

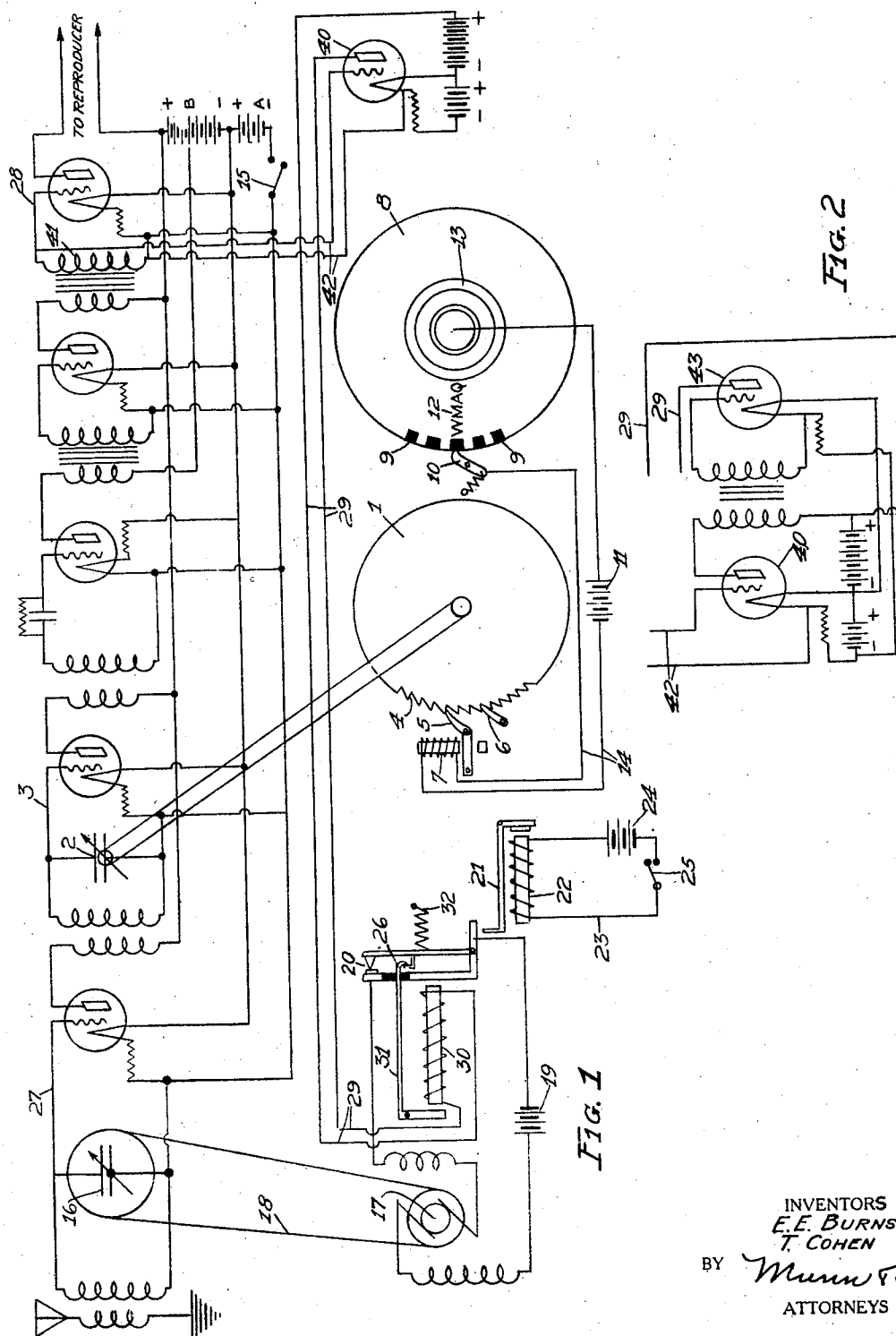
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SELECTOR AND AUTOMATIC TUNER FOR RADIOCIRCUITS

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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.

An object of our invention is to provide an improvement over that set forth in our prior application, Serial No. 76,814, filed Dec. 21, 1925. In said prior application, we disclosed an automatic tuning element for tuning a receiving circuit with the incoming wave, this tuning element being controlled by a surge of plate current at resonance. In said application, the circuit disclosed included two stages of radio-frequency, a detector stage, and two stages of audio-frequency. The tuning control element was shown as actuated by a surge of plate current from the second stage of audio-frequency.

The present invention is an improvement in that a special tuner tube is used in connection with the second stage of audio-frequency, and the control circuit is actuated by a current surge in the plate circuit of the tuner tube. This is of advantage for the following reasons:

It is important for the best quality of reception, that is, to receive speech or music without distortion of sound, that the D. C. components of plate current should remain practically constant. We accomplish this by the present invention, since in the present form of the device, the D. C. components of the plate current in the receiving circuit may be practically constant, while at the same time, a change of plate current occurs in the plate circuit of the tuner tube. Thus self-tuning is secured without sacrificing the quality of reception. Furthermore, since the grid current of the tuner tube of the present device is practically zero, no energy is absorbed from the receiving circuit.

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

Figure 1 is a diagrammatic view of a receiving circuit, with the automatic tuner and selector connected therewith, and

Figure 2 is a diagrammatic view of a modified form of control, in which an amplifier is used in connection with the tuner tube.

In order that the present invention may be clearly understood, we will describe certain parts of the circuit which have been al-

ready described in connection with our said pending application. The two stages of radio-frequency, the detector stage, and the two stages of audio-frequency 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.

5 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 15 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 apparatus thus far described is that disclosed in our prior application. The novel feature of the present invention consists in the provision of a tuner tube 40 connected across the secondary 41 of the transformer of the last stage of amplification, which I have indicated generally at 28, by means of wires 42. When a radio receiver is tuned to resonance with received signals, voltage changes take place in the grid and plate circuits which do not occur under other conditions. In the connection shown, the voltage changes act on the grid circuit of the tuner tube, causing variations in the current of the plate circuit. The tuner tube may have different grid bias from that of the tube to whose circuit it is connected. Because of different grid bias, the average plate current (D. C. component) of the receiver tube may be practically constant while there is a surge of current in the plate circuit of the tuner tube when the receiver is tuned to resonance with the received signals. The current surge in the plate circuit of the tuner tube is designed to operate the relay instead of the current surges in the receiver circuit proper.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. The operator, after closing the switch 15 and rotating the dial 8, 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 and with received signals. At this point, a surge of current from the plate circuit of the tube will flow along the wires 29 and energize the magnet 30. The magnet 30 is wound in such a manner as to actuate the lever 31 when a current of a predetermined value, say one milampere, is produced. 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 be held at resonance with each other, and will therefore receive signals from the stations desired.

In Figure 2, we have shown a modified form of the device in which the tuner tube has an amplifier 43, and in which the amplified current, due to the surge in the tube 40, is transmitted by the wires 29 to the magnet 30 in the manner described above.

As stated before, two distinct advantages are secured over that form of the device shown in my prior application, for with this present construction the D. C. component of the plate current in the receiving circuit may be practically constant, while at the same time a change of plate current occurs in the plate circuit of the tuner tube for operating the magnet 30 to control the motor. Thus self-tuning is secured without sacrificing the quality of reception. Furthermore, since the grid current of the tuner tube is practically zero, no energy is absorbed from the receiving circuit.

In the drawings, we have shown the tuner tube as being connected with the secondary of the last stage of amplification, but it will be understood that this tuner tube might be connected with the receiving circuit at any point where there are voltage variations, since such voltage variations would cause a corresponding surge of current in the plate circuit of the tuner tube.

The arrangement described above, in which the variations of the current in the plate circuit of the tuner tube are made use of to control the tuning element, may be used in any form of receiving circuit, such as the neutrodyne, the superhetrodyne, or the regenerative.

We claim:

1. The combination with a radio circuit, of a tuning element for bringing the circuit into resonance with a received signal, an electron tube separate from but having its grid circuit connected to the receiving circuit, and means actuated by a change of the

plate current of the tube for controlling the tuning element.

2. The combination with a radio circuit, of a tuning element for bringing the circuit into resonance with a received signal, an electron tube separate from but having its grid circuit connected to the receiving circuit, and means actuated by an increase of the plate current of the tube for controlling the tuning element.

3. The combination with a radio circuit, of a tuning element for bringing the circuit into resonance with a received signal, a motor for actuating the tuning element, an electron tube separate from but having its grid circuit connected to the receiving circuit, and means actuated by a change of the plate current of the tube for controlling the motor.

4. The combination with a radio circuit, of a tuning element for bringing the circuit into resonance with a received signal, a motor for actuating the tuning element, an electron tube separate from but having its grid circuit connected to the receiving circuit, and a relay actuated by a change of the plate current of the tube for controlling the motor.

5. The combination with a radio circuit, of a tuning element for bringing the circuit into resonance with a received signal, an electron tube separate from but having its

grid circuit connected to the receiving circuit, and means actuated by an amplified surge of current in the tube for controlling the tuning element.

6. In a radio circuit, a tuning element for bringing the circuit into resonance with a received signal, an electron tube separate from but having its grid circuit connected to the receiving circuit, and means actuated by an increase of the plate current of the tube and responsive to modulated waves for controlling the tuning element.

7. The combination with a radio receiving circuit, of a tuning element for bringing the circuit into resonance with a received signal, an electron tube not a part of but associated with said radio receiving circuit, and means actuated by an increase of the plate current of said electron tube for controlling the tuning element.

8. The combination with a radio receiving circuit, of a tuning element for bringing the circuit into resonance with a received signal, a motor for actuating the tuning element, an electron tube not a part of but associated with the receiving circuit, and a relay actuated by a change of the plate current of said electron tube for controlling the motor.

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