

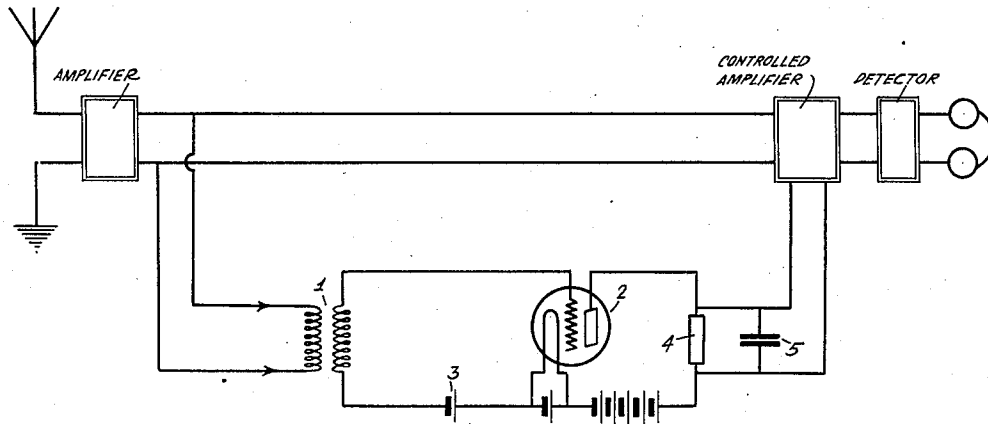
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AUTOMATIC VOLUME CONTROL FOR RADIOTELEGRAPHY

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AUTOMATIC VOLUME CONTROL FOR
RADIOTELEGRAPHY

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The present invention relates to volume control, and more particularly to means for automatically regulating the amplification factor in radio telegraph receivers.

5 A great number of arrangements are known in the prior art for automatically controlling the degree of amplification in telephonic reception. The general principle utilized in these is as follows: the direct current component of the rectified carrier waves produces across a resistance
10 a fall of potential dependent upon the intensity or signal strength of the wave reaching the rectifier, the fall of potential, in turn, influencing in some suitable manner the amplification factor of the amplifier associated with the rectifier so that
15 with increasing carrier-wave amplitude the amplification factor decreases. A time-lag device is usually provided to prevent the amplification from being unduly altered by the rapid variations of the carrier-wave amplitude produced by the
20 modulation; but such variations being permitted only by the comparatively slow changes of atmospheric origin.

Now, such schemes are not suitable for regulating the amplification in telegraphy work. For,
25 if the time of retardation (time-lag) is long compared with a keying impulse, then the amplification will be a function of the mean value of the carrier-wave current during this period. Hence,
30 with the same strength of the signal current, it will be adjusted differently according to whether the transmitter at the time in question is sending out predominantly dashes or dots. If in the
35 course of long working intervals the amplification has gradually risen so high that its further growth is prevented only by action of the stray upon the
40 amplification control, it will fall off but slowly as new signals come in. In other words, the first signals occur coincidentally with marked disturbances and become illegible.

45 If, the time-lag is made short compared with the duration of a keying impulse, then the full amplification will always be reached during the intervals between signals (spaces), and thus the spaces will be filled with disturbances. As a
50 result reception becomes illegible, even though the aforementioned drawback of long retarding periods is avoided.

According to the present invention the defects,
55 just described, are eliminated. Upon the arrival of signals, the amplification factor is regulated in a downward direction during times which are short compared with the duration of a keying impulse, whereas the amplification increases in the absence of sufficiently strong signals at a

rate roughly corresponding to the rate of decay of the field intensity at the beginning of a fading spell, thus preventing the amplification factor, at any rate, from substantially increasing during the intervals, or spaces, between two key signals,
60 or impulses. In this way, after an intermission, and at the start of the first signal, the amplification is decreased so rapidly that it attains a value corresponding to the signal strength prior to the completion of the first signal. Since, upon the
65 failure, or in the absence, of signals, it changes but slowly, it will be seen that during the interval, or space, until the next signal occurs, (if the latter is to constitute a Morse-code signal conjointly with the former impulse) the amplifica-
70 tion will not be substantially changed. Indeed, it will be only during long intermissions that the amplification will increase to such a degree that instead of the failing, or absence, of telegraphic signals stray or atmospheric will be appreciably amplified and thus be perceivable.
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The novel features which I believe to be characteristic of my invention are set forth in particularity in the appended claims, the invention
80 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 one circuit organization whereby my invention may be carried
85 into effect.

In the drawing, the incoming impulses, after suitable amplification, are fed through transformer 1 to the electron discharge tube 2, the grid of which is subject to the action of a biasing potential from battery 3 so that, in unenergized state, no plate current will flow across the tube. When an alternating current potential reaches the grid of tube 2, a plate current is caused to arise which occasions a fall of potential across a resistance 4 included in the
90 plate lead. This fall of potential at the resistance 4 serves to regulate the amplification by utilizing it for instance, as a grid bias for one or more amplifier stages arranged subsequent to the rectifier input end so that the amplification factor decreases as the grid biasing potential grows.
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Resistance 4 has a condenser 5 shunted across its terminals. When an alternating current potential arises at the grid of tube 2, then the time of charge of condenser 5, and thus the time of the production of the grid bias potential regulating the amplification factor, is given by the size of the condenser 5 and the resistance re-
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sulting from paralleling the internal resistance of tube 2 and resistance 4. But in the absence of an alternating current potential at the grid of tube 2, the condenser is discharged, the grid bias potential drops, and the amplification factor increases at a rate which depends on the size of condenser 5 and the size of resistance 4. This is due to the fact that the biasing battery 3 is active at the grid of tube 2, and in the absence of alternating current potentials at the grid, the internal resistance of tube 2 grows infinitely high.

Now, according to this invention, the size of condenser 5 is so chosen that the time of charging by way of the internal resistance of tube 2 is shorter than the duration of a keying signal of the transmitter. The resistance 4 becomes high compared with the internal resistance of tube 2. The rates of increase and decrease of grid biasing potential are then proportional to the ratio of the resistance 4 to the parallel connection of resistance 4 and the internal tube resistance. Since according to the invention, the amplification should drop rapidly and grow slowly, the resistance 4 should be high compared with the internal resistance of the tube operating as a rectifier.

While I have indicated and described one arrangement 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 organization shown and described, but that many modifications may be made without departing from the scope of my invention as set forth in the appended claims.

What I claim is:

1. In combination, in a radio receiver, an amplifier for received signals, a detector coupled to the amplifier output, means for collecting signal energy coupled to the amplifier input, a rectifier stage coupled between the collecting means and the amplifier input, said rectifier stage including an electron discharge tube independent of said detector and provided with means for maintaining the grid thereof normally biased to cut-off in the absence of signal energy, a biasing resistor connected in the rectifier tube output circuit, means for connecting the input circuit of the amplifier across said resistor whereby the amplification characteristic of the amplifier is automatically regulated by the intensity of the collected signal energy, and a condenser in shunt with said resistor, said resistor being so high compared with the internal resistance of the rectifier tube, and the condenser having such a magnitude, that the amplification of the amplifier decreases rapidly and increases slowly.

2. In combination, in a radio receiver, an amplifier for received signals, a detector coupled to the amplifier output, means for collecting signal energy coupled to the amplifier input, a rectifier stage coupled between the collecting means and the amplifier input, said rectifier stage being independent of said detector and including an electron discharge tube provided with means for

maintaining the grid thereof normally biased to cut-off in the absence of signal energy, a biasing resistor connected in the rectifier tube output circuit, means for connecting the input circuit of the amplifier across said resistor whereby the amplification characteristic of the amplifier is automatically regulated by the intensity of the collected signal energy, and a condenser in shunt with said resistor of a magnitude such that the amplification of the regulated amplifier increases slowly when no signal energy is collected and decreases rapidly when collected signal energy is impressed on the rectifier input.

3. In combination, in a radio receiver for receiving keying impulse signals from a transmitter, an amplifier for received signals, a detector coupled to the amplifier input, a rectifier stage coupled between the collecting means and the amplifier input, said rectifier stage being independent of said detector and including an electron discharge tube provided with means for maintaining the grid thereof normally biased to cut-off in the absence of signal energy, a biasing resistor connected in the rectifier tube output circuit of a value higher than the internal resistance of the rectifier tube, means for connecting the input circuit of the amplifier across said resistor whereby the amplification characteristic of the amplifier is automatically regulated by the intensity of the collected signal energy, and a condenser in shunt with said resistor of a magnitude such that the amplification of the regulated amplifier increases slowly when no signal energy is collected and decreases rapidly when collected signal energy is impressed on the rectifier input, whereby the amplification is prevented from substantially increasing during the intervals between successive keying impulses.

4. In combination, in a radio receiver, an amplifier for received signals, a detector coupled to the amplifier output, means for collecting signal energy coupled to the amplifier input, a rectifier stage coupled between the collecting means and the amplifier input, said rectifier stage being independent of said detector and including an electron discharge tube provided with means for maintaining the grid thereof normally biased to cut-off in the absence of signal energy, a biasing resistor connected in the rectifier tube output circuit, means for connecting the input circuit of the amplifier across said resistor whereby the amplification characteristic of the amplifier is automatically regulated by the intensity of the collected signal energy, and a condenser in shunt with said resistor of a magnitude such that the amplification of the regulated amplifier increases slowly when no signal energy is collected and decreases rapidly when collected signal energy is impressed on the rectifier input, and said biasing resistor having a resistance value which is more than eight times higher than the reciprocal of the product of the slope and the reciprocal amplification factor of the rectifier tube.

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