R. A. WEAGANT.

VACUUM VALVE DETECTOR.

APPLICATION FILED MAR. 10, 1917.

1,379,706.

Patented May 31, 1921.

Fig. 2

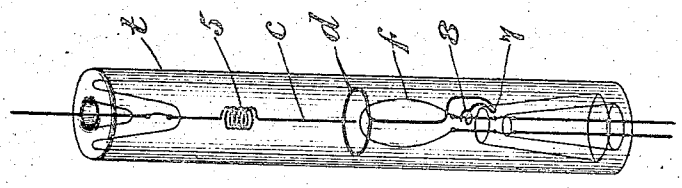
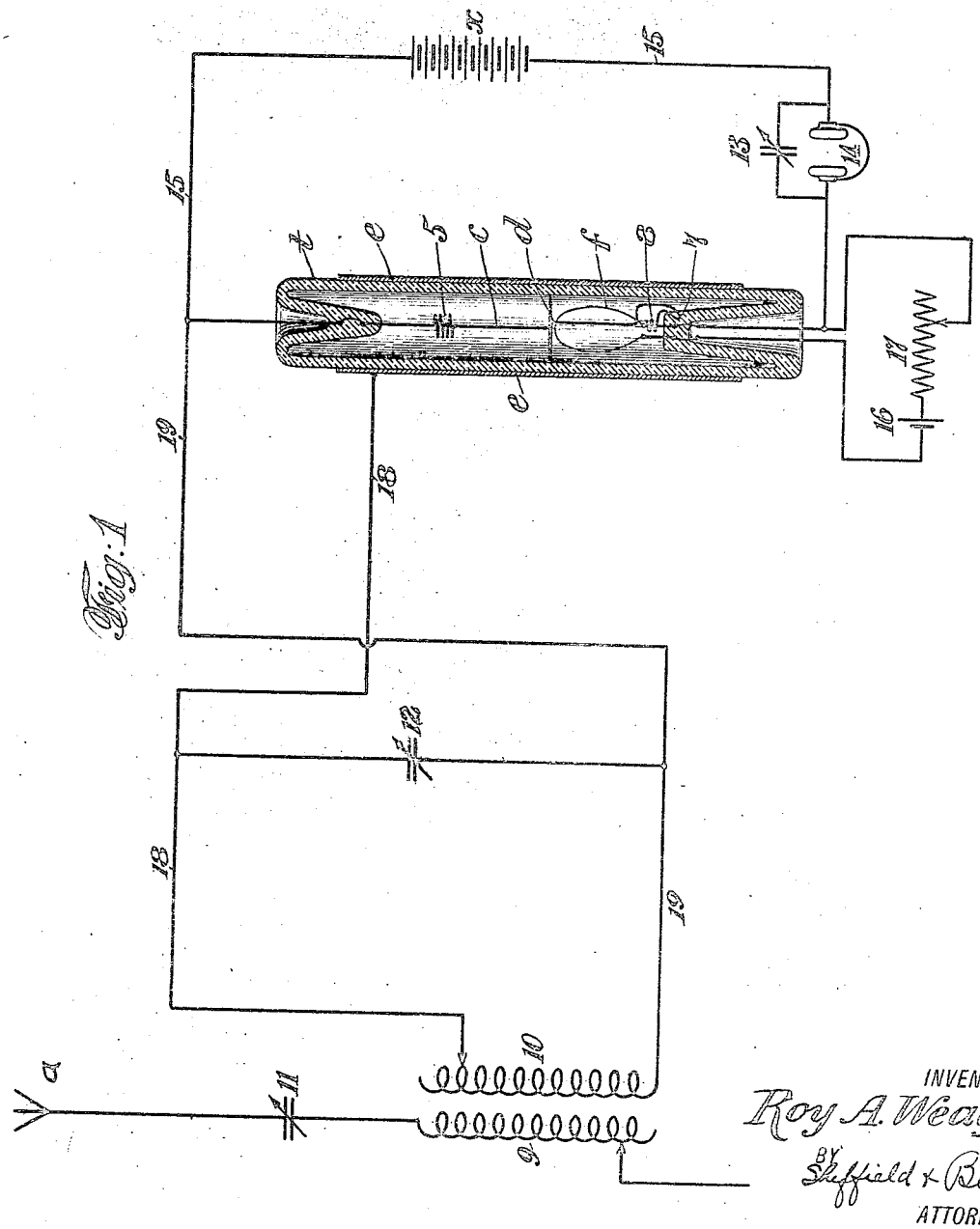


Fig. 1



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VACUUM-VALVE DETECTOR.

1,379,706. Specification of Letters Patent. Patented May 31, 1921.

Application filed March 10, 1917. Serial No. 153,934.

To all whom it may concern:

Be it known that I, ROY ALEXANDER WEAGANT, a citizen of the United States, and residing in the township of Roselle, county of Union, State of New Jersey, have made certain new and useful Improvements in Vacuum-Valve Detectors, of which the following is a specification.

This invention relates to vacuum valve devices used to detect or amplify electrical oscillations of audio or radio frequency, of the general type described in Fleming U. S. Patent 803,684, and particularly to those having a structure similar to the valve disclosed in my prior application, Serial No. 18,644.

In using devices like that shown in my said application comprising an exterior control element, which element, when its potential is raised by a received impulse, projects an electro-static field into the path of the electron stream, difficulty has been experienced from strong electrical disturbances which rendered the tube or valve temporarily inoperative, varying in time from a fraction of a second to ten or fifteen minutes. This difficulty is of a serious nature in the commercial use of the device as interruption of the functions of the tube occur every time such strong electrical disturbances take place. The object of this invention is to overcome or obviate the defects named. I accomplish this object by the improved arrangement described herein. This arrangement includes a vacuum tube, two electrodes, one of which is preferably heated, and a guard device located wthin the vacuum. The electrodes are preferably so disposed that they are comparatively close to each other at one point only, and the mean distance separating them is comparatively great compared to the distance at that point. This is desirable in that it provides a short path for a portion of the electron flow and tends to make the electron flow continuous notwithstanding static. The guard device referred to is preferably in the form of a ring and is preferably disposed at or adjacent the point where the electrodes approach each other and is electrically connected to the hot electrode. It operates to discharge any charge that occurs or accumulates on the interior wall of the tube in the vicinity of its location.

The accompanying drawing illustrates the preferred embodiment of my invention.

Figure 1 shows the complete vacuum tube with its two inclosed electrodes, the guard device, and the exterior control electrode connected in the circuits of a wireless telegraph receiver. Fig. 2 shows the tube in perspective omitting the exterior control element to make clear the relative position of the parts.

The tube, *t*, is of glass, evacuated to any desired degree. The hot electrode is a filament, *f*, and the cold electrode, *c*, is a wire of metal preferably including helical turns, 5. The wire forming electrode *c* is preferably of small diameter and is preferably placed to embrace the central axis of the tube, its tip pointing at the cathode. The guard device, *d*, is in the form of a ring, and is supported at 7, preferably in contact with the inner wall of the tube as shown, and is electrically connected to filament, *f*, by a metal wire conductor, 8. The guard device is preferably located so as to surround the space between the electrodes, as shown in the drawing, but good results may also be had by placing it around the hot filament. All of the above mentioned parts are sealed in the tube. Outside the tube, *t*, is an electrostatic control element, *e*, preferably a cylinder of brass or copper fixed firmly onto the exterior surface of tube, *t*. In extent, this element, *e*, preferably incloses all the active area of electron flow including elements *c* and *f*, and may even overlap this area. Thus the guard device, *d*, always lies within the zone covered by the control element *e*. Moreover, the device *d* extends over only a relatively small portion of the part of the tube in which the electron flow occurs.

The circuit shown in Fig. 1 is well known for use with vacuum detectors. The antenna, *a*, adjustable inductances 9 and 10 associated as transformer coils and the adjustable condensers, 11 and 12, are well known. The battery, *x*, is in circuit with head telephone, 14. The circuit, 15, is connected to the cold element, *c*, and the hot element, *f*. The heating battery and ad-

justable resistance are shown at 16, 17. The electrical connections 18 and 19 electrically unite cold element *c*, and control element *e*, to opposite terminals of coil 10, and the condenser 12.

In operation by proper adjustment of battery, *x*, the heating means 16, 17 and the condensers, 12, the tube may be used as a detector, amplifier or generator of oscillations. When static or other effects tend to cause the tube to become "plugged," that is, to suspend its functions, the guard device prevents the accumulation of a charge on the interior of the walls of the tube, and thus maintains the device in operative condition.

While I have described only one modification of my improved device, I am aware that other modifications may be made by those skilled in the art and I desire protection for all such modifications as come within the scope of my claims.

What I claim is:

1. A vacuum tube device of the kind described, comprising an evacuated vessel, a hot electrode and a cold electrode sealed within said vessel, means for discharging a charge on the interior wall of said vessel, said means located intermediate said electrodes, and means whereby said first mentioned means is maintained at the same potential as said hot electrode.

2. A vacuum tube device of the kind described, comprising an evacuated vessel, a hot electrode and a cold electrode sealed within said vessel, a control element located outside said vessel in close proximity to its walls, a device for discharging a charge on the interior wall of said vessel, and means whereby said device is maintained at the same potential as a portion of said hot electrode.

3. A vacuum tube device of the kind described comprising an evacuated vessel, a hot electrode and a cold electrode sealed within said vessel, a control element located outside of the vessel, a metallic wire ring located within said vessel in close proximity to its walls, and means whereby said ring is maintained at the same potential as said hot electrode.

4. In a device of the character described, a vacuum chamber; a hot electrode, and a cold electrode, separated, sealed within said chamber, and so arranged that the mean distance between all parts of said electrodes is relatively great as compared with the distance between a point on one and a point on the other, in combination with a device located intermediate said elements for discharging a positive charge on the interior wall of said chamber, and means for maintaining said device at the same potential as said hot electrode.

5. In a device of the character described, a vacuum chamber; a hot electrode, and a cold electrode, separated, sealed within said chamber, and so arranged that the mean distance between all parts of said electrodes is relatively great as compared with the distance between a point on one and a point on the other in combination with a device located intermediate said two elements for discharging a charge on the interior wall of said chamber, means for maintaining said device at the same potential as said hot electrode, and a control electrode, located outside said chamber, in close proximity thereto.

6. In a device of the character described, a vacuum chamber, a hot electrode, and a cold electrode, separated and sealed within said chamber so that the mean distance between all parts of said electrodes is relatively great as compared with two points, one on each electrode, in combination with a ring shaped device located intermediate said electrodes for discharging a charge on the interior wall of said chamber and means for maintaining said ring at the same potential as said hot electrode.

7. The combination with a thermionic device of an external electrostatic control element therefor, and means for discharging a charge produced on the interior of said device when said element is charged.

8. The combination of a thermionic device having an anode and a hot cathode therein, of an electrostatic control element supported by the thermionic device for rapidly varying the value of the thermionic current between said electrodes, means for indicating changes in value of said current and means for discharging a charge produced on the inner surface of said device when said element is charged.

9. The combination with a thermionic device having an anode and a hot cathode therein, of an electrostatic control element associated with the thermionic device for rapidly varying the value of the thermionic current between said electrodes, means for indicating changes in value of said current and means for discharging a charge produced on the inner surface of said device when said element is charged, said means being electrically connected to a portion of said cathode.

10. The combination with a thermionic device having an anode and a hot cathode therein, of an external electrostatic control element therefor, and means for discharging a charge produced on the interior of said device when said element is charged, said discharging means being connected to said cathode.

11. The combination with a thermionic device having a spaced anode and cathode of an external electrostatic control element therefor extending the entire distance be-

tween said anode and cathode, and means for discharging a charge produced on the interior of said device when said element is charged.

12. As an article of manufacture, a thermionic device having an anode formed with a wire-like portion pointing toward the cathode having its end separated therefrom by a distance relatively small as compared with the average distance between said cathode and anode.

13. As an article of manufacture, a thermionic device having an anode formed with a substantially straight tip pointed toward a hot cathode having its end separated therefrom by a distance relatively small as compared with the average distance between said cathode and anode.

14. As an article of manufacture, a thermionic device having an anode formed with a substantially straight tip pointed toward a hot cathode, and a guard ring whose plane is close to the end of said anode and which is connected to said cathode.

15. As an article of manufacture, a thermionic device having an anode formed with a substantially straight tip extending toward the hot cathode, a guard ring whose plane is close to the end of said anode and which is connected to said cathode, and an external electrostatic control element.

16. A vacuum tube device of the kind described comprising an evacuated vessel, a heated filament and an electrode sealed within said vessel, a source of continuous current having its negative pole connected to said filament and its positive pole connected to said electrode, an electrostatic control element for the thermionic current, means for discharging a charge produced on the interior of said vessel when said control element is charged and means whereby said first means is maintained at the same potential as a part of said cathode.

17. A combination of an evacuated vessel having an anode and a hot cathode therein, of an electrostatic control element supported by said vessel in close relationship with the electron stream between said electrodes whereby the value of the thermionic current therebetween may be rapidly varied, means for discharging a charge produced on the interior wall of said vessel when said control element is charged and means whereby said first means is maintained at the same potential as a part of said cathode.

ROY ALEXANDER WEAGANT.