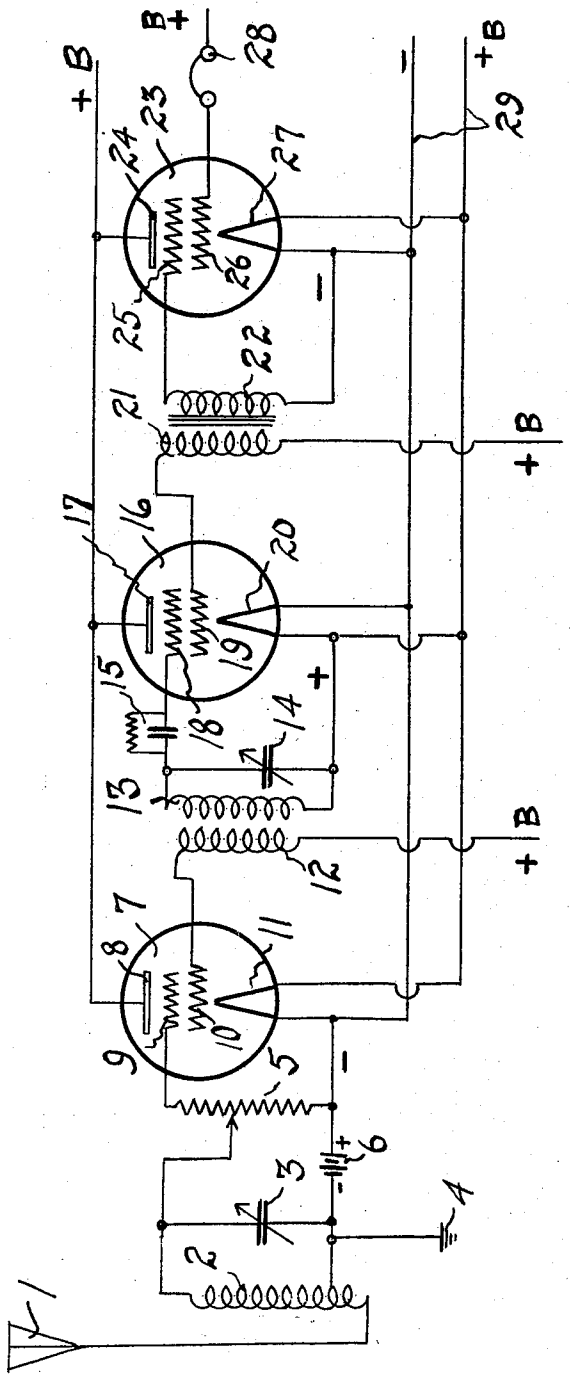
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RADIO CIRCUIT

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UNITED STATES PATENT OFFICE

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RADIO CIRCUIT

Application filed October 22, 1929. Serial No. 401,423.

This invention relates in general to improvements in radio circuits, particularly multi-stage vacuum tube coupled circuits.

One of the objects of this invention is the provision in circuits of the above type of double grid vacuum tubes and suitable connections therefor.

Another object of this invention is the provision between one of the grids of such a vacuum tube and the cathode of a resistance which may be varied to control the oscillations and volume of the circuit.

Another object of this invention involves the use of double grid vacuum tubes using one grid for a control or input electrode and the other grid for the output electrode.

A still further object of this invention is the provision of radio circuits employing double grid tubes in which the potential on the anode may be considerably less than necessary on the anode of a single grid tube.

A still further object of this invention is the provision of a multi-stage vacuum tube circuit employing double grid vacuum tubes in which the sound reproducing device or similar load is connected to one of the grids of the last vacuum tube.

A still further object of this invention contemplates the use of biasing means for the control grid.

These and other objects, as will appear from the following disclosure, are secured by means of this invention.

This invention resides substantially in the combination, construction, arrangement and relative location of parts and circuital connections, all as will be described in greater detail below.

Referring to the drawing, the single figure is a diagrammatical illustration of one way in which double grid vacuum tubes may be associated into a useful radio circuit.

The general object of this invention is the provision of a multi-stage radio circuit employing double grid tubes in which the voltage on the anodes may be lower than usual and by means of which a considerable gain in volume is secured. One of the features of this invention is the connection of the input circuit of the vacuum tubes to one grid and the output circuits to the other grid. In addition a variable resistance is shunted across the input grid and cathode of one of the tubes by means of which oscillations and volume may be readily controlled. Furthermore, when desired, a suitable biasing voltage may be placed upon the control grid. Further advantages are secured by this arrangement as will appear below.

Referring to the drawing, the antenna or other suitable energy collector is shown at 1 connected to one terminal of the input inductance 2. This inductance is grounded at a suitable point which may be variable if desired, as shown at 4. The other terminal of the inductance 2 is connected to the variable contact on a suitable resistance 5 shunted across the control grid 9 and the cathode 11 of the double grid vacuum tube 7. The inductance 2 is shunted by means of a suitable variable condenser 3 by means of which it can be tuned to any desired incoming wave. In the grid return lead is shown a suitable biasing battery 6. It may be pointed out here that in using double grid tubes it has been found that such a biasing battery is not in general necessary but it is disclosed as within the contemplation of this invention.

The grid 10 situated between the control grid 9 and the cathode 11 is connected to the primary 12 of a suitable radio frequency transformer. This primary has its other terminal connected to the positive side of a suitable B voltage source. The secondary 13 of this transformer shunted and tuned by the variable condenser 14 is connected by one terminal to the control grid 18 of the double grid vacuum tube 16 through a suitable grid leak system 15 and by its other terminal to the cathode 20. The grid 19 is connected to the primary 21 of an audio transformer. The other terminal of this primary is connected to a suitable B voltage source. The secondary 22, which may be tuned if desired, is connected across the control grid 25 and the cathode 27 of the double grid vacuum tube 25. The grid 26 is connected to a suitable sound reproducing device 28 which has its other treminal connected to the positive

side of a suitable B voltage source. All of the anodes 8, 17 and 24 are connected together and to the proper B voltage source. In an arrangement of this type the B voltage may be of a lower value than that normally employed on the anode. The cathodes 11, 20 and 27 are connected in parallel to the wires 29 which are connected to a suitable current source therefor. In the arrangement shown the grid return lead of the vacuum tube 16 is connected to the positive side of the cathode current source. If desired, a suitable biasing battery may be employed in the return lead of the control grid 25.

The arrangement above described constitutes one stage of radio frequency amplification, a detector stage, and one stage of audio frequency amplification. It will be at once apparent that this invention need not be restricted to such a circuit since the principles of this invention may be applied to many other circuit forms.

With an arrangement of this type employing a lower plate voltage than normally required it is possible to considerably increase the gain per stage by employing double grid vacuum tubes in which the grid between the control grid and the cathode is connected in the output circuit of each stage. The variable resistance 5 permits of controlling the oscillations of the radio frequency stage as well as the double volume output of the circuit.

While I have disclosed the principles of operation and construction of my invention in connection with one form of circuit I do not desire to be limited to that particular form since it is at once apparent that these principles of construction and operation may be employed in many other forms of radio circuits. I desire, therefore, to be limited only to the principles and scope of this invention as defined in the appended claims.

What I seek to secure by United States Letters Patent is:

1. In a multi-stage radio circuit the combination comprising a plurality of vacuum tubes each having an anode and a cathode and two grids arranged at relatively different distances from the cathode, input circuits connected between the grids furthest from the cathodes and the cathodes, output circuits connected to the other grids of said vacuum tubes, the input circuits and the output circuits of intermediate tubes being coupled together in a multi-stage circuit and an electro-responsive device connected directly in circuit with the grid nearest the cathode of the last vacuum.

2. In a multi-stage radio frequency amplifier detector and an audio frequency amplifier system, the combination comprising a double grid vacuum tube having an input circuit including a variable resistance and one of said grids and a cathode, the other of said grids connected in an output circuit, a double grid vacuum tube detector having an input circuit including one of its grids and a cathode coupled to the output circuit of said first tube, the second grid of said detector being connected in an output circuit, a third double grid vacuum tube having an input circuit including one of its grids and a cathode coupled to the output circuit of the detector tube and a sound responsive device connected to the second grid of said third vacuum tube, the grid in the input circuit of each tube being further from the cathode than the other grid.

3. In a radio circuit as described, the combination comprising a vacuum tube having a cathode, an anode and two grids, an input circuit connected to one of said grids and said cathode including a variable resistance, means for impressing a voltage on said anode and an output circuit including the other of said grids, said grid connected in the output circuit being mounted between the first grid and the cathode.

4. In a radio circuit stage as described, the combination including a vacuum tube having an anode, a cathode and two grids, an input circuit including one of said grids and the cathode, means in said input circuit for impressing a negative potential on said grid, and an output circuit including the second grid which is between the first grid and the cathode.

5. In a radio circuit of the type described, the combination comprising a plurality of vacuum tubes each having an anode, a cathode, and two grids between the anode and cathode, means for impressing a positive voltage on all of said anodes, input circuits for each of said vacuum tubes including the grid nearest the anode, an output circuit connected to the grid nearest the cathode, the output circuits and input circuits of the intermediate tubes being coupled together.

6. A radio circuit of the type described, comprising a vacuum tube having a cathode, an anode and two grids, placed at different distances from the cathode, an input circuit including the grid furthest from the cathode and the cathode, means for impressing a voltage on said anode, and an output circuit including the grid nearest the cathode.

7. In a radio circuit as described, the combination comprising a vacuum tube having a cathode, an anode and two grids located at different distances from the cathode, an input circuit connected to the grid furthest from the cathode and said cathode including a variable resistance, means for impressing a voltage on said anode, and an output circuit including the other of said grids.

In testimony whereof I have hereunto set my hand on this 21st day of October A. D., 1929,

THOMAS D. THOMPSON.