

Feb. 7, 1933.

E. F. W. ALEXANDERSON

1,896,534

ELECTRICAL SYSTEM

Filed May 13, 1927

2 Sheets-Sheet 1

Fig. 1.

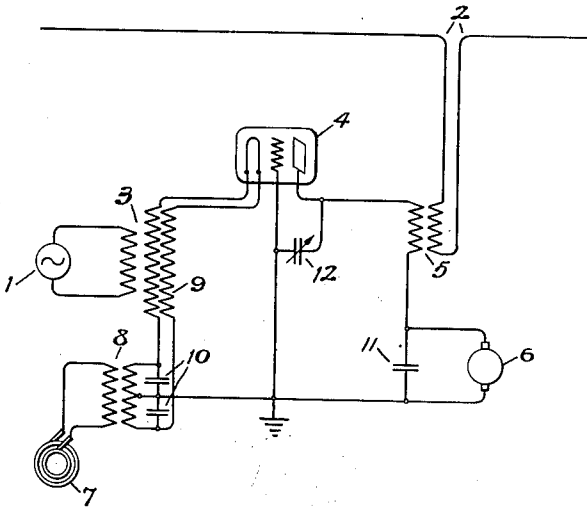
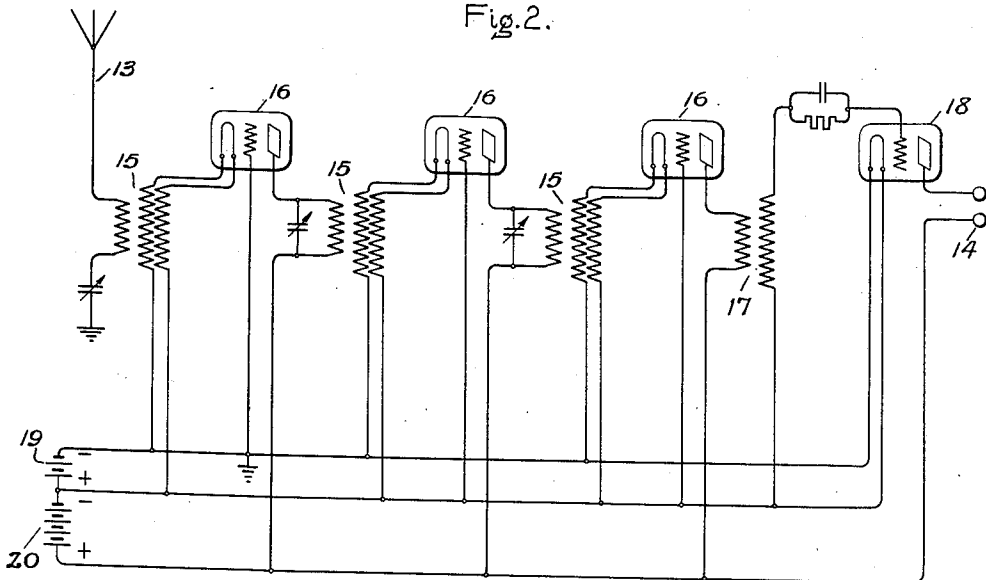


Fig. 2.



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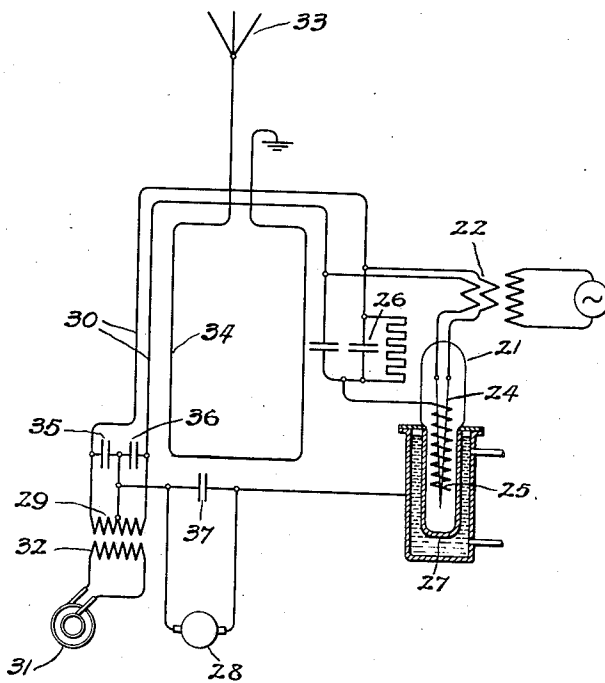
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2 Sheets-Sheet 2

Fig. 3.



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UNITED STATES PATENT OFFICE

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ELECTRICAL SYSTEM

Application filed May 13, 1927. Serial No. 191,254.

My invention relates to electrical systems comprising a space discharge device which is provided with input and output circuits, and has for its principal object the provision of an improved apparatus and method of operation whereby the tendency of the output circuit to feed energy back into the input circuit is greatly reduced.

In the operation of a space discharge device provided with input and output circuits and operated at the high frequencies utilized in wireless telegraphy and telephony, difficulty is frequently encountered due to feed-back between the output and input circuits of the device. This feed-back of energy from the output circuit to the input circuit is largely due to the capacity coupling between the control grid and anode of the device and is objectionable for the reason that it tends to interfere with the amplification of the control impulses applied to the input circuit. In accordance with my invention the grid is maintained at ground potential and the potential of the cathode is varied in accordance with the impulses to be amplified. Under these conditions, the grounded grid acts as a shield between the input and output circuits, and feed-back due to coupling between these circuits is avoided.

My invention will be better understood from the following description when considered in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

Referring to the drawings, Fig. 1 illustrates a transmitting apparatus wherein my invention has been embodied; Fig. 2 illustrates the application of my invention to a receiving apparatus, and Fig. 3 illustrates a modified form of transmitter.

The transmitting apparatus illustrated by Fig. 1 comprises a high frequency generator 1 which may have its output modulated by any suitable means and is connected to an antenna 2 through means comprising an input transformer 3, a space discharge device 4, an output transformer 5 and a source 6 for supplying the anode current of the device 4. Heating current is supplied to the cathode of the device 4 from a source 7 through a

transformer 8 and a bi-filar secondary winding 9 of the input transformer 3. High frequency shunts, shown as condensers 10 and 11, are respectively connected between the secondary terminals of the cathode heating transformer 8 and between the terminals of the source 6. Tuning of the output circuit is effected by means of a capacity 12 which is connected between the grid and anode of the device 4. With these connections, the grounded grid acts as a shield between the input and output circuits thereby preventing any capacity coupling between the cathode and anode and avoiding feed-back between the input and output circuits of the device 4.

The receiving apparatus of Fig. 2 comprises an antenna 13 and a telephone 14 which are interconnected through means comprising transformers 15 and amplifiers 16, a transformer 17 and a detector 18, heating current being supplied to the cathodes of the devices 16 and 18 from a source 19 and the anode currents of these devices being supplied from a source 20. The operation of this receiving apparatus will be readily understood in view of what has been said with regard to Fig. 1.

The system shown by Fig. 3 comprises a space discharge device 21 which is provided with an input circuit including a two-wire transformer winding 22, a cathode 24, a grid 25 and a grid leak device 26, and with an output circuit including the cathode 24, an anode 27, a direct current source 28, a transformer winding 29, a two-wire circuit 30 and the two-wire winding 22. Heating current is supplied from a source 31 to the cathode 24 through the winding 22, the circuit 27 and the winding 29 which is inductively related to a primary winding 32 connected to the source 31. It should be noted that the output circuit of the device 21 is coupled to an antenna 33 through a single turn loop 34, and that condensers 35, 36 and 37 are arranged to shunt the high frequency currents past the sources 28 and 31.

With control impulses applied to the input circuit between the cathode 24 and the point at which the grid 25 is connected to the output circuit, the effect of these impulses is to

vary the potential of the cathode 24 with respect to the grid 25 and anode 27. Under these conditions, the potential of the cathode 24 is varied in accordance with the impulses to be amplified and there is little, if any, energy fed from the output circuit through the capacity between the grid and anode into the input circuit.

The embodiment of the invention illustrated and described herein has been selected for the purpose of clearly setting forth the principles involved. It will be apparent, however, that the invention is susceptible of being modified to meet the different conditions encountered in its use and I therefore aim to cover by the appended claims all modifications within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. The combination of a space discharge device provided with a cathode and an anode and with a grid maintained at a fixed potential, an output circuit comprising said cathode and anode, and means connected between said grid and anode for tuning said output circuit.

2. The combination of a space discharge device provided with a cathode and an anode and with a grid maintained at a fixed potential, an input circuit comprising a bi-filar input transformer connected between said grid and cathode, and heating current supply means connected to said cathode through said bi-filar winding.

3. The combination of a space discharge device provided with a cathode and an anode and with a grid maintained at ground potential, an output circuit comprising said cathode and anode, an input circuit comprising said cathode and grid, an input transformer comprising a bi-filar winding common to said circuits, and a source of heating current connected to said cathode through said bi-filar winding.

4. The combination of a space discharge device provided with a cathode and an anode and with a grid maintained at ground potential, an output circuit comprising said cathode and anode, an input circuit comprising said cathode and grid, an input transformer comprising a bi-filar winding common to said circuits, a source of heating current connected to said cathode through said bi-filar winding, and means for grounding said grid and said circuits at a common point.

In witness whereof, I have hereunto set my hand this 12th day of May 1927.

ERNST F. W. ALEXANDERSON.