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CIRCUIT ARRANGEMENT FOR THE CONTROL OF GLOW TUBES

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Fig. 1

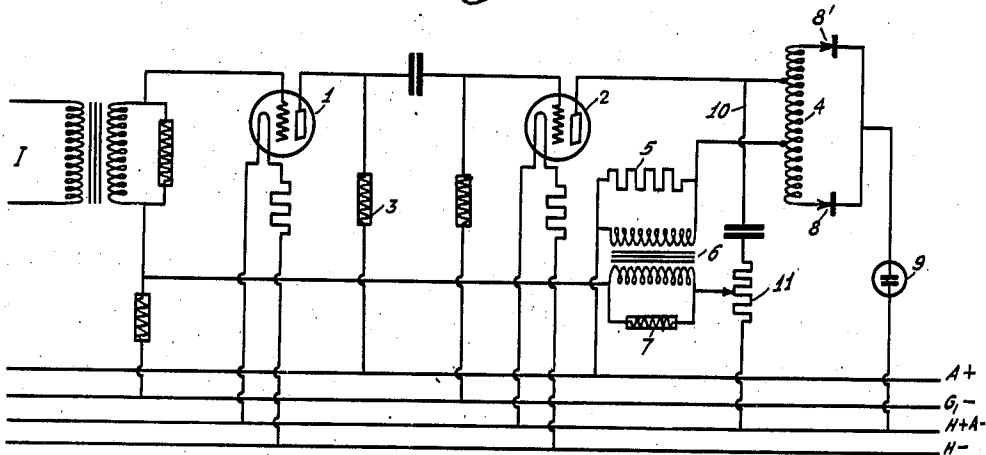
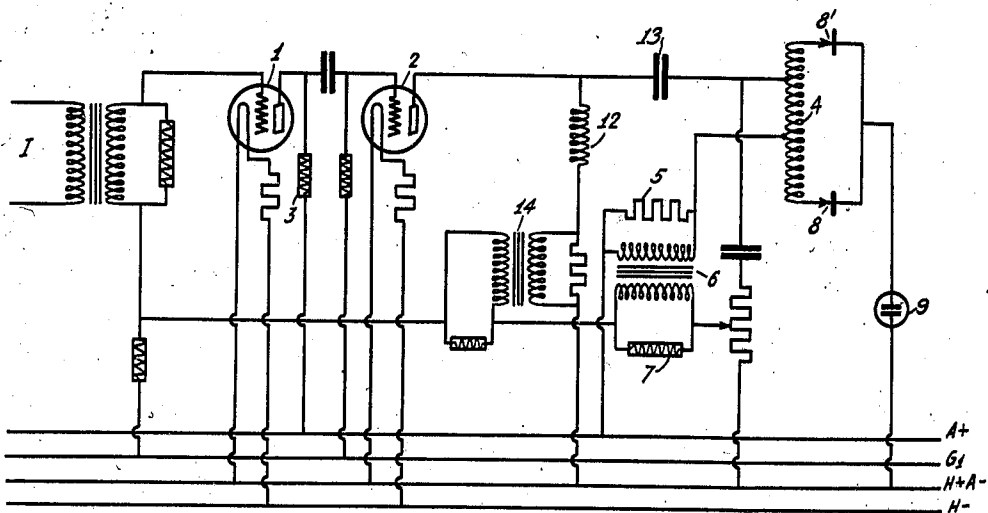


Fig. 2



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CIRCUIT ARRANGEMENT FOR THE
CONTROL OF GLOW TUBES

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11 Claims. (Cl. 176—124)

In arrangements for the electric control of the brightness of glow tubes, for instance in so-called writing tubes for the purposes of picture telegraphy, the unsteadiness of the current potential characteristic of the glow tubes makes itself felt in disturbing manner in that the changes in intensity of the glow light do not faithfully follow the changes in the amplitude of the signal potential.

According to the present invention, this fault is overcome by compensating the resistance of the glow tube through the use of amplifier tubes by means of feed-back, and insuring the stability of the circuit arrangement by means of suitable negative feed-back energy.

Due to the feed-back or back-coupling the plate A. C. of the amplifier tube feeding the glow tube is rendered independent of the resistance of the glow tube loading circuit so that the glow tube current follows the control potential linearly. The decrease in the stability of the circuit arrangement, caused by the back-coupling, is eliminated by negative feed-back or a counter-coupling. It will thus be appreciated that the potential returned to act on the grid of the amplifier will be equal to the difference between the feed-back voltage and the negative feed-back voltage. Any change in the resistance characteristics of the glow lamp will cause a change in the difference of the two potentials fed back to the grid and by suitably porportioning these two energies, the compensating voltage returned to the grid will be just equal to that necessary to counteract the change in the glow lamp resistance.

The invention is illustrated in the circuit diagrams, Figs. 1 and 2 showing two embodiments by way of example.

In Fig. 1 a receiving tube 1 which receives energy from the input circuit I, and a power tube 2 are coupled by resistance 3. In the plate circuit of power tube 2 are connected a winding part 4, used as auto-transformer, of a transformer and a small resistance 5 to which is connected in parallel a transformer 6. The transformer 6 is provided with the high-ohmic loading resistance 7. The transformer circuit contains two rectifiers 8, 8' which jointly feed the glow lamp 9 with rectified current. From transformer winding 4 branches off a line 10 on whose regulatable resistance 11 may be taken off the back-coupling potential and impressed on the grid of tube 1. In the circuit of the back-coupling line is also disposed the counter-coupling arrangement in the shape of transformer 6 which likewise impresses on the grid of the first tube a partial amount of

the plate circuit potential, of opposite phase to that returned by the connection to the potentiometer 11, of the power tube.

If in the course of the operation of the arrangement the characteristic of the glow tube moves due to heating, that is, if its striking potential and its resistance value varies, the control potential is automatically changed by the back-coupling and the counter-coupling in such manner that the current is not influenced. This results from the fact that the direct feed-back potential is proportional to the voltage appearing at the output of the tube 2, while the negative feed-back potential is proportional to the current flowing through the glow lamp 9. The difference between these two potentials which determines the amount of compensation, is accordingly, influenced by the resistance of the tube. For example, if the resistance of the tube increases, assuming, that the output voltage of the tube 2 is held constant, then the potential of the negative feed-back is less than it was formerly, since less current will flow through the lamp. Accordingly, therefore, the direct feed-back potential predominates, causing an increased voltage to appear at the output of the tube 2, which, in effect, overcomes the increase in resistance of the tube 9. If the resistance of the tube 9 decreases, then more current will flow through the lamp and accordingly, a greater negative feed-back potential is provided which reduces the actual potential actuating the grid of tube 1, and accordingly, the output of the tube 2 is reduced to compensate for the decrease in resistance.

Fig. 2 shows a similar circuit arrangement, except that in this case however only the alternating potential is fed to the rectifier circuit by means of a choke coil 12 and a condenser 13. In this arrangement the operation is enhanced by compensating the potential drop produced in the tube due to the magnetizing current of the choke and the transformer by means of a further back-coupling. This additional negative feed-back compensation is desirable in order to overcome frequency effects existing in the use of the choke. Accordingly, there is provided in the plate circuit of tube 2 a small ohmic resistance and a coupling transformer 14, whose primary winding is connected in parallel with the ohmic resistance and whose secondary is disposed in the back-coupling line.

Having now described my invention, what I claim and desire to secure by Letters Patent is the following:

1. The method of controlling impedance loads 55

varying with changes in amplitude of the current passed therethrough from an audion amplifier which comprises supplying energy to the load from the audion output and feeding back to the audion input a voltage determinable by the changes in impedance of the load due to variations in amplitude of the output current, whereby the output current from the audion is determined from the signal potential input and is independent of the load impedance.

2. In a system for supplying current to variable impedance devices, a plurality of resistance coupled amplifiers and an input circuit therefor, a variable impedance element in the output of the second of said amplifiers, and means associated with the output circuit of the second amplifier for feeding back to the amplifier input circuit a voltage developed in proportion to the changes in impedance of the load due to variations in amplitude of the output current whereby the effective output from said amplifiers is determined solely in accordance with the applied signal potentials.

3. The method of controlling glow tubes from an audion amplifier which comprises supplying energy to the glow tube from the audion output, feeding back to the audion input a voltage determinable by the voltage drop across the load including the glow tube, and combining this voltage with input voltage, whereby the effective output current from the audion is proportional to the input signal potential and is independent of variations of glow tube impedance with changes in the amplitude of the current through the glow tube.

4. In a device having an audion of which the output current passes through an impedance which is a function of current amplitude flowing therethrough, the step in the method of maintaining the output current independent of value of the load impedance which comprises feeding back to the input of the tube a voltage of sufficient magnitude and suitable phase to neutralize the effect of changes with amplitude in the load impedance upon the normal plate current flow.

5. A method of compensating for changes in impedance of a load circuit energized from an audion amplifier, which comprises supplying energy to the load circuit from the audion amplifier output, feeding back to the input of the audion amplifier a portion of the output voltage therefrom, simultaneously feeding back to the audion input a counter-phase voltage variable with changes in impedance of the load due to variations in amplitude of the output current from the audion amplifier, and controlling the gain of the audion amplifier in accordance with the difference of the two out-of-phase energies fed back to the input of the audion amplifier.

6. A system for controlling the gain in an amplifier for variations in impedance of the load therein due to changes in the amplitude of the current passing through the amplifier which comprises a thermionic amplifier, having an input and an output circuit, means connecting a variable impedance to the output circuit of said amplifier, means for deriving a proportionate voltage from the output of said amplifier, means for deriving a voltage in accordance with the current flowing through said variable impedance, means for adding both of said derived voltages out of phase with each other, and means to impress the difference between said derived voltages upon the input of said amplifier.

7. In combination, a light producing device whose impedance is a function of the amplitude of current passing therethrough, an amplifier feeding the light producing device, and feedback means connected between the light producing device and the amplifier to maintain the amplitude of the current independent of the impedance of the light producing device.

8. In combination, a current responsive light producing device whose impedance is a function of the amplitude of the current passing therethrough, a source of energy for energizing the light device and feedback means for controlling the source of energy connected between the light device and source of energy to maintain the amplitude of the current independent of the impedance of the light producing device.

9. In combination, a linear amplifier, a non-linear current-impedance operated light producing device, feedback means connecting the amplifier to the light producing device, and means for altering the linearity of the amplifier to compensate for the non-linearity of the light device.

10. In combination, a linear amplifier having input and output circuits, a non-linear current-impedance operated light producing device connected in the output circuit, and means from the amplifier output circuit to the input circuit for feeding back energy to the input circuit for altering the linearity of the amplifier to compensate for the non-linearity of the light device.

11. In combination, an alternating current amplifier having a plurality of thermionic tubes, a variable light emitting device, a rectifier fed by energy from the amplifier and feeding energy to the variable light emitting device, a voltage feedback circuit connected between the rectifier and one of the thermionic tubes of the amplifier to control the energy fed by the amplifier to the rectifier in accordance with the energy fed from the rectifier to the variable light emitting device.

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