Aug. 20, 1935. R. M. SOMERS 2,011,953

ELECTRICAL TRANSMISSION SYSTEM

Filed July 10, 1931 2 Sheets-Sheet 1

FIG. 1

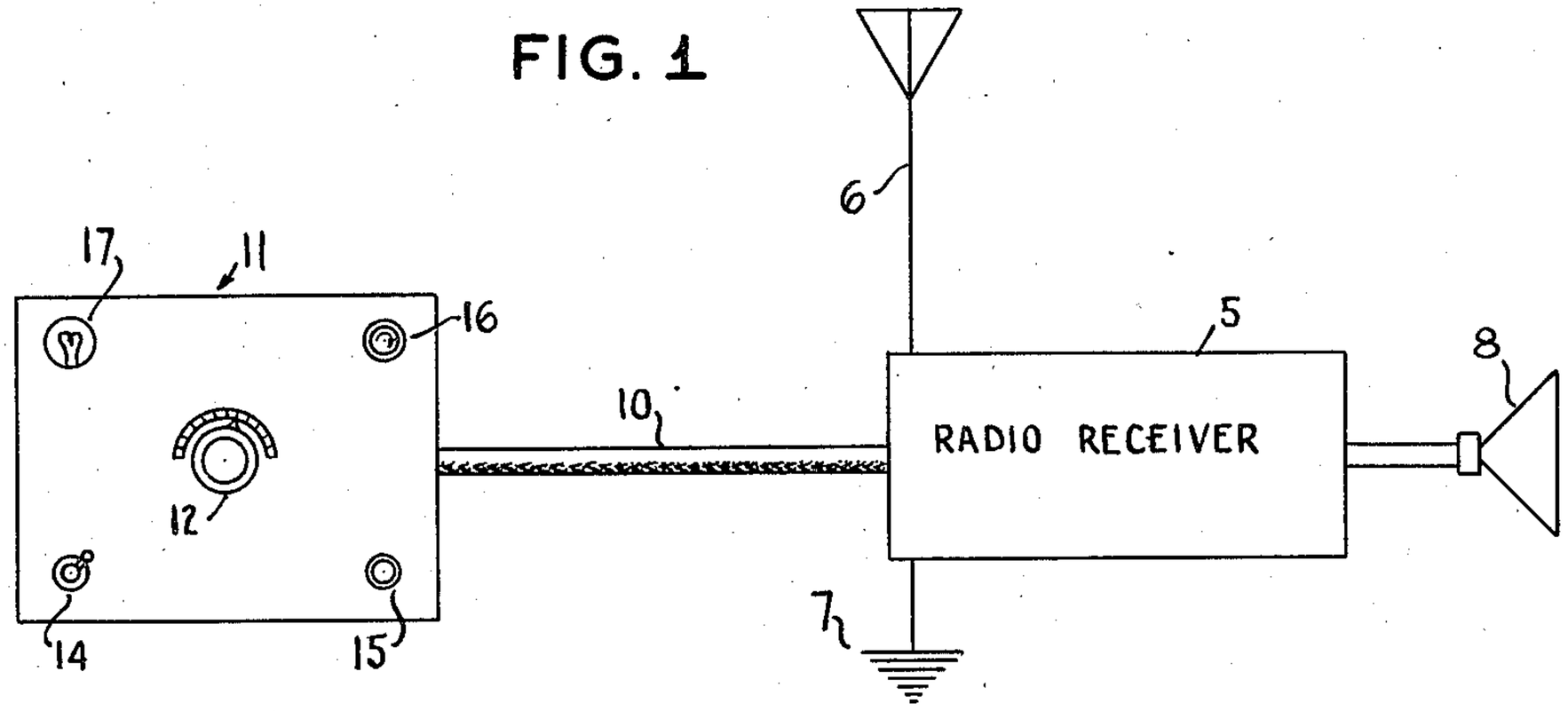
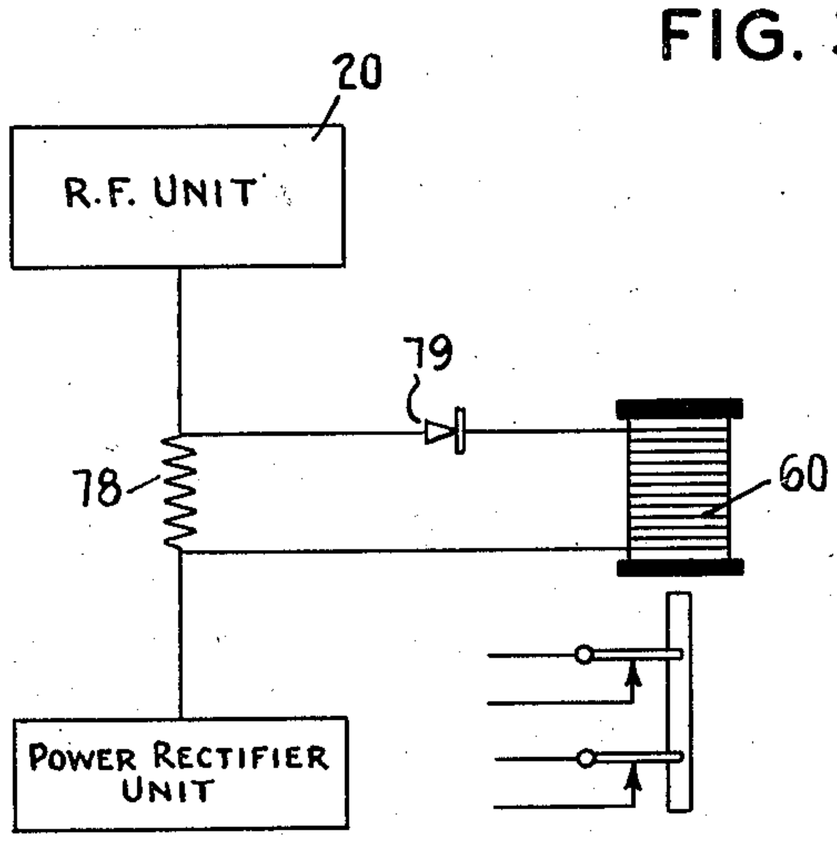


FIG. 3



INVENTOR

Richard M. Somers

BY his ATTORNEY

Henry Lanahan

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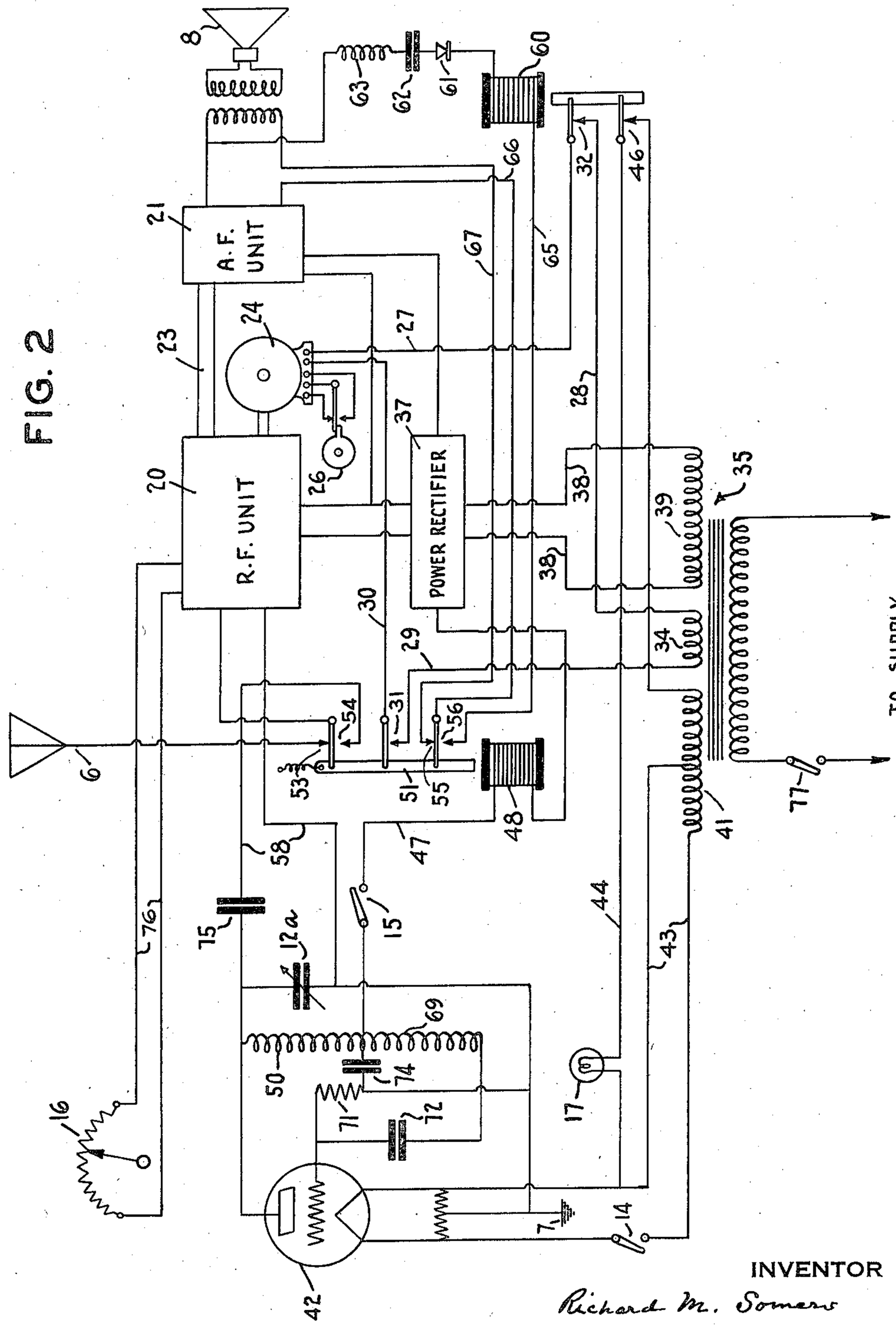
FIG. 2



INVENTOR

Richard M. Somers

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Henry Lanahan

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ELECTRICAL TRANSMISSION SYSTEM

Richard M. Somers, East Orange, N. J., assignor to Thomas A. Edison, Incorporated, West Orange, N. J., a corporation of New Jersey

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13 Claims. (Cl. 250—20)

This invention relates to electrical transmission systems and particularly to methods of and means for controlling broadcast receiving systems.

An object of the invention is to control the tuning of an electrical signalling system.

Another object of the invention is to control a broadcast receiver from a remote position.

A further object of the invention is to tune a broadcast receiving system and control its output from a remote point.

It is well known that electrical signalling systems and especially radio broadcast receivers may be adjusted to select any one of a plurality of signals on various frequency channels. This selection is accomplished by tuning elements mounted to operate as a single unit. The tuning unit may be manually operated or driven by a motor under control of circuit switches at a remote point.

The present invention is applicable to such a remote control system wherein energization of the motor which drives the tuning instruments is under control of a variable frequency oscillator at the remote position. In brief, an oscillator is adjusted to generate any one of a band of frequencies corresponding in range to the range of the receiver. The transmission of the oscillator frequency to the receiver controls the driving motor. The motor is energized by simply closing a relay circuit at the remote position, the motor being stopped at the correct tuning point when the receiver tuning instruments reach a position such that the receiver is tuned to the oscillator frequency, preferably by means of a relay responsive to change of plate current in the receiver.

Preferably, the relay is arranged to stop the movement of the tuning instruments only when the receiver reaches exact resonance with the oscillator frequency.

The features of novelty which I believe to be characteristic of my invention are set forth with particularity in the appended claims. My invention itself, however, both as to its fundamental principles, and as to its particular embodiments will best be understood by reference to the specification and accompanying drawings, in which:

Fig. 1 is a diagrammatic drawing of a receiver system equipped with remote control apparatus in accordance with my invention.

Fig. 2 is a schematic circuit diagram; and

Fig. 3 is a detail view of one form of modification of the circuit of Fig. 2.

Referring now more particularly to Fig. 1, a radio receiver 5 preferably connected to an antenna 6 and ground 7, and having a loud speaker 8, is connected through a flexible conductor cable 10 to a remote control unit 11. This control unit, which may be placed at any position within cable length, is provided with the necessary controls for complete remote control operations. A station selector dial 12 which may be inscribed with wave lengths, frequencies, or station call letters is shown. There is also provided a start switch 14, tuning switch 15, volume control 16 and tuning operating lamp 17. It is to be understood that any other panel arangements may be employed without departing from the spirit of the invention. The corresponding elements just mentioned are similarly numbered in Fig. 2.

Referring to Fig. 2, the receiver unit is shown in two sections as a radio frequency amplifier unit 20 (which may include the detector) and an audio frequency amplifier unit 21. Since both of these amplifiers are well known in the art and form, per se, no part of my present invention, they are not described in detail. The output of the radio frequency unit is supplied to the input of the audio frequency unit by conductors 23. A motor 24 of any suitable type is mechanically connected by a shaft to the tuning elements (not shown), which are usually variable condensers. A reversing cam 26 reverses the direction of rotation of the motor 24 after each 180° rotation of the condenser shaft but the system may be arranged for a full 360° rotation of the tuning condensers. The motor is energized over conductors 27, 28, 29 and 30 through contact switches 31 and 32 from secondary 34 of power transformer 35.

The receiver units are preferably energized from a power pack 37 which in turn is supplied over conductors 38 from secondary 39 of the power transformer. The third secondary 41 of the power transformer is tapped and supplies the filament of oscillator tube 42 through conductors 43 and signal lamp 17 over conductor 44, switch 46 and one of the conductors 43, as well as the filaments of the various tubes of the radio and audio amplifiers and the power supply device, if desired. The power pack 37 also supplies anode potential for tube 42 over conductor 47 which includes the winding of relay 48, a manual switch 15 and winding 50. The relay 48 has an armature 51 which controls contacts 53, 54, 31, 55 and 56: contact 53 connecting and disconnecting the antenna 6 to and from the unit 20; contact 54 connecting and disconnecting the oscillator output to and from the unit 20 over conductor 58;

contact 31 controlling the power supply to motor 24; and contacts 55 and 56 controlling the transfer of the output of unit 21 from loud speaker 8 to a circuit including a relay 60, rectifier 61 and series tuning elements 62 and 63 and vice versa, this transfer being done over conductors 65, 66 and 67.

Referring particularly to the oscillator circuit, this may include coupling inductances 50 and 69 with tuning element 12a controlled by knob 12 in Fig. 1. The time constant of grid leak 71 and condenser 72 may be such as to start and stop high frequency oscillations at an audible rate, thereby introducing "self-modulation" of an audible frequency. This audible note may be for example 1000 cycles. Blocking condensers 74 and 75 keep the direct current from the grid of tube 42 and the receiver input circuit, respectively. Other types of oscillators may be employed in this invention such as the usual type high frequency oscillator or the combination of high frequency and low frequency oscillators with intermodulation. The volume control rheostat 16 may control the bias on the radio frequency amplifier tubes or may be in the receiver input circuit, connection being made over conductors 76, or a separate motor may be provided, controlled by volume increase and decrease switches.

The operation of the circuit is as follows: By closing main power switch 77, the receiver is energized together with the signal lamp 17 indicating that the receiver is in operating condition. To tune the receiver from the unit 11, switch 14 is closed to energize the filament of oscillator tube 42. The oscillator is then tuned to the wave length to be received, for instance station WOR at a frequency of 710 kilocycles. This is accomplished by the dial 12. When this setting is made, the operator then closes switch 15 supplying anode potential to the oscillator tube and simultaneously actuating relay 48. Operation of relay 48 connects the oscillator output circuit 58 to the receiver unit 20 by making contact 54 and simultaneously disconnects the antenna 6 from the receiver unit by breaking contact 53 thereby rendering such unit unresponsive to radio broadcast signals and indeed to any electrical disturbances or effects extraneous to the receiver unit excepting only those originated by the oscillator of control unit 11. Simultaneously, contact 31 is made completing the motor energizing circuit over conductors 27, 28, 29 and 30 and rotating the tuning condensers. Also, simultaneously contact 55 is broken, disconnecting the speaker 8 from the low frequency amplifier unit 21, and contact 56 is made connecting this unit in circuit with relay 60, rectifier 61 and filter elements 62 and 63.

The circuits remain as just described until the tuning condensers have been adjusted to pass 710 kilocycles, at which instant the receiver is tuned to the oscillator frequency and the 1000 cycle component thereof is amplified in audio amplifier 21. This component is rectified by rectifier 61 to operate the direct current relay 60. Operation of relay 60 breaks contact 32 which disconnects motor 24 from its power supply, stopping the tuning condensers to receive any signal on 710 kilocycles. Simultaneously, contact 46 is broken, being on the same armature, this contact opening the supply circuit to lamp 17.

When lamp 17 is extinguished, the operator at unit 11 is informed that the receiver has been tuned and switch 15 is then opened. This action de-energizes relay 48, restoring the contacts to normal as shown in the circuit. That is, unit 20 is connected to antenna 6 and disconnected from the oscillator, contact 31 is broken which again breaks the motor power supply circuit, and contacts 55 and 56 are respectively made and broken disconnecting the unit 21 from the relay 60 and connecting it to the speaker 8. It is obvious that de-energization of relay 60 makes the motor supply circuit contact 32 but as this circuit is broken at contact 31, the motor is not energized. The making of contact 46, however, again lights the lamp 17, indicating that the circuit is normal. It is to be noted that although there appear to be several operations, they occur either simultaneously or in extremely rapid sequence, complete tuning being accomplished rapidly.

When an unmodulated oscillator is employed with the relay 60 located as shown in Fig. 2, contact 53 is always made in order to obtain a beat frequency in the audio range. In this case the oscillator is calibrated to correspond with the broadcast frequency range but it will be understood that it will differ in its tuning from the tuning of the receiver by the frequency of the beat note.

In Fig. 3 a circuit modification is shown in which the relay 60 of Fig. 2 is in shunt to a resistance 78 in the plate supply circuit for the radio frequency unit 20. A rectifier 79 permits the direct current relay to operate from alternating current in the plate circuit. The filter 62, 63 (Fig. 2) may also be used, preventing operation of relay 60 by static or other extraneous receiver noises, the filter being tuned to the 1000 cycle audio note in Fig. 2 and to the beat note in Fig. 3.

Although the invention has been described in its preferred embodiments, it will be understood that modifications and changes may be made without departing from the spirit and scope of my invention, as will be understood by those skilled in the art.

I claim:—

1. In an electrical signalling system, in combination, a receiver having a signal selector which is adjustable to effect tuning of the receiver to any of a plurality of signal frequencies, electromotive means for adjusting such signal selector, a local source of high frequency currents normally physically connected to said receiver, means for initiating operation of said adjusting means and for simultaneously rendering said receiver responsive only to currents from said source, and means in a circuit of said receiver controlled by currents from said source for interrupting the operation of said adjusting means when said receiver is tuned to a definite relation with the high frequency currents from such source.

2. In an electrical signalling system, in combination, a receiver having a signal selector which is adjustable to effect tuning of the receiver to any of a plurality of signal frequencies, electro-motive means for adjusting such signal selector, an oscillator normally physically connected to said receiver, means for controlling the oscillator frequency, means for initiating operation of said adjusting means and for simultaneously rendering said receiver responsive only to currents generated by said oscillator, and means in a circuit of said receiver controllable by currents from said oscillator for stopping adjustment of said signal selector at resonance with the oscillator frequency.

3. In an electrical signalling system, in combination, a receiver having a signal selector which

is adjustable to effect tuning of the receiver to any of a plurality of signal frequencies, electromotive means for adjusting such signal selector, an oscillator normally physically connected to said receiver, means for controlling the oscillator frequency, means for initiating operation of said adjusting means and for simultaneously rendering said receiver responsive only to currents from said oscillator and means electrically connected, during adjustment of said signal selector, in a circuit of said receiver and responsive to currents from said oscillator for terminating adjustment of said signal selector when resonance with the oscillator frequency is obtained.

4. In a signalling system, in combination, a receiver comprising tunable circuits for selecting signals, power means for varying the tuning of said circuits, a circuit for energizing said power means, a relay energizable from the output of said receiver to open said circuit, an oscillator normally physically connected to said receiver, and means whereby oscillator currents will be supplied to said receiver and the receiver will be rendered responsive only to currents from the oscillator whenever said power means is operating to vary the tuning of said tunable circuits.

5. In a signalling system, in combination, a receiver comprising tunable circuits for selecting signals, power means for varying the tuning of said circuits, a circuit for energizing said power means and comprising a relay for interrupting such circuit, connections for energizing said relay from the output of said receiver, an oscillator normally physically connected to said receiver, and means whereby oscillator currents will be supplied to the input of said receiver and the receiver will be rendered responsive only to currents from the oscillator whenever said power means is operating to vary the tuning of said tunable circuits.

6. In a signalling system, in combination, a receiver comprising tunable circuits for selecting signals, power means for varying the tuning of said circuits, a circuit for energizing said power means and comprising a relay for interrupting such circuit, connections comprising a rectifier for energizing said relay from the output of said receiver, an oscillator normally physically connected to said receiver, and means whereby oscillator currents will be supplied to the input of said receiver and the receiver will be rendered responsive only to currents from the oscillator, whenever said power means is operating to vary the tuning of said tunable circuits.

7. In an electrical signalling system, the combination of a receiver having adjustable tuning elements, a motor mechanism for adjusting said elements, a device for controlling said motor mechanism, said device including an oscillator normally physically connected to said receiver, means whereby during tuning of the said receiver, said oscillator is electrically connected to the receiver and the receiver is rendered responsive only to currents from the oscillator, and means controlled by the current in a circuit of the receiver for de-energizing said motor mechanism when the receiver is tuned to a predetermined relation with the frequency of the oscillator.

8. In an electrical signalling system, the combination of a receiver having adjustable tuning elements, a motor for adjusting said elements, an oscillator normally physically connected to said receiver and independent as to its frequency of the receiver, an input circuit for said receiver, means for electrically connecting said oscillator to said input circuit and for rendering said receiver responsive only to currents from the oscillator when the oscillator is energized, and means controlled by the current in a circuit of said receiver and rendered operative to de-energize said motor only upon the receiver being tuned to a predetermined relation with the frequency of the oscillator.

9. In a broadcast receiver system, the combination of a receiver unit having tuning elements, a loud speaker for said unit, an antenna for said unit, a motor for adjusting said tuning elements, an oscillator normally independent of said receiver unit, and means for coupling the output of said oscillator to said receiver and for concurrently disconnecting said loud speaker and said antenna from said receiver unit and energizing said motor when said oscillator is energized.

10. The method of tuning a radio receiver from a remote position comprising generating at said remote position currents of a frequency corresponding to any selected one of a plurality of broadcast station frequencies, simultaneously conditioning the receiver so that it can be affected only by the currents generated at such remote position, impressing the said currents corresponding to said selected frequency on said receiver, adjusting the receiver tuning elements, and utilizing the current in a circuit of said receiver to terminate the adjustment of said tuning elements.

11. The method of tuning radio receiving apparatus to any selected one of a plurality of different frequencies which comprises generating at a position remote from said apparatus currents of a frequency having a predetermined relation to the selected frequency, simultaneously conditioning the receiving apparatus so that it can be affected only by currents generated at such remote position, impressing such generated currents on the receiving apparatus, varying the tuning of the receiving apparatus and utilizing the output of the receiving apparatus to terminate variation of its tuning.

12. The method of adjusting a radio receiver to any selected one of a plurality of different frequencies which comprises generating currents of a frequency having a predetermined relation to the selected frequency and simultaneously conditioning the receiver so that it can be affected only by currents of a frequency having said predetermined relation, impressing said currents on said receiver, simultaneously varying the tuning of said receiver, utilizing the output of said receiver to stop the variation of its tuning, and terminating the impression of said currents on said receiver when the latter has been tuned to the selected frequency.

13. In a radio receiver system, the combination of a receiver, means for tuning said receiver, means for actuating said tuning means, a loud speaker and an antenna for said receiver, an oscillator located remotely of said receiver unit, means for connecting said oscillator to said receiver and for concurrently disconnecting said loud speaker and said antenna from said receiver, and energizing said actuating means when said oscillator is energized, an output circuit for said receiver, and means in said output circuit for de-energizing said actuating means when said receiver unit is tuned to the frequency of said oscillator.

RICHARD M. SOMERS.