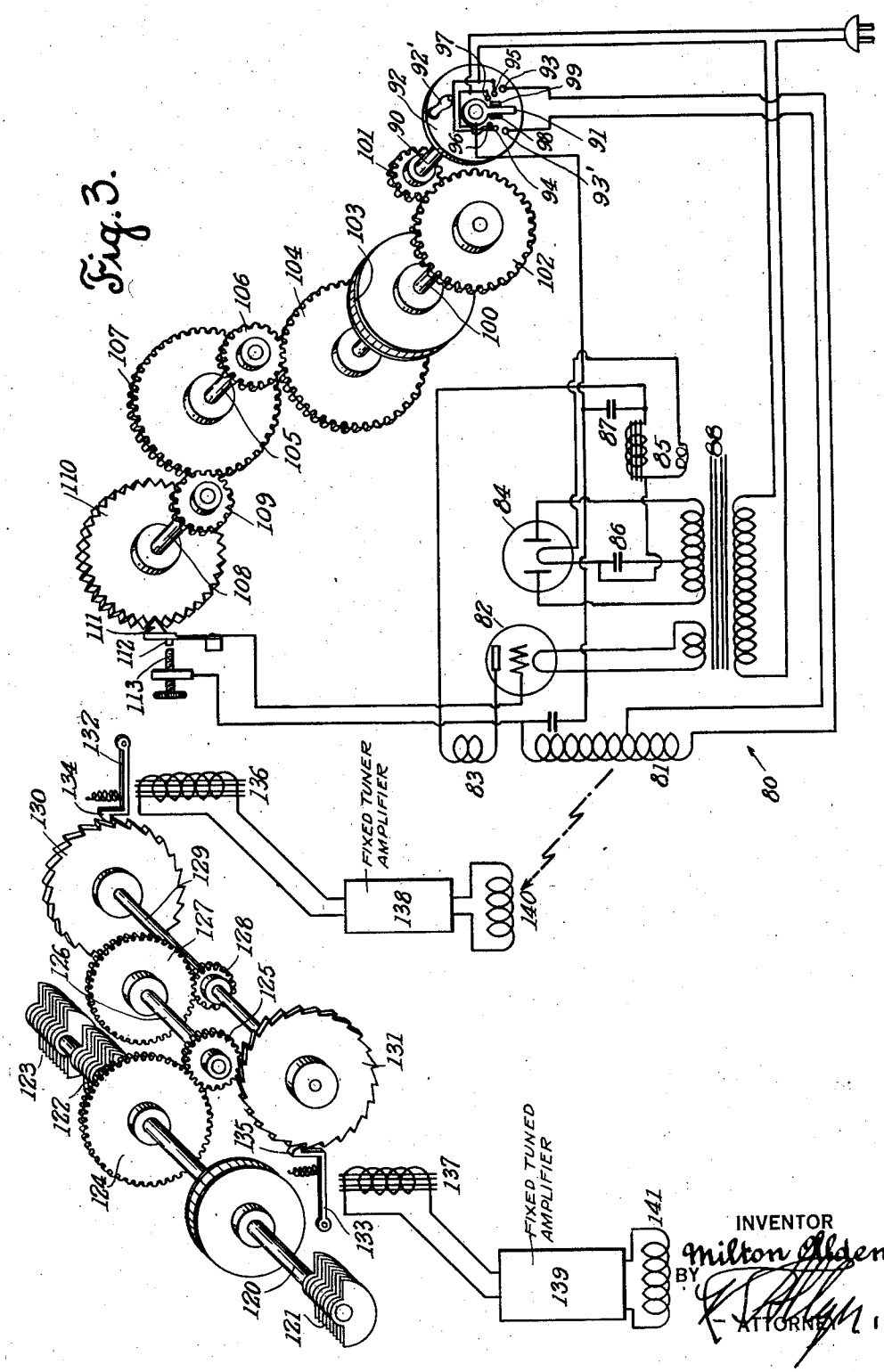
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Fig. 3.



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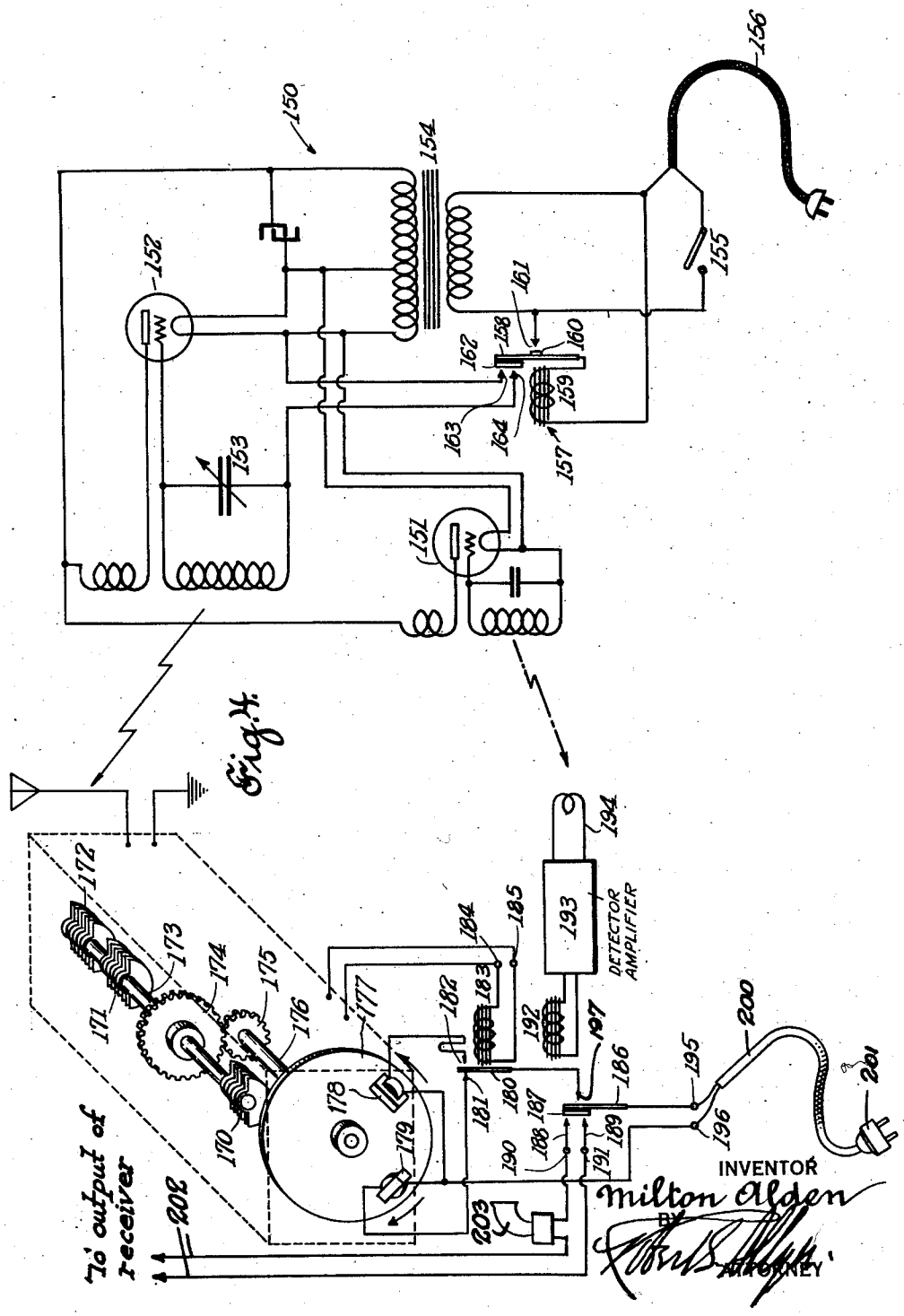


Fig. 4.

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REMOTE CONTROLLED RADIO RECEPTION

Milton Alden, Brockton, Mass., assignor, by mesne assignments, to Radio Inventions, Inc., a corporation of New York

Application February 4, 1927. Serial No. 165,954

13 Claims. (Cl. 250—40)

The main object of my invention is to produce a radio receiver which may be tuned from any reasonable distance by means of a control box, there being no physical connection between said receiver and its control box.

Another object is to produce a receiver which may be tuned from a distance by means of wave energy.

The modern large broadcast receiver is capable of producing sufficient volume, while still maintaining high quality, to be comfortably heard anywhere on one floor of the average private dwelling. It is extremely difficult to move such a receiver from room to room and more particularly so if separate batteries and an outdoor antenna are used. By means of my invention the receiver may be installed, for instance, in the living room and tuned from the dining room, sun porch, etc. without the use of wires or other physical connections between the manually controlled element and the receiver. The control box may be made small, light and extremely portable, and may be placed near a favorite chair, upon the dinner table, etc. and if, or when a change of program is desired, it may be had without the necessity of arising and walking to the receiver proper.

In the drawings and in the following description, we disclose four methods of accomplishing these results, but we do not desire to restrict ourselves to these particular embodiments, but rather we desire to broadly claim a radio receiver which may be controlled from a distance without physical connections between the control point and the receiver.

Referring to the drawings Fig. 1 is a diagrammatic drawing of one embodiment of the invention in which the energy delivered to the receiver from the control box is in the form of sound waves.

Fig. 2 is a similar arrangement in which the energy for controlling the tuning is delivered by radio waves preferably of extremely high frequency.

Fig. 3 is an arrangement in which radio waves are used to control the tuning of the receiver, but in this arrangement there is a scale at the control box which corresponds in its reading to the wavelength, frequency or dial setting of the tuning element of the receiver, so that a particular station may be chosen without "hunting".

Fig. 4 is a diagrammatic and schematic drawing of another arrangement.

In Fig. 1 the shaft 10 of the tuning elements, which in this case are shown diagrammatically as the condensers 11, 12 and 13, carries the worm wheel 14 which engages the worm 15 which is carried on the shaft 16 of the small motor 17 which is operated by the battery 18, or other power source. Properly associated with this motor 17 is the reversing switch 19 whose movable part 20 is normally held by spring or other means in the noncontacting central position shown in the drawing.

This member 20 may be moved in either direction by the magnets 21 or 22. These magnets are energized by the out-put of one of the two amplifiers 23 and 24. These amplifiers being preferably particularly designed to amplify frequencies of the order usually designated as the higher audio frequencies.

The in-put of these amplifiers consists of resonant circuits 25 and 26 which for purposes of illustration, we will consider to have periods of 8000 and 12000 cycles, respectively. These circuits are coupled as by inductance 27 to the out-put of the filter-amplifier 28 which may be either a band-pass filter having its cut-offs slightly below 8000 cycles and slightly above 12000 cycles or a high-pass filter having its cut-off slightly below 8000 cycles in connection with an amplifier. The input of this filter-amplifier may be a microphone or other device for the conversion of sound waves into electrical pulsations as indicated by 29.

The receiver may be any suitable type, but should preferably be of the single control type. The control box 40 has suitably mounted on its exterior two tuning forks 41 and 42 which are electrically actuated in a manner similar to the common door-bell buzzer except that it is preferable to use microphone buttons, such as 43 and 44, rather than rigid contacts, as the amplitude of vibration of a tuning fork at this frequency is so small that it is difficult to get a clean-cut make and break with any common form of contact.

The single pole double-throw switch 47 is normally spring held in the non-contacting or central position, as indicated in the drawings, but when turned to the right or left its contacting member becomes engaged with the contacts 48 or 49, thus closing the circuit including one of the two tuning forks and the battery 50, which may consist of dry cells or other suitable cells, thus actuating one of said forks.

In operation when the switch handle 47 is at rest, neither of the forks are actuated and the motor 17 is disconnected from its source of power 18. Upon turning the switch 47 in one direction, one of the tuning forks is set in mo-

tion, its sound waves are impressed on the microphone 29, amplified by the filter-amplifier 28, and passed into one of the resonant circuits 25 or 26, depending on the frequency of the fork which has been set into motion. One of these circuits will close the reversing switch 19 so as to run the motor 17 in one direction, while the other will cause the motor 17 to run in the reverse direction, thus rotating the shaft 10 of the tuning elements in one direction or the other. Thus holding the switch 47 against one of its contacts will increase the resonant frequency of the receiver, while holding it against the other contact will decrease the frequency, thus permitting searching for various stations within the frequency range of the receiver from the control box.

The frequencies selected for the tuning forks should be of the order mentioned as the ears of the average person are so insensitive to such frequencies that the sound waves existing during the tuning operation will not interfere with the hearing of a broadcast program and these sound waves, of course, will cease to exist when the desired program has been found, and the switch handle released.

The high-pass or band-pass filter incorporated within the filter-amplifier 28 will prevent accidental operation of the tuning elements by ordinary room noises conversation etc. or by the frequencies emanating from the loud speaker. The amplifier system should be sufficiently insensitive so that harmonic components or overtones coming from the loud speaker of or near the two tuning fork frequencies chosen will not cause the switch 19 to function and the resonant circuits 25 and 26 should have a high persistence or slow building up function so that they are difficult to shock-excite and therefore the switch 19 will not be operated by plain noise within the room.

The embodiment shown in Fig. 2 operates in a somewhat similar manner except that preferably short radio waves emanate from the control box rather than high frequency sound waves. In this case the control box diagrammatically indicated by 40*a* may contain a vacuum tube oscillator whose entire operating current is preferably obtained through a cord and plug 60 from the alternating current house mains. This oscillator should generate either one of two short radio waves, such as 5 and 10 meters according to the position of the switch 47*a* which is normally spring held in a central or off position.

The radiation from the control box takes place largely from the loop 61 which is preferably in a horizontal plane, as are the receiving loops 62 and 63. This positioning of the loops insures proper angularity between them for maximum transmission and reception, regardless of the position of the control box 40*a* on its table or other support.

The tuning elements, motor drive, reversing switch and reversing switch actuating means are similar to that shown in Fig. 1 previously described.

The magnets 21 and 22 in this embodiment are connected to the out-puts of two detector amplifier systems 64 and 65. One of these systems is resonant to one of the control box wavelengths and the other is resonant to the remaining control box wavelength. The in-puts of these systems are connected to the loops 62 and 63 respectively.

The essential difference between this embodiment and the embodiment shown in Fig. 1 is the use of a different medium for carrying the energy from the control box to the receiver. The functioning of the two embodiments is so similar that it is believed unnecessary to go further into the details of the embodiment shown in Fig. 2, and just described.

In the embodiment shown in Fig. 3 a complete oscillator which may derive all its power from the alternating current house mains is indicated at 80. This oscillator transmits one of two wavelengths depending on whether the whole or a part of the inductance 81 is included in the circuit. For the purposes of explanation we will assume that the wavelengths chosen are 20 and 30 meters, respectively. The oscillator tube is shown at 82, the feed-back coil at 83, the rectifier tube for the plate supply at 84, the plate supply choke at 85, plate supply condensers at 86 and 87 and the plate and filament transformer at 88.

In this oscillator I have indicated one form of oscillating circuit but it should be understood that any one of several forms may be employed.

Upon the shaft 90 having the arm 91 is mounted the wheel 92 adapted to be manually revolved as by the handle 92'. This wheel 92 drives the shaft 90 upon engagement of the arm 91 with the contacts 93', 94, and 96 or 93, 95, and 97 depending upon the direction of rotation. The contacts 94, 95, 96 and 97 are preferably of a yielding nature, while the contacts 93' and 93 are non-yielding and it is these contacts through which the drive is effected.

The arm 91 carries two conducting plates 98 and 99 which are insulated from it, but which, when attempt is made to rotate the shaft 90, close the circuit between the contacts 94 and 96 or the contacts 95 and 97, depending on the direction of the rotation, thus closing the 60 cycle line and setting the oscillator 80 in operation. This arm 91 is normally spring centered (method not shown) so as to remain midway between the contacts 93' and 93 when no effort is being made to rotate the shaft 90. The shaft 90 drives the shaft 100 by means of the pinion 101 and the gear 102. The dial 103 may be frictionally held upon the shaft 100 but may be provided with stops (not shown) allowing substantially 360 degrees of rotation and may be suitably calibrated in wavelengths, kilocycles, numerals or station call letters. The gear 104 drives the shaft 105 through the pinion 106. Upon this shaft 105 is mounted the gear 107 which drives the shaft 108 through the pinion 109. Upon this shaft 108 is mounted the toothed wheel 110.

The pawl 111 engages with the face of the wheel 110 so that upon the rotation of this wheel the contacts 112 and 113 are made and broken, thus opening and closing the grid circuit of the oscillator tube 82 and causing the oscillator 80 to transmit a pulse or short wave-train for each angular displacement including one tooth of the wheel 110.

At 120 we have indicated a shaft carrying three tuning condensers of a single control radio receiver as 121, 122 and 123. This shaft 120 also carries the gear 124 which engages with the pinion 125 carried by the shaft 126. This shaft 126 carries the gear 127 which engages the pinion 128 of the shaft 129. This latter shaft carries the two oppositely faced ratchet wheels 130 and 131.

The armatures 132 and 133 carry the pawls 134 and 135 which upon excitation of their respective

magnets 136 and 137 engage their respective ratchet wheels. These pawls are out of engagement with their respective ratchet wheels when their magnets are not excited. These magnets are connected to the properly rectified and filtered out-put of the detector amplifier systems indicated at 138 and 139, which may be provided at their in-puts with some suitable form of pick-up or antenna, such as, the coils 140 and 141.

In operation the scale or dial 103 is set at a reading corresponding to the frequency, wavelength or whatever has been chosen, of the receiver whose tuning elements are shown at 121, 122 and 123.

We have assumed for purposes of explanation that the two chosen wavelengths of the oscillator 80 are 20 and 30 meters. Then, if the manual control 92 is rotated in a clockwise direction, a wavelength of 20 meters will be radiated or if in a counter-clockwise direction 30 meters. The rotation of this manual control 92 will effect the more gradual rotation of the scale or dial 103 but a considerably faster rotation of the toothed wheel 110.

The gear ratio between the shafts 108 and 100 depends upon the band of wavelengths to be covered, the fineness of tuning desired at the receiver and the number of teeth in the wheel 110.

For purposes of explanation, we will assume that a total of 100 wavelengths 10 kilocycles apart are desired and that the fineness of tuning will require variation within two kilocycles. Let us also assume that the wheel 110 is provided with 50 teeth. On these assumptions we will require 500 breaks of the contacts 112 and 113 for one revolution of the dial 103. Therefore, in this particular case the gear ratio between the shafts 108 and 100 should be 10 to 1.

Let us assume that the in-put of the detector amplifier system 138 is tuned for the shorter wave and 139 for the longer wave of the oscillator 80. Then, as the manual control 92 is turned clockwise for, each make and break of the contacts 112 and 113 the oscillator 80 will send out a pulse, which after proper amplification and filtration will cause the pawl 134 to move the ratchet wheel 130 through an angle including 1 tooth and for each pulsation from the oscillator 80 the wheel 130 will have moved a corresponding tooth. If, on the other hand, the manual control 92 is moved in a counter-clockwise direction, the same procedure will take place with respect to the wheel 131, but the shaft 129 will be rotated in the opposite direction from that in which it is rotated when the rotation is effected by the pawl 134 and the wheel 130.

The gear ratio between the shaft 129 and the shaft 120 should be chosen to correspond with the equivalent factors of the control device. In the case assumed, the ratio should be 20 to 1 as the tuning condensers 121, etc. should revolve 180 degrees during a complete revolution of the dial 103.

The shaft 120 should be provided with stops (not shown) to prevent rotation throughout more than 180 degrees. If these stops should be provided and if at any time the calibration of the dial 103 should not correspond to the position of the tuning elements 121, etc., the dial and the tuning elements can be readily brought back in to phase by rotating the manual control 92 in one direction or the other for some length of time. As the friction driven dial 103 will come up against a stop and the rest of the control system will continue to function and bring the shaft 120 against its non-yielding stop, both will then once more be in phase and tuning may be continued in the usual manner.

In Fig. 4 the remote control station 150 has two alternating current operated vacuum tube oscillators. The tube 151 with its associated circuits forms a complete oscillator, of a fixed wavelength, said wavelength being outside and preferably below the wavelength band of the receiver to be controlled. The vacuum tube 152 and its associated circuits, including the variable condenser 153 forms an oscillator system of variable wavelength, whose wavelength should include the band covered by the receiver to be operated. The transformer to supply the power to the cathode and anode circuits is shown at 154, an operating switch at 155 and an attachment cord and plug at 156.

At 157 is shown a current operated interrupter, the armature 158 of which should preferably have sufficient mass to vibrate at a fairly low period, such as 5 or 10 vibrations a second. This armature is operated by the laminated electro-magnet 159 and the contacts 160 and 161. This armature 158 carries a contact 162 which should be insulated from the armature. This contact 162 may close the circuit between the contacts 163 and 164, thus opening and closing the grid return of the oscillator tube 152 upon the oscillation of the armature 158.

The tuning elements of a single control receiver are indicated diagrammatically at 170, 171 and 172 mounted upon the shaft 173. No stops are provided for these tuning elements and they may be rotated indefinitely in either direction. The shaft 173 carries the gear 174 which engages the pinion 175 upon the shaft 176 which carries the conducting disc 177. This disc 177 passes between two magnets consisting of sets of laminated wound pole pieces diagrammatically indicated at 178 and 179.

The disc 177 and either of its associated sets of pole pieces comprises an eddy current repulsion motor of the type frequently used in alternating current integrating watt-meters and also as a means for rotating the turn table on various well known types of electrical phonographs.

The armature 180 is adapted to make contact with one or the other of the contacts 181 and 182 and is normally spring pressed against the contact 181. This armature may be excited by the electro-magnet 183 having terminals 184 and 185. The armature 186 carries an insulated contact piece 187 adapted to connect together the contacts 188 and 189 having terminals 190 and 191 and is normally in a position in which this connection is effected. Terminals 190 and 191 are connected by wires 202 to a loud speaker 203. Wires 202 are prolonged and arranged as shown in the drawings so that the receiver out-put, loud speaker and contact making device 188, 189, 187 are all in a series circuit. The armature 186 may be excited by the electro-magnet 192 which is connected to the properly filtered and rectified out-put of the detector amplifier system 193. This detector amplifier system is provided with a pick-up device, such as the coil 194 and may be especially constructed to respond to the frequency chosen for the oscillator tube 151 and its associated system.

The terminals 184 and 185 of the magnet 183 should be connected to the properly rectified and filtered out-put of the main receiver whose tuning elements are indicated at 170, 171 and 172.

The terminals 195 and 196 are provided which

may be connected by means of cord 200 and plug 201 to the usual alternating current house line (not shown).

In operation the condenser 153 is set at such a position that the oscillating tube 152 and its associated circuits is adjusted to transmit the wave-lenth it is desired to receive at the remote controlled receiver, whose tuning elements are indicated at 170, etc. The switch 155 is then closed, setting both oscillators into operation.

The oscillating tube 151 and its associated circuits transmits to the in-put 194 of the detector amplifier 193, causing the armature 186 to be drawn over and to make contact with the contact 197, thus exciting the field of the magnetic system 179 and causing the disc 177 to rotate in, say, a clockwise direction. The oscillator 152 is transmitting and inactive for substantially equal intervals, the period depending upon the speed of vibration of the current operated interrupter 157.

When the disc 177 has rotated through a sufficient angle to bring the main receiver in resonance with the oscillator 153, the magnet 183 will be excited and will cause the armature 180 to be pulled over into contact with the yieldingly supported contact 182, thus disconnecting the motor system 179 and connecting the motor system 178 which is arranged to operate in a counter-clockwise direction. Thus upon each "break" of the contacts 160 and 161, the tuning elements will be rotated slightly in one direction about the point of resonance of the main receiver with the period of the oscillator 152 and upon each "make" will be rotated slightly in the other direction about said point, and by proper design of the apparatus this rotation may be made very slight. When this point has been reached, the switch 155 is opened, stopping both oscillators, allowing the armature 180 to spring back against its contact 181 and the armature 186 to spring back against its contacts 188 and 189, thus stopping the excitation of both motor systems and leaving the main receiver substantially in resonance with the oscillator 152.

If another wavelength is desired, the condenser 153 is placed at a corresponding setting and the process repeated. The terminals 190 and 191 may be placed in series with the loud speaker 203 so that during the tuning operation the loud speaker will not respond to the extremely strong modulated signals from the oscillator 152.

It will be seen that by this system the scale (not shown) of the condenser 153 may be placed at a position corresponding to any desired frequency or wavelength within the desired band. The switch 155 may be closed for a short interval and the main receiver will then bring itself substantially into resonance with this wavelength.

It should be understood that other modifications of the broad invention may be made within the scope of the claims.

I claim:

1. A radio receiver having means for tuning from a distant point said means comprising two oscillators adapted for operation from house lighting mains, one of said oscillators being operated intermittently throughout the tuning operation, the other of said oscillators being operated continuously throughout the tuning operation, electrically driven means for securing said intermittent operation, means at said receiver for receiving and amplifying said continuous oscillations, a contact closing device associated with the output of said amplifying means, a contact closing device associated with the output of said radio receiver, and two motor systems operating in opposite directions associated with said latter contact closing device.

2. A receiver adapted for remote control by means of vibrating energy having means responsive to said energy, amplifying means and controlling means consisting of two relays one of said relays being associated with the output of said amplifying means, two motor systems of opposite torque controlled by said relay, the other of said relays being operated from the output of said receiver, oscillating means for actuating said amplifying means and other oscillating means for exciting said receiver.

3. A radio receiver having multiple tuning means for common control, mechanism for adjusting the common control comprising two oscillators, one of which is operated intermittently thruout the tuning operation and the other of which is operated continuously thruout the tuning operation, means for automatically producing intermittent operation, means at the receiver for receiving and amplifying the continuous oscillations, circuit control means associated with the output of said amplifying means, circuit control means associated with the output of said radio receiver and motor mechanism including reversible parts associated with the latter circuit control means.

4. A method of tuning a radio receiver from a remote point consisting of transmitting from said point two electric waves, one continuously and at a frequency outside of the frequency band covered by said receiver and the other intermittently at the frequency to which it is desired to tune said receiver, receiving said continuously transmitted frequency at said receiver, the reception of said continuous transmission changing the resonant frequency of the receiver in one direction and the reception of said intermittent transmission changing said frequency in the opposite direction.

5. A radio receiver having means for tuning from a distant point, said means comprising two oscillators, one of said oscillators producing intermittent oscillations, the other of said oscillators producing continuous oscillations, means for securing said intermittent operation, means at said receiver for receiving and amplifying said continuous oscillations, a contact closing device associated with the output of said amplifying means, a contact closing device associated with the output of said radio receiver, and two motor systems operating in opposite directions associated with said latter contact closing device for actuating the tuning elements of the receiver.

6. A receiver adapted for remote tuning control by means of vibrating energy having means responsive to said energy, amplifying means and controlling means consisting of two relays, one of said relays being associated with the output of said amplifying means, motive means controlled by said relay for tuning the receiver, the other of said relays being operated from the output of said receiver, oscillating means for actuating said amplifying means and other oscillating means for exciting said receiver.

7. A radio receiver having multiple tuning means for common control, mechanism for adjusting the common control comprising two oscillators, one of which is operated throughout the tuning operation and the other of which is operated continuously throughout the tuning operation, means for automatically producing oper-

ation of the first mechanism, means at the receiver for receiving and amplifying the continuous oscillations, circuit control means associated with the output of said amplifying means, circuit control means associated with the output of said radio receiver, and motor mechanism including reversible parts associated with the latter circuit control means.

8. A method of tuning a radio receiver from a remote point consisting of transmitting from said point two electric waves, one at a frequency outside of the frequency band covered by said receiver and the other at the frequency to which it is desired to tune said receiver, receiving said first transmitted frequency at said receiver, the reception of said latter frequency changing the resonant frequency of the receiver in one direction and the reception of the other frequency changing the frequency of the receiver in the opposite direction.

9. A remotely controlled radio receiver including tuning elements, a reversible motor actuating said tuning elements, relay switching means for reversing the direction of rotation of said motor and actuated by the audio frequency output of said receiver, relay means determining the rotation of said motor and actuated by detector amplifier means, pick-up means tuned to a predetermined frequency and actuating said detector amplifier means, remote control means including an oscillator emitting oscillations of the frequency to which said pick-up means is tuned, another oscillator emitting oscillations of the frequency to which it is desired said receiver be tuned, and means for intermittently energizing said last oscillator.

10. The method of remotely controlling a radio receiver having two tuned pick-up means which includes transmitting oscillations of a predetermined frequency to one of said pick-up means, amplifying the output of said pick-up means, initiating the tuning of said receiver in one direction, transmitting oscillations of the frequency to which it is desired said receiver be tuned, picking up said oscillations by the other pick-up means, amplifying said oscillations and reversing the direction of tuning with said amplified oscillations.

11. A radio receiver including motor driven tuning means normally operative so as to tune in one direction, oscillation controlled relay means determining the operation of said motor driven tuning means, relay means actuated by the output of said receiver and operating so as to reverse the direction of motion of said tuning means, and a remote control station comprising oscillating means radiating oscillations of a frequency to which said first relay means are responsive, and an oscillator emitting oscillations of the frequency to which it is desired that said motor driven tuning means be adjusted.

12. A radio receiver self-tuning to a predetermined frequency including rotary tuning means, reversible motor means operating said rotary tuning means, relay means actuating said motor means so as to rotate said tuning means in one direction and responsive to a frequency other than said predetermined frequency and relay means reversing said motor means so as to rotate said tuning means in the opposite direction and responsive to said predetermined frequency.

13. A remotely controlled and motor adjusted radio receiver self-tuning to a predetermined frequency, comprising a remotely situated control station capable of generating said predetermined frequency and also of generating another differing control frequency and a locally situated control station including two relays, responsive respectively to said differing and said predetermined frequency, the first of said relays causing said receiver to be motor adjusted in one direction substantially continuously and also rendering electrically inactive the loud speaker circuit of said receiver and the second of said relays causing said receiver to be motor adjusted in the opposite direction from that determined by said first relay.

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