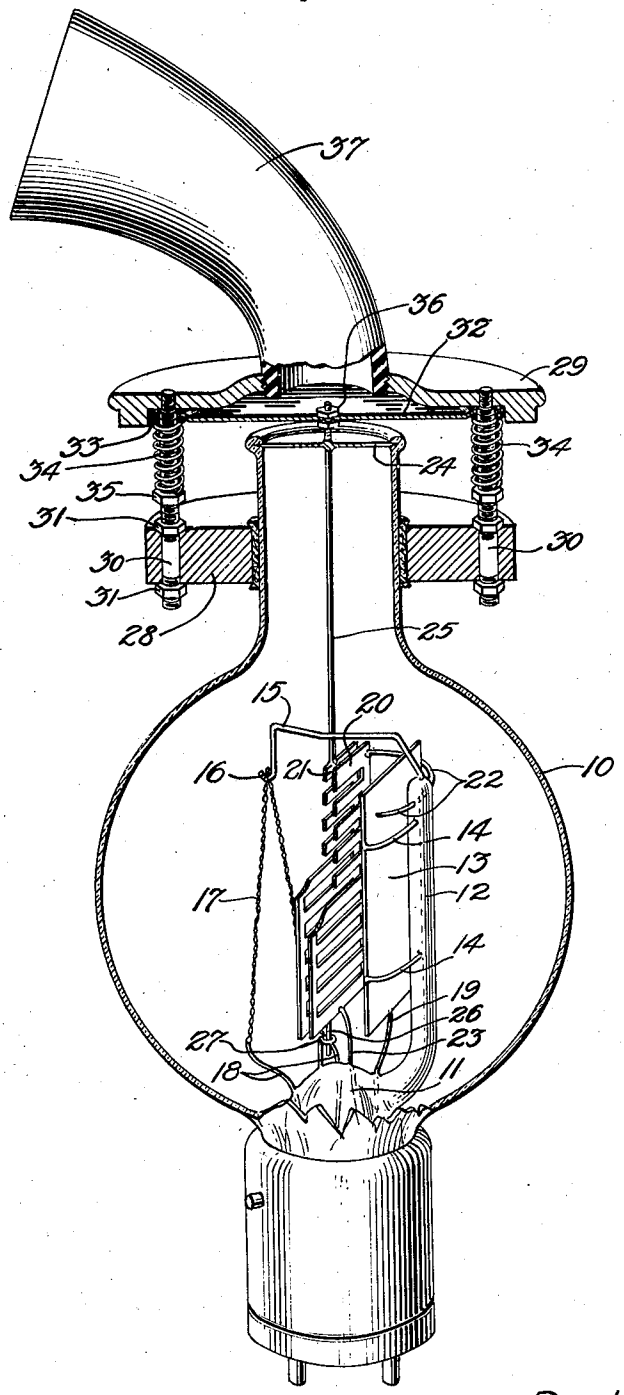
Jan. 12, 1926. 1,569,684

P. SCHWERIN

ELECTRON DISCHARGE DEVICE

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UNITED STATES PATENT OFFICE.

PAUL SCHWERIN, OF NEW YORK, N. Y., ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ELECTRON-DISCHARGE DEVICE.

Application filed April 11, 1922. Serial No. 551,531.

To all whom it may concern:

Be it known that I, PAUL SCHWERIN, a citizen of the United States, residing at New York, in the county of New York, State of New York, have invented certain new and useful Improvements in Electron-Discharge Devices, of which the following is a full, clear, concise, and exact description.

This invention relates to electron discharge devices and pertains especially to a telephone transmitter employing a space discharge current.

It is an object of the invention to transform mechanical vibrations into electrical vibrations for the purpose of transmitting speech or signals.

Another object of the invention is to transmit speech waves, or the like, by causing variations in the impedance of an electric discharge device through the agency of mechanical vibrations.

These and other objects of the invention may be accomplished by providing within an electron discharge device a grid having apertures, the size of which may be varied and means for causing variations in the size of said apertures in response to mechanical vibrations developed exterior of the device. These vibrations may be developed in a diaphragm by speech waves impinging thereon.

In the accompanying drawing, the single figure is an elevation, partly broken away, of an embodiment of the invention.

A vessel 10 is provided with a stem 11, from which an arbor 12 extends into the central portion of the vessel. A plate or anode 13 is supported from the arbor 12 by the wires 14. A wire 15 is sealed in the end of the arbor 12 and extends upwardly and over the anode 13 and is provided with a hook 16 at its free end which is disposed approximately symmetrical with respect to the end of the arbor 12. A filament 17 is strung over the hook 16 and has its ends connected to leading-in wires 18 sealed in the stem. A leading-in wire 19, also sealed in the stem, is provided for the anode 13.

The control electrode is composed of two grid members 20 and 21 of which 20 is rigidly supported from the arbor 12 by means of wires 22 and from the stem 11 by a leading-in wire 23 sealed in the stem.

The upper end of the vessel 10 comprises a tubular neck the outer end of which is closed by a flexible member 24, sealed in the neck and forming a portion of the vessel. The periphery of the member 24 is tapered and may be sealed in the neck of the vessel in accordance with the disclosure in United States patent to Houskeeper No. 1,293,441, to form a vacuum tight connection between the glass portion of the vessel and the member 24. The grid 21 is supported from the member 24 by means of a rod 25, extending through and carried by the member 24, and is provided at its lower end with a rod 26 fitting in an eyelet 27, supported from the stem 11. The member 21 is thus reciprocatively mounted relative to the member 20 and may be caused to reciprocate by movement transmitted thereto through the rod 25. The grid members 20 and 21 are provided with horizontal slots which, when the grid members are in one position, form apertures of a width equal to that of the slots extending through the entire electrode. In other positions of the grids, the apertures are of less width than the slots.

Surrounding the neck of the vessel 10 and mounted thereon is a collar 28. A disc 29 is supported from the collar 28 by means of the bolts 30 passing through the collar 28 and threaded into the disc 29. Nuts 31 hold the bolts 30 in position on the collar 29. In the lower portion of the disc 29 is a circular socket in which is arranged a diaphragm 32 having apertures through which pass the ends of the bolts 30. Around the periphery of the diaphragm 32 is a holder 33, portions of which overlap each face of the diaphragm. On the bolts 30 are provided helical springs 34, one set of ends of which bear against the holder 33 to force it against the bottom of the socket in the disc 29 to put the diaphragm 32 under tension and the other set of ends bear against nuts 35 on the bolts 30. The portion of the rod 25 exterior of the vessel 10 is screw-threaded and projects through an aperture in the diaphragm 32. On this screw-threaded portion are provided, on each side of the diaphragm, nuts 36. The disc 29 is also provided with a mouthpiece 37.

In the operation of this device speech waves transmitted through the mouthpiece 37 impinge against the diaphragm 32 causing the vibration thereof. These vibrations are

communicated to the grid 21 through the medium of the rod 25 and cause a reciprocation of the grid 21 relative to the grid 20 The effective size of the openings through the control member is varied by the reciprocation of the grid member 21, thereby causing variations in the impedance of the space current between the cathode 17 and the anode 13. The resulting variations in the space current may be transmitted to a distant point according to any of the well-known methods. Obviously either direct current or alternating current may be modulated by the arrangement of the invention in accordance with the signals to be transmitted.

The tension applied to the diaphragm 32 may be varied by adjusting the nuts 35, and by manipulation of the nuts 36 on the rod 25 adjustment may be made to obtain a maximum sensitiveness of the device.

It is, of course, understood that various modifications may be made in the structural features of this device without in any way departing from the spirit of the invention as set forth in the appended claims. For example, it is within the contemplation of this invention that the control electrode and the anode be of substantially cylindrical configuration and that the cathode be a straight filament co-axial with the control electrode and anode. The grid supporting rod may be given a lateral motion as shown in DeForest patent No. 1,309,753, in which case the slots should preferably be arranged transverse to the direction of movement.

The invention claimed is:

1. A transmitting device comprising a vessel a portion of the wall of which is flexible, a pair of grids within said vessel, one of said grids being movable relative to the other, and means connecting said flexible portion and said movable grid.

2. An electron discharge device comprising a vessel a portion of the wall of which is flexible, a pair of grids within said vessel, one of said grids being mounted for reciprocation relative to the other, and means connecting said flexible portion and said reciprocable grid.

3. A telephone transmitter comprising a vessel having a flexible portion, a pair of grids within said vessel, one of said grids being capable of reciprocation relative to the other, a rod connecting said flexible portion and said movable grid, a diaphragm supported by said vessel and a rigid connection between said flexible portion and said diaphragm.

4. A transmitting device comprising a vessel having a flexible portion, a pair of grids within said vessel, one of said grids being movable relative to the other, a rod connecting said movable grid and said flexible portion, a diaphragm supported by said vessel, and a rigid connection between said diaphragm and said flexible portion.

5. An electron discharge device comprising a vessel having a flexible portion and a stem, a grid member rigidly supported by said stem, a wire sealed in said stem and having an eye at its free end, a second grid member, a rod extending from said second grid member and passing through said eye, and a second rod carried by said second grid and connected to said flexible portion.

6. A telephone transmitter comprising a vessel having a flexible portion, a stationary and a movable grid within said vessel, a rod connecting said movable grid and said flexible portion, a collar supported by said vessel exterior thereof, a diaphragm supported by said collar, and a rigid connection between said diaphragm and said flexible portion.

7. A transmitting device comprising a vessel having a neck closed by a flexible member, a movable grid within said vessel, a rigid connection between said grid and said flexible member, a collar carried by said neck exterior of said vessel, a disc having a socket, a diaphragm located in said socket, bolts connected to said collar and said disc and passing through said diaphragm, adjustable abutment members on said bolts, springs interposed between said diaphragm and said abutment members, and a rigid connection between said diaphragm and said flexible member.

8. An electron discharge device comprising a vessel having a neck, a flexible member sealed in said neck, a stationary and a movable grid within said vessel, and a rigid connection between said movable grid and said flexible member.

9. A telephone transmitter comprising a vessel having a flexible portion, a cathode and anode, a pair of grids interposed between said cathode and anode, one of said grids being movable relative to the other, and means connecting said flexible portion and said movable grid.

10. A transmitting device comprising a vessel having a flexible portion, a cathode, an anode, a grid electrode interposed between said cathode and anode, and means for varying the effective area of the openings through said grid in response to vibration of said flexible portion.

11. A telephone transmitter comprising a vessel having a flexible portion, a cathode, an anode, a grid electrode interposed between said cathode and anode, means for varying the effective area of the openings through said grid electrode in response to vibration of said flexible portion, and means responsive to speech for vibrating said flexible portion.

12. In combination, a vessel having a flexible portion, a cathode, an anode, a grid electrode interposed between said cathode and

anode, and means varying the effective surface of said grid electrode in response to vibration of said flexible portion.

13. In combination a vessel having a flexible portion, a cathode, an anode, and a grid interposed between said cathode and anode, means varying the effective surface of said grid in response to vibration of said flexible portion, and means responsive to speech for vibrating said flexible portion.

14. In combination a glass vessel, a flexible metal insert forming a portion of said vessel, a cathode, an anode, a movable grid interposed between said cathode and anode, a member connecting said grid and said metal insert, a diaphragm, and a member connecting said diaphragm and metal insert whereby speech waves impressed upon said diaphragm are effective to cause vibration of said grid.

In witness whereof, I hereunto subscribe my name this 5th day of April A. D., 1922.

PAUL SCHWERIN.