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CIRCUIT ARRANGEMENT FOR THERMIONIC AMPLIFYING TUBES COUPLED BY TRANSFORMERS

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Fig. 1

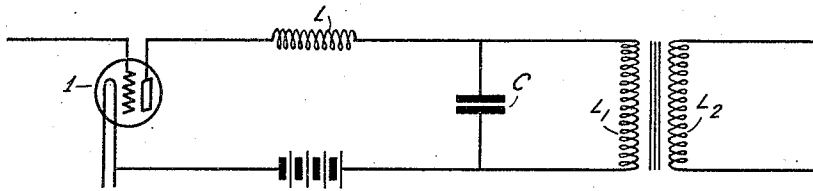
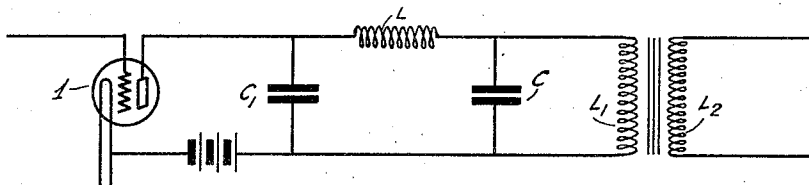


Fig. 2



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CIRCUIT ARRANGEMENT FOR THERMIONIC AMPLIFYING TUBES COUPLED BY TRANSFORMERS

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In applying transformers for coupling successive tubes of thermionic amplifiers it appears, that with a higher frequency the amplification decreases more quickly as the ratio of transformation is chosen higher. The ratio of transformation should consequently be chosen lower as the range of frequencies, which is wanted to be rather evenly amplified, is wider. This constitutes a drawback, since in the case of the values being properly chosen the amplification is practically equal to the amplification factor of the tube multiplied by the ratio of transformation.

the frequency determined by these elements exceeds the so-called "leakage resonance" of the transformer. In addition it is advisable to satisfy the inequality:

$$\frac{R}{\omega L} < 1$$

wherein

$$\omega = \sqrt{\frac{1}{LC}}$$

It has been found that in the case of applying the invention there is no objection in using a ratio of transformation 1:10 for low frequency transformers, in association with the customary triodes having an internal resistance of approximately 10,000 ohms, without the amplification of the high frequencies of the region of audibility being reduced. The aggregate works like a low pass filter, the cut-off frequency of which may be determined by a judicious choice of the various magnitudes. The fall of the characteristic curve above the requisite range of frequencies is rather steep.

This fall may still be rendered steeper, however, in the manner indicated in Figure 2, viz. by inserting another condenser C_1 between those ends of the self-induction L and the primary winding L_1 which are not directly connected together. This condenser may have approximately the same capacity as the condenser C . In addition this condenser prevents regeneration as far as the high frequencies are concerned.

In a special case the various magnitudes in a transformer having a ratio of transformation 1:10 are chosen as follows:

$$\begin{aligned} L_1 &= 10 \text{ H} \\ L_2 &= 1000 \text{ H} \\ L &= 0.3 \text{ H} \\ C = C_1 &= 0.002 \text{ F} \\ R &= 10^4 \text{ ohms} \end{aligned}$$

The invention affords a means of amplifying a wide range of frequencies even at a higher ratio of transformation, said means consisting in that a self-induction is connected in series and a capacity in parallel with the primary winding of the transformer, the values of these elements being so chosen that the requisite extension of the evenly amplified region is obtained.

According to the invention a second condenser may be provided which is inserted between the ends of the primary winding and the said self-induction, which ends are not directly connected.

This invention will be more clearly understood by reference to the accompanying drawing representing by way of example, two possible embodiments of the invention.

Figure 1 shows an embodiment in which R designates the internal resistance of the triode 1. L_1 and L_2 respectively denote the primary and secondary windings of the transformer by which the plate circuit of the triode is coupled with a next tube not shown.

L designates an inductance coil connected in series with the primary winding L_1 . C denotes a condenser coupled in parallel with L_1 .

The values of L and C are so chosen, that

Claims:

1. Means for amplifying a wide range of frequencies substantially evenly throughout the range, comprising an electron discharge device having an input circuit and an output circuit, said output circuit including the primary winding of a transformer having a high ratio of transformation, a utilizing circuit including the secondary winding of said transformer, an inductance in said output circuit in series with said primary winding and a capacity shunted across said primary winding, said condenser and said inductance having values such that the resonance frequency determined by them exceeds the leakage resonance frequency of the transformer, and the ratio between the ohmic resistance and the inductance occurring in the circuit constituted by the said inductance, said capacity and the internal resistance of said electron discharge device is less than unity for the resonance frequency.

2. Means for amplifying a wide range of frequencies substantially evenly over the entire range comprising an electron discharge device having an input circuit and an output circuit, said output circuit including the primary winding of a coupling transformer, a utilizing circuit including the secondary of said transformer, an inductance in said output circuit in series with said primary and a capacity shunted across said primary of such values that the resonance frequency determined by them exceeds the leakage resonance frequency of the transformer, and the ratio between the ohmic resistance and the reactance occurring in the circuit constituted by said inductance, capacity and the internal resistance of said electron discharge device is less than unity for the resonance frequency.

3. In combination, an electron discharge device having input and output circuits, said output circuit including the primary winding of a coupling transformer, a utilizing circuit including the secondary of said transformer, an inductance in said output circuit, a capacity shunted across said inductance and said primary winding, a second capacity shunted across said primary winding, said elements having such values that the ratio between the ohmic resistance and the reactance occurring in the circuit constituted by said inductance, said capacities and the internal resistance of the electron discharge device is less than unity at a frequency greater than the leakage resonance frequency of said transformer.

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