

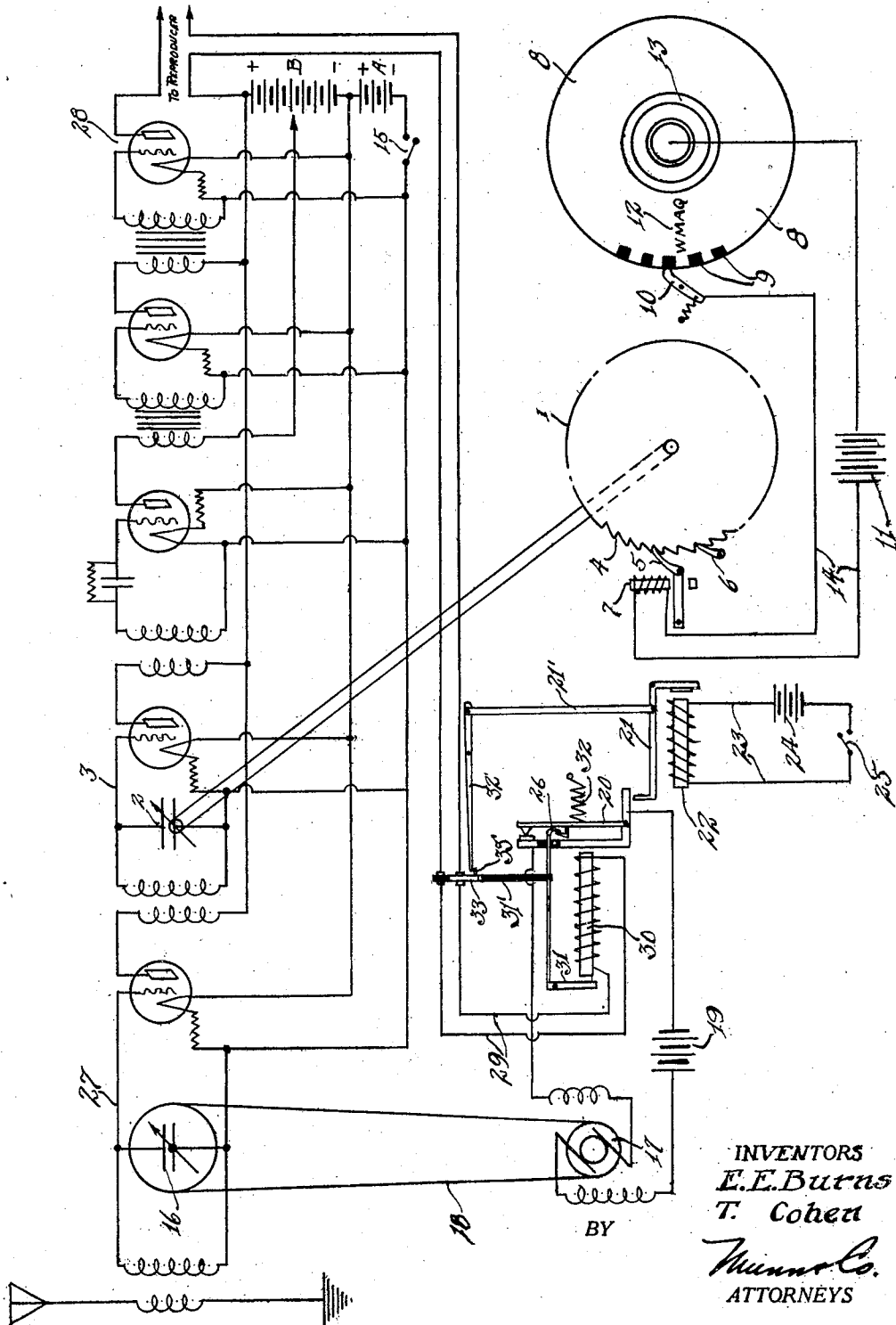
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SELECTOR AND AUTOMATIC TUNER FOR RADIO CIRCUITS

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SELECTOR AND AUTOMATIC TUNER FOR RADIOCIRCUITS.

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Our invention relates to improvements in selectors and automatic tuners for radio circuits, and it consists in the combinations, constructions, and arrangements herein described and claimed.

The phenomenon of resonance is very striking in circuits of radio-frequency. In order that the energy of the oscillations flowing in one circuit may be transferred more effectively by electro-magnetic induction, the two circuits must have the same natural frequency of oscillation. If the receiving circuit is set into oscillation and the frequency of the circuit is carefully adjusted by a tuning element, a point will be found where a hot wire ammeter, for example, in the audio-frequency part of the circuit, will give a maximum deflection when the receiving circuit is in resonance with the frequency of the received wave. At all other points, the ammeter will show a lower reading. It has been shown that the adjustment of the receiving circuit to a point where the deflection of the ammeter is maximum is such that the two tuned circuits have substantially the same period of oscillation, or the same natural frequency, and it is under such adjustments only that large values of current can be induced in the receiving circuit. From actual test, we have found that the increase in plate current of the first stage of audio at resonance with an incoming wave is approximately one milliamperes, while the increase in plate current of the second stage audio is approximately eight milliamperes. Local signals were being received at the time this experiment was made.

We make use of this additional surge of plate current at resonance for automatically tuning the receiving circuit with the incoming wave.

The principal object of our invention is to provide an automatic tuning element for tuning a receiving circuit with the incoming wave, the tuning element being controlled by the surge of plate current at resonance.

A further object of our invention is to provide a device of the type described which makes use of a novel selector for predetermining the desired signals to be received by the receiving or local circuits.

A further object of our invention is to provide a device of the type described in which the selector and automatic tuning element may be operated by a distant control.

In this way, we are permitted to dispose the loud speaker and the remote control in a room of a hotel, for example, and dispose the receiving set in some other part of the building.

Other objects and advantages will appear in the following specification, and the novel features of the invention will be particularly pointed out in the appended claims.

Our invention is illustrated in the accompanying drawing, forming part of this application, in which

The drawing shows a receiving circuit with the automatic tuner and the selector connected therewith.

We have shown a radio receiving circuit employing two stages of radio-frequency, a detector stage, and two stages of audio-frequency. These stages are electrically connected to each other and to the sources of current in the usual manner.

We will first describe the selector. We have shown the selector as tuning one of the stages of radio-frequency. It is obvious that the selector may be a separate unit if desired, but, for example, we have connected the selector with the tuning element of one of the radio-frequency circuits.

The selector comprises a ratchet 1 which is operatively connected to the tuning element 2 in the radio-frequency circuit 3. The teeth 4 in the ratchet 1 may be of any size desired such as, for example, a size sufficient to turn the tuning element to change the frequency of the circuit 3, ten kilocycles. It is obvious that any other amount of turning may be substituted for the amount just set forth.

The ratchet 1 is advanced step by step by means of a pawl 5 and the ratchet is held in advanced position by means of a second pawl 6. The pawl 5 is actuated by a magnet 7, this magnet being energized by a make-and-break device indicated generally at 8. The make-and-break device, in the present instance, consists of a metal disc having insulating portions 9. A spring-pressed terminal 10 yieldingly engages with the periphery of the disc, and when touching the metal between the insulating portions 9, completes a circuit from a source of current 11 to the magnet 7. This circuit energizes the magnet 7, moving the pawl 5, and advancing the ratchet 1 one tooth. This of course will actuate the tuning element.

The disc 8 may be disposed in a room of a

hotel, for example, and may have the call letters of the broadcasting stations printed thereon, as at 12. The operator, wishing to tune in the station, merely rotates the disc 8 by means of the knob 13 until the call letters of the desired station are brought into view. While the disc 8 is being rotated, it will cause the pawl 5 to advance the ratchet 1 and the tuning element 2 to the required position for the circuit 3 to receive the signals sent out by the station in question. The ratchet 1, together with the magnet 7 and its associate parts, is disposed adjacent to the tuning element 2 and is electrically connected by the wires 14 with the make-and-break device 8. In this way, the receiving set may be disposed any distance away from the make-and-break device. This permits distant control.

A filament switch 15 is of course provided and may now be turned on. This switch may also be disposed adjacent to the make-and-break device 8.

We will now describe the automatic tuning element. This element may be separate from the radio circuit, if desired, in the same manner as the selector could be a separate unit. However, to simplify the showing, we have made use of another of the radio-frequency stages. The tuning element 16 is operatively connected to a motor 17 by means of a belt 18. This showing is diagrammatic, and it is to be noted that any actuating means for the tuning element 16 may be substituted for the motor 17 without departing from the spirit and scope of our invention.

The motor is electrically connected with a source of current 19 and with a relay switch 20. The switch 20 is closed by means of a lever 21, the lever 21 in turn being controlled by a magnet 22. Wires 23 connect the magnet 22 with a source of current 24 and with a control switch 25. The switch 25 is disposed adjacent to the make-and-break device 8.

The operator, after closing the switch 15 and rotating the dial 8 to the required station, closes the switch 25. This closes the circuit to the magnet 22, energizing the magnet and actuating the lever 21. The lever 21 in turn closes the motor control switch 20, this switch being held in closed position by means of a catch 26. The motor 17 will now actuate the tuning element 16 until the tuning element brings the radio-frequency circuit 27 into resonance with the radio-frequency circuit 3. At this point, a surge of plate current from the second stage of audio-frequency indicated generally at 28, will flow along the wires 29 and energize a magnet 30. As stated in the first part of the specification, this surge of plate current at resonance is approximately one milliamperere or more. The magnet 30 is wound in such a manner as to actuate the lever 31 when an additional surge

of current of one milliamperere flows through the wires 29. The movement of the lever 31 releases the catch 26, thus allowing the spring 32 to open the switch 20. The motor is stopped and therefore ceases to actuate the tuning element 16. The circuits receiving the incoming signal will therefore be held at resonance with each other and will therefore receive the signals from the station desired.

It should be noted that although we have shown a relay for controlling the motor circuit, any other means for controlling the motor circuit in a similar manner will answer the purpose. The principal feature is to provide some means actuated by an increase of plate current at the point of resonance for stopping further movement of the tuning element whereby the set is automatically tuned.

The lever 31 also actuates a short circuit plate 33 for cutting off the flow of current to the magnet 30 after the magnet has actuated the lever 31. It should be noted that the switch 25 is kept closed just long enough to cause the lever 21 to close the motor switch 20. A different station may be tuned in, if desired, by merely turning the dial 8 and then again closing the switch 25. The same operation will be repeated, as heretofore set forth, the tuning element 16 stopping from further movement when the circuits 3 and 27 are in resonance with each other. In stopping the device, the switch 15 is opened. It is obvious that the automatic tuning element may be used independently of the selector, in this case the tuning element tuning the receiving circuit into resonance with the incoming signals. If the tuning element is used alone, or the selector is used alone, either device may be employed in any single control radio circuit.

When the tuning element and the selector are used together, they can control any double control circuit. The tuner does not have to precede the selector in the circuit. Either one may be placed in any one of the stages of radio-frequency, or in the grid circuit of the detector stage. In like manner, the plate current for operating the relay may be taken from any one of the stages of audio-frequency. We have found that the best results, however, are obtainable from the last A. F. stage.

The short circuit plate 33 is adapted to be moved to short the circuit by a rod 31' connected to the lever 31. This movement takes place when the magnet 30 is energized. Of course the rod 31' is returned to inoperative position when the lever 31 drops back into normal position for again receiving the lever 20, the next time the lever is actuated. It will now appear that the plate 33 still shorts the circuit and that the rod 31' is spaced from the plate.

When the switch 25 is again closed, it will close the switch 20 and will also move an arm 21' and swing the lever 32', this lever moving a pin 33', which in turn slides the plate 33 into the position shown. 35

We claim:

1. In a radio circuit, an electron tube responsive to rectified modulated waves, a motor-actuated tuning unit, a selector, a tuning unit actuated by said selector, and means actuated by a change of plate current of said electron tube at resonance for stopping the motor-actuated tuning unit at the frequency for which the selector tuning unit is set. 15

2. The combination with a radio circuit of a tuning element for bringing the circuit into resonance with received signals and means actuated by a change in the plate current of an electron tube of the receiving circuit operating near a bend of its plate-current grid-voltage curve to stop the movement of the tuning element at resonance. 20

3. The combination with a radio circuit of a tuning element for bringing the circuit into resonance with received signals, a motor for actuating said element, a source of current for said motor, and means actuated by a change in the plate current of an electron tube of the receiving circuit operating near a bend of its plate-current grid-voltage curve 30

for stopping the movement of said motor when the tuning element is at or near the peak of its resonance curve, the point on the curve being determined by the constants of the circuit and the intensity of the received signal.

4. The combination with a radio circuit of a tuning element for bringing the circuit into resonance with received signals, a motor for actuating said element, a source of current for said motor and means actuated by an increase in the plate current of an electron tube of the receiving circuit operating near the lower bend of its plate-current grid-voltage curve for stopping the movement of said motor when the tuning element is at or near the point of resonance. 40 45

5. The combination with a radio circuit of a tuning element for bringing the circuit into resonance with received signals and means actuated by a change in the plate current of an audio frequency amplifier tube of the receiving circuit and responsive to modulated waves to stop the movement of the tuning element at a point on the resonance curve determined by the constants of the circuit and the intensity of the received signals. 50 55

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