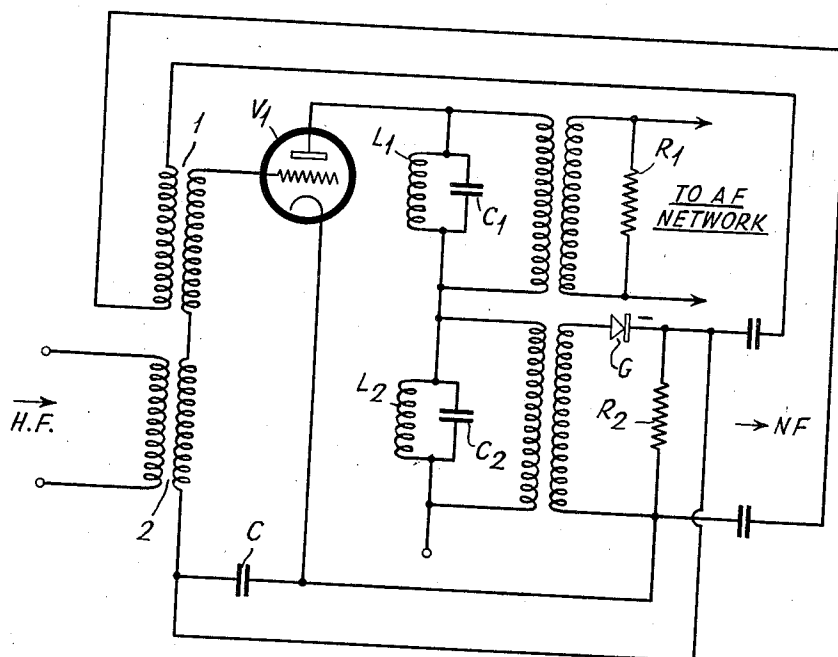


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AUTOMATIC AMPLIFICATION CONTROL

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AUTOMATIC AMPLIFICATION CONTROL

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To provide a more favorable exploitation of amplifier tubes it is known to utilize a tube for simultaneous amplification of different frequency ranges. This type of amplifier circuit, known as a reflex circuit, was hitherto used in the first place for broadcast purposes. But, beyond this it can also be considered for all such cases in which tubes are to be operated with a possibly high exploitation thereof. In recent times a multiple utilization of tubes has been aimed at, also, in apparatus for carrier current systems, more especially if these are to be simple in structure and portable. The tube then effects at the same time an amplification of the high-frequency, i. e. of the carrier and sidebands, or of a single sideband and audio-frequency.

If, in such a multiple utilization of tubes, an automatic volume control and level control is to be carried out, it is often desirable to carry out the control for the two frequency ranges, simultaneously amplified by the tube, at different degrees, more especially to control only one frequency range or the other one.

In accordance with the invention for influencing to a varying degree the degree of amplification for the two frequency ranges, the outer resistance of the tube will be dimensioned smaller for the one range, and larger for the other range than the inner resistance of the tube. Where only a control of one range is to be carried out while the other range need practically not be influenced, the resistor of the range not to be influenced will be chosen large and the resistor of the other range small as compared with the inner tube resistance. The functioning of a circuit according to the invention will be explained by the example shown in the figure.

The figure shows an amplifier tube V_1 which is to serve for simultaneous high frequency amplification and audio-frequency amplification in a carrier current system. The high frequency energy HF is applied to the input circuit of the tube across the transformer 2. The oscillatory circuit $L_2 C_2$ is tuned to the high frequency and effects the transmission of the high frequency energy to the rectifier G. The audio frequency voltage NF appearing at the resistor R_2 will be applied across the transformer 1 to the grid circuit of tube V_1 for another amplification. As regards audio frequency, the resistor R_1 of the load is coupled to the plate circuit of the tube across the oscillatory circuit $L_1 C_1$ tuned to audio frequency. For the selection of NF and HF the drawing shows simple oscillatory circuits. It is obvious that also other types of circuits may be

chosen depending on the task of the amplifier. The audio frequency potential appearing at the resistor R_2 serves at the same time after having been smoothed by the condenser C, for displacing the grid potential, and, hence, for controlling the level.

The voltage u_a at the load impedance R_a of an amplifier having the inner resistance R_i , the mutual conductance S, and the alternating grid voltage e_g is given by:

$$u_a = S \left(\frac{R_a R_i}{R_a + R_i} \right) e_g \quad (1)$$

For excessive matching $R_a > R_i$ there will be approximately:

$$u_a = \frac{1}{D} (e_g) \quad (2)$$

For insufficient matching $R_a < R_i$ there is:

$$u_a = S R_a e_g \quad (3)$$

The displacement of the grid potential influences in the first place the mutual conductance S. The letter D is the reciprocal of the amplification factor. Through proper choice of the matching the possibility exists of controlling either both circuits, i. e. the audio-frequency circuit and the high-frequency circuit, or to control only one of said circuits whereby the control curve can be influenced by the degree of matching.

If, in the circuit shown, the resistors R_1 and R_2 are dimensioned such that $R_1 > R_a > R_2$, it can be accomplished that the control effects only the high frequency. At fluctuating input voltage of the high frequency, therefore, owing to the controls, the high frequency remains constant in this circuit, while at the same time the degree of amplification for the audio frequency remains practically unchanged. Eventually, an advantage may be had, if the audio frequency is controlled to a certain extent so as to compensate irregularities of the high frequency control. To this end, the deviation of the load impedances from the inner resistance of the tube is to be maintained correspondingly smaller.

The circuit according to the invention which is neither limited to certain types of tubes, nor to the shown adaptation of the reflex circuit, permits, without the necessity of additional means, of controlling in different degrees the degree of amplification for the two frequency ranges. This principle of the invention is also retained when using tubes in which S as well as D are influenced.

What is claimed is:

1. In combination with a transmission tube having input and output electrodes, a signal input circuit coupled to the input electrodes and impressing thereon carrier frequency energy modulated by frequencies chosen from a different frequency range, a carrier frequency output circuit coupled to the output electrodes, means for deriving voltages of the modulation frequencies from the energy in the output circuit, means for impressing the derived voltage upon said input electrodes, a second output circuit coupled to said output electrodes for developing voltage of said modulation frequencies, means for controlling the amplification of said tube, and the internal resistance of said tube having a magnitude intermediate the magnitudes of the resistances of said two output circuits and the resistance magnitude of said modulation output circuit exceeding that of the carrier output circuit and tube internal resistance whereby said amplification control is effective solely at carrier frequency.

2. In a reflex amplifier stage of the type including a tube having at least a cathode, signal grid and plate, an audio modulated carrier energy input circuit coupled between the grid and cathode, a carrier output circuit coupled to the cathode and plate, a demodulator coupled to the output circuit, means impressing audio voltage from the demodulator upon the signal grid, an audio voltage output circuit coupled to the said plate, means responsive to variations in the carrier voltage for controlling the amplifier tube amplification, the magnitudes of the resistances of said two output circuits being substantially different, and the magnitude of the internal resistance of the tube exceeding the magnitude of the resistance of said carrier output circuit and being less than the magnitude of the audio output circuit resistance whereby said amplification control is effective solely at carrier frequency.

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