

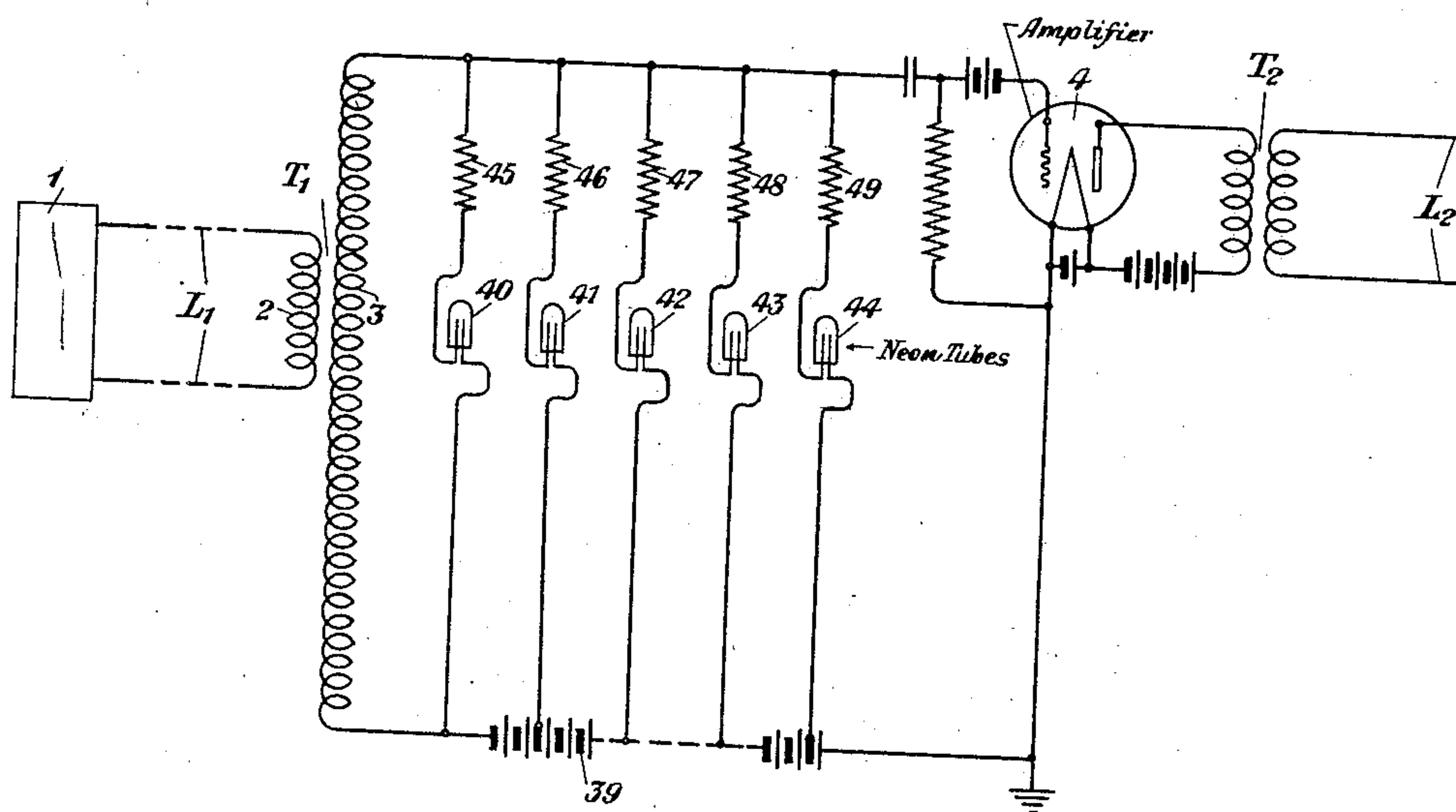
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AUTOMATIC VOLUME CONTROL SYSTEM

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AUTOMATIC VOLUME-CONTROL SYSTEM

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This invention relates to automatic volume control systems and particularly to means for automatically controlling the volume of energy transmitted over or through a transmitting medium so that it will at all times have a predetermined relation to the volume of the energy at the source thereof, which relation is a function of the volume of the signal to be transmitted.

10 In the transmission of electrical energy over or through a transmitting medium such as a telephone circuit, it may be desirable to change the volume of energy to be transmitted to bring it within the limits of transmission of the telephone circuit. If the volume transmitted is excessively high, cross-talk will be produced in adjacent circuits. On the other hand, if the volume falls below the level of noise on the telephone circuit, distortion of the signal will result. Various ways have been proposed heretofore to vary the volume of energy that is impressed by some source upon a telephone transmission circuit to keep the volume as transmitted within the limits described above. Those methods employing some form of manual control have been expensive and frequently not satisfactory because of the inherent delay. In the automatic systems of the prior art distortion has been produced by the fact that the operation is instantaneous and continuous.

My invention resides in means for automatically controlling the volume of energy to be transmitted over or through a transmitting medium so that the volume as transmitted will at all times bear a predetermined relation to the volume of energy from the source connected with the transmitting medium.

40 The other objects of this invention will be apparent from the following description when read in connection with the attached drawing showing schematically a form of the invention in which the volume control is effected by the operation of devices controlling the effective connection of shunt circuits across the input of the connecting amplifier.

50 In the drawing, 1 represents a source of energy which is connected with an input circuit

circuit L_1 . The source of energy 1 may be any form of device capable of producing electrical energy, the magnitude of which may vary with time. Or it may represent, for example, a transmitter adapted to translate sound into electrical energy, the latter varying with changes in volume of the sound impressed upon the transmitter. The input circuit is connected with the primary winding 2 of the transformer T_1 . The secondary winding 3 is connected with the grid of the amplifier 4, the plate circuit of which is connected by the transformer T_2 with a line circuit L_2 or to a receiving device which may have predetermined limits as to the volume that may be efficiently handled thereby. The input circuit of the amplifier 4 is shunted by a plurality of paths, each having therein a gaseous discharge device, such as a neon tube, and a resistance one purpose of which is to extinguish the discharge of the tube after it has operated and the applied voltage has fallen again to lower limits. A source of potential 39 is adapted to apply a biasing voltage to the said tubes so that each will operate at a voltage from the line L_1 differing from that of the others. Thus, the tube 44, which has the maximum biasing voltage applied thereto, would be biased by 39 to break down at the smallest increase above normal in the volume of energy being transmitted over the line L_1 . The operation of this tube places a relatively low impedance path across the secondary 3 of the transformer T_1 and thus reduces the voltage applied to the grid of the amplifier 4. The gain of the amplifier is accordingly reduced and, in consequence, the volume of energy transmitted over the line L_2 is less than it would have been had not the tube 44 broken down. With successive increases in volume upon the line L_1 , the remaining neon tubes will successively operate as the applied voltage reaches their operating values, and other shunt paths of relatively lower impedance will be established across the secondary of the transformer, thus further decreasing the gain of the amplifier 4. As the volume upon the line L_1 tended to diminish after reaching a certain abnormally high value, the voltage across the tubes would gradually

drop in value and the discharge through the tubes would be extinguished, the operation being facilitated by the resistances 45 to 49, inclusive, connected in series with the said tubes. In this way, the shunt paths would be effectively opened one after another and the amplifier gain correspondingly increased.

The arrangement shown in the drawing is characterized by instantaneous action of the volume control devices so that delay circuits are not required. The system is further characterized by simplicity and relatively low cost.

While the invention has been described in connection with a transmission line having predetermined limits as to the volume it is capable of efficiently handling, it may be employed in other ways. Thus, for example, it may be used in the making of phonograph records, in which it is desirable to reduce the volume so that it will be within the limits that the recording means is capable of handling. Furthermore, the invention may be employed as an expander as well as a compressor.

The form in which the invention is disclosed is purely schematic and it is, of course, obvious that the invention may be embodied in other forms without departing from the spirit and scope of the appended claims.

What is claimed is:

1. In an automatic volume control system, the combination with a source of energy, the volume of which is subject to variations, a transmitting medium, an amplifier having its output circuit connected with the said medium, connecting means to apply the voltage of the said source to the said transmitting medium, a plurality of gas discharge devices, each in series with a source of biasing voltage, the magnitude of which will cause each of said devices to break down at a voltage from the said source different from the breakdown voltages of the others, the said devices being bridged across the input of the said amplifier, whereby the gain of the said amplifier may be varied.

2. In an automatic volume control system, the combination with a source of energy, the volume of which is subject to variations, a transmitting medium, an amplifier having its output circuit connected with the said medium, connecting means to apply the voltage of the said source to the said transmitting medium, a voltage control system connected between the said amplifier and the said connecting means comprising a plurality of gas discharge devices, each in series with one of a plurality of resistances, each differing in magnitude from the others, and each of said devices being potentially biased to a degree differing from that of the others whereby the gain of the said amplifier varies with changes in the volume of the said source.

3. In an automatic volume control system,

the combination with a source of energy, the volume of which varies with time, of a transmitting medium, and means to vary the volume applied by the said source to the said transmitting medium, the said means including a transformer connecting the said source and the said amplifier and a plurality of shunt paths normally of relatively high impedance across the input of the said amplifier, each path including a neon tube biased by a direct potential, the said potentials differing for the various tubes whereby each operates at a different potential from said source to reduce the impedance of the shunt paths.

4. In an automatic volume control system, the combination with a source of energy, the volume of which varies with time, of a transmitting medium, having well defined volume limits, and means to vary the volume applied by the said source to the said transmitting medium, the said means including a transformer connecting the said source and the said amplifier and a plurality of shunt paths normally of relatively high impedance across the input of the said amplifier, each path including a neon tube biased by a direct potential, the said potentials differing for the various tubes, whereby each operates at a different potential from the said source to reduce the impedance of the paths, and a resistance connected in each of said shunt paths, the magnitudes of the various resistances differing from each other.

In testimony whereof, I have signed my name to this specification this 20th day of May, 1927.

MAURICE E. STRIEBY.