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REMOTELY CONTROLLED RADIO RECEIVER

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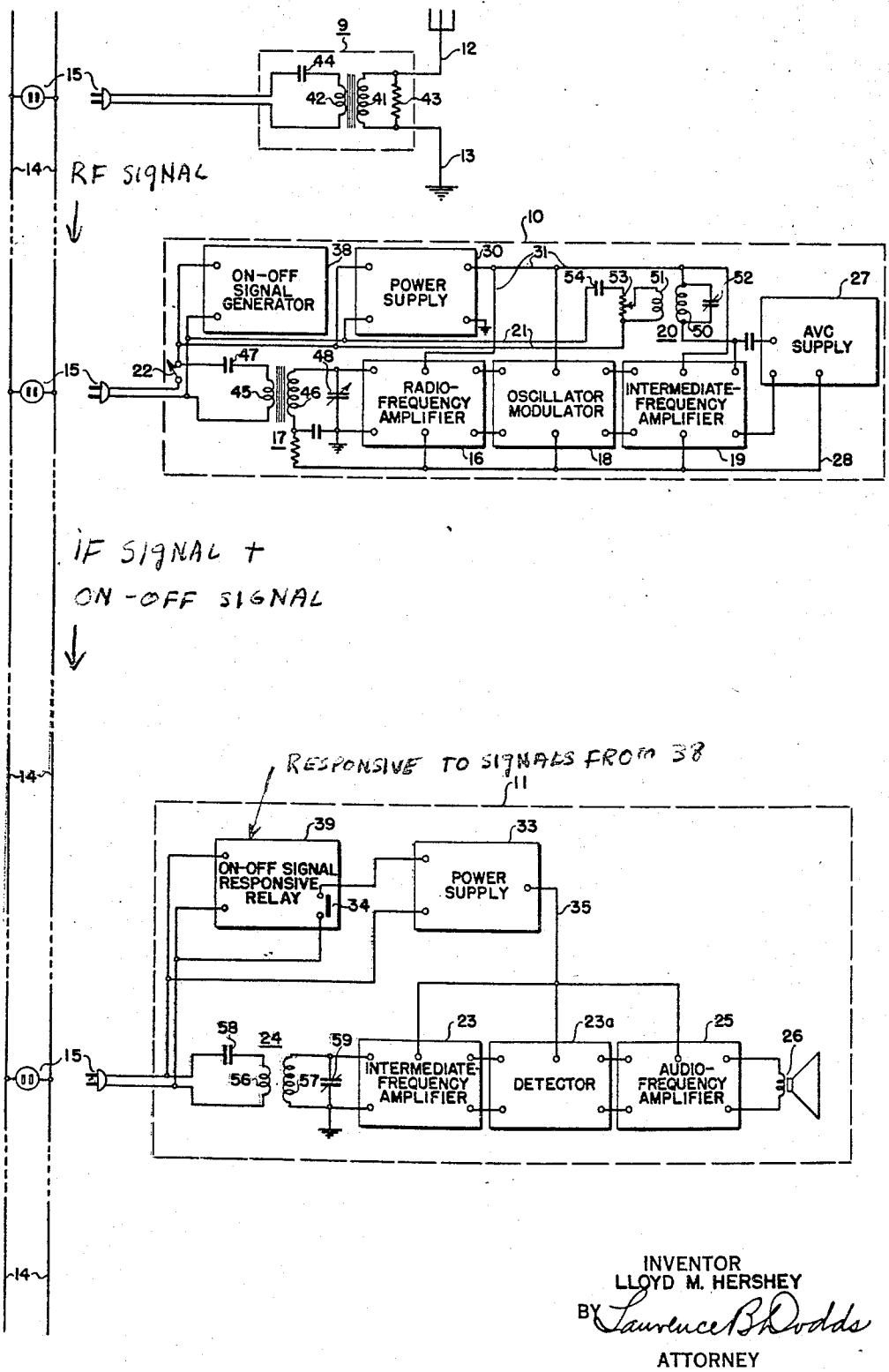

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REMOTELY CONTROLLED RADIO RECEIVER

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7 Claims. (Cl. 250—20)

This invention relates generally to remotely controllable radio receivers and particularly to receivers comprising a remote control not involving the use of additional control wires between the control unit and the receiver.

It is frequently desirable to effect a control of a radio receiver from a point remote from the receiver or remote from the antenna connection, or both. 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 procure the best acoustical effect and to control the receiver by means of a compact control unit from a remote point. Furthermore, it may be desirable to move the control unit from one part of the house to another. In addition, it may be inconvenient to bring an antenna connection to the desired location of the receiver or of the control unit. It is difficult to meet these requirements if a cable conductor is required between the separated units, both because of the unwieldiness of the cable and because of the complexity and expense of the control. In some arrangements of the prior art, control of a motor for operating the tuning units of the receiver has been effected from a remote control station. Such arrangements have, among other disadvantages, the disadvantage of requiring expensive additional parts. Since the remote control unit is not always used in a place from which the tuning dial of the receiver can easily be seen, it is also desirable to have some means at the control unit for indicating the station to which the receiver is tuned. For this purpose, follower arrangements have been devised so that a station indicator at the control unit moves in unison with the tuning units at the receiver. However, no satisfactory follower arrangement which is both inexpensive and accurate in operation has yet been devised.

It is an object of the present invention, therefore, to provide a wave-signal receiver which may be remotely controlled and which is not subject to the above-mentioned disadvantages.

It is another object of the invention to provide a wave-signal receiver which may be remotely controlled and in which the receiver control operations are effected directly at the remote control station.

In accordance with one embodiment of the invention, there is provided a receiver comprising an antenna circuit and one or more sections including a control section. The control section comprises the usual tuning and other control elements of the receiver. A portion of the power transmission line which supplies power to the receiver is utilized to transmit to the control section radio-frequency signals intercepted by the receiver antenna. In the case of a superheterodyne receiver, there is preferably provided another section in addition to the control section, the other section constituting the reproducing section and comprising the remainder of the parts of a conventional receiver. In this case, a portion of the transmission line is also utilized to transmit intermediate-frequency signals from the control section to the reproducing section. Thus, the antenna circuit and the sound-reproducing section of the receiver may be permanently placed at any convenient point, or points, and the receiver may be controlled from a control section which may be plugged into the power line at any convenient power outlet. Preferably, a means for deriving an automatic amplification control bias is provided within the control section of the receiver and the bias is applied to one or more of the tubes of the stages within the control section.

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 complete superheterodyne receiver embodying the invention.

Referring now more particularly to the drawing, there is shown schematically a superheterodyne receiver including a control section 10 and a sound-reproducing section 11. Considering first the essential elements of the receiver, per se, it comprises, in general, an antenna ground circuit 12,13 coupled to the power transmission line 14 through an impedance-matching device 9 and a convenience outlet and plug 15; a radio-frequency selector and amplifier 16 having its input circuit coupled to power line 14 through a convenience outlet and plug 15 and an impedance-matching device 17, and its output circuit connected to a tunable frequency changer or oscillator-modulator 18, the output circuit of which is coupled, in turn, to the input circuit of an intermediate-frequency selector and amplifier 19. The intermediate-frequency output circuit of amplifier 19 is coupled through an impedance-matching device 20, conductors 21, switch 22, and convenience outlet and plug 15 to the power line 14 in order that the intermediate-frequency signals may be transmitted to the sound-reproducing section 11 of the receiver over the power line 14.

A second intermediate-frequency amplifier 23, included in section 11, is coupled through an impedance-matching device 24 and a convenience outlet and plug 15 to the power line 14. Connected in cascade to the output circuit of intermediate-frequency amplifier 23, in the order named, are a signal detector 23a, an audio-frequency amplifier 25, and a sound-reproducing device 26. An automatic amplification control or A. V. C. bias is derived in section 10 from unit 27 coupled to amplifier 19 and is applied over conductor 28 to one or more of the tubes of radio-frequency amplifier 16, oscillator-modulator 18, and intermediate-frequency amplifier 19 to maintain the input to detector 23a within a relatively narrow range for a wide range of received signal amplitudes.

A power supply unit 30 is provided for section 10 of the receiver and is coupled to the power lines 14, when the switch 22 is closed, to provide operating potentials for the tubes of section 10 over conductor 31, in a conventional manner. A power supply unit 33 is provided for section 11 of the receiver and, when coupled to the power line 14 through relay contacts 34, provides operating potentials for the tubes of section 11 over conductor 35, in a conventional manner.

Neglecting the portions of the circuit constituting the present invention presently to be described, the operation of the receiver just described is well understood in the art and a detailed description thereof is unnecessary. In brief, however, signals intercepted by the antenna 12 are transmitted by impedance-matching device 9 and line 14 to radio-frequency amplifier 16, wherein they are amplified and translated to the tunable frequency changer 18 for conversion to intermediate-frequency signals in a well-known manner. The intermediate-frequency signals are selected and amplified in intermediate-frequency amplifier 19 and transmitted through impedance-matching device 20, conductors 21, and power line 14 to the second intermediate-frequency amplifier 23 for further selection and amplification. The intermediate-frequency output of amplifier 23 is passed to detector 23a wherein the audio frequencies of modulation are derived. The audio-frequency signal is further amplified in amplifier 25 and supplied in the usual manner to loud-speaker 26 for reproduction. The unidirectional output of the A. V. C. supply unit 27 is applied by way of connection 28 to one or more of the tubes of radio-frequency amplifier 16, oscillator-modulator 18, and one or more of the tubes of intermediate-frequency amplifier 19, thereby maintaining the amplitude of the signal input to detector 23a within a narrow range for a wide range of received signal amplitudes.

In order that the power supply unit may be connected to power lines 14 through relay contacts 34 by means of an operation effected at control unit 10, there is provided an on-off signal generator 38 for generating a signal which is effective to energize the relay 39. It will be understood that units 38 and 39 may be of a conventional type and do not constitute a part of the present invention.

Coming now to the details of the parts of the system comprising the present invention, the impedance-matching device 9 coupled between the antenna-ground circuit 12, 13 and the power transmission line 14 comprises a transformer 41, 42, preferably having a comminuted iron core, a resistor 43 connected across primary winding 41, and a blocking condenser 44 interposed between secondary winding 42 and the power transmission line 14.

Impedance-matching device 17, provided for matching the impedance of line 14 with the input impedance of radio-frequency amplifier 16, comprises a transformer 45, 46, preferably having a comminuted iron core, and a blocking condenser 47 and switch 22 interposed between the primary winding 45 and line 14. A tuning condenser 48 is coupled across secondary winding 46.

Impedance-matching device 20, provided for matching the output impedance of intermediate-frequency amplifier 19 with the impedance of transmission line 14, comprises a transformer having closely coupled windings 50, 51. Primary winding 50 is tuned to the intermediate-frequency signal by means of a condenser 52, while secondary winding 51 is coupled to transmission line 14 through a voltage divider resistor 53, a blocking condenser 54, and conductors 21. The tap on resistor 53 may be utilized as a manual volume control at the remote section of the receiver.

Impedance-matching device 24, provided for matching the input impedance of the second intermediate-frequency amplifier 23 with the impedance of the power transmission line 14, comprises a transformer 56, 57, the primary winding 56 being coupled to transmission line 14 through a blocking condenser 58. The secondary winding 57 is tuned to the intermediate frequency of the receiver by means of a condenser 59.

It is believed that the operation of the circuits comprising the present invention will be readily apparent from the description given above. It is seen that the control section 10 of the receiver comprises all of the conventional control elements of a receiver of the superheterodyne type and that the remaining elements of a conventional superheterodyne receiver are comprised within the reproducing section 11. By virtue of the impedance-matching devices 9, 17, 20, and 24, received signals are transferred efficiently as radio-frequency signals from antenna circuit 12, 13 to line 14 and from line 14 to radio-frequency amplifier 16; and as intermediate-frequency signals from amplifier 19 to line 14 and from line 14 to amplifier 23. By virtue of the fact that the radio-frequency signals and the intermediate-frequency signals normally have a wide frequency separation, they do not mutually interfere by virtue of both being present on line 14. It will also be understood that choke coils may be utilized in the power transmission line to prevent signals generated within the receiver from interfering with other similar receivers operating upon the same power line and to prevent such receiver or other apparatus from affecting the operation of the receiver described. It is apparent that power supply means 33 may be connected to the power line 14 by means of relay contacts 34 operating in response to a signal generated by unit 38 when switch 22 is closed at the control section of the receiver. It is thus apparent that the remote control arrangement described permits either the antenna circuit or the sound-reproducing unit, or both, to be located at points remote from the control unit and that any of these units may be moved about at will, merely being plugged into a convenience outlet near the most desirable location.

While there have been described what are at

present considered to be the preferred embodiments 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. A modulated-carrier signal receiver of the superheterodyne type comprising at least two sections, each including an intermediate-frequency signal-translating stage, power supply means for each of said sections, said power supply means respectively being adapted to be connected to a common house power transmission line at remotely spaced points thereof, and an intermediate-frequency coupling circuit for coupling said signal-translating stage of each of said sections to said transmission line, whereby at least a portion of said power transmission line may serve as an intermediate-frequency two-wire transmission line between said sections.

2. A modulated-carrier signal receiver of the superheterodyne type comprising at least two sections, each of said sections including an intermediate-frequency signal-translating stage and one of said sections comprising the control elements of the receiver, power supply means for each of said sections, said power supply means respectively being adapted to be connected to a common house power transmission line at remotely spaced points thereof, an intermediate-frequency coupling circuit for coupling said signal-translating stage of each of said sections to said transmission line, whereby at least a portion of said power transmission line may serve as an intermediate-frequency two-wire transmission line between said sections.

3. A modulated-carrier signal receiver of the superheterodyne type comprising at least two sections, each including an intermediate-frequency signal-translating stage, power supply means for each of said sections, said power supply means respectively being adapted to be connected to a common house power transmission line at remotely spaced points thereof, an intermediate-frequency coupling circuit for coupling said signal-translating stage of each of said sections to said transmission line, whereby at least a portion of said power transmission line may serve as an intermediate-frequency two-wire transmission line between said sections, and an impedance-matching device included in each of said intermediate-frequency coupling circuits for matching the impedance of its respective section with the impedance of said transmission line.

4. A modulated-carrier signal receiver of the superheterodyne type comprising at least two sections, each including an intermediate-frequency signal-translating stage and one of said sections comprising the control elements of the receiver, power supply means for each of said sections, said power supply means respectively being adapted to be connected to a common house power transmission line at remotely spaced points thereof, an intermediate-frequency coupling circuit for coupling each of said sections to said transmission line, whereby at least a portion of said power transmission line may serve as an intermediate-frequency two-wire transmission line between said sections, an on-off signal generator in said one of said sections, means for utilizing said transmission line for transmitting the signal generated by said generator to the other of said sections, and a relay in the other of said sections responsive to said signal for controlling the circuit of the power supply means included in said other of said sections.

5. A modulated-carrier signal receiver of the superheterodyne type comprising at least two sections, each including an intermediate-frequency signal-translating stage and one of said sections comprising the control elements of the receiver, power supply means for each of said sections, said power supply means respectively being adapted to be connected to a common house power transmission line at remotely spaced points thereof, an intermediate-frequency coupling circuit for coupling each of said sections to said transmission line, whereby at least a portion of said power transmission line may serve as an intermediate-frequency two-wire transmission line between said sections, and a volume control voltage divider included in the intermediate-frequency coupling circuit of said one of said sections.

6. A modulated-carrier signal receiver of the superheterodyne type comprising at least two sections, each of said sections including an intermediate-frequency signal-translating stage and one of said sections including a radio-frequency signal-translating stage, power supply means for each of said sections, said power supply means respectively being adapted to be connected to a common house power transmission line at remotely spaced points thereof, radio-frequency selector means for coupling said transmission line to said radio-frequency signal-translating stage, an intermediate-frequency coupling circuit for coupling said intermediate-frequency signal-translating stage of each of said sections to said transmission line, whereby at least a portion of said power transmission line may serve as a radio-frequency transmission line to couple to said radio-frequency stage radio-frequency signals induced therein and as an intermediate-frequency two-wire transmission line between said sections.

7. A modulated-carrier signal receiver of the superheterodyne type comprising at least two sections, each of said sections including an intermediate-frequency signal-translating stage, an antenna circuit, power supply means for each of said sections, said power supply means respectively being adapted to be connected to a common house power transmission line at remotely spaced points thereof, impedance-matching means for coupling said antenna circuit to said transmission line, an intermediate-frequency coupling circuit for coupling said signal-translating stage of each of said sections to said transmission line, whereby at least a portion of said power transmission line may serve as a radio-frequency transmission line between said antenna circuit and one of said sections and as an intermediate-frequency two-wire transmission line between said sections.

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