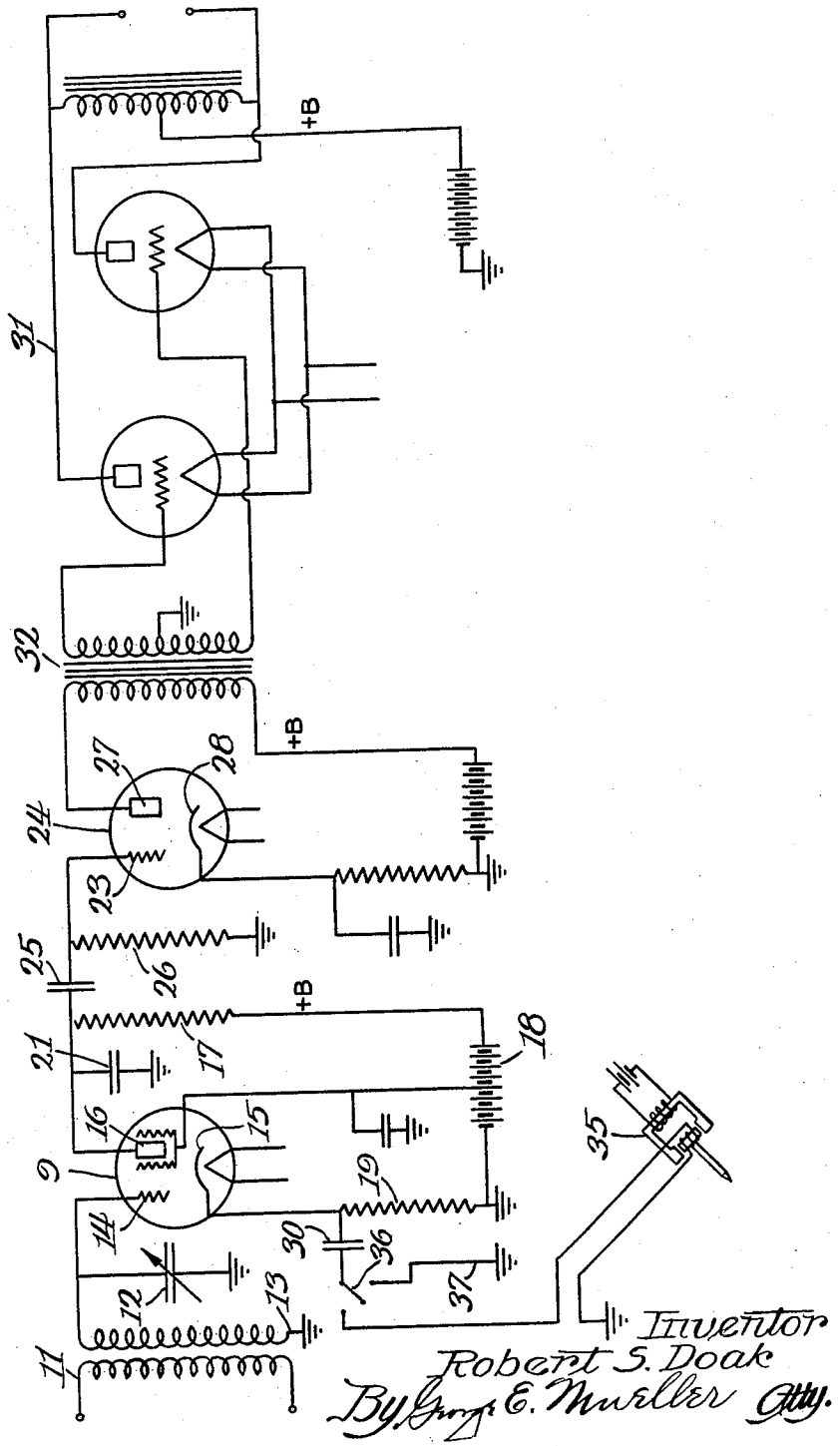
Sept. 20, 1932. R. S. DOAK 1,877,825

RADIO CIRCUIT

Filed Nov. 27, 1929



Patented Sept. 20, 1932 1,877,825

UNITED STATES PATENT OFFICE

ROBERT S. DOAK, OF CHICAGO, ILLINOIS, ASSIGNOR TO PREMIER ELECTRIC COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

RADIO CIRCUIT

Application filed November 27, 1929. Serial No. 410,076.

My invention relates to amplifying apparatus and more particularly to amplifying apparatus for a combination radio and phonograph system.

In the combination radio and phonograph apparatus heretofore known the detector tube has not been used for amplifying the signals from the phonograph pick-up because the coupling between the detector stage and the preceding radio frequency stage has been designed for the transfer of radio frequency energy and was, therefore, inefficient or wholly inoperative for impressing the phonograph pick-up signals upon the grid of the detector audion.

An object of the invention is to provide a new and improved radio and phonograph apparatus.

A further object is to provide a detector audion adapted for amplifying phonograph signals.

A further object is to provide a double input system for an amplifying audion.

A further object is to provide a system having two input circuits for an amplifying audion, both of which are simultaneously connected thereto.

Other objects and advantages will appear from the following description.

In accordance with the general features of the invention a radio frequency device is provided for impressing the radio frequency signal upon the grid of a detector audion, and an independent device is provided for impressing the phonograph signals upon the cathode of the audion while the grid is maintained at a substantially constant potential, while the apparatus is used for amplifying phonograph signals.

The single figure of the drawing illustrates a circuit diagram embodying the features of the invention, in which a detector audion 9 is coupled to a preceding radio frequency circuit or to an antenna through a radio frequency transformer 11, preferably of the air core type. The secondary of a transformer is tuned by a variable condenser 12, and one side of the transformer is grounded at 13 while the other side leads to a grid 14 of the detector audion. This audion is also provided with a cathode 15, and an anode 16. The output or anode circuit of the audion includes cathode 15, anode 16, a resistance element 17, a source of energy 18, and a biasing resistance 19. The signal from the input circuit is impressed upon grid 14 of the audion and is amplified in the output circuit, as is well known in the art. A by-pass condenser 21 may be provided for shunting the high frequency component of the detected current from the output circuit. The function of the resistance element 19 is to maintain the cathode slightly positive with respect to the grid. The current fluctuations of the output circuit are impressed upon a grid 23 of an audio frequency audion 24 through a condenser 25, a suitable leak resistance 26 being provided in the grid circuit of audion 24. Audion 24 is provided with an anode 27 and cathode 28, which form a part of its output circuit which is coupled to a push-pull stage of amplification 31, through an audio frequency transformer 32.

In using this portion of the radio receiver in connection with a phonograph pick-up the input or grid circuit is left connected to the grid of detector audion 9 in the same manner as when it is used for detecting radio frequency signals. The phonograph signals obtained from a phonograph record by means of a pick-up 35 are impressed upon cathode 15 between the cathode and resistance element 19 through a condenser 30. A switch 36 is connected to condenser 30 for connecting the condenser either to the phonograph pick-up or to a ground 37. When the condenser is connected to a ground it serves to by-pass high frequency currents from the resistance and when it is connected to the phonograph pick-up it serves to prevent direct current from flowing through the pick-up. The phonograph signals cause a variation of the potential of cathode 15 with respect to grid 14. I have found that the electron discharge between the cathode and anode of a tube can be controlled by maintaining the grid potential constant and varying the cathode potential as well as by varying the grid potential and keeping the cathode potential constant as is the customary practice.

When the phonograph signals are impressed upon cathode 15 the grid 14 will remain at substantially ground potential due to the fact that the secondary of the radio frequency transformer through which the grid is grounded offers practically no impedance to low frequency currents.

The electron discharge between the cathode and anode is controlled by the potential variation of the cathode 15 with respect to grid 14 by the phonograph signals which are impressed upon the cathode. The phonograph signals will, therefore, be amplified by the detector tube and transmitted to the audio frequency amplifying stages following the detector. The detector stage may be connected directly to the push-pull amplifier if desired, since the detector stage alone in connection with the push-pull amplifier gives sufficient amplification for the phonograph signals.

In order to reproduce sounds from a phonograph record no changes are necessary in the radio circuit. All that is necessary is to change switch 36 from the ground to the pick-up. The radio frequency transformer remains connected to the grid at all times irrespective of whether the apparatus is used for broadcast reception or for phonograph reproduction. By the use of this system the detector stage is made use of for amplifying phonograph signals, which adds an additional stage of amplification to the phonograph signals which have heretofore been applied to the first audio stage following the detector.

It will be understood that the apparatus herein described and disclosed is merely illustrative of the invention and that many modifications and changes may be made therein without departing from the spirit and scope of the invention.

What I claim is new and desire to protect by Letters Patent of the United States is:—

1. In a combination radio and phonograph system, an audion having a grid, cathode, and anode, an input circuit associated with said grid, a plate circuit including the cathode and anode, an impedance element in series with said cathode, and means for impressing phonograph signals at a point between said impedance and cathode.

2. In a radio system an audion having a grid, a cathode, and an anode, an input circuit connected to the grid of said audion, an output circuit connected to the anode and cathode and including an impedance element, one side of said impedance element being connected to the cathode and the other side being grounded, and a second input circuit connected between said impedance element and the cathode.

3. In a radio system, an audion having a grid, a cathode, and an anode, a plurality of input circuits, one of said input circuits being connected to the grid of said audion, an output circuit including a biasing resistance, the second input circuit being connected to a point between the cathode and said biasing resistance.

4. In a radio system, an audion having a grid, a cathode, and an anode, an output circuit connected between the anode and cathode and including a resistance, an input circuit connected to the grid of said audion, and a second input circuit connected to a point between said resistance and the cathode.

In witness whereof I hereunto subscribe my name this 24th day of October, 1929.

ROBERT S. DOAK.