

Sept. 21, 1937.

E. KLOTZ ET AL

2,093,564

AUTOMATIC VOLUME CONTROL CIRCUIT

Filed Sept. 15, 1933

Fig. 1

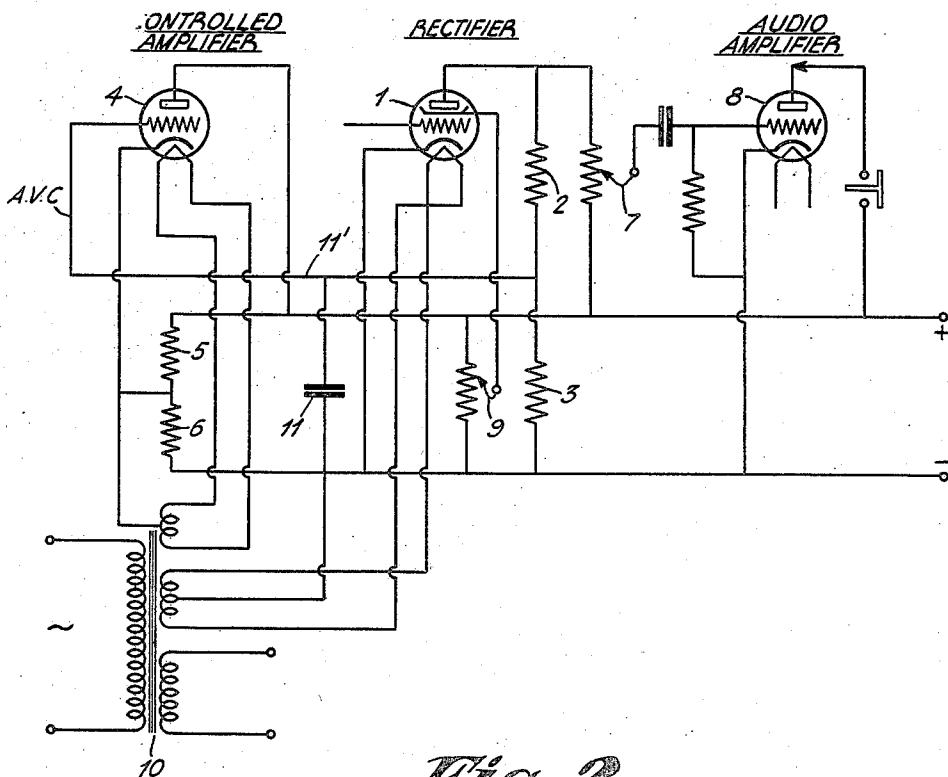
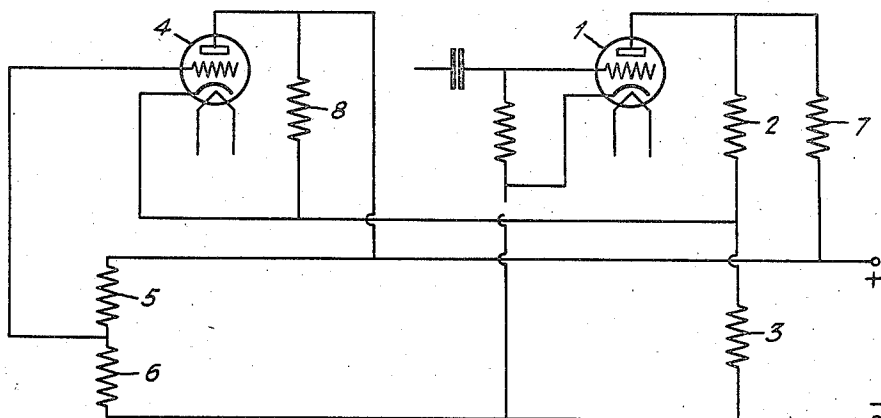


Fig. 2



INVENTOR
ERNST KLOTZ
RUDOLF RECHNITZER
BY *H. S. Grover*
ATTORNEY

UNITED STATES PATENT OFFICE

2,093,564

AUTOMATIC VOLUME CONTROL CIRCUIT

Ernst Klotz and Rudolf Rechnitzer, Berlin, Germany, assignors to Telefunken Gesellschaft für Drahtlose Telegraphie m. b. H., Berlin, Germany, a corporation of Germany

Application September 15, 1933, Serial No. 689,520
In Germany November 18, 1932

2 Claims. (Cl. 250—20)

The present invention relates to automatic gain control systems for receivers employing tubes provided with indirectly heated cathodes.

In application Serial No. 647,719, filed December 17, 1932 issued June 30, 1936 as U. S. P. 2,046,144, there is described a receiver circuit for indirectly heated tubes with an arrangement for fading or automatic volume control. Since by this circuit the volumes of the single stations are balanced, it is necessary to provide an arrangement by which that volume is adjusted with which the single stations are to be reproduced.

In the present invention a voltage divider serves this purpose and which is at the same time the outer resistance of the anode of the rectifier tube. This resistance is tapped so as to obtain the voltage to be transmitted to the succeeding audio frequency tube. Furthermore, the arrangement permits of also balancing those differences in the volumes which are due to the different modulations of the single transmitters.

The novel features which we believe to be characteristic of our 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 we have indicated diagrammatically several circuit organizations whereby our invention may be carried into effect.

In the drawing,

Figure 1 shows an arrangement employing the invention,

Figure 2 shows a modification.

In Figure 1, the numeral 1 represents the rectifier tube, and 4 is the high frequency tube, the amplification of which will be controlled. As more definitely described in the aforesaid application, to this end a positive potential is applied to the cathode of tube 4 by the voltage divider 5—6. The anode potential of the rectifier tube is applied to the grid of the high frequency tube as control voltage across resistance 2 through the lead marked "AVC". If the fluctuations of the plate potentials are too great, the value of the control voltage can be reduced by means of the resistance 3. Since by this arrangement the transmitters are adjusted to the same volume, a provision is necessary by which it is possible to vary these volumes.

To this end, the outer resistance 7 of the anode of the rectifier tube 1 is constructed at the same time as a voltage divider, so that by means of

this divider the voltage can be tapped which is to be transmitted to the succeeding audio frequency tube. Due to the different modulations, the volume of the single stations fluctuates within certain limits, in spite of the fading control. The voltage divider 7 may also be utilized for balancing these fluctuations.

Since the data, or constants, of different types of tubes differ from each other, at an exchange of a rectifier tube the voltage divider would have to be so changed, that in the event of a missing amplitude, the anode potential of the rectifier tube 1 would be approximately equal to the cathode potential of the high frequency tube 4. Since this would involve a cumbersome measure, the present invention provides a voltage divider 9, by which the screen grid potential of the rectifier tube 1 can be adjusted. By varying the screen grid potential the plate current of this tube changes, and consequently the plate potential, so that when a tube is exchanged it is easily possible to obtain the original conditions.

In the receiver circuit of the invention, it is necessary to apply to the cathode a positive potential of the order of 100–150 volts. However, in order to avoid electrolytic decomposition in multi-grid tubes, the allowable voltage stress of the path filament cathode is about 80 volts. In order to prevent an excess value, the line transformer 10 is provided, in accordance with the invention, with a special heating winding for that tube in which a positive potential is applied to the cathodes. The center of this heating winding is likewise connected to the cathode.

In the arrangement of the present invention it may easily happen that the very rapid oscillations caused by the modulation are balanced by the fading control. In order to avoid such action, in addition, a condenser 11 is inserted between the control voltage lead 11', and the cathode, and which can be so dimensioned together with the resistance 2, that the entire arrangement has a time constant below which control does not take place. It is suitable to carry out the dimensioning in such manner that the time constant is of the order of 0.05 second.

In the aforesaid application only such a circuit is described which is necessary if an anode rectifier is used as detector. Figure 2 of this application shows the arrangement which is necessary if an audion or grid leak rectifier is used as detector. 1 designates the audion tube, 4 is the high frequency tube to be controlled, 5—6 is the voltage divider by which in the present case a positive potential is applied to the grid of the high frequency

tube, while in this case the anode potential is applied to the cathode of the high frequency tube.

In order to render the variation of the direct current resistance of the high frequency tube ineffective, anode and cathode of the high frequency tube are bridged by a resistance 8. In like manner, as described in the aforesaid application, the control voltage may here be divided by a voltage divider 2—3.

The signal circuit, usually connected to the input electrodes of the tubes 4 and 1, in each figure have been omitted, to preserve simplicity of disclosure. Those skilled in the art can readily supply such details.

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

What is claimed is:—

1. In combination with a controlled radio frequency amplifier, a rectifier tube of the screen grid type, an audio tube, a source of direct current voltage, connections from the anodes of the amplifier and rectifier to the positive side of the source, a resistor connected between the rectifier anode and the said positive side, a pair of resistors connected in series between the anode of the rectifier and the negative side of the source, a direct current voltage connection between one of the input electrodes of the amplifier and a point intermediate the resistors, a second pair of

resistors connected across the source, a direct current voltage connection between a point intermediate the second pair of resistors and the remaining input electrode of the amplifier, one of said intermediate points being at a positive voltage with respect to the other, and a variable coupling element connected between the audio tube and the anode circuit of the rectifier, a resistor connected across said source, and a variable connection between the screen grid of the rectifier and the last named resistor.

2. In combination with a controlled radio frequency amplifier, a rectifier tube of the screen grid type, an audio tube, a source of direct current voltage, connections from the anodes of the amplifier and rectifier to the positive side of the source, a resistor connected between the rectifier anode and the said positive side, a pair of resistors connected in series between the anode of the rectifier and the negative side of the source, a direct current voltage connection between one of the input electrodes of the amplifier and a point intermediate the resistors, a second pair of resistors connected across the source, a direct current voltage connection between a point intermediate the second pair of resistors and the remaining input electrode of the amplifier, one of said intermediate points being at a positive voltage with respect to the other, and means for varying the screen grid voltage of the rectifier tube to maintain the voltage of the first of said intermediate points at a desired voltage when the rectifier tube is replaced by a new tube.

RUDOLF RECHNITZER.
ERNST KLOTZ.