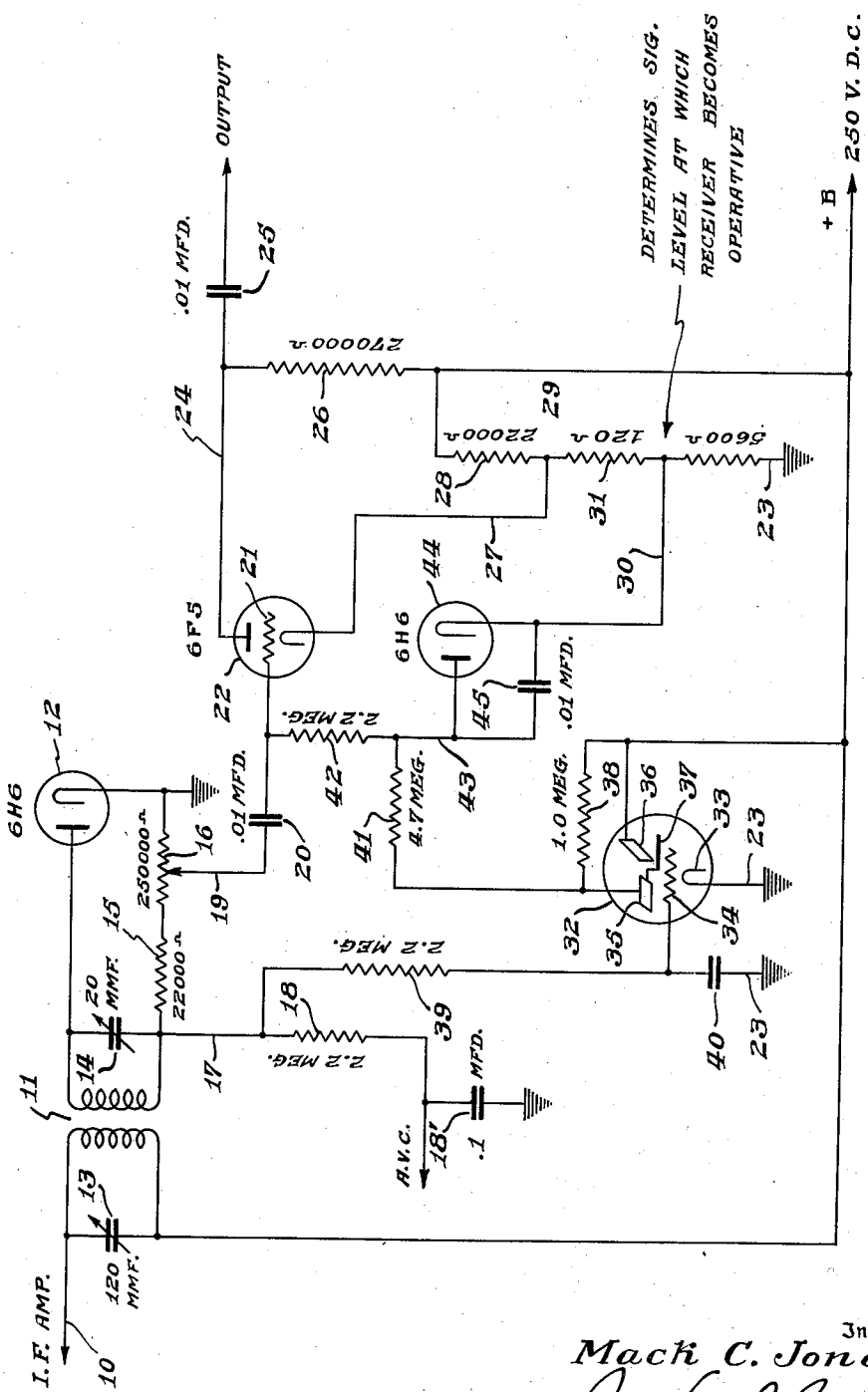
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SILENCING AND INDICATING DEVICE

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SILENCING AND INDICATING DEVICE

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4 Claims. (Cl. 250—20)

This invention relates to silencing and indicating devices such as are useful for indicating the tuning of radio apparatus and for silencing such apparatus during periods of zero or low signal level. It has for its principal object the provision of a combined tuning indicator and silencer which is inexpensive, is of simple construction, and is readily applicable to different types of apparatus.

A distinguishing characteristic of the herein disclosed embodiment of the invention is the use of a tuning indicator electron discharge device, such as that disclosed by United States Patents 2,051,189 and 2,094,684, both to indicate the tuning of a radio receiver and to silence the receiver when the received signal level is below a predetermined value.

The invention will be better understood from the following description considered in connection with the accompanying drawing, and its scope is indicated by the appended claims.

The single figure of the drawing is a wiring diagram illustrating the application of the invention to a radio receiver. It should be understood, however, that this showing is merely illustrative of one of the many possible embodiments of the invention.

The illustrated circuit includes modulated carrier supply means, shown as a lead 10 which is coupled through a transformer 11 to a modulation or audio frequency detector 12, the primary and secondary circuits of the transformer 11 being tuned, respectively, by the capacitors 13 and 14, and the detected output being derived from the resistors 15 and 16.

From the terminal 17 of the resistor 15 there is derived an automatic volume control potential which is applied, through a filter network including a resistor 18 and a capacitor 18', to preceding amplifier stages (not shown), as is customary in circuits of this character.

From the adjustable volume control terminal 19 of the resistor 16, the detected signal is applied through a coupling capacitor 20 to the grid 21 of an audio frequency amplifier 22 provided with an output circuit including a ground terminal 24 which may be coupled through a capacitor 25 to succeeding audio amplifier stages or to other suitable utilization circuits.

Anode potential is applied to the amplifier 22 from the plus B terminal through a resistor 26, cathode potential is applied through the lower terminal 27 of a resistor section 28 of the bleeder resistor 29, and control grid bias potential is applied through the lower lead 30 of the bleeder resistor section 31.

Tuning of the channel including the detector 12 and the amplifier 22 is indicated by an electron discharge device 32, which may be of the same type as that disclosed by the aforesaid patents. This visual indicating device 32 includes a two-section cathode 33, an amplifier grid 34 and an amplifier anode 35 surrounding one section of the cathode, and a visual indicator 36 and a control electrode 37 which surrounds the other section of the cathode. As will be apparent, the anode 35 is connected to the control electrode 37 of the visual indicating element of the device, and the pattern on the indicating element or target 36 is determined by the value of the current flowing through a resistor 38 connected between the amplifier anode 35 and the indicating device fluorescent anode or target 36. Potential is applied to the amplifier control grid 34 of the device 32 through the lead 17, and a filter network including a resistor 39 and a capacitor 40 and anode-cathode potential is applied through the plus B lead and one of the ground leads 23.

When the channel 12—22 is detuned, the current through the resistors 15 and 16 is low, the potential of the indicator device control grid 34 approaches that of the detector and indicator device cathodes, a relatively large current flows through the resistor 38, the amplifier anode 35 and indicator control electrode 37 become negative with respect to the constant voltage fluorescent target 36, and there is produced on this target a shadow the size of which is determined by the resistor 38 and the constants of the various circuits.

When the channel 12—22 is tuned to resonance, the current of the resistors 15—16 is a maximum, the grid 34 is more negative with respect to the cathode 33, the current of the anode 35 is reduced, the target 36 and the control electrode 37 approach the same voltage, electrons reach more of the surface of the target 36, which then exhibits a luminous glow over its entire surface, as is well known.

A distinguishing characteristic of the present invention is the use of variation in the potential of the visual indicator anode 35 to interrupt or silence the signal during the periods of low signal level.

To this end, the anode 35 is connected through resistors 41 and 42 to the control grid 21 of the amplifier 22, and there is interposed between the lead 30 and the common lead 43 of the resistors

41 and 42 a diode which is shunted by a capacitor 45.

With these connections, the indicating device anode 35, the grid of the amplifier 22, and the anode of the diode 44 approach cathode or ground potential during periods of low signal, and the amplifier and diode circuits are interrupted. As the signal level increases, the indicating device grid becomes more negative, less current flows through the resistor 38, and the potential of the indicator and diode anodes and of the amplifier control grid becomes more positive, thus permitting the signal to pass through the amplifier 22. The bias potential applied to the amplifier grid 21 through the resistor section 31 is set by the diode 44, which maintains zero voltage between its cathode and anode when the anode tends to go positive due to the decreased drop of the resistor 38. The signal level at which the amplifier 22 begins to pass the signal is, of course, determined by the voltage applied to the lead 30, which obviously may be adjusted along the bleeder resistor 29 if desired.

Otherwise stated, the device 32, which heretofore has served merely as a visual tuning indicator, now also functions during periods of low signal level to apply to the amplifier 22 a control grid bias whereby the signal is interrupted, and during periods of high signal level to permit the application of normal bias potential to this grid from the bleeder resistor 29.

I claim as my invention:

1. The combination with a radio signal rectifier and a signal amplifier coupled to said rectifier, of a signal-responsive indicator tube having a control grid and an anode, means for applying a bias potential to said control grid, means in circuit with said anode providing a variable potential thereon in response to variations in potential on said control grid, means providing a connection between said anode and the amplifier to provide normal operation of said amplifier, a potential drop producing resistor in said last-named connection, a diode rectifier device having an anode electrode connected with the output end of said potential drop producing device and having a cathode, means providing a fixed source of biasing potential for said amplifier of a value to effect substantially cut-off of the signal flow through said amplifier, said last-named means providing a negative terminal connected with the diode cathode and a circuit interconnecting said amplifier and indicator tube and providing a potential difference between the electrodes of the diode such that in the absence of signals the anode is negative with respect to the cathode.

2. In a signal receiving apparatus including a device having a cathode, a control grid, an anode and additional electrodes arranged to indicate visually the tuning of a channel in response to a signal variable biasing potential applied to said control grid, and wherein a detector is coupled to the input circuit of an amplifier, the combination of means including a potential drop producing resistor in circuit with the anode of said indicator device and a connection to the amplifier providing a control circuit responsive to the operation of said device for interrupting the received signal through said amplifier during periods of low signal level, means for applying normal grid bias potential to said amplifier during periods of higher levels of said signal, a diode rectifier having a cathode connected with said last-named means and having an anode in circuit with said biasing connection for said amplifier and means providing a potential drop through said connection between said anode and the anode of said indicator device.

3. In an apparatus including an electron discharge device having a control grid and an anode, said device being arranged to indicate visually the tuning of a channel wherein a detector is coupled to the input circuit of an amplifier, the combination of means for causing the anode voltage of said device to vary in response to signal variations, means for controlling the grid potential of said amplifier in accordance with the anode voltage variations of said device, and means including a diode connected between the cathode and grid of said amplifier and responsive to a predetermined value of said anode potential for applying normal bias potential to said grid.

4. In a radio signal amplifying channel the combination with a signal rectifier providing a signal variable biasing potential, of a signal indicator device comprising a control grid connected with said signal rectifier, and having an output anode circuit providing a potential variable in response to variations in potential on said grid, a signal amplifier having a control grid connected with said anode circuit, a relatively high resistance potential drop producing device in said connection, a diode rectifier having an anode connected with the output end of last last-named device and having a cathode, means providing a source of biasing potential for said amplifier, and means for applying said biasing potential through said diode rectifier device to said amplifier in response to variations in potential in said indicator output circuit corresponding to signals of a predetermined high amplitude.

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