

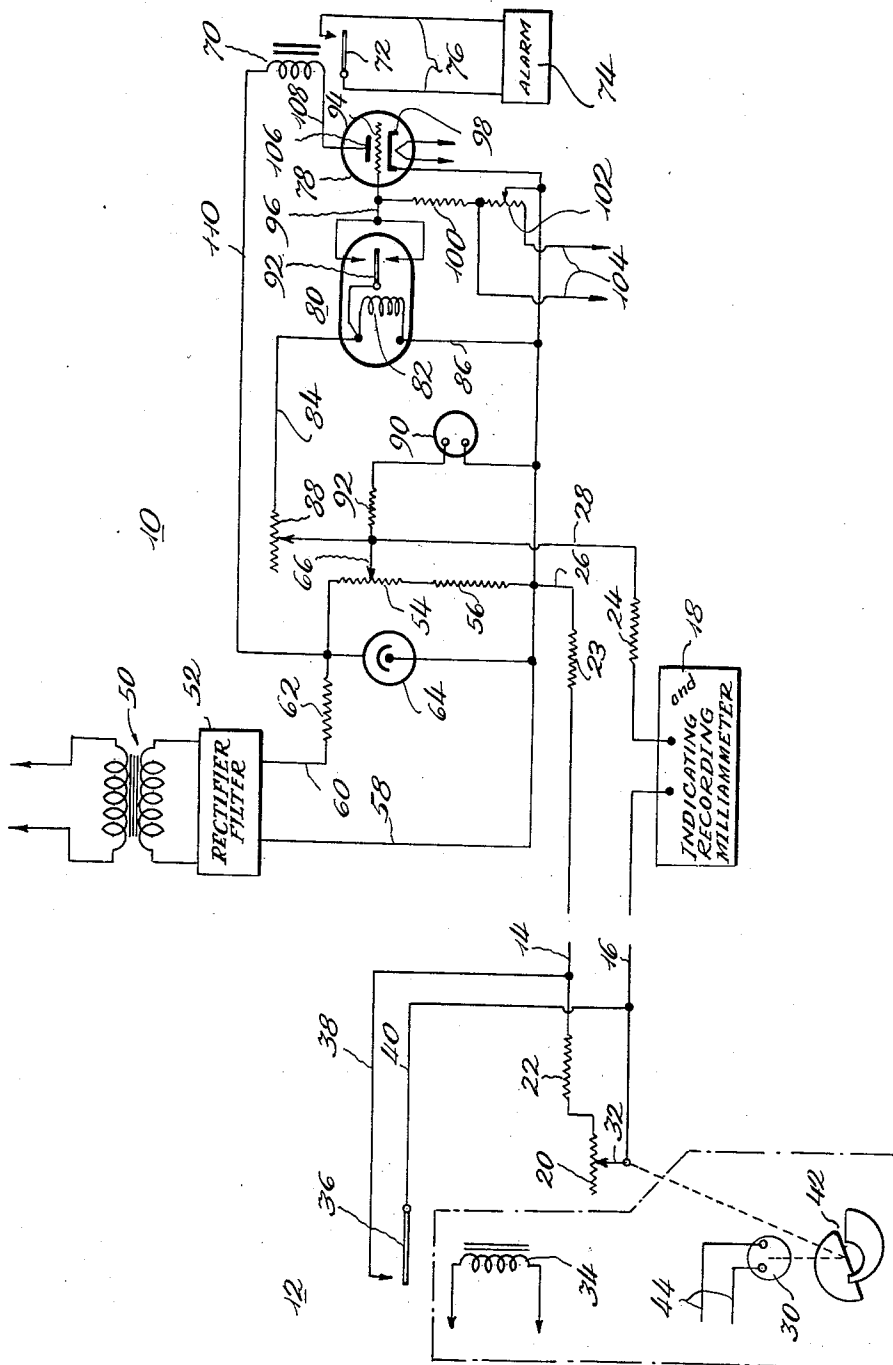
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REMOTE RADIO RECEIVER TUNING INDICATING APPARATUS

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UNITED STATES PATENT OFFICE

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REMOTE RADIO RECEIVER TUNING
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The present invention relates to remote radio receiver tuning indicating apparatus and has for its primary object the provision of new and improved apparatus of this character.

Another object of the present invention is the provision of new and improved apparatus for indicating at a remote point, such as a central indicating or recording station, the tuning of a radio receiver located at a point distant from the station, as in the home of the owner of the receiver.

A further object of the present invention is the provision of new and improved radio receiver tuning indicating apparatus including means for accurately indicating the tuning of a radio receiver operatively connected to the receiver through a telephone circuit.

A further object of the present invention is the provision of new and improved remote radio receiver tuning indicating apparatus including a circuit, preferably a telephone circuit, extending from the radio receiver to a central recording station, variable impedance means associated with the receiver and variable in response to the tuning of the receiver, and indicating means located at the recording station controlled by said impedance means.

Another object of the present invention is the provision of new and improved means for indicating or recording at a central station the tuning of a radio receiver located remote from the station and including also means for indicating the operative condition of the receiver. The last mentioned means preferably includes means for changing the impedance to a predetermined value when the radio receiver is turned off, thereby to operate the indicating means to a particular position indicative of the fact that the radio receiver is off.

Still another object of the present invention is the provision of new and improved apparatus for indicating at a remote point the tuning of a radio receiver located remote therefrom and coupled to the apparatus through a telephone circuit having associated therewith a voltage source connected to the circuit and means for indicating variations in the voltage source beyond predetermined limits.

Other objects and advantages of the present invention will become apparent from the ensuing description of an embodiment thereof, in which reference is had to the accompanying drawing, the single figure of which is a schematic representation of the invention.

In brief, the present invention has for its pri-

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mary purpose the indication, or recording, or both, at a central station the various broadcast stations to which a radio receiver located as in a home is tuned. It comprises, preferably, a telephone circuit extending between the home and station, variable impedance means the value of which is varied in response to changes in tuning of the receiver, and current responsive means at the station for indicating or recording, or both, the current changes resulting from changes in the impedance and thus the tuning of the receiver.

The apparatus of the present invention comprises, in the main, two units, the first of which is indicated by reference character 10 and is located at the central point or station and a second unit, indicated by the reference character 12, which is coupled to a radio receiver. The two units are coupled to each other, preferably through a telephone circuit including the conductors 14 and 16. The units may be permanently coupled or may be coupled at desired or selected times through a telephone exchange, not shown.

While the figure illustrates apparatus for indicating or recording the tuning of a single receiver, it should be understood that the tuning of any number of receivers may be recorded by similar apparatus associated with each of the receivers whose operation is to be indicated or recorded.

It is preferred that the unit 10 include an indicating and recording means which may be an indicating and recording milliammeter 13 coupled to the telephone circuit, and that the current flow in this circuit be varied in response to the tuning of the radio receiver by variable impedance means including a resistor 20 coupled to the telephone circuit through a fixed resistor 22. The circuit is supplied with voltage of a predetermined value, such as about 90 volts, through fixed resistors 23 and 24 at the recording station and conductors 25 and 28 leading to the voltage source. The resistor 20 may have a value of about 10,000 ohms of which a portion only is actually used. The resistor 22 may have a value of about 1,000 ohms and resistors 23 and 24 values of about 5,000 and 10,000 ohms, respectively.

The effective value of the variable resistor 20 associated with the receiver is varied in response to the tuning of the receiver and it changes the current flow in the telephone circuit and through the milliammeter whenever the tuning is changed. The current flow at any time is thus indicative

of the station to which the radio receiver is tuned. The resistor is preferably controlled by a unidirectional motor 30 mechanically connected to a movable contact 32 associated with the resistor.

The motor may comprise a part of an electronic device coupled to a radio receiver and operable to positions indicative of the tuning of the receiver and thus to the various broadcast stations to which the receiver is tuned. This electronic device is preferably of the type disclosed and claimed in my copending application, Serial No. 511,246, filed November 22, 1943, and assigned to the assignee of this application. The electronic device is not illustrated nor will it be described in detail. It is believed sufficient to state that it includes a relay 34 which is adapted to be energized whenever the receiver is turned on (and which may remain energized for a brief period after the receiver is turned off because of a delay in the cooling of a cathode of a rectifier tube, provided a tube using an indirectly heated cathode is used, as is used in said application). This relay is utilized to operate a movable switch blade 36 effectively to connect the variable resistor 20 to the telephone circuit when the receiver is turned on. When the relay is deenergized, which is the case when the radio receiver is turned off, the switch is closed thereby effectively to disconnect the resistor 20 by short circuiting it, and also resistor 22, through a circuit including the conductors 38 and 40.

The electronic device includes not only the motor 30 but also a variable capacitor 42 forming part of the electronic control. The motor is so controlled that it is energized when the tuning of the receiver is changed to operate the capacitor to a point indicative of the station to which the receiver is tuned. When this point is reached, the motor is deenergized and stopped. It will thus be apparent that the value to which the resistor 20 is adjusted for a particular tuning of the receiver is indicative of the station to which the receiver is tuned. The motor 30 is supplied with power through a pair of conductors 44 under the control of the electronic control device.

Another of the features of the present invention is the provision of means for indicating the operativeness of the radio receiver, thereby to provide an indication of the on and off periods of the receiver. This indication is provided by means controlled by the relay controlled switch 36 which, it may be remembered, effectively disconnects the variable impedance from the circuit and substitutes a predetermined resistance, in this case zero resistance, in place of it. The result is a decrease in the resistance of the indicating circuit, in which the milliammeter is connected, so that when the receiver is turned off, the milliammeter indicating and recording means are moved to a predetermined position indicative of the fact that the receiver has been turned off.

Power is supplied to the indicating circuit from a suitable source such as the usual 110 volt alternating current source through means including a transformer 50 and a rectifier and filter 52, which may be of conventional construction. The output of the rectifier and filter is coupled to a potentiometer including the series connected resistors 54 and 56 through a circuit including conductors 58 and 60, the latter of which has interposed therein a resistor 62. In order better to maintain the voltage constant, a voltage regulator tube 64, which may be of the VR-90 type, is connected across the potentiometer resistors 54 and 56. The conductor 26 of the indicating circuit is

connected to conductor 58 and conductor 28 is connected through an adjustable contact 66 to the resistor 54, whereby the voltage supplied to the indicating circuit may be adjusted to some desired value such as 90 volts.

In accordance with another feature of my invention, means are provided for indicating variation of the indicating circuit voltage from the desired value. This is of importance because if the voltage variation is too great, the indicating means will not operate accurately because the change in voltage changes the current flow.

The voltage variation indicating means includes a relay 70, operating a switch 72 controlling an alarm 74 and energizing the alarm when the voltage variation exceeds predetermined limits. The alarm may be of any suitable type connected to the switch through conductors 76 and will therefore not be described in detail.

The energization of the relay 70 is preferably controlled by an electron tube 78 (which may be of the 76 type), which is rendered sufficiently conductive to operate relay 70 when the voltage variation exceeds the desired limits. The conductivity of the tube is controlled by a relay 80 controlling the grid potential of the tube.

The relay 80 includes a winding 82 connected to the indicating circuit by conductors 84 and 86, the former of which has interposed therein an adjustable resistor 88. If desired, a voltmeter 89 may be connected to the indicating circuit through a resistor 92, thereby to give a visual indication of the voltage across the indicating circuit.

The relay 80 includes a movable switch blade 92 adapted to render the grid 94 of the tube 78 more positive when the voltage variation exceeds the desired limits, which may be about plus or minus two volts. When this variation is exceeded, the switch blade 92 engages one or the other of the stationary contacts associated therewith, thereby to connect the grid to conductor 96 and thus to the voltage source through a grid connection 98. The grid is connected to the common conductor 58, to which the cathode 98 is also connected, through a fixed resistor 100 and an adjustable resistor 102. A normal bias of suitable value is applied to the grid 94 through the adjustable resistor 102, which is connected to a suitable source of bias voltage through conductors 104.

The relay 70 is connected to the output circuit of tube 78. One terminal is connected to the anode 106 of the tube by conductor 108 and the other terminal is connected to the voltage supply means through conductor 110.

In the following description of operation, it is assumed that the transformer 50 has been connected to a suitable source of power and that the radio receiver has been placed in operation with the result that the relay 34 has been energized to open the switch 36, thereby effectively to connect the variable resistor 20 to the indicating means 18. The effective value of resistor 20 in the circuit depends on the position of the adjustable contact arm 32 and thus upon the station to which the receiver is tuned. The current flow through the indicating and recording milliammeter is thus a predetermined value indicative of the station to which the receiver is tuned.

If the user of the radio tunes in another station, the adjustable contact 32 is moved to a different position. It is so moved by the motor 30, which operates the variable capacitor 42 to a position corresponding to the tuning. Each time the tuning is varied, the motor 30 is operated to

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move the capacitor 42 and adjustable contact 32 into positions corresponding to the tuning. As a consequence, the indicating and recording milliammeter provides an instantaneous and continuous indication and recording of the stations to which the receiver is tuned.

In the event the voltage supplied to the indicating circuit varies beyond the prescribed limits, the energization of relay winding 82 varies with the result that the movable contact 92 moves in one direction or the other, depending upon the direction of variation, to render the tube 78 more conductive so as to effect operation of the relay 78 and its switch 72 to energize the alarm 74.

When the radio receiver is turned off, the relay 34 is deenergized and its associated switch 36 effectively disconnects the variable resistor 20 from the indicating means. The effective disconnection results from the short circuiting of resistors 20 and 22 with the result that an increased current flows through the milliammeter and the indicating and recording means of the latter are moved to a predetermined position to indicate that the radio receiver has been turned off. When the receiver is turned on, the relay 34 is energized and opens switch 36 thereby to remove the short circuit across resistors 20 and 22 and effectively to connect them in the indicating circuit.

While but a single embodiment of the invention has been described in detail, it should be understood that these details are not intended to be limitative of the invention, except in so far as set forth in the accompanying claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. Apparatus for indicating at a central station the tuning of a radio receiver located at a remote point therefrom, including in combination, electrically operated indicating means at the central station, a circuit extending from the central station to the radio receiver and coupled to said indicating means, means including impedance means variable in response to the tuning of the receiver and coupled to said circuit for operating said indicating means to indicate the tuning of the receiver, and means operable in response to the operative condition of the receiver for changing said impedance means a predetermined extent when the radio receiver is disconnected from its source of power.

2. Apparatus for indicating at a remote point the transmitting station to which a radio receiver is tuned for reception when in use, comprising means associated with said receiver and responsive to tuning of said receiver for developing a signal having a characteristic variable with tuning of said receiver to represent the station to which the receiver is tuned for reception when in use, means responsive to the turning of said receiver on and off for correspondingly modifying said signal, a signal transmission link for transmitting said signal from said receiver to said

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remote point, and means at said remote point controlled over said link by said signal and responsive to said modification of said signal and said variations in the variable characteristic thereof for indicating when said receiver is in use and the station to which the receiver is tuned for reception.

3. Apparatus for indicating at a central station the tuning of a radio receiver located at a point remote therefrom, comprising a circuit extending from said central station to said receiver, potentiometer means at said receiver for varying the magnitude of current flow over said circuit in accordance with variations in the tuning of said receiver, means responsive to the turning of said receiver on and off for further modifying in opposite senses the magnitude of current flow in said circuit, and current responsive recording means at said central station responsive to said variations in current flow in said circuit for producing a record of the stations to which said receiver is tuned for reception and responsive to said modifications in the current flow in said circuit for producing a record of the periods of use and non-use of said receiver.

4. Apparatus for indicating at a remote point the tuning condition of a wave signal receiver when in use, comprising, means including an impedance means variable in response to the tuning of said receiver for developing a signal having a characteristic which varies with changes in tuning of said receiver to represent the particular channel to which said receiver is tuned when in use, means responsive to the turning on of said receiver for correspondingly modifying said signal and means responsive to the tuning off of said receiver for rendering said impedance means ineffective to vary said characteristic, a signal transmission link for transmitting said signal from said receiver to said remote point, and means at said remote point controlled over said link by said signal and responsive to the modification of said signal either by virtue of rendering said impedance means ineffective or by virtue of varying said impedance means for indicating when said receiver is in use and the channel to which said receiver is tuned when in use.

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The following references are of record in the file of this patent:

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Number	Country	Date
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Certificate of Correction

Patent No. 2,439,201.

April 6, 1948.

ROBERT A. CLARK, JR.

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows: Column 4, line 38, for the word "variations" read *variation*; column 6, line 36, for "tuning" read *turning*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 1st day of June, A. D. 1948.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.

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