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RECEIVER VOLUME CONTROL

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Fig. 1

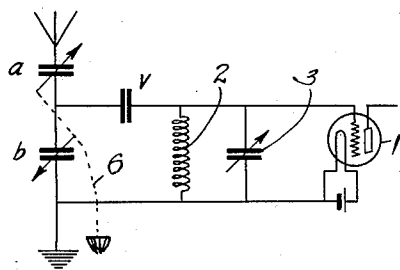


Fig. 2

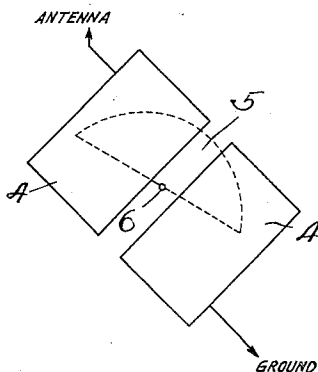


Fig. 3

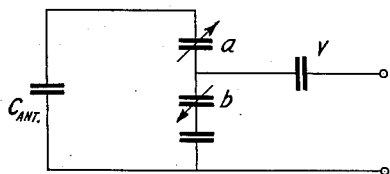
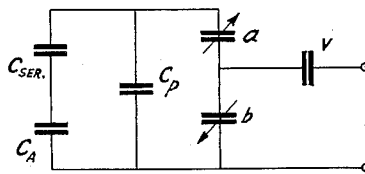


Fig. 4



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RECEIVER VOLUME CONTROL

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7 Claims. (Cl. 250—20)

The present invention relates to the regulation of the energy output of radio receivers, and, more particularly, to radio receiver volume control systems.

For adjusting the loudness or volume of receiver apparatus, it is customary to cut down the heating of one of the radio frequency amplifier tubes, or else to vary one of the other working potentials of this tube. In uni-control receiver sets, recourse is often had to an additional or auxiliary, input tube whose grid is in aperiodic coupling relationship with the antenna, so that tuning is accomplished entirely independent of the characteristics of the antenna. A variable resistance connected between the grid and the filament then serves for adjusting the volume. However, variation of the filament energy is unserviceable for indirectly or externally heated tubes because of their high thermal inertia.

The adjustment and regulation of another working potential broadly involves the drawback of resulting in curved characteristics so that the tube in question modulates the incoming wave with such uncontrollable disturbing potentials as happen to be present. If the volume regulation is pushed rather far, distortion in reception becomes added to other disturbances that are present. The danger of modulation of the incoming wave by interfering or jamming transmitters, no matter what their wave-length, arises also in the case where an aperiodic input tube is employed, because all of the potentials picked up by the aerial act at the grid of this tube with their full value, while in the usual tuned reception the incoming wave is markedly amplified. The absence of tuned amplification has the additional consequence that the well-known "shot" effect makes itself felt in a disturbing and disagreeable manner even in the presence of an aggregate amplification diminished by this value.

Now, I have invented a volume regulator by means of which the aforementioned disadvantages are entirely eliminated. The regulator is also useful in indirectly heated tubes. It insures, besides, receiver tuning which is effectively independent of the antenna characteristics.

Fig. 1 diagrammatically shows a circuit embodying a volume regulator according to my invention.

Fig. 2 is a detail view of a capacity employed in the circuit in Fig. 1.

Fig. 3 shows a modified form of volume control circuit.

Fig. 4 shows still another modification.

The novel features which I believe to be characteristic of my invention are set forth in particularity in the appended claims, the invention itself, however, as to both its organization and method of operation will best be understood by reference to the following description taken in connection with the drawing in which I have indicated diagrammatically several circuit organizations whereby my invention may be carried into effect.

Referring, now, to the accompanying drawing in which like reference letters in the different figures represent the same parts, *a* and *b* constitute a capacitive potentiometer. The middle of the capacitive potentiometer is united by way of a capacity *V* to the grid of the first tube 1. The input of tube 1 includes the resonant circuit comprising the inductance 2 and variable tuning capacity 3. The said potentiometer consists of two coupled opposite condensers.

The simplest scheme would be to provide a standard flat condenser with two sets of stator plates 4, 4', as shown in Fig. 2. The single set of rotor plates 5, arranged on a single shaft 6, cooperates with each stator set 4 and 4' to produce the variable capacity *a* and *b* in Fig. 1. By a definite plate section any desired shape of volume regulation can be insured. It can readily be demonstrated that the whole regulation is governed by the relationship between the initial capacity of the rotor 5 and the antenna stator set 4, and between the end capacity of the rotor 5 and the grounded stator set 4. In the presence of maximum volume, conditions are the same as in the presence of normal antenna coupling.

Undesirable detuning of the input circuit when manipulating the volume control 6 resides in the variation of the total additional capacity arising in the circuit. But the same is small inasmuch as the capacity being in series with capacity *V* is always high compared with the latter. If desired, it may be nearly or completely obviated by the adoption of special circuit schemes as shown, e. g., in Figs. 3 and 4.

Referring to Fig. 3, the antenna capacity is represented by the capacity *C_{ANT}* and is connected in series with *b*. Thus, *a* is lower, when *b* is higher, though the sum total of *a* and *b* remains unaltered. The end capacities of *a* and *b* are alike; and maximum detuning occurs when the volume regulator occupies the median position.

Capacities *a* and *b* may also be provided with plates having such a contour that the entire capacity connected in parallel with the input

circuit remains unchanged. In that case all detuning owing to the volume controller is precluded. Since a certain sectional shape or contour holds good only for a definite antenna capacity, the receiving antenna is adjusted to this value by the supplementary capacity being connected either in parallel, or in series as shown in Fig. 4, where the antenna capacity C_A is connected in series with the series capacity C_{SER} , and in parallel with the parallel capacity C_P .

While I have indicated and described several systems for carrying my invention into effect, it will be apparent to one skilled in the art that my invention is by no means limited to the particular organizations shown and described, but that many modifications in the circuit arrangements, as well as in the apparatus employed, may be made without departing from the scope of my invention as set forth in the appended claims.

What I claim is:

1. In a radio receiver, a space discharge amplifier, means for tuning the amplifier input circuit, volume control means connected to said input circuit comprising a pair of uni-control, inversely variable condensers, and condensive means for connecting the amplifier grid to the common terminal of both condensers.

2. In a radio receiver, an antenna, a tube amplifier including a tunable input circuit, a variable condenser for tuning said circuit, and volume control means between the antenna and input circuit comprising a capacitive potentiometer independent of said tuning condenser, said potentiometer including two sets of stator plates and only one set of rotor plates, the grid of said tube being connected to said rotor plates.

3. In a radio receiver, an antenna, a tube amplifier including a tunable input circuit, a variable condenser for tuning said circuit, an independent volume control means between the antenna and input circuit comprising a capacitive potentiometer, and additional capacitive means connected in series with said antenna and designed for preventing de-tuning of said tunable input circuit when the potentiometer is adjusted.

4. In combination with the tunable input circuit of a radio frequency amplifier of a radio receiver, said circuit including a variable condenser for tuning the amplifier through a desired frequency range, and an antenna circuit, means for adjusting the amplification of said amplifier, said means comprising a variable condenser arranged in the antenna circuit, and a condenser

coupling said last named condenser with said input circuit, said amplification adjusting variable condenser consisting of a pair of independent stators and a common rotor, said rotor being conductively connected to said coupling condenser.

5. In a radio receiver having a first radio frequency circuit, and a second radio frequency circuit coupled thereto, the combination with a volume control device for regulating the volume of sound reproduced by said receiver, said variable coupling device including a condenser having two separated fixed plates and a single rotary plate cooperating therewith, the plates being so arranged that an increase in capacity between two of such plates is accompanied by a decrease in capacity between one of said two plates and the third plate, and means for moving said rotary plate to control the volume of sound reproduced by said receiver by varying the coupling between said two circuits, said variations in coupling tending to introduce incidentally variations in tuning of one of said circuits, and said variations in tuning being compensated for by two of the plates of said coupling device, in such a way as to maintain substantially constant the tuning of said circuits as the coupling therebetween is varied.

6. In a radio receiving system including an antenna circuit, a three-plate condenser having two of its plates connected in said antenna circuit, a radio frequency amplifying circuit, a third plate of said condenser being connected to said last mentioned circuit, means to vary the position of said third plate with respect to said other two plates, whereby simultaneously to vary the coupling between said antenna circuit and said radio frequency amplifier and to maintain substantially constant the tuning of said antenna circuit.

7. In a radio receiving system, the combination of an antenna circuit including two series connected variable condensers, means for adjusting the values of said condensers in opposite directions, a radio frequency amplifier having a tunable input circuit and a coupling condenser having one terminal connected to a point of high radio frequency potential of said input circuit and its other terminal connected to the common terminal of said series connected condensers, the capacity of said coupling condenser having a low value as compared to the joint capacity of said antenna and said series connected condensers.

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