Dec. 3, 1929. E. H. TRUMP 1,738,408

THERMIONIC AMPLIFIER

Filed Dec. 24, 1926

Fig. 1

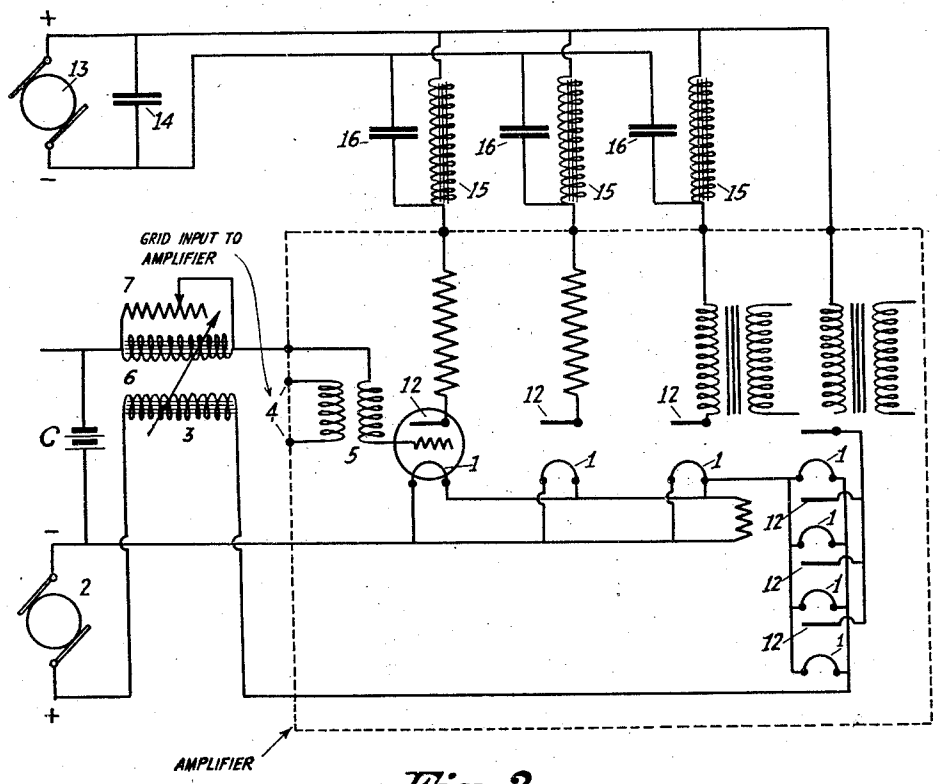
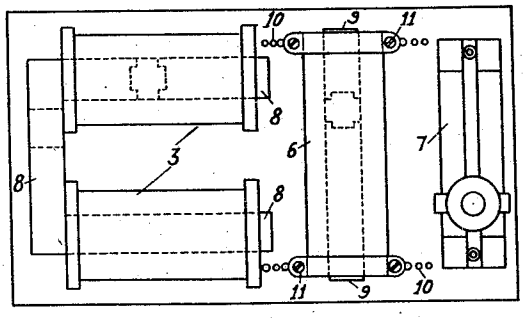


Fig. 2



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THERMIONIC AMPLIFIER

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This invention relates to thermionic amplifiers and is particularly suitable for use with repeaters of the kind used, for example, on board ship to repeat in one part of the ship a musical programme or the like which is given in another part of the ship. In such cases there is usually available an ample supply of electric power from dynamo electric machines, but, as is well known, the presence of "commutator ripple" and other variations in potential render such power unsuitable for direct use in known amplifiers. One of the objects of the present invention is to provide an amplifier which can make use of such power with a minimum of interference by undesired noise.

According to this invention chokes are inserted in the power supply to the cathode and in an effective grid circuit on the input side of the amplifier, the said chokes being coupled to one another. Preferably the degree of coupling is made variable and one or both of the chokes is or are provided with a variable shunt resistance. Preferably also the anode power supply is obtained from a dynamo-electric machine through an arrangement of smoothing chokes and condensers.

The invention is illustrated in the accompanying drawing, in which Figure 1 is a schematic circuit diagram, and Figure 2 is a diagrammatic plan view of one form of construction.

In the form of construction illustrated in the figures which show the invention as applied to a multi-stage thermionic amplifier indicated diagrammatically within the dotted lines and which may be of any of the known types, for instance, resistance-coupled, transformer-coupled, etc., the cathodes 1 of the valves are supplied with direct current from a dynamo-electric machine 2 subject to slight potential variations, and in one of the main leads from the said machine is inserted a choke 3. The grid input 4 to the amplifier is effected, through a transformer 5 and in series with the secondary of the said transformer and with the grid bias battery C (if desired) is inserted a second choke 6, which is coupled to the first choke 3 and across which is connected a variable shunt resistance 7. The remainder of the circuit shown in Figure 1 indicates that of a known amplifier arrangement, those valves whose plates are connected in parallel constituting a multi-valve last stage amplifier, the transformer on the extreme right of the figure being the output transformer of this stage, while the transformer to the left of the output transformer is the grid transformer for said stage. The choke coil 3 is formed by windings on the two limbs of a U-shaped core 8, and the choke coil 6 is formed by a winding on a straight open core 9. The two chokes are carried on a base plate so that the straight core 9 is at right angles to the limbs of the U-shaped core 8. One of the chokes, preferably that with the straight core 9, is arranged to be able to be mounted in any of a plurality of mounting holes 10, so that it may be adjusted and fixed by means of screws 11, in the position which gives the best degree of coupling. In practice it has been found that a rather small degree of coupling is sufficient, and in this arrangement the necessary coupling is obtained by the linking of the leakage fields from the cores of the chokes.

The anodes 12 of the valves are supplied from a separate high tension dynamo-electric machine 13 to the negative terminal of which the valve filaments are connected in any known way, as by earthing. A smoothing condenser 14 is connected across the said machine, and in the leads to the anodes of certain of the valves smoothing chokes 15 are inserted. A condenser 16 is connected between the anode side of each smoothing choke and the negative terminal of the high tension supply. The resistances shown adjacent the anodes 12 of the first two valves indicate the usual so-called coupling resistances. In some cases the provision of smoothing chokes and associated condensers may not be necessary for the anodes of all the valves in the amplifier.

The choke in the grid circuit and that in the filament lighting circuit must be coupled together in a direction such that the noises caused by ripple in the filament current are

annulled by voltage ripple applied to the grid, for obviously if the said chokes are coupled in the other direction, the noises will only be made worse. The action of these two impedances is simply that they enable a suitable variable voltage to be applied to the grid to entirely counterbalance the effect of the varying voltage on the filaments.

The correct working of the device obviously depends in some measure on obtaining a voltage of very flat wave form on the first grid of the amplifier, and having a comparatively big lag relative to the current variations in the filaments, to correspond as nearly as possible to the variation in temperature (at ripple frequency) of the said filaments.

Having now particularly described the nature of my invention, what I claim is:—

1. A thermionic amplifier arrangement, comprising cathodes adapted to be heated by the power supply of a dynamo-electric machine, a choke coil in the lead to said cathodes, and a second choke coil in the grid circuit on the input side of the amplifier coupled to said first-mentioned coil, whereby interference by commutator ripple from the supply source is suppressed or minimized.

2. The arrangement as set forth in claim 1, one of said chokes being provided with a U-shaped core and the other of said chokes being provided with a straight core, the coupling being effected by linkage of the leakage fields from the cores of said chokes.

3. A thermionic amplifier arrangement, comprising cathodes adapted to be heated by the power supply of a dynamo-electric machine, a choke coil in the lead to said cathodes, and a second choke coil in the grid circuit on the input side of the amplifier coupled to said first-mentioned coil, the coupling between said chokes being variable.

4. A thermionic amplifier arrangement, comprising cathodes adapted to be heated by the power supply of a dynamo-electric machine, a choke coil in the lead to said cathodes, and a second choke coil in the grid circuit on the input side of the amplifier coupled to said first-mentioned coil, one of said chokes being adapted to be mounted in any of a plurality of positions with respect to the other choke, thereby varying the coupling therebetween.

5. A thermionic amplifier arrangement comprising a plurality of cathodes, a choke coil in the lead to said cathodes, a second choke coil in the grid circuit on the input side of the amplifier coupled to said first-mentioned coil, and a variable resistance shunting one of said chokes.

6. A thermionic tube arrangement comprising an element adapted to be heated by a direct current source subject to slight potential variations for producing electron emission, an inductance coil in a lead to said element, and a second inductance coil connected to another element of said tube and coupled to the first mentioned inductance for minimizing effects due to the potential variations of said current source.

7. A thermionic tube arrangement comprising an element adapted to be heated by a direct current source subject to slight potential variations for producing electron emission, an inductance coil connected in a lead to said element, and a second inductance coil connected to the grid of said tube and coupled to the first mentioned inductance for minimizing effects due to the potential variations of said current source.

8. A thermionic tube arrangement comprising an element adapted to be heated by a direct current source subject to slight potential variations for producing electron emission, an inductance coil connected in a lead to said element, and a second inductance coil connected to the grid of said tube and adjustably coupled to the first mentioned inductance for minimizing effects due to slight potential variations of said current source.

9. A thermionic tube arrangement comprising an element adapted to be heated by a direct current source subject to slight potential variations for producing electron emission, an inductance coil in a lead to said element, a second inductance coil connected to another element of said tube and coupled to the first mentioned inductance for minimizing effects due to the slight variations of said current source, and a resistance connected across one of said inductances.

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