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AUTOMATIC VOLUME CONTROL

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Fig. 1

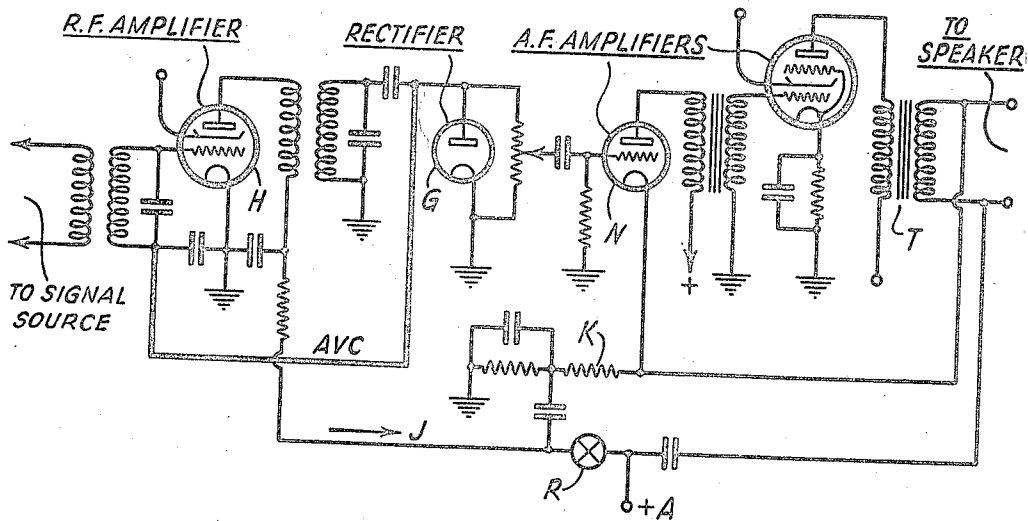
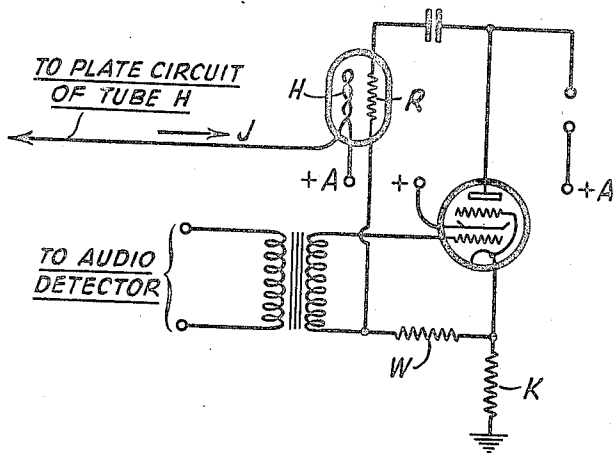


Fig. 2



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AUTOMATIC VOLUME CONTROL

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9 Claims. (Cl. 250—20)

It is known in the art that volume control means may be used simultaneously in both the radio and the audio parts of a receiver apparatus. This insures the advantage that such fluctuations of the average radio frequency amplitude as may still remain after regulation in the radio portion will be compensated so that a practically constant and stable output potential is obtained. Because of the high audio amplitude, however, distortions will be unavoidable with the use of what is known in the prior art as grid potential regulation as applied to a tube of the exponential characteristic type. As a matter of fact, special designs of tube would be required in this case.

According to the invention a receiver comprising volume control means in both the radio and the audio parts is designed in such a way that the fading control in the audio portion is accomplished by regulation of the value of a negative feedback.

The invention offers the advantage that, on the one hand, upon reception of transmitter stations of average and great power or field intensity, the audio portion operates under conditions free from distortions, while, on the other hand, in case of reception of weak stations, there arises no reduction of sensitiveness of the set as a result of the fact that the negative feedback, or anti-regeneration, has been reduced. In other words, the advantage of the distortion-corrective action of the negative feed-back is utilized particularly in the case when the same is needed, while the shortcoming inherent in the reduction of gain is removed particularly when it is troublesome. In other words, the merits and demerits of negative feedback are utilized under most favorable conditions. Contradistinct thereto, in unvaried negative feedback schemes the distortions of a receiver which substantially arise in the audio portion, to be sure, are markedly diminished, though they tend to prevent at the same time from receiving feeble stations because of the reduction of the gain.

The outstanding feature of the invention could also be expressed by stating that the amount of equalization, or correction, of distortion in the audio portion is adapted to the intensity of the incoming field so that it is rendered operative particularly for the stronger stations and thus for stations that are mostly heard. Inasmuch as the regulation of the negative feedback in the audio portion because of the dependence of this action upon the average carrier amplitude exercises at the same time a volume control action,

the scheme moreover insures the advantage of assuring a stable output potential.

If the negative feedback is so designed that the high frequencies are subject to a reduced negative feedback action, there results at the same time a variation of the band-width. For it will be noted that when a powerful station is coming in, the negative feedback action is operative so that the high frequencies which have been slighted, for instance, in the radio portion are emphasized with a resultant great breadth of the audio band, while in the reception of feeble transmitters the negative feedback is nearly ineffective so that the high frequencies will not be favored.

Volume control in the radio portion is accomplishable in well known manner by means of grid-voltage regulation. However, it is also possible to effect volume control by regulation of negative feedback effected in the radio part with audio energy. However, the essential characteristic of the invention resides in the regulated negative feedback in the audio part inasmuch as it is in the latter where maximum distortions arise.

Figs. 1 and 2 show different embodiments of the invention. Fig. 1 illustrates a regulating rectifier G for radio signals which regulates the grid biasing voltage of an RF amplifier tube H. The negative feedback potential in the audio portion, for instance, is taken off across the output transformer T and impressed upon the cathode resistance K of the AF tube N preceding the last. Included in one of the negative feedback leads is a resistance R such as a glow-lamp which is a function of the current, the said resistance being traversed by the anode or plate current J (or the cathode current or screen-grid current) of the regulated or AVC-controlled tube H. As a result, the intensity of the negative feedback is influenced. Upon reception of a weak transmitter station, as will be noted, the plate current J is regulated upwards so that the resistance of the glow-lamp increases with the result that a lower portion of the negative feedback potential arises across the resistance K.

Referring to Fig. 2 it will be seen that the negative feedback or degenerative relation is insured only inside the last stage of the receiver in that the negative feedback potential is divided between the resistances R, W, and K and then impressed upon the grid of the power tube. R in this scheme is a temperature dependent resistance such as uranium dioxide resistance which is heated from the heater winding H

which is traversed by the plate currents J of the regulated tubes. There are other embodiments conceivable for the basic idea of the invention, for instance, in which an electron tube is utilized for the regulated or controlled resistance R, as is well known in the prior art.

What is claimed is:

1. In a radio receiver provided with at least one signal carrier transmission tube, a detector and an audio frequency network, means providing degenerative feedback of audio voltage from a later point in the audio network to an earlier point thereof, means responsive to signal carrier amplitude variation for controlling the gain of the transmission tube, and means responsive to variation in space current flow of the controlled tube for controlling the magnitude of said degenerative feedback.

2. In a radio receiver provided with at least one signal carrier transmission tube, a detector and an audio frequency network, means providing degenerative feedback of audio voltage from a later point in the audio network to an earlier point thereof, means connected to said detector, responsive to signal carrier amplitude variation, for controlling the gain of the transmission tube, and means responsive to variation in space current flow of the controlled tube for controlling the magnitude of said degenerative feedback.

3. In a radio receiver provided with at least one signal carrier transmission tube, a detector and an audio frequency network, means providing degenerative feedback of audio voltage from a later point in the audio network to an earlier point thereof, means, responsive to signal carrier amplitude variation, for controlling the gain of the transmission tube, and temperature-dependent resistance means responsive to variation in space current flow of the controlled tube for controlling the magnitude of said degenerative feedback.

4. In a radio receiver provided with at least one signal carrier transmission tube, a detector and an audio frequency network, means providing degenerative feedback of audio voltage from a later point in the audio network to an earlier point thereof, means, responsive to signal carrier amplitude variation, for controlling the gain of the transmission tube, and means common to the space current path of the controlled tube and said feedback means, and responsive to variation in space current flow of the controlled tube,

for controlling the magnitude of said degenerative feedback.

5. In a signal carrier reception system including a carrier energy transmission network and an audio amplifier circuit, a circuit connected between two successive points of the audio circuit for feeding back audio voltage, and means connected to said carrier network and responsive to signal carrier amplitude variation for automatically adjusting the magnitude of the feedback voltage.

6. In a signal carrier reception system including a carrier energy transmission network and an audio amplifier circuit, a circuit connected between two successive points of the audio circuit for feeding back audio voltage in degenerative phase, and temperature-dependent means connected to said carrier network and responsive to signal carrier amplitude variation for automatically adjusting the magnitude of the feedback voltage.

7. In a modulated carrier reception system of the type including a carrier amplifier, a demodulator and a modulation amplifier, the method which includes degeneratively feeding back modulation voltage from the modulation amplifier output to its input, deriving a direct current voltage from the amplified carrier energy which varies directly with the carrier amplitude, applying the direct current voltage to the carrier amplifier in a gain-reducing sense as the carrier amplitude increases, and controlling the magnitude of said feedback, in response to the variation of the carrier amplifier space current, in a sense such as to increase feedback as the carrier amplitude increases.

8. In combination with at least two cascaded signal transmission tubes, a signal feedback path between the output and input of the second tube, and means, including an element in the space current path of said first tube, for controlling the magnitude of signal feedback in response to the amplitude variation of the signal.

9. In an audio-modulated carrier receiver of the type provided with an audio amplifier, means for providing degenerative audio feedback between two successive points of the amplifier, and means responsive solely to the carrier amplitude variation for automatically adjusting the magnitude of said feedback.

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