

July 19, 1932.

R. URTEL

1,868,034

MODULATING ARRANGEMENT FOR TRANSMITTER TUBES

Filed Feb. 6, 1929

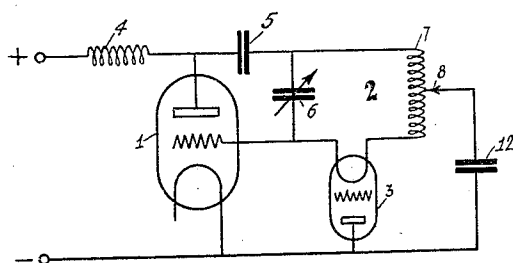


Fig. 1

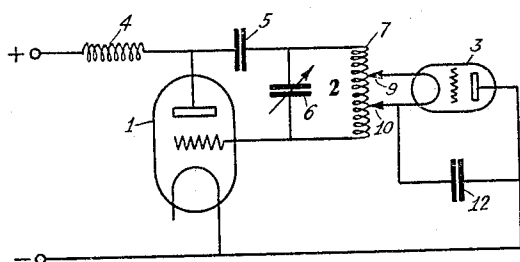


Fig. 2

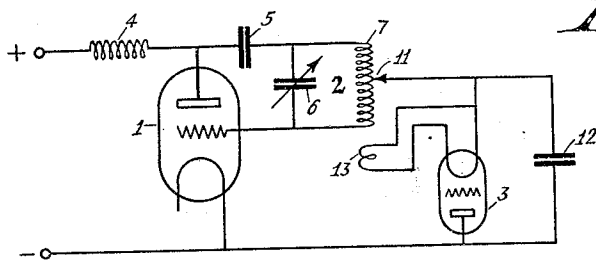


Fig. 3

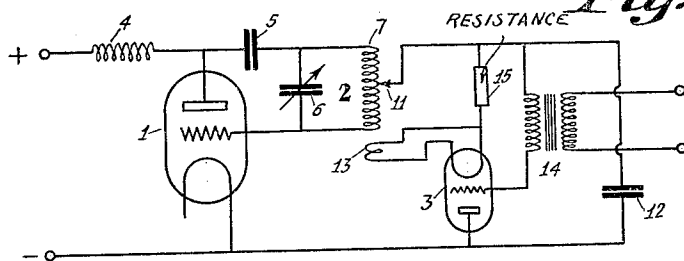


Fig. 4

Inventor
RUDOLF URTEL

By his Attorney *J. Adams*

UNITED STATES PATENT OFFICE

RUDOLF URTEL, OF BERLIN, GERMANY, ASSIGNOR TO TELEFUNKEN GESELLSCHAFT
FÜR DRAHTLOSE TELEGRAPHIE M. B. H., OF BERLIN, GERMANY, A CORPORATION
OF GERMANY

MODULATING ARRANGEMENT FOR TRANSMITTER TUBES

Application filed February 6, 1929, Serial No. 337,776, and in Germany February 13, 1928.

This invention relates to a modulation system and more particularly to a modulation system in which a space discharge device is used as a modulator.

- 5 The problem of heating in modulator tubes in case of grid modulation schemes is attended with particularly great difficulties because the filament of the modulator tube is turned toward the grid of the transmitter tube which fact has necessitated the use of separate cathode heating sources.

It is an object of the present invention to dispense with the separate filament current sources.

- 15 Another object of the invention is to utilize current derived from the oscillation circuit for heating the filament.

- Other objects of the invention will appear from time to time in the following detailed description when read in connection with the
20 appended drawing in which

- Figure 1 illustrates diagrammatically one embodiment of my invention showing the modulator tube filament connected directly to
25 the oscillation circuit;

Figure 2 illustrates another embodiment utilizing an auto transformer coupling;

Figure 3 illustrates a transformer connection; and

- 30 Figure 4 shows diagrammatically an arrangement similar to Figure 3 except that a means for obtaining a grid biasing potential is shown.

- In the drawing, Figures 1 to 4 inclusive, 1
35 represents a transmitter tube having an anode, a grid electrode and a cathode the latter of which may be heated in any well known manner (not shown).

- A plate filament circuit of the transmitter
40 tube 1 comprising a choke coil 4 is energized by a direct current source (not shown). A grid filament circuit comprises a portion of coil 7 of the oscillation circuit 2 and a condenser 12 and a variable grid leak device 3
45 shunted around said condenser 12.

- The adjustable grid leak device 3 comprises a three element vacuum tube of well known form. Oscillation circuit 2 also includes a
50 tunable condenser 6 which condenser is utilized to tune the circuit 2 to the desired fre-

quency. The purpose of tube 3 as is well known is to modulate the high frequency energy. The variations in intensity of sound may be translated into corresponding modulating currents by means of a circuit which includes a microphone (not shown) coupled to the grid circuit of tube 3 through transformer 14 (see Figure 4).

Condenser 5 precludes the direct current from the anode source from entering the oscillation circuit while the purpose of choke 4 is to prevent high frequency energy from entering the source.

Now, according to the present disclosure, as shown in Figure 1, a separate filament heating source for the modulator tube 3 is dispensed with by reason of the fact that the filament of the said modulator tube 3 is connected in the oscillation circuit 2 of the transmitter tube 1 and is thus heated by current derived from the oscillation circuit.

In the embodiment shown by Figure 2, two taps 9 and 10 taken off at the coil 7 contained in the oscillation circuit serve as connections for the filament of the modulator tube 3, one of these taps at the same time serves as the filament point forming part of what is known in the art as the "three-point connection."

Contradistinct from the auto-transformer coupling method used in the embodiment shown by Figure 2, a transformer method of feeding the filament of the modulator tube is shown in Figure 3. This method involves the advantage that in series with the tube, as shown in Figure 4, a supplementary resistance 15 may be connected in the grid direct current path, the potential fall occasioned across this resistance serving as the biasing potential for the modulator tube. Of course, a number of other modes of carrying this idea into practice are conceivable within the purview of this invention.

It is not necessary for the application of the idea to be dealing with self-excited (direct) transmitters, for the same scheme is useful also for pilot-tube operated (absorber) schemes. A special advantage in that case is that, for instance, the modulator tube of an amplifier stage may be fed from the oscilla-

tion circuit of the preceding stage or from the pilot tube.

I claim:

1. In a radio system, a vacuum tube transmitter circuit comprising an oscillation circuit, a grid condenser, a grid leak for said condenser comprising a triode having anode cathode and grid electrodes said cathode being energized to an electron emitting condition with oscillatory energy from said oscillation circuit.

2. In a modulation system a space discharge device comprising an anode a control electrode and a cathode, a parallel resonant circuit including an inductance connected across said anode and control electrode, a connection including a capacity between an intermediate point of said inductance in said parallel resonance circuit and said cathode and a variable resistance device shunted across said capacity, said resistance device comprising an electron discharge device having its cathode coupled to said inductance whereby said cathode is energized to an electron emitting condition with high frequency energy derived from said inductance.

3. In a modulation system, a space discharge device comprising an anode a cathode and a control electrode, a capacity shunted across said anode and control electrode, a coil connected in parallel with said capacity, said capacity and coil forming a parallel resonant circuit, a connection including a condenser between an intermediate point of said coil and said cathode and a variable resistance device shunted across said condenser, said resistance device comprising an electron discharge device having its cathode coupled to said inductance whereby said cathode is energized to an electron emitting condition with high frequency energy derived from said inductance.

4. In a modulation system, a space discharge device comprising an anode a cathode and a control electrode, a resonant circuit including an inductance and a capacity connected between said anode and control electrode, a second capacity connected between said cathode and a point intermediate said inductance and a variable resistance and a fixed resistance in series shunted across said last named capacity, said variable resistance comprising an electron discharge device having an anode a cathode and a control electrode, said fixed resistance maintaining said cathode at a suitable potential relative to said control electrode and said cathode being coupled to said resonant circuit whereby the cathode of said variable resistance is energized to an electron emitting condition with high frequency energy derived from said resonant circuit.

5. In a modulation system, a space discharge device comprising an anode a cathode and a control electrode, a resonance circuit

including an inductance and a capacity connected between said anode and control electrode, a second capacity connected between said cathode and an intermediate point of said inductance, and a variable resistance shunted across said last named capacity, said variable resistance comprising the output circuit of a space discharge device, said variable resistance comprising an electron discharge device having an anode a cathode and a control electrode, said cathode being coupled to said resonant circuit whereby said cathode is energized to an electron emitting condition with energy from said receiving circuit.

6. In a modulation system, a space discharge device having an anode, a cathode and a control electrode, a parallel resonant circuit comprising an inductance and a capacity connected between said anode and control electrode, a second capacity connected between said cathode and a point on said inductance, a second space discharge device having a cathode, an anode and a control electrode, the anode thereof being connected to one side of said second capacity and the cathode thereof to the other side of said second capacity and means for energizing to an electron emitting condition the cathode of said second space discharge device with oscillatory energy from said resonant circuit.

RUDOLF URTEL.

100

105

110

115

120

125

130